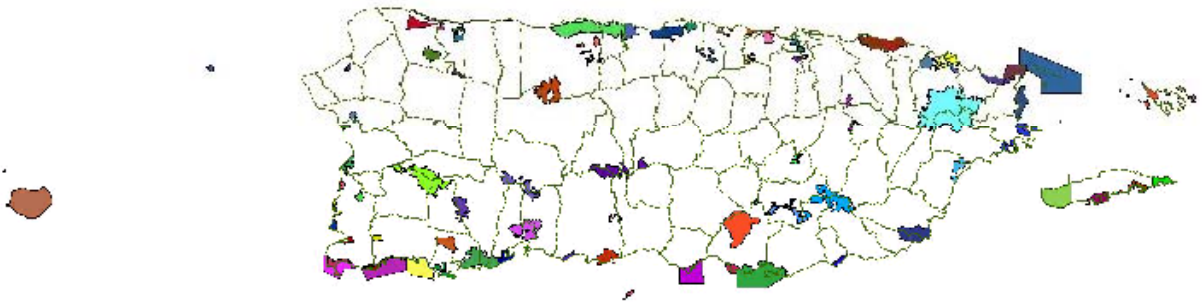


Puerto Rico Critical Wildlife Areas

*Commonwealth of Puerto Rico
Department of Natural and Environmental Resources
Bureau of Fish and Wildlife
Terrestrial Resources División
San Juan, Puerto Rico
January 2005*



*By: Eduardo A. Ventosa-Febles, María Camacho Rodríguez,
José L. Chabert Llompart, José Sustache Sustache
and Daniel Dávila Casanova*



Table of Contents

Acknowledgements	v
Dedicatory	vi
Preface	vii
Introduction	1
1) Las Cucharillas Marsh, Cataño	4
2) Buchanan Haystack Hills and Fort Buchanan Pond, Bayamón	10
3) Torrecillas-Piñones-Vacía Talega Swamp, Carolina-Canóvanas-Loíza	14
4) Barrio Borinquen, Trujillo Alto Lake, Bairoa La 25 and Gurabo River Mouth, Trujillo Alto-Caguas-Gurabo	21
5) Baja Swamp and Herrera River Mouth, Río Grande	25
6) Ensenada Comezón and Espíritu Santo River, Río Grande	29
7) Río Mar, Street # 968, Río Grande	35
8) Luquillo Mountain	38
9) San Miguel, La Paulina and El Convento Natural Area, Luquillo-Fajardo	43
10) Laguna Grande, Laguna Aguas Prietas and Adjacent Area, Fajardo	49
11) Fajardo Coast Line	53
12) La Cordillera Natural Reserve, Fajardo	56
13) Flamenco Peninsula, Culebra	60
14) Flamenco Lagoon, Culebra	61
15) Cornelio Lagoon, Culebra	62
16) Resaca Mountain, Culebra	66
17) Resaca Beach, Culebra	67
18) Brava Beach, Culebra	68

19) Larga Beach and Zoní Lagoon, Culebra	69
20) Maillux Pond, Culebra	73
21) Puerto del Manglar Inlet and Mangroves, Culebra	73
22) Los Caños Mangroves, Culebra	75
23) Cementerio Bay, Culebra	76
24) Culebra’s Surroundings Cays	76
25) Vieques West Coast	81
26) Ensenada Honda Mangroves, South Vieques	88
27) Yanuel Lagoon, South Vieques	92
28) Chiva Swamp, South Vieques	96
29) Tapón Bay, South Vieques	97
30) Ferro Bay, Mosquito Bay and Sombe Bay, South Vieques	101
31) East Tip of Vieques and Conejo Cay	106
32) Former Roosevelt Roads Naval Base, Ceiba	110
33) Ceiba State Forest.....	115
34) Humacao Natural Reserve, Humacao	119
35) Pandura Mountain Range, Yabucoa-Maunabo	125
36) Palmas Pond, Arroyo	130
37) Carite State Forest, Cayey	134
38) Cerro El Gato and Associated Areas, Cayey	139
39) Cidra Lake, Cidra	143
40) Aguirre State Forest, Punta Pozuelo, Cayos Caribes, Cayos La Barca and Mar Negro, Guayama-Salinas	147
41) Punta Arenas, Salinas	156
42) Salinas Training Area, Salinas	160

43) Punta Petrona Mangroves and Caracoles Cay, Santa Isabel	164
44) Cabuyón Mangroves and Fríos Cay, Ponce	168
45) Caja de Muertos Complex, Santa Isabel, Juana Díaz-Ponce	172
46) Serrallés Lagoons Complex, Juana Díaz-Ponce	177
47) Toro Negro State Forest, Ciales-Jayuya-Ponce-Juana Díaz-Orocovis	181
48) Las Salinas Lagoon / El Tuque, Ponce	186
49) Monte Guilarte State Forest, Adjuntas-Guayanilla-Peñuelas-Yauco	189
50) Punta Verraco, Cerro Toro and Punta Ventana, Guayanilla	195
51) Guayanilla Hills, Guayanilla	199
52) Guánica Lagoon, Guánica-Lajas	203
53) Guánica State Forest and Adjacent Lands	210
54) San Jacinto Salt Flats and Tamarindo Lagoon, Guánica	215
55) Susúa State Forest and Adjacent Lands, Yauco-Sabana Grande	219
56) La Parguera Natural Reserve, Lajas	223
57) Cartagena Lagoon, Lajas	230
58) Boquerón State Forest, Cabo Rojo	237
59) Boquerón Wildlife Refuge, Cabo Rojo	241
60) Cabo Rojo Salt Flats and Adjacent Areas, Cabo Rojo	247
61) Punta Guaniquilla Natural Reserve, Cabo Rojo	252
62) Joyuda Lagoon Natural Reserve, Cabo Rojo	257
63) Cuevas Lagoon, Cabo Rojo	262
64) Sabanetas Swamp/Caño Boquilla, Mayagüez	266
65) Maricao State Forest, Mayagüez-San Germán-Maricao-Sabana Grande	271
66) Mona Island	278

67) Monito Island	287
68) Pozo Hondo Swamp, Añasco	292
69) Cayures Swamp/Central Coloso, Aguada	296
70) Desecheo Island	300
71) Barrio Coto, Isabela	305
72) Guajataca Cliffs, Isabela-Quebradillas-Camuy	307
73) Guajataca State Forest, Isabela	312
74) Guajataca Lake, Isabela-San Sebastián-Camuy-Quebradillas	317
75) Barrio Cocos and Bellaca Creek, Quebradillas	321
76) Carrizales Mangroves, Hatillo	328
77) Tiburones Swamp and La Tembladera Pond, Arecibo	332
78) Cambalache State Forest, Arecibo-Barceloneta	340
79) Río Abajo State Forest, Arecibo-Utuado	346
80) Hacienda La Esperanza Natural Reserve, Manatí	349
81) Tortuguero Lagoon, Cabo Caribe Swamp and Rica Lake, Manatí-Vega Baja	354
82) Cibuco Swamp, Vega Baja	360
83) Vega State Forest, Vega Baja-Vega Alta	365
84) Lakes and Forests of Dorado, Dorado	368
85) Mogotes Río Lajas y Nevárez, Toa Baja	373
86) El Mameyal, Dorado	376
87) San Pedro Swamp, Toa Baja	379

Acknowledgements

Many individuals made this publication possible through the contributions of time and effort. We will like to thank all of the personnel of the Terrestrial Resources Division of the DNER for their help and support. The following people are particularly deserving of recognition. José Berríos, Cynthia Ruiz and Miguel García help in the manuscript and logistic support. This document was greatly benefited from comments by the different land managers from the Reserves, Refuges and Sanctuaries and the Forest Service Division. Thanks to Aida Rosario, Director of the Fisheries Research Laboratory (Bureau of Fish and Wildlife, DNER), for providing an office and materials to the project personnel. Mr. Vicente Quevedo from the Natural Heritage Program provides important information for the evaluation of some Critical Wildlife Areas. Also, the Natural Heritage Program provides the GIS layers and IKONOS for the maps. Ricardo López-Ortiz (Terrestrial Resources Division, DNER) provides invaluable support and encouragement. Personnel of the Yellow-Shouldered Blackbird Project provide equipment and field assistance. The Puerto Rican Ornithological Society Inc. (SOPI) provide important unpublished data (bird inventories) for some of the areas. Also we will like to thanks the personnel from the International Institute of Tropical Forestry: William Gould, Brick Fevold and Caryl Alarcón, for their comments and support of the final product. We apologize in the event that we have failed to acknowledge some individuals who have assisted with this project over the extended period of time required fort its completion.

This project was conducted concurrently with the tasks of the Puerto Rico Priority Habitat for Conservation Project (R-3.1) and sponsored by the U.S. Fish & Wildlife Service and the Puerto Rico Department of Natural and Environmental Resources.

Dedicatory

We honor to dedicate this joint effort to Mr. José Luis Chabert Llompart (Tito). Tito has been working in the DNER since 1976, and led the Terrestrial Resources Division since 1993 to December 2004. His love and dedication to our natural, environmental and human resources deserve our gratitude and simulation. To our adviser, friend and big brother....THANKS!

Preface

The Critical Wildlife Areas document (CWA) fulfills one of the most fundamental responsibilities of the Puerto Rico Department of Natural and Environmental Resources (DNER): to provide comprehensive information on important wildlife and habitat resources in Puerto Rico and associated islands. The DNER impart important wildlife and habitat information to local governments, state and federal agencies, private landowners and consultants for land use planning purposes. It is the intent of this document that areas of critical wildlife habitat be protected and preserved from degradation due to incompatible land use *in situ* or adjacent to the areas. While some species of wildlife can adapt to human encroachment to a certain extent, careful planning is needed to ensure that important wildlife habitats are not destroyed and that wildlife/human conflicts are minimized.

History of the development of Critical Wildlife Areas concept in Puerto Rico:

In 1974, Mr. Carlos Carrera (DNER, Area of Planning and Resource Analysis), in the first symposium of the DNER, introduces the initial effort of the CWA's. In his work title "Natural Critical Areas of Puerto Rico", he develops the concept of natural critical areas and the criteria for considering a natural area as critical. In 1979, Raffaele and Duffield (DNER, Area of Planning and Resource Analysis) documented the second effort in describing each of the island's most critical wildlife areas and the faunal features that establish the importance of each site. One year later, Moreno and Pérez (DNER, Scientific Research Area) prepared a supplement of the later document, including 18 additional habitats that were found to be of importance to wildlife. They also defined critical area as "any habitat that is indispensable for the survival of a species or group of species".

In 1983 the DNER began a Natural Heritage Program, with the support from The Nature Conservancy. The Natural Heritage Program compiled a list of "Critical Elements" of Puerto Rico's flora and fauna, endemic and/or extremely rare. As part of the Natural Heritage Program, they have a Conservation Data Center Program. This program was created within the DNER by Law 150, of August 4, 1988 with the following mission: *"To endow the Puerto Rico Department of Natural and Environmental Resources with a mechanism allowing the acquisition of areas of high natural value, to conserve and protect them for use and enjoyment by present and future generations of Puerto Ricans"*.

In 1988, Cardona and Rivera (DNER, Scientific Research Area) revise the status of the areas found in the coastal zone of Puerto Rico and its satellite islands that were included in the 1979 document and in the 1980 supplement. The study focused on areas supporting critically threatened or endangered wildlife species and those associated with wetlands and marine or aquatic habitats. The main purpose of that work was to assess changes in habitat quality and to incorporate information available on wildlife use that has become available after the publication of the 1979 document and 1980 supplement.

Introduction

After twenty years from the last revision, and understanding the meaningful of this document, we entitle the task to make a peer review of each critical wildlife area and generate a new actualized list. Some former CWA's were found to be degraded or lost, in such a way that were drop in rank or removed from the list, while others, which maintain their critical value, were recommended to be kept on that category or upgraded and ought their conservation. New areas were added resulting in an updated list of CWA. The majority of the State Forest, Refugees and Reserves were also included. For the description of these areas we use the Silander et al. 1986 and Negrón González 1988 documents.

Each CWA's were evaluated in terms of faunal composition of the areas. The criteria used for the evaluation of each area is the same as Raffaele and Duffield (1979); and are the following:

- 1) Is there one or more species unique to the locality and found nowhere else
- 2) Is the site of particular importance for breeding, roosting, feeding, or some other behavior even though the organism ranges elsewhere
- 3) Is the site a center of abundance for game or endangered species
- 4) Does the site have outstanding potential to be developed as (2) or (3) above

Other categories for evaluating each CWA's is the presence of species of limited distribution and/or game species. These categories are the same as Cardona and Rivera (1988) and are the following:

- 1) Species considered endangered or threatened under the Federal Endangered Species Act of 1973, as amended
- 2) Species considered endangered or threatened under the Regulation to Govern the Management of Threatened and Endangered Species in the Commonwealth of Puerto Rico (2004).
- 3) Species of importance to hunting, even their hunting is prohibited and do not belong to the above categories
- 4) Aquatic, wading and shorebirds, migrant or resident, which largely depend on coastal habitats up to about one kilometer inland.

This new version of the Puerto Rico Critical Wildlife Areas has significance changes in its format. For each area, the following parameters are described:

- Area Description
- Ownership/Protection
- Special Recognition
- Wildlife
 - Birds
 - Reptiles
 - Amphibians
 - Mammals
 - Fish
 - Invertebrates

Critical Plants
Threats
Conservation Recommendations
References
Map 1
Map 2

In the Area Description:, we identify the municipalities where the CWA lay, with its boundaries and geographic location, including land cover in hectares. Also, a description of the topography, life zone and plant associations among others are given for each area. For the Ownership/Protection section, we try to identify the owner(s) of the land and/or its administrator(s), and identified if any protection is applied. In the Special Recognition segment, we mention if the area was previously classified as a CWA, or any other recognition (i.e., Forest, Reserve, Important Bird Area, National Estuaries, etc.). Also, we mention its actual classification in terms of wildlife importance. We followed the 1979 and 1988 documents in classifying areas as primary or secondary importance to wildlife.

For the Wildlife segment, we document wildlife inventories available in the literature, forest or land manager's wildlife checklist, and census done by project personnel or other DNER employees or by the Puerto Rico Ornithological Society Inc. (SOPI). We did not considered agricultural or domesticated species as wildlife (i.e., Cows, Red junglefowl). Scientific and common names were obtained from the Integrated Taxonomic Information System (ITIS 2005), from PR-GAP Terrestrial Vertebrates Species List (USFS 2004), and from Nature Serve (2005). Wildlife considered in this document includes birds, reptiles, amphibians, mammals, fish, and invertebrates. Exotics species are also mentioned. Much of this information is contained in Agency reports and manuscripts. Those that we were able to obtain are cited in the document. This list does not intent to be a final wildlife inventories. For Critical Plants, we try to include plants of special concern (rare, threatened or endangered) inventories. For this we employ the same methods used for wildlife inventories.

In the Threats and Conservation Recommendations sections, we mention past and actual threats found in the areas and actual recommendations for each CWA. It intends to identify the main threats to the integrity of the CWA and recommended actions to protect/conservate the habitat for wildlife. For this, we use the following methodology: field observation, photo interpretation (IKONOS satellite images 2002), land managers interview, and literature review. In the Reference section, a list of literature cited (published and unpublished) used for the documentation of each CWA is presented. Unpublished literature includes departmental reports, memos, and checklist, among others.

For each area, we include two types of maps: the first map use the US Fish and Wildlife Service National Wetland Inventories, the Puerto Rico Roads, and the Puerto Rico Forest and Reserve layers. The second map is the corresponded IKONOS satellite image (using the same projection) of the CWA. Also, municipalities' boundaries, Priority Areas for Conservation, and other references data are show.

To ensure the accuracy of the information for each CWA, copy of our finding was sent to each land managers (U.S. Fish & Wildlife Service, P.R. Department of Natural and Environmental Resources, and to the P.R. Conservation Trust) to incorporate their review of the manuscript. Is our intention that this document is used as a primarily source of information for commonwealth and federal agencies whenever conservation of natural resources is an issue. The

Department of Natural and Environmental Resources and those other agencies that through out their ministry functions give or approve endorsements or permits should be aware that their action doesn't impact negatively this Critical Wildlife Areas.

Literature Cited

- Cardona, J. E. and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico. Department of Natural Resources. Puerto Rico Coastal Zone Management Program. Scientific Research Area. San Juan, Puerto Rico. 173 pp.
- Carrera, C. 1974. Natural Critical Areas of Puerto Rico. Primer Simposio del Departamento de Recursos Naturales. Estación Experimental Agrícola. Departamento de Recursos Naturales, San Juan, P. R. Pp.47-48.
- Departamento de Recursos Naturales y Ambientales. 2004. Reglamento para regir las especies vulnerables y en peligro de extinción en el Estado Libre Asociado de Puerto Rico. Departamento de Estado Número Reglamento 6766. ELA, DRNA, San Juan, P.R. 60 pp.
- ITIS. 2004. Integrated Taxonomic Information System. Smithsonian Institution/NMNH MRC – 0180. Washington, DC 20560-0180. URL: <http://www.itis.usda.gov/>
- Moreno, J. A and Pérez, R. 1980. First supplement to critical wildlife areas of Puerto Rico. Puerto Rico Department of Natural Resources, Scientific Research Division, San Juan, P.R. 16 pp.
- NatureServe Organization. 2005. 1101 Wilson Boulevard 15th Floor, Arlington, VA 22209. URL: <http://www.natureserve.org/>
- Negrón González, L. 1988. Lagunas de Puerto Rico. En Compendio Enciclopédico de los Recursos Naturales de Puerto Rico. Volumen 3. Por : José L. Vivaldi (Editor). Estado Libre Asociado de Puerto Rico. Departamento de Recursos Naturales. San Juan, Puerto Rico. 248 pp.
- Raffaele, H. and J. M. Duffield. 1979. Critical wildlife areas of Puerto Rico. Division of Fish and Wildlife Planning, Dept. of Natural Resources, Puerto Rico. 165 pp.
- Silander S.; Gil de Rubio, H.; Miranda, M and M. Vázquez. 1986. Los Bosques de Puerto Rico. Compendio Enciclopédico de los Recursos Naturales de Puerto Rico (Estudio IV). Volumen X. Tomo II. Estado Libre Asociado de Puerto Rico. Departamento de Recursos Naturales. Área de Investigaciones Científicas. San Juan, Puerto Rico. 389 pp.
- United State Forest Service. 2004. PR-GAP Terrestrial Vertebrate Species List. Report produced by USFS, International Institute of Tropical Forestry, Puerto Rico GAP Analysis Project.

Puerto Rico Critical Wildlife Areas

1- Las Cucharillas Marsh, Cataño, Puerto Rico

Area Description:

Las Cucharillas Marsh (LCM) is located in the municipalities of Cataño, Guaynabo and Bayamón. It covers approximately 500 ha consisting mostly of herbaceous wetlands. It also includes some mangroves and open water areas. The marsh serves as a floodplain for the Santa Catalina, Lajas and San Diego creeks that are connected to San Juan Bay through the Malaria Channel. The Aguas Frías Channel, which connects to the original Bayamón River Channel and the San Fernando Channel, also drain the Marsh. It has to the north the Palo Seco Peninsula, to the south Fort Buchanan, to the west it has the Palmas urban area and the Bayamón River and to the east it has the town of Cataño. LCM comprehends the biggest wetland in the metropolitan area. It serves an important role in flood control and water quality improvement. The marsh also serves as a filter, treating contaminants before they reach estuarine waters.

This marsh contains the highest diversity of waterfowl document in all the San Juan Bay Estuary (Rivera-Rentas 2003). Migratory species such as the American Black duck, the Green-wing teal, and the Ruddy duck have been reported. Also, the Yellow-shouldered blackbird, and endemic and endangered species, has been consistently observed in the marsh.

Ownership/Protection:

The Commonwealth of Puerto Rico owns some areas of this marsh and other areas are of private ownership. Recently, the Bacardí Corporation has transferred 4 ha of land in Las Cucharillas Marsh to the Universidad Metropolitana for a land preservation project. The land, which contains mangroves forests and wetlands, will be perpetually maintained as an environmentally protected area through deed restrictions and covenants consistent with a Land Management Work Plan that was developed for this project (USEPA 2004). The donation is part of a larger Las Cucharillas Marsh Environmental Project.

Special Recognition:

In 1979, the DNER designated part of LCM as a Wildlife Reserve. In 2004 the area is declared a Natural Reserve. In response to the current threats to the area and in recognition of its economic importance, several community organizations, such as the Comité Pro Rescate de Juana Matos and the Comité de Vecinos de Puente Blanco, have expressed their interest in managing the marsh as an ecotourism resource (Villanueva et al. 2000).

As important as it is for wildlife, LCM has an equally or superior role regarding flood protection and water quality improvement. The LCM is classified for the first time as a Critical Wildlife Area (henceforth CWA) of primary importance.

Wildlife:

Birds

American black duck *Anas rubripens*, Green-winged teal *A. crecca*, Northern Shoveler *A. clypeata*, White cheeked pintail *A. bahamensis*, Ruddy duck *Oxyura jamaicensis*, Caribbean Coot *Fulica caribaea*, Yellow shouldered blackbird *Agelaius xanthomus* (accidental). There is evidence of West Indian Whistling duck *Dendrocygna arborea* using two different wetland plants: Southern cattail *Typha domingensis* for roosting and Island leather fern *Acrosticum danaeifolium* for nesting (Bonilla 2004). Blue-winged teal *Anas discors*, Ring neck duck *A.*

collaris, American Wigeon *A. americana*, Mallard duck *A. platyrhynchos*, Masked duck *Nomonyx dominicus*, Lesser scaup *Aythya affinis*; Brown pelican *Pelecanus occidentalis*, Pied-billed grebe *Podilymbus podiceps*, Magnificent frigatebird *Fregata magnificens*, Great blue heron *Ardea herodias*, Green heron *Butorides virescens*, Cattle egret *Bubulcus ibis*, Great egret *Casmerodius albus*, Snowy egret *Egretta thula*, Little blue heron *E. caerulea*, Tricolored heron *E. tricolor*, Black-crowned night heron *Nycticorax nycticorax*, Yellow-crowned night heron *Nyctanassa violacea*, Least bittern *Ixobrychus exilis*, Red-tailed hawk *Buteo jamaicensis* Osprey *Pandion haliaetus*, Peregrine falcon *Falco peregrinus*, Merlin *F. columbarius*, American kestrel *F. sparverius*, Clapper rail *Rallus longirostris*, Sora *Porzana carolina*, Purple gallinule *Porphyryla martinica*, Common moorhen *Gallinula chloropus*, American coot *Fulica americana*, Piping plover *Charadrius melodus*, Killdeer *C. vociferus*, Black-necked stilt *Himantopus mexicanus*, Common snipe *Gallinago gallinago*, Spotted sandpiper *Actitis macularia*, Herring gull *Larus argentatus*, Laughing gull *L. atricilla*, Scaly-naped pigeon *Patagioenas squamosa*, Zenaida dove *Zenaida aurita*, White-winged dove *Z. asiatica*, Common ground dove *Columbina passerina*, Mangrove cuckoo *Coccyzus minor*, Smooth-billed ani *Crotophaga ani*, Short-eared owl *Asio flammeus*, Antillean Mango *Anthracothorax dominicus*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Caribbean Martin *Progne dominicensis*, Cave swallow *Hirundo fulva*, Red-legged thrush *Turdus plumbeus*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Puerto Rican Vireo *Vireo latimeri*, Yellow warbler *Dendroica petechia*, Adelaide's warbler *D. adelaidae*, Prairie warbler *D. discolor*, Northern waterthrush *Seiurus noveboracensis*, Bananaquit *Coereba flaveola*, Puerto Rican Spindalis *Spindalis portoricensis*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Yellow-faced grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, Saffron finch *Sicalis flaveola*, Grasshopper sparrow *Ammodramus savannarum*, Shiny cowbird *Molothrus bonariensis*, Greater Antillean Grackle *Quiscalus niger*, Greater Antillean Oriole *Icterus dominicensis*, Troupial *I. icterus*, Yellow-fronted canary *Serinus mozambicus*, Pin-tailed whydah *Vidua macroura*, House sparrow *Passer domesticus*, Orange cheeked waxbill *Estrilda melpoda*, Warbling silverbill *Lonchura malabarica*, Bronze mannikin *L. cucullata*, Nutmeg mannikin *L. punctulata*, Chestnut mannikin *L. malaca*, Java sparrow *Padda oryzivora* (Rivera Herrera 1996; 2000; 2001; 2002; Ventosa et al. 2005).

Reptiles

Puerto Rican ground lizard *Ameiva exsul*, Common anole *Anolis cristatellus*, Garden lizard *A. pulchellus*, Green iguana *Iguana iguana* (Rivera Herrera 1996; 2000; 2001; 2002).

Amphibians

Giant toad *Bufo marinus*, White-lipped frog *Leptodactylus albilabris*, Bullfrog *Rana catesbiana*, Antillean coqui *Eleutherodactylus antillensis*, Grass coqui *E. brittoni*, Common coqui *E. coqui* (Rivera Herrera 1996; 2000; 2001; 2002).

Threats:

In 1979, the DNER designated part of LCM as a Wildlife Reserve. However, such a designation has not protected the Marsh from being filled in due to Cataño's urban and industrial development pressures. Filling for residential, industrial, and storage facilities has continued in the marsh, threatening its fragile integrity. In addition to such pressures, LCM is being fragmented and endangered by the illegal disposal of solid wastes. Present threats include

proposed hydrological changes to the Malaria Channel that would drain part of the Marsh to provide space for industrial developments, urban sprawl and other human-induced changes.

Conservation Recommendations:

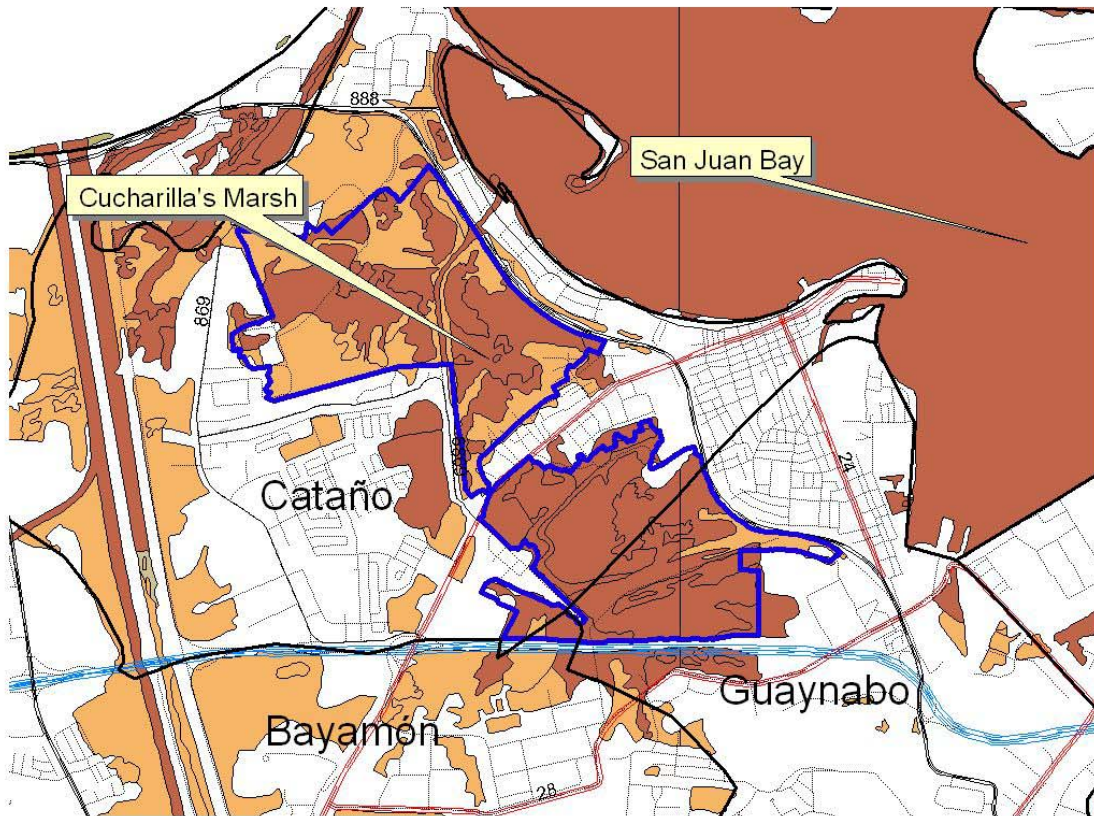
In 1999, the Project of “Las Cucharillas Marsh: Protection, Restoration and Management Plan” was implemented on behalf of the Puerto Rico Power Authority and the School of Environmental Affairs at the Universidad Metropolitana. Its goals are to establish a Land Acquisition Plan, and to restore, protect and manage LCM. The protection of the marsh as a green area will help buffer air emissions produced by several facilities such as the Puerto Nuevo and Palo Seco power plants in the Cataño area, where many residents suffer from asthma and other respiratory conditions (Villanueva et al. 2000).

References

- Bonilla, G. 2004. Distribution and population density of resident aquatic birds in Puerto Rico. Final performance report. Project T.1.1. Department of Natural and Environmental Resources San Juan, Puerto Rico. 26 pp.
- Morales, C.; Ch. Batista, T. Marrero, A. Díaz. G. Ortiz and C. Padín. 2003. Documento de Designación de la Reserva Natural Ciénaga Cucharillas. Ana G. Méndez University System, Universidad Metropolitana.
- Rivera Herrera, L. J. 1996. Lista de Flora y Fauna del Estuario de la Bahía de San Juan. Programa del Estuario de la Bahía de San Juan.
- Rivera Herrera, L. J. 2000. Tercer Censo Navideño de Aves del National Audubon Society realizado el 18 de diciembre de 2000. Programa del Estuario de la Bahía de San Juan.
- Rivera Herrera, L. J. 2001. Cuarto Censo Navideño de Aves del National Audubon Society realizado el 14 de diciembre de 2001. Programa del Estuario de la Bahía de San Juan.
- Rivera Herrera, L. J. 2002. Quinto Censo Navideño de Aves del National Audubon Society realizado el 18 de diciembre de 2000. Programa del Estuario de la Bahía de San Juan.
- Rivera-Rentas, A. 2003. First Annual Report Las Cucharillas Marsh: Protection, Restoration and Management Project. Ana G. Mendez University System. Universidad Metropolitana. Submitted to the Puerto Rico Energy Power Authority (PREPA).
- U.S. Environmental Protection Agency. 2004. Region 2 News & Speeches. Property transfer in Cataño area das valuable land for preservation to Las Cucharillas Marsh. Wednesday, November 24, 2004.
- Ventosa, Eduardo A.; M. Camacho, J.L. Chabert, J. Sustache and D. Dávila. 2005. Puerto Rico Waterfowl Focus Areas Puerto Rico Department of Natural and Environmental Resources; North American Waterfowl Management Plan and Atlantic Coast Joint Venture. 82 pp.

Villanueva, E., L. J. Rivera-Herrera, S. Rivera-Colón, M. Tacher-Roffe, C. Guerrero-Pérez, and C. Ortiz-Gómez. 2000. Comprehensive Conservation and Management Plan for the San Juan Bay Estuary. San Juan Bay Estuary Program Office. U.S. Army Corps of Engineers Building, San Juan, P.R. 420 pp.

Cucharilla's Marsh



- Municipios.shp
- Areas con prioridad de conservacion.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

Cucharilla's Marsh



-  Municips.shp
-  Areas con prioridad de conservacion.shp

2- Buchanan Haystack Hills and Fort Buchanan Pond, Bayamón, Puerto Rico

Area Description:

The Buchanan haystack hills and the Buchanan freshwater pond are located in the grounds of Fort Buchanan. The haystack hills are habitat for the boa and the pond is important habitat for waterfowl (Cardona and Rivera 1988). The Buchanan haystack contains 146 ha of forested karts habitat. This area, during late 70's, was partially destroyed as a result of a highway construction. The Fort Buchanan Pond has an area of approximately 3.2 ha (Molinaris 1981). Although it is property of the San Juan Cement Company, the artificial pond is surrounded by facilities of Fort Buchanan. Molinaris (1981) described the composition of the vegetation surrounding the pond and documented reproduction of the state vulnerable Ruddy Ducks. There is no evidence of significant changes in the area within Fort Buchanan relative to 1980.

Ownership/Protection:

The majority of the area is an Army Base Camp, administered by the U.S. Department of Defense. Part of the Buchanan Haystack Hills area is a passive park, administered by the Park Trust of Puerto Rico since 1993. It is actually Enrique Monagas Park, which includes a passive recreational area and a horse riding area.

Special Recognition:

Buchanan Haystack Hills was first classified as CWA in the 1980 (Moreno and Pérez 1980). They classified it as a CWA of secondary importance because was heavily deteriorated. In 1988 (Cardona and Rivera) classified it as primary CWA. The Fort Buchanan Pond was classified as primary CWA in the 1980 and 1988 (Moreno and Pérez; Cardona and Rivera, respectively). Today, these areas represent an important habitat for the endangered Puerto Rican Boa, and we will continue to classify it as a primary CWA.

Wildlife:

Birds at Buchanan Haystack Hills

In a recent study performed by DNER from 1997-1999; thirty five bird species were identified in Monagas Park: Zenaida dove *Zenaida aurita*, Common ground dove *Columbina passerina*, Stripe headed tanager *Spindalis portoricensis*, Bananaquit *Coereba flaveola*, Pearly eye thrasher *Margarops fuscatus*, Smooth-billed ani *Crotophaga ani*, Black-cowled oriole *Icterus dominicensis*, Adelaide's warbler *Dendroica adelaidae*, Scaly-napped pigeon *Patagioenas squamosa*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Northern mockingbird *Mimus polyglottos*, Gray kingbird *Tyrannus dominicensis*, Black-whiskered vireo *Vireo altiloquus*, Puerto Rican Vireo *V. latimeri*, Red-legged thrush *Turdus plumbeus*, Red-tailed hawk *Buteo jamaicensis*, Mangrove cuckoo *Coccyzus minor*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Antillean Mango *Anthracothorax dominicus*, Green mango *A. viridis*, Caribbean Martin *Progne dominicensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Black-faced grassquit *Tiaris bicolor*, Yellow-faced grassquit *T. olivacea*, Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, Saffron finch *Sicalis flaveola*, Nutmeg mannikin *Lonchura punctulata*, Bronze mannikin *L. cucullata*, Orange cheeked waxbill *Estrilda melpoda*, Pin-tailed whydah *Vidua macroura*, Canary winged parakeet *Brotogeris versicolurus*, Blue and gold macaw *Ara ararauna*, Umbrella cockatoo *Cacatua alba* (Data from Study W-19, Terrestrial Resources Division, DNER, 1999).

Birds in the Fort Buchanan Pond

The vulnerable Ruddy duck *Oxyura jamaicensis*, Little blue heron *Egretta caeurulea*, Great blue heron *Ardea herodias*, Pied-billed grebe *Podilymbus podiceps*, Common moorhen *Gallinula chloropus* (Cardona and Rivera 1988).

Reptiles

The endangered Puerto Rican boa *Epicrates inornatus* and the Puerto Rican giant anole *Anolis cuvieri* are very common in the haystack hills; the Puerto Rican slider *Trachemys stejnegeri* is common in the pond (Cardona and Rivera 1988).

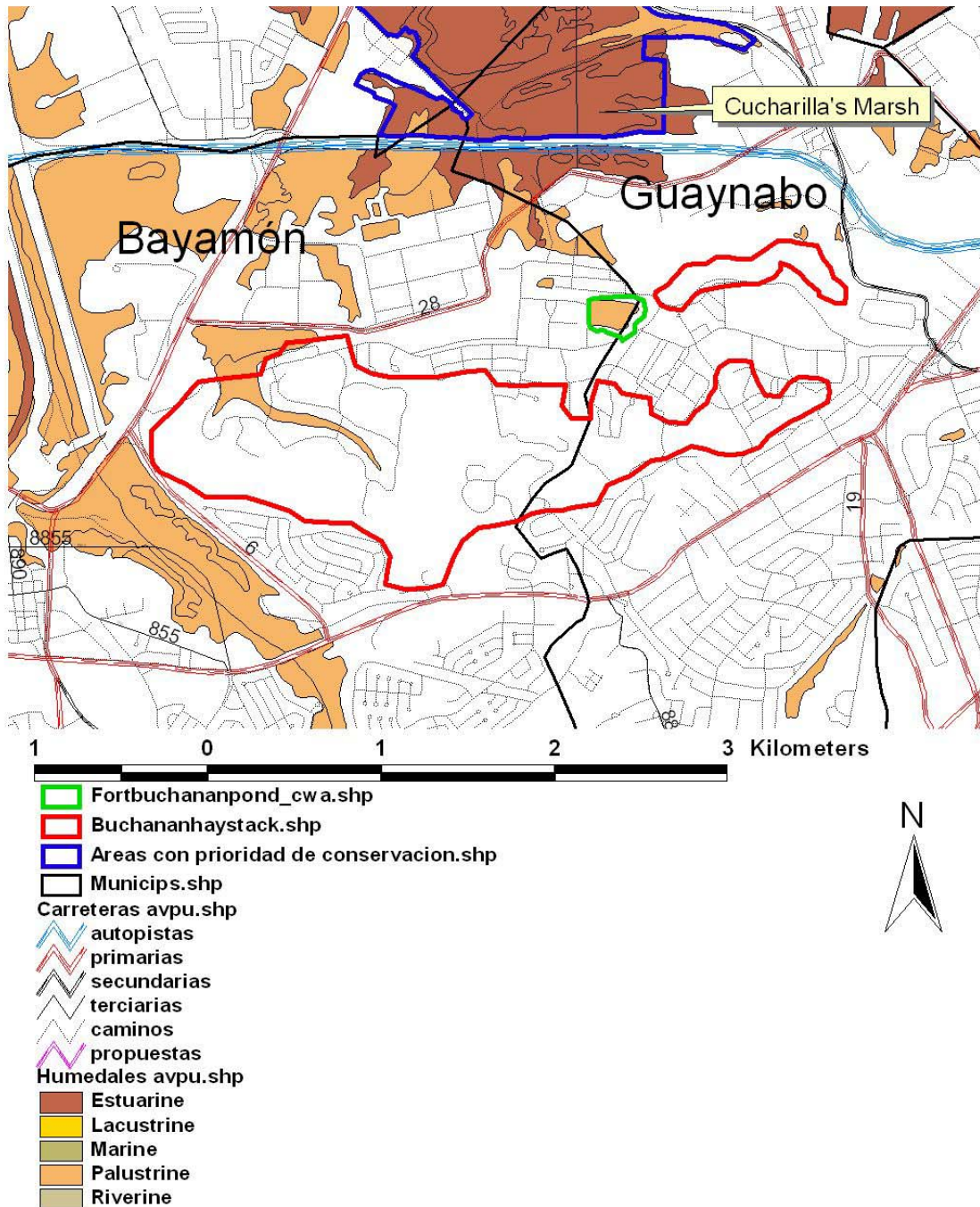
Threats:

Currently, these areas are relatively well protected by the Administration of the Fort Buchanan Army Base. The Puerto Rican boa population may be threatened by urban development in the area. Some parts of the mogotes were removed in the 1980's for construction materials, resulting in habitat loss for the wildlife. In the Fort Buchanan freshwater pond, there have been several attempts to develop the pond for recreational purposes in the past. Those development purposes are still present in these days.

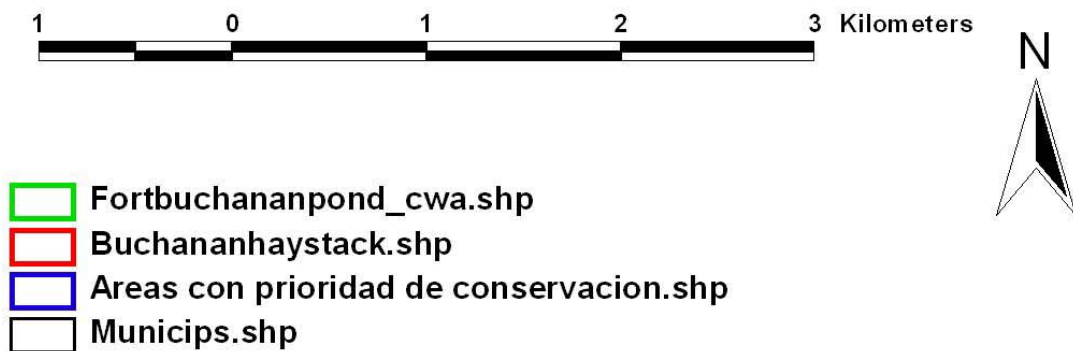
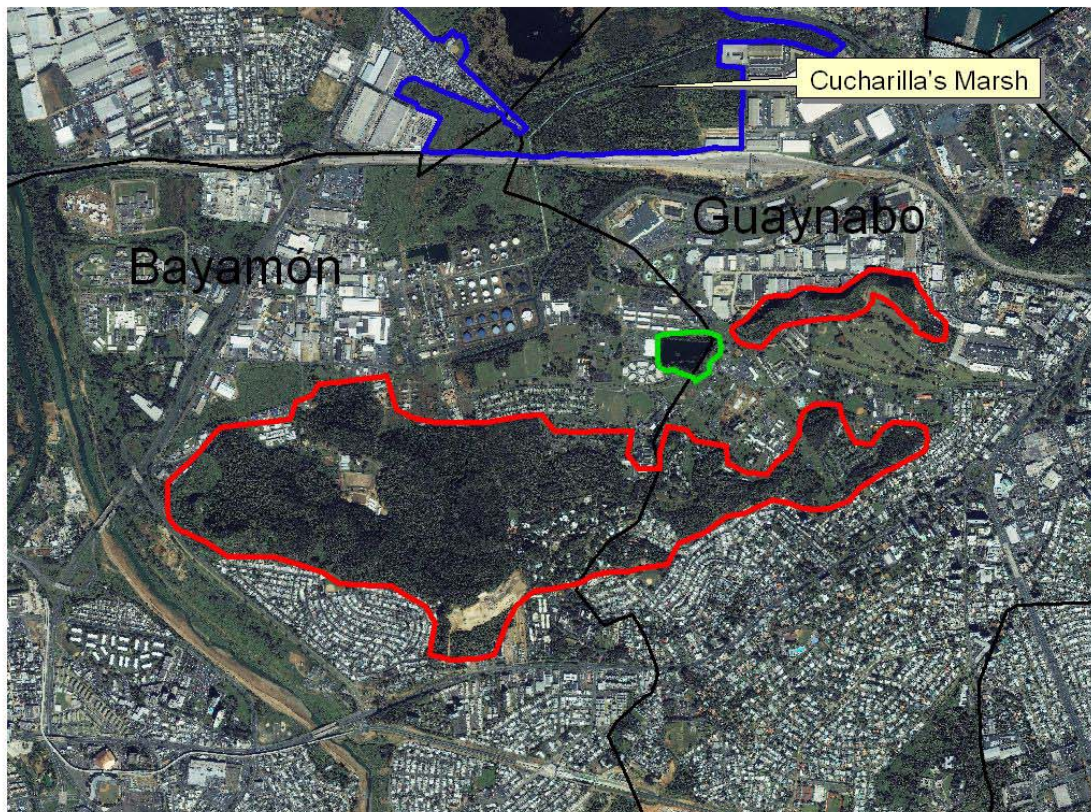
References:

- Camacho, M., López, M. and J. Chabert. 1997. Final Report Project W-19 "Exotic Established Species in the Wildlife". Puerto Rico Department of Natural & Environmental Resources, Terrestrial Resources Division. San Juan, P.R. 00906. 52 pp.
- Molinares, A. 1981. Reproduction and Morphology of the West Indian Ruddy Duck in Puerto Rico. MS Thesis. Oklahoma State University.

Buchanan Haystack Hills and Fort Buchanan Pond



Buchanan Haystack Hills and Fort Buchanan Pond



3- Torrecillas-Piñones-Vacía Talega Swamp System, Carolina-Loíza-Canóvanas, Puerto Rico

Area Description:

The complete area covers 4,047 ha in size, and together with the Piñones Forest, the Torrecillas region contains the largest mangrove forest system in the Island of Puerto Rico (PR Planning Board 1992; San Juan Bay Estuary Program Office 2000). It's located between the municipalities of Loíza, Carolina and Canóvanas. Other habitats present in the area are: coastal zone, sand dunes, karst hills, coconut plantations, littoral woodland, lagoons and wetlands (Scott and Carbonell 1986). Estuarine and palustrine types of wetlands dominate the area, there is also a *Pterocarpus officinalis* swamp forest; marshes and temporary ponds. The *Pterocarpus* forest covers 21.62 ha, and it is characterized because it's flooded and covered in 40% by woody vegetation. Two big lagoons are included: Piñones Bioluminescent Lagoon and Torrecillas Lagoon, which are interconnected by the Piñones Channel. Torrecillas Lagoon is the biggest Lagoon and has an exit to San Jose Lagoon, through the Suárez Channel. The San José Lagoon exits to the San Juan Bay through the Martín Peña Channel (PR Planning Board 1992).

Being the biggest mangrove forest system in the Island, the area is home for a wide variety of wildlife that includes birds, fish, reptiles, mollusks and crustaceans. It also protects the coastal zone from flooding and function as a big lung in the metropolitan area of Puerto Rico. The wetlands of this CWA store and filter flood waters produced by the Río Grande de Loíza and by heavy seas, as well as the runoff from adjacent uplands (Villanueva et al. 2000).

General vegetation includes mangrove forest, *Pterocarpus officinalis* wetland forest, herbs species like *Typha domingensis*, *Cladium jamaicensis*, *Acrostichum* spp. and *Cyperus giganteus*. Others sectors support *Eichhornia crassipes*, *Pistia stratiotes*, *Nymphaea* spp. and *Lemna perpusilla*. In the sandbar a littoral evergreen forest with coconut field plantation can be observed (Del Llano et al. 1980).

This mangrove system includes channels and several islets that possess distinctive characteristics, among them are the islets Punta Larga and Punta Mosquito in the Torrecillas Lagoon and the Carmelita islet in the Piñones Lagoon. Another islet in the area is Juan Pérez, which possess peculiar characteristics. The islets Punta Larga, Punta Mosquito and Carmelita are characterized by the presence of mangrove forest. Carmelita is an important habitat for some birds, there is a colony of Cattle egret *Bubulcus ibis* that nests in this islet all year around, and also supports the biggest population of Snowy egret *Egretta thula* in the Island of Puerto Rico (Raffaele and Duffield 1979; PR Planning Board 1992).

Ownership/Protection:

The Commonwealth's Land Administration owns a portion of the area (approximately 1024 ha) and the rest is privately owned.

Special Recognition:

The Piñones State Forest portion of this area (631 ha) was established in 1918. In 1974 a Management plan was created for the Forest and for 1450 ha in the east (Silander et al. 1986). The U.S. Fish and Wildlife Service recognized one wetland as priority under the federal Emergency Wetlands Resources Act of 1986: Torrecilla Baja/Alta. This system supports the federally endangered hawksbill and leatherneck turtles, and is home to several other federally endangered species, including the West Indian manatee, Yellow-shouldered blackbird, and Brown pelican. Much of this area is included in Unit PR-87 of the Coastal Barrier Resources Program. Additionally, a portion (approximately 1024 ha) of this large and complex area was

designated a Natural Reserve in 1979. Mainly because of the role of The Torrecillas-Piñones-Vacia Talega Swamp System for migrant and resident wading and shorebirds, it is classified as a primary CWA. The DNER Natural Heritage Program has classified the whole area as a Special Planning Area, because of the importance for the wildlife (Puerto Rico Planning Board 1992).

Wildlife:

Birds

The area has been declared as primary habitat for the birds of Puerto Rico. The avian richness of Piñones and Torrecillas is well documented, supporting a large number of herons and egrets roosting in this place (Raffaele and Duffield 1979). Ninety-five bird species have been reported (Pérez and Ferrer 1983), including a big population of Brown pelican *Pelecanus occidentalis* and a population of Least Tern *Sterna antillarum*. There are also reports of the presence of West Indian Whistling duck *Dendrocygna arborea* and Masked duck *Nomonyx dominicus*. All of these bird species has low population numbers in the Island of Puerto Rico and are protected by endangered species laws.

Some other birds reported in the area includes: Pied-billed grebe *Podilymbus podiceps*, Brown booby *Sula leucogaster*, Double crested cormorant *Phalacrocorax auritus* (accidental), (Cardona and Rivera 1988); Frigate bird *Fregata magnificens*, Great blue heron *Ardea herodias*, Cattle egret *Bubulcus ibis*, Great egret *Egretta alba*, Snowy egret *E. thula*, Little blue heron *E. caerulea*, Yellow-crowned night heron *Nyctanassa violacea*, Least bittern *Ixobrychus exilis*, Glossy ibis *Plegadis falcinellus*, Hooded merganser *Lophodytes cucullatus*, Fulvous whistling duck *Dendrocygna bicolor*, Blue-winged teal *Anas discors*, Lesser scaup *Aythya affinis*, Red-tailed hawk *Buteo jamaicensis*, American kestrel *Falco sparverius*, Peregrine falcon *F. peregrinus*, Osprey *Pandion haliaetus*, Clapper rail *Rallus longirostris*, Sora rail *Porzana carolina*, Purple gallinule *Porphyryla martinica*, Common gallinule *Gallinula chloropus*, American coot *Fulica americana*, Caribbean Coot *F. caribaea*, American oyster catcher *Haematopus palliatus*, Semipalmated plover *Charadrius semipalmatus*, Wilson plover *C. wilsonia*, Black-bellied plover *Pluvialis squatarola*, Ruddy turnstone *Arenaria interpres*, Common snipe *Gallinago gallinago*, Spotted sandpiper *Actitis macularia*, Greater yellowlegs *Tringa melanoleuca*, Lesser yellowlegs *T. flavipes*, Sanderling *Calidris alba*, Dowitcher *Limnodromus griseus*, Black-necked stilt *Himantopus mexicanus*, Laughing gull *Larus atricilla*, Royal tern *Sterna maxima*, Sandwich tern *S. sandvicensis*, Black tern *Chlidonias niger*, White-crowned pigeon *Patagioenas leucocephala*, Zenaida dove *Zenaida aurita*, White-winged dove *Z. asiatica*, Ground dove *Columbina passerina*, Rock pigeon *Columba livia*, Monk parakeet *Myiopsitta monachus*, Mangrove cuckoo *Coccyzus minor*, Smooth-billed ani *Crotophaga ani*, Green throated carib *Eulampis holosericeus*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Puerto Rican Vireo *Vireo latimeri*, Black-whiskered vireo *V. altiloquus*, Prothonotary warbler *Protonotaria citrea*, Northern parula *Parula americana*, Yellow warbler *Dendroica petechia*, Cape may warbler *D. tigrina*, Prairie warbler *D. discolor*, Palm warbler *D. palmarum*, Black and white warbler *Mniotilta varia*, American Redstart *Setophaga ruticilla*, Ovenbird *Seiurus aurocapilla*, Northern waterthrush *S. noveboracensis*, Common yellowthroat *Geothlypis trichas*, Bananaquit *Coereba flaveola*, Greater Antillean Grackle *Quiscalus niger*, Greater Antillean Oriole *Icterus dominicensis*, Glossy cowbird *Molothrus bonariensis*, Yellow-faced grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Hooded weaver finch *Lonchura cucullata*, Tricolored nun *L. malacca*, Orange cheeked waxbill *Estrilda melpoda*, Grey kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Puerto Rican Flycatcher *Myiarchus antillarum*, Caribbean elaenia *Elaenia martinica*, Cave swallow

Petrochelidon fulva, Barn swallow *Hirundo rustica*, Caribbean Martin *Progne dominicensis*, Antillean mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Red-legged thrush *Turdus plumbeus*. The yellow-shouldered blackbird *Agelaius xanthomus* has been reported as an accidental bird (Pérez and Ferrer 1980).

Reptiles

Crested anole *Anolis cristatellus*, Barred anole *A. stratulus*, Common grass anole *A. pulchellus*, Puerto Rico ground lizard *Ameiva exsul*, Puerto Rican slider *Trachemys stejnegeri*, Puerto Rican boa *Epicrates inornatus* in the karst hills areas and upland areas south of Vacía Talega (J. Chabert pers. comm.). Leather back turtles *Dermochelys coriacea* and Hawksbill turtles *Eretmochelys imbricata* nests in the sandy beaches of the area (Cardona and Rivera 1988).

Amphibians

Giant toad *Bufo marinus*, Bullfrog *Rana catesbeiana*, Common coqui *Eleutherodactylus coqui*, Antillean coqui *E. antillensis* and White-lipped frog *Leptodactylus albilabris* (DRN 1985).

Mammals

West Indian Manatee *Trichechus manatus*.

Fish

About 38 species of fish have been identified, these include: Barbudo *Polydactylus virginicus*, Pargo rubio *Lutjanus apodus* among others.

Crustaceans

Blue land crab *Cardisoma guanhumi*, *Callinectes sapidus*, *Macrobachium carcinus*, *Aratus pisoni*, *Goniopsis cruentata*, *Ucides cordatus*, *Uca spp.*, *Grapsus grapsus*, *Xiphocaris elongate* and *Atya spp.*

Threats:

These terrains have severe development pressure since 1960's and have been in jeopardy because of the construction of mega hotels. The natural landscape provides the perfect setting for the development of recreational activities. Due to this setting, this CWA has been under severe development pressure for many years. The construction of a bridge over the Loíza River and the widening and paving of road 187 connecting Loíza and Piñones have greatly increased vehicular traffic movement through the area.

Also there is great pressure for development of large tracts of privately owned lands, especially in the eastern end of the Forest and the Vacía Talega sector which is one of the little upland available in the Torrecillas-Piñones-Vacía Talega Swamp System. Urban development of the only upland tracts of the sector will eliminate the biotic elements from this system. The development of intense land use activities such as condos, hotels, and housing units would certainly degrade the area's natural resources, which, in turn, would negatively impact present and proposed uses (Villanueva et al. 2000).

Upscale urbanization developments and hotels are being proposed for private sectors within the eastern portion of the proposed Natural Reserve of Torrecilla Alta. These projects receive public and political support, apparently because they believe the Natural Reserve is limiting that town's economic development. Other threat of the area is the presence of coliforms

in the waters that enter through the Blasina Channel to the mangrove system because of unsuitable disposition of organic waste materials from houses and shops inside the area of special planning (P.R. Planning Board 1992).

Conservation Recommendations:

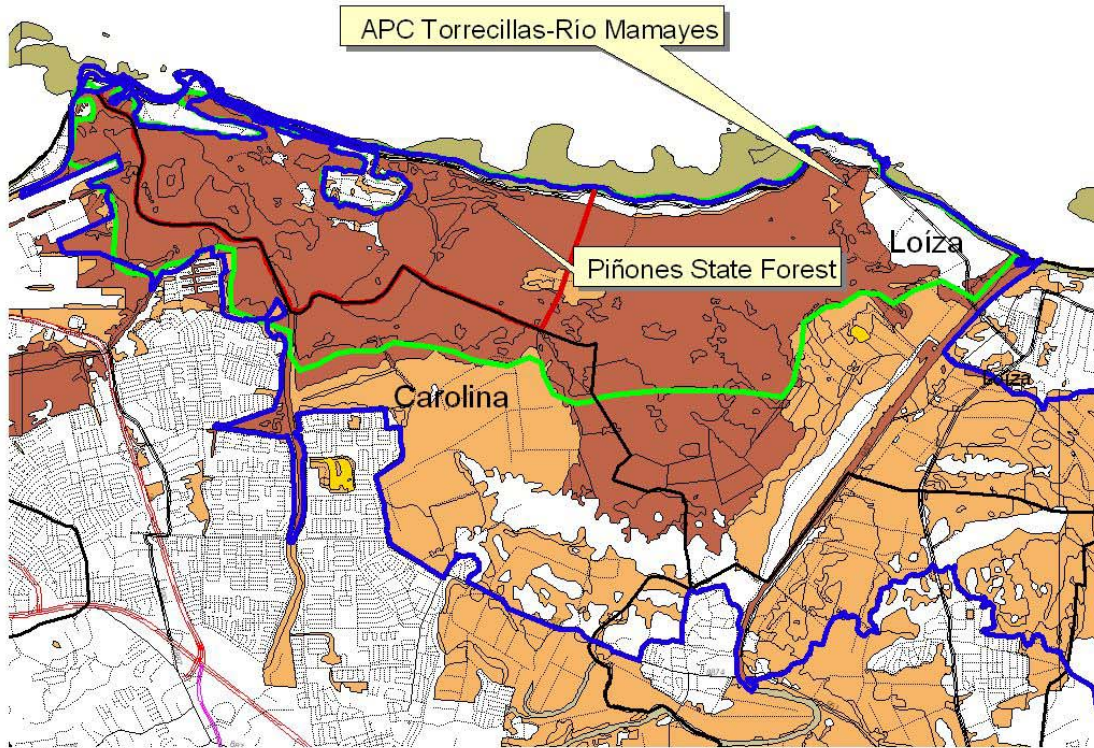
Is highly recommended to expand the Piñones State Forest and designate the Piñones-Torrecilla-Vacía Talega area as a Natural Reserve. Mechanism and recommendations for land acquisition was already developed by the Natural Heritage Program (DRNA 1993). A plan should be developed that incorporates the community's needs and ensures its participation in the management of the reserve. Development in the area should be limited to protect the aesthetic and natural values of the region.

References:

- Cardona-Pérez, M. 1983. Documento de Designación Reserva Natural de Torrecilla Alta. Departamento de Recursos Naturales. Planificación de Recursos Costaneros, Pesca y Vida Silvestre. Programa de Manejo de la Zona Costanera, San Juan, Puerto Rico.
- Del Llano, M.; Woodbury, R. y G. Cintrón. 1980. Flora del Bosque de Piñones. Borrador preliminar. Departamento de Recursos Naturales. San Juan, Puerto Rico.
- Departamento de Recursos Naturales. 1979. Los Sistemas de Mangles en Puerto Rico. Programa Manejo de Zona Costanera.
- _____. 1985. Documento de Designación Reserva Natural Torrecilla Alta. Programa de Manejo de Zona Costanera.
- _____. 1993. Recomendaciones de mecanismos de adquisición para el Área Natural de Vacía Talega-Piñones-Torrecilla Alta (Proyecto F-22). Estado Libre Asociado de Puerto Rico, Departamento de Recursos Naturales, División de Patrimonio Natural. 48 pp.
- Pérez, N. and H. Ferrer. 1980. Avifauna-Informe Técnico, Área de Planificación Especial de Piñones. División de Planificación de Recursos Costaneros, Pesca y Vida Silvestre, Departamento de Recursos Naturales.
- Puerto Rico Planning Board. 1992. Plan de Manejo del Área de Planificación Especial de Piñones. Estado Libre Asociado de Puerto Rico. Oficina del Gobernador. Junta de Planificación.
- San Juan Bay Estuary Program Office. 2000. Comprehensive Conservation and Management Plan for the San Juan Bay Estuary. Funded by the USEPA; PRDNER and PREQB. 420 pp.
- Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge

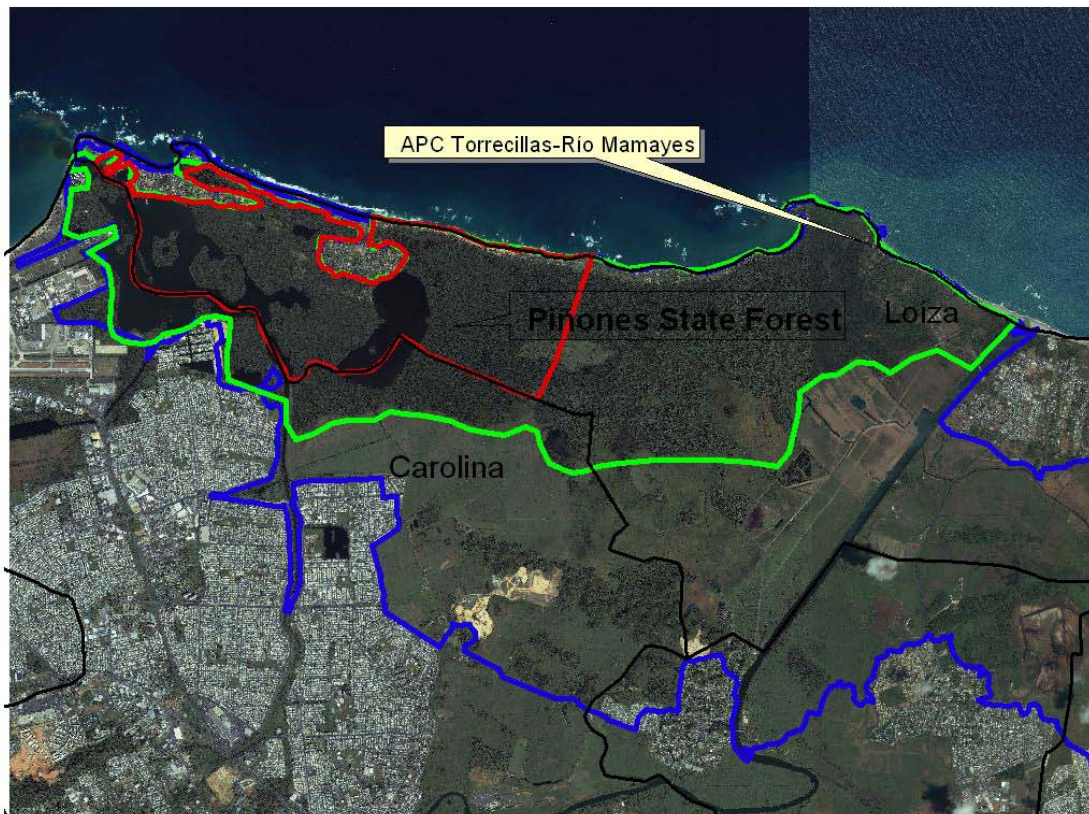
Villanueva, E., L. J. Rivera-Herrera, S. Rivera-Colón, M. Tacher-Roffe, C. Guerrero-Pérez, and C. Ortiz-Gómez. 2000. Comprehensive Conservation and Management Plan for the San Juan Bay Estuary. San Juan Bay Estuary Program Office. U.S. Army Corps of Engineers Building, San Juan, P.R. 420 pp.

Torrecillas Swamp System







- ▭ Areas con prioridad de conservacion.shp
- Municips.shp
- Torrecillascwa.shp
- Bosques_y_reservas.shp
- Carreteras avpu.shp
 - ▬ autopistas
 - ▬ primarias
 - ▬ secundarias
 - ▬ terciarias
 - ▬ caminos
 - ▬ propuestas
- Humedales avpu.shp
 - ▭ Estuarine
 - ▭ Lacustrine
 - ▭ Marine
 - ▭ Palustrine
 - ▭ Riverine

Torrecillas Swamp System



3 0 3 6 Kilometers



-  Municips.shp
-  Bosques_y_reservas.shp
-  Torrecillascwa.shp
-  Areas con prioridad de conservacion.shp

4- Barrio Borinquen, Trujillo Alto Lake, Lake Bairoa La 25 and Gurabo River Mouth, Trujillo Alto-Caguas-Gurabo, Puerto Rico

Area Description:

Located in the municipalities of Trujillo Alto, Gurabo and Caguas, the Trujillo Alto Lake and the Bairoa Lake are nourished by the Río Grande de Loíza River. Several water bodies such as Río Grande de Loíza, Río Caguitas, Río Bairoa and Lago Carraízo runs through the area. The vegetation in the area is dense and Bamboo trees are common in the area.

Ownership/Protection:

Mostly private properties; the rivers are of public domain and the lakes are property of the Puerto Rico Water Authority.

Special Recognition:

This area was included as a CWA in 1980 because of the presence and nesting area of the Puerto Rican Plain pigeon (PRPP) *Patagioenas inornata wetmorei* (Moreno and Pérez 1980). According to the biological data of the DNER Heritage Division (Quevedo and Beltrán 2000), there is an area known as “Altos de San Luis”, which have extensive stands of Bamboo tree and secondary forest, where PRPP nests, sleeps and feeds. Because the habitat of the PRPP has been reduced principally by urban development, we classified this area as a primary for the survival of the species.

Wildlife:

Birds

For the Trujillo Alto Lake, Purple gallinule *Porphyryla martinica*, Caribbean Coot *Fulica caribaea* and Least grebe *Tachybaptus dominicus* are reported. In 1959, the Limpkin *Aramus guarauna* was last recorded from this area (Raffaele 1989).

In Bairoa Lake there is presence of: Black-crowned night heron *Nycticorax nycticorax* nesting in the area, Great blue heron *Ardea herodias*, Little blue heron *Egretta caerulea*, Snowy egret *E. thula*, Tricolored heron *E. tricolor*, Puerto Rican Plain pigeon *Patagioenas inornata*, West Indian tree duck *Dendrocygna arborea*. Gurabo river mouth is one of few areas where the Greater Yellowlegs *Tringa melanoleuca* is found year round in Puerto Rico (Moreno and Pérez 1980).

Threats:

Some of the threats affecting the area are water pollution by solid wastes and urban development. Lake Bairoa La 25 is highly polluted by organic and inorganic pollutants. The area mentioned above which is called “Altos de San Luis” is been affected due to the development of the residential project “Haciendas del Lago” (Quevedo and Beltrán 2000).

Conservation Recommendations:

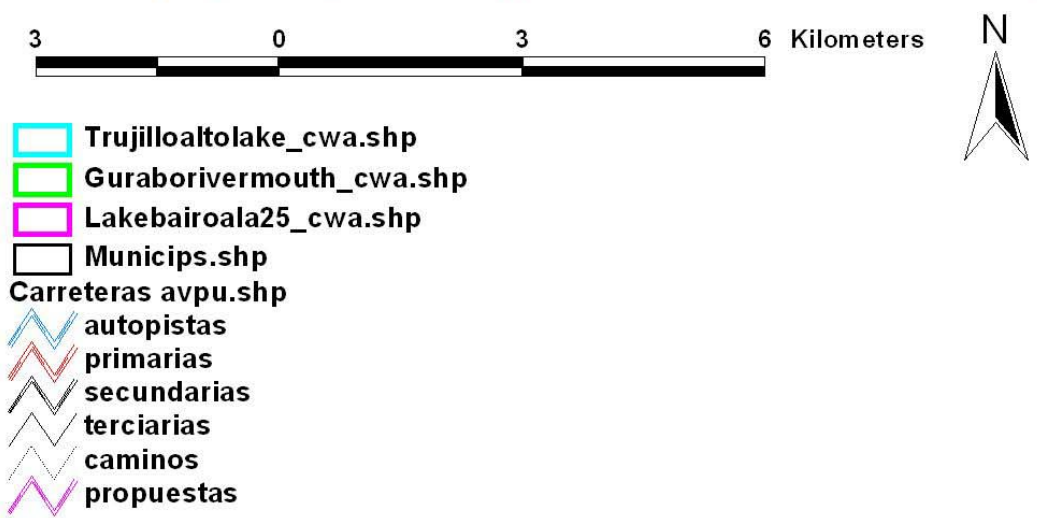
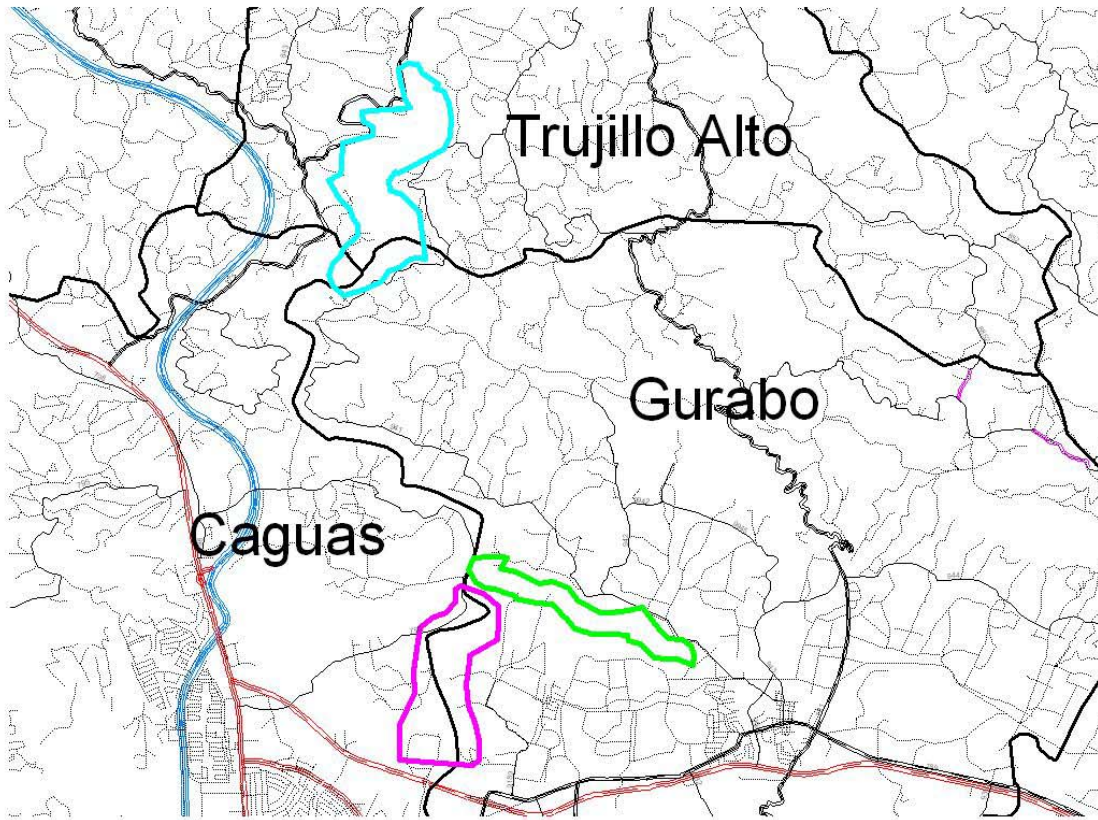
The breeding habitats for the PRPP have been highly degraded or modified. In order to protect this species, these lands should be acquired by the DNER and a management plan should be developed.

References:

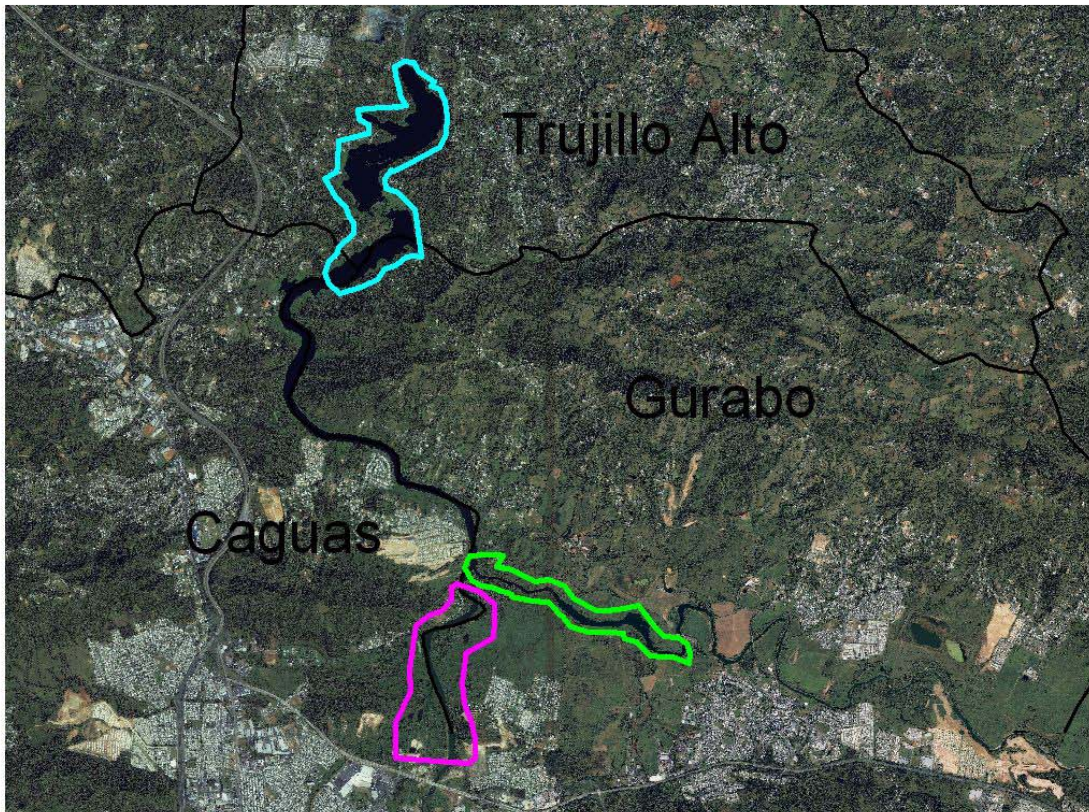
Quevedo Bonilla, V. and Beltrán Burgos. 2000. Delimitación del hábitat de la Paloma sabanera *Columba inornata wetmorei* dentro de los municipios de Cidra, Comerío y Caguas, Puerto Rico. Departamento de Recursos Naturales y Ambientales. Área de Planificación Integral. División de Patrimonio Natural. San Juan, Puerto Rico. 73 pp.

Raffaele, H.A. 1989. A guide to the birds of Puerto Rico and the Virgin Islands. Princeton University Press, Princeton, New Jersey. 254 pp.

Barrio Borinquen, Trujillo Alto Lake, Bairoa La 25 Lake and Gurabo River Mouth



Barrio Borínquen, Trujillo Alto Lake, Lake Bairoa La 25, and Gurabo River Mouth



-  Trujilloaltolake_cwa.shp
-  Guraborivermouth_cwa.shp
-  Lakebairoala25_cwa.shp
-  Municipips.shp

5- Baja Swamp and Herrera River Mouth, Río Grande, Puerto Rico

Area Description:

Located in the municipality of Río Grande, southwest to the Berwind Golf Course in Loíza, the area consists of freshwater swamp and the Herrera River mouth (Cardona and Rivera 1988). The system connects to the Espíritu Santo River through the San Luis Channel. The 2002 aerial photo shows that the area is drier than in previous years. Although this area is not well studied, it is known to have some importance to waterfowl (Raffaele and Duffield 1979).

The area has an extension of approximately 172.80 ha of mangroves. David Ramos (DNER Terrestrial Resources Division Biologist) has studied the area for more than 18 years and considers this area as a priority area for acquisition in order to perform management for waterfowl establishment. He also identified this swamp as an important area for hunting (waterfowl, doves and pigeons).

Ownership/Protection:

The Puerto Rico Land Authority owns the majority of the lands. Others are privately owned.

Special Recognition:

The Baja Swamp was classified in 1979 and in 1988 as CWA of secondary importance (Raffaele and Duffield 1979; Cardona and Rivera 1988, respectively). Today, using recent census data on waterfowl and hunters reports, we classified the Ciénaga Baja Swamp as a CWA of primary importance, because the potential it has to sustain native and migratory waterfowl.

Wildlife:

Birds

Although no data have been published on the avian presence in Baja Swamp, the DNER biologists have reported thirty one bird species: Cattle egret *Bubulcus ibis*, Great egret *Ardea alba*, Great blue heron *A. herodias*, Little blue heron *Egretta caerulea*, Green heron *Butorides virescens*, Killdeer *Charadrius vociferus*, Black-necked stilt *Himantopus mexicanus*, Common moorhen *Gallinula chloropus*, Red-tailed hawk *Buteo jamaicensis*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Zenaida dove *Zenaida aurita*, White-winged dove *Z. asiatica*, Common ground dove *Columbina passerina*, Gray kingbird *Tyrannus dominicensis*, Northern mockingbird *Mimus polyglottos*, Caribbean Martin *Progne dominicensis*, Bananaquit *Coereba flaveola*, Greater Antillean Grackle *Quiscalus niger*, Yellow-faced grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, Bronze mannikin *Lonchura cucullata*, Blue-winged teal *Anas discors*, Green-winged teal *A. crecca*, White cheeked pintail *A. bahamensis*, American wigeon *A. americana*, Lesser scaup *Aythya affinis*, Ring-necked duck *A. collaris*, Common snipe *Gallinago gallinago*, West Indian Whistling duck *Dendrocygna arborea*, Ruddy duck *Oxyura jamaicensis*, Masked duck *Nomonyx dominicus* (DNER 1993).

Fish

Tilapia fish *Tilapia mossambica* (DNER 1993).

Invertebrates

Blue land crab *Cardisoma guanhumii* (Cardona and Rivera 1988).

Threats:

This area appeared to be degraded for agricultural purposes and cattle grazing. Also, cutting of the vegetation is a common practice presumably for pasture improvement. But this habitat could be improved for the establishment of migratory birds.

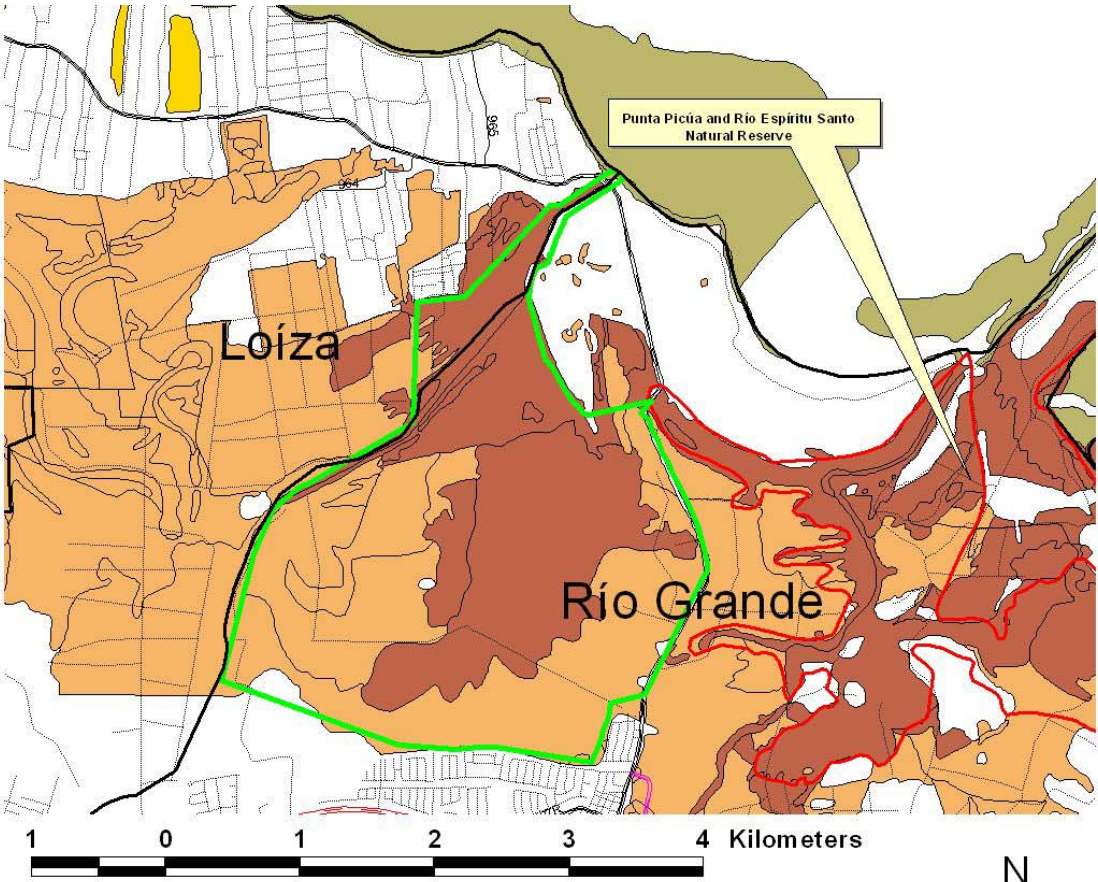
Conservation Recommendations:

To acquire the lands associated with the swamp and start a restoration project to improve its qualities for waterfowl establishment.

References:

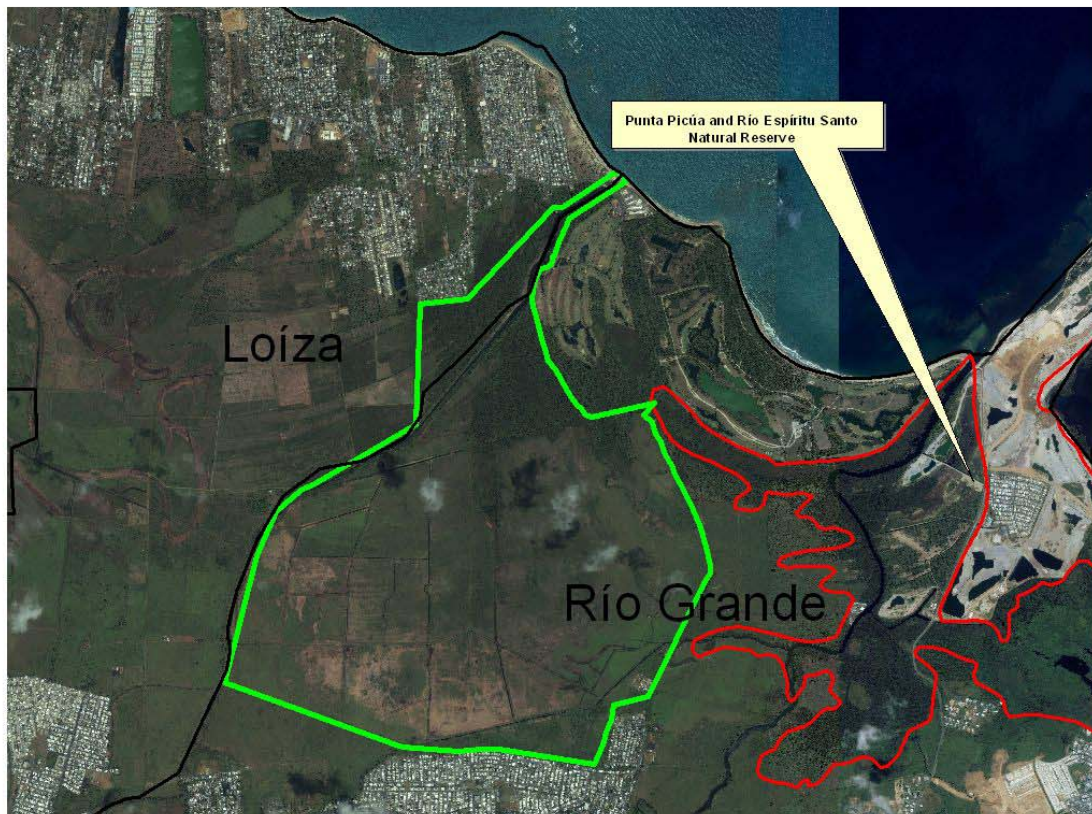
DNER. 1993. Letter from David Ramos and Antonio Matos to Ricardo Cotte. Scientific Research Area, Terrestrial Resources Division, San Juan, P.R.

Baja Swamp and Herrera River Mouth






- Municipios.shp
- Ciénaga baja cwa.shp
- Bosques_y_reservas.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

Baja Swamp and Herrera River Mouth



1 0 1 2 3 4 Kilometers



-  Municips.shp
-  Ciénaga baja cwa.shp
-  Bosques_y_reservas.shp

6- Ensenada Comezón and Espíritu Santo River Natural Reserve, Barrio Zarzal, Río Grande, Puerto Rico

Area Description:

The Espíritu Santo River Natural Reserve covers over 202 ha in size. It has to the north the Atlantic Ocean, to the south lays Barrio Jimenez and PR Road #3, to the east lays Barrio Zarzal, Cerro Bravo, Las Coles, Punta Percha y Barrio Mameyes II, to the west lays Ciénaga Baja and Herrera River. The habitats consist in a river, coastal zone, mangrove forest and wetlands.

The whole area can be divided in three major areas: Punta Picúas, Espíritu Santo River and the Coastal-Marine Zone. Ensenada Comezón is an inlet, surrounded by Punta Miquillo to the west and Punta Picúa to the right. This ecosystem has mangrove forest, wetlands and coastal dry forest. Espíritu Santo River is born in the mountains of El Yunque and it ends to the west of Punta Miquillo in the municipality of Río Grande producing an estuary.

The coastal zone has a wide zone of coral reef and *Thalassia* beds, which is an important food resource for the Manatee *Trichechus manatus*, endangered species since 1985 and present in the area (JP 1995). Also, this CWA continue to support the rare White-crowned pigeon *Patagioenas leucocephala*, the endangered Brown pelican *Pelecanus occidentalis* and the vulnerable Caribbean Coot *Fulica caribaea*. Raffaele (1978) reported the endangered West Indian Whistling duck *Dendrocygna arborea* to use this CWA. Lately, this species has not been observed in this area anymore, although this type of habitat can harbor a population of this endangered species.

Ownership/Protection:

This was the first Natural Reserve made up entirely of private lands (Cardona and Rivera 1988). Actually, the Rio Espíritu Santo Natural Reserve continues to be in private ownerships; a total of 39 different landowners have properties included within the boundaries of this reserve.

Special Recognition:

The Puerto Rico Planning Board declared the area a Natural Reserve in 1982. In both CWA previous documents, it was classified as a primary CWA. Today, the natural value of this ecosystem continues and it still classified as a prime one.

Wildlife:

Birds

Sixty-seven bird species have been reported in the area: Brown pelican *Pelecanus occidentalis*, Frigatebird *Fregata magnificens*, Great blue heron *Ardea herodias*, Great egret *A. alba*, Green heron *Butorides virescens*, Little blue heron *Egretta caerulea*, White egret *E. thula*, Tricolored heron *E. tricolor*, Cattle egret *Bubulcus ibis*, Black-crowned night heron *Nycticorax nycticorax*, Red-tailed hawk *Buteo jamaicensis*, Osprey *Pandion haliaetus*, American kestrel *Falco sparverius*, Clapper rail *Rallus longirostris*, Common moorhen *Gallinula chloropus*, Caribbean Coot *Fulica caribaea*, Semipalmated plover *Charadrius semipalmatus*, Piping plover *C. melodus*, Wilson's plover *C. wilsonia*, Killdeer *C. vociferous*, Ruddy turnstone *Arenaria interpres*, Black-bellied plover *Pluvialis squatarola*, Whimbrel *Numenius phaeopus*, Spotted sandpiper *Actitis macularia*, Willet *Catoptrophorus semipalmatus*, Least sandpiper *Calidris minutilla*, Semipalmated sandpiper *C. pusilla*, Common snipe *Gallinago gallinago*, Royal tern *Sterna maxima*, Bridled tern *S. anaethetus*, Least tern *S. antillarum*, Fulvous whistling duck *Dendrocygna bicolor*, White-crowned pigeon *Patagioenas leucocephala*, Ground dove

Columbina passerina, Mangrove cuckoo *Coccyzus minor*, Smooth-billed ani *Crotophaga ani*, Green mango *Anthracothorax viridis*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Caribbean Martin *Progne dominicensis*, Bank swallow *Riparia riparia*, Barn swallow *Hirundo rustica*, Pearly eye thrasher *Margarops fuscatus*, Northern mockingbird *Mimus polyglottos*, Bananaquit *Coereba flaveola*, Black and white warbler *Mniotilta varia*, Northern parula *Parula americana*, Palm warbler *Dendroica palmarum*, Yellow warbler *D. petechia*, Ovenbird *Seiurus aurocapilla*, Northern waterthrush *S. noveboracensis*, Louisiana Waterthrush *S. motacilla*, American Redstart *Setophaga ruticilla*, Pin-tailed whydah *Vidua macroura*, Warbling silverbill *Lonchura malabarica*, Chestnut manikin *L. malacca*, Bronze manikin *L. cucullata*, Napoleon weaver *Euplectes afer*, Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, Stripe headed tanager *Spindalis portoricensis*, Black-faced grassquit *Tiaris bicolor*, Yellow-faced grassquit *T. olivacea*, Zenaida dove *Zenaida aurita* (DRN 1982; DRN 1982a; Ferrer et al. 1982; Terrestrial Resources Division Data 2004).

Reptiles

Anolis cristatellus, *A. pulchellus*, (Acosta et al 1973).

Amphibians

Eleutherodactylus coqui, *Leptodactylus albilabris* (Acosta et al 1973).

Fishes in the Estuary and in Comezón Inlet

Eighty-one fish species have been reported in these areas: *Aetobatus narinari*, *Elops saurus*, *Tarpon atlanticus*, *Anguilla rostrata*, *Muraena miliaris*, *Gymnothorax funebris*, *Harengula humeralis*, *Opisthonema oglinum*, *Cetengraulis edentulus*, *Anchoa hepsetus*, *Anchoa clupeioides*, *Hyporhamphus unifasciatus*, *Strongylura timucu*, *Tylosurus crocodilus*, *Poecilia vivipara*, *Holocentrus rufus*, *H. adscensionis*, *Oostethus lineatus*, *Pseudophallus mindii*, *Syngnathus sp.*, *Centropomus undecimalis*, *C. pectinatus*, *C. ensiferus*, *Epinephelus striatus*, *Priacanthus cruentatus*, *Caranx hippos*, *C. latus*, *Chloroscombrus chrysurus*, *Selene vomer*, *Trachinotus goodei*, *Lutjanus apodus*, *L. griseus*, *L. jocu*, *Ocyurus chrysurus*, *Diapterus olisthostomus*, *D. rhombeus*, *Eucinostomus lefroyi*, *E. melanopterus*, *E. leucostictus*, *Pomadasy crocro*, *Archosargus rhomboidalis*, *Bairdiella ronchus*, *B. batabana*, *B. sanctaeluciae*, *Cynoscion jamaicensis*, *Larimus breviceps*, *Micropogon furnieri*, *Pseudupeneus maculatus*, *Holacanthus tricolor*, *H. ciliaris*, *Pomacanthus arcuatus*, *Chaetodon striatus*, *Tilapia mossambica*, *Halichoeres poeyi*, *H. bivittatus*, *Sparisoma radians*, *S. chrysopterum*, *Mugil curema*, *M. liza*, *Agonostomus monticola*, *Sphyrnaena barracuda*, *S. guachanche*, *Polydactylus virginicus*, *Lupinoblennius dispar*, *Eleotris pisonis*, *Dormitator maculatus*, *Gobiomorus dormitory*, *Awaous tajasica*, *Bathygobius soporator*, *Gobionellus boleosoma*, *G. oceanicus*, *G. spes*, *Acanthurus coeruleus*, *Scomberomorus regalis*, *Cytharichtys spilopterus*, *Achirus lineatus*, *Symphurus plaguesia*, *Lagocephalus laevigatus*, *Sphaeroides testudineus* (DRNA 1982a; Ferrer et al. 1982).

Invertebrates

Snails in the estuary

Neritina punctulata, *Thiara granifera*, *Neritina clenchi* (Pyron and Covich 2003).

Echinodermata:

Sea Urchin

Eucidaris tribuloides, *Tripneustes esculentus*, *Echinometra lucunter*, *Diadema antillarum*.

Sea Stars:

Ophiocoma, *Ophiotrix*.

Sea cucumber:

Holothuria mexicana.

Crustaceans

Blue land crab *Cardisoma guanhumi*, *Coenobita clypeatus*, Marine crab *Ocypode quadrata*, River crab *Armases ricordi*, Hairy crab *Ucides cordatus*, Fiddler crab *Uca thayeri*, *Calappa flamea*, Mangrove crab *Aratus pisoni*, *Clibanarius cubensis*, *Goniopsis cruentata*, *Callinectes boucorti* (Acosta et al 1973). Zambuco crab *Ucides cordatus*. *Panilurus argus* and *P. guttatus* in the reefs (DRN 1982a)

Threats:

Construction of permanent structures such as mega resorts, home shares, houses and Guests Inn in the vicinity of the Reserve; mangrove cutting, and jet sky's in the area that can harm the manatees. Also, the establishment of new, non-complying structures is always a threat. Actually, the Paradisus Hotel proposes two boardwalk projects in the coastal zone area. This development would destroy the *Thalassia* beds of the region, affecting feeding habitat of the endangered Antillean manatee and the nesting area of the Leatherback sea turtles (Rivera-Marrero 2004).

There are some other conflicts such as the segregation, selling and plotting of the lands without government permits; the construction of houses in Punta Picúa, the realignment of the access track and the extraction of soil and sand near the Reserve are activities associated with the destruction of this CWA (JP 1995).

Conservation Recommendations:

To enforce vigilance by the DNER and to control the authorization for building permanent structures in the area.

References:

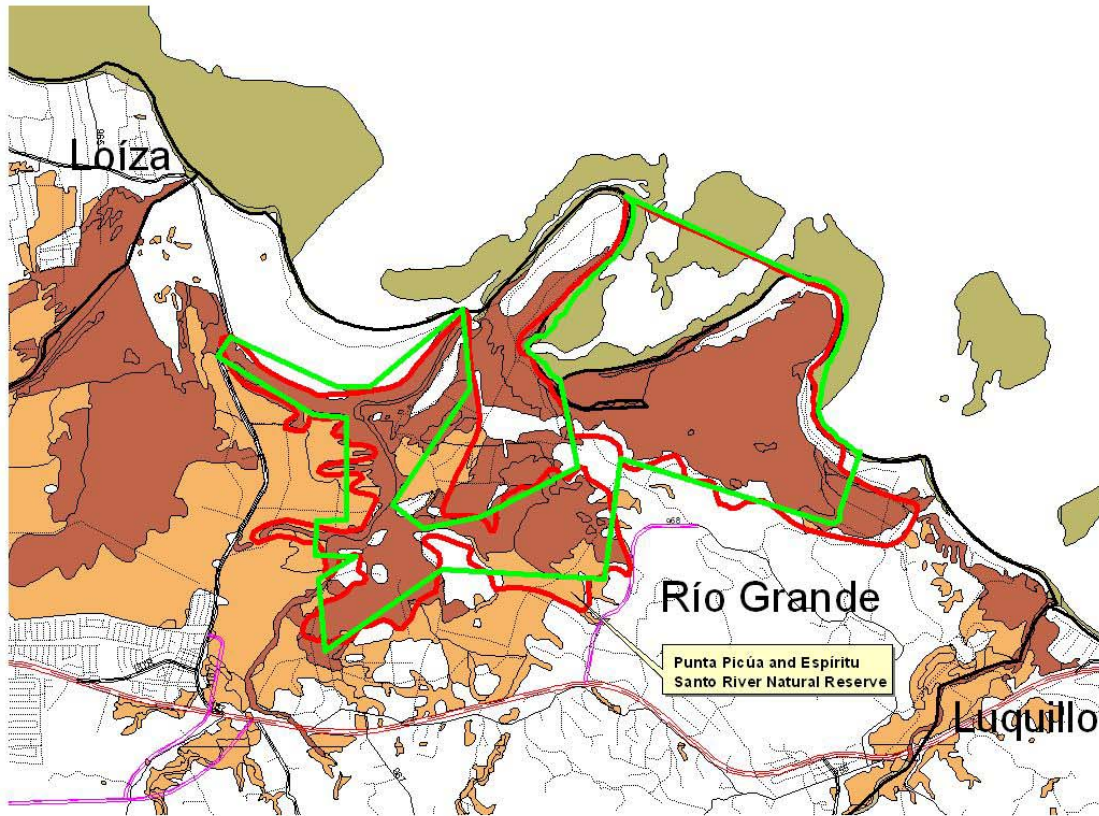
Acosta, C. R. T.; Vélez, M. J. Y R. Woodbury. 1973. Estudio Ecológico e Inventario del Manglar Espíritu Santo y Ciénaga La Picúa, Río Grande, Puerto Rico. Departamento de Biología, Universidad de Puerto Rico, Río Piedras. Informe preparado con ayuda económica del Departamento de Vivienda y Desarrollo Urbano.

Departamento de Recursos Naturales. 1982. Reserva Natural del Río Espíritu Santo. Programa Pro-Patrimonio Natural de Puerto Rico.

_____. 1982a. Documento de Designación Reserva Natural Río Espíritu Santo. Programa de manejo de la Zona Costanera. Área de Planificación de Recursos. División de Recursos Terrestres. 68 pp.

- _____. 1994. Informe de Titularidad Plan de Manejo Reserva Natural Río Espíritu Santo. Área de Planificación Integral. División de Patrimonio Natural.
- _____. 1995. Plan y Reglamento Especial para el Sector Punta Picúa. Área de Planificación Física. Negociado de Planes de Usos de Terrenos.
- Ferrer, H.; M. Rivera; J. Villamil; R. Sallés, y J. K. González. 1982. Suplemento de Información Técnica para la Designación del Sector del Río Espíritu Santo como Reserva Natural. Departamento de Recursos Naturales, Programa de Manejo de Zona Costanera, San Juan, Puerto Rico.
- Junta de Planificación. 1995. Plan y Reglamento Especial para el Sector Punta Picúa. Área de Planificación Física. Negociado de Planes de Usos de Terrenos 1995. 49 pp.
- Pyron, M. and A. P. Covich. 2003. Migration patterns, densities, and growth of *Neritina punctulata* snails in Rio Espíritu Santo and Rio Mameyes, Northeastern Puerto Rico. Carib. J. Sci., Vol. 39, No. 3. pp. 338-347.
- Rivera Marrero, M. 2004. Bajo fuego dos tablados de Paradisus. El Nuevo Día, 8 de noviembre de 2004. Página 56

Ensenada Comezón

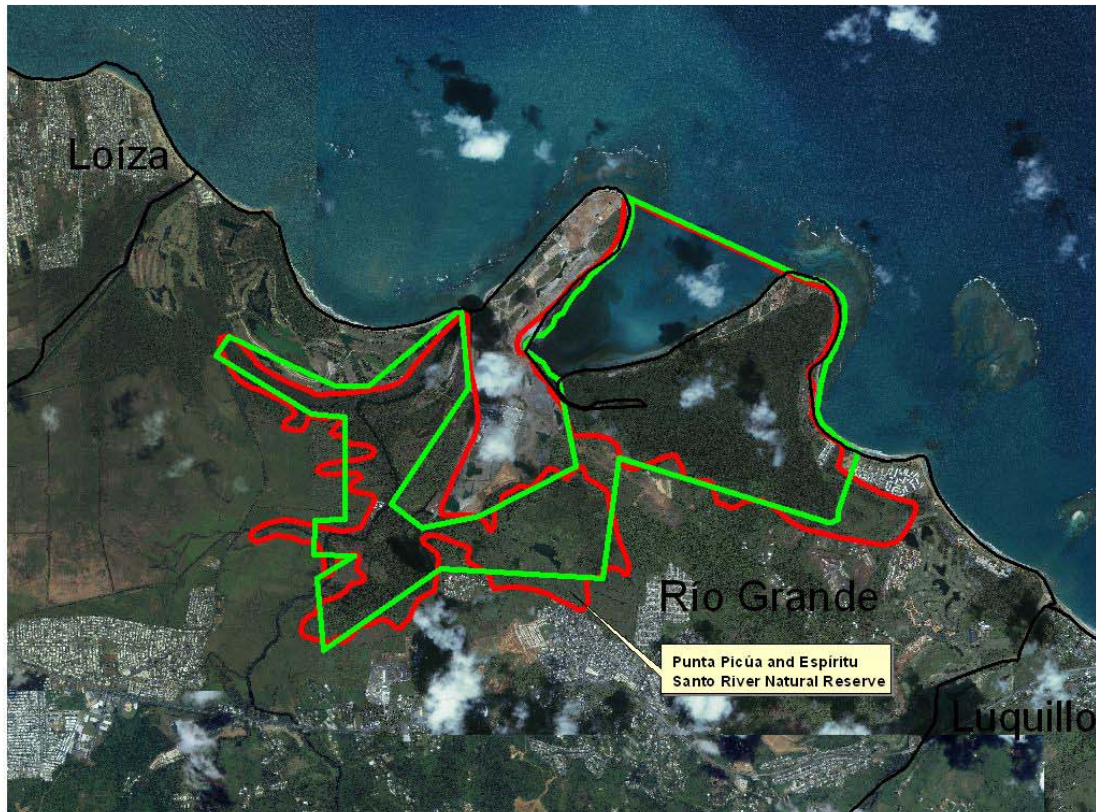





3 0 3 Kilometers



-  Ensenada comezón cwa.shp
-  Bosques_y_reservas.shp
-  Municips.shp
- Carreteras avpu.shp
 -  autopistas
 -  primarias
 -  secundarias
 -  terciarias
 -  caminos
 -  propuestas
- Humedales avpu.shp
 -  Estuarine
 -  Lacustrine
 -  Marine
 -  Palustrine
 -  Riverine

Ensenada Comezón



-  Municipals.shp
-  Ensenada comezón cwa.shp
-  Bosques_y_reservas.shp

7- Río Mar, Street # 968, Río Grande, Puerto Rico

Area Description:

This area was included because of the presence of the Virgin Island Tree Boa (*Epicrates monensis granti*), a critically endangered species. Actually is the only place in the Island where this species has found a good survival habitat. It is located north of road 3, in Las Coles Sector. The road 968 is in the north and in the northwest is the Río Espíritu Santo Natural Reserve. The area has dense vegetation, with various individuals of tall *Ficus* trees. There is also good habitat for different wildlife species.

Ownership/Protection:

Private properties southeast the Río Espíritu Santo Natural Reserve.

Special Recognition:

Because Rio Mar is the only habitat for the critically endangered Virgin Island Tree Boa, this area is classified for the first time as a primary CWA.

Wildlife:

Virgin Island Tree Boa *Epicrates monensis granti* (García 1992; Puente-Rolón 2001).

Threats:

Urban and tourism development pressure such as Resorts and Guest Inn.

Conservation Recommendations:

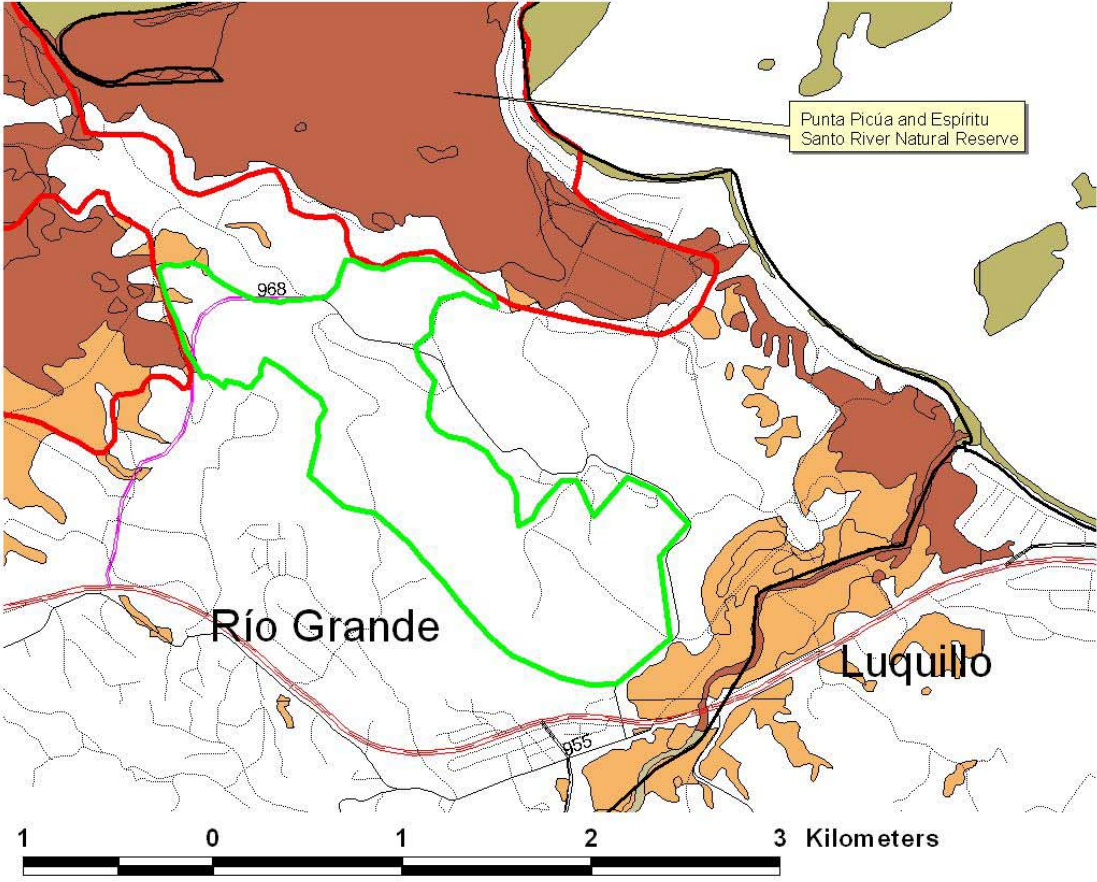
To develop strategies for land acquisition by the DNER and declare this area as a critical habitat for the endangered Virgin Island Tree Boa.

References:

García, M. A. 1992. Current Status and Distribution of *Epicrates monensis* in Puerto Rico. Final Report. Puerto Rico Natural and Environmental Resources.

Puente-Rolón, Alberto R. 2001. Current Status and Distribution of the Virgin Island Boa *Epicrates monensis granti* in Puerto Rico. Department of Natural and Environmental Resources. San Juan, Puerto Rico.

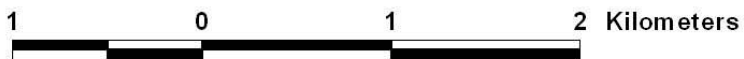
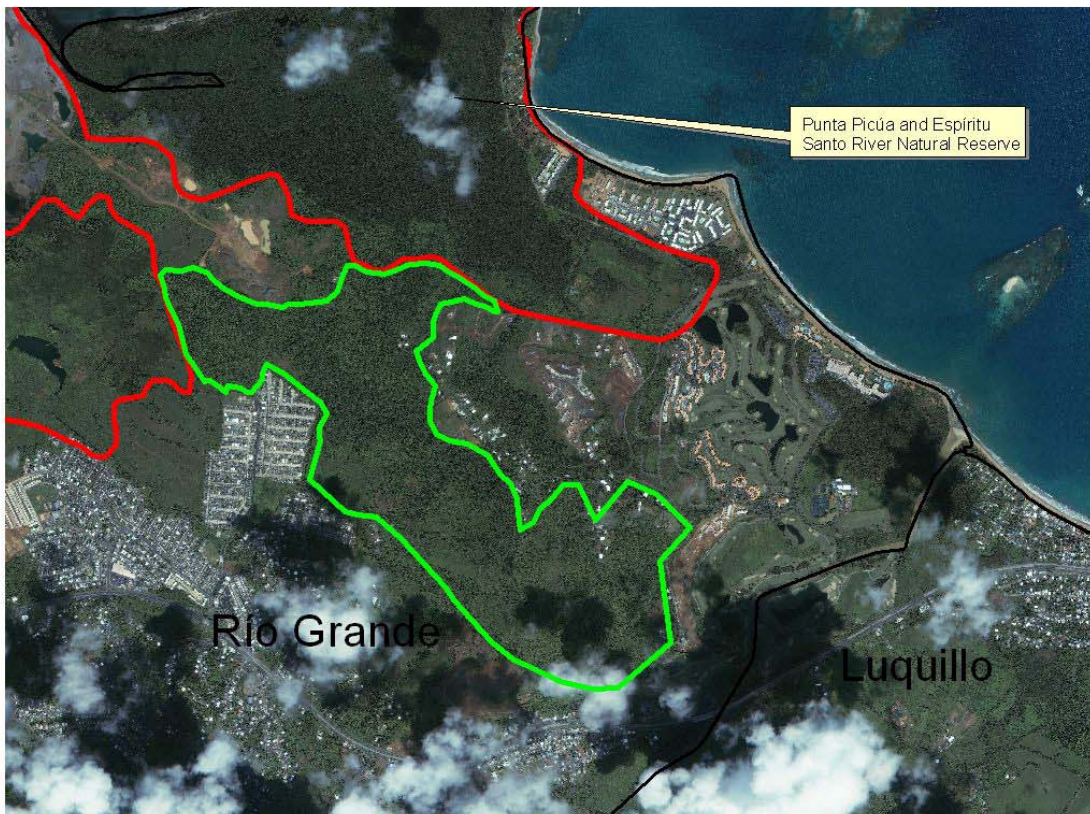
Street # 968, Rio Mar



- Rio mar cwa.shp
- Municips.shp
- Bosques_y_reservas.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine



Street # 968, Rio Mar



-  Rio mar cwa.shp
-  Municips.shp
-  Bosques_y_reservas.shp

8- Luquillo Mountains, Luquillo, Puerto Rico

Area Description:

Caribbean National Forest (CNF) is located in the mountains of seven different municipalities: Río Grande, Luquillo, Fajardo, Ceiba, Naguabo, Las Piedras and Canóvanas, and its the origin of important rivers in the east side: Río Grande de Loíza, Río Espíritu Santo, Río Blanco, Río Mameyes, Río Fajardo, Río Sabana. It encompasses over 11,300 ha of land, making it the largest block of public land in the Island of Puerto Rico. CNF, locally known as El Yunque, is one of the most popular recreation sites in Puerto Rico and the US National Forest System. Almost a million tourists, from Puerto Rico, the US mainland, and abroad experience this tropical rain forest environment each year (USFS 2004)

Elevations in the Forest range from 30.5 meters at the northern boundary to 1,080 meters at El Toro Peak. Topography ranges from gentle slopes at lower elevations to rugged mountain slopes exceeding 60% at higher elevations, where vertical rock-faced cliffs are numerous (USFS 2004). Four main type of forest can be found in this huge forest: Tabonuco Forest, Palo Colorado Forest, Sierra palm Forest and Elfin Forrest (Silander et al. 1986). This is the place with highest precipitation in the entire Island.

Although the CNF is one of the smallest forests in the National Forest System, (11,300 ha), it is one of the most biologically diverse areas that the agency manages. The CNF contains over 240 species of native trees, of which 88 are rare and are only found in the Forest. Along with the trees, the CNF includes 50 species of native orchids and over 150 species of ferns. This relatively small land area also supports 127 species of terrestrial vertebrate and 10 species of aquatic invertebrates (USFS 2004). In addition to support the critically endangered (CE) Puerto Rican Parrot *Amazona vittata*, this forest harbors a number of other rare species: the CE Puerto Rican Sharp-shinned Hawk *Accipiter striatus venator*, the CE Broad-winged Hawk *Buteo platypterus brunnescens*, the vulnerable (VU) Elfin-woods warbler *Dendroica angelae* and the VU Puerto Rican Boa *Epicrates inornatus*. Also, some VU or CE *Eleutherodactylus* sp. are reported in this Forest.

Ownership/Protection:

Lands of the Caribbean National Forest are administrated by the United States Forest Service.

Special Recognition:

It was declared a Federal Forest Reserve in 1903, but it had been protected since 1860 by the Crown of Spain (Silander et al. 1986). This Forest was declared as a Luquillo Biosphere Reserve, designated by UNESCO in 1976 (Ding et al. 2001). Raffaele and Duffield (1979) classified this CWA as “one of Puerto Rico’s most critical faunal regions”. In 2004, BirdLife International and the Puerto Rican Bird Society (henceforth SOPI) recognized the Caribbean National Forest as an Important Bird Area. Today, forest composition remains similar to the 1970’s, and it’s still classified as a primary CWA due to the high diversity of species.

Wildlife:

Birds

Forty-two bird species have been reported in the Caribbean National Forest: Sharp-shinned hawk *Accipiter striatus*, Red-tailed hawk *Buteo jamaicensis*, Puerto Rican Broad-winged hawk *B. platypterus*, Scaly-napped pigeon *Patagioenas squamosa*, Zenaida dove *Zenaida aurita*, Ruddy quail-dove *Geotrygon montana*, Puerto Rican parrot *Amazona vittata*,

Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Smooth-billed ani *Crotophaga ani*, Puerto Rican Screech owl *Megascops nudipes*, Black swift *Cypseloides niger*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Green mango *Anthracothonax viridis*, Puerto Rican todody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Cave swallow *Petrochelidon fulva*, Barn swallow *Hirundo rustica*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Red-legged thrush *Turdus plumbeus*, Puerto Rican Vireo *Vireo latimeri*, Black and white warbler *Mniotilta varia*, Northern parula *Parula americana*, Cape may warbler *Dendroica tigrina*, Black-throated blue warbler *D. caerulescens*, Elfín wood warbler *D. angelae*, Louisiana Waterthrush *Seiurus motacilla*, American Redstart *Setophaga ruticilla*, Antillean Euphonia *Euphonia musica*, Puerto Rican Spindalis *Spindalis portoricensis*, Puerto Rican tanager *Nesospingus speculiferus*, Yellow-faced grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Bananaquit *Coereba flaveola*, Bronze mannikin *Lonchura cucullata*, Greater Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis* (Silander et al 1986).

Reptiles

Thirteen reptiles species have been reported in the Rainforest: *Typhlops sp.*, Puerto Rican boa *Epicrates inornatus*, Puerto Rican Racer *Alsophis portoricensis*, Yellow bearded anole *Anolis gundlachi*, Emerald anole *A. evermanni*, Barred anole *A. stratulus*, Puerto Rican giant anole *A. cuvieri*, Crested anole *A. cristatellus*, Upland grass anole *A. krugii*, *A. occultus*, Common grass anole *A. pulchellus*, Common dwarf gecko *Sphaerodactylus macrolepis*, Puerto Rican galliwasp *Diploglossus pleei* (Silander et al. 1986).

Amphibians

Fourteen amphibians species have been reported: Puerto Rican coqui *Eleutherodactylus portoricensis*, Melodus coqui *E. wightmanae*, Ground coqui *E. richmondi*, Tree hole coqui *E. hedricki*, Common coqui *E. coqui*, Antillean coqui *E. antillensis*, Grass coqui *E. brittoni*, Locust coqui *E. locustus*, Cricket coqui *E. gryllus*, Web footed coqui *E. karlshmidt*, Burrowing coqui *E. unicolor*, Mottled coqui *E. eneidae*, White-lipped frog *Leptodactylus albilabris*, Giant toad *Bufo marinus* (Silander et al. 1986).

Mammals

Fifteen mammals have been reported in the Luquillo Mountains: *Mormoops blainvilli*, *Pteronotus fuliginous*, *Artibeus jamaicensis*, *Brachyphylla cavernarum*, *Erophylla bombifrons*, *Monophyllus redmani*, *Stenoderma rufum*, *Eptesicus fuscus*, *Lasiurus borealis*, *Molossus molossus*, *Tadarida brasiliensis*, *Rattus norvegicus*, *R. rattus*, *Herpestes auropunctatus*, *Felix catus* (Ding et al. 2001).

Threats:

Urban sprawl around the National Forest boundaries is the major threats of this unique Subtropical Rain Forest.

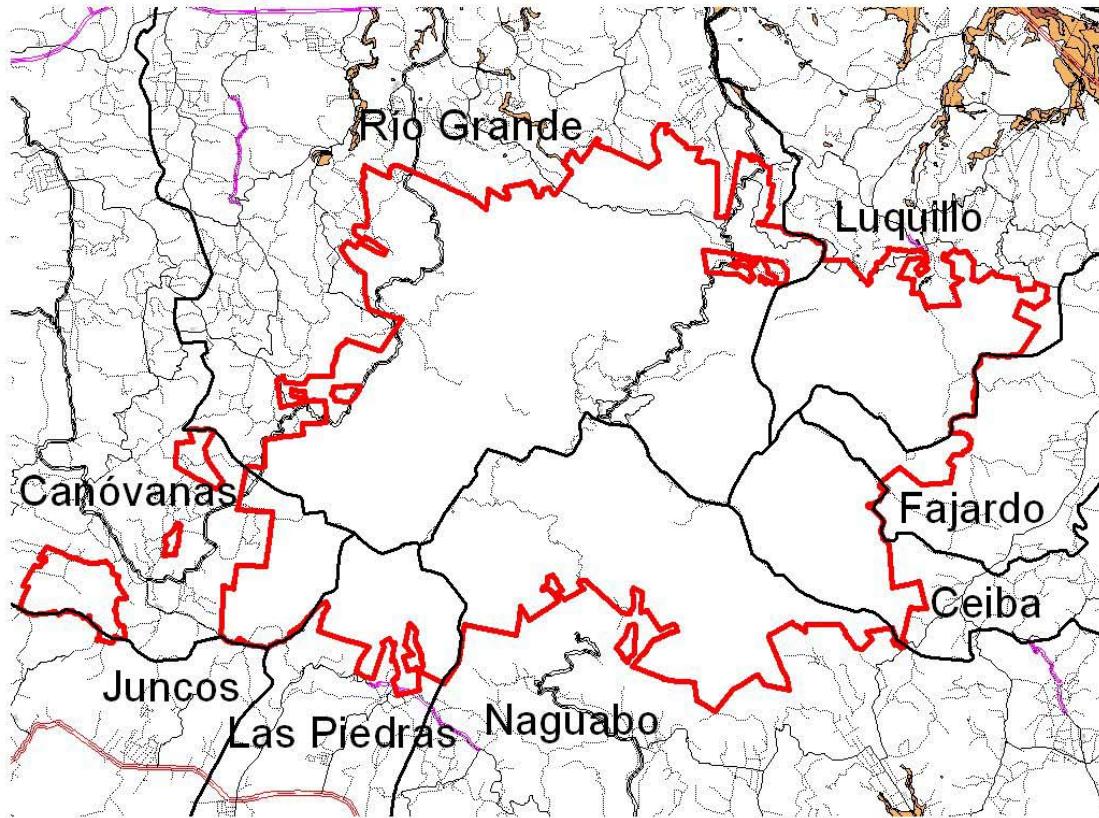
Conservation Recommendations:


Create a buffer zone between forest boundaries and private property in order to assure the protection of this fragile ecosystem.

References:

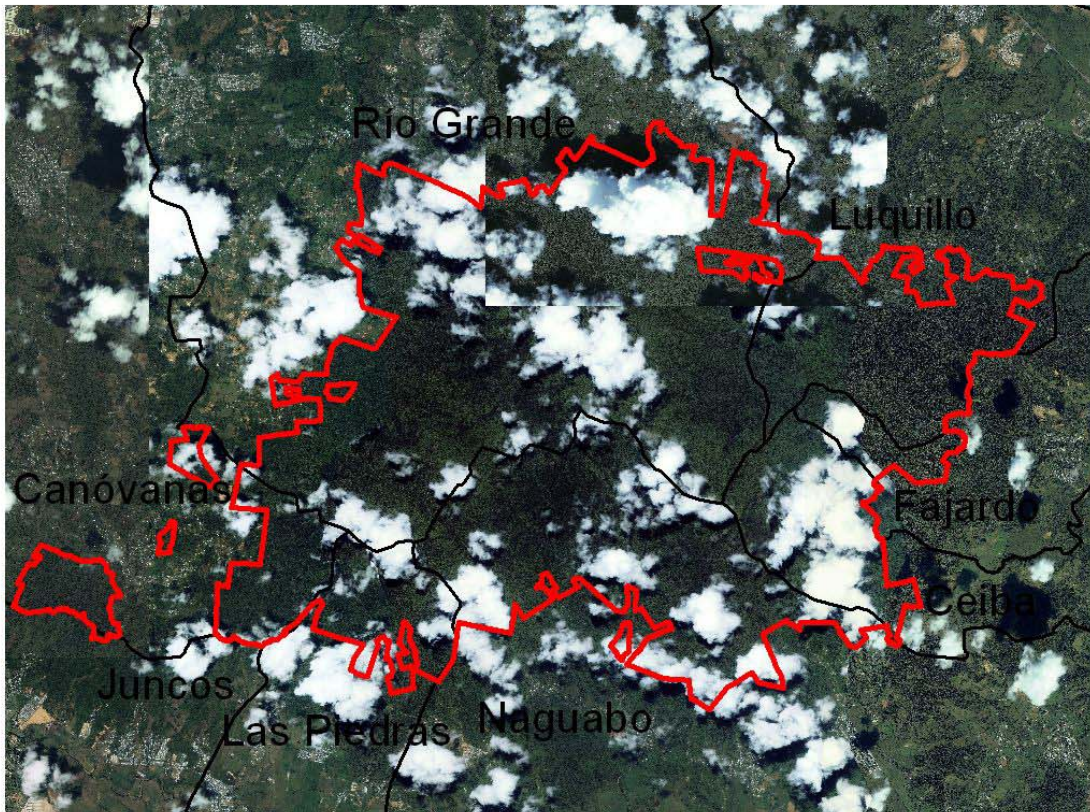
- Ding, M. M.; Brown, S. and A. E. Lugo. 2001. A Continental Subtropical Forest in China Compared with an Insular Subtropical Forest in the Caribbean. Gen. Tech. Rep. IITF-17. USDA Forest Service. International Institute of Tropical Forestry. Río Piedras, Puerto Rico.
- USFS. 2004. United State Forest Service, Southern Region, Caribbean National Forest. www.southernregion.fs.fed.us/caribbean/forest.htm

Luquillo Mountain



-  Municips.shp
-  Bosques_y_reservas.shp
- Carreteras avpu.shp
 -  autopistas
 -  primarias
 -  secundarias
 -  terciarias
 -  caminos
 -  propuestas
- Humedales avpu.shp
 -  Estuarine
 -  Lacustrine
 -  Marine
 -  Palustrine
 -  Riverine

Luquillo Mountain



-  Bosques_y_reservas.shp
-  Municipios.shp

9- San Miguel, Las Paulinas and El Convento Natural Area, Luquillo-Fajardo

Area Description:

The San Miguel and Las Paulinas area is located in the east side of the Island, between the municipalities of Luquillo and Fajardo, in the longitude 65° 42'30" and latitude 18° 21'30" (DRN 1992). It has a territorial extension of 827 ha (2,044 cuerdas) includes the area of San Industrial Development Company Miguel I, San Miguel II, Las Paulinas, El Convento and the public beach Seven Seas. The habitats of the area consist of mangrove forest, wetlands, lagoons, rivers, sandy beaches, coral reefs and coastal dry forest. Three rivers are present in this CWA: Sabana River, Pitahaya River and Juan Martín River. The area also has very high scenic value and harbors many vulnerable and endangered species.

Ownership/Protection:

The terrains that comprehend the proposed Nature Reserve are divided in segments, some of them are private property, and other terrains are Government property: 1-San Miguel I- Private property of 194.63 ha (494.99189 cuerdas) that belongs to Westbrook Luquillo, L. P. (according to the property register). 2-San Miguel II- Private property of 132.093 ha (335.9469 cuerdas) that belongs to Juaza Inc. (according to the property register). 3-Las Paulinas-Public property of 172.9641 ha (439.8902 cuerdas) that belongs Puerto Rico Industrial Development Company. 4-The north portion of El Convento-Public property of 185.9732 ha (472.9756 cuerdas) that belongs to Puerto Rico Industrial Development Company. 5- Dos Mares private property-70.7757 ha (180 cuerdas) belongs to Dos Mares, S. E. 6- The south portion of El Convento- Private property of 211.5407 ha (538 cuerdas) that belongs to Fernández Cerra Family. 7- Seven Seas Beach- Public property of 86.5036 ha (220 cuerdas) that belongs to Puerto Rico National Park Company. 8-Sabana Property- Private property of 11.7959 ha (30 cuerdas) that belongs to Sabana Inc. 9-Noroeste Property (a)-Private property of 3.7353 ha (9.5 cuerdas) that belongs to Luquillo Associates and St. James Servicing Corporation. 10-Northwest Property (b)-Private property of 4.1285ha (10.5 cuerdas) that belongs to Sucesión Rodríguez (according to the property register) (Data provided by L. J. Rivera, IDS 2005).

Special Recognition:

The entire area that comprehends 827 ha (2,044 cuerdas) was proposed for designation in 1992 as Natural Reserve by the DNER as an extension of the Cabezas de San Juan Natural Reserve, El Convento Segment (DRNA 1992). Although the terrains are of prime ecological quality, this is the first time that the area is classified as a CWA. Because its unique biodiversity, we classified it as a prime one. The sandy beaches of these properties represent the most important nesting habitat for the Leatherback turtle *Dermochelys coriacea* in the main island in Puerto Rico.

Wildlife:

Birds

One hundred and thirteen bird species have been reported in the area: Red-tailed hawk *Buteo jamaicensis*, Belted kingfisher *Ceryle alcyon*, West Indian Whistling duck *Dendrocygna arborea*, Masked duck *Nomonyx dominica*, Ruddy Duck *Oxyura jamaicensis*, Great egret *Ardea alba*, Great blue heron *A. herodias*, Cattle egret *Bubulcus ibis*, Green heron *Butorides virescens*, Little blue heron *Egretta caerulea*, Snowy egret *E. thula*, Tricolored heron *E. tricolor*, Yellow-crowned night heron *Nyctanassa violacea*, Black-crowned night heron *Nycticorax nycticorax*, Antillean nighthawk *Chordeiles gundlachii*, Semipalmated plover *Charadrius semipalmatus*,

Snowy plover *C. alexandrinus*, Piping plover *C. melodus*, Killdeer *C. vociferous*, Wilson's plover *C. wilsonia*, Black-bellied plover *Pluvialis squatarola*, Plain pigeon *Patagioenas inornata*, Scaly-napped pigeon *P. squamosa*, White-crowned pigeon *P. leucocephala*, Rock pigeon *Columba livia*, Common ground dove *Columbina passerina*, White-winged dove *Zenaida asiatica*, Zenaida dove *Z. aurita*, Mangrove cuckoo *Coccyzus minor*, Yellow-billed cuckoo *C. americanus*, Smooth-billed ani *Crotophaga ani*, Grasshopper sparrow *Ammodramus savannarum*, Bananaquit *Coereba flaveola*, Adelaide's warbler *Dendroica adelaidae*, Prairie warbler *D. discolor*, Palm warbler *D. palmarum*, Yellow warbler *D. petechia*, Blackpoll warbler *D. striata*, Cape May warbler *D. tigrina*, Antillean Euphonia *Euphonia musica*, Common yellowthroat *Geothlypis trichas*, Black-cowled Oriole *Icterus dominicensis*, Northern Oriole *I. galbula*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Shiny cowbird *Molothrus bonariensis*, Northern parula *Parula americana*, Prothonotary warbler *Protonotaria citrea*, Greater Antillean Grackle *Quiscalus niger*, Louisiana Waterthrush *Seiurus motacilla*, Northern waterthrush *S. noveboracensis*, American Redstart *Setophaga ruticilla*, Puerto Rican Spindalis *Spindalis portoricensis*, Black-faced grassquit *Tiaris bicolor*, Yellow-faced grassquit *T. olivacea*, Blue-winged warbler *Vermivora pinus*, Orange cheeked waxbill *Estrilda melpoda*, Bronze mannikin *Lonchura cucullata*, Nutmeg mannikin *L. punctulata*, Merlin *Falco columbarius*, Peregrine falcon *F. peregrinus*, American kestrel *F. sparverius*, Magnificent frigatebird *Fregata magnificens*, American Oystercatcher *Haematopus palliatus*, Barn swallow *Hirundo rustica*, Caribbean Martin *Progne dominicensis*, Cave swallow *Petrochelidon fulva*, Herring gull *Larus argentatus*, Laughing gull *L. atricilla*, Least tern *Sterna antillarum*, Common tern *S. hirundo*, Royal tern *S. maxima*, Sandwich tern *S. sandvicensis*, Roseate tern *S. dougalli*, Pearly-eyed thrasher *Margarops fuscatus*, Northern mockingbird *Mimus polyglottos*, Osprey *Pandion haliaetus*, House sparrow *Passer domesticus*, Brown pelican *Pelecanus occidentalis*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Orange bishop *Euplectes franciscanus*, Pin-tailed whydah *Vidua macroura*, Pied-billed grebe *Podilymbus podiceps*, Least grebe *Tachybaptus dominicus*, Orange fronted parakeet *Aratinga canicularis*, Caribbean Coot *Fulica caribaea*, Common moorhen *Gallinula chloropus*, Purple gallinule *Porphyryula martinica*, Black-necked stilt *Himantopus mexicanus*, Spotted sandpiper *Actitis macularia*, Ruddy turnstone *Arenaria interpres*, Sanderling *Calidris alba*, Red knot *C. canutus*, Western sandpiper *C. mauri*, Pectoral sandpiper *C. melanotos*, Least sandpiper *C. minutilla*, Semipalmated sandpiper *C. pusilla*, Common snipe *Gallinago gallinago*, Short billed dowitcher *Limnodromus griseus*, Lesser yellowlegs *Tringa flavipes*, Greater yellowlegs *T. melanoleuca*, Solitary sandpiper *T. solitaria*, Short-eared owl *Asio flammeus*, Brown booby *Sula leucogaster*, Puerto Rican Tody *Todus mexicanus*, Antillean Mango *Anthracothorax dominicus*, Green throated Carib *Eulampis holosericeus*, Antillean crested hummingbird *Orthorhyncus cristatus*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Caribbean elaenia *Elaenia martinica*, Puerto Rican Flycatcher *Myiarchus antillarum*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Puerto Rican Vireo *Vireo latimeri*, Black-whiskered vireo *V. altiloquus* (CSA 2001).

Reptiles

Since 1986 to the present, DNER personnel have been monitoring the nesting activities of the Leather backed turtle in 18km of the northeastern shoreline from the east of Punta Picúa, Municipality of Rio Grande to the east up to Cape San Juan, at the Municipality of Fajardo, observing a constant rise in the nesting activities. In 1986 only, 142 nests were identified, more than 2,000 neonates were liberated and 21 turtles were marked in the beach at the nesting activity (Horta 1991).

From the 18 km. of monitored areas, biologists has identified the 6.9 km of shoreline known as Fincas San Miguel, Paulinas and Convento as Index beaches because the high concentration of nesting activities found on these beaches is comparable to that of the beaches on Culebra Island. Index beaches are characterized as high energy beaches with sandy shoreline and no development in the coastal area, reflecting that 95% of the 1, 9857 identified nests have been located in the study area (Horta et al 2002).

The highest record in nesting activities was in 2001 with at least 409 activities identified. Biologists observed that approximately 80% of the nesting activities are completed nests. During these years night patrol, 117 new turtles have been identified and tagged using Monell marks in the front flippers and Avid Pit tags for turtles identified in seasons 1999-2002. Forty-four remigrant turtles have been identified, all previously marked. From this number, biologists have identified from nesting beaches on Culebra (20), St. Croix (2), and Fajardo (22). The remigration of turtles from Fajardo can fluctuate between 1 and 3 years with the oldest turtle been identified as remigrant in more than one season, as tagged in 1991. 45,035 hatchlings have been counted directly from a total of 643 nests. Using basic statistics and extrapolating from the total number of 1157 nests during all seasons, the number of hatching produced for these 17 years may surpass 75, 000 hatchings (Horta et al 2002).

This information suggests that (1) there is a growing nesting population in this area; (2) that there is a relationship with other nesting beaches of the Caribbean, especially Culebra Island; (3) that the height of nesting activities in the 6.9 km of shoreline known as Fincas San Miguel, Paulinas and Convento beaches compares with all the 18 Km of studied beaches because of the nondevelop coastal area; (4) that the development of these coastal areas of Fincas San Miguel, Paulinas and Convento will affect the nesting population as well as the Culebra population (Horta et al 2002).

Nesting Activities for the Leatherback turtle *Dermochelys coriacea* in Puerto Rico northeast coast *:

BEACH	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
Convento	48	40	12	31	44	39	51	64	121	450
Paulinas	23	38	14	31	41	47	32	21	97	375
San Miguel	8	46	25	28	72	39	19	85	218	450
Total	79	124	51	90	157	125	102	170	346	1275

*Table prepared by H. Horta, Forest Manager, La Cordillera Natural Reserve of the field data compiled by DNER personnel during the months of march to august of each year.

Other reptiles in the area: Red eared slider *Trachemys scripta*, Puerto Rican slider *T. stejnegeri*, Common anole *Anolis cristatellus*, Gundlanch's anole *A. gundlachi*, Mountain garden lizard *A. krugii*, Grass anole *A. pulchellus*, Painted anole *A. stratulus*, Green iguana *Iguana iguana*, Greater Antillean leaf-toed gecko *Phyllodactylus wirshingi*, Townsend's dwarf gecko *Sphaerodactylus townsendi*, Gage's dwarf gecko *S. gaigae*, Common dwarf gecko *S. macrolepis*, Puerto Rican ground lizard *Ameiva exsul*, Puerto Rican boa *Epicrates inornatus* (CSA 2001).

Amphibians

Giant toad *Bufo marinus*, *Eleutherodactylus antillensis*, *E. brittoni*, *E. cochranae*, *E. coqui*, *Leptodactylus albilabris*, Bullfrog *Rana catesbeiana* (CSA 2001).

Critical Plants

Cobana negra *Stahlia monosperma*, Bloodweed tree *Pterocarpus officinalis*, Beautiful goetzea *Goetzea elegans* (CSA 2001); Arana *Schoepfia arenaria*, Ortegón *Coccoloba rugosa* Ausuba *Manilkara pleeana*, *Eugenia sessiflora*, *Ziziphus rignoni* (Natural Heritage Division Data, DNER).

Threats:

Threats to this region, in general, are development pressures for Mega resorts that can jeopardize the natural resources present in the area.

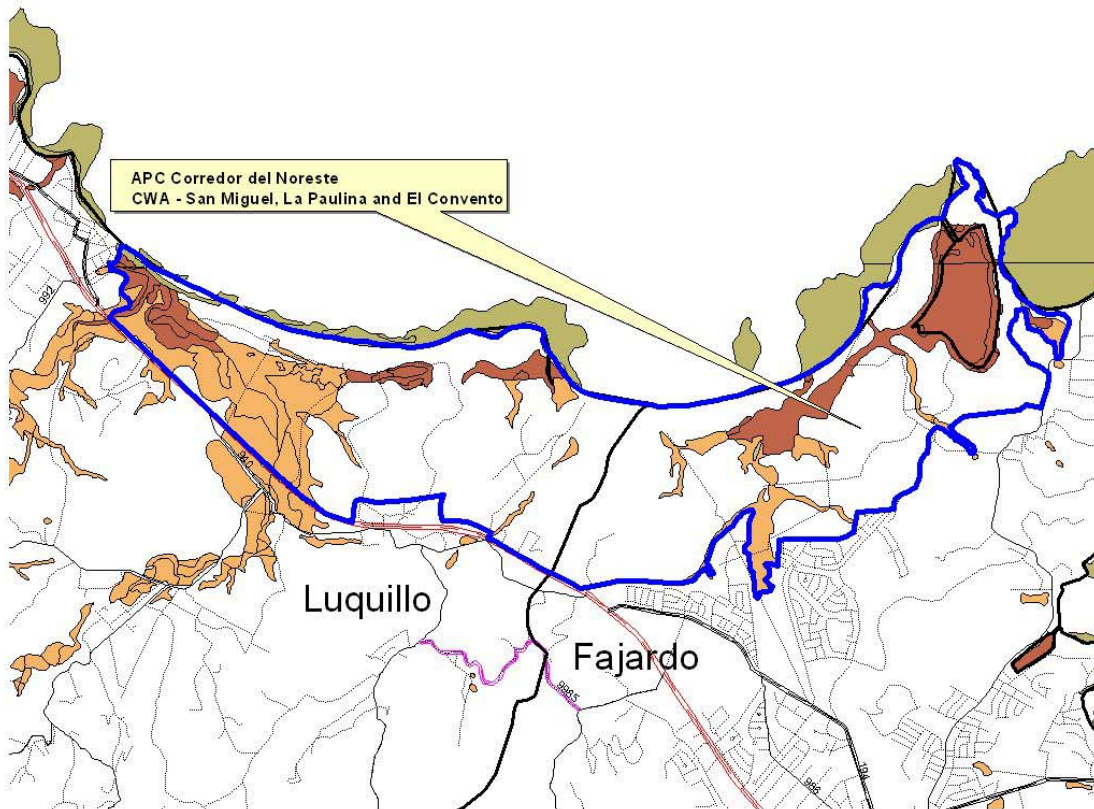
Conservation Recommendations:

To designate the area as a Natural Reserve as proposed by DNER in 1992 (DRN 1992).

References

- CSA Group, Inc. 2001. Apéndice H: Estudio de Flora y Fauna Terrestre, San Miguel Resort, Luquillo, Puerto Rico. En Declaración de Impacto Ambiental Preliminar San Miguel Resort. Preparado para: Westbrook Luquillo LP, Juaza, Inc.
- Horta, H. C. 1991. Manejo de las poblaciones de anidaje del Tinglar *Dermochelys coriacea* en las costas de Luquillo y Fajardo. En XVII Simposio de los Recursos Naturales Celebrado en el Auditorio del DRNA. 13 y 14 de noviembre. 373 pp.
- Horta, H. C.; R. Ramos; M.A. Ramos; H. J. Horta. and K. E. Oacio. 2002. Abstract. 17 years of monitoring and management of leatherback sea turtle nesting population in the northeast coast of Puerto Rico. La Cordillera Natural Reserve. Puerto Rico Department of Natural and Environmental Resources. 2 pp.
- Departamento de Recursos Naturales. 1992. Documento de Designación de la Reserva Natural Cabezas de San Juan Segmento El Convento. Área de Planificación de Recursos. San Juan, Puerto Rico. 76 pp.

San Miguel, La Paulina and El Convento Natural Area



- Areas con prioridad de conservacion.shp
- Municipios.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

San Miguel, La Paulina and El Convento Natural Area



1 0 1 2 3 4 Kilometers



-  Areas con prioridad de conservacion.shp
-  Municipios.shp

10- Laguna Grande, Laguna Aguas Prietas and adjacent areas, Fajardo, Puerto Rico

Area Description:

The whole area is approximately 202 ha in size and includes the presence of different ecosystems including lagoons, mangrove forest, coastal dry forest, *Thalassia* beds and coral reefs. This CWA have two main lagoons: Laguna Grande and Aguas Prietas. These lagoons are important because they are surrounded by mangrove forest, producing a buffer zone for bird species to roost and reproduce, including perching birds and waterfowl.

Laguna Grande is a bioluminescent lagoon located 5 Km to the north of Fajardo town, it has an average of 1.42 m in depth and an average water volume of 719, 800 m³. The lagoon has a sea entrance through a channel of 1.09 Km in length, 7.7 m wide and 0.7 m in depth from Las Croabas beach. The bottom of the lagoon is sandy with *Thalassia* beds and *Acetabularia* grass. The lagoon is surrounded by Red mangrove *Rhizophora mangle*. The salinity fluctuates between 20%-40%, with a temperature of 25-30 °C and dissolved oxygen of 2.0-7.2 mg/l (Candela et al. 1968).

The Aguas Prietas Lagoon is located in northeastern Puerto Rico (18°22'28" N, 65°38'35" W), in the municipality of Fajardo (Negrón González 1986). It has an area of 52 ha and is connected to the sea by a channel of 50 m wide. At least four heron species were found nesting in the mangrove forest that surrounds Aguas Prietas Lagoon (Rivera-Ortiz et al. 1981).

Ownership/Protection:

Although the land belongs to the DNER, the lighthouse belongs to the United States Coast Guard and the Conservation Trust of Puerto Rico administrates the lands. Other area is owned by the Puerto Rico Industrial Development Corporation.

Special Recognition:

Part of this CWA is since 1986 the Las Cabezas de San Juan Natural Reserve. The Laguna Grande and Laguna Aguas Prietas where classified as a CWA in 1979 (Raffaele and Duffield) and in 1988 (Cardona and Rivera). They determined to classify it as one of secondary importance in terms of wildlife.

Because this CWA have the presence of birds classified as endangered or threatened (i.e., Brown pelican, Caribbean Coot, White-crowned pigeon) and other important game species, we change the classification of the area as a CWA of primary importance.

Wildlife:

Birds

Eighty-seven birds species have been reported in the whole area. Among them are: Blue throated carib *Eulampis holosericeus*, Antillean crested hummingbird *Orthorhyncus cristatus*, Caribbean elaenia *Elaenia martinica*, Brown pelican *Pelecanus occidentalis*, Pied-billed Grebe *Podilymbus podiceps*, Magnificent frigatebird *Fregata magnificens*, Greater flamingo *Phoenicopterus ruber*, Green heron *Butorides virescens*, Tricolored heron *Egretta tricolor*, Little blue heron *E. caerulea*, Caribbean Coot *Fulica caribaea*, American coot *F. americana*, White-crowned pigeon *Patagioenas leucocephala*, Northern waterthrush *Seiurus noveboracensis*, Orange fronted parakeet *Aratinga canicularis*, Belted kingfisher *Ceryle alcyon*, Mangrove cuckoo *Coccyzus minor*, Common moorhen *Gallinula chloropus*, Clapper rail *Rallus longirostris*, American Oystercatcher *Haematopus palliatus*, Yellow warbler *Dendroica petechia*, Blue-winged teal *Anas discors*, Green-winged teal *A. crecca*, White cheeked pintail *A. bahamensis*, Ruddy duck *Oxyura jamaicensis* (Molinaris 1981; Weaver et al. 1988).

Reptiles

Green iguana *Iguana iguana*, Puerto Rican ground lizard *Ameiva exsul*

Amphibians

Giant toad *Bufo marinus*, Bullfrog *Rana catesbeiana*

Threats:

Aguas Prietas Lagoon is fairly well protected from human disturbance. The more threatened area is in the eastern portion, where does National Park Company administer a large camping ground.

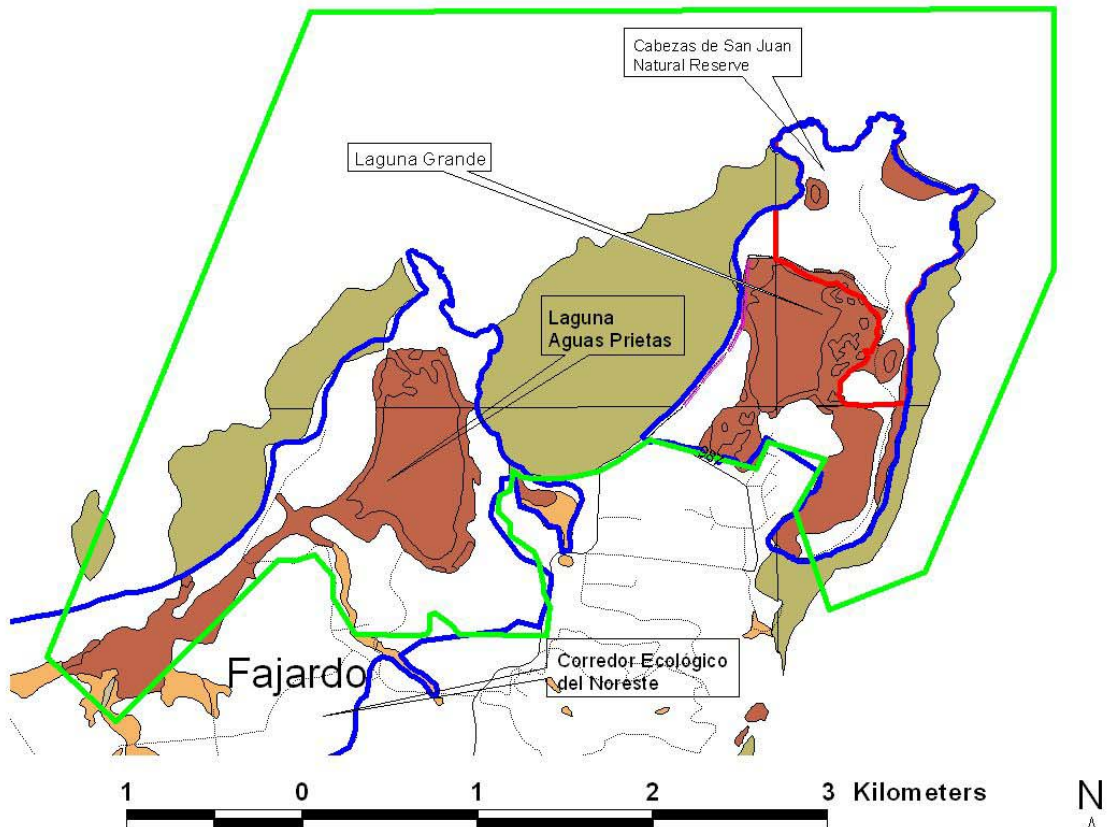
Conservation Recommendations:

Because these lagoons are important areas for waterfowl, the principal recommendation is to add the Aguas Prietas Lagoon as part of the Cabezas de San Juan Natural Reserve.

References:

- Candela, G., Cintrón G and F. McKenzie. 1968. Estudio ecológico de la Laguna Grande y el área de manglar que la circunda.
- Molinares, A. 1981. Reproduction and Morphology of the West Indian Ruddy Duck in Puerto Rico. MS Thesis. Oklahoma State University.
- Rivera-Ortiz, M.; J. Villamil, A. Molinares; J. Berríos y W. Ortiz. 1981. Suplemento de información técnica para la Reserva Natural de las Cabezas de San Juan, Fajardo, Puerto Rico. Área de Investigaciones Científicas, Departamento de Recursos Naturales. San Juan, Puerto Rico.
- Weaver, P. L.; J., Ramirez and J. L. Coll Rivera. 1998. Las Cabezas de San Juan Natural Reserve (El Faro).

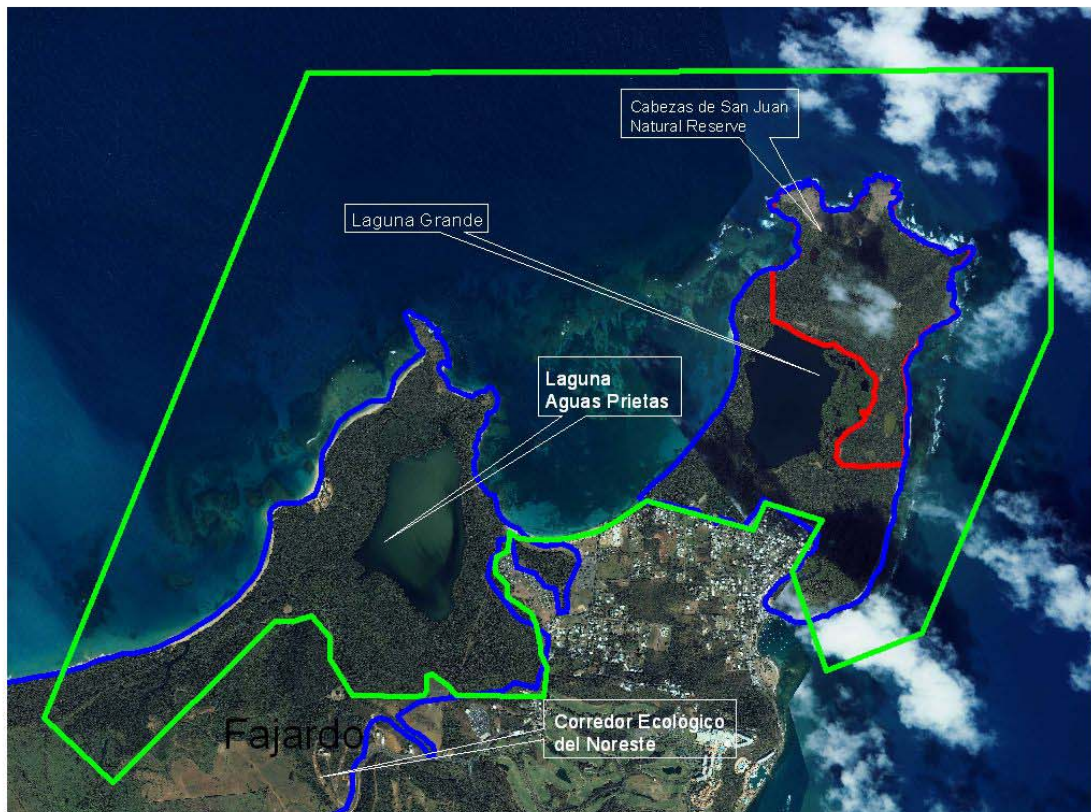
Laguna Grande, Laguna Aguas Prietas and Adjacent Areas



- ▭ Aguas prietas & grande lagoon and adjacent areas.shp
- ▭ Areas con prioridad de conservacion.shp
- ▭ Bosques_y_reservas.shp
- Carreteras avpu.shp
 - ▬ autopistas
 - ▬ primarias
 - ▬ secundarias
 - ▬ terciarias
 - ▬ caminos
 - ▬ propuestas
- Humedales avpu.shp
 - ▭ Estuarine
 - ▭ Lacustrine
 - ▭ Marine
 - ▭ Palustrine
 - ▭ Riverine



Laguna Grande, Laguna Aguas Prietas and Adjacent Areas



- Aguas prietas & grande lagoon and adjacent areas.shp
- Areas con prioridad de conservacion.shp
- Bosques_y_reservas.shp

11- Fajardo Coastline, Fajardo, Puerto Rico

Area Description:

The area includes Sardinera beach, Fajardo beach and the coastal keys: Obispo Cay, Zancudo Cay, Roncador Reef, Corona Reef, Ahogado Cay and Ramos Island, also Medio Mundo inlet up to Punta Figueras and the area of Puerto Medio Mundo (Cardona and Rivera 1988).

The east coast of Puerto Rico represents an important habitat for the West Indian manatee *Trichechus manatus* and for marine turtles. Rathbun et al. (1985), confirms its importance by reveals that endangered sea turtles utilize this CWA heavily. Hector Horta, DNER Refuge Manager, reports nesting of the endangered Leatherback sea turtles *Dermochelys coriacea* and the Hawksbill sea turtle *Eretmochelys imbricate* in this coastline. He also reports the endangered Green turtle *Chelonia mydas* feeding in this CWA (H. Horta pers. comm.). Also, there had been sightings of the endangered Yellow-shouldered blackbird *Agelaius xanthomus*.

Ownership/Protection:

Different private owners. The coastal zone is owned by the Commonwealth of Puerto Rico.

Special Recognition:

It was classified as a primary CWA in 1979 (Raffaele and Duffield) and in 1988 (Cardona and Rivera). Today, although some portions of this CWA are degrade since 1979, it continues to be one of the Island's primary CWA's, mainly because the presence of the endangered marine turtles and manatees.

Wildlife:

In the literature, there is not a vertebrate's inventory for this CWA. We included only endangered species reported for this area. Green sea turtle *Chelonia mydas*, Leatherback sea turtle *Dermochelys coriacea*, Hawksbill sea turtle *Eretmochelys imbricata*, Yellow-shouldered blackbird *Agelaius xanthomus*, West Indian manatee *Trichechus manatus*.

Threats:

The most likely threat of the area is the construction of Mega resorts and Marinas that could harm the natural resources in the area. Populations of the endangered West Indian manatee and sea turtles can be threatened by these and others shoreline activities. Manatee poaching was reported by Rathbun et al. (1985) in the Fajardo River area. Manatee-boat collision and water quality degradation are others threats.

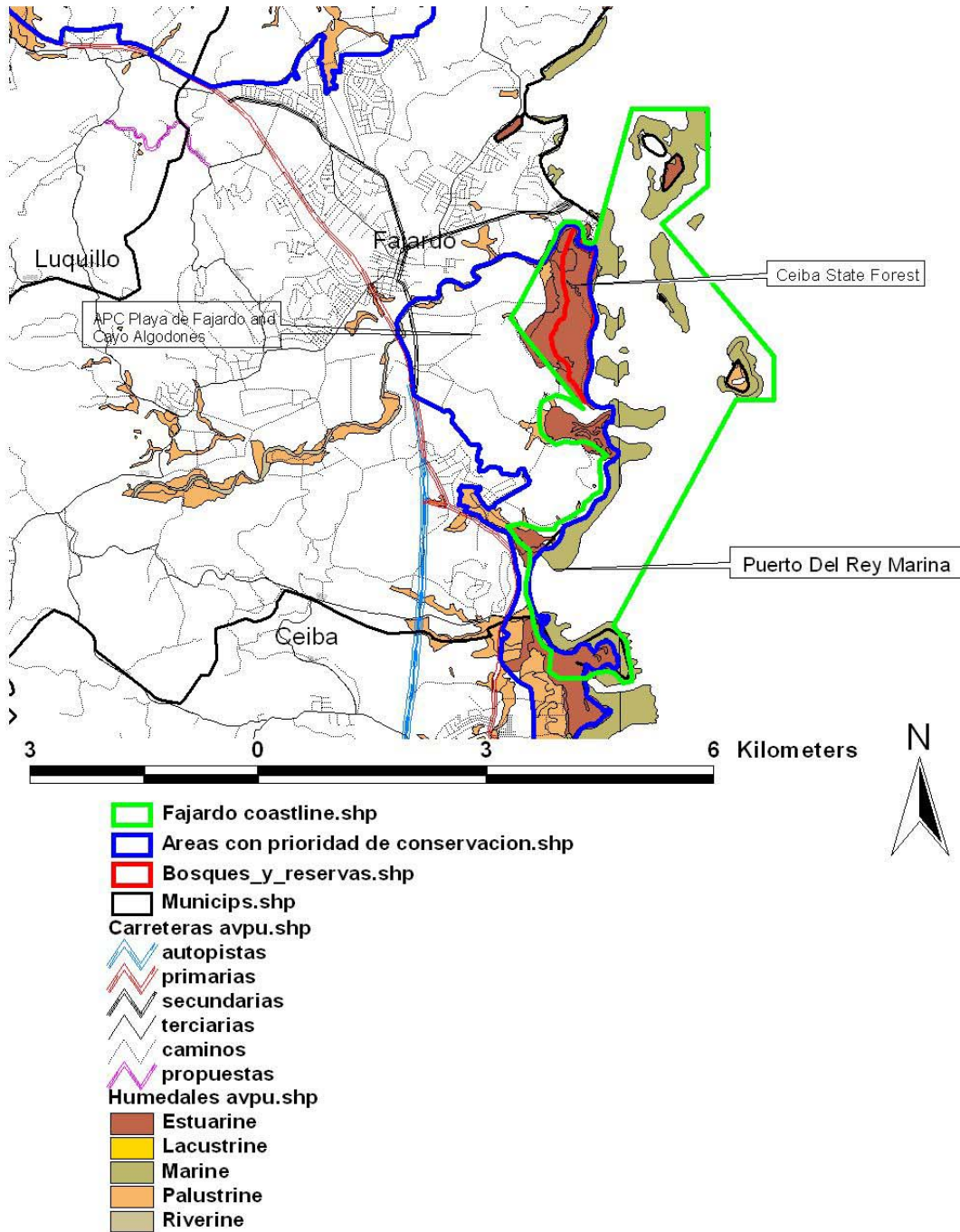
Conservation Recommendations:

One important recommendation is to declare this CWA as a sanctuary for the manatee and sea turtles. It is imperative to restrict or prohibit developments along the shoreline.

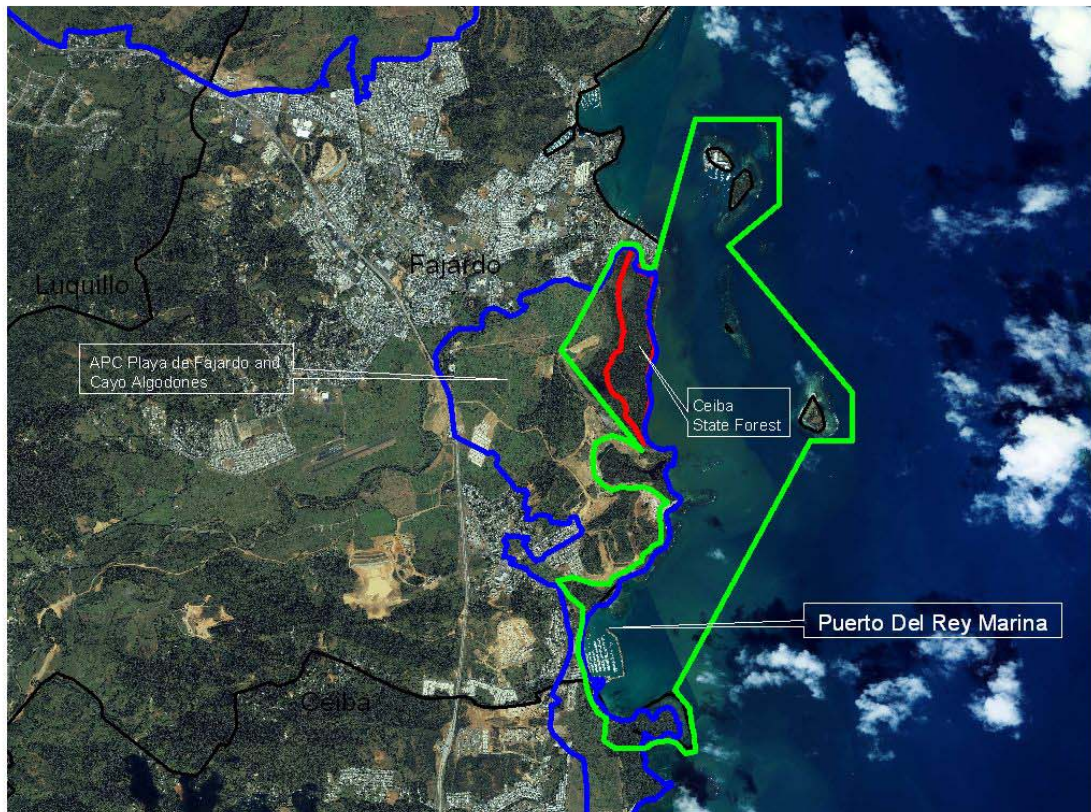
References:

Rathbun, G. B., T. Carr, N. Carr, and C. A. Woods. 1985. The distribution of Manatees and sea turtles in Puerto Rico, with emphasis on Roosevelt Roads Naval Station. Installation Planning Division, Engineering Command. Atlantic Division Naval Facilities.

Fajardo Coastline







Fajardo Coastline



3 0 3 6 Kilometers



-  Fajardo coastline.shp
-  Areas con prioridad de conservacion.shp
-  Bosques_y_reservas.shp
-  Municipios.shp

12- La Cordillera Natural Reserve, Fajardo, Puerto Rico

Area Description:

La Cordillera Natural Reserve is located to the east of Cabezas de San Juan in Fajardo (18°22'N, 65°32'W). It is a shallow, narrow submarine ridge approximately 29 km long, turning east-southeast and supporting a number of islets with high quality fringing reefs (PRDNR 1980). Some of the cays are: Los Farallones, Icacos cay, Ratonos cay, Diablos cay, Blanquilla cay, Cucaracha cay, Hermanos reef, Barriles reef and Lobos cay. Island vegetation changes from low scrub in the northwest to sea grapes and white mangroves in the southeast. These cays are abundant in *Thalassia testudinum* and are surrounded by different species of coral. Surrounding these islands are the best-developed fringing reefs of the northeast coast of Puerto Rico.

In Palominos Island there is the presence of different plants associations: 1-Grass and ornamental plants; 2-Beach and marine littoral; 3- Coastal wetland; 4-Andropogon Sabana (Acacia); 5-Spiny thicket and 6-Cliff mature forest (Cintrón et al. 1990).

Ownership/Protection:

Lobos cay, Palominos Island and Palominitos Island are private property and are not part of the Natural Reserve; Icacos cay and Ratonos cay belongs to the Industrial Development Company, the others belong to the Commonwealth of Puerto Rico (Cintrón et al. 1990).

Special Recognition:

The area was designated a Natural Reserve in 1980 because of the importance of the cays to the survival of wildlife. It was classified as a CWA in 1979 (Raffaele and Duffield) because it was an important nesting habitat for a variety of sea birds. In 2004, BirdLife International and SOPI recognized La Cordillera Natural Reserve as an Important Bird Area. Today, it's still classified as a primary CWA; the main reason are because it supports a number of seabird breeding colonies, the nesting of two endangered sea turtles species (Green and Hawksbill turtle), and the presence of the endangered Virgin Island's Tree Boa. Also, the threatened Roseate Tern (*Sterna dougallii*) uses this CWA (Hector Horta, pers. comm.).

Wildlife:

Birds

Twenty-six bird species have been reported in the area. Brown pelican *Pelecanus occidentalis*, Yellow warbler *Dendroica petechia*, Gray kingbird *Tyrannus dominicensis*, Green heron *Butorides virescens*, Clapper rail *Rallus longirostris*, Black-necked stilt *Himantopus mexicanus*, Spotted sandpiper *Actitis macularia*, Lesser yellowlegs *Tringa flavipes*, Zenaida dove *Zenaida aurita*, Bahamas pintail *Anas bahamensis*, Laughing gull *Larus atricilla*, Brown booby *Sula leucogaster* (reported breeding in some keys); the brown booby colony at La Cordillera is the largest colony in the eastern Puerto Rico; Brown noddy *Anous stolidus* (reported breeding); Frigatebird *Fregata magnificens*, Sooty tern *Sterna fuscata* (breeds on Lobos), Sandwich tern *S. sandvicensis*, Royal tern *S. maxima*, Bridled tern *S. anaethetus*, Roseate tern *S. dougallii*, Common tern *S. hirundo*, Great blue heron *Ardea herodias*, Spotted sandpiper *Actitis macularia*, Ruddy turnstone *Arenaria interpres*, Caribbean Martin *Progne dominicensis*, Yellow warbler *Dendroica petechia*, Oyster catcher *Haematopus palliatus*, White-tailed tropicbird *Phaeton lepturus*. There are reports of the Short-eared owl *Asio flammeus* nesting in Palominos Island (Cintrón et al. 1990).

Reptiles

Virgin Islands boa *Epicrates monensis granti* have been observed in Diablos cay; Hawksbill turtle *Eretmochelys imbricata* have been seen very frequently in the coral reefs and in the water surface and also nests in the beaches of Icacos cay, Ratones cay, Lobos cay, Diablo cay and Palominos islet; Green turtles *Chelonia mydas* feed on the marine grass *Thalassia testudinum* and nest in Palominos Island from June and September; Crested anole *Anolis cristatellus* is present in Icacos, Ratones, Lobos, Blanquilla, Konyokí, Diablo, Palominos and Palominitos; Puerto Rican ground lizard *Ameiva exsul* is in Icacos, Ratones, Lobo, Blanquilla, Konyokí, Diablo, Palomino and Palominitos; Common grass anole *Anolis pulchellus* is in Icacos, Ratones, Lobo, Blanquilla, Diablo y Palominos; Barred anole *A. stratulus* in Icacos, Ratones, Lobo, Blanquilla, Diablo, Palominos and Palominito; Green iguana *Iguana iguana* introduced and abundant in Icacos cay; Slippery-backed mabuya *Mabuya mabouya sloanii* is in Icacos and in Palomino Island (Cintrón et al. 1990); Nichols' dwarf gecko *Sphaerodactylus nicholsi towsendi* is in Icacos, Ratones, Lobo, Blanquilla, MacKenzie, Konyokí, Diablo, Palominos and Palominitos; Richard's blind snake *Typhlops richardi* is in Diablo, Palominos and Palominitos (Pinto Rodríguez, unpublished data); Common dwarf gecko *Sphaerodactylus macrolepis* (Cintrón et al. 1990).

Threats:

Solid waste disposal in the beaches of the cays leaved by visitors; pollution by boats and anchorage in the corral reefs. Introduced Green iguanas are abundant on Icacos. Feral cats and rats are abundant (Cardona and Rivera 1988). Predation by rats, cats and iguanas of sea turtles and seabirds' eggs are a threat. There is a population of feral rabbits whose population numbers are unknown. It is also unknown the date they were introduced (Cintrón et al. 1990).

Conservation Recommendations:

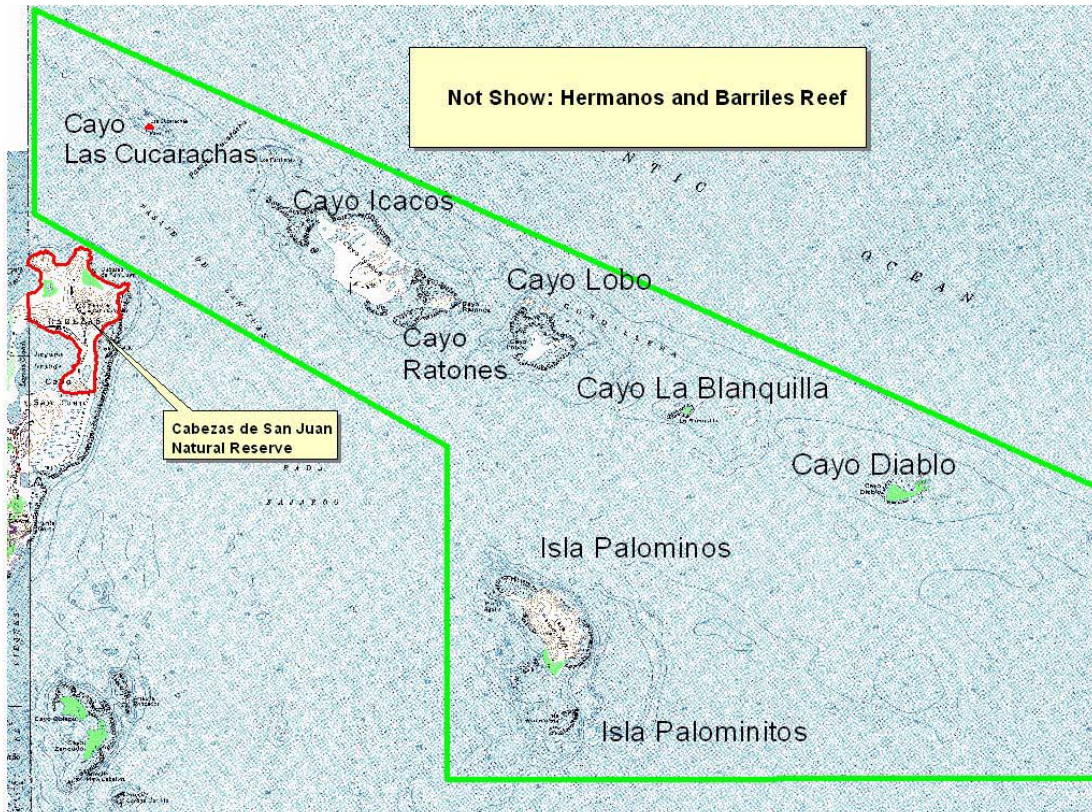
To include Cayo Largo as part of the Natural Reserve; to determine title of the private Islands and to develop an acquisition plan (PRDNR 1980). To eradicate terrestrial exotics species, such as rats, cats and green iguanas.

References:

- Cintrón, B.; G. Proctor, J. Cardona; and P. Ortiz-Rosas. 1990. Informe sobre el inventario de Flora y Fauna de Isla Palomino, Fajardo, Puerto Rico.
- Departamento de Recursos Naturales. 1982. Reserva Natural La Cordillera. Programa de Manejo de la Zona Costanera. San Juan, Puerto Rico.
- _____. 1990. Suplemento Técnico para el Manejo de la Reserva Natural La Cordillera, Fajardo. Programa de Manejo de la Zona Costera. San Juan, Puerto Rico.
- McKenzie, F. and M. Benton. 1972. Biological Inventory of the Waters and Keys of North-East Puerto Rico. Division of Natural Resources, Department of Public Works. San Juan, Puerto Rico.
- Pinto Rodríguez, B. Unpublished data. Herpetofauna de la Reserva Natural La Cordillera. Departamento de Recursos Naturales.

PRDNR. 1980. Issue Paper on Proposed Puerto Rico Marine Sanctuary Sites: La Parguera, La Cordillera-Culebra, Mona-Monito. Puerto Rico Natural Resources Department and Sanctuary Program Office. National Oceanic and Atmospheric Administration Office of Coastal Zone Management.

La Cordillera Natural Reserve



-  La cordillera natural reserve2.shp
-  Bosques_y_reservas.shp

13- Flamenco Peninsula, Culebra Island, Puerto Rico

Area Description:

Located in the northwestern tip of Culebra Island, the Flamenco Peninsula is part of the Culebra National Wildlife Refuge. It was a key target range of the U.S. NAVY. In the past, this area supported a large number of seabirds breeding colonies. Between Punta Tamarindo and Bahía de Tamarindo, lies an important area for the endangered Green sea turtle *Chelonia mydas*.

Ownership/Protection:

The U.S. Fish and Wildlife Service as part of Culebra Wildlife Refuge ha administrate approximately 66 ha; the remainder of the peninsula is administrated by the DNER (Cardona and Rivera 1988).

Special Recognition:

Because the Flamenco Peninsula is the most important breeding area for the Sooty tern *Sterna fuscata* in Puerto Rico and its one of the few localities where the Slippery-backed mabuya *Mabuya mabouya sloanii* is found, we still classified the place as a primary CWA.

Wildlife:

Birds

Sooty tern *Sterna fuscata* nests in Punta Molinos; Bridled tern *S. anaethetus* and Brown Noddy *Anous stolidus* where observed in the Flamenco Peninsula during breeding season (Cardona and Rivera 1988). Others birds reported in this peninsula are the uncommon Red-billed tropicbird *Phaethon aethereus*, the White-tailed tropicbird *P. lepturus*, the threatened Roseate Tern *Sterna dougallii*, and the Yellow-crowned night heron *Nyctanassa violacea* (NOAA 2000). Actually, the Sooty tern and the Whitetail tropicbird are the sea birds species in this peninsula (J. Saliva pers. comm.).

Reptiles

The threatened Slippery-backed mabuya *Mabuya mabouya sloanii* is reported in the southeastern basal portion of the Peninsula.

Threats:

The continued development of thick pastures and shrubby vegetation could discourage tern from nesting, causing a reduction in tern use of the area. Also, poaching of eggs can be a threat for bird colonies.

Conservation Recommendations:

It is important to continue patrolling the area and control public access in order to protect breeding seabird colonies. Also, a grass management program should be established to improve nesting sites.

References:

National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, U.S. Coast Guard, Department de Recursos Naturales y Ambientales, and U.S. Department of the Interior. 2000. Sensitivity of Coastal and Inland Resources to Spilled Oil; Puerto

14- Flamenco Lagoon, Culebra, Puerto Rico

Area Description:

Located in the northwestern portion of the Island, near the base of Flamenco Peninsula, it is a rainfall dependent lagoon surrounded by mangrove. It may dry up completely during seasons of severe drought, but usually has enough water to sustain a diversity of waterfowl (Cardona and Rivera 1988). This fairly large lagoon, surrounded by mangrove and other woody vegetation, depends entirely on rainfall (Negrón González, 1988).

The littoral vegetation is composed by the White mangrove *Laguncularia recemosa* and the buttonbush mangrove *Conocarpus erectus* (Aponte-Pagán 1981). Flamenco Lagoon is the coastal biggest lagoon in Culebra Island and has an extension of 30 ha (Negrón González 1986). Wetmore (1917) attributes this name to the presence of the Greater Flamingo (*Phoenicopterus rubber*).

It is arguably the best area for waterfowl in Culebra Island. Raffaele and Duffield (1979) observed about 400 White-cheeked ducks along with other waterfowl in this lagoon. Chabert (1987) reported that the lagoon harbored over 300 hundreds of the threatened Ruddy ducks and over 600 hundreds of the threatened White cheeked pintail (Terrestrial Resources Division Data).

Ownership/Protection:

The Flamenco Lagoon is a private property. The Culebra Conservation and Development Administration administrate the area.

Special Recognition:

The United States Fish and Wildlife Service recognized this wetland as an acquisition priority under the Federal Emergency Wetlands Resources Act of 1986: Flamenco Lagoon. Since 1979, the DNER has classified Flamenco Lagoon as a Primary CWA (Raffaele and Duffield 1979; Cardona and Rivera 1988). Because of its importance for native and migrant waterfowl, the Flamenco Lagoon is still classified as a primary CWA.

Wildlife:

White-cheeked pintail *Anas bahamensis*, Blue-winged teal *A. discors*, Ruddy duck *Oxyura jamaicensis*, Least grebe *Tachybaptus dominicus*, Common moorhen *Gallinula chloropus*, the vulnerable Caribbean Coot *Fulica caribaea*, Black-necked stilt *Himantopus mexicanus*, Ruddy turnstone *Arenaria interpres*, Spotted sandpiper *Actitis macularia*, Wilson's plover *Charadrius wilsonia*, Semipalmated plover *C. semipalmatus*, Greater yellowlegs *Tringa melanoleuca*, Semipalmated sandpiper *Calidris pusilla*, Least sandpiper *C. minutilla*, White-rumped sandpiper *C. fuscicollis*, Hudsonian godwit *Limosa haemastica* (Cardona and Rivera 1988; NOAA 2000; Kapan 2003; Terrestrial Resources Data 2004). In the borders of the lagoon, the White-crowned pigeon *Patagioenas leucocephala* had been observed (Vivaldi and Paniagua 1988).

Threats:

The development of recreational facilities at nearby Flamenco Beach and the increase of human presence on its access road, which borders the lagoon, may adversely affect wildlife use of the area. Other threats on the area include the increase in size of a nearby garbage dump and the construction of several additional houses in the strip of land between the lagoon and Flamenco Bay.

Conservation Recommendations:

To develop strategies for land acquisition by the DNER and declare this area as a Wildlife Refuge.

References:

- Aponte-Pagán, M. 1981. Informe de reconocimiento de las lagunas de Culebra (Memorando). Departamento de Recursos Naturales, San Juan, P.R.
- Kapan, D.D. 2003. Avistamientos en Culebra y Cambalache. *In: El Bien-te-veo*. Sociedad Ornitológica Puertorriqueña Vol VI, Núm. I: 3-4.
- National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, U.S. Coast Guard, Departamento de Recursos Naturales y Ambientales, and U.S. Department of the Interior. 2000. Sensitivity of Coastal and Inland Resources to Spilled Oil; Puerto Rico Atlas. Published in Seattle, Washington. Hazardous Materials Response Division of NOAA. 48 pp.
- Ortiz-Rosas, P. and V. Quevedo-Bonilla. 1987. Áreas con prioridad para la conservación en Puerto Rico. Programa Pro-Patrimonio Natural. Estado Libre Asociado de Puerto Rico, Departamento Recursos Naturales. 217 pp.
- Scott, D. A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge.
- Wetmore, A. 1917. The Birds of Culebra Island, Porto Rico. *Auk* 34:51-62.

15- Cornelio Lagoon, Culebra, Puerto Rico

Area Description:

Located on Culebra's western coast, between Tamarindo and Melones tip, this is a small shallow lagoon, seasonally dry. It is 0.26 km long and 0.15 km wide, with a perimeter of 7.0 km. The littoral vegetation is dominated by Black mangrove *Laguncularia racemosa* and behind there is a dry forest with *Bursera simaruba* dominating the landscape (Negrón González 1988).

Ownership/Protection:

Classified as a Public Land of the Commonwealth of Puerto Rico (Planning Board Map of 1987). Owners of one of the houses built near vicinity of the lagoon placed a barbwire fence around what they claim is their property, including Cornelio Lagoon (Cardona and Rivera 1988).

Special Recognition:

In 1979, Raffaele and Duffield classified it as prime wildlife areas because it is an important breeding area for the vulnerable White-cheeked pintail *Anas bahamensis*. In 1988, Cardona and Rivera classified it also as a primary wildlife area, adding two waterfowl species using this lagoon: the threatened Ruddy duck *Oxyura jamaicensis* and the endangered Masked duck *Nomonyx dominicus*. Because this relatively isolated lagoon is still providing excellent habitat for these three threatened or endangered waterfowl species, the area is still considered a primary CWA.

Wildlife:**Birds**

Thirty-eight species have been reported in Cornelio Lagoon: Blue-winged teal *Anas discors*, White-cheeked pintail *A. bahamensis*; Ruddy duck *Oxyura jamaicensis* is reported as occasional; Masked duck *Nomonyx dominicus*, Common moorhen *Gallinula chloropus*, Black neck stilt *Himantopus mexicanus* (Cardona and Rivera, 1988). Wilson's plover *Charadrius wilsonia*, Semipalmated plover *C. semipalmatus*, Stilt sandpiper *Calidris himantopus*, Pectoral sandpiper *C. melanotos*, Semipalmated sandpiper *C. pusilla*, Least sandpiper *C. minutilla*, Western sandpiper *C. mauri*, Ruddy turnstone *Arenaria interpres*, Spotted sandpiper *Actitis macularia*, Lesser yellowlegs *Tringa flavipes*, Gray kingbird *Tyrannus dominicensis*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Smooth-billed ani *Crotophaga ani*, Bananaquit *Coereba flaveola*, Yellow warbler *Dendroica petechia*, Adelaide's warbler *D. adalaidae*, Yellow-faced grassquit *Tiaris bicolor*, Antillean Mango *Anthracothorax dominicus*, Common ground dove *Columbina passerina*, Zenaida dove *Zenaida aurita*, Scaly-naped pigeon *Patagioenas squamosa*, Mangrove cuckoo *Coccyzus minor*, American kestrel *Falco sparverius*, Red-tailed hawk *Buteo jamaicensis*, Cattle egret *Bubulcus ibis*, Great blue heron *Ardea herodias*, Yellow-crowned night heron *Nyctanassa violacea*, Laughing gull *Larus atricilla*, Belted kingfisher *Ceryle alcyon*, Brown booby *Sula leucogaster*, Brown pelican *Pelecanus occidentalis* (Data provided by Terrestrial Resources Division and from José E. Rodríguez, SOPI, 2001-2003).

Mammals

White-tailed deer *Odocoileus virginianus* (Terrestrial Resources Division Data 2004).

Threats:

It appears that private parties can start certain forms of housing development close of the lagoon, causing degradation of the habitat. It is important to clarify the ownership of the lagoon as soon as possible in order to end future construction close of the lagoon and possible degradation of this CWA.

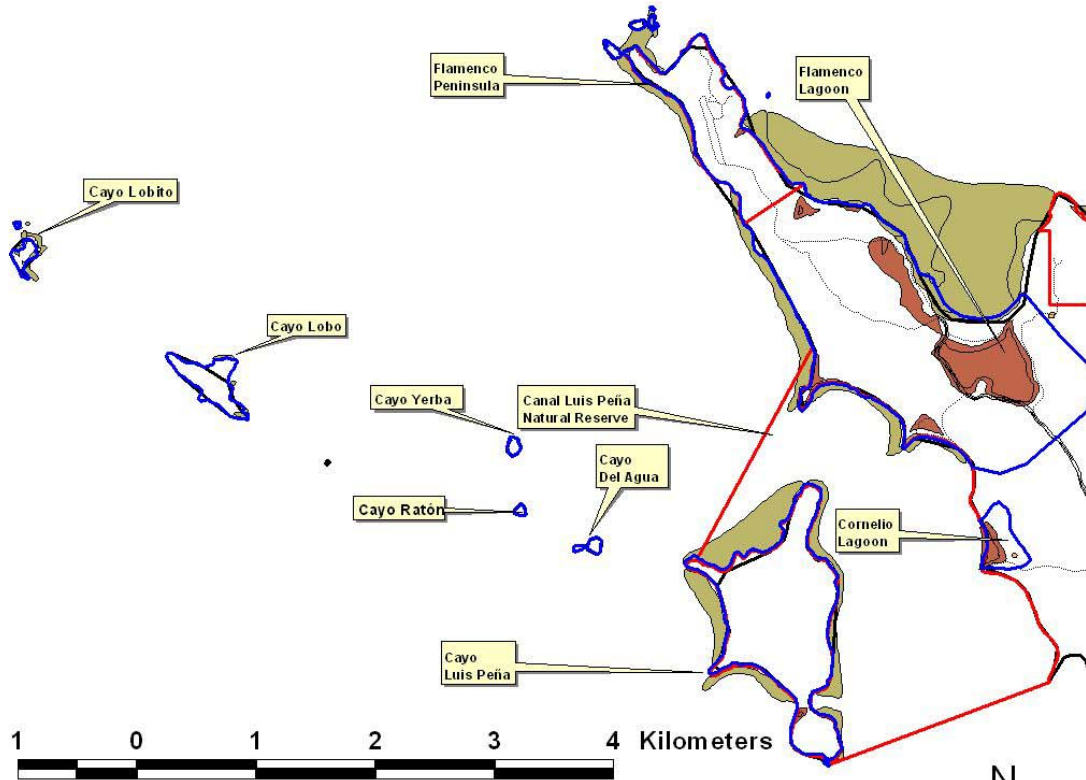
Conservation Recommendations:

To develop strategies for land acquisition by the DNER and declare this area as a Wildlife Refuge.

References:

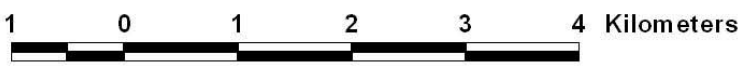
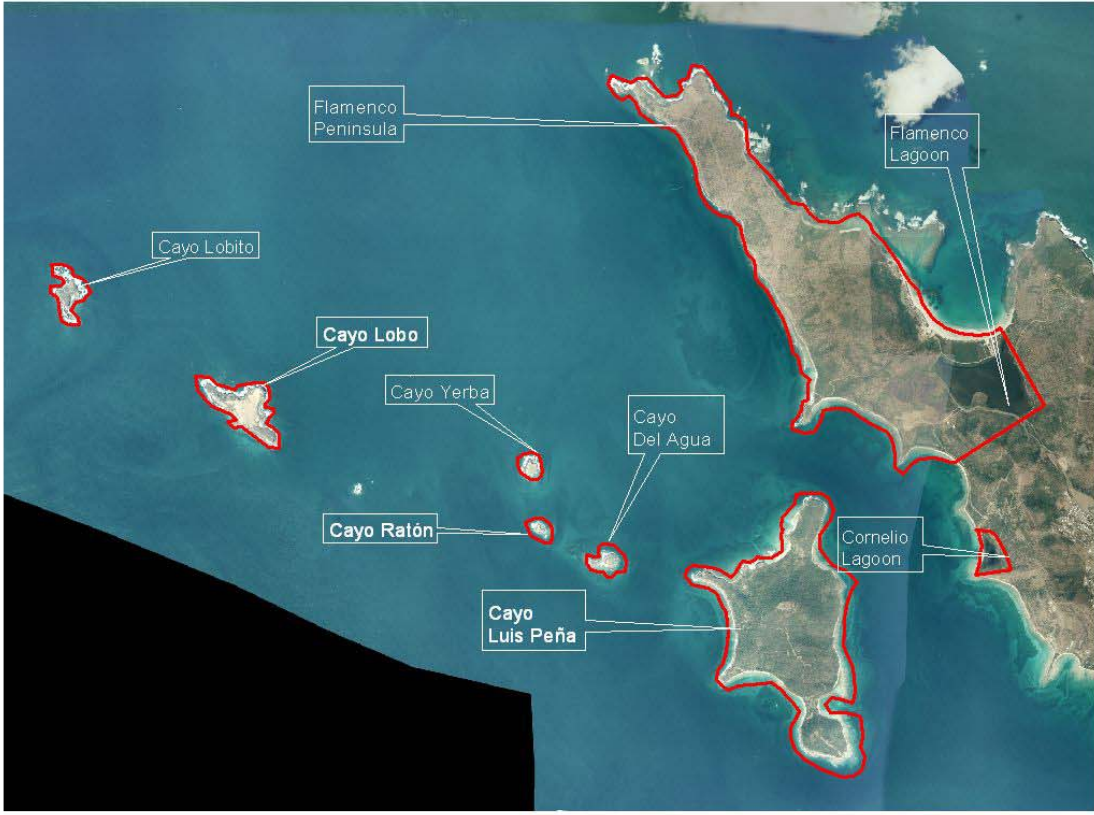
Rodríguez, Sergio E. 2003. Resumen Avistamientos de Especies de Aves, Laguna Tamarindo, Culebra. Unpublished data.

West Culebra and Surrounding Islets



- Areas con prioridad de conservacion.shp
- Bosques_y_reservas.shp
- Municipios.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

West Culebra and Surrounding Islets



16- Resaca Mountain, Culebra, Puerto Rico

Area Description:

Located in the north central portion of the Island, it is also part of the Culebra National Wildlife Refuge and includes two different type of forest: moist and dry forest. Mount Resaca contains the largest remaining forest, an area of rock-strewn canyons and ravines forming a unique habitat known as the boulder forest (USFWS 2004). Other vegetative zones, including the thick natural thorn thickets, palm forest types and cactus scrub associations, support diverse numbers of bird and reptile species.

Includes habitat type thought to be critical for the endangered Culebra giant anole *Anolis roosevelti*, but the species has not been observed during the last several decades (Cardona and Rivera 1988). On a recent visit (March 2003), personnel of DNER searched part of this remote and difficult mountain area in search of the giant anole. This two-day search in Resaca Mountain yielded no specimens of the giant anole. Resaca Mountain CWA had one of the two known population of the endangered endemic bushy herb *Peperomia wheeleri*.

Ownership/Protection:

The U.S. Fish and Wildlife Service as a part of the Culebra National Wildlife Refuge administer the lands.

Special Recognition:

It is part of the critical habitat of the endangered Culebra Giant Anole. In 1979 it was classified as a prime wildlife area and in the 1988 document as a CWA of secondary importance. The Culebra Island Giant Anole seems to have become extinct in the wild and thus represent the first of Puerto Rico's reptile known to have become extinct since Columbus's arrival. Considering this issue, we agree with Cardona and Rivera (1988), and classified Resaca Mountain as of secondary importance to wildlife.

Wildlife:

Reptiles

Resaca Mountain is the Critical Habitat for the Culebra Giant Anole *Anolis roosevelti*, although no individuals had been found in recent searches (Ojeda-Kessler 1986; Gaa 1987). Other *Anolis* reported in 2003 visit where: Crested anole *A. cristatellus*, Common grass anole *A. pulchellus*, and Barred anole *A. stratulus*. Also, the Green iguana *Iguana iguana* was commonly found in the coastal forest (Terrestrial Resources Division Data 2003).

References:

- Gaa, A. 1987. Culebra Giant Anole Status Determination Study, Final Report, Department of Natural Resources, San Juan, P.R.
- Ojeda-Kessler, A. G. 1986. Culebra Giant Anole Status Determination Study. E-S-1 Study 4. Final Report. Scientific Research Area. Department of Natural Resources. San Juan, Puerto Rico.
- USFWS. 2004. United State Fish & Wildlife Service, National Wildlife Refuge Systems, Culebra National Wildlife Refuge. <http://southeast.fws.gov/Culebra/>

17- Resaca Beach, Culebra, Puerto Rico

Area Description:

Resaca Beach is located in the northwestern portion of the Island, east of the Flamenco Public Beach. Its nearer beach Flamenco by steep cliffs and exposed rocks separates this high-energy beach. This relative remote and undisturbed beach is an important nesting habitat for endangered marine turtles, including the Leatherback sea turtle *Dermochelys coriacea* and the Hawksbill sea turtle *Eretmochelys imbricata*.

In 2000 and 2001, a total of 66 and 80 Leatherback nests respectively were found by project personnel of the Marine Turtles Conservation Project (DNER 2000; DNER 2001).

Ownership/Protection:

Owned by the Commonwealth of Puerto Rico and administrated by the U.S. Fish and Wildlife Service as a part of the Culebra National Wildlife Refuge. There is a cooperative agreement between the USFWS and the DNER for the management and conservation of Culebra's sea turtle nesting beaches.

Special Recognition:

This CWA is still classified as primary one because of its importance for the breeding success of the endangered Leatherback and the Hawksbill sea turtle. This beach is the second most important nesting area for Leatherbacks in Puerto Rico, followed by Brava Beach in Culebra Island.

Wildlife:

Reptiles

Leatherback turtle *Dermochelys coriacea*, Hawksbill turtle *Eretmochelys imbricata*

Threats:

Cattle, feral dogs and poaching are always threats for turtle's eggs and neonates.

Conservation Recommendations:

To continue the Leatherback and Hawksbill sea turtles nesting success program and the patrolling during breeding season. To maintain and repair when necessary the fence parallel to the beach, constructed to exclude cattle form the turtle's nesting area. To continue with the control of non-native dangerous animals such as cats (Terrestrial Resources Data 2004).

References:

Department of Natural and Environmental Resources. 2000. Final Report Marine Turtles Conservation Project. Leatherback turtle (*Dermochelys coriacea*) nesting in Brava, Resaca, Zoni and Flamenco Beaches, Culebra, P.R. By. Jovino Márquez-Soto.

_____. 2001. Final Report Marine Turtles Conservation Project. Leatherback turtle (*Dermochelys coriacea*) nesting in Brava, Resaca, Zoni and Flamenco Beaches, Culebra, P.R. By. Jovino Márquez-Soto.

Hall, K. V. and A. D. Tucker. 1985. Leatherback turtle *Dermochelys coriacea* nesting in Culebra, Puerto Rico in 1985. Research report submitted to the U. S. Fish and Wildlife Service.

18- Brava Beach, Culebra, Puerto Rico

Area Description:

Located in the north shore of the Island, Brava beach is a one-kilometer long high-energy beach. It is very similar to Resaca Beach, but more accessible. Because of its difficult access, there is reduced disturbance by humans. This is an important nesting area for the endangered Leatherback sea turtle. In 2000 and 2001, a total of 139 and 303 Leatherback nests, respectively, were recorded in this beach by personnel of the Marine Turtles Conservation Project (DNER 2000; DNER 2001).

Ownership/Protection:

The Commonwealth of Puerto Rico owns this CWA. There is a cooperative agreement between the USFWS and the DNER for the management and conservation of Culebra's sea turtle nesting beaches.

Special Recognition:

It is classified as a primary CWA.

Wildlife:

Reptiles

Hawksbill turtle *Eretmochelys imbricata*, Leatherback turtle *Dermochelys coriacea*.

Threats:

Turtle eggs poaching and predation by feral dogs and cats.

Conservation Recommendations:

To continue the Leatherback and Hawksbill sea turtles nesting success program and the patrolling during breeding season. To maintain and repair (when necessary) the fence parallel to the beach, constructed to exclude cattle from the turtle's nesting area.

References:

Department of Natural and Environmental Resources. 2000. Final Report Marine Turtles Conservation Project. Leatherback turtle (*Dermochelys coriacea*) nesting in Brava, Resaca, Zoni and Flamenco Beaches, Culebra, P.R. By. Jovino Márquez-Soto.

_____. 2001. Final Report Marine Turtles Conservation Project. Leatherback turtle (*Dermochelys coriacea*) nesting in Brava, Resaca, Zoni and Flamenco Beaches, Culebra, P.R. By. Jovino Márquez-Soto.

19- Larga Beach and Zoni Lagoon, Culebra, Puerto Rico

Area Description:

This CWA is in the northern coast of the Island (18⁰, 19'39" N and 65⁰, 15'44"W), and is composed of a shallow lagoon surrounded by mangroves and a long stripe of sandy beach. Zoni Lagoon has an area of 4.54 ha and it is surrounded by mangroves and a long narrow stripe of sandy beach (Negrón González 1986). Cattle use an area on the southeastern portion of the lagoon intensively.

Shrubby vegetation has developed in the slope area formerly dominated by grasses around parts of Zoni Lagoon. It is surrounded by dead mangrove in the interior, and inland, there is a fringe of black and white mangrove (Aponte-Pagán 1981). Possibly reduced cattle grazing have promoted the development of the shrubby vegetation.

Ownership/Protection:

The Commonwealth of Puerto Rico owns the Larga Beach and Zoni Lagoon, but the surrounding hills are private.

Special Recognition:

Both areas were and continue to be classified as one of primary value. Larga Beach continues to be an important breeding area for endangered sea turtles (Leatherback and Hawksbill sea turtles) and the Zoni Lagoon harbor important waterfowl species, including the threatened White-cheeked pintail, Ruddy duck and the Caribbean Coot.

Wildlife:

Birds

This area continues to support breeding of the threatened White-cheeked pintail *Anas bahamensis*. This species is known to nest in the shrubby pastures on the hills surrounding the lagoon to the southeast. Brown pelican *Pelecanus occidentalis*, Pied-billed grebe *Podilymbus podiceps*, Common moorhen *Gallinula chloropus*, Ruddy duck *Oxyura jamaicensis*, Caribbean Coot *Fulica caribaea*. In 1989, a breeding colony of the Laughing gull *Larus atricilla* was observed (J. Saliva pers. comm.). Other birds reported are the Bananaquit *Coereba flaveola* and the Blackpoll warbler *Dendroica striata*, Peregrine *Falco peregrinus*, Brown booby *Sula leucogaster*, and the Magnificent frigatebird *Fregata magnificens* (Kapan 2003).

Reptiles

The beach located north of the lagoon, is an important breeding area for endangered Leatherback and Hawksbill sea turtles.

Threats:

The hills to the southeast of the lagoon are privately owned and new unpaved roads have been built. Some of the land has been divided into small lots. The area is under threat of development, as the zoning classification allows for the construction of housing, albeit with certain restrictions.

Conservation Recommendations:

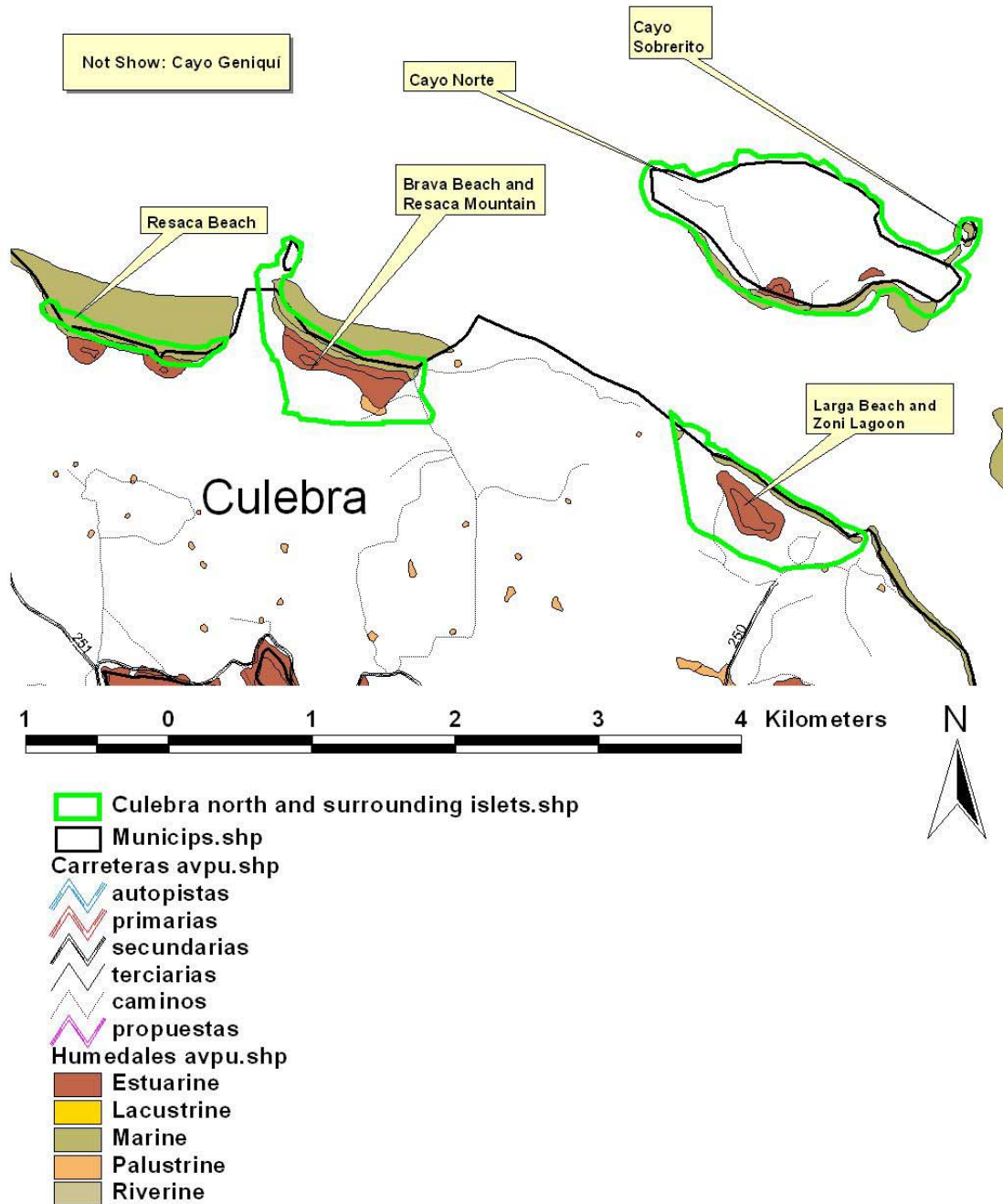
It is necessary to designate the area surrounding Zoni Lagoon with a more restrictive classification. Otherwise, its value for threatened or endangered native avifauna and for migratory waterfowl may decrease or be lost in the near future.

References:

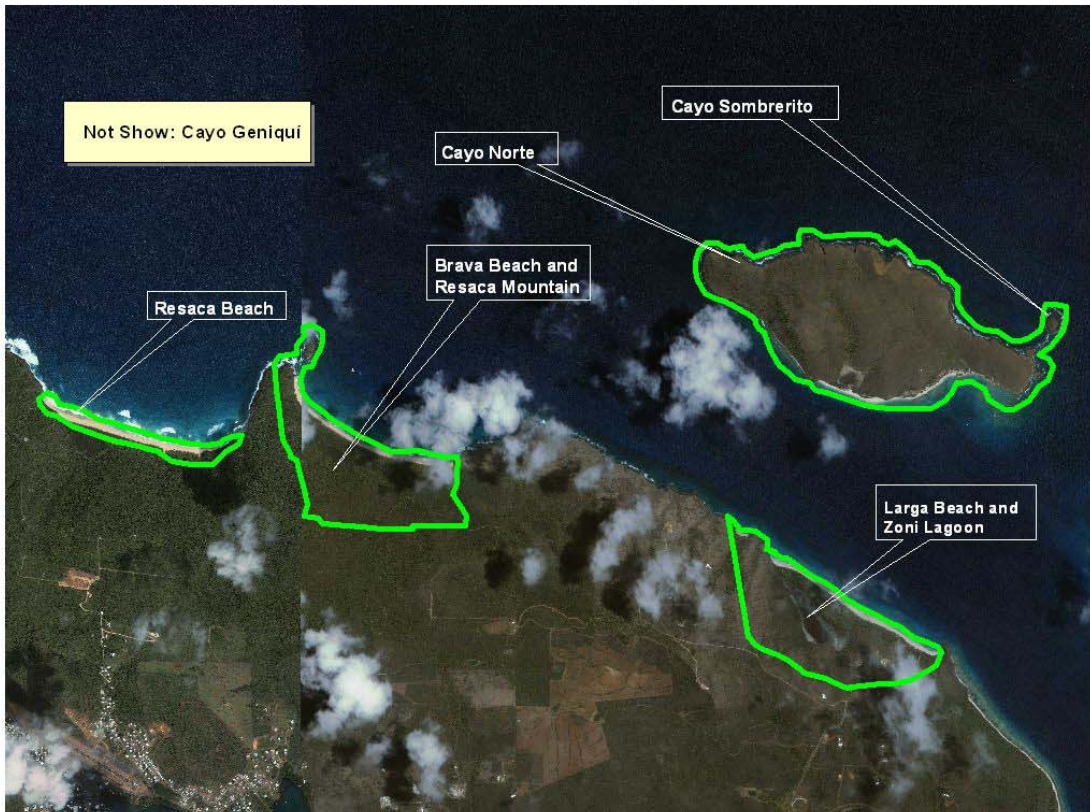
Aponte Pagán, M. 1981. Informe de reconocimiento de las Lagunas de Culebra (Memorando).
Dept. Rec. Nat., San Juan, P.R.

Kapan, D.D. 2003. Avistamientos en Culebra y Cambalache. *In*: El Bien-te-veo. Sociedad
Ornitológica Puertorriqueña Vol VI, Núm. I: 3-4.

North Culebra and Surrounding Islets



North Culebra and Surrounding Islets



 Culebra north and surrounding islets.shp

20- Maillux Pond, Culebra, Puerto Rico

Area Description:

This is an artificial pond, created mainly for domestic purposes. The water level appeared to be constant during the year (Bonilla, 2004). Personnel of the DNER, Distribution and Population Density of Resident Aquatic Birds in Puerto Rico Project, visited this small pond one time per month to conduct different waterfowl counts. Data from this project showed that this pond is an important feeding, nesting and roosting area for the threatened White-cheeked Pintail (Bonilla, 2004). During one visit in 2004, they found approximately 400 individuals in a single count.

Ownership/Protection:

Private property.

Special Recognition:

The Maillux Pond is for the first time included in the Puerto Rico CWA inventories, and we classified it as one of secondary importance.

Wildlife

This CWA support the largest population of the threatened White-cheeked Pintail *Anas bahamensis*.

Threats:

Possible degradation by owners, dredging or urban development are some threats.

Conservation Recommendations:

Creation of artificial ponds on public lands with similar characteristic for the establishment of waterfowl should be a priority. To develop strategies for management plans for the complete establishment of the White-cheeked Pintail and other native and migrant waterfowl on artificial ponds.

References:

Bonilla, G. 2003. Distributions and Population Density of Resident Aquatic Birds in Puerto Rico. Interim Report. Department of Natural and Environmental Resources, Terrestrial Resources Division, San Juan, P.R.

21 Puerto Del Manglar, Culebra, Puerto Rico

Area Description:

Located in the southeastern portion of the Island, it is approximately 23 ha in size and it's one of Culebra's mainland units of the Culebra National Wildlife Refuge administered by the U. S. Fish and Wildlife Service. Puerto Del Manglar is an inlet with the presence of the bioluminescence phenomenon and the coast is surrounded by mangroves (Cardona and Rivera 1988).

The mangroves of Puerto Del Manglar serve as roosting and nesting sites for Cattle egrets, Brown pelicans, Yellow-crowned night herons, Scaly-naped pigeons and White-crowned pigeons. These vital trees serve as a buffer, filtering sediment carried by runoff from the surrounding sloping terrain, again helping to protect marine water quality (USFWS 2004). It was previously classified as a CWA mainly because the vulnerable White-crowned pigeon occurs here and the bioluminescence in the bay. The endangered Brown pelican roosts in the mangroves and feeds in the Bay of Puerto Del Manglar.

Ownership/Protection:

Puerto Del Manglar is part of the Culebra National Wildlife Refuge, administered by the U. S. Fish and Wildlife Service.

Special Recognition:

In 1979, Raffaele and Duffield classified it as a CWA of secondary values, and Cardona and Rivera (1988) as an area of primary importance to wildlife. Today, although the private properties around are under development pressure, Puerto Del Manglar continues to have an important ecological value and is still classified as a primary CWA.

Wildlife

Birds

White-crowned pigeon *Patagioenas leucocephala*, Brown pelican *Pelecanus occidentalis*, Magnificent frigatebird *Fregata magnificens*, Sooty tern *Sterna fuscata* (Cardona and Rivera 1988). Brown booby *Sula leucogaster*, Laughing gull *Larus atricilla*, Royal tern *Sterna maxima*, Roseate tern *S. dougallii*, Common tern *S. hirundo* and Sandwich tern *S. sandvicensis* forage in the Puerto de Manglar bay (J. Saliva pers. com.). Other birds reported are: Little blue heron *Egretta caerulea*, Snowy egret *E. thula*, Great egret *Ardea alba*, Great blue heron *A. herodias*, Greater yellowlegs *Tringa melanoleuca*, Lesser yellowlegs *T. flavipes*, Black-necked stilt *Himantopus mexicanus*, Stilt sandpiper *Calidris himantopus*, Ruddy turnstone *Arenaria interpres*, Black-bellied plover *Pluvialis squatarola*, Short-billed dowitcher *Limnodromus griseus*, Clapper rail *Rallus longirostris*, American kestrel *Falco sparverius*, Osprey *Pandion haliaetus*, Common ground dove *Columbina passerina*, Smooth-billed ani *Crotophaga ani*, Northern waterthrush *Seiurus noveboracensis*, Blackpoll *Dendroica striata*, Prairie warbler *D. discolor*, Bananaquit *Coereba flaveola*, Black-faced grassquit *Tiaris bicolor* (Kapan 2003).

Reptiles

It is also one of the most important feeding areas for Green sea turtle *Chelonia mydas* in Culebra.

Threats:

Private properties around this CWA can be developed, causing habitat loss and degradation, and probably, contamination by sediments on the bay, caused by erosion and runoff.

Conservation Recommendations:

Sedimentation patterns and intensities, as well as other aspects that may be detrimental to the area's ecology should be considered before additional development is permitted around the area (Cardona and Rivera 1988).

References:

Kapan, D.D. 2003. Avistamientos en Culebra y Cambalache. *In: El Bien-te-veo*. Sociedad Ornitológica Puertorriqueña Vol VI, Núm. I: 3-4.

USFWS. 2004. United State Fish & Wildlife Service, Culebra National Wildlife Refuge General Information. http://caribbean-ecoteam.fws.gov/culebra_index.htm.

22- Los Caños, Culebra, Puerto Rico

Area Description:

Located in the east of the town of the Island, between the Puerto de Manglar and Cementerio Bay CWA's, Los Caños is approximately 29 ha in size and it is composed of mangrove stands, islets and interconnecting channels. It is an important area for migrant and resident shorebirds, and it is part of the Culebra National Wildlife Refuge (Cardona and Rivera 1988). Wildlife use of the area is poorly known.

Ownership/Protection:

Los Caños is part of the Culebra National Wildlife Refuge, administered by the U. S. Fish and Wildlife Service.

Special Recognition:

Because it's an important roosting area for the rare White-crowned pigeon, and the threatened White-cheeked pintail, is still classified as a prime wildlife area.

Wildlife:

Birds

White-crowned pigeon *Patagioenas leucocephala* and the Scaly-naped pigeon *P. squamosa* roost in this CWA (J. Saliva pers.comm.). Others birds are the White-cheeked pintail *Anas bahamensis*, Black-necked stilt *Himantopus mexicanus*, Green heron *Butorides virescens* and the Greater yellowlegs *Tringa melanoleuca*.

Threats:

Private properties around this CWA can be developed, causing habitat loss and degradation, and probably, contamination by sediments on the bay, caused by erosion and runoff.

Conservation Recommendations:

To continue the patrolling of the area by personnel of law enforcement of USFWS in order to control possible activities that can affect the quality of this CWA.

References:

None

23- Cementerio Bay, Culebra, Puerto Rico

Area Description:

Located on the northeastern portion of Ensenada Honda Bay, in the south coast of the Island, Cementerio Bay is composed mainly of red mangroves (Cardona and Rivera 1988). The local cemetery is on a hill to the northwest of this cove (bay). At the east of the bay, there are the facilities of DNER and USFWS offices.

Ownership/Protection:

The Cementerio Bay is owned by the Commonwealth of Puerto Rico, but the surrounding hills are private.

Special Recognition:

Today, as in the 1979 and 1988 documents, this CWA is still classified as secondary to wildlife.

Wildlife

This mangrove supports a roost for Cattle egrets *Bubulcus ibis* and the rare White-crowned pigeon *Patagioenas leucocephala*.

Threats:

Private properties around this CWA can be developed, causing habitat loss and degradation, and probably, contamination by sediments on the bay, caused by erosion and runoff.

Conservation Recommendations:

To incorporate this CWA to the Culebra National Wildlife Refuge.

References:

None

24- Culebra's Surrounding Cays, Culebra, Puerto Rico

Area Description:

Culebra's surrounding islets include: Cayo Yerba, Cayo Luis Peña, Cayo Matojo, Cayo Del Agua, Cayo Ratón, Cayo Lobo, Cayo Lobito, Cayo Alcarraza, Cayo Noroeste, Cayo Molinos, Cayo Geniquí, Culebrita, Cayo Pelá y Pelaita and Punta Soldado. The cays that have sandy beaches (Culebrita, Cayo Luis Peña and Cayo Norte) are important breeding areas for endangered sea turtles (Raffaele and Duffield 1979).

Ownership/Protection:

All islets and cays surrounding Culebra Island, except privately owned Cayo Norte, are administered by the U.S. Fish and Wildlife Service as part of Culebra's National Wildlife Refuge.

Special Recognition:

It was included in 1979 and 1988 document as a primary CWA. Raffaele and Duffield (1979) described this CWA as “one of Puerto Rico’s prime wildlife resources”. The current condition of this CWA remains unchanged since 1979, and is still classified as a primary one for wildlife.

More recently, the DNER designate in 2004 the ocean area between Culebra and Luis Peña Cay as the Fisheries Marine Reserve of Luis Peña Channel in Culebra to protect the coral reefs and the marine organisms associated to the area. The shallow waters of the fringing reef located in Punta Melones and Tarja Bay, inside the reserve constitutes a natural nursery for fishes of high commercial value. The diversity of coral species is representative of the northeast region of the Caribbean (Pagán Villegas et al. 1999).

Wildlife:

Birds

Zenaida dove *Zenaida aurita* breeds on all of the Culebra’s surrounding islets. In Cayo Yerba, there is a breeding population of the threatened Roseate tern *Sterna dougallii*. The uncommon Audubon’s shearwater *Puffinus iherminierie* and the Caribbean Martin *Progne dominicensis* occur here. In Cayo Matojo breeds the Sandwich tern *Sterna sandvicensis*, the Royal tern *S. maxima* and there is the Audubon’s shearwater *Puffinus iherminierie*. In Cayo Luis Peña breeds the uncommon Red-billed tropicbird *Phaethon aethereus*, the White-tailed tropicbird *P. lepturus*, and the uncommon Audubon’s shearwater *Puffinus iherminierie*. In Cayo Del Agua breeds the White-tailed tropicbird *Phaethon lepturus* and the Bridled tern *Sterna anaethetus*. In Cayo Ratón breeds the threatened Roseate tern *Sterna dougallii*, the Bridled tern *S. anaethetus*, and the uncommon Red-billed tropicbird *Phaethon aethereus*. In Cayo Lobo, no surveys have been done but apparently, the two species of Tropicbirds and the uncommon Audubon’s shearwater *Puffinus iherminierie* nest in this cay. In Cayo Lobito nests the Laughing gull *Larus atricilla*, the Sandwich tern *Sterna sandvicensis*, the Royal tern *S. maxima*, the Bridled tern *S. anaethetus*, the uncommon Audubon’s shearwater *Puffinus iherminierie*, the uncommon Red-billed tropicbird *Phaethon aethereus*, and the American Oystercatcher *Haematopus palliatus*. In Cayo Alcarraza breeds the Sooty tern *Sterna fuscata*, the Bridled tern *S. anaethetus*, the uncommon Audubon’s shearwater *Puffinus iherminierie*, the rare Masked booby *Sula dactylatra*, the Brown booby *S. leucogaster* and the Caribbean Martin *Progne dominicensis*. In Cayo Noroeste breed the Sooty tern *Sterna fuscata*, the Bridled tern *S. anaethetus*, the threatened Roseate tern *S. dougallii*, the Brown noddy *Anous stolidus*, and the Black noddy *A. minutus* (not breeding). In Cayo Molinos breeds the Sooty tern *Sterna fuscata*, the Bridled tern *S. anaethetus*, the Brown noddy *Anous stolidus*, the White-tailed tropicbird *Phaethon lepturus*, the uncommon Red-billed tropicbird *P. aethereus* and. In Cayo Geniquí breeds the Brown booby *Sula leucogaster*, the Bridled tern *Sterna anaethetus*, the Laughing gull *Larus atricilla*, the uncommon Red-billed tropicbird *Phaethon aethereus*, the Red-footed booby *Sula sula*; also the Brown noddy *Anous stolidus* and the Magnificent frigatebird *Fregata magnificens* roost in this cay. In Cayo Culebritas, there’s no report of breeding sea birds, but breeding of the White-tailed tropicbird *Phaethon lepturus* may occur. In Cayo Pelá and Pelaita breeds the Scaly-naped Pigeon *P. squamosa* and the Zenaida dove *Zenaida aurita*. In Punta Soldado (south Culebra) breeds the Roseate tern *Sterna dougallii* and the White-tailed tropicbird *Phaethon lepturus* (Unpublished data provided by Dr. Jorge Saliva, U.S. Fish & Wildlife Biologist).

Reptiles

Slippery-backed mabuya *Mabuya mabouya sloanii*, Hawksbill turtle *Eretmochelys imbricata* and Green turtle *Chelonia mydas* occurs at Luis Peña and Culebrita Island (Cardona and Rivera 1988).

Threats:

In the past, the Culebra's adjacent cays were used for aerial bombardment, dive-bombing and air-to ground missile practices. These practices finished in 1970 (USACE 1995). The cays and islets surrounding the island of Culebra are almost devoid of development pressures since they were designated part of the Culebra National Wildlife Refuge in 1975. Predation by rats occurs in Cayo Luis Peña (J. Saliva pers. comm.). Also illegal poaching, primarily of the Sooty tern and wild fires are a threats.

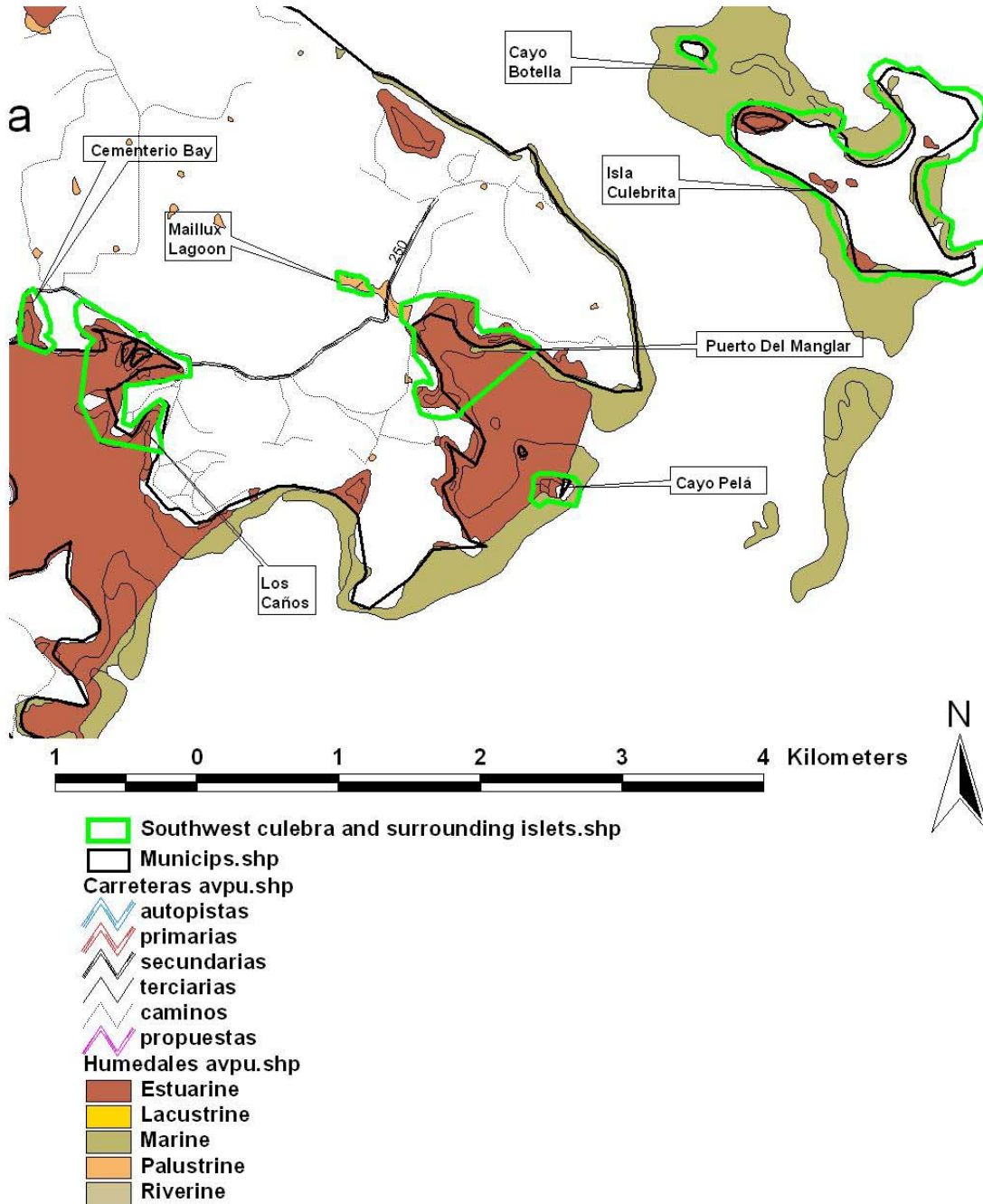
Conservation Recommendations:

To continue the patrolling of the cays by personnel of the USFWS and DNER Law Enforcement Division during the weekends and summer season. This action will minimize disturbance to the islets wildlife and ecology (Cardona and Rivera 1988).

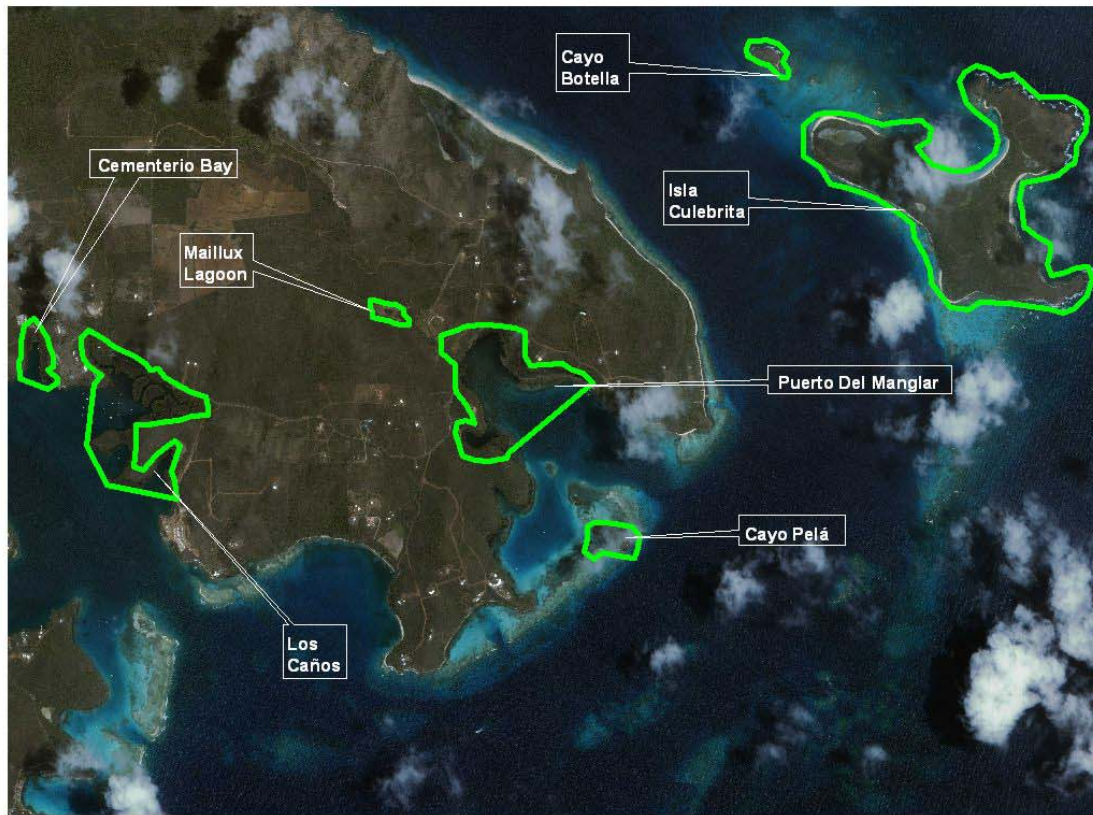
References:

- Departamento de Recursos Naturales y Ambientales. 1999. Documento de Designación de la Reserva Natural Cayo Luis Peña. Programa de Manejo de la Zona Costanera de Puerto Rico. 44 pp.
- Pagán-Villegas, I. M., E. A. Hernández-Delgado and V. P. Vicente. 1999. Documento de Designación de la Reserva Natural del Canal Luis Peña, Departamento de Recursos Naturales y Ambientales, San Juan, Puerto Rico. 21 de mayo de 1999.
- U.S. Army Corps of Engineers. 1995. Draft Work Plan Engineering Evaluation/Cost Analysis, Formerly Used Defense Site, Culebra Island, Puerto Rico, ESE Project No. 3195803G. Prepared by Environmental Science & Engineering, Inc. Gainesville, Florida.

Southwest Culebra and Surrounding Islets




Southwest Culebra and Surrounding Islets



1 0 1 2 3 4 Kilometers



 Southwest culebra and surrounding islets.shp

25- Vieques West Coast, Vieques, Puerto Rico

Area Description:

The western end of Vieques Island (approximately 3,320 ha) was used by the US NAVY since 1943 (and until 2001) for ammunition storage, communications and other activities to support services for Roosevelt Roads Naval Station on the main island of Puerto Rico and the Atlantic Fleet Weapons Training Facility on the eastern end of Vieques. Before the acquisition for military purposes in the 1940's, the property was comprised of a series of sugar cane plantations that had been cultivated since the late 1800's under private and corporate ownership. These lands were originally established as Conservation Zones in 1986 in accordance with the 1983 MOU between the Government of Puerto Rico and the U.S. NAVY (Commonwealth of Puerto Rico, Puerto Rico Conservation Trust and the United States Department of the Interior 2002).

The western Vieques is characterized by low hills and nearly flat areas, and gently sloped areas dissected by deep ravines and rivulets formed by the natural draining of surface water. Because of the higher humidity and relatively moderate disturbances from the past; the ravines constitute a distinctive habitat for plant and wildlife communities (Commonwealth of Puerto Rico, Puerto Rico Conservation Trust and the United States Department of the Interior 2002). The habitat of the area comprehends rocky and sandy beaches, lagoons, subtropical moist forest, subtropical dry forest, mangrove forest, salt flats and mudflats.

Ownership/Protection:

The U.S. NAVY transferred 3,183 ha of land on the western end of Vieques Island to the Commonwealth of Puerto Rico; 1,650 ha to the Municipality of Vieques, 314.43 ha to the Puerto Rico Conservation Trust and 1,218.40 ha to the Department of the Interior to be managed as a Wildlife Refuge by the U.S. Fish and Wildlife Service. These lands are considered Conservation Zone (Oscar Diaz, Refuge manager, pers. comm.).

Special Recognition:

The whole area contains marine, aquatic and upland forest systems supporting a great variety of wildlife making it a primary wildlife area (Cardona and Rivera 1988). In 2004, BirdLife International and SOPI recognized Vieques Island as an Important Bird Area. Today, this whole area still recognized as a prime wildlife area.

Wildlife:

Birds

White-crowned pigeon *Patagioenas leucocephala*, White-cheeked pintail *Anas bahamensis* in some brackish lagoons, as well as the West Indian whistling duck *Dendrocygna arborea*. In Boca Quebrada Lagoon: Common moorhen *Gallinula chloropus*, Great egret *Ardea alba*, Tricolored heron *Egretta tricolor* and Little blue heron *E. caerulea* (Cardona and Rivera 1988); Mourning dove *Zenaida macroura* and Scaly-naped pigeon *Patagioenas squamosa* (NOAA et al 2000). Birds reported in Monte Pirata: Red tailed hawk *Buteo jamaicensis*.

Reptiles

Leatherback turtle *Dermochelys coriacea*, Hawksbill turtle *Eretmochelys imbricata*, Green sea turtle *Chelonia mydas* and the Loggerhead turtle *Caretta caretta* (Geo-Marine 1996).

Mammals

The seagrass beds in the western side of the Mosquito Pier are prime habitat for the West Indian manatee *Trichechus manatus*.

Threats:

Within the lands transferred to the USFWS there are three sites that the US NAVY identified as contaminated and are under investigation. The US NAVY is the main entity responsible for the clean up of these sites, under the guidance of the US Environmental Protection Agency and the Puerto Rico Environmental Quality Board, in compliance with Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (Commonwealth of Puerto Rico, Puerto Rico Conservation Trust and the United States Department of the Interior, 2002).

Conservation Recommendations:

The three sites identified by the US NAVY as contaminated, should be cleaned and restored. These areas of concern are:

- 1) Waste Explosive Open Burn/Open Detonation Range – the contaminated area is probably not larger than 20 ha, but approximately 162 ha have been fenced and signed for the public safety.
- 2) Mangrove Disposal Site – located north side of the road nearby Laguna Kiani. The area has been estimated to be 1.2 ha and have been fenced and posted as closed to the public.
- 3) Operation Area Disposal Site – located adjacent to a stream that drains into Vieques Sound along its northeastern border. The area covers approximately 0.5 ha and appears to be 2-4 feet deep.

Wildlife monitoring should be implemented to detect population trends and to provide insights into their causes, if any. Channels to the lagoons should be kept operational to prevent degradation of the mangrove systems.

Kiani Lagoon Complex

Area Description:

Located in the northwest part of Vieques Island, this complex includes three lagoons: El Pobre, Boca Quebrada and Arenas Lagoons. It is probably the most remote and best-protected tract of swamp anywhere in Puerto Rico and consequently species rare elsewhere can survive here. Around these lagoons, there are very dense strands of red mangrove making it very difficult to penetrate them. There are also saltflats and mudflats and in the driest areas there is a black mangrove forest and a coastal dry forest. A very dense population of Land crab *Cardisoma guanhumi* is noticeable in the area.

The west side of Mosquito Pier in the northwestern area of Vieques is a prime locality for the endangered West Indian Manatee. The whole area contains marine, aquatic and upland forest systems supporting a great variety of wildlife making it a primary wildlife area.

Ownership/Protection:

The west coast of Vieques is part of the Vieques National Wildlife Refuge, and is administered by the United States Fish and Wildlife Service, Caribbean Island National Wildlife Refuges.

Birds at Kiani Lagoon Complex

Forty two bird species have been reported in Kiani Lagoon Complex: Blue-winged teal *Anas discors*, White-cheeked Pintail *A. bahamensis*, Ruddy duck *Oxyura jamaicensis*, West Indian whistling duck *Dendrocygna arborea* (probably nests) (Terrestrial Resources Division Data 2004). Yellow-crowned night heron *Nyctanassa violacea*, Great blue heron *Ardea herodias*, Great egret *A. alba*, Common moorhen *Gallinula chloropus*, Clapper rail *Rallus longirostris*, White-crowned pigeon *Patagioenas leucocephala* (Cardona and Rivera 1988). Pied-billed grebe *Podilymbus podiceps*, Brown pelican *Pelecanus occidentalis*, Magnificent frigatebird *Fregata magnificens*, Green-backed heron *Butorides virescens*, Tricolored heron *Egretta tricolor*, Little blue heron *E. caerulea*, Cattle egret *Bubulcus ibis*, Great egret *Ardea alba*, Least bittern *Ixobrychus exilis*, Red-tailed hawk *Buteo jamaicensis*, Clapper rail *Rallus longirostris*, Black-necked stilt *Himantopus mexicanus*, Zenaida dove *Zenaida aurita*, White-winged dove *Z. asiatica*, Common ground dove *Columbina passerina*, Green throated carib *Eulampis holosericeus*, Antillean crested hummingbird *Orthorhyncus cristatus*, Gray kingbird *Tyrannus dominicensis*, Caribbean elaenia *Elaenia martinica*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Black-whiskered *Vireo altiloquus*, Bananaquit *Coereba flaveola*, Yellow warbler *Dendroica petechia*, Greater Antillean Grackle *Quiscalus niger*, Glossy cowbird *Molothrus bonariensis* (Raffaele 1972); Caribbean coot *Fulica caribaea*, Masked duck *Nomonyx dominicus* (not seen recently) (NOAA et al 2000); Puerto Rican woodpecker *Melanerpes portoricensis*, Loggerhead kingbird *Tyrannus caudifasciatus*, Puerto Rican flycatcher *Myiarchus antillarum*, Mangrove cuckoo *Coccyzus minor* (Terrestrial Resources Division data 2005); Little blue heron *Egretta caerulea*, Killdeer *Charadrius vociferus*, Black-bellied plover *Pluvialis squatarola*, Greater yellowlegs *Tringa melanoleuca*, Palm warbler *Dendroica palmarum*, Ruddy turnstone *Arenaria interpres* (Sorrié 1975).

Reptiles

Green iguana *Iguana iguana*

Mammals

Herpestes auropunctatus

Invertebrates

Blue land crab *Cardisoma guanhumi*

Critical Plants:

Cobana negra *Stahlia monosperma*.

Playa Grande Lagoon

Area Description:

Playa Grande Lagoon, with an extension of 19.7 ha (Negrón González 1986) is the biggest lagoon of the island and its located on the southwest. Dense red mangroves strands dominate the littoral vegetation. It is an important site for shorebirds and rare waterfowl and contains a large roost made up of a number of heron species (DNR 1979).

Ownership/Protection:

The Playa Grande Lagoon is part of the Vieques National Wildlife Refuge, administered by the United States Fish and Wildlife Service, Caribbean Island National Wildlife Refuges.

Birds at Playa Grande Lagoon

Forty seven bird species have been identified in Playa Grande Lagoon: White-crowned pigeon *Patagioenas leucocephala*, Great blue heron *Ardea herodias*, Black-crowned Night heron *Nycticorax nycticorax*, (DNR 1979); Least sandpiper *Calidris minutilla*, Stilt sandpiper *C. himantopus*, Loggerhead kingbird *Tyrannus caudifasciatus*, Grasshopper sparrow *Ammodramus savannarum*, Common yellowthroat *Geothlypis trichas*, Black and white warbler *Mniotilta varia* (Sorrié 1975); Louisiana heron *Egretta tricolor*, Snowy egret *E. thula*, Little blue heron *E. caerulea* (Cardona and Rivera 1988); Blue-winged teal *Anas discors*, White-cheeked pintail *A. bahamensis*, Ruddy duck *Oxyura jamaicensis* (Terrestrial Resources data 2004); Magnificent frigatebird *Fregata magnificens*, Green-backed heron *Butorides virescens*, Cattle egret *Bubulcus ibis*, Great egret *Ardea alba*, Yellow-crowned night-heron *Nyctanassa violacea*, Clapper rail *Rallus longirostris*, Common moorhen *Gallinula chloropus*, Semipalmated plover *Charadrius semipalmatus*, Wilson's plover *C. wilsonia*, Black-bellied plover *Pluvialis squatarola*, Semipalmated sandpiper *Calidris pusilla*, Short billed dowitcher *Limnodromus griseus*, Black-necked stilt *Himantopus mexicanus*, Laughing gull *Larus atricilla*, Scaly-napped pigeon *Patagioenas squamosa*, Zenaida dove *Zenaida aurita*, Green throated carib *Eulampis holosericeus*, Antillean crested hummingbird *Orthorhyncus cristatus*, Gray kingbird *Tyrannus dominicensis*, Caribbean elaenia *Elaenia martinica*, Pearly-eyed thrasher *Margarops fuscatus*, Black-whiskered vireo *Vireo altiloquus*, Bananaquit *Coereba flaveola*, Yellow warbler *Dendroica petechia*, Greater Antillean grackle *Quiscalus niger*, Glossy cowbird *Molothrus bonariensis* (Raffaele 1972); Caribbean coot *Fulica caribaea*, Masked duck (not seen recently) (NOAA et al. 2000); Antillean nighthawk *Chordeiles gundlachi*, Adelaide's warbler *Dendroica adelaidae*, Black-faced grassquit *Tiaris bicolor* (Terrestrial Resources Division data 2005).

Fish at Playa Grande Lagoon

Mugil curema, *Caranx sp.*, *Strongylura sp.*, *Eucinostomus argenteus*, *Poecilia vivipara* (Negrón González 1986).

Critical Plants at Playa Grande Lagoon:

Cobana negra *Stalia monosperma*, Beautiful goetzea *Goetzea elegans*.

Birds at Monte Pirata

Yellow billed cuckoo *Coccyzus americanus*, Worm eating warbler *Helminthos vermivorous* (Sorrié 1975). There are also reports of the presence of the three species of Quail-Doves: Bridled quail-dove *Geotrygon mystacea*, Key West quail-dove *Geotrygon chrysis*, Ruddy quail dove *G. montana* (Oscar Diaz, Refuge manager, pers.comm. 2005).

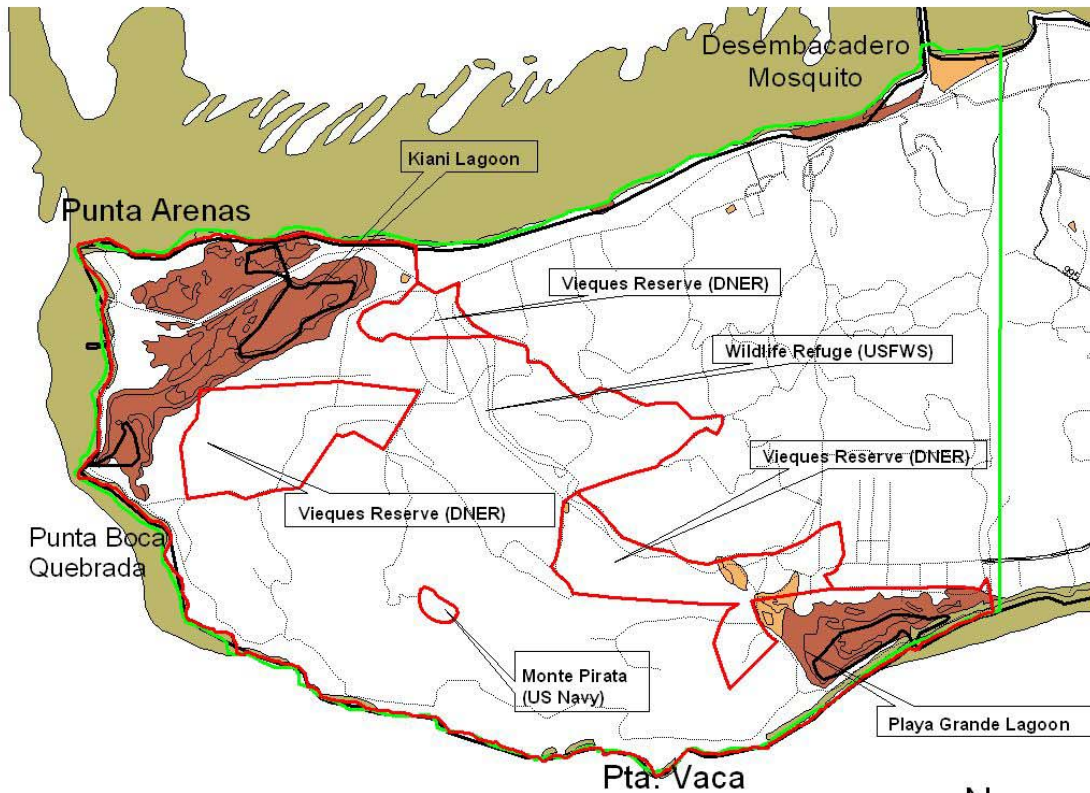
Critical plants at Monte Pirata:

Thoma's lidflower *Calyptranthes thomasi* and Woodbury's stopper *Eugenia woodburyana* (NOAA et al. 2000). *Calyptranthes thomasi*; *Mariscus urbanii* (grassy banks and woodlands at higher elevation); *Maytenus cymosa*; *Tillandsia lineatispica* (Geo-Marine 1996).

References:

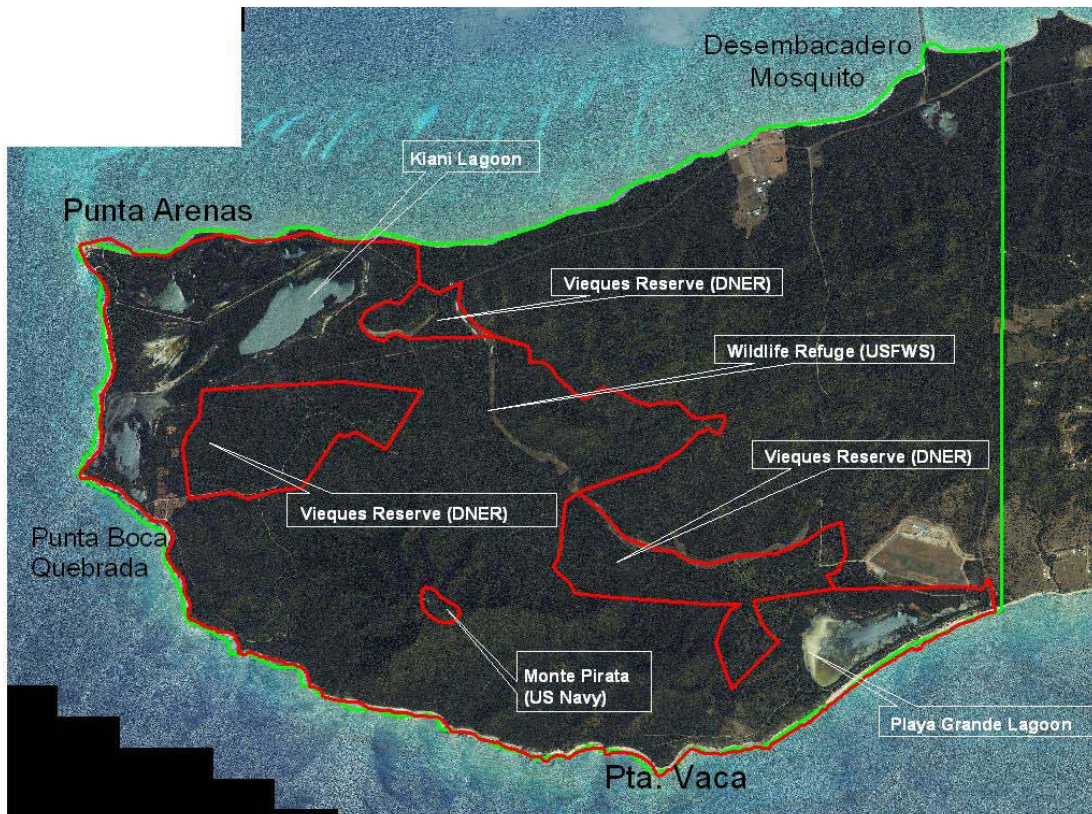
- Commonwealth of Puerto Rico, Puerto Rico Conservation Trust and the United States Department of the Interior. 2002. Management Plan for the Western Vieques Conservation Areas. Vieques, Puerto Rico.
- Geo-Marine. 1996. U.S. Naval Station, Roosevelt Roads. Land Use Management Plan (L.U.M.P.) for U.S. Naval Facilities, Vieques, Puerto Rico.
- National Oceanic and Atmospheric Administration. National Ocean Service. Office of Response and Restoration. Hazardous Materials Response Division; United States Environmental Protection Agency; United States Coast Guard; Natural and Environmental Resources Department and United States Department of the Interior. 2000. Published in Seattle, Washington by the Hazardous Materials Response Division of NOAA.
- Raffaele, H. A. 1972. Fauna in Vieques. Survey of the Natural Resources. Section X. Commonwealth of Puerto Rico. Environmental Quality Board. Bureau of Wildlife. Area of Natural Resources. Department of Public Works.
- Sorrié, B. A. 1975. Observations on the Birds of Weques Island, Puerto Rico. *Carib. J. Sci.*, 15 (1-2). Pp. 103.
- Ventura Barnés, J. 1947. Additions to the Puerto Rican Avifauna with notes on little known species. *Auk* Vol. 64. Pp. 400-406.

Vieques West Coast



- Bosques_y_reservas.shp
- West vieques cwa.shp
- Municipios.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

Vieques West Coast



-  Bosques_y_reservas.shp
-  West vieques cwa.shp

26- Ensenada Honda Mangrove, Vieques Island South Coast

Area Description:

The Ensenada Honda Mangrove CWA is located east of Laguna Yanuel and west of Laguna Matías. It consists of tall mangrove trees that grow thickly in the borders. This area was part of the bombing range of the NAVY and actually, the access is not permitted by the U.S. Fish & Wildlife Service. Aerial photo shows that this CWA has not changed significantly since 1970's.

Ownership/Protection:

The United States Fish and Wildlife Service, Caribbean Island National Wildlife Refuges administer part of the Vieques National Wildlife Refuge.

Special Recognition

The DNER classified this CWA as one of primary wildlife.

Wildlife:

Cardona and Rivera (1988) reported that Rathbun et al. 1985, observed few sea turtles in the Ensenada Honda bay during 49 weekly aerial censuses in the mid-1980. They also mention some birds: Common moorhen *Gallinula chloropus*, several heron species, Glossy cowbird *Molothrus bonariensis*, and Yellow warbler *Dendroica petechia*. Sorrié (1975) reported the presence of Mourning warbler *Oporornis formosus*.

Other birds in the area are: Brown pelican *Pelecanus occidentalis*, Caribbean coot *Fulica caribaea*, Least tern *Sterna antillarum*, Masked duck *Nomonix dominicus*, Ruddy duck *Oxyura jamaicensis*, White cheeked pintail *Anas bahamensis*, White crowned pigeon *Patagioenas leucocephala* (NOAA et al 2000; Terrestrial Resources Division data 2005); Black-necked stilt *Himantopus mexicanus* and Greater flamingo *Phoenicopterus ruber* (a group of 13 individuals seen in 2001; Oscar Diaz, Refuge manager, pers. comm.); Green throated carib *Eulampis holosericeus*, Antillean crested hummingbird *Orthorhyncus cristatus*, Gray kingbird *Tyrannus dominicensis*, Puerto Rican flycatcher *Myiarchus antillarum*, Caribbean elaenia *Elaenia martinica*, White winged dove *Zenaida asiatica*, Zenaida dove *Zenaida aurita*, Common ground-dove *Columbina passerina*, Adelaide's warbler *Dendroica adelaidae*, Black-faced grassquit *Tiaris bicolor*, Mangrove cuckoo *Coccyzus minor* (Terrestrial Resources Division data 2005).

Mammals

West Indian manatee *Trichechus manatus* (Belardo 2003).

Critical Plants:

Cobana negra *Stahlia monosperma*. In Caño Cruz area (east side of Ensenada Honda) there is a population of *Psychilis macconnellidae*.

Marine habitat:

Large patches of turtle grass *Thalassia testudinum* cover the bottom of the northern part of the bay. Occasional specimens of the sponge *Tedania ignis*, the bivalve *Isognomon alatus*, scarce filamentous algae, and cirripeds are present in this area (Yamhure 1972).

Threats

Pollution of the bay and surrounding waters by military materials are always a threat to this ecosystem.

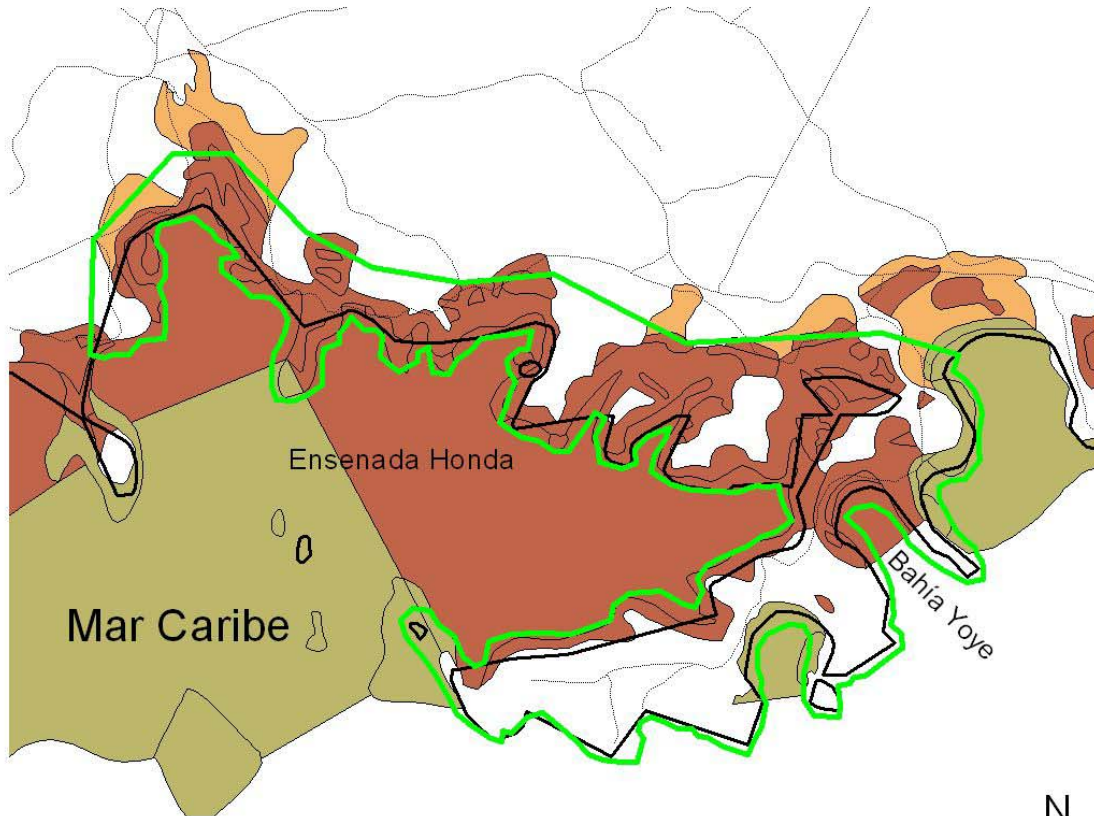
Conservation Recommendations:

Because military practices are not longer allowed, the area should be cleaned and restored. Increased monitoring should be established to help determine actual wildlife use of the area.

References:

- Belardo, E. 2003. Letter to DNER Natural Heritage Division. Actualized Information of Critical Species in Vieques. August 6, 2003.
- Geo-Marine. 1996. U.S. Naval Station, Roosevelt Roads. Land Use Management Plan (L.U.M.P.) for U.S. Naval Facilities, Vieques, Puerto Rico.
- National Oceanic and Atmospheric Administration. National Ocean Service. Office of Response and Restoration. Hazardous Materials Response Division; United States Environmental Protection Agency; United States Coast Guard; Natural and Environmental Resources Department and United States Department of the Interior. 2000. Published in Seattle, Washington by the Hazardous Materials Response Division of NOAA.
- Rathbun, G. B., T. Carr, N. Carr, & C.A. Woods. 1985. The distribution of Manatees and sea turtles in Puerto Rico, with emphasis on Roosevelt Roads Naval Station. Installation Planning Division, Engineering Command. Atlantic Division Naval Facilities.
- Sorrié, B. A. 1975. Observations on the Birds of Weques Island, Puerto Rico. *Carib. J. Sci.*, (1-2). Pp. 89-103.
- Yamhure, A. A. 1972. Section XIII. A Quick Survey of the Aufwuchs (Epibiota) of the Mangroves. In Vieques 1972 Survey of the Natural Resources. Environmental Quality Board. Commonwealth of Puerto Rico/ Office of the Governor.

Ensenada Honda Mangrove



0.9 0 0.9 1.8 Kilometers



-  Ensenada honda mangrove.shp
-  Municips.shp
- Carreteras avpu.shp
 -  autopistas
 -  primarias
 -  secundarias
 -  terciarias
 -  caminos
 -  propuestas
- Humedales avpu.shp
 -  Estuarine
 -  Lacustrine
 -  Marine
 -  Palustrine
 -  Riverine

Ensenada Honda Mangrove



 Ensenada honda mangrove cwa.shp

27- Yanuel Lagoon, Vieques Island South Coast

Area Description:

The Yanuel Lagoon is a brackish water lagoon located south Algodones Lagoon. It has an extension of 9.9 ha (Negrón González 1986). This lagoon is surrounded by mangrove. At present, the area remains inaccessible, and still could potentially harbor some waterfowl or rare species. The lagoon is interconnected to the Ensenada Honda Bay by a channel. The channel and the lagoon are surrounded by tall red mangroves *Rhizophora mangle*. Also, the White and Black mangrove are present (*Laguncularia racemosa* and *Avicennia germinans* respectively).

Ownership/Protection:

The United States Fish and Wildlife Service, Caribbean Island National Wildlife Refuges administer part of the Vieques National Wildlife Refuge.

Special Recognition:

The DNER classified this CWA as one of primary wildlife.

Wildlife:

Yanuel Lagoon supports a variety of bird species, including doves and pigeons and a number of wading birds. During the migratory bird season, plovers and sandpipers occur in large concentrations around the shallow fringes of the lagoon and surrounding salt flats.

Twenty four bird species have been reported in Yanuel Lagoon: White-crowned pigeon *Patagioenas leucocephala* (Cardona and Rivera 1988); White cheeked pintail *Anas bahamensis*, Blue-winged teal *A. discors* (Terrestrial Resources data 2004); Green-backed heron *Butorides virescens*, Little blue heron *Egretta caerulea*, Tricolored heron *E. tricolor*, Clapper rail *Rallus longirostris*, Black-necked stilt *Himantopus mexicanus*, Zenaida dove *Zenaida aurita*, Common ground dove *Columbina passerina*, Mangrove cuckoo *Coccyzus minor*, Green throated carib *Eulampis holosericeus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Caribbean elaenia *Elaenia martinica*, Bananaquit *Coereba flaveola*, Greater Antillean grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis* (Raffaele 1972); Brown pelican *Pelecanus occidentalis*, Caribbean coot *Fulica caribaea*, Common moorher *Gallinula chloropus*, Least tern *Sterna antillarum*, Masked duck *Nomonyx dominicus*, Ruddy duck *Oxyura jamaicensis* (NOAA et al 2000).

Critical Plants:

Near Laguna Yanuel there is a population of *Stalia monosperma*.

Threats:

This area has been under continually bombing from the United States NAVY practice maneuvers for over forty years and most of the area is known to be contaminated. Contamination of the bay and surrounding waters by military materials are always a threat to this ecosystem.

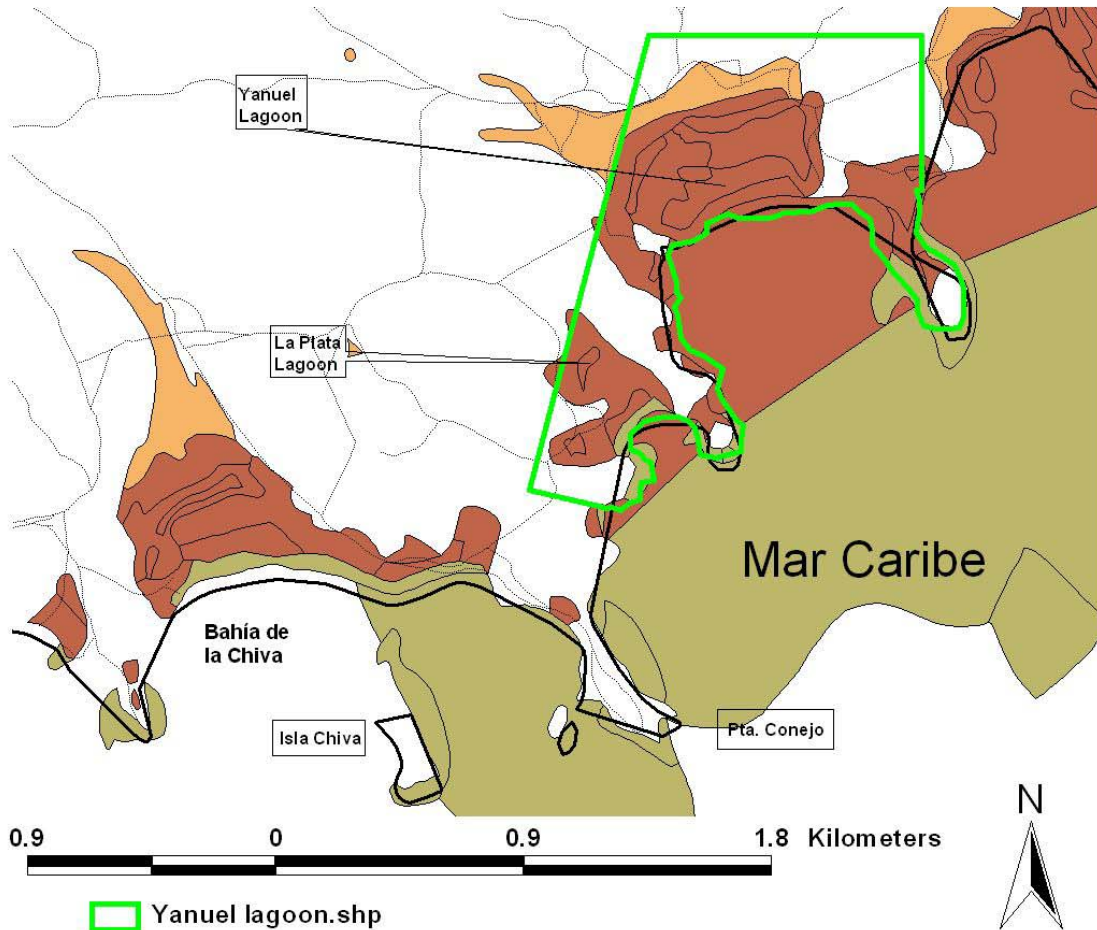
Conservation Recommendations:

Because military practices are not longer allowed, the lagoon should be restored. Also part of the restoration process is the decontamination and cleaning of the sites identified by the US NAVY as contaminated and under investigation. Increased monitoring should be established to help determine actual wildlife use of the area.

References:

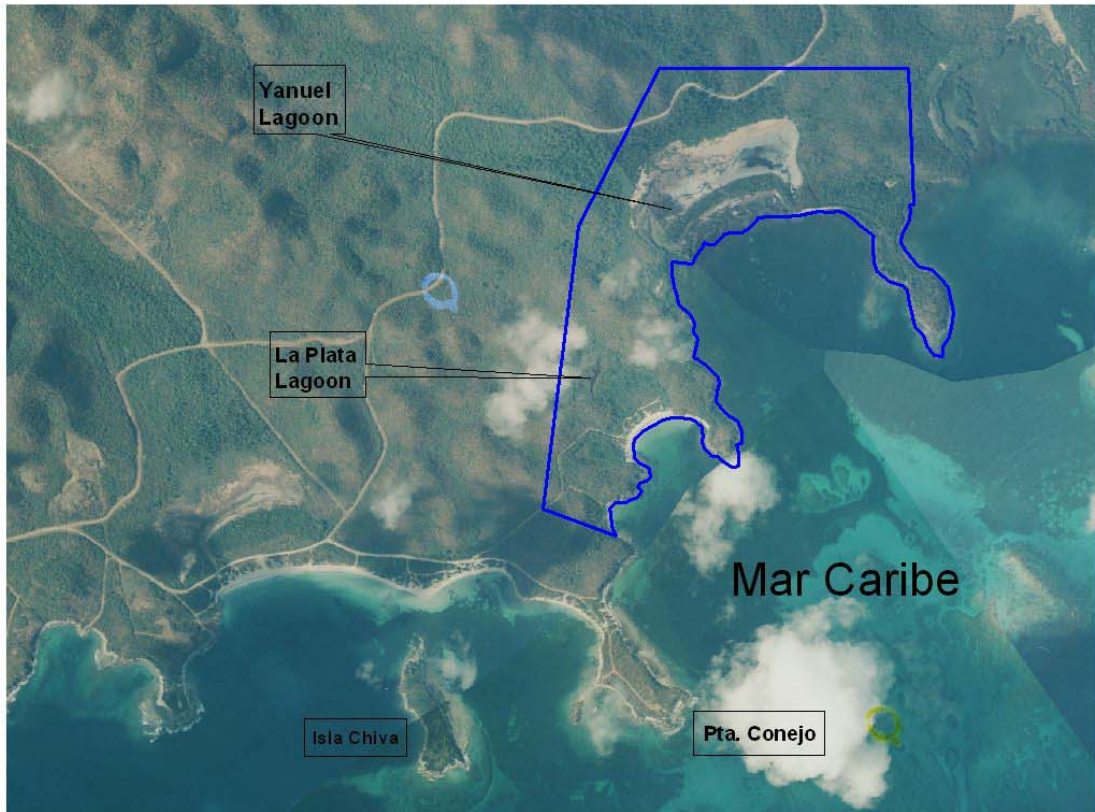
- National Oceanic and Atmospheric Administration. National Ocean Service. Office of Response and Restoration. Hazardous Materials Response Division; United States Environmental Protection Agency; United States Coast Guard; Natural and Environmental Resources Department and United States Department of the Interior. 2000. Published in Seattle, Washington by the Hazardous Materials Response Division of NOAA.
- Raffaele, H. A. 1972. Section X. Fauna in Vieques 1972 Survey of the Natural Resources. Commonwealth of Puerto Rico. Environmental Quality Board. Bureau of Wildlife. Area of Natural Resources. Department of Public Works.

Yanuel Lagoon



-  Yanuel lagoon.shp
-  Municips.shp
- Carreteras avpu.shp
 -  autopistas
 -  primarias
 -  secundarias
 -  terciarias
 -  caminos
 -  propuestas
- Humedales avpu.shp
 -  Estuarine
 -  Lacustrine
 -  Marine
 -  Palustrine
 -  Riverine

Yanuel Lagoon



 Yanuel lagoon cwa.shp

28- Chiva Swamp, Vieques Island South Coast

Area Description:

Chiva Swamp CWA is located within the U.S. NAVY Base of Camp García. The dominant tree species is the red mangrove. In the north and southeast, black mangrove and white mangrove are the dominant species. The swamp has an area of 13.3 ha. At present, the area remains inaccessible, and still could potentially harbor some waterfowl or rare species.

Ownership/Protection:

Vieques National Wildlife Refuge, administered by the United States Fish and Wildlife Service, and part of Caribbean Island National Wildlife Refuges.

Special Recognition:

The DNER classified this CWA as one of primary wildlife.

Wildlife:

Twenty four bird species are reported for Chiva Swamp: White-cheeked pintail *Anas bahamensis* (Raffaele and Duffield 1979); Common moorhen *Gallinula chloropus*, Least tern *Sterna antillarum*, Magnificent frigatebird *Fregata magnificens* (Cardona and Rivera 1988); Caribbean coot *Fulica caribaea*, Masked duck *Nomonyx dominicus*, Ruddy duck *Oxyura jamaicensis*, West Indian whistling duck *Dendrocygna arborea* (NOAA et al 2000); Yellow warbler *Dendroica petechia*, Bananaquit *Coereba flaveola*, Black-faced grassquit *Tiaris bicolor*, Yellow-faced grassquit *Tiaris olivacea*, Killdeer *Charadrius vociferus*, Wilson's plover *Charadrius wilsonia*, Green throated carib *Eulampis holosericeus*, Gray kingbird *Tyrannus dominicensis*, Puerto Rican flycatcher *Myiarchus antillarum*, Caribbean elaenia *Elaenia martinica*, White crowned pigeon *Patagioenas leucocephala*, Zenaida dove *Zenaida aurita*, White-winged dove *Zenaida asiatica*, Common ground-dove *Columbina passerina*, Mangrove cuckoo *Coccyzus minor*, Green-backed heron *Butorides virescens* (Terrestrial Resources Division data 2005)

Threats:

This area has been under continually bombing from the United States NAVY practice maneuvers for over sixty years and most of the area is known to be contaminated.

Conservation Recommendations:

Because military practices are not longer allowed, the area should be decontaminated. Ecosystem restoration shall be a high priority. A control program of exotic vegetation in combination with reforestation with native flora should be commenced.

References:

National Oceanic and Atmospheric Administration. National Ocean Service. Office of Response and Restoration. Hazardous Materials Response Division; United States Environmental Protection Agency; United States Coast Guard; Natural and Environmental Resources Department and United States Department of the Interior. 2000. Published in Seattle, Washington by the Hazardous Materials Response Division of NOAA.

Raffaele, H. A. 1972. Section X. Fauna in Vieques 1972 Survey of the Natural Resources. Commonwealth of Puerto Rico. Environmental Quality Board. Bureau of Wildlife. Area of Natural Resources. Department of Public Works.

29- Tapón Bay, Vieques, Puerto Rico

Area Description:

Located southern central portion of the Island, between Puerto Del Ferro and Bahía de la Chiva, Tapón Bay is composed of a small mangrove forest and a medium size salt pond that is intermittently flooded (Cardona and Rivera 1988). This CWA has the same bioluminescent phenomenon as Mosquito Bay. Dove hunters heavily frequented this area during the 70's because of the large numbers of these birds that frequent the locality (Raffaele and Duffield 1979). Hunting in wildlife areas located within military facilities have been prohibited since early 80's (Cardona and Rivera 1988). Tapón Bay is also known as Blue Beach and it's open for public use until 6:00 p.m.

Ownership/Protection:

Part of the Vieques National Wildlife Refuge is administered by the United States Fish and Wildlife Service, Caribbean Island National Wildlife Refuges.

Special Recognition

The DNER classified this CWA as one of primary wildlife.

Wildlife

Birds

Twenty two bird species have been reported in Tapón Bay: White-crowned pigeon *Patagioenas leucocephala*, White cheeked pintail *Anas bahamensis*, Osprey *Pandion haliaetus*, Black-necked stilt *Himantopus mexicanus*, White-winged dove *Zenaida asiatica* (Cardona and Rivera 1988). Little blue heron *Egretta caerulea*, Cattle egret *Bubulcus ibis*, Clapper rail *Rallus longirostris*, Wilson's plover *Charadrius wilsonia*, Scaly-napped pigeon *Patagioenas squamosa*, Zenaida dove *Zenaida aurita*, White-winged dove *Z. asiatica*, Caribbean martin *Progne dominicensis*, Greater Antillean grackle *Quiscalus niger* (Raffaele 1972); Killdeer *Charadrius vociferus*, Mangrove cuckoo *Coccyzus minor*, Black faced grassquit *Tiaris bicolor*, Yellow faced grassquit *T. olivacea*, Yellow warbler *Dendroica petechia*, Caribbean elaenia *Elaenia martinica*, Green-backed heron *Butorides virescens*, White-crowned pigeon *Patagioenas leucocephala*, Bananaquit *Coereba flaveola*, Gray kingbird *Tyrannus dominicensis* (Terrestrial Resources Division data 2005).

Threats

Contamination of the bay and surrounding waters by military disposals.

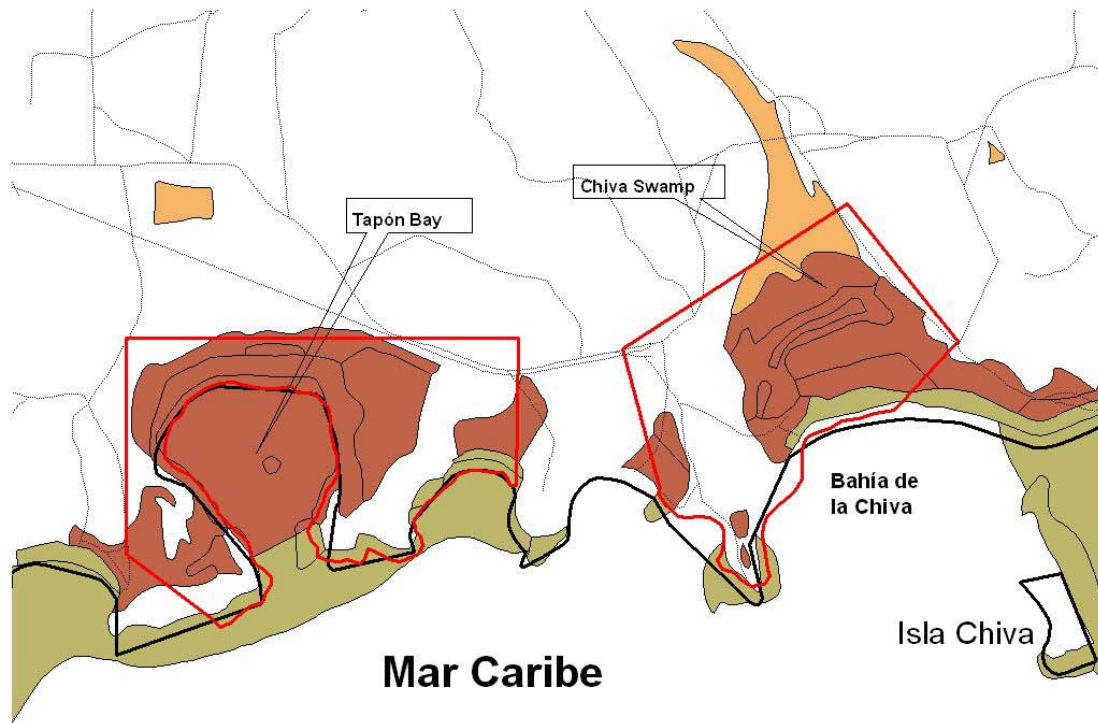
Conservation Recommendations

Increase extant wildlife inventories in the area.

References

Raffaele, H. A. 1972. Section X. Fauna in Vieques 1972 Survey of the Natural Resources. Commonwealth of Puerto Rico. Environmental Quality Board. Bureau of Wildlife. Area of Natural Resources. Department of Public Works.

Chiva Swamp and Tapón Bay



0.7 0 0.7 1.4 Kilometers




- Civa swamp and tapon bay cwa.shp
- Municips.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

Chiva Swamp and Tapón Bay



0.8 0 0.8 1.6 Kilometers



 Civa swamp and tapon bay cwa.shp

30- Ferro Bay, Mosquito Bay, and Sombe Bay, Vieques, Puerto Rico

Area Description:

Located south central of the Island, the area is important because it supports a diverse avifauna that includes terrestrial birds, waterfowl, wading birds and shorebirds. It has to the north road 997, to the east Camp García, to the west it extend up to La Esperanza urban area and to the south the Caribbean Sea up to three nautical miles (Rivera Ortiz et al. 1990). The habitat includes mangrove forest, salt ponds and arid scrub vegetation (Cardona and Rivera 1988).

The Natural Reserve Bioluminescent Bay is located in the south coast of Vieques and it comprehends 471 ha in size being a natural area with the major ecological values in Vieques, because of the bioluminescent phenomenon in Mosquito Bay. Today is considered one of the best areas with this phenomenon in the Caribbean (Seliger 2001).

The ecological importance of the Natural Reserve remains in the variety of ecosystems in a small area, these includes: sandy beaches, coastal dry forest, salt flats, coconut forest, pastures, mangrove forest, rocky coast and marine grass (Rivera Ortiz et al. 1990).

Ownership/Protection:

The terrains that comprehend the Reserve belongs to Compañía de Fomento Industrial de Puerto Rico, PRIDCO (Rivera Ortiz et al. 1990).

Special Recognition:

The Bioluminescent Bay in south Vieques (Mosquito Bay) was declared a Natural Reserve in 1989 (Rivera Ortiz et al. 1990). Today it still classified as a primary CWA.

Wildlife:

Birds

In 1988, Fuentes-Santiago mentions the presence of forty-nine bird species living in the area. We have found forty-four in the literature and in field visits. These are: Brown pelican *Pelecanus occidentalis*, Peregrine falcon *Falco peregrinus*, White-checked pintail *Anas bahamensis*, Clapper rail *Rallus longirostris*, Black-necked stilt *Himantopus mexicanus*, Greater yellowlegs *Tringa melanoleuca*, Lesser yellowlegs *T. flavipes*, Black-bellied plover *Pluvialis squatarola*, Ruddy quail-dove *Geotrygon montana*, Red-billed tropicbird *Phaeton aethereus* nests at Cayo Real o Cayo de Afuera (Cardona and Rivera, 1988).

Birds reported in Lagoon at Ensenada Sombe: Great blue heron *Ardea herodias*, Green-backed heron *Butorides virescens*, Cattle egret *Bubulcus ibis*, Little blue heron *Egretta caerulea*, Tricolored heron *E. tricolor*, Clapper rail *Rallus longirostris*, Wilson's plover *Charadrius wilsonia*, Semipalmated sandpiper *Calidris pusilla*, Short billed dowitcher *Limnodromus griseus*, White-crowned pigeon *Patagioenas leucocephala*, Zenaida dove *Zenaida aurita*, White-winged dove *Z. asiatica*, Common ground dove *Columbina passerina*, Smooth-billed ani *Crotophaga ani*, Green throated carib *Eulampis holosericeus*, Antillean crested hummingbird *Orthorhyncus cristatus*, Gray kingbird *Tyrannus dominicensis*, Caribbean elaenia *Elaenia martinica*, Northern mockingbird *Mimus polyglottos*, Black-whiskered vireo *Vireo altiloquus*, Bananaquit *Coereba flaveola*, Yellow warbler *Dendroica petechia*, Greater Antillean grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis* (Raffaele, 1972). There is also presence of White-crowned pigeon *Patagioenas leucocephala* on the road to Green Beach (Dejersey Gemmill 2003); Ruddy duck *Oxyura jamaicensis*, Ring-necked duck *Aythya collaris*, Lesser scaup *A. affinis*, Masked duck *Nomonix dominicus*, Caribbean coot *Fulica caribaea*, Blue winged teal *Anas discors* (NOAA et al 2000); Great egret *Ardea alba*, Yellow-crowned night

heron *Nyctanassa violacea*, Mangrove cuckoo *Coccyzus minor*, Magnificent fregatebird *Fregata magnificens* (Terrestrial Resources Division data 2005); Black bellied plover *Pluvialis squatorola* (Sorrié 1975).

Red billed tropicbird *Phaeton aethereus*, Brown booby *Sula leucogaster*, American oystercatcher *Haematopus palliatus* and Greater yellowlegs *Tringa melanoleuca* in Cayo de Afuera and Great blue heron *Ardea herodias* in Cayo de Tierra (Sorrié 1975). Key West quail dove *Geotrygon chrysis*, Bridled quail dove *Geotrygon mystacea* and Adelaide's warbler *Dendroica adelaidae* in Puerto Ferro (Sorrié 1975).

Mammals

West Indian Manatee *Trichechus manatus*.

Threats:

The main threat is improper use of the area by local visitors and tourism.

Conservation Recommendations:

An education and interpretation program should address the public about the Natural Reserve, its natural and cultural resources and values, and the importance of protecting such an area.

References:

Aponte Reyes, M. 2004. Revisión al Borrador Plan de Manejo para la Reserva Natural Bahía Bioluminiscente de Vieques. Departamento de Recursos Naturales y Ambientales. División de Reservas Naturales y Refugios de Vida Silvestre. San Juan, Puerto Rico

Dejersey Gemmill, D. 2003. Letter to Vieques Refuge Manager. April 04, 2003.

Fuentes-Santiago, G. I. 1988. Documento de Designación Reserva Natural Bahías Luminiscentes de Vieques. División de Planificación de Recursos Terrestres, Área de Planificación. Departamento de Recursos Naturales. San Juan, Puerto Rico.

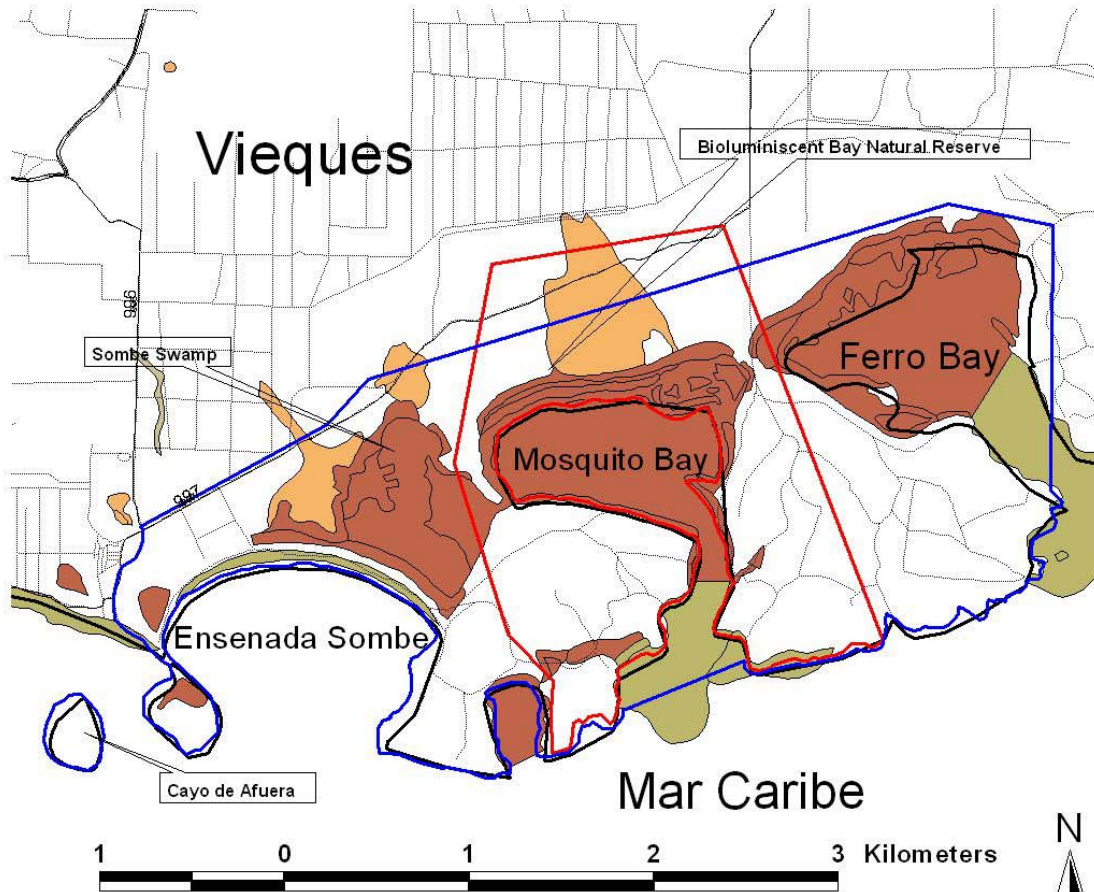
National Oceanic and Atmospheric Administration. National Ocean Service. Office of Response and Restoration. Hazardous Materials Response Division; United States Environmental Protection Agency; United States Coast Guard; Natural and Environmental Resources Department and United States Department of the Interior. 2000. Published in Seattle, Washington by the Hazardous Materials Response Division of NOAA.

Raffaele, H. A. 1972. Section X. Fauna in Vieques 1972 Survey of the Natural Resources. Commonwealth of Puerto Rico. Environmental Quality Board. Bureau of Wildlife. Area of Natural Resources. Department of Public Works.

Rivera Ortiz, M.; E. López, and G. I. Fuentes Santiago. 1990. Plan de Manejo Reserva Natural Bahía Bioluminiscente de Vieques. Departamento de Recursos Naturales. Programa de Manejo de la Zona Costanera. Área de Planificación de Recursos. División de Recursos Terrestres, San Juan, Puerto Rico.

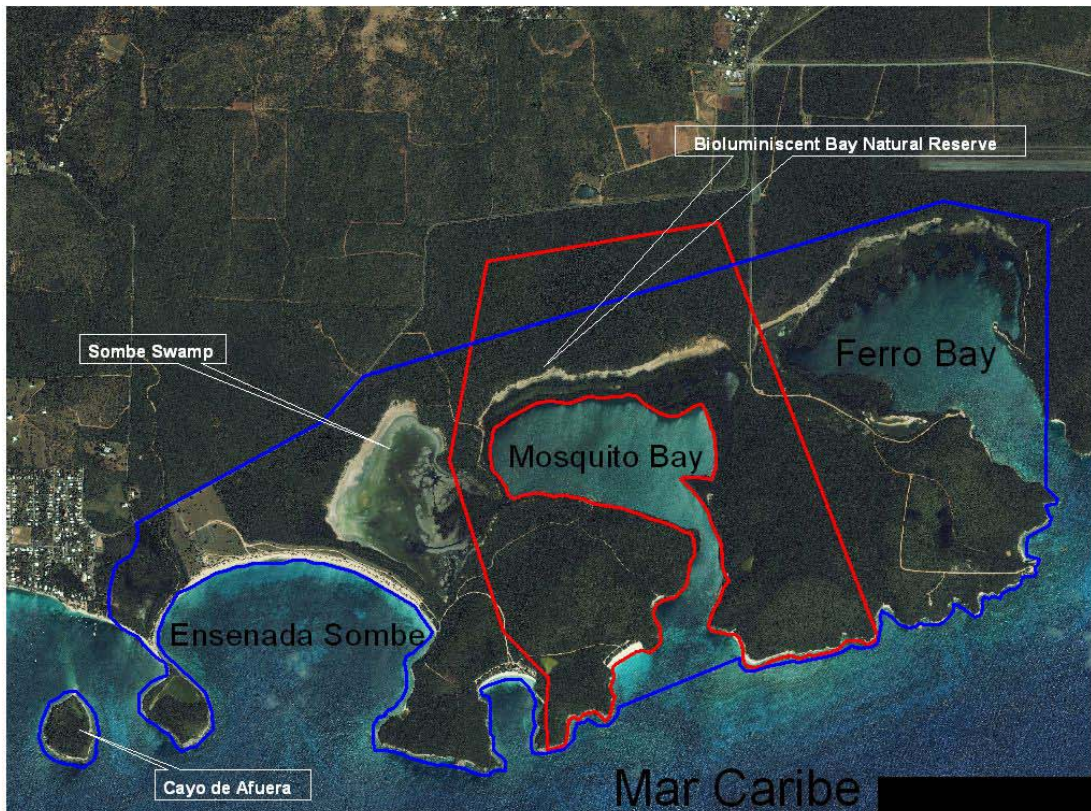
Seliger, H. 2001. Bioluminescence in Puerto Mosquito and conditions for its preservation as a Bioluminescent Bay. Final Report to the National Park Service: SER National Park Service Order # P5017000339. The John Hopkins University, Baltimore MD.



Ferro Bay, Mosquito Bay and Sombe Bay



- Ensenada sombe swamp, mosquito bay, ferro bay cwa.shp
- Bosques_y_reservas.shp
- Municipios.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

Ferro Bay, Mosquito Bay and Sombe Bay



-  Ensenada sombe swamp, mosquito bay, ferro bay cwa.shp
-  Bosques_y_reservas.shp

31- East Tip of Vieques and Conejo Cay, Vieques Island

Area Description:

The east point of Vieques, which includes Cerro Matías, Matías Lagoon, Punta Salinas, Punta Este, Blanca Beach, Anones Lagoon, Salinas del Sur Bay and Jalobre Mount among others, is an important habitat for wildlife species. This part of Vieques lay within the bombing range of the Camp García Marine Base. This area has been under continually bombing from the United States NAVY practice maneuvers for over sixty years and most of the area is known to be contaminated. The whole east of Vieques covers 5,867.95 ha and still important habitat for wildlife and for endangered species (Oscar Diaz, Refuge manager, pers. comm.).

Conejo Cay is located about 1.6 km south of Cerro Matías in Vieques and it is an important nesting habitat for marine bird species. During the 1960's this small island was used as a bombing target.

Ownership/Protection:

This area is part of the Vieques National Wildlife Refuge, administered by the United States Fish and Wildlife Service, and part of Caribbean Island National Wildlife Refuges.

Special Recognition:

In 2004, BirdLife International and SOPI recognized the east tip of Vieques and Conejo Cay as an Important Bird Area. The DNER recognized this as a prime wildlife area.

Wildlife:

Birds

Birds reported in the east side of Vieques include: White-tailed tropicbird *Phaeton lepturus*, White-checked pintail *Anas bahamensis*-this species use the area as nesting site, as well as the Roseate tern *Sterna dougalli* (Oscar Diaz pers. comm.), Zenaida dove *Zenaida aurita*, Mourning dove *Z. macroura*. There are also historical reports of the presence of Greater flamingo *Phoenicopterus ruber* in the Salinas de Vieques, at the extreme eastern end of this island (Ventura Barnés 1947). Conejo Cay, also located in the east side, is an important nesting habitat for bird species. American oystercatcher *Haematopus palliatus*, Roseate tern *Sterna dougallii* and White-tailed tropicbird *Phaeton lepturus* has been reported nesting in Conejo Cay, also this cay harbors one of the largest breeding colonies of the Brown pelican *Pelecanus occidentalis* in Puerto Rico (Cardona and Rivera 1988). Other birds reported are: Caribbean coot *Fulica caribaea*, Masked duck *Nomonyx dominicus* and Ruddy duck *Oxyura jamaicensis* (NOAA 2000).

Reptiles

Hawksbill turtle *Eretmochelys imbricata*, Leatherback turtle *Dermochelys coriacea*, Green turtle *Chelonia mydas*, nests in Yellow beach and in Tortuga beach. There is also the rare Vieques dwarf gecko *Sphaerodactylus macrolepis inigoii*, and the endemic Roosevelt dwarf gecko *S. roosevelti*.

Threats:

This area has been under continually bombing from the United States NAVY practice maneuvers for over forty years and most of the area is known to be contaminated. In May 1 2003, the US NAVY maneuvers and bombing ended in Vieques lands.

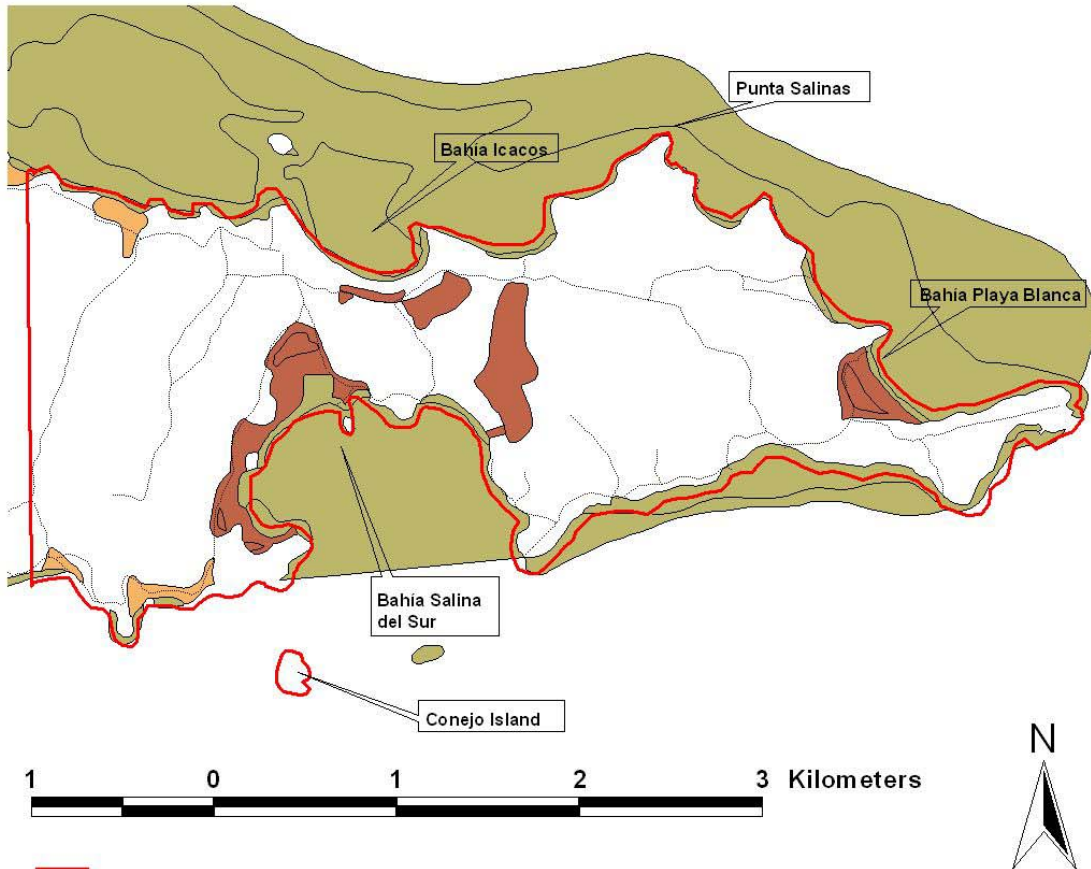
Conservation Recommendations:

Because military practices are not longer allowed, this part of Vieques Island should be restored, including the waters, wetlands, and the upland used for military activities. The area should be decontaminated. Ecosystem restoration shall be a high priority whenever deemed necessary. A control program of exotic vegetation in combination with reforestation with native flora should be commenced.

References:

- National Oceanic and Atmospheric Administration. National Ocean Service. Office of Response and Restoration. Hazardous Materials Response Division; United States Environmental Protection Agency; United States Coast Guard; Natural and Environmental Resources Department and United States Department of the Interior. 2000. Published in Seattle, Washington by the Hazardous Materials Response Division of NOAA.
- Rivera-Milán, F. F. 1993. Standardization of roadside counts of Columbids in Puerto Rico and Vieques Island. U. S. Dept. Int. Natl. Biol. Surv., Resour. Publ. No. 197. 26pp.
- _____. 1995. Spatial and temporal variation in the detectability of Columbids in Puerto Rico and on Vieques Island. *Neotrop. Ornithol.* 6:1-17.
- Ventura Barnés, J. 1947. Additions to the Puerto Rican Avifauna with notes on little known species. *Auk* Vol. 64. Pp. 400-406.


East Tip of Vieques and Conejo Cay



- East tip of vieques and conejo island cwa.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

East Tip of Vieques and Conejo Cay



 East tip of vieques and conejo island cwa.shp

32- Former Roosevelt Roads Naval Base Mangroves, Ceiba, Puerto Rico

Area Description:

The former U.S. Naval Station Roosevelt Roads mangroves are located on the east coast of Puerto Rico in the municipality of Ceiba. The facility occupies approximately 3,238 ha and is bordered on all sides but the west by the Caribbean Sea.

This CWA area includes the extensive mangroves ecosystems, Piñero Island and Cabeza de Perro Cay. Roosevelt Roads Naval Station contains one of the largest stands of relatively pristine mangrove habitat in the Caribbean Basin. Mangrove habitat is critical to many species of Neotropical migrant birds and was once the host of breeding colonies of the endangered Yellow-shouldered Blackbird (*Agelaius xanthomus*) (YSBL). During 1975-1976, Post and Wiley (1976) estimated that about 200 YSBL existed in this CWA. By 1982, the population had declined to six pairs (97% decline) (Cruz et al., 1989). In 2002, only three nests were found (DNER 2002). From 2003 to 2004, no nest of YSBL has been seen, although they have count two individuals in the Naval Station facilities (DNER 2003 and 2004).

The terrain ranges from low (12-15 m) hills on either side of the harbor entrance to a low ridge in the northwest quadrant having a maximum elevation of about 92 m. The importance of the coast of Ceiba lays on the presence of many bays and coves that provides refuge for a variety of species. The presence of extensive areas of the sea grass *Thalassia testudinum* provide habitat for different marine species that are endangered. Also there is extensive mangrove stands interspersed with saltflats, shallow ponds and forested hills. These areas are of great importance for resident and migratory bird species.

Ownership/Protection:

This area used to be Roosevelt Roads NAVY Base and today some areas are part of the Commonwealth of Puerto Rico. Roosevelt Roads is due to close on 31 March 2004. On Sept. 30, 2003, the President of the United States signed into law the fiscal year 2004 Defense Appropriations Act. The legislation included language that calls for the NAVY to close Naval Station Roosevelt Roads no later than six months after enactment of the act.

Special Recognition:

This CWA is classified as one of the endangered Yellow-shouldered blackbird critical habitats (U.S. Fish and Wildlife Service 1995). The Roosevelt Roads mangroves complex and coastal waters are still classified as a primary CWA.

Wildlife:

Birds

Thirty seven bird species have been reported in the mangroves of Ceiba: West Indian Whistling duck *Dendrocygna arborea*, Least grebe *Tachybaptus dominicus*, Ruddy duck *Oxyura jamaicensis*, Brown pelican *Pelecanus occidentalis*, Yellow shouldered blackbird *Agelaius xanthomus*, White-crowned pigeon *Patagioenas leucocephala*, Black-necked stilt *Himantopus mexicanus*, Common moorhen *Gallinula chloropus*, (Cardona and Rivera 1988). White-cheeked pintail *Anas bahamensis*, Blue-winged teal *A. discors*, Green-winged teal *A. crecca*, Lesser scaup *Aythya affinis*, Green heron *Butorides virescens*, Great blue heron *Ardea herodias*, Great egret *A. alba*, Snowy egret *Egretta thula*, Tricolored heron *E. tricolor*, Little blue heron *E. caerulea*, Caribbean Coot *Fulica caribaea*, Clapper rail *Rallus longirostris*, Osprey *Pandion haliaetus*, American Oystercatcher *Haematopus palliatus*, Greater yellowlegs *Tringa melanoleuca*, Spotted sandpiper *Actitis macularia*, Black-bellied plover *Pluvialis*

squatarola, Whimbrel *Numenius phaeopus*, Least sandpiper *Calidris minutilla*, Northern waterthrush *Seiurus noveboracensis*, Royal tern *Sterna maxima*, Bananaquit *Coereba flaveola*, Pearly-eyed thrasher *Margarops fuscatus*, Greater Antillean Grackle *Quiscalus niger*, Yellow warbler *Dendroica petechia*, White-winged dove *Zenaida asiatica*, Caribbean elaenia *Elaenia martinica*, Puerto Rico stripe headed tanager *Spindalis portoricensis*, Gray kingbird *Tyrannus dominicensis*, Shiny cowbird *Molothrus bonariensis* (Terrestrial Resources Division Data 2004).

Reptiles

Green turtle *Chelonia mydas*, Hawksbill turtle *Eretmochelys imbricata*.

Mammals

West Indian manatee *Trichechus manatus*

Threats:

Mangrove ecosystems around the world suffer degradation from logging, coastal development, spraying of herbicides, conversion to fishponds, and from oil spills and other pollutants. Part of the mangrove forest of Ceiba had suffers form oil spills; one in 1986 (Ballou and Lewis III 1989) and another in 1999 (Wilkinson et al. 2001), both with jet fuel, impacting a total of 19 ha of mangrove forest. On November 27, 1986, 59,000 gallons of JP-5 fuel washed down a catchments stream (tidal creek) and into Ensenada Honda. Two mangrove forest areas were contaminated, one in the tidal creek and the other at the head of the saltwater bay. On October 20, 1999, 112,000 gallons of JP-5 fuel spilled from a day-tank at the U.S. NAVY Base. The oil flowed into an underground drainage pipe, which runs under a runway and several roads for several hundred yards. The pipe empties into an open drainage ditch, which drains to a 12-hectare mangrove forest. This forest drains through a culvert into Ensenada Honda Bay (NOAA 2002).

There are several significant areas of environmental concern; however, since groundwater is not utilized for any purposes at Roosevelt Roads, or down gradient of it, and none of the areas of environmental concern are presently utilized for residential purposes, the most significant current threats are adverse environmental impacts to the surface waters of Ensenada Honda and other marine bays and mangrove areas bordering the facility (U.S. Environmental Protection Agency 2004).

Conservation Recommendations:

The extensive system of mangrove forest, ponds and mudflats should be carefully preserved for the perpetuity of the biodiversity that it supports. The continued loss of mangrove forests worldwide underscores the importance of projects focusing on restoration of forest structure and functions.

References:

- Ballou, T. G. and R. R. Lewis III. 1989. Environmental assessment and restoration recommendations for a mangrove forest affected by jet fuel. *In*: Proceedings of the 1989 International Oil Spill Conference, pp. 407-412.
- Cruz, A., J.W. Wiley, T.K. Nakamura, and W. Post. 1989. The Shiny Cowbird *Molothrus bonariensis* in the West Indian region - biogeographical and ecological implications. *In*:

Biogeography of the West Indies: Past, Present, and Future. Sandhill Crane Press, Inc., Gainesville, Florida. 896 pp.

Department of Natural and Environmental Resources. 2002. Annual Progress Report. Puerto Rico Endangered Species Program, ES 1-19, Study 2 Yellow-shouldered Blackbird Recovery Actions. Ricardo López-Ortiz, Study Leader.

_____. 2003. Annual Progress Report. Puerto Rico Endangered Species Program, ES 1-20, Study 2 Yellow-shouldered Blackbird Recovery Actions. Ricardo López-Ortiz, Study Leader.

_____. 2004. Annual Progress Report. Puerto Rico Endangered Species Program, ES 1-21, Study 2 Yellow-shouldered Blackbird Recovery Actions. Ricardo López-Ortiz, Study Leader.

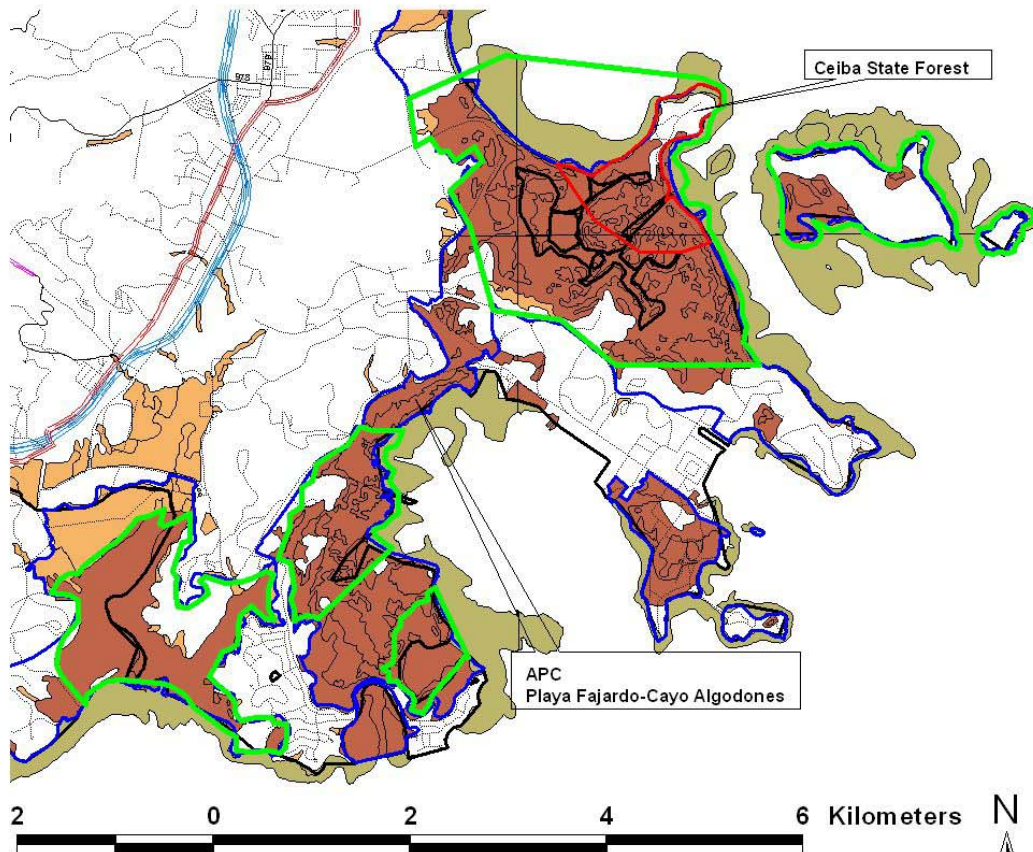
National Oceanic and Atmospheric Administration. 2002. Oil spills in mangroves, planning and response considerations. Rebecca Hoff Editor. Office of Response and Restoration, NOAA Ocean Service, Seattle, Washington. 48 pp.

U.S. Environmental Protection Agency. 2004. Region 2 RCRA Records Center. U.S. Naval Station Roosevelt Roads EPA ID Number: PR2170027203. <http://www.epa.gov/region02/waste/fsroos.pdf>

U.S. Fish and Wildlife Service. 1995. Yellow-shouldered Blackbird (*Agelaius xanthomus*) Recovery Plan. Prepared by Marelisa T. Rivera for the U.S. Fish and Wildlife Service, Atlanta, Georgia. 80 pp.

Wilkinson, D. L., C. Moore, M. Lopez, and M. Figueroa. 2001. Natural resource damage assessment for a JP-5 fuel spill at Naval Station Roosevelt Roads, Puerto Rico. Pre-Final Report. Norfolk: Atlantic Division, Naval Facilities Engineering Command. 96 pp.

Roosevelt Roads Naval Base



- ▭ Roosevelt roads naval base.shp
- ▭ Bosques_y_reservas.shp
- ▭ Areas con prioridad de conservacion.shp
- Municipios.shp
- Carreteras avpu.shp
 - ▬ autopistas
 - ▬ primarias
 - ▬ secundarias
 - ▬ terciarias
 - ▬ caminos
 - ▬ propuestas
- Humedales avpu.shp
 - ▭ Estuarine
 - ▭ Lacustrine
 - ▭ Marine
 - ▭ Palustrine
 - ▭ Riverine

Roosevelt Roads Naval Base



- Roosevelt roads naval base.shp
- Bosques_y_reservas.shp
- Areas con prioridad de conservacion.shp

33- Ceiba State Forest, Fajardo, Ceiba and Naguabo, Puerto Rico

Area Description:

The Ceiba State Forest is located in the east coast between the municipalities of Fajardo and Ceiba. The area is divided in two segments: the Fajardo segment has a land cover of 107 ha; the Naguabo segment has 36 ha, for a total of 143 ha of land cover. In 1993 one other segment was added from the municipality of Ceiba: Los Machos Mangroves, Punta Figuera and Los Corchos area (H. Horta pers. comm.). The Forest is located in the subtropical dry forest life zone with elevations lower than 5m. Usually the soils are submerged in salty water and the dominant vegetation is mangrove (Silander et al 1986).

Ownership/Protection:

Some areas were transfer to the Federal government specifically to the Roosevelt Roads NAVY Base (Silander 1986). Today mostly all of the terrains are part of the Commonwealth of Puerto Rico.

Special Recognition:

The area was declared a Forest in 1918 and in 1979 was declared as a Natural Reserve (Silander et al 1986). In 2004, BirdLife International and SOPI recognized Ceiba State Forest as an Important Bird Area. Because this mangrove ecosystem is critical to many species of Neotropical migrant birds and was once the host of breeding colonies of the endangered Yellow-shouldered Blackbird and other threatened species, we include for the first time Ceiba State Forest as a primary CWA.

Wildlife:

The area is important as marine and terrestrial habitats for wildlife species (Silander 1986). Neotropical migrant birds visit this mangroves habitat. The endangered Brown Pelican *Pelecanus occidentalis*, roost in the mangroves of Punta Figuerita (Fajardo segment) and in Cayo Algodones (Naguabo segment) (H. Horta pers. comm.). Personnel from DNER report one of the endangered Yellow-shouldered blackbird *Agelaius xanthomus* close to the Naguabo segment (DNER 2002).

Threats:

Mangrove ecosystems around the world suffer degradation from logging, coastal development, spraying of herbicides and from oil spills and other pollutants. On December 19, 1978 the *Peck Slip* released between 440,000 and 450,000 gallons of Bunker C oil into open waters offshore of eastern Puerto Rico. Within two days oil had stranded in segments along 26 km of eastern Puerto Rico shorelines, mostly sand beach. However, some oil entered outer and inner fringing mangroves in three areas and inner basin mangroves in one of these areas (NOAA 2002). Also, over the past years, atmospheric events such as hurricanes had adversely affected the east coast of the island.

Conservation Recommendations:

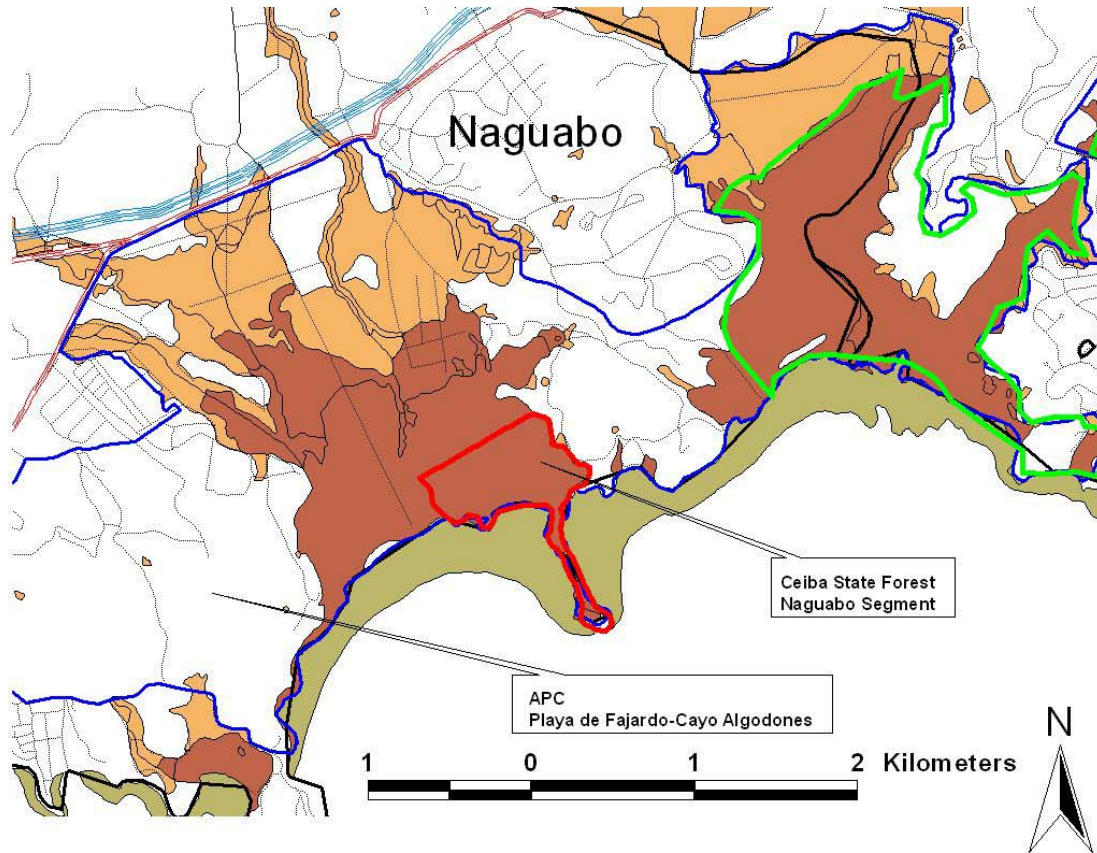
Same as Roosevelt Roads CWA.

References:

Department of Natural and Environmental Resources. 2002. Annual Progress Report. Puerto Rico Endangered Species Program, ES 1-19, Study 2 Yellow-shouldered Blackbird Recovery Actions. Ricardo López-Ortiz, Study Leader.

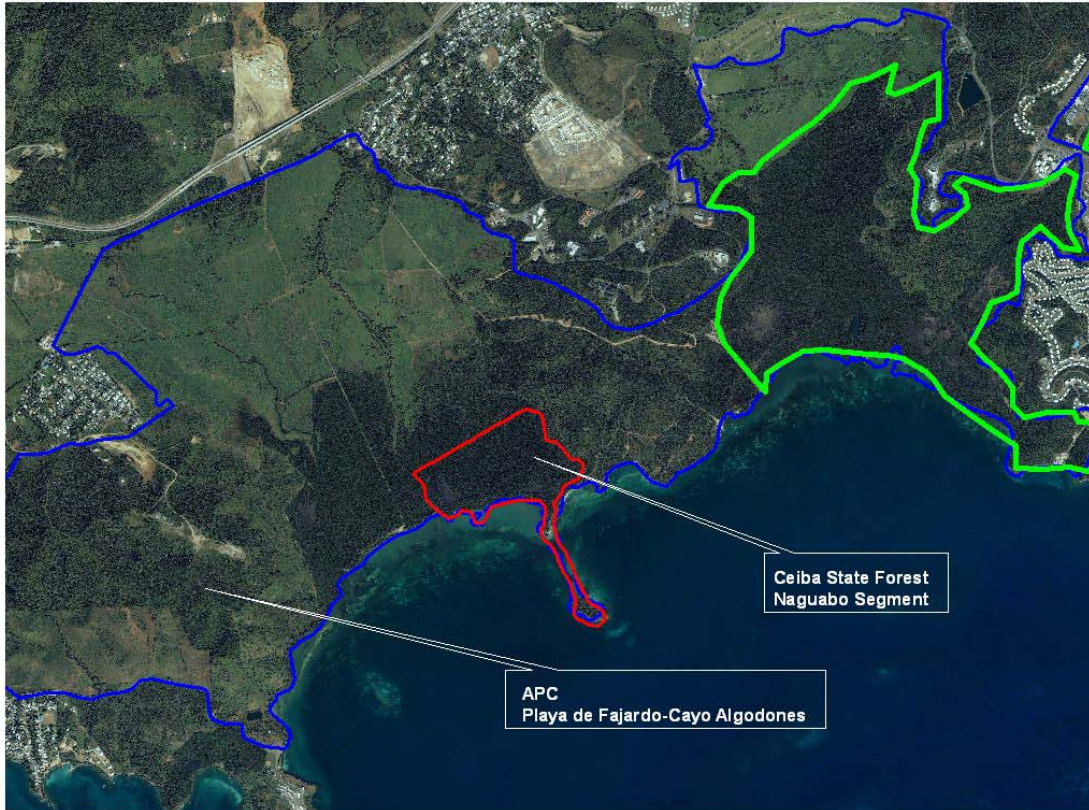
National Oceanic and Atmospheric Administration. 2002. Oil spills in mangroves, planning and response considerations. Rebecca Hoff Editor. Office of Response and Restoration, NOAA Ocean Service, Seattle, Washington. 48 pp.



Ceiba State Forest (Naguabo Segment)



- █ Roosevelt roads naval base.shp
- █ Bosques_y_reservas.shp
- █ Areas con prioridad de conservacion.shp
- Municipios.shp
- Carreteras avpu.shp
 - ▬ autopistas
 - ▬ primarias
 - ▬ secundarias
 - ▬ terciarias
 - ▬ caminos propuestos
- Humedales avpu.shp
 - █ Estuarine
 - █ Lacustrine
 - █ Marine
 - █ Palustrine
 - █ Riverine

Ceiba State Forest (Naguabo Segment)



-  Roosevelt roads naval base.shp
-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

34- Humacao Natural Reserve, Humacao, Puerto Rico

Area Description:

The Humacao Natural Reserve (HNR) is located in eastern Puerto Rico (18°10'N, 65°46'W); 56 km southeast San Juan, in the municipalities of Naguabo and Humacao. The HNR is within a historic coastal plain estuary formed by 3 interconnected valleys and drainages. It had an area of 1,026 ha with an altitude at sea level of 0-2 m. The HNR consist of 3 distinct units: Santa Teresa, Mandri, and Pterocarpus. It is located in the Subtropical Moist Life Zone (Ewel and Whitmore 1973).

Six habitats types occur at HNR: 1) coastal Lagoon (248.6 ha), 2) herbaceous marsh (363.9 ha), 3) mangrove Forest (25.2 ha), 4) Pterocarpus forest (256.6 ha, largest remaining stand of *Pterocarpus officinalis* in Puerto Rico), 5) secondary coastal forest (50.9 ha), and 6) beach scrub (9.6 ha, nesting site for marine turtles). This habitat supports a whole variety of waterfowl including native and migratory. The lagoons that formed this system are shallow with a maximum depth of 2 m (Negrón González 1986). For a complete description of the HNR, see Vilella and Gray 1997.

Waterfowl hunting is currently allowed. Hunting is only permitted in Mandri unit, because Santa Teresa unit is designated as Sanctuary. In the Humacao coast, marine turtles nest in approximately 9 km of sandy beach. During the 2003 breeding season, a total of 42 and 121 active nests of Leatherback and Hawksbill sea turtle respectively were found (Montero 2004).

Ownership/Protection:

Puerto Rico Land Authority and Land Administration own Santa Teresa and Mandri units, respectively. DNER leases the government land, and has management jurisdiction. The Pterocarpus unit is owned by several entities including DNER, Puerto Rico Conservation Trust, and private landowners. Recently, the DNER acquire approximately 113 ha to be incorporated to the HNR (Manuel Corbet, HNR Manager, pers. comm.).

Special Recognition:

The HNR was officially designated in 1986 as a wetland and waterfowl reserve (DNER 1995). The U.S. Fish and Wildlife Service recognize this wetland as priority under the federal Emergency Wetlands Resources Act of 1986: Humacao *Pterocarpus* Forest. Both forests (Mangroves and Pterocarpus) are old growth, and collectively represent one of Puerto Rico's largest pristine wetland systems. In 2004, BirdLife International and SOPI recognized Humacao Wildlife Refuge as an Important Bird Area. We still classified the HNR as a primary CWA.

Wildlife:

Birds

A total of one hundred and five bird species are reported in the HNR. About eight bird species classified as threatened or endangered use this refuge, some of them are Caribbean Coot *Fulica caribaea*, Least Tern *Sterna antillarum*, Mangrove Cuckoo *Coccyzus minor*, Puerto Rican Screech Owl *Megascops nudipes*, Least grebe *Tachybaptus dominicus*, Brown pelican *Pelecanus occidentalis*, Peregrine Falcon *Falco peregrinus*, West Indian Whistling duck *Dendrocygna arborea*, White checked pintail *Anas bahamensis*, American wigeon *A. americana*, Northern pintail *A. acuta*, Northern Shoveler *A. clypeata*, Blue-winged teal *A. discors*, Green-winged teal *A. crecca*, Lesser scaup *Aythya affinis*, Ring-necked duck *A. collaris*, Hooded merganser *Lophodytes cucullatus*, Masked duck *Nomonyx dominicus*, Ruddy duck *Oxyura jamaicensis*, Snow goose *Chen caerulescens*, Trumpeter swamp *Cygnus*

buccinator, Black-bellied whistling duck *Dendrocygna autumnalis*, Common moorhen *Gallinula chloropus*, Purple gallinule *Porphyryla martinica*, Pied-billed grebe *Podilymbus podiceps*, White-crowned pigeon *Patagioenas leucocephala*, Scaly-napped pigeon *P. squamosa*, Zenaida dove *Zenaida aurita* (Cardona and Rivera 1988); Spotted sandpiper *Actitis macularia*, American black duck *Anas rubripes*, Antillean Mango *Anthracothorax dominicus*, Green mango *A. viridis*, Short-eared owl *Asio flammeus*, Great blue heron *Ardea herodias*, Canvasback *Aythya valisineria*, Canary winged parakeet *Brotogeris versicolurus*, Cattle egret *Bubulcus ibis*, Red-tailed hawk *Buteo jamaicensis*, Green heron *Butorides virescens*, Pectoral sandpiper *Calidris melanotos*, Common snipe *Gallinago gallinago*, Great egret *Ardea alba*, Belted kingfisher *Ceryle alcyon*, Semipalmated plover *Charadrius semipalmatus*, Killdeer *C. vociferus*, Wilson's plover *C. wilsonia*, Bananaquit *Coereba flaveola*, Rock pigeon *Columba livia*, Common ground dove *Columbina passerina*, Smooth-billed ani *Crotophaga ani*, Yellow rumped warbler *Dendroica coronata*, Prairie warbler *D. discolor*, Yellow warbler *D. petechia*, Little blue heron *Egretta caerulea*, Snowy egret *E. thula*, Tricolored heron *E. tricolor*, Orange cheeked waxbill *Estrilda melpada*, Merlin *Falco columbarius*, American kestrel *F. sparverius*, Frigate bird *Fregata magnificens*, American coot *Fulica americana*, Common yellowthroat *Geothlypis trichas*, Black-necked stilt *Himantopus mexicanus*, Barn swallow *Hirundo rustica*, Troupial *Icterus icterus*, Least bittern *Ixobrychus exilis*, Herring gull *Larus argentatus*, Laughing gull *L. atricilla*, Bronze mannikin *Lonchura cucullata*, Warbling silverbill *L. malabarica*, Chestnut mannikin *L. malacca*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Pearly-eyed thrasher *Margarops fuscatus*, Northern mockingbird *Mimus polyglottos*, Black and white warbler *Mniotilta varia*, Shiny cowbird *Molothrus bonariensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Black-crowned night heron *Nycticorax nycticorax*, Yellow-crowned night-heron *Nyctanassa violacea*, Antillean crested hummingbird *Orthorhyncus cristatus*, Osprey *Pandion haliaetus*, Northern parula *Parula americana*, Cave swallow *Petrochelidon fulva*, Double-crested cormorant *Phalacrocorax auritus*, Glossy ibis *Plegadis falcinellus*, Black-bellied plover *Pluvialis squatarola*, Sora *Porzana carolina*, Purple martin *Progne subis*, Prothonotary warbler *Protonotaria citrea*, Greater Antillean Grackle *Quiscalus niger*, Northern waterthrush *Seiurus noveboracensis*, American Redstart *Setophaga ruticilla*, Puerto Rican Spindalis *Spindalis portoricensis*, Royal tern *Sterna maxima*, Red footed booby *Sula sula*, Black-faced grassquit *Tiaris bicolor*, Yellow-faced grassquit *T. olivacea*, Lesser yellowlegs *Tringa flavipes*, Greater yellowlegs *T. melanoleuca*, Solitary sandpiper *T. solitaria*, Loggerhead kingbird *Tyrannus caudifasciatus*, Gray kingbird *T. dominicensis*, Black-whiskered vireo *Vireo altiloquus*, Pintailed whydah *Vidua macroura*, Zenaida dove *Zenaida aurita* (Acosta et al 1973; DNR 1980 and 1981; Negrón et al 1984).

Reptiles

Sea turtles nest in the sandy beach: Leather back turtle *Dermochelys coriacea*, Hawksbill turtle *Eretmochelys imbricata*, Loggerhead sea turtle *Caretta caretta*, Puerto Rican slider *Trachemys stejnegeri*. Other reptiles are: Puerto Rican ground lizard *Ameiva exsul*, Crested anole *Anolis cristatellus*, Common grass anole *A. pulchellus*, Nichol's dwarf gecko *Sphaerodactylus nicholsi* (Aponte et al 1973; DNR 1980 and 1981; Negrón et al 1984).

Amphibians

Coqui spp. *Eleutherodactylus spp.*, White-lipped frog *Leptodactylus albilabris*, Giant toad *Bufo marinus*, Bullfrog *Rana catesbeiana*. (Acosta et al 1973; DNR 1980 and 1981; Negrón et al 1984).

Crustaceans

Callinectes marginatus, *Cardisoma guanhumi*, *Goniopsis cruentata*, *Macrobrachium acanthurus*, *M. elongate*, *Ocypode quadrata*, *Paleomonon pandaliformis*, *Armases ricordi*, *Uca thayeri* (Acosta et al 1973; DNR 1980 and 1981; Negrón et al 1984).

Fish

Awaous tajasica, *Caranx hippos*, *Caranx latus*, *Centropomus enfiserus*, *Centropomus pectinatus*, *Centropomus undecimalis*, *Cetengraulis endentulus*, *Diapterus plumieri*, *Eleotris pisonis*, *Elops saurus*, *Eucinostomus melanopterus*, *Gobiomorus dormitor*, *Gobionellus boleosoma*, *Gobionellus oceanicus*, *Gobiosoma gemmatum*, *Lepomis microlophus*, *Lutjanus jocu*, *Megalops atlantica*, *Mugil curema*, *Mugil liza*, *Ostethus brachyurus*, *Poecilia reticulata*, *Poecilia vivipara*, *Strongylura timucu*, *Tilapia mossambica* (Acosta et al. 1973; DNR 1980 and 1981; Negrón et al. 1984).

Mammals

Small Indian mongoose *Herpestes javanicus*, House mouse *Mus musculus*, Norway rat *Rattus norvegicus*, Black rat *R. rattus*.

Threats:

Degradation of the habitat is one of the factors responsible of the waterfowl population decline. The HNR was heavily degraded during the 1920's for agricultural purposes (sugar cane). This results in deforestation and drainage of nearly all HNR coastal wetlands (DNR, 1985). Coastal forest and beach scrub were also cleared for cultivation of coconut palm (*Cocos nucifera*) and grazing (Vilella and Gray 1997).

Theses lagoons store water carried from rivers and runoff from landscape. These waters may contain contaminants, pesticides, herbicides and nutrients (DNER 1994). Frontera canal is still listed as an Environmental Protection Agency Superfund Site, because of heavy metal contamination in the late 1970's-early 1980's (Vilella and Gray 1997).

In the sandy beaches areas, sea turtles nesting are threatened by various human activities: vehicles, cavalcade, and cows traveling across the nesting areas; construction near the coast; artificial illumination; turtle eggs poaching; and killing of a nesting female. These activities were reported for the 2003 breeding season in Humacao area (Montero 2004).

Conservation Recommendations:

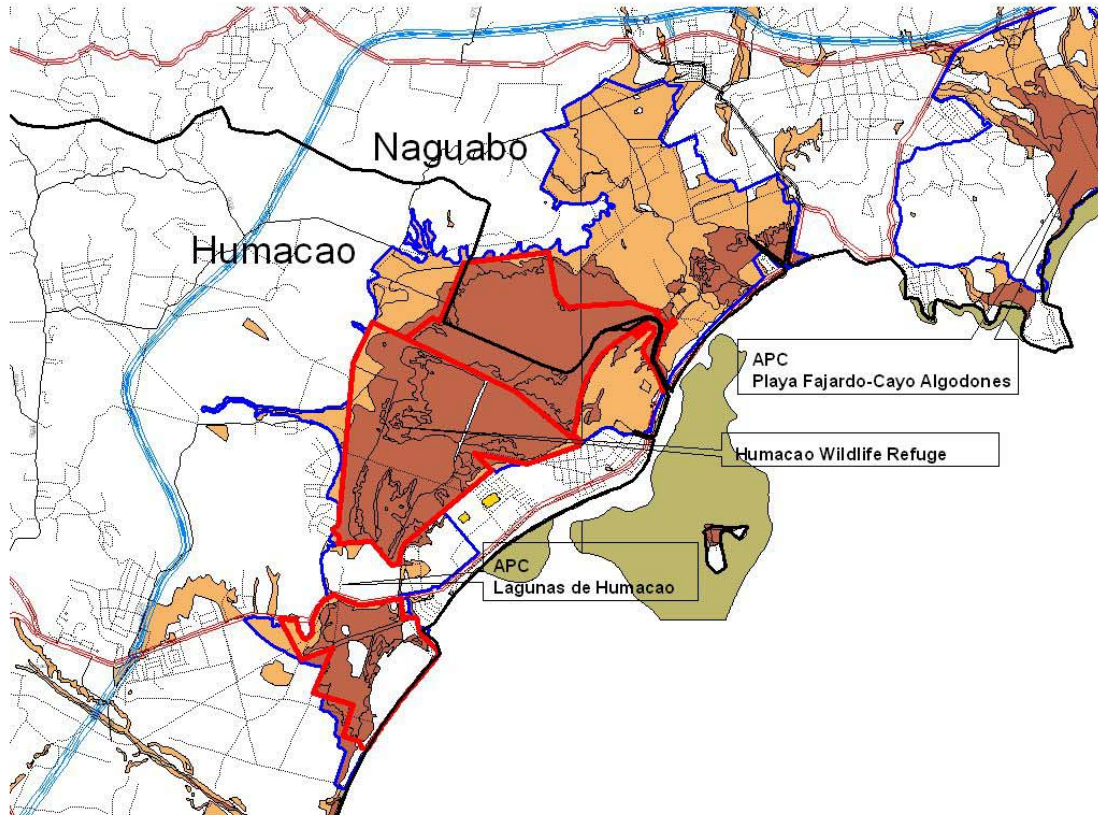
Precipitation, runoff, and effluents affect water qualities in the HNR lagoons. Water chemistry in the drainage should be continuously monitored to prevent fish kills. Management should include water level manipulation in managed cells and vegetation control on selected areas. For more information see the HNR ecological assessment and management plan (Vilella and Gray 1997).

References:

Acosta, C.R.T., M.J. Vélez, and R. Woodbury. 1973. Estudio ecológico e Inventario del Pantano de Agua Dulce de Naguabo y Humacao, Puerto Rico. U.S. Department of Housing and Urban Development.

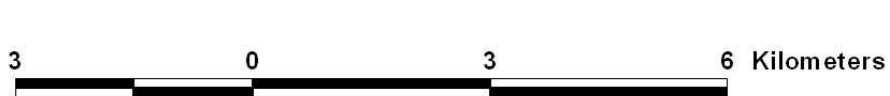
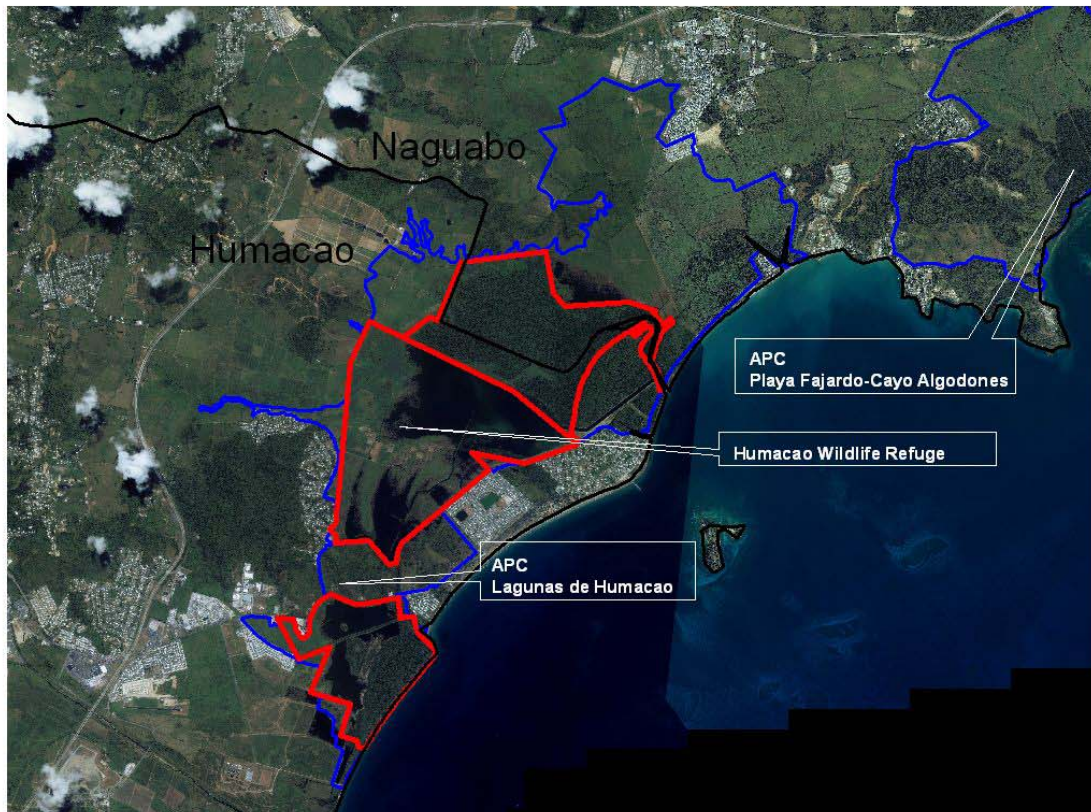
- Bonilla, G., M. Vázquez, y E. Berríos. 1992. Status, estimado poblacional y distribución de cuatro aves acuáticas nativas en Puerto Rico. Departamento de Recursos Naturales de Puerto Rico. Simposio XVIII de los Recursos Naturales de Puerto Rico. Vol. XVIII.
- Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.
- Departamento de Recursos Naturales. 1980. Evaluación ambiental de las lagunas, manglares, y ciénagas de los sectores Punta Morrillo y Santa Teresa en Humacao. Estado Libre Asociado de Puerto Rico. San Juan, P.R. 17 pp.
- _____. 1981. Proposal for the management of a fish and wildlife refuge in the Mandri lagoons, Humacao, P.R. Estado Libre Asociado de Puerto Rico. San Juan, P.R. 38 pp.
- _____. 1985. Documento de Designación Reserva Natural Pantano y Bosque de Pterocarpus de Humacao. Programa de Manejo de la Zona Costanera. San Juan, Puerto Rico.
- _____. 1994. Assessment of habitat conditions in the lagoons included in the Humacao Fish and Wildlife Refuge, Dingell Johnson Project F-5. Estado Libre Asociado de Puerto Rico. San Juan, P.R. 62 pp.
- Departamento de Recursos Naturales y Ambientales. 1995. Operation of the Humacao Wildlife Refuge, Grant Agreement FW-10. Estado Libre Asociado de Puerto Rico. San Juan, P.R. 27 pp.
- _____. 1996. Plan estratégico de los recursos naturales de pesca y vida silvestre. Borrador. Gobierno de Puerto Rico, DRNA, Administración de Recursos Naturales, Negociado de Pesquería y Vida Silvestre.
- Ewel, J.J., and J.L. Whitmore. 1973. The ecological life zones of Puerto Rico and the U.S. Virgin Islands. U.S. Dept. Agric. For. Serc. Res. Pub. ITF-18. Rio Piedras, P.R. 71 pp.
- Montero, Lesbia. 2004. Informe preliminar Proyecto de Conservación de Tortugas Marinas Humacao y Maunabo, Puerto Rico. Proyecto ES-1-20. Informe sometido al DRNA, Div. Recursos Terrestres, Programa de Especies Protegidas. 28 pp.
- Negrón, L., R. Pérez, and Felipe Cuevas. 1983. Evaluación ecológica del sistema estuarino-lagunar de Humacao como hábitaculo de vida silvestre. Pages 63-89 *In* Memorias del Quinto Simposio de la fauna de Puerto Rico y el Caribe. Colegio Universitario de Humacao. Humacao, P.R.
- Vilella, F. J. and M. J. Gray. 1997. Ecological Assessment and Management Plan for the Humacao Wildlife Refuge. Final Report Project FW-10. Mississippi Cooperative Fish and Wildlife Research Unit.



Humacao Wildlife Refuge



- Municipios.shp
- Bosques_y_reservas.shp
- Areas con prioridad de conservacion.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

Humacao Wildlife Refuge



-  Municipios.shp
-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

35- Pandura Mountain Range, Yabucoa-Maunabo, Puerto Rico

Area Description:

This huge mountain range starts in the coastal zone and finish in the upland areas, it is located in Punta Toro, Punta Yegua and Punta Quebrada Honda. It has to the north the town of Yabucoa. Contains various high peaks including Cerro La Pandura, Cerro Santa Elena y Cerro El Sombrerito. The Pandura Mountain Range lays within the sub-tropical moist forest life zone (Ewel and Whitmore 1973).

The batholiths of San Lorenzo are exposed over a continuous area over 467 km² and are associated with smaller stocks of similar rock composition known as the “Yabucoa Granite: (Fettke 1958). Most rock exposures occur around the towns of Yabucoa and Maunabo. This area have a cave systems, known as “guajonales”, which, when associated with waterways, are inhabited by *Eleutherodactylus cooki* (Burrowes 1997). This species is a candidate for listing as endangered by the USFWS (Vega-Castillo 2000). The Guajón requires (1) large rock boulders that form caves or “guajonales” (2) rock crevices within these caves, and (3) streams or flowing water under caves or “guajonales” (Joglar 2000). These conditions only exist in this CWA.

Ownership/Protection:

Privately owned lands sparsely populated.

Special Recognition:

The Natural Heritage Program classified this area as a Priority Area for Conservation. The DNER classified this area as a CWA of secondary importance (Raffaele and Duffield 1979; Cardona and Rivera 1988). Because at present it's the only know habitat of the threatened Guajón, we reclassified this CWA as one of primary importance.

Wildlife:

Birds

Fifty seven bird species have been reported in the Pandura Mountain Range: Frigate bird *Fregata magnificens*, Brown pelican *Pelecanus occidentalis*, Pied-billed grebe *Podilymbus podiceps*, Great egret *Ardea alba*, Cattle egret *Bubulcus ibis*, Green heron *Butorides virescens*, Osprey *Pandion haliaetus*, Red-tailed hawk *Buteo jamaicensis*, American kestrel *Falco sparverius*, Merlin *F. columbarius*, Purple gallinule *Porphyryla martinica*, Common moorhen *Gallinula chloropus*, Common dove *Columba livia*, Scaly-napped pigeon *Patagioenas squamosa*, White-crowned pigeon *P. leucocephala*, Plain pigeon *P. inornata*, White-winged dove *Zenaida asiatica*, Zenaida dove *Z. aurita*, Mourning dove *Z. macroura*, Common ground dove *Columbina passerina*, Mangrove cuckoo *Coccyzus minor*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Smooth-billed ani *Crotophaga ani*, Antillean Mango *Anthracothorax viridis*, Green throated carib *Eulampis holosericeus*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Puerto Rican lesser Antillean Pewee *Contopus portoricensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Puerto Rican Vireo *Vireo latimeri*, Black-whiskered vireo *V. altiloquus*, Cave swallow *Petrochelidon fulva*, Pearly-eyed thrasher *Margarops fuscatus*, Northern mockingbird *Mimus polyglottos*, Northern parula *Parula americana*, Adelaide's warbler *Dendroica adelaidae*, Black and white warbler *Mniotilta varia*, Worm eating warbler *Helmitheros vermivorus*, Common yellowthroat *Geothlypis trichas*, Hooded warbler *Wilsonia citrina*, Bananaquit *Coereba flaveola*, Puerto Rican Spindalis *Spindalis portoricensis*, Yellow-faced

grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, Greater Antillean Oriole *Icterus dominicensis*, Orange cheeked waxbill *Estrilda melpoda*, Bronze mannikin *Lonchura cucullata*, House sparrow *Passer domesticus* (Data provided by SOPI 2004).

Reptiles

Puerto Rican Racer *Alsophis portoricensis* (Vega-Castillo 2000).

Amphibians

The most important critical wildlife element in the area is the presence of the endemic Puerto Rican Demon or Guajón *Eleutherodactylus cooki* that occurs almost exclusively in this area. The species thrives among the dark, humid spaces that exist between large (10 to 20 feet in diameter) boulders of volcanic rock origin known as Guajonales (Cardona and Rivera 1988). In addition to the Guajón, the common coqui *E. coqui* and the white-lipped frog *Leptodactylus albilabris* can be found at the streams (Vega-Castillo, 2000).

Mammals

Black rat *Rattus rattus*, Domestic cat *Felis catus* (Vega-Castillo 2000).

Threats:

Deforestation and habitat modification for agricultural and rural development have encroached upon known habitat of the threatened Puerto Rican Demon or Guajón.

Conservation Recommendations:

Collection of ecological and demographic data such as distribution, population fluctuations, habitat descriptions, and habitat use are essential to implement protection and conservation measures for the threatened Puerto Rican Demon (Vega-Castillo 2000). The occurrence of the *E. cooki* only on privately owned land makes conservation on this species complex and restricts the potential for management. Conservation efforts should concentrate on the acquisition and protection of privately owned land within the range of *E. cooki* (Joglar 2000).

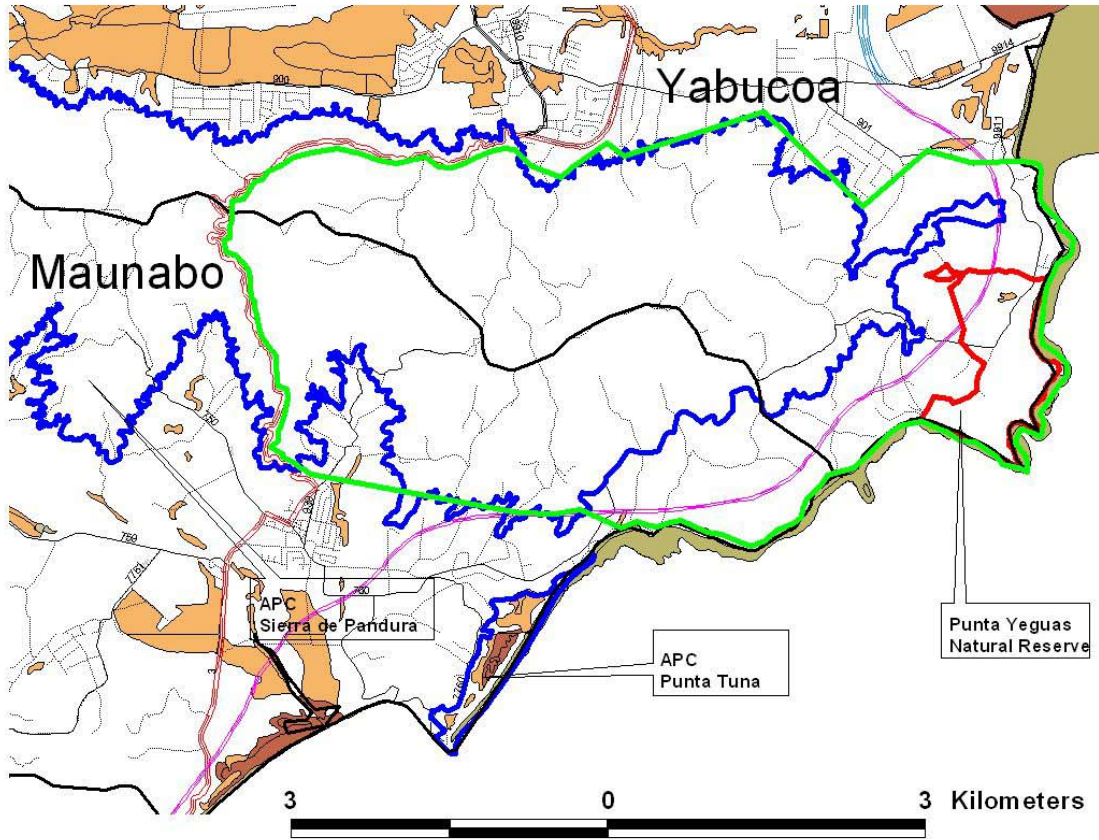
References:

- Burrowes, Patricia A. 1997. The reproductive biology and population genetics of the cave-dwelling Puerto Rican Frog, *Eleutherodactylus cooki*. PhD. Thesis, University of Kansas City, Department of Systematic and Ecology.
- Ewel, J.J., and J.L. Whitmore. 1973. The ecological life zones of Puerto Rico and the U.S. Virgin Islands. U.S. Dept. Agric. For. Serc. Res. Pub. ITF-18. Rio Piedras, P.R. 71 pp.
- Fettke, C. R. 1958. The geology of the Humacao district of Porto Rico. *In* Scientific Survey of Porto Rico and the Virgin Islands. New York Academy of Sciences. Study II, part 2:117-197.
- Joglar, R.L. 2000. Survey for the webbed-footed coqui (*Eleutherodactylus karlschmidti*), the Guajón (*Eleutherodactylus cooki*) and Puerto Rican boa (*Epicrates inornatus*) on the Río

Valenciano Project Area, Juncos, Puerto Rico. Final Report submitted to Black and Veatch Special Projects Corp. 6601 College Boulevard, Overland Park, Kansas 66211.

Vega-Castillo, Sondra Ivelisse. 2000. Habitat description and comparison of the Puerto Rican Demon or Guajón, (*Eleutherodactylus cooki*) at two localities in the eastern part of Puerto Rico. M.S. Thesis, University of Puerto Rico, Mayagüez, P.R.

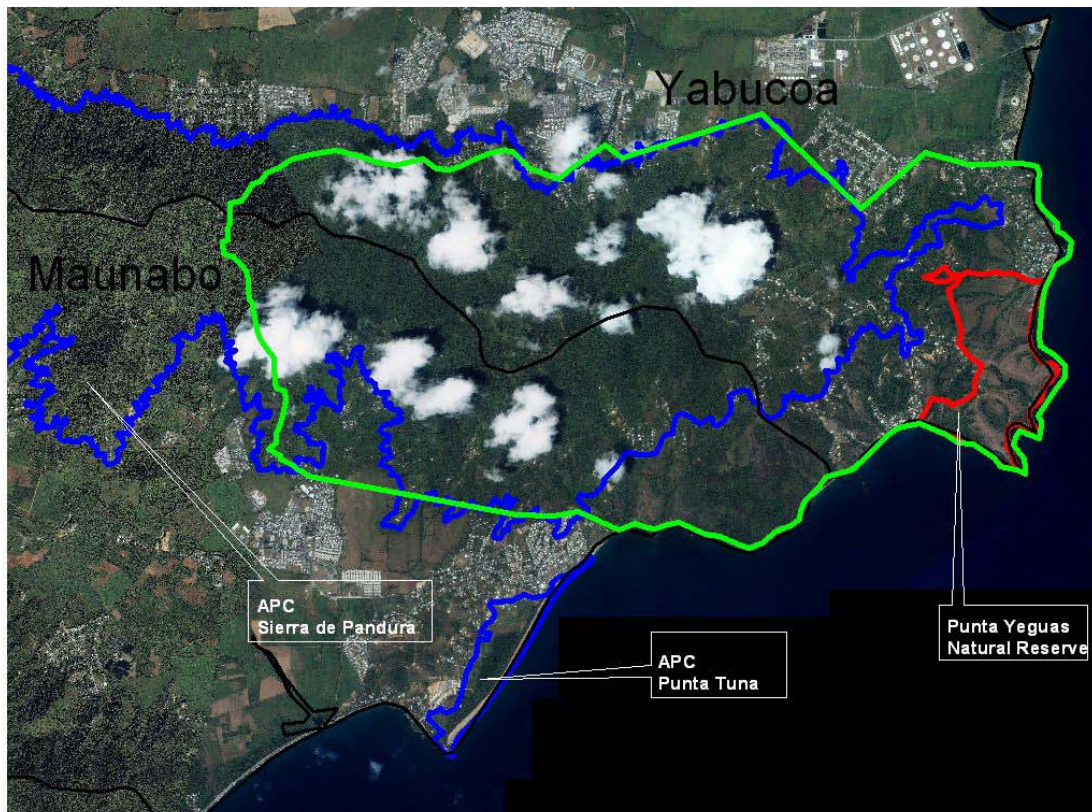
Pandura Mountain Range




- ▭ Pandura mountain range.shp
- Municipals.shp
- Bosques_y_reservas.shp
- Areas con prioridad de conservacion.shp
- Carreteras avpu.shp
 - ▬ autopistas
 - ▬ primarias
 - ▬ secundarias
 - ▬ terciarias
 - ▬ caminos
 - ▬ propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine



Pandura Mountain Range



-  Pandura mountain range.shp
-  Municips.shp
-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

36- Palmas Pond, Arroyo, Puerto Rico

Area Description:

Palmas Pond is located southeast of Puerto Rico, north of the Punta Guilarte Public Beach in Arroyo. The area contains 146 ha of wetland. This area was formerly utilized for sugarcane industry. It is surrounded by several sugarcane fields on its northern and western portions (Cardona and Rivera 1988). Actually, the vegetation that surrounds the pond is primarily cattail *Typha dominguensis*. In the past, this area was a popular hunting ground (D. Ramos pers. comm.). On a recent visit, the size of the pond has been severely reduced by the cattail growth, creating a non-favorable habitat for waterfowl's species.

Ownership/Protection:

Privately owned.

Special Recognition:

This area was classified first as a primary CWA by Cardona and Rivera (1988). Today, the area seems less valuable in terms of wildlife, although restoration could be possible if actions are taken. Until then, we classified this CWA as one of secondary importance.

Wildlife:

Birds

Fifty one bird species have been reported in Palmas Pond: Brown pelican *Pelecanus occidentalis*, Ruddy duck *Oxyura jamaicensis*, Masked duck *Nomonyx dominica*, Caribbean Coot *Fulica caribaea*, American coot *F. americana*, Common moorhen *Gallinula chloropus*, Black-crowned night heron *Nycticorax nycticorax*, Pied-billed grebe *Podilymbus podiceps*, Great egret *Ardea alba*, Snowy egret *Egretta thula*, Little blue heron *E. caerulea*, Cattle egret *Bubulcus ibis*, Green heron *Butorides virescens*, Osprey *Pandion haliaetus* (Cardona and Rivera 1988; Terrestrial Resources Data 2004). Magnificent frigatebird *Fregata magnificens*, Red-tailed hawk *Buteo jamaicensis*, American kestrel *Falco sparverius*, Lesser Golden plover *Pluvialis dominica*, Wilson's plover *Charadrius wilsonia*, Semipalmated plover *C. semipalmatus*, Black-necked stilt *Himantopus mexicanus*, Ruddy turnstone *Arenaria interpres*, Semipalmated sandpiper *Calidris pusilla*, Least sandpiper *C. minutilla*, Royal tern *Sterna maxima*, Sandwich tern *S. sandvicensis*, Least tern *S. antillarum*, Common dove *Columba livia*, Scaly-naped pigeon *Patagioenas squamosa*, White-winged dove *Zenaida asiatica*, Zenaida dove *Z. aurita*, Common ground dove *Columbina passerina*, Antillean crested hummingbird *Orthorhyncus cristatus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Black-whiskered vireo *Vireo altiloquus*, Caribbean Martin *Progne dominicensis*, Cave swallow *Petrochelidon fulva*, Northern mockingbird *Mimus polyglottos*, Yellow warbler *Dendroica petechia*, Bananaquit *Coereba flaveola*, Puerto Rican Spindalis *Spindalis portoricensis*, Yellow-faced grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, Yellow headed blackbird *Xanthocephalus xanthocephalus*, Greater Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, House sparrow *Passer domesticus*, Red bishop *Euplectes franciscanus*, Orange cheeked waxbill *Estrilda melpoda*, Nutmeg mannikin *Lonchura punctulata* (Data provide by SOPI 2004).

Threats:

Cattails growths are reducing the pond quality, affecting waterfowl's establishment. Possible eutrophication is present.

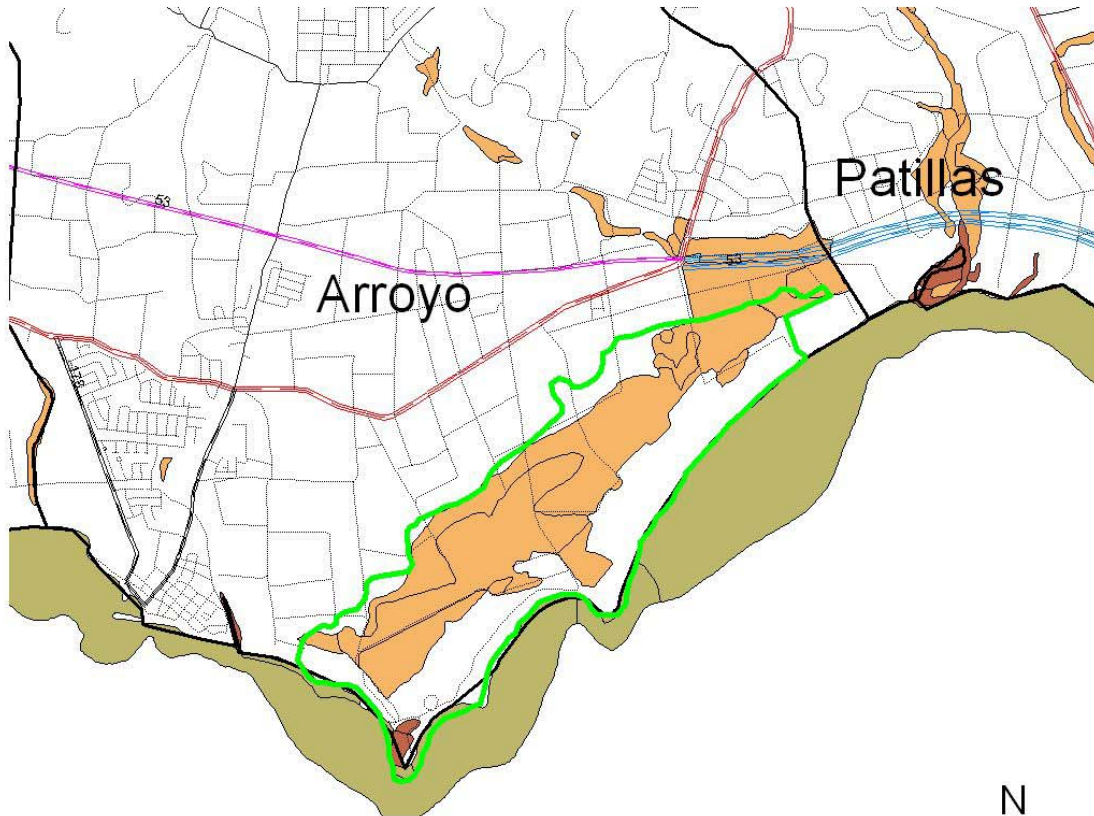
Conservation Recommendations:

The main recommendation is to restore the pond for the establishment of waterfowl's and wading birds. This CWA should be acquired and restore in order to improve the pond and adjacent areas.

References:

None

Palmas Pond



- Palmas pond cwa.shp
- Municips.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

Palmas Pond



-  Palmas pond cwa.shp
-  Municipals.shp

37- Carite State Forest, Cayey, Puerto Rico

Area Description:

The Carite State Forest is in the southeast part of the island, located in the Sierra de Cayey, between the municipalities of San Lorenzo, Patillas, Guayama, Cayey and Caguas. This forest is divided in four segments and it is located in three different life zones: 1-Subtropical humid forest 2-Subtropical very humid forest and 3-Lower montane forest (Silander et al 1986). Carite Forest is classified as a subtropical moist forest (Ewel and Whitmore 1973). The forest is mainly transitional with many ecotones. Some of the forest's native vegetation has been replaced by *Eucalyptus rubustus* and *Pinus caribaea* (Pérez-Rivera and Nadal 1996).

The forest is comprised of 2,671 ha, with elevations ranging from 250 meters to 903 meters. Its highest peak is Cerro La Santa at 903 m. Most of the forest area is composed of well-dissected, mature topography with slopes ranging from 20 to 60 percent (DRN 1976).

Five categories of forest have been recognized: 1-Upper montane 2-Lower montane 3-Dwarf 4-Early secondary 5-Plantations (DRN 1976). The forest is the origin of three rivers: Río Grande de Loíza, Río Patillas and Río La Plata (Silander et al 1986). A forest ranger has been in the area since 1935 and critical areas in the forest had been identified such as the dwarf forest; areas with rare species and Tabonuco areas (Silander et al 1986).

The endangered Puerto Rican Broad-winged hawk *Buteo platypterus brunnescens*, an uncommon and extremely local resident in Puerto Rico, was unknown from the Carite forest until 1980, when the existence of a resident population present year-round was reported (Hernández-Prieto, 1980). In 1992, 20 broad-winged hawks were counted in the Carite forest and a population of 22 individuals was estimated (Delannoy, 1992). In the Carite forest the species has been reported from the Elfin forest, Caimitillo, Granadillo, Tabonuco, and slope forest types (Hernandez 1980; Delannoy 1992). Delannoy (1997) report a breeding population of the critically endangered Sharp-shinned hawk *Accipiter striatus venator* in the Carite Forest (Delannoy 1992).

Ownership/Protection:

Carite State Forest is a public land of the Commonwealth of Puerto Rico and administered by the DNER. This forest was established in 1935 for wood production and to protect the basin of the Río Grande de Loíza, Río Grande de Patillas and Río Grande de la Plata rivers.

Special Recognition:

The Carite State Forest was first recognized as a CWA for its avian richness in 1980 (Moreno and Pérez). In 2004, BirdLife International and SOPI recognized Carite State Forest as an Important Bird Area. Because it's wildlife richness and the populations of two critically endangered hawks (Broad-winged and Sharp-shinned hawks) we classified the Carite State Forest as primary area for wildlife.

Wildlife:

Hernández-Prieto (1980) determined that species richness is higher in the Caimitillo *Microphollys chrysophylloides* Forest, followed by the Granadillo *Buchenavia capitata* and Tabonuco *Dacryoides excelsa* forest.

Birds

Forty eight bird species have been reported in the Carite Forest: Bananaquit *Coereba flaveola*, Puerto Rican Tanager *Nesospingus specularis*, Puerto Rican Tody *Todus mexicanus*, Stripe headed tanager *Spindalis portoricensis*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Red-legged thrush *Turdus plumbeus*, Black-faced grassquit *Tiaris bicolor*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Gray kingbird *Tyrannus dominicensis*, Elfin wood warbler *Dendroica angelae*, Black-throated blue warbler *D. caerulescens*, Red-tailed hawk *Buteo jamaicensis*, Puerto Rican Broad-winged hawk *B. platypterus*, Sharp-shinned hawk *Accipiter striatus*, Puerto Rican Screech owl *Megascops nudipes*, Key west quail-dove *Geotrygon chrysis*, Ruddy quail-dove *G. montana* Scaly-napped pigeon *Patagioenas squamosa*, Zenaida dove *Zenaida aurita*, White-winged dove *Z. asiatica*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Cave swallow *Petrochelidon fulva*, Pearly-eyed thrasher *Margarops fuscatus*, Black-whiskered vireo *Vireo altiloquus*, Antillean Euphonia *Euphonia musica*, Green heron *Butorides virescens*, Louisiana Waterthrush *Seiurus motacilla*, Cattle egret *Bubulcus ibis*, Green mango *Anthracothorax viridis*, American Redstart *Setophaga ruticilla*, Black and white warbler *Mniotilta varia*, Northern mockingbird *Mimus polyglottos* (DNR 1974). Kestrel *Falco sparverius*, Common ground dove *Columbina passerina*, Mangrove cuckoo *Coccyzus minor*, Smooth-billed ani *Crotophaga ani*, Loggerhead kingbird *Tyrannus caudifasciatus*, Caribbean Martin *Progne dominicensis*, Puerto Rican Vireo *Vireo latimeri*, Black-throated green warbler *Dendroica virens*, Parula warbler *Parula americana*, Adelaide's warbler *Dendroica adelaidae*, Greater Antillean Oriole *Icterus dominicensis*, Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, Yellow-faced grassquit *Tiaris olivacea*, Puerto Rican Flycatcher *Myiarchus antillarum* (Pérez and Moreno 1980).

Reptiles

The Tabonuco forest is the area with the highest number of reptiles in the forest (Silander 1986). Thirteen reptile species have been reported in the forest (Hernández-Prieto 1980): Klauber's dwarf gecko *Sphaerodactylus klauberi*, Common dwarf gecko *S. macrolepis*, Puerto Rican ground lizard *Ameiva exsul*, Puerto Rican pygmy anole *Anolis occultus*, Emerald anole *A. evermanni*, Barred anole *A. stratulus*, Yellow-bearded anole *A. gundlachi*, Crested anole *A. cristatellus*, Common grass anole *A. pulchellus*, Upland grass anole *A. krugii*, Puerto Rican giant anole *A. cuvieri*, Puerto Rican Racer *Alsophis portoricensis*. Also the Puerto Rican boa *Epicrates inornatus* is reported (H. Serrano, Forest Manager pers. comm.).

Amphibians

Fifteen amphibians species have been reported in the Carite Forest, with the highest diversity located in the Caimitillo forest (Hernández-Prieto, 1980; Silander et al 1986). These includes: Golden coqui *Eleutherodactylus jasperi* where an area in the forest (to the west of Lago Carite) is considered as the critical habitat for this species although this species have not been seen in the last years; Common coqui *E. coqui*, Puerto Rican coqui *E. portoricensis*, Ground coqui *E. richmondi*, Wrinkled frog *E. wightmanae*, Eneida's coqui *E. eneidae*, Warty coqui *E. locustus*, Tree-hole coqui *E. hedricki*, Cricket coqui *E. gryllus*, Antillean frog *E. antillensis*, Grass coqui *E. brittoni*, Web-footed coqui *E. karlschmidti*, Whistling frog *E. cochraniae*, White-lipped frog *Leptodactylus albilabris* and the Giant toad *Bufo marinus* complete the list.

Critical Plants:

The endangered orquid *Lepantes caritencis* and the endangered shrub *Gonocalix concolor* are reported (H. Serrano pers. comm.).

Threats:

There are continuing threats of establishment of new communications facilities along the northwestern section of the Carite Forest, the area of highest Broad-winged hawk densities. The location and size of new recreation facilities among the Carite State Forest could potentially eliminate broadwing and sharpshin habitats or bring human activities too close to preferred nesting habitat. Also, access to farms through forested land could destroy preferred habitat for these species (Delannoy 1997).

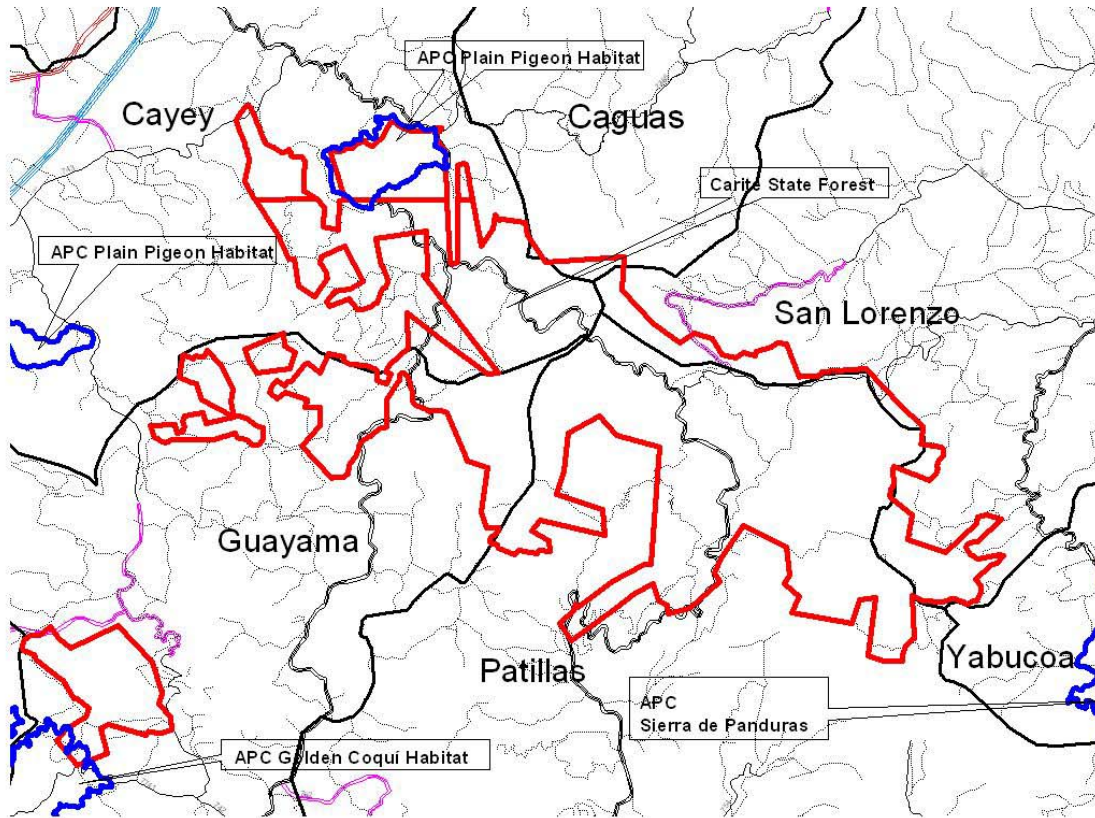
Conservation Recommendations:

Management practices to enhance the survival of the endangered Broad-winged and Sharp-shinned hawk and guarantee habitat and species protection should be implemented.

References:

- Delannoy, C.A. 1992. Status surveys of the Puerto Rican sharp-shinned hawk (*Accipiter striatus venator*) and Puerto Rican Broad-winged hawk (*Buteo platypterus brunnescens*). Final report submitted to the U.S. FWS.
- _____. 1997. Status of the Broad-winged hawk and Sharp-shinned hawk in Puerto Rico. Carib. J. Sci., 33: 21-33.
- Department of Natural Resources. 1974. Plan de Manejo de Bosque de Carite.
- _____. 1976. The Master Plan for the Commonwealth Forests of Puerto Rico. Prepared for the Bureau of Outdoor Recreation by Area of Planning and Evaluation of Resources Division of Forest Planning.
- Ewel, J.J., and J.L. Whitmore. 1973. The ecological life zones of Puerto Rico and the U.S. Virgin Islands. U.S. Dept. Agric. For. Serc. Res. Pub. ITF-18. Rio Piedras, P.R. 71 pp.
- Hernández-Prieto, E. 1980. Estudio de aves, reptiles y anfibios en la reserva forestal de Carite. Informe presentado como requisito del curso Ciencias Naturales 306, Programa de Mantenimiento Ambiental. Facultad de Ciencias Naturales, Universidad de Puerto Rico, Recinto de Río Piedras, Río Piedras, Puerto Rico.
- Pérez-Rivera, R. and E. Nadal. 1996. Use of bird nests by *Eleutherodactylus* frogs in the Carite Forest, Puerto Rico. Carib. J. Sci.. 32: 201-205.

Carite State Forest

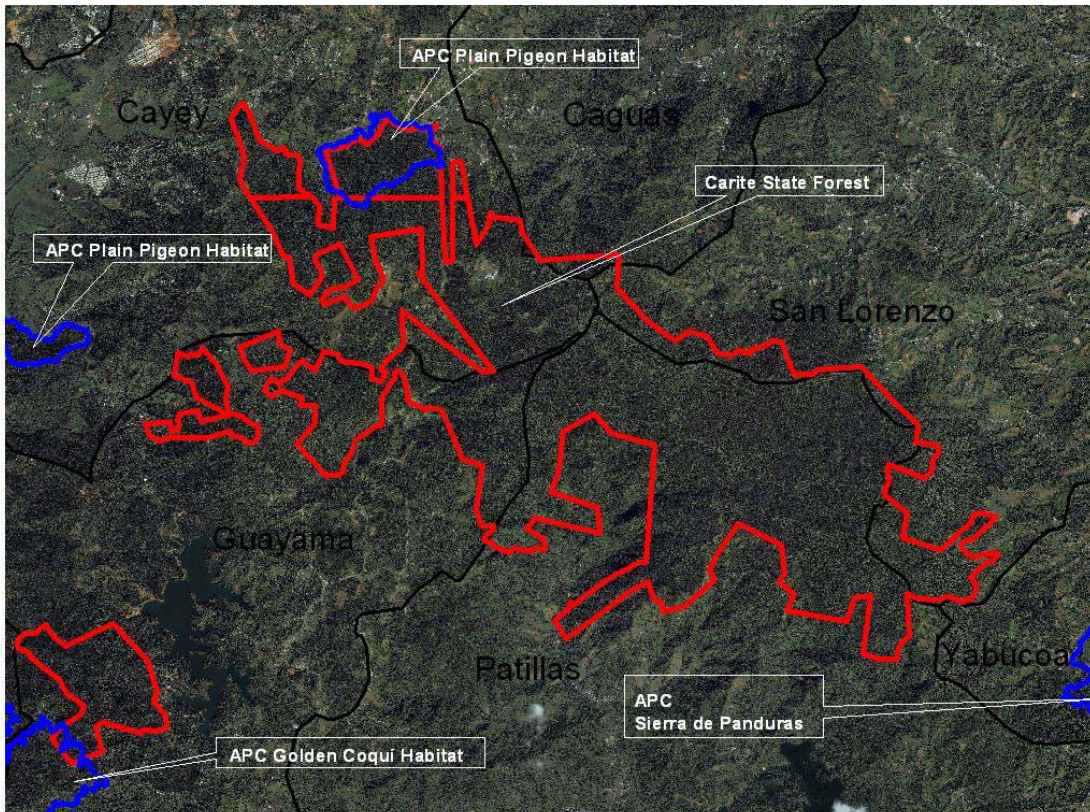


3 0 3 6 Kilometers

- ▭ Areas con prioridad de conservacion.shp
- ▭ Bosques_y_reservas.shp
- Municips.shp
- Carreteras avpu.shp
 - ▬ autopistas
 - ▬ primarias
 - ▬ secundarias
 - ▬ terciarias
 - ▬ caminos
 - ▬ propuestas
- Humedales avpu.shp
 - ▭ Estuarine
 - ▭ Lacustrine
 - ▭ Marine
 - ▭ Palustrine
 - ▭ Riverine



Carite State Forest



3 0 3 6 Kilometers



-  Areas con prioridad de conservacion.shp
-  Bosques_y_reservas.shp
-  Municips.shp

38- Cerro El Gato and Associated Areas, Cayey, Puerto Rico

Area Description:

With an elevation of 820m Cerro El Gato is located in the Sumido town of the municipality of Cayey and it's the third highest mountain in Cayey, being Cerro La Tabla (890m) and Cerro Avispa (850m) the two highest peaks (Municipio de Cayey 2004).

Ownership/Protection:

Privately owned.

Special Recognition:

Cerro El Gato was classified a CWA in 1979 (Raffaele and Duffield) of primary importance. Also it was designated Critical Natural Habitat by the DNER for the Golden coqui *Eleutherodactylus jasperi*. This includes elevations higher than 700 meters: starting at the union between road 715 and the contour line of 700m to the west along the road until the connection with a soil trail without name or number, from here to the north and northeast along that trail until it finds again the contour line of the 700m (DNER 2004). Designated Critical Natural Habitat for the Golden coqui also includes Cerro Avispa and the Sierra de Cayey, both in elevations higher than 700m in the municipality of Cayey (DNER 2004). Today, Cerro El Gato and its Associated Areas are still classified a CWA of primary importance.

Wildlife

Distribution of the Golden coqui is restricted to areas of dense bromeliad growth, which are associated with rock faces, isolated trees, and the margins of forest in a mountainous area which receives a large amount of moisture in the form of dew (USFWS 1992). The species has been found only in water-containing bromeliads of the genera *Vriesia*, *Hoenbergia*, and *Guzmania* (USFWS 1992).

Studies carried out in 1976 indicated that it was normal to find two or more adults and two or more size-classes of juveniles per bromeliad. Population levels are not currently known and may be critical. Surveys carried out in 1986, 1987, and 1989, did not encounter any individuals (USFWS 1992).

Although classified as Critically Endangered (DNER 2004), the species is presumed to be extinct due to the failure to find or heard any single individual in exhausting searches performed by scientists' since 1981 (Joglar 1998).

Threats:

Because the whole area is under private's owners, it can be subject to degradation or destruction for urban development.

Conservation Recommendations:

All currently known habitats are privately owned and habitat protection through purchase, donation, lease, or easement should be the highest priority action. Additional surveys are urgently needed in order to determine the current status of the species (USFWS 1992).

References:

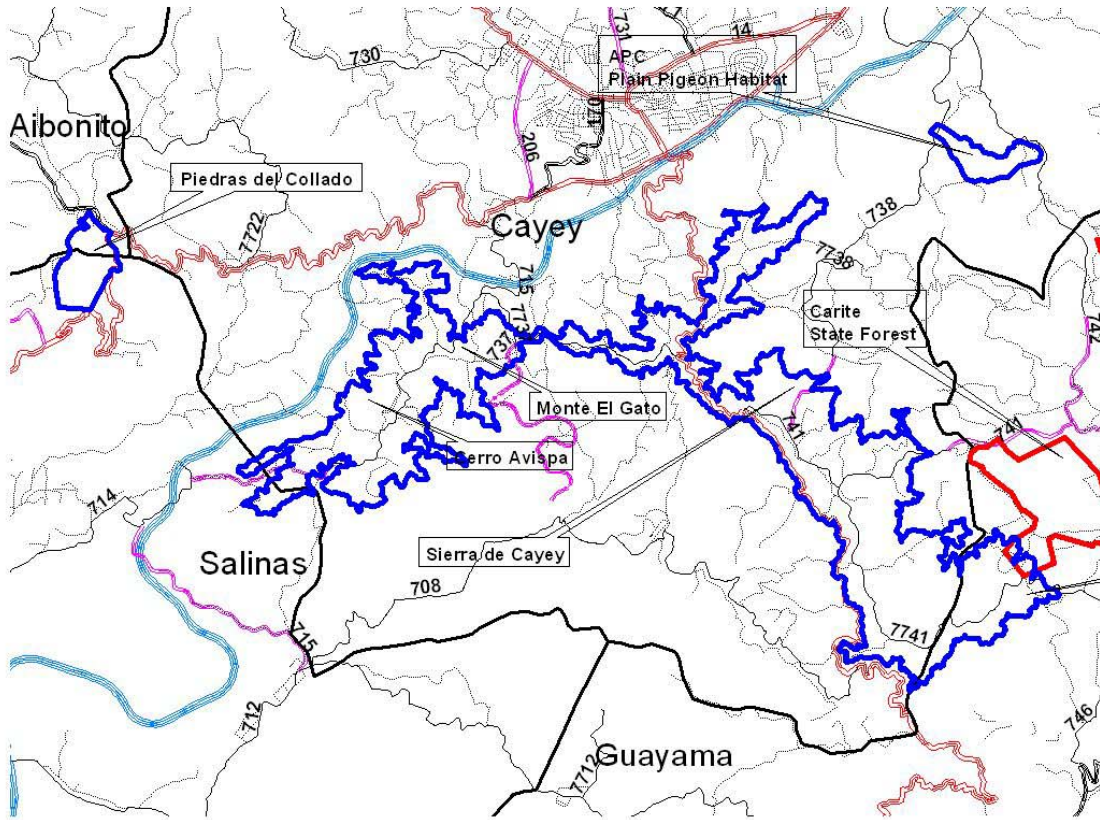
DNER. 2004. Reglamento para regir las especies vulnerables y en peligro de extinción en el Estado Libre Asociado de Puerto Rico. Reglamento 6766. 60 pp.

Municipio de Cayey. 2004. Historia de Cayey. www.ortizal.com/cayey.htm

Joglar, R. L. 1998. Los Coquíes de Puerto Rico, Su Historia Natural y Conservación. Editorial de la Universidad de Puerto Rico. 232 pp.

USFWS. 1992. Species Account Golden coqui *Eleutherodactylus jasperii*. [endangered.fws.gov/i/d/sad\)e.html](http://endangered.fws.gov/i/d/sad)e.html)

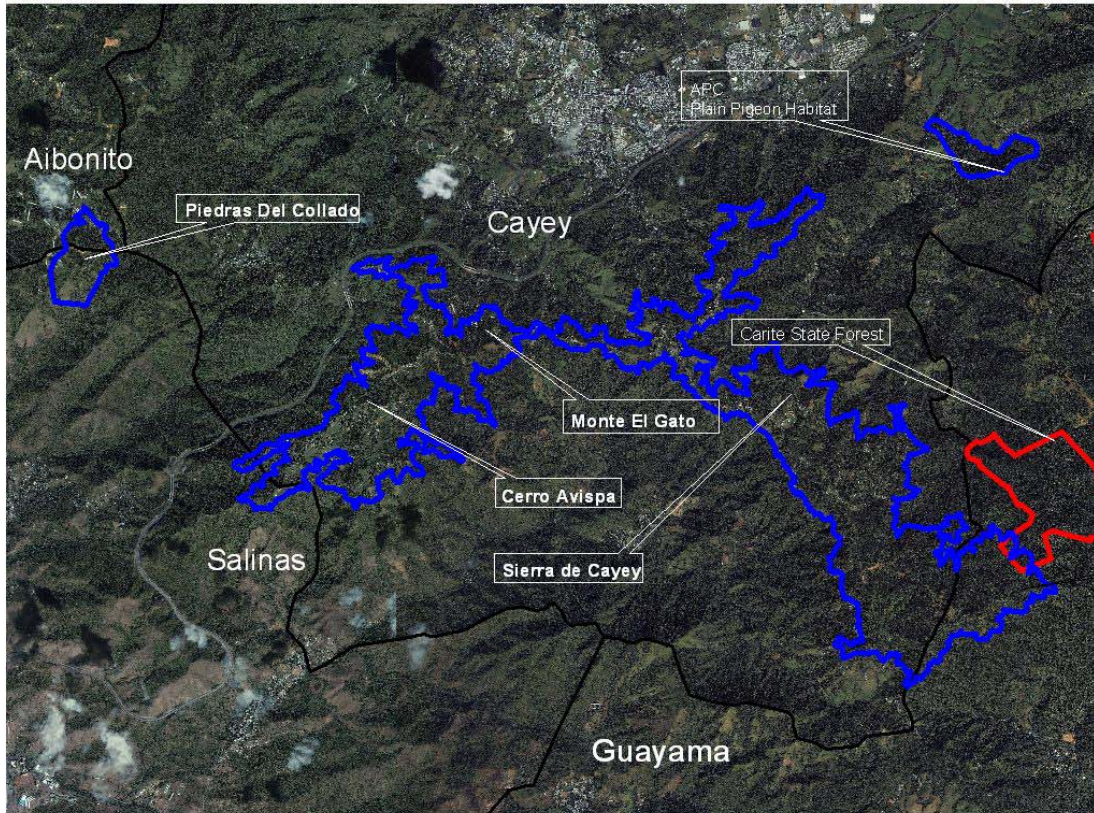
Cerro El Gato and Associated Areas



- Areas con prioridad de conservacion.shp
- Bosques_y_reservas.shp
- Municipios.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine



Cerro El Gato and Associated Areas



-  Areas con prioridad de conservacion.shp
-  Bosques_y_reservas.shp
-  Municips.shp

39- Cidra Lake, Cidra, Puerto Rico

Area Description:

In the northeast of Cidra lays Lago de Cidra, a man-made reservoir approximately 1.8 miles long with numerous fingers extending up the canyons. The ravines draining into the lake contain dense stands of hardwoods, palm, and Bamboo trees *Bambusa vulgaris* (USFWS 1990). The construction of this reservoir was finished in 1946. The surface has numerous fingerlike openings to the sides, resembling galleries. The water came through the Bayamón River and the Sabana River (Quevedo and Beltrán 2000).

Ownership/Protection:

Cidra Lake is administrated by the Puerto Rico Water Supply and Sewer Authority as part of the drinking water supply system of for the metropolitan area of San Juan (Quevedo and Beltrán 2000).

Special Recognition:

Raffaele and Duffield (1979) recognized the Cidra Lake as a CWA because the endangered Puerto Rican Plain pigeon was know to survive in the vicinity of this lake. Today, although the area has suffered some degradation, it continues to be used by the Plain pigeon, and we recognized as a prime wildlife area.

Wildlife

Puerto Rican Plain pigeon *Patagioenas inornata wetmorei* uses for nesting bamboo groves in these ravines and along the lake. Nests are also built in the hardwood canyons, usually in the Pomarrosa tree *Syzygium jambos* (Banks et al. 2003; USFWS 1990; Rivera-Milán et al. 2003); but the species uses also the Mango tree *Mangifera indica*, Bamboo tree, Tamarind tree *Tamarindus indica* and Almond tree *Terminalia catappa* among others (Rivera-Milán et al 2003). In general, the Puerto Rican plain pigeon use the immediacy of the lake as a place to rest, sleep and as a nesting site (Quevedo and Beltrán 2000).

Fish

Cidra Lake is the lake with the highest fishing activities in Puerto Rico. Sixteen fish species have been reported in this lake: Large mouth bass (Lobina) *Micropterus salmoides*, Peacock cichlid (Tucunare) *Cichla ocellaris*, Freshwater sardines *Dorosoma petenense*, Blue gill (Chopa criolla) *Lepomis macrochirus*, Chopa caracolera *L. auritus*, Redbreast sunfish (Chopa pecho colorado) *L. auritus*, Pez gato ó Barbudo (various species): *Ictalurus punctatus*, *I. catus*, *I. marmoratus*, *I. melas*, Tilapias (several species): *T. aurea*, *T. mossambica*, *T. rendalis*, *T. nilotica* and the Oscar *Astronotus ocellatus*, which is a new record for the lake, an exotic predator (Iris Corujo, DNER Fisheries biologist pers. comm.).

Threats:

The U.S. Environmental Protection Agency (EPA) announced the listing of the Cidra Ground Water Contamination site in Cidra, Puerto Rico, on the National Priorities List (NPL) of the most contaminated hazardous waste sites, making it eligible for federal cleanup dollars. The Agency's focus at Cidra is the Pre-Robles Volcanic Rock aquifer under the municipality that provides the source of municipal drinking water. The Puerto Rico Department of Health closed four public supply wells due to contamination in the late 1990s and 2000. Samples from the

closed wells indicate the presence of several volatile organic compounds, primarily tetrachloroethylene, trichloroethylene and 1, 1-dichloroethylene (EPA Federal Register 2004).

There are 15 active public supply wells within four miles of the site, which provide drinking water to almost 9,000 people. The active public supply wells are routinely monitored, and the monitoring has shown that the Cidra site is not currently impacting these wells. EPA will be performing a study to determine the nature and extent of contamination at the Cidra site. Ground water flows toward and discharges to Cidra Lake. (EPA Federal Register 2004).

Recently, the Cidra municipality, change the zoning near the lake to a manufacturing zone, this has been detrimental, because organic material is now dumped into the lake waters. Although, there is pollution recorded in the Cidra Lake, is still the lake with the highest fishing activities in the Island of Puerto Rico; there is evidence that the species maintain high quality value and no harm for people have been reported (Iris Corujo pers. comm.).

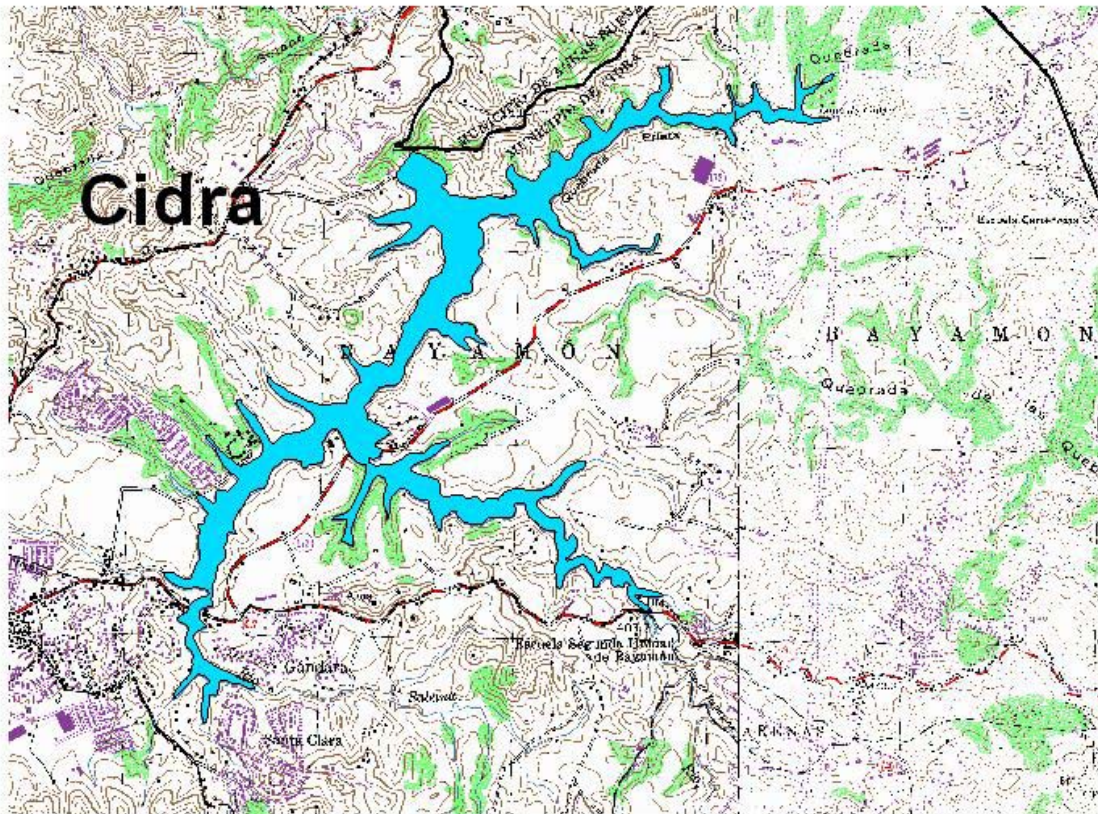
Conservation Recommendations:

The stands of secondary forest and the bamboo clumps that grow in pockets near the margin of the lake should be protected against contaminant and possible cutting. The DNER should acquire the property near the lake that is called Treasure Island to construct facilities such as bathrooms, parking lots and a boat ramp for the use of the people that uses the lake (Iris Corujo pers. comm.).

References:

- Banks, R. C.; Cicero, C.; Dunn, J. L. Kratter, A. W.; Rasmussen, P. C.; Remsen, J. V.; Rising J. D. and D. F. Stotz. 2003. Forty Four Supplement to the American Ornithologists' Union Check-List of North American Birds. *The Auk* 120(3): 923-931.
- EPA. 2004. NPL Site Narrative for Cidra Ground Water Contamination. Federal Register Notice: July 22, 2004. www.epa.gov/superfund/sites/npl/nar1712.htm
- Quevedo Bonilla, V. and Beltrán Burgos. 2000. Delimitación del hábitat de la Paloma sabanera *Columba inornata wetmorei* dentro de los municipios de Cidra, Comerío y Caguas, Puerto Rico. Departamento de Recursos Naturales y Ambientales. Área de Planificación Integral. División de Patrimonio Natural. San Juan, Puerto Rico. 73 pp.
- Rivera-Milán, F. F.; C.A. Ruíz; J. Cruz, and J. Sustache. 2003. Reproduction of Plain pigeons (*Columba inornata wetmorei*) in east-central Puerto Rico. *The Auk* 120 (2): 446-480.
- USFWS. 1990. Endangered and Threatened Species of the Southeastern United States (The Red Book) FWS Region 4 -As of 11/90. Endangered.fws.gov/i/b/sab40.htm

Cidra Lake

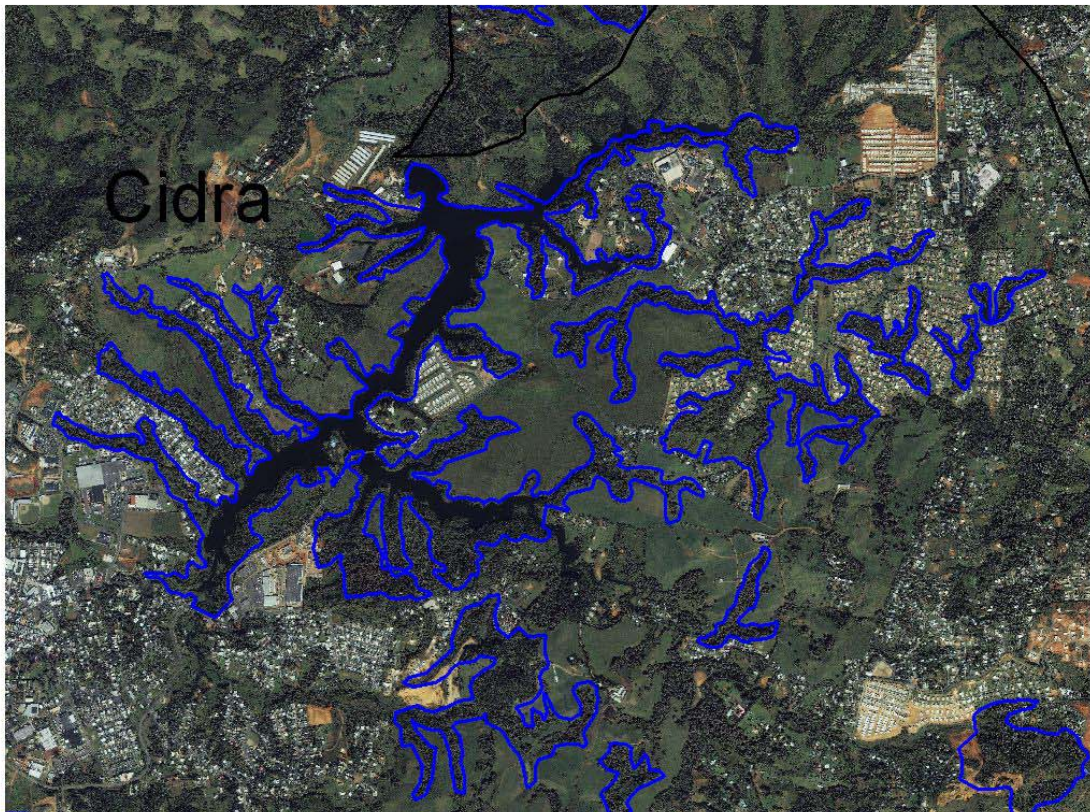


1 0 1 2 Kilometers



- Lagos_lagunas.shp
LAGOS
LAGUNAS
Municipios.shp

Cidra Lake



-  Areas con prioridad de conservacion.shp
-  Municipios.shp

40- Aguirre State Forest, Punta Pozuelo, Cayos Caribe, Cayos La Barca and Mar Negro; Guayama and Salinas, Puerto Rico

Area Description:

Aguirre State Forest is located in the south coastal valley of Puerto Rico, near Jobos Bay, between the municipalities of Guayama, and Salinas, in the subtropical dry forest life zone (Ewel and Whitmore 1973). This forest has a land cover of 968 ha and it is divided in four main segments (Silander et al 1986).

Punta Pozuelo is part of Aguirre State Forest and it's the closest point to Cayo Caribe. Punta Pozuelo borders part of the southern portion of Jobos Bay, which is one of the prime areas supporting breeding population of the West Indian Manatee *Trichechus manatus* (Cardona and Rivera 1988).

Cayos Caribe is a chain of seventeen tears shaped islets, 1.8 km long. They are about 2 km southeast of Mar Negro and adjacent to Punta Pozuelo. Scour channels reaching depths up to six meters separate these islets. Cayos Caribe and Cayos La Barca has interactions between seagrass beds, mangroves and coral reef. Most of these islets are covered by mangrove, although some contain small areas of evergreen littoral woodland and/ or secondary vegetation. All four species of mangrove occur on these islands (DNR and NOAA 1983).

Some of the islets of Cayos Caribe and Cayos La Barca can be classified as "over-wash mangrove islands". A principal feature of these islets is that they are subject to the daily influence of the tides. The wave regime regulates to some extent the structural development of the vegetation, especially mangroves. Observed differences in leaf areas, biomass and productivity of the mangroves on these islands are probably due to variations in the degree of wave exposure, salinity and nutrient concentrations. Other islets within the Cayos Caribe chain contain hypersaline lagoons. These lagoons represent an advanced stage in a series of succession events brought about by changes in topography and salinity of the soil. As soil salinities inside the islands increase due to restricted water circulation and high evaporation, death of *Rhizophora* leads to colonization by *Avicennia*. As salinities continue to increase, the growth of black mangrove becomes stunted and the island assumes an "annular" appearance with a ring of red mangroves around the inner core of stunted *Avicennia* (Cintrón et al 1978; DNR and NOAA 1983). Eventually, conditions become so restrictive that no trees can grow in the core and a depression and lagoon are formed. The larger cays have dry forest species in their interior (J. Salguero, Jobos Bay National Estuarine Research Reserve Manager pers. comm.).

There is also in the area a shallow lagoon (Pozuelo Lagoon) with an area of 14 ha, 0.67 km in length and 0.3 km wide (Negrón 1982; Negrón González 1986). This lagoon is surrounded by mangrove.

Mar Negro area is located at the western end of Jobos Bay; it is included as an integral part of Jobos Bay National Estuarine Research Reserve (JBNERR) (DRNA 1998). The JBNERR covers an area of 1,133 ha., but this has increased recently (J. Salguero pers. comm.). The Mar Negro unit forms the bulk property of the sanctuary. Salt flats and sea grasses are the major components (J. Salguero pers. comm.). It has an area of 405 ha of which nearly 55% is mangrove forest and associated vegetation, lagoons and channels. Fringe and basin mangrove forests characterize the area of Mar Negro.

Three lagoons also characterize the Mar Negro unit: Mar Negro, Zauta and Chica. Mar Negro Lagoon lays close to the westerly limits of the sanctuary, adjacent to the community of Las Mareas. It has an area of 280 ha and maximum depths of around three meters. It serves as anchorage for local fishing boats. This lagoon receives raw sewage discharges from Las Mareas (DNR and NOAA 1983).

Zauta Lagoon is smaller than Mar Negro, but reaches depths up to eight meters. Wildlife is more abundant in this lagoon because of its lower level of human disturbances. Chica Lagoon is a very inaccessible area, almost in the middle of Mar Negro. It is a shallow lagoon with an area nearly one square kilometer. No studies have been conducted in this lagoon (DNR and NOAA 1983).

Ownership/Protection:

Aguirre State Forest, Punta Pozuelo, Cayos Caribe and Mar Negro are public lands managed by the DNER.

Special Recognition:

The area was declared a Forest in 1918 (Silander et al 1986). The others units are part of the JBNERR. The JBNERR was designated in September 1981 by agreement between the DNER and the National Oceanic and Atmospheric Administration. Designation established Jobos Bay as the eleventh site in the National Estuarine Research System. In 2004, BirdLife International and SOPI recognized Aguirre State Forest and JBNERR as an Important Bird Area.

This CWA is a very important habitat for shorebirds and endangered species. Wunderle et al. (1989) observed a total of 22,574 shorebirds of 22 species in JBNERR. The Brown pelican, the Puerto Rican Plain pigeon, the Snowy plover and the Yellow-shouldered blackbird are endangered species found in the JBNERR. Other endangered species encountered in the Reserve are the Hawksbill, Green and Leatherback sea turtles, the Puerto Rican Boa, Cook's anole and the West Indian manatee (Robles et al. 2002; J. Salguero pers. comm). This area still classified as a primary for wildlife.

Wildlife:

Birds

One hundred and eighty four birds species have been reported in the Aguirre Forest: Brown pelican *Pelecanus occidentalis*, Brown booby *Sula leucogaster*, Frigatebird *Fregata magnificens*, Great blue heron *Ardea herodias*, Great egret *A. alba*, Green heron *Butorides virescens*, Little blue heron *Egretta caerulea*, Tricolored heron *E. tricolor*, Cattle egret *Bubulcus ibis*, Snowy egret *Egretta thula*, Yellow-crowned night heron *Nyctanassa violacea*, Black-crowned night heron *Nycticorax nycticorax*, Glossy ibis *Plegadis falcinellus*, Flamenco *Phoenicopterus ruber*, White-checked pintail *Anas bahamensis*, Blue-winged teal *A. discors*, Osprey *Pandion haliaetus*, Peregrine falcon *Falco peregrinus*, American kestrel *F. sparverius*, Red-tailed hawk *Buteo jamaicensis*, Turkey vulture *Cathartes aura*, Clapper rail *Rallus longirostris*, Common moorhen *Gallinula chloropus*, Sora rail *Porzana carolina*, Semipalmated plover *Charadrius semipalmatus*, Snowy plover *C. alexandrinus*, Wilson's plover *C. wilsonia*, Killdeer *C. vociferous*, Semipalmated plover *C. semipalmatus*, Common snipe *Gallinago gallinago*, American oyster catcher *Haematopus palliatus*, Black bellied plover *Pluvialis squatarola*, Ruddy turnstone *Arenaria interpres*, Whimbrel *Numenius phaeopus*, Black skimmer *Rynchops niger*, Spotted sandpiper *Actitis macularia*, Greater yellowlegs *Tringa melanoleuca*, Lesser yellowlegs *T. flavipes*, Willet *Catoptrophorus semipalmatus*, Red knot *Calidris canutus*, Pectoral sandpiper *C. melanotos*, Least sandpiper *C. minutilla*, Semipalmated sandpiper *C. pusilla*, Stilt sandpiper *C. himantopus*, Western sandpiper *C. mauri*, Black-necked stilt *Himantopus mexicanus*, Short-billed dowitcher *Limnodromus griseus*, Herring gull *Larus argentatus*, Laughing gull *L. atricilla*, Common tern *Sterna hirundo*, Least tern *S. antillarum*, Royal tern *S. maxima*, Sandwich tern *S. sandvicensis*, Brown noddy *Anous stolidus*, White-

crowned pigeon *Patagioenas leucocephala*, Scaly-napped pigeon *P. squamosa*, Puerto Rican plain pigeon *P. inornata*, Common dove *Columba livia*, Zenaida dove *Zenaida aurita*, White winged dove *Z. asiatica*, Mourning dove *Z. macroura*, Common ground dove *Columbina passerina*, Hispaniola parrot *Amazona ventralis*, Red-crowned parrot *A. viridigenalis*, Budgerigar *Melopsittacus undulates*, Monk parakeet *Myiopsitta monachus*, Mangrove cuckoo *Coccyzus minor*, Yellow billed cuckoo *C. americanus*, Smooth-billed ani *Crotophaga ani*, Puerto Rican screech owl *Megascops nudipes*, Short-eared owl *Asio flammeus*, Antillean nighthawk *Chordeiles gundlachi*, Common nighthawk *C. minor*, Puerto Rican emerald *Chlorostilbon maugaeus*, Green mango *Anthracothorax viridis*, Antillean black swift *Cypseloides niger*, Green throated carib *Eulampis holosericeus*, Belted kingfisher *Ceryle alcyon*, Puerto Rican woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Puerto Rican lesser Antillean pewee *Contopus portoricensis*, Caribbean elaenia *Elaenia martinica*, Barn swallow *Hirundo rustica*, Cave swallow *Petrochelidon fulva*, Caribbean martin *Progne dominicensis*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Black-whiskered vireo *Vireo altiloquus*, Bananaquit *Coereba flaveola*, Black and white warbler *Mniotilta varia*, Northern parula *Parula americana*, Yellow warbler *Dendroica petechia*, Blackpoll warbler *D. striata*, Prairie warbler *D. discolor*, Orange-cheeked waxbill *Estrilda melpoda*, Red bishop *Euplectes franciscanus*, Ovenbird *Seiurus aurocapilla*, Northern waterthrush *S. noveboracensis*, Common yellowthroat *Geothlypis trichas*, American redstart *Setophaga ruticilla*, Yellow shouldered blackbird *Agelaius xanthomus*, Shiny cowbird *Molothrus bonariensis*, Greater Antillean grackle *Quiscalus niger*, Puerto Rican flycatcher *Myiarchus antillarum*, Black-faced grassquit *Tiaris bicolor*, Yellow-faced grassquit *T. olivacea*, White-rumped sandpiper *Calidris fuscicollis*, Sanderling *C. alba*, Marbled godwit *Limosa fedoa*, Ruff *Philomachus pugnax*, Wilson's phalarope *Phalaropus tricolor*, Roseate tern *Sterna dougallii*, Orange-winged parrot *Amazona amazonica*, Antillean crested hummingbird *Orthorhyncus cristatus*, Adelaide's warbler *Dendroica adelaidae*, Pin-tailed whydah *Vidua macroura*, Bronze mannikin *Lonchura cucullata* (Silander et al. 1986; DRNA 2000; Robles et al. 2002; Camacho et al. 2004; J. Salguero pers. comm); American Black duck *Anas rubripes*, Ruddy duck *Oxyura jamaicensis*, Least grebe *Tachybaptus dominicus*, Pied-billed grebe *Podilymbus podiceps*, Audubon's shearwater *Puffinus iherminerie*, Greater shearwater *P. gravis*, Green-backed heron *Butorides virescens*, Reddish egret *Egretta rufescens*, White ibis *Eudocimus albus*, Clapper rail *Rallus longirostris*, American Coot *Fulica americana*, Caribbean Coot *F. caribaea*, Merlin *Falco columbarius*, Killdeer *Charadrius vociferus*, American Golden plover *Pluvialis dominicus*, Black-bellied plover *P. squatarola*, Ruddy turnstone *Arenaria interpres*, Sanderling *Calidris alba*, Stilt sandpiper *C. himantopus*, Western Sandpiper *C. mauri*, Pectoral sandpiper *C. melanotos*, Least sandpiper *C. minutilla*, Long-billed dowitcher *Limnodromus scolopaceus*, Solitary sandpiper *Tringa solitaria*, Black tern *Chlidonias niger*, Least tern *Sterna antillarum*, Sooty tern *S. fuscata*, Caspian tern *S. caspia*, Gull-billed tern *S. nilotica*, Common ground dove *Columbina passerina*, Ringed turtle-dove *Streptopelia risoria*, Canary-winged parakeet *Brotogeris versicolurus*, Antillean Mango *Anthracothorax dominicus*, Puerto Rican Tody *Todus mexicanus*, Northern rough winged swallow *Stelgidopteryx dominicensis*, Red-legged thrush *Turdus plumbeus*, Puerto Rican Vireo *Vireo latimeri*, Yellow-rumped warbler *Dendroica coronata*, Cape may warbler *D. tigrina*, Palm warbler *D. palmarum*, Mourning warbler *Oporornis philadelphia*, Prothonotary warbler *Protonotaria citrea*, Northern Waterthrush *Seiurus motacilla*, Blue-winged warbler *Vermivora pinus*, Hooded warbler *Wilsonia citrine*, Scarlet tanager *Piranga olivacea*, Puerto Rican Spindalis *Spindalis portoricensis*, Grasshopper sparrow *Ammodramus savannarum*, Blue grosbeak *Passerina caerulea*, Blue bunting *P. cyanea*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Greater

Antillean Oriole *Icterus dominicensis*, Troupial *I. icterus*, House sparrow *Passer domesticus*, Indian Silverbill *Lonchura malabarica*, Nutmeg mannikin *L. punctulata* (SOPI 2005).

Reptiles

Green iguana *Iguana iguana*, Crested anole *Anolis cristatellus*, Common grass anole *A. pulchellus*, Barred anole *A. stratulus*, Dryland grass anole *A. poncensis*, Cook's anole *A. cooki*, Puerto Rican ground lizard *Ameiva exsul*, Townsend's dwarf gecko *Sphaerodactylus townsendi*, Common dwarf gecko *S. macrolepis*, Nichol's dwarf gecko *S. nicholsi*, Brook's house gecko *Hemidactylus brookii*, Greater Antillean leaf-toed gecko *Phyllodactylus wirshingi*, Leatherback turtle *Dermochelys coriacea*, Green turtle *Chelonia mydas*, Hawksbill turtle *Eretmochelys imbricata* (Silander et al., 1986; DRNA, 2000; Robles et al., 2002; J. Salguero pers. comm).

Amphibians

Giant toad *Bufo marinus*, White-lipped frog *Leptodactylus albilabris*, Common coqui *Eleutherodactylus coqui*, Tree frog *E. antillensis* (Silander et al. 1986; Robles et al. 2002).

Mammals

West Indian manatee *Trichechus manatus*, Jamaican fruit-eating bat *Artibeus jamaicensis*, Velvety free-tailed bat *Molossus molossus*, Greater bulldog bat *Noctilio leporinus*, Mongoose *Herpestes javanicus*, House mouse *Mus musculus*, Black rat *Rattus norvegicus* (Robles et al. 2002). Feral cats *Felis catus* and dogs *Canis domesticus* are present in the JBNERR (J. Salguero pers. comm).

Fish Species Found in Jobos Bay

Nurse shark *Ginglymostoma cirratum*, Blacknose shark *Carcharchinus acronotus*, Reef shark *Carchachinus perezii*, Lemon shark *Negaprion brevirostris*, Atlantic sharpnose shark *Rhizoprionodon porosus*, Scalloped hammerhead *Sphyrna lewini*, Southern stingray *Dasyatis americana*, Spotted eagle ray *Aetobatus narinari*, Ladyfish *Elops saurus*, Tarpon *Megalops atlanticus*, Bonefish *Albula vulpens*, Spaghetti eel *Moringua edwardsi*, Chain moray *Echidna catenata*, Green moray *Gymnothorax funebris*, Spotted morey *Gymnothorax vicinus*, Goldentail moray *Muraena miliaris*, Keyworm eel *Ahlia egmontis*, Sharptail eel *Myrichthys acuminatus*, Goldspotted snake eel *Myrichthys oculatus*, Speckled worm eel *Myrophis punctatus*, False pilchard *Harengula clupeola*, Red ear sardine *Harengula humeralis*, Dwarf herring *Jenkinsia lamprotaenia*, Threadfin herring *Opisthonema oglinum*, Spanish sardine *Sardinella aurita*, Cuban anchovy *Anchoa cubana*, Striped anchovy *Anchoa hepsetus*, Dwarf herring *Jenkinsia lamprotaenia*, Small anchovy *Anchoa parva*, Whalebone *Cetengraulia edentulous*, Galliwasp *Synodus foetens*, Sand diver *Synodus intermedius*, Southern emerald clingfish *Arcos amplycirrhus*, Red clingfish *Arcios rubiginosus*, Sargassumfish *Histrio histrio*, Ogilbia sp., Pearlfish *Carapus bermudensis*, Balao *Hemiramphus balao*, Ballyhoo *Hemiramphus brasiliensis*, Halfbeak *Hyporhamphus unifasciolatus*, Redfin needlefish *Strongylura notata*, Timucu *Strongylura timou*, Agujon *Tylorosus acus*, Hound needlefish *Tylorosus crocodrylus*, Rivulus *Rivulus marmoratus*, One spot livebearer *Poecilia vivipara*, Hardhead silverside *Atherinomorus stipes*, Longjaw squirrelfish *Holocentrus ascensionis*, Longspine squirrelfish *Holocentrus marianus*, Squirrelfish *Holocentrus rufus*, Dusky squirrelfish *Holocentrus vexillarius*, Blackbar soldierfish *Myripristis jacobus*, Trumpetfish *Aulostomus maculates*, Crested pipefish *Cosmocampus brachycephalus*, Longsnout seahorse *Hippocampus reidi*, Pugnose pipefish *Syngnathus dunckeri*, Shortfin pipefish *Syngnathus elucens*, Sargassum pipefish *Syngnathus pelagicus*, Caribbean pipefish *Syngnathus rousseau*, Swordspine snook *Centropomus ensiferus*,

Tarpon snook *Centropomus pectinatus*, Snook *Centropomus undecimalis*, Rock hind *Epinephelus adscensionis*, Red hind *Epinephelus guttatus*, Jewfish *Epinephelus itajitara*, Nassau grouper *Epinephelus striatus*, Barred hamlet *Hypoplecturus puella*, Black grouper *Myopteroperca bonaci*, Tiger grouper *Mycteroperca tigris*, Lantern bass *Serranus baldwini*, Harlequin bass *Serranus tigrinus*, Greater soapfish *Rypticus saponaceus*, Spotted soapfish *Rypticus subbifrenatus*, Soapfish *Rypticus sp.*, Fairy basslet *Gramma loreto*, Bigeye *Priacanthus arenatus*, Glasseye snapper *Priacanthus cruentatus*, Flamefish *Apogon maculatus*, Sawcheek cardinalfish *Apogon quadrimatus*, Blackfin cardinalfish *Astrapogon puncticulatus*, Conchfish *Astrapogon stellatus*, Dusky cardenalfish *Phaetoptyx pigmentaria*, Sharksucker *Echeneis naucrates*, Remora *Remora remora*, Yellow jack *Caranx bartholomaei*, Blue runner *Caranx crysos*, Crevalle jack *Caranx hippos*, Horse eye jack *Caranx latus*, Bar jack *Caranx ruber*, Atlantic bumper *Chloroscombrus crysurus*, Roundscad *Decapterus punctatus*, Leatherjack *Oligoplitee saurus*, Atlantic moonfish *Selene setapinnis*, Lookdown *Selene vomer*, Pompano *Trachinotus carolinus*, Permit *Trachinotus falcatus*, Palometa *Trachinotus goodei*, Mutton snapper *Lutjanus analis*, Schoolmaster *Lutjanus apodus*, Cubera snapper *Lutjanus apodus*, Cubera snapper *Lutjanus cyanopterus*, Gray snapper *Lutjanus griseus*, Dog snapper *Lutjanus jocu*, Mahogany snapper *Lutjanus mahogany*, Lane snapper *Lutjanus synagris*, Yellow snapper *Ocyurus chrysurus*, Jackknife *Equetus lanceolatus*, Shorthead drum *Larimus breviceps*, Jewsharp drummer *Menticirrhus martinicus*, Whitemouth croaker *Micropogonis furnieri*, Reef croaker *Odontoscion dentex*, Snake croaker *Ophioscion adustus*, Small drum *Stellifer stellifer*, Yellowgoatfish *Mulloidichthys martinicus*, Spotted goatfish *Pseudopeneus maculatus*, Glassy sweeper *Pempheris schamburgki*, Yellow chub *Kyphosus incisor*, Bermuda chub *Kyphosus sectatrix*, Atlantic spadefish *Chaetodipterus faber*, Foureye butterflyfish *Chaetodon capistratus*, Queen angelfish *Holacanthus ciliaris*, Rock beauty *Holocanthus tricolor*, Gray angelfish *Pomacanthus arcuatus*, French angelfish *Pomacanthus paru*, Tilapia *Tilapia mossambica*, Sargent major *Abudefduf saxatilis*, Night sergeant *Abudefduf taurus*, Brown chromis *Chromis multiilineata*, Yellowtail damselfish *Chromis cyanea*, Longfin damselfish *Pomacentrus diencaeus*, Dusky damselfish *Pomacentrus dorsopunicane*, Beaugregory *Pomacentrus leucostictus*, Bicolor damselfish *Pomacentrus partitus*, Threespot damselfish *Pomacentrus planifrons*, Cocoa damselfish *Pomacentrus variabilis*, Redspot hawkfish *Amblycirrhitus pinos*, Spanish hogfish *Bodianus rufus*, Dwarf wrasse *Doratonotus megalepis*, Slippery dick *Halichoeres bivittatus*, Yellowhead wrasse *Halichoeres garnoti*, Clown wrasse *Halichoeres maculipinna*, Blackear wrasse *Halichoeres poeyi*, Puddingwife *Halichoeres radiatus*, Hogfish *Lachnolaimus maximus*, Bluehead wrasse *Thalossoma bifasciatum*, Blue parrotfish *Scarus coeruleus*, Mottlefin parrotfish *Scarus croicensis*, Rainbow parrotfish *Scarus guacamaia*, Princess parrotfish *Scarus taeniopterus*, Queen parrotfish *Scarus vetula*, Redband parrotfish *Sparisoma aurofrenatum*, Redtail parrotfish *Sparisoma chrysopterum*, Bucktooth parrotfish *Sparisoma radians*, Redfin parrotfish *Sparisoma rubripinne*, Spotlight parrotfish *Sparisoma viridae*, White mullet *Mugil curema*, Fantail mullet *Mugil trichodon*, Great barracuda *Sphyraena barracuda*, Guaguanche *Spyraena guachancho*, Southern sennet *Sphyraena picudilla*, Barbu *Polydactylus virginicus*, Mottled jawfish *Opistognathus maxillosus*, Sand stargazer *Dactyloscopus tridigittatus*, Roughead blenny *Acanthemblemaria aspera*, Spinny head blenny *Acanthemblemaria spinosa*, Twinhorn blenny *Coralliozetus cardonae*, Roughhead triplefin *Enneanectes boehlkei*, Puffcheek blenny *Labrisomus bucciferus*, Palehead blenny *Labrisomus gobio*, Mimic blenny *Labrisomus guppyi*, Longfin blenny *Labrisomus haitiensis*, Spotcheek blenny *Labrisomus nigricinctus*, Hairy blenny *Labrisomus nuchipinnis*, Goldline blenny *Malacoctenus aurolineatus*, Brazilian blenny *Malacoctenus delalandi*, Imitator blenny *Malacoctenus erdmani*, Dusky blenny *Malacoctenus gilli*, Rosy blenny *Malacoctenus*

macropus, Saddled blenny *Malacoctenus triangulatus*, Coral blenny *Paraclinus cingulatus*, Banded blenny *Paraclinus fasciatus*, Blackfin blenny *Paraclinus nigripinnis*, Eelgrass blenny *Stathmonotus stahli*, Pearl blenny *Hypleurochilus aequipinnis*, Orange spotted blenny *Hypleurochilus springeri*, Redlip blenny *Ophioblennius atlanticus*, Emerald sleeper *Erotelis smaragdus*, Notchtongue goby *Bathygobius curacao*, Island frillfin goby *Bathygobius mysbacium*, Frillfin goby *Bathygobius soporator*, Colon goby *Coryphopterus diorus*, Bridled goby *Coryphopterus glucofraenum*, Ninelined goby *Ginsburgellus novemlineatus* (Cardona 1984; DRNA 2000; Robles et al. 2002).

Threats:

The impact of industrial growth and the urban development on groundwater levels is a serious concern in the Jobos Bay watershed. More than 500 housing units have been constructed in the last four years, increasing the volume of groundwater extraction. New projects, like the golf course, hotel and its Villas Complex, and the AES coal energy-generating plant, also require vast amount of fresh water for their operations. The Salinas Municipal landfill, managed by BFI, is under expansion. Lixiviates from this landfill may be reaching the aquifer and the bay. The Aguirre Power Plant has also undergone considerable expansion. Other mayor industries like Chevron-Phillip Core, Ayers-Whyeth, IPR Pharmaceuticals, Baxter Caribe, Inc., Colgate-Palmolive and ProChem continue their operations while the long-term effects of effluents and emissions on human and natural resources are still unknown. Some others threats are the following: illegal hunting, fishing and crab collection, recreational watercraft, illegal filling and construction on coastal zone, and intentional fires (J. Salguero pers. comm.).

Conservation Recommendations:

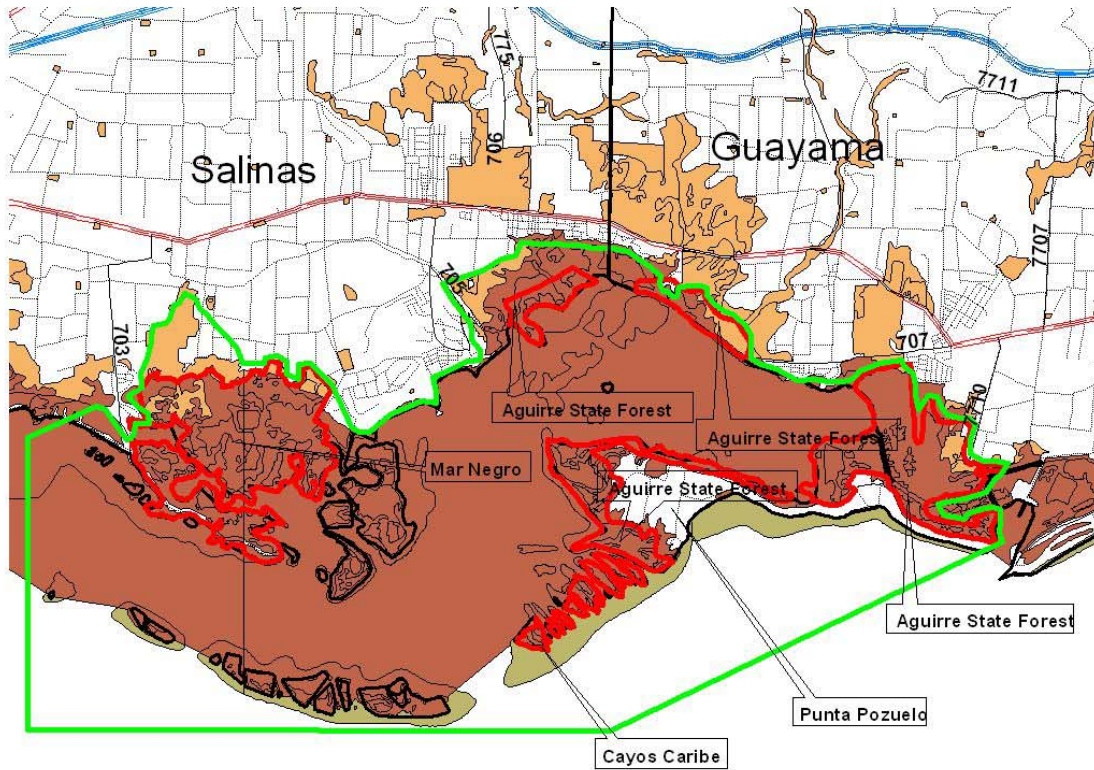
To determine possible sources of pollution in the different ecosystems, a monitoring program to detect organic compounds was done in JBNERR (J. Salguero pers. comm.). Also, it is important to develop a monitoring program for metals and assess the effects of these compounds on the flora, fauna and water resources of Jobos watershed. For more details of conservation recommendations, see Robles et al., 2002.

References:

- Berrios, J.; Canals, M.; Ferrer, H; García, A.; González, J.; Molinares, A.; Nieves, L. O. Pérez, R. A.; Rivera, M.; Silander, S. y J. Villamil. 1981. Suplemento Técnico para el Plan de Manejo del Área de Bahía de Jobos. DRN. Tomo I y Tomo II. J. Villamil y M. Canals (editores). División de Asesoramiento Técnico, Área de Investigaciones Científicas. Departamento de Recursos Naturales. San Juan, Puerto Rico.
- Camacho, M., M. López and J. Chabert. 1997. Final Report Project W-19 "Exotic Established Species in the Wildlife". Puerto Rico Department of Natural & Environmental Resources, Terrestrial Resources Division. San Juan, P.R. 00906. 52 pp.
- Cardona, M. 1984. Reserva Natural de Mar Negro y Bahía de Jobos. Departamento de Recursos Naturales. Planificación de Recursos Costaneros. División de Zona Costanera.
- Department of Natural Resources Commonwealth of Puerto Rico and U. S. Department of Commerce National Oceanic and Atmospheric Administration Office of Ocean and

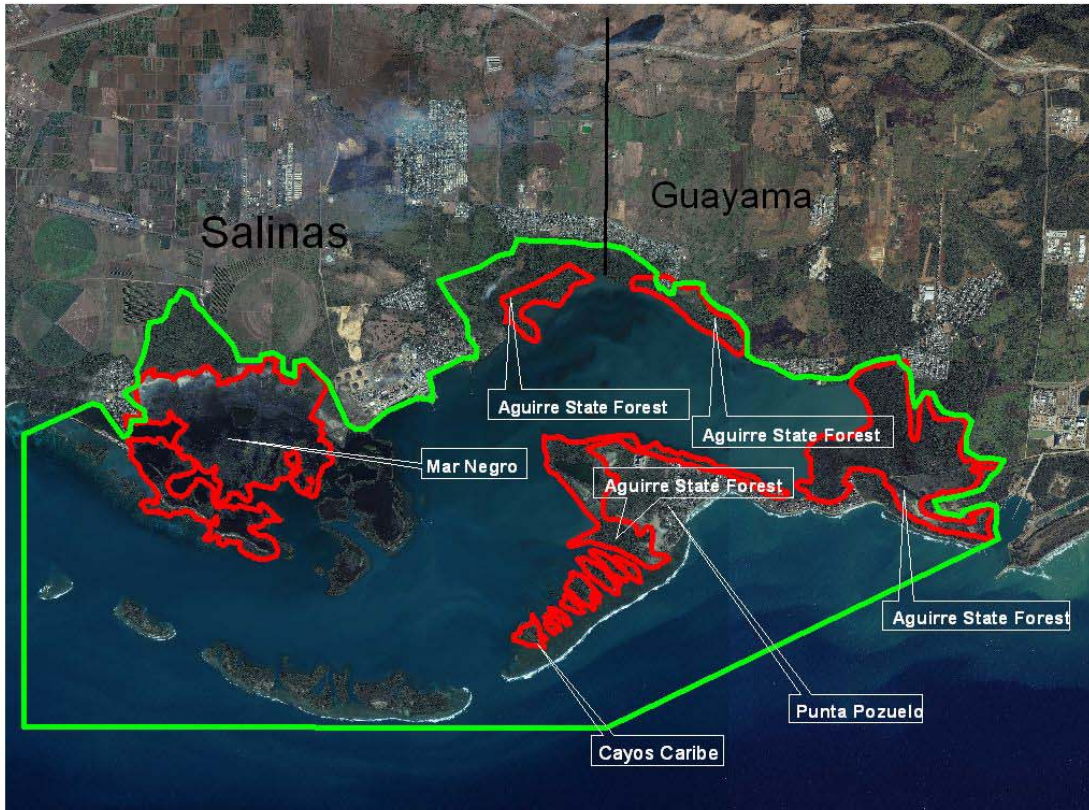
- Coastal Resource Management. 1983. Jobs Bay National Estuarine Sanctuary, Management Plan. 87 pp.
- Departamento de Recursos Naturales y Ambientales. 1998. Plan de Manejo Área de Planificación Especial Bahía de Jobs. Programa de Manejo de la Zona Costanera.
- _____. 2000. Plan de Manejo para la Reserva Nacional de Investigación Estuarina de Bahía de Jobs (JBNERR). Programa de Manejo de la Zona Costanera. En conjunto con Junta de Planificación (JP), Oficina del Gobernador y Administración Nacional Oceánica y Atmosférica (NOAA), Departamento de Comercio de EU. 253 pp.
- Díaz, C.; del Llano, M.; Canals, M.; Cintrón, B. y J. Toro. 1983. Suplemento Técnico para el Plan de Manejo de la Reserva Natural de Bahía de Jobs. Departamento de Recursos Naturales.
- Ewel, J.J., and J.L. Whitmore. 1973. The ecological life zones of Puerto Rico and the U.S. Virgin Islands. U.S. Dept. Agric. For. Serc. Res. Pub. ITF-18. Rio Piedras, P.R. 71 pp.
- Negrón, L.; Pérez, M; Cintrón, G. and M. Aponte. 1982. Lagunas Costeras de Puerto Rico. Departamento de Recursos Naturales. San Juan, Puerto Rico. 234 pp.
- Robles, P.O., C. M. González, E. N. Laboy and J. Capella. 2002. Jobs Bay Estuarine profile: A National Estuarine Research Reserve. Ralph Field Editor. Jobs Bay NERR, Aguirre, P.R. 107 pp.
- Sociedad Ornitológica de Puerto Rico Inc (SOPI). 2005. Atlas de aves de Puerto Rico, Reserva Natural Bahía de Jobs, Borrador. Data sin publicar.
- Wunderle, J.M., R. B. Waide and J. Fernández. 1989. Seasonal abundance of shorebirds in the Jobs Bay Estuary in southern Puerto Rico. *J. Field Ornithol.*, 60(3): 329-339.



Aguirre State Forest, Punta Pozuelo, Cayos Caribe and Mar Negro



- Aguirre state forest, punta pozuelo, cayos caribe, mar negro.shp
- Bosques_y_reservas.shp
- Municipios.shp
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas

Aguirre State Forest, Punta Pozuelo, Cayos Caribe and Mar Negro



-  Aguirre state forest, punta pozuelo, cayos caribe, mar negro.shp
-  Bosques_y_reservas.shp

41- Punta Arenas, Salinas, Puerto Rico

Area Description:

Located south east of Playa Salinas in the Salinas municipality, it contains a large shallow lagoon system and small mangrove islets (Cardona and Rivera 1988). The National Wetland Inventory has identified this area as a tidal wetland because it is composed by coastal lagoons and mangrove islets (DRNA 1998). The area comprehends dry forest, salt flats, coastal fringe vegetation and sea grasses (J. Salguero, JBNERR Manager pers. comm.). Although this area could be a potential nesting habitat for the endangered Yellow-shouldered blackbird *Agelaius xanthomus*, no evidence of this has been observed (R. López-Ortiz pers. comm.).

Ownership/Protection:

Private ownership.

Special Recognition:

This area is recognized as an important hunting ground for dove, pigeons and waterfowl species (D. Ramos pers. comm.). Punta Arenas is recognized as an important area for Brown pelicans; where up to 300 feed, rest and roost here (J. Salguero pers. comm.). Also is a major area for migrant shorebirds; more than 1,000 individuals may be found at one time (J. Salguero pers. comm.). The DNER include Punta Arenas as one of the Puerto Rico Waterfowl Focus Area (Ventosa et al. 2005). Because this area supports species of importance to hunting, and it is a center of abundance for an endangered species, Punta Arenas continues to be a primary wildlife area.

Wildlife:

Birds

Sixty bird species are reported in this CWA: Black-necked stilt *Himantopus mexicanus*, Tricolored heron *Egretta tricolor*, Yellow-crowned night heron *Nyctanassa violacea*, Cattle egret *Bubulcus ibis*, Brown pelican *Pelecanus occidentalis*, White cheeked pintail *Anas bahamensis*, Blue-winged teal *A. discors* (Cardona and Rivera 1988). Others birds reported are the Ruddy duck *A. clypeata*, Pied-billed grebe *Podilymbus podiceps*, Magnificent frigatebird *Fregata magnificens*, Great egret *Ardea alba*, Cattle egret *Bubulcus ibis*, Green heron *Butorides virescens*, Little blue heron *Egretta caerulea*, Snowy egret *E. thula*, Reddish egret *E. rufescens*, Clapper rail *Rallus longirostris*, Red-tailed hawk *Buteo jamaicensis*, Osprey *Pandion haliaetus*, American Kestrel *Falco sparverius*, Turkey vulture *Cathartes aura*, Semipalmated plover *Charadrius semipalmatus*, Killdeer *C. vociferous*, Wilson's plover *C. wilsonia*, Black-bellied plover *Pluvialis squatarola*, Black-necked stilt *Himantopus mexicanus*, Spotted sandpiper *Actitis macularia*, Ruddy turnstone *Arenaria interpres*, Stilt sandpiper *Calidris himantopus*, Western sandpiper *C. mauri*, Least sandpiper *C. minutilla*, Semipalmated sandpiper *C. pusilla*, Willet *Catoptrophorus semipalmatus*, Short-billed dowitcher *Limnodromus griseus*, Ruff *Philomachus pugnax*, Lesser yellowlegs *Tringa flavipes*, Greater yellowlegs *T. melanoleuca*, Royal tern *Sterna maxima*, Sandwich tern *S. sandvicensis*, Rock pigeon *Columba livia*, Common ground-dove *Columbina passerine*, White-winged dove *Zenaida asiatica*, Zenaida dove *Z. aurita*, Mourning dove *Z. macroura*, Mangrove cuckoo *Coccyzus minor*, Smooth-billed ani *Crotophaga ani*, Antillean Nighthawk *Chordeiles gundlachii*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Cave swallow *Petrochelidon fulva*, Pearly-eyed thrasher *Margarops fuscatus*, Northern Mockingbird *Mimus polyglottos*, Prairie warbler *Dendroica discolor*, Yellow warbler

D. petechia, Northern Waterthrush *Seiurus motacilla*, Bananaquit *Coereba flaveola*, Black-faced grassquit *Tiaris bicolor*, Shiny cowbird *Molothrus bonariensis*, Greater Antillean Grackle *Quiscalus niger*, Houser sparrow *Passer domesticus* (SOPI 2005).

Threats:

Human activities such as garbage dump, landfill, vehicle, motorcycle and horse riding impact the normal water flowing on this wetland. Also, deforestation and fire on the vegetation occurs in this area. Others threats are hunting and illegal harvesting of crabs (J. Salguero pers. comm.).

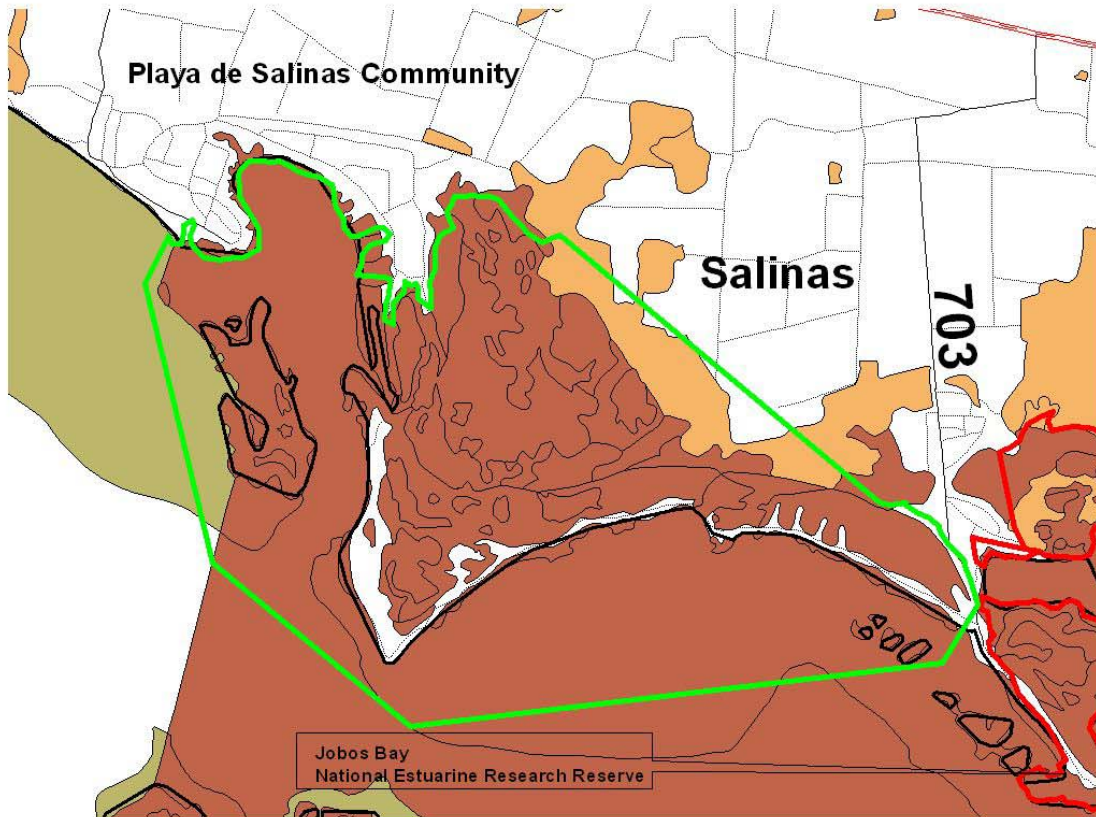
Conservation Recommendations:

To incorporate this wetland to the Jobos Bay National Estuarine Research Reserve.

References:

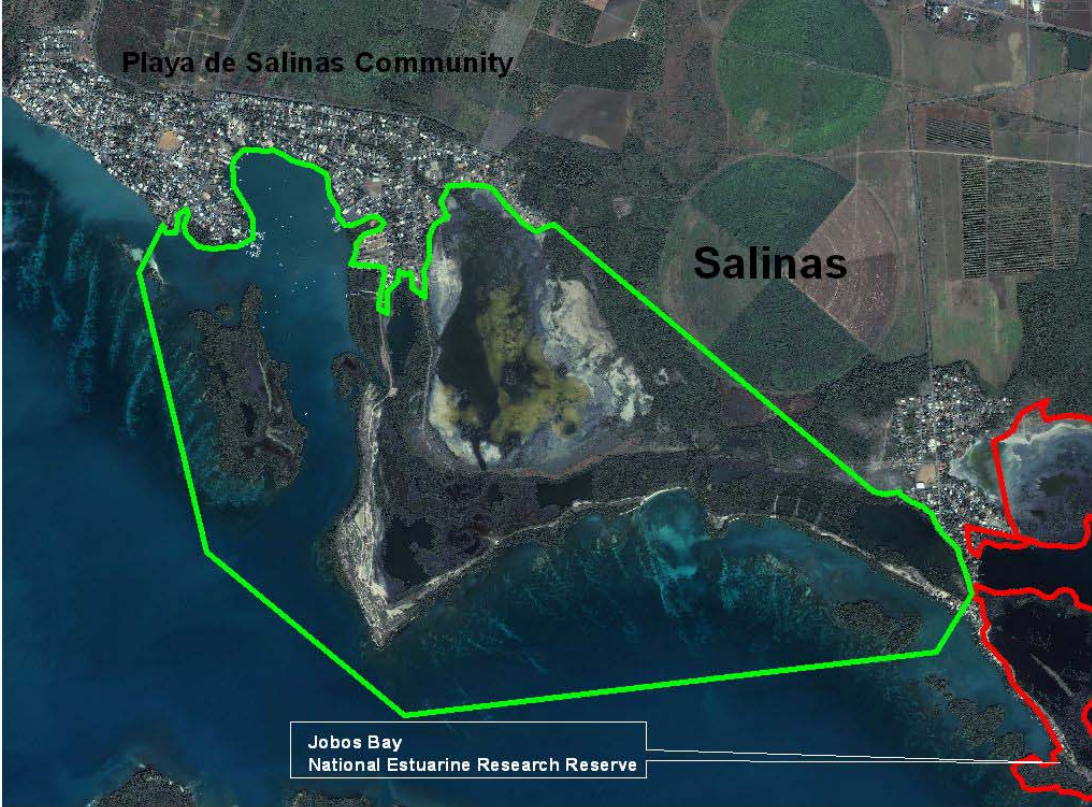
- Departamento de Recursos Naturales y Ambientales. 1998. Plan de Manejo Área de Planificación Especial Bahía de Jobos. Programa de Manejo de la Zona Costanera.
- Sociedad Ornitológica de Puerto Rico Inc (SOPI). 2005. Atlas de aves de Puerto Rico, Reserva Natural Bahía de Jobos, Borrador. Data sin publicar.
- Ventosa, Eduardo A.; M. Camacho, J.L. Chabert, J. Sustache and D. Dávila. 2005. Puerto Rico Waterfowl Focus Areas Puerto Rico Department of Natural and Environmental Resources; North American Waterfowl Management Plan and Atlantic Coast Joint Venture. 82 pp.



Punta Arenas



-  Punta arenas.shp
-  Bosques_y_reservas.shp
-  Municipios.shp
- Humedales avpu.shp**
 -  Estuarine
 -  Lacustrine
 -  Marine
 -  Palustrine
 -  Riverine
- Carreteras avpu.shp**
 -  autopistas
 -  primarias
 -  secundarias
 -  terciarias
 -  caminos
 -  propuestas

Punta Arenas



-  Punta arenas.shp
-  Bosques_y_reservas.shp

42- Salinas Training Area, Salinas, Puerto Rico

Area Description:

Camp Santiago Training Site is a military installation, which supports the different units of the Puerto Rico National Guard (PRNG) and other branches of the Armed Forces by providing training areas. Is a federally owned property, which occupies approximately 5,261 ha, including a 283 ha, cantonment area and a 544 ha impact area for weapons training ranges (PRNG 2000). Camp Santiago is the largest National Guard training site in the Caribbean and supports training for all Department of Defense military services.

Eight ecosystems are present within overall Camp Santiago area: 1-Semi-evergreen forest: dominated by native trees of 15 m height with a lower story of 6 to 9 m. It is distributed along some moist ravines subject to temporary flooding during rainy season 2-Cactus-thorn forest. Large cacti and small thorny trees dominate this ecosystem 3-Cactus thorn savanna; cacti and shrubby vegetation 4-Cliff rock outcrops; grasses and low shrubs, which are indicators of shallow soils and windy conditions 5-Deciduous woodlands; secondary forest vegetation, and small to medium trees with heavy vine coverage. 6-Grassland; grass associations like *Panicum maximum* and *Bothrioclova pertusa* 7-Garden urban forest; this ecosystem had a diverse composition due to the introduction of exotic and ornamental plants. 8-River-wetlands-aquatics; these areas have longer periods where the soil is saturated with water. The water regime in these areas is subject to rain events (PRNG 2000).

Ownership/Protection:

Camp Santiago is a federally owned property.

Special Recognition:

This training area was classified as an area of secondary importance to wildlife. It was included in the 1979 document mainly because the endangered Puerto Rican Plain pigeon and the rare Puerto Rican Short-eared owl were reported in Camp Santiago. At present, there's not enough recent data to confirm or deny this. Until more data are available, we still classified tentatively the Salinas Training area a CWA of secondary importance.

Wildlife:

Birds

Fifty three bird species are reported for Salinas Training area: Great blue heron *Ardea herodias*, Cattle egret *Bubulcus ibis*, Green heron *Butorides virescens*, Snowy egret *Egretta thula*, *Nyctanassa violacea*, Turkey vulture *Cathartes aura*, Red-tailed hawk *Buteo jamaicensis*, Merlin *Falco columbarius*, American kestrel *F. sparverius*, Peregrine falcon *F. peregrinus*, Helmeted meleagris *Numida meleagris*, Killdeer *Charadrius vociferus*, Rock pigeon *Columba livia*, Common ground dove *Columbina passerina*, Key west quail-dove *Geotrygon chrysis*, Zenaida dove *Zenaida aurita*, Mourning dove *Z. macroura*, White-winged dove *Z. asiatica*, Mangrove cuckoo *Coccyzus minor*, Smooth-billed ani *Crotophaga ani*, Short-eared owl *Asio flammeus*, Puerto Rican Screech owl *Megascops nudipes*, Antillean nighthawk *Chordeiles gundlachi*, Antillean Mango *Anthracothorax dominicus*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Puerto Rican Pewee *Contopus portoricensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Gray kingbird *Tyrannus dominicensis*, Cave swallow *Petrochelidon fulva*, Northern mockingbird *Mimus polyglottos*, Red-legged thrush *Turdus plumbeus*, Black-whiskered vireo *Vireo altiloquus*, Puerto Rican Vireo *V. latimeri*, Adelaide's warbler *Dendroica adelaidae*, Prairie warbler *D. discolor*,

Northern parula *Parula americana*, Bananaquit *Coereba flaveola*, Greater Antillean Oriole *Icterus dominicensis*, Troupial *I. icterus*, Shiny cowbird *Molothrus bonariensis*, Greater Antillean Grackle *Quiscalus niger*, Antillean Euphonia *Euphonia musica*, Puerto Rican Spindalis *Spindalis portoricensis*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Black-faced grassquit *Tiaris bicolor*, Yellow-faced grassquit *T. olivacea*, Black and white warbler *Mniotilta varia*, Grasshopper sparrow *Ammodramus savannarum*, House sparrow *Passer domesticus*, Bronze mannikin *Lonchura cucullata*, Nutmeg mannikin *L. punctulata* (PRNG 2000); Red crowned parrot *Amazona viridigenalis* (Camacho et al. 1999).

Reptiles

Cosmopolitan house gecko *Hemidactylus mabouia*, Common dwarf gecko *Sphaerodactylus macrolepis*, Puerto Rican ground lizard *Ameiva exsul*, Crested anole *Anolis cristatellus*, Barred anole *A. stratulus*, Common grass anole *A. pulchellus*, Puerto Rican Racer *Alsophis portoricensis* (PRNG 2000).

Amphibians

Giant toad *Bufo marinus*, Grass coqui *Eleutherodactylus brittoni*, Common coqui *E. coqui*, White-lipped frog *Leptodactylus albilabris* (PRNG 2000).

Mammals

Velvety free-tailed bat *Molossus molossus*, House mouse *Mus musculus*, Black rat *Rattus rattus*, Norway rat *R. norvegicus*, Small Indian mongoose *Herpestes javanicus*, Feral dog *Canes familiars*, Feral cat *Felis domesticus*, Horse *Equus caballus*, Bull *Bos taurus*, Goats *Capra hircus*, Sheep *Ovis aries* (PRNG 2000).

Critical Plants:

The U.S. Fish and Wildlife Service indicated that rare and endangered plant species are known to occur in the area of Las Piedras Chiquitas inside Camp Santiago. These species include the federally endangered *Solanum drymophilum* and the rare *Dicliptera krugii* (PRNG 2000).

Threats:

Pollution of lands by military materials and activities are a threat to this area. Also, sporadic fire occurs in these dry lands. In the past, discharge of treated wastewater into an intermittent stream known as Quebrada Honda occurs.

Conservation Recommendations:

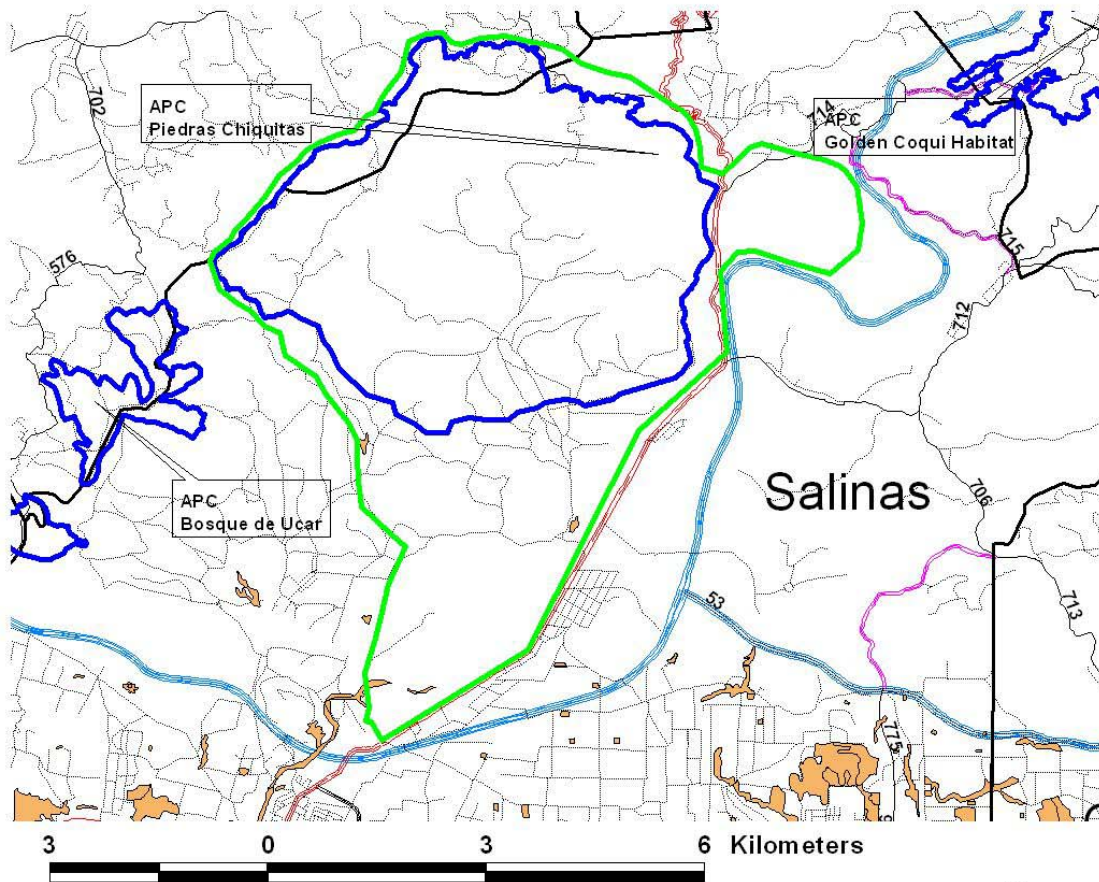
Some recommendations for this land are reforesting training areas, surveying and educating soldiers in environmental issues.

References:

Camacho-Rodríguez, M.; J. Chabert-Llompart and M. López-Flores. 1999. Guía para la Identificación de las Aves Exóticas Establecidas en Puerto Rico. DRNA. División de Recursos Terrestres. San Juan, Puerto Rico. 51 pp.

Puerto Rico Army National Guard. 2000. Environmental Assessment. Proposed sewer line. Camp Santiago Training Site. Salinas, Puerto Rico.

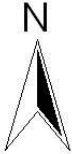
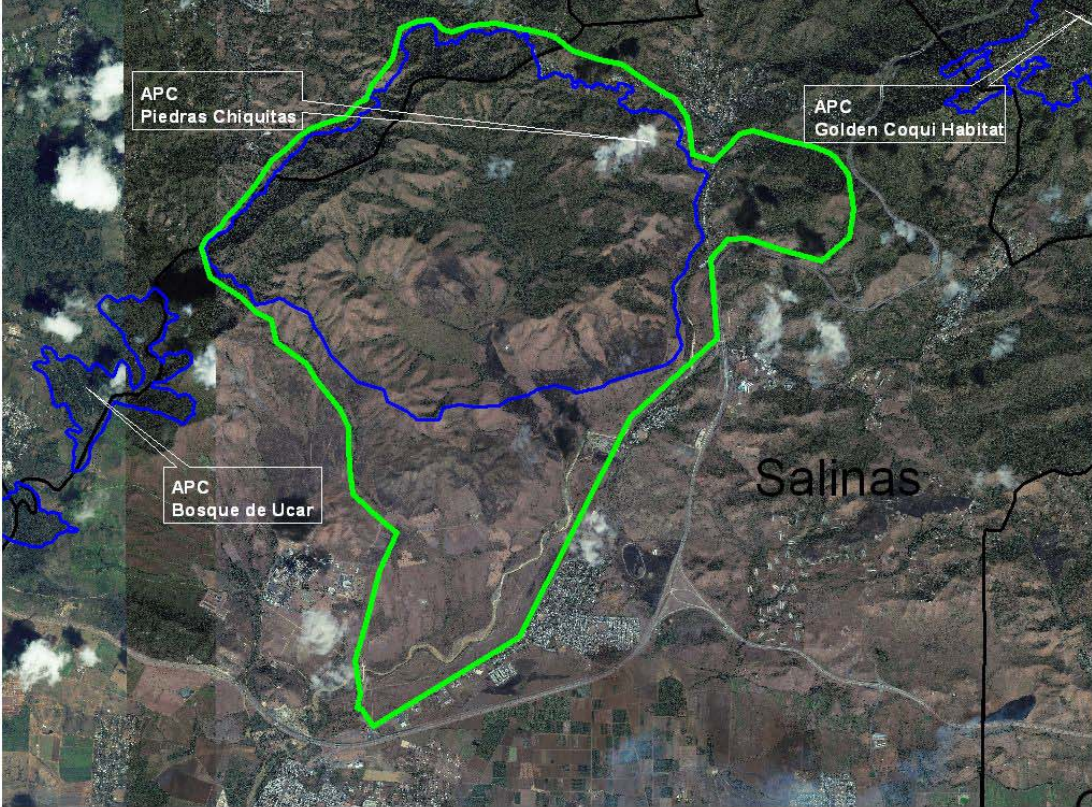
Salinas Training Area






- ▭ Salinas training area.shp
- ▭ Areas con prioridad de conservacion.shp
- Municipios.shp
- Humedales avpu.shp
 - ▭ Estuarine
 - ▭ Lacustrine
 - ▭ Marine
 - ▭ Palustrine
 - ▭ Riverine
- Carreteras avpu.shp
 - ▬ autopistas
 - ▬ primarias
 - ▬ secundarias
 - ▬ terciarias
 - ▬ caminos
 - ▬ propuestas



Salinas Training Area



-  Salinas training area.shp
-  Areas con prioridad de conservacion.shp
-  Municipios.shp

43- Punta Petrona Mangrove and Caracoles Cay, Santa Isabel, Puerto Rico

Area Description:

This CWA is located south east of the town of Santa Isabel and had an area of approximately 231 ha. It is a fairly extensive and undisturbed mangrove area whose physical characteristics appeared to be excellent for a diverse fauna that include the endangered Brown Pelican. It is composed of mangrove forest with ponds, channels and various cays, surrounded by relatively tranquil and shallow waters. In aerial surveys performed in 1984-1985, Punta Petrona mangroves and the coastal zone surrounding the area was a premier habitat for the West Indian Manatee *Trichechus manatus* (Rathbun et al. 1985).

The Punta Petrona Mangrove is a labyrinth of channels and lagoons. It is composed of Cayo Cabezazos, Cayo Caracoles, Cayo Alfeñique; and the sectors of Isla Puerca, Punta Águila, Bahía Rincón and Punta Petrona. Narrow channels separate these islets. The three cays comprehend approximately 2.6 ha in size (Cardona and Rivera 1988). Different mangroves ecosystems form this area: littoral, islets, and dwarf mangroves.

Ownership/Protection:

Public land administered by the Commonwealth of Puerto Rico.

Special Recognition:

Punta Petrona was designated a Natural Reserve in 1979. In the same year, was classified as a CWA by the DNER. Also, in 1988 the DNER classified this zone a Critical Coastal Wildlife Area. The NOAA identified this area as a productive for commercial and recreationally important fisheries (NOAA 2004). Also, this wetland is a Puerto Rico Waterfowl Focus Area (Ventosa et al. 2005). The Punta Petrona reef system, together with the mangroves, sea grass and dunes constitute an important natural system and it's still classified as a primary area for wildlife.

Wildlife:

Birds at Punta Petrona:

Brown pelican *Pelecanus occidentalis*, Antillean nighthawk *Chordeiles gundlachi*, Green heron *Butorides virescens*, Great blue heron *Ardea herodias* Yellow-crowned night heron *Nyctanassa violacea*, Cattle egret *Bubulcus ibis*, Common moorhen *Gallinula chloropus*, White-checked pintail *Anas bahamensis*, Osprey *Pandion haliaetus* (Cardona and Rivera 1988). There is also Blue-winged teal *Anas discors*, Green-winged teal *A. crecca*, Ruddy duck *Oxyura jamaicensis* and American Oystercatcher *Haematopus palliatus* (Ventosa et al. 2005).

Birds at Caracoles Cay:

Brown pelican, Yellow-crowned night heron, Magnificent Frigatebird *Fregata magnificens* nest in this cay; Green heron, Great blue heron, American Oystercatcher (Cardona and Rivera 1988).

Birds at Cayo Cabezazos:

Brown pelican, Magnificent frigatebird, Yellow-crowned night-heron, Antillean Mango *Anthracothorax dominicus*, Ruddy turnstone *Arenaria interpres*, Red-tailed hawk *Buteo jamaicensis*, Green heron, Great egret *Ardea alba*, Belted kingfisher *Ceryle alcyon*, Prairie warbler *Dendroica discolor*, Yellow warbler *D. petechia*, Merlin *Falco columbarius*, Red-billed tropicbird *Phaeton aethereus*, Clapper rail *Rallus longirostris*, Northern waterthrush *Seiurus*

noveboracensis, Royal tern *Sterna maxima*, Sandwich tern *S. sandvicensis*, Zenaida dove *Zenaida aurita* (Terrestrial Resources Division Data 2004).

Birds at Alfeñique Cay:

Ruddy turnstone, Belted kingfisher, Osprey, American Oystercatcher (Terrestrial Resources Division Data 2004).

Reptiles at Berbería Cay:

Green sea turtle *Chelonia mydas* (Cardona and Rivera 1988).

Mammals

West Indian Manatee *Trichechus manatus* (Cardona and Rivera 1988).

Threats:

Although apparently no urban development pressure is acting in Punta Petrona, threats to the integrity of the wetland derive from the agricultural practices prevalent in the area.

Conservation Recommendations:

Restoration of marginal or abandoned farmlands, both wetland and upland, should be pursued where possible and followed with long-term management. Agricultural runoff and potential leaching of pollution should be monitored. Water quality within the impoundments should be monitored for pollution from agricultural practices as well as the quality and integrity of the mangrove forest, channels and cays.

Public education is an important component of long-term management for the Punta Petrona Natural Reserve and should be fostered to increase public awareness about the role this area plays in waterfowl and migratory birds.

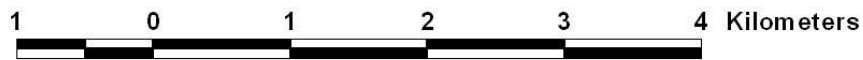
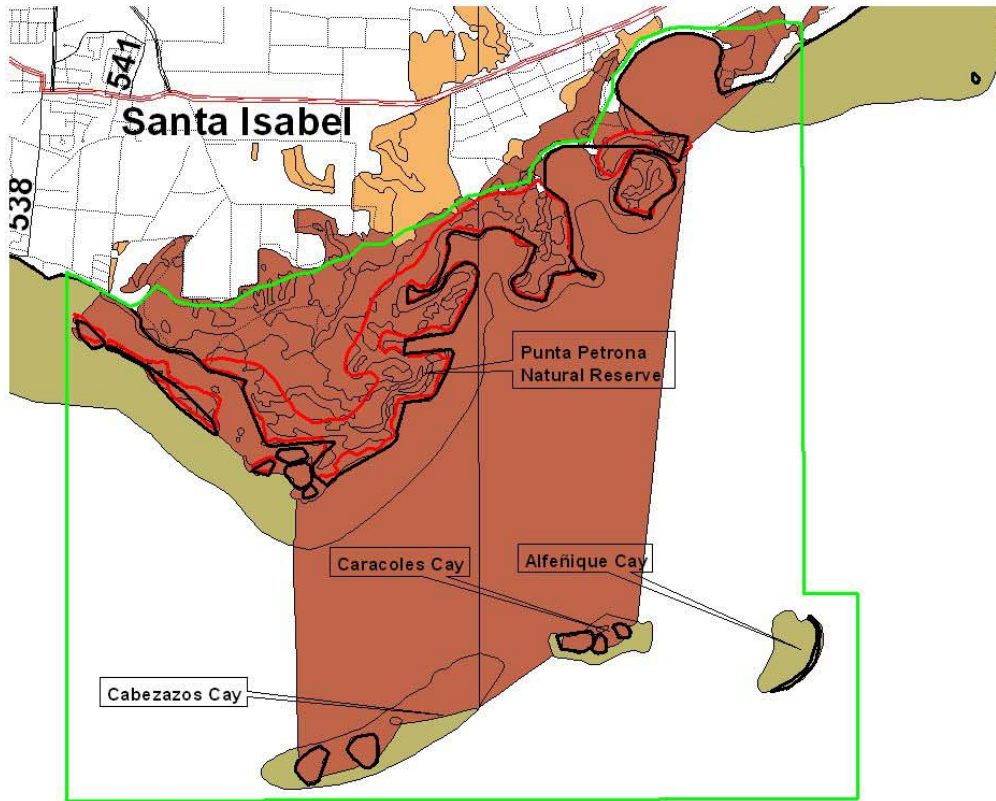
References:

Rathbun, G. B., T. Carr and C. A. Woods. 1985. The distribution of Manatees and Sea turtles in Puerto Rico, with emphasis on Roosevelt Roads Naval Station. Installation Planning Division, Engineering Command. Atlantic Division Naval Facilities.

National Oceanic and Atmospheric Administration. 2004. Caribbean Coral Reef Fisheries Management Theme. Natural Reserve in Puerto Rico and USVI. Department of Commerce, NOAA Fisheries. 5pp.

Ventosa, Eduardo A.; M. Camacho, J.L. Chabert, J. Sustache and D. Dávila. 2005. Puerto Rico Waterfowl Focus Areas Puerto Rico Department of Natural and Environmental Resources; North American Waterfowl Management Plan and Atlantic Coast Joint Venture. 82 pp.

Punta Petrona Mangroves and Caracoles Cay



- Punta petrona mangroves & caracoles cay.shp
- Municips.shp
- Bosques_y_reservas.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

Punta Petrona Mangroves and Caracoles Cay



-  Punta petrona mangroves & caracoles cay.shp
-  Bosques_y_reservas.shp

44- Cabuyón Mangrove and Fríos Cay, Ponce, Puerto Rico

Area Description:

The Cabuyón Mangrove is located at 17°N, 66°W; 5 km south of Mercedita Airport in Barrio Vayas, Municipality of Ponce. This wetland covers an area approximately of 4.80 km². This area, know as Finca La Esperanza, is an estuarine wetland consisting of a mangroves forest with grassland usually flooded by heavy rains. The artificial ponds are product of sand land extraction for human activities. Hunters groups identified this wetland as an important hunting area.

Ownership/Protection:

This area is in private ownership by different private partnership.

Special Recognition:

A private group called “Consejo Ecológico de Conservación de Caza y Pesca” and the local government have the intention to start the process to declare this wetland as a Conservation Area. Cardona and Rivera (1988) classified this area as a Costal CWA of secondary importance. Recent data show that this is an important waterfowl hunting area. The DNER classified the Cabuyón Mangrove (La Esperanza) as one of the Puerto Rico Waterfowl Focus Area (Ventosa et al. 2005). Today, using the information available, we reclassified it as a primary area for wildlife.

Wildlife:

Birds

Forty eight bird species have been identified in Cabuyón Mangrove and Fríos Cay in Ponce: Brown pelican *Pelecanus occidentalis*, Magnificent frigatebird *Fregata magnificens*, Least bittern *Ixobrychus exilis*, Great blue heron *Ardea herodias*, Great egret *A. alba*, Snowy egret *Egretta thula*, Little blue heron *E. caerulea*, Tricolored heron *E. tricolor*, Green heron *Butorides virescens*, Black-crowned night heron *Nycticorax nycticorax*, Caribbean Coot *Fulica caribaea*, Common moorhen *Gallinula chloropus*, Clapper rail *Rallus longirostris*, Sora *Porzana carolina*, Common snipe *Gallinago gallinago*, Blue-winged teal *Anas discors*, Green-winged teal *A. crecca*, White-checked pintail *A. bahamensis*, Lesser scaup *Aythya affinis*, Ring-necked duck *A. collaris*, Turkey vulture *Cathartes aura*, Osprey *Pandion haliaetus*, American kestrel *Falco sparverius*, Black-bellied plover *Pluvialis squatarola*, Snowy plover *Charadrius alexandrinus*, Wilson’s plover *C. wilsonia*, Black-necked stilt *Himantopus mexicanus*, Spotted sandpiper *Actitis macularia*, White-crowned pigeon *Patagioenas leucocephala*, White-winged dove *Zenaida asiatica*, Zenaida dove *Z. aurita*, Common ground dove *Columbina passerina*, Mangrove cuckoo *Coccyzus minor*, Antillean Mango *Anthracothorax dominicus*, Cave swallow *Petrochelidon fulva*, Northern mockingbird *Mimus polyglottos*, Adelaide’s warbler *Dendroica adelaidae*, Yellow warbler *D. petechia*, Prairie warbler *D. discolor*, American Redstart *Setophaga ruticilla*, Northern waterthrush *Seiurus noveboracensis*, Bananaquit *Coereba flaveola*, Yellow-faced grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, Grasshopper sparrow *Ammodramus savannarum*, Greater Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, Cattle egret *Bubulcus ibis* (SOPI, 2004; Terrestrial Resources Division Data 2004; Ventosa et al. 2005).

Threats:

There is a high pressure for tourism development in this zone. A mega hotel and a golf court are some of the proposed activities that threaten this CWA. Actually, the area is seriously considered for the “Port of the Americas” project. This project will highly impact the wetlands, water quality and the sea grasses on this CWA. This development will impact approximately 24 ha of land (CSA Group Inc. 2004).

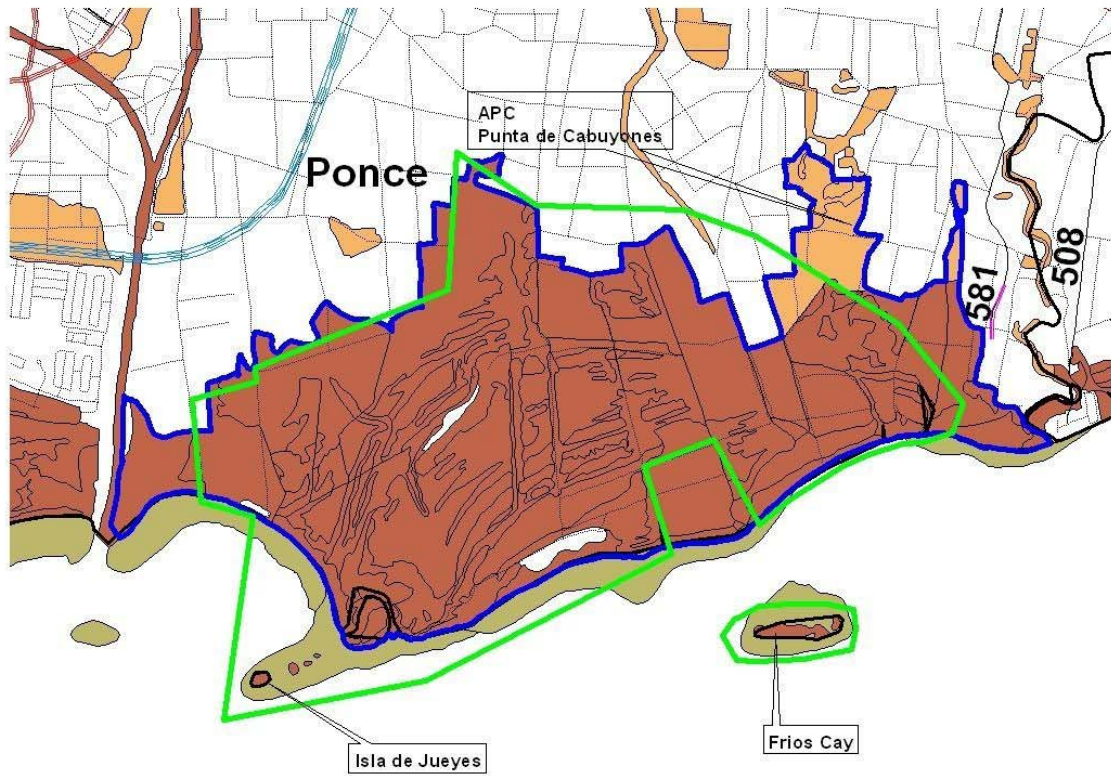
Conservation Recommendations:

This area should be considered to be declared as a Natural Reserve. Lease or other types of agreements should be developed between conservation agencies and/or private groups with landowners in order to protect this important waterfowl wetland from real developments pressures. Some management recommendations are to restore the natural hydrology of the area and to reforest the zone with appropriate shrubs and woody species.

References:

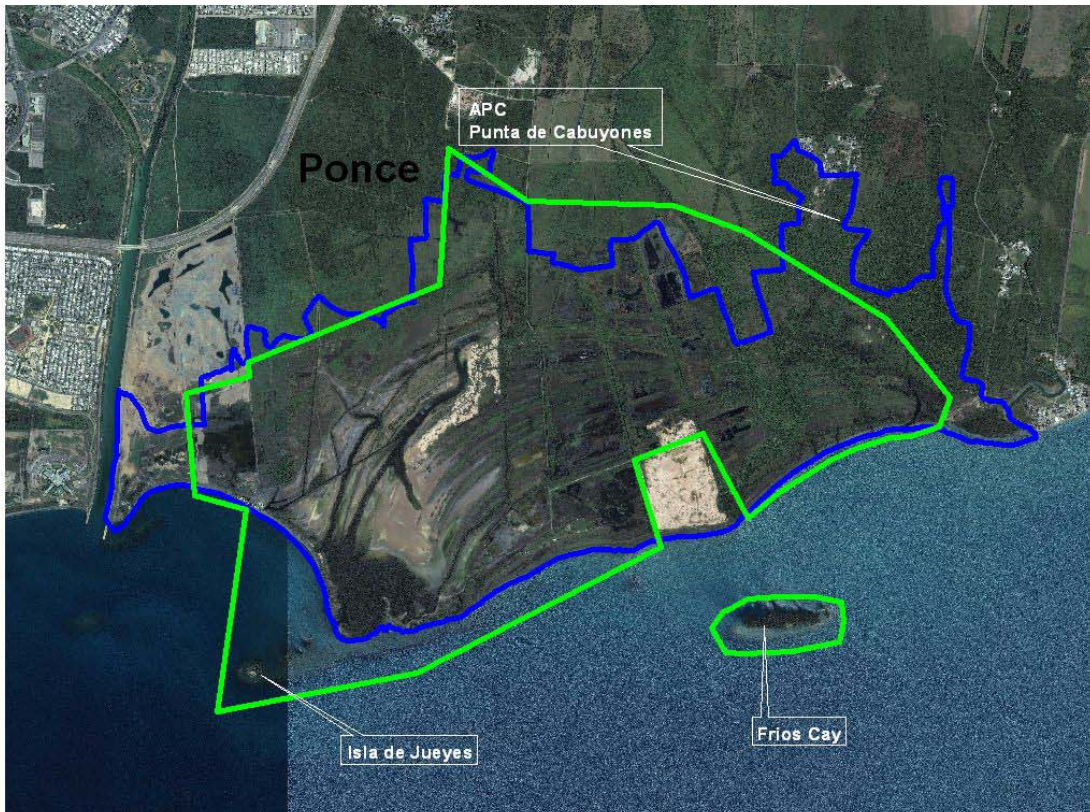
- CSA Group, Inc. 2004. Port of the Americas Comprehensive Mitigation Plan for impacts to wetland, water quality and sea grasses at the Ponce Harbor and its vicinity. San Juan, P.R. 32 pp.
- Ventosa, Eduardo A.; M. Camacho, J.L. Chabert, J. Sustache and D. Dávila. 2005. Puerto Rico Waterfowl Focus Areas Puerto Rico Department of Natural and Environmental Resources; North American Waterfowl Management Plan and Atlantic Coast Joint Venture. 82 pp.



Cabuyón Mangroves and Frios Cay



- Cabuyón mangroves and frios cay.shp
- Areas con prioridad de conservacion.shp
- Municipios.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

Cabuyón Mangroves and Frios Cay



-  Cabuyón mangroves and frios cay.shp
-  Areas con prioridad de conservacion.shp

45- Caja de Muertos Complex, Santa Isabel, Juana Diaz and Ponce, Puerto Rico

Area Description:

Caja de Muertos Complex on the south coast includes Caja de Muertos Island (17°55'N, 66°33'W, 8.5 km off the coast and west of Santa Isabel), Cayo Berbería (17°55'N, 66°27'W, 5.5 km to the north-east) and Cayo Morrillitos at the tip of Caja de Muertos. It has an average longitude of 2.75 km and 1.85 km wide (Villamil et al. 1980). Morrillitos is a tiny island next to Caja de Muertos. Berbería Cay is located 5.5 Km of Caja de Muertos. This islet has a longitude of 1.5 km and 200 m wide. It is connected to Caja de Muertos by a bank of shallow waters of 5.49 m of depth (Villamil et al. 1980). These three CWA's comprise an area of approximately 202 ha (Cardona and Rivera 1988). Caja de Muertos Island is an important nesting area for the hawksbill and green sea turtle, showing a breeding success of 69% and 68% respectively (Calderón 1993).

Ownership/Protection:

Berbería Cay, Caja de Muertos and Morrillitos Island are a Natural Reserve and are administered by the DNER, Bureau of Reserves, Refuges and Sanctuaries.

Special Recognition:

It was designated a Natural Reserve in 1980. The DNER classified this area as a CWA of primary importance in Raffaele and Duffield 1979 and Cardona and Rivera 1988, mainly because it was an important nesting site for sea turtles, White-tailed tropicbird and the endangered Roseate tern. They considered this complex among Puerto Rico's prime wildlife areas. Today it's still considered a CWA of primary importance.

Wildlife:

Birds in Caja de Muertos Island and Morrillitos Island

Forty seven bird species have been reported in Caja de Muertos Island: Wilson's storm petrel *Oceanites oceanicus*, White-tailed tropicbird *Phaeton lepturus*, Red-billed tropicbird *Phaeton aethereus*, Brown pelican *Pelecanus occidentalis*, Brown booby *Sula leucogaster*, Frigatebird *Fregata magnificens*, Little blue heron *Egretta caerulea*, Green heron *Butorides virescens*, Yellow-crowned night-heron *Nyctanassa violacea*, Osprey *Pandion haliaetus*, American Oystercatcher *Haematopus palliatus*, Wilson's plover *Charadrius wilsonia*, Killdeer *C. vociferus*, Lesser golden plover *Pluvialis dominica*, Ruddy turnstone *Arenaria interpres*, Spotted sandpiper *Actitis macularia*, Solitary sandpiper *Tringa solitaria*, Laughing gull *Larus atricilla*, Roseate tern *Sterna dougallii*, Royal tern *S. maxima*, Gull billed tern *S. nilotica*, Least tern *S. antillarum*, Sandwich tern *S. sandvicensis*, Sooty tern *S. fuscata*, Brown noddy *Anous stolidus*, Zenaida dove *Zenaida aurita*, Common ground dove *Columbina passerina*, Mangrove cuckoo *Coccyzus minor*, Smooth-billed ani *Crotophaga ani*, Short-eared owl *Asio flammeus*, Belted kingfisher *Ceryle alcyon*, Cave swallow *Petrochelidon fulva*, Pearly-eyed thrasher *Margarops fuscatus*, Red-legged thrush *Mimus polyglottos*, Black and white warbler *Mniotilta varia*, Prothonotary warbler *Protonotaria citrea*, Pine warbler *Dendroica pinus*, Yellow warbler *D. petechia*, American Redstart *Setophaga ruticilla*, Northern waterthrush *Seiurus noveboracensis*, Bananaquit *Coereba flaveola*, Black-faced grassquit *Tiaris bicolor* (Villamil et al 1980). Others birds reported in the island are the Peregrine falcon *Falco peregrinus*, Gray kingbird *Tyrannus dominicensis*, Whimbrel *Numenius phaeopus*, Great egret *Ardea alba*, and during migration season, some ducks species (probably blue-winged duck *Anas discors*) have been seen in the lagoon (Carlos Cianchini, Caja de Muerto Refuge Manager, pers. comm.).

Birds in Berbería Cay

Thirteen bird species have been reported in Berbería Cay: Brown pelican *Pelecanus occidentalis*, Brown booby *Sula leucogaster*, Great egret *Ardea alba*, Great blue heron *A. herodias*, Green heron *Butorides virescens*, Yellow-crowned night-heron *Nyctanassa violacea*, Little blue heron *Egretta caerulea*, Spotted sandpiper *Actitis macularia*, Black-necked stilt *Himantopus mexicanus*, Roseate tern *Sterna dougallii*, Royal tern *S. maxima*, Sandwich tern *S. sandvicensis*, Mangrove cuckoo *Coccyzus minor*, Yellow warbler *Dendroica petechia* (Villamil et al. 1980; Cardona and Rivera 1988; Terrestrial Resources Data 2004).

Herpetofauna of Caja de Muertos Island

Roosevelt dwarf gecko *Sphaerodactylus roosevelti*, Townsend's dwarf gecko *S. towsendi*, Leaf toed gecko *Phyllodactylus wirshingi*, Puerto Rican ground lizard *Ameiva exsul*, Blue tailed ground lizard *A. wetmorei*, Crested anole *Anolis cristatellus*, Common grass anole *A. pulchellus*, Cook lizard *A. cooki*, Green iguana *Iguana iguana*, North American worm lizard *Amphisbaena xera*, Puerto Rican worm lizard *A. caeca*, Grant's blind snake *Typhlops granti*, Richard's blind snake *T. richardi platycephalus*, Puerto Rican Racer *Alsophis portoricensis* (Villamil et al 1980). Nesting activities of Green turtle *Chelonia mydas* and Hawksbill turtle *Eretmochelys imbricata* (Calderón Díaz 1993).

Mammals at Caja de Muertos

Fig eating bat *Artibeus jamaicensis* (Díaz 1983).

Echinoderms in Caja de Muertos Island

Evapta lata (Coral reef), *Holothuria mexicana* (*Thalassia*), *Diadema antillarum* (Coral reef and *Thalassia*), *Tripneustes esculentus* (Coral reef and *Thalassia*), *Echinometra lucunter* (Coral reef), *Astropecten duplicatus* (Coral reef), *Oreaster reticulatus* (Coral reef), *Ophicoma echinata* (Coral reef, *Thalassia* and Rocky bottom), *Ophiotrix angulata* (Coral reef) (Villamil et al 1980).

Crustaceans in Caja de Muertos Island Natural Reserve

Tetraclita squamosa, *Gonodactylus oerstedii*, *Amphipodos spp.*, *Coenobita clypeatus*, *Clibanarius tricolor*, *Arenaeus cribarius*, *Grapsus grapsus*, *Ocypode albicans*, *Gecarcinus lateralis*, *Geocarcinus ruricola*, *Uca pugilator*, *Armases ricordi*, *Aratus pisonii*, *Mitrax sculptus*, *Panilurus argus* (Villamil et al 1980).

Threats:

Poaching of sea turtle eggs is no longer occurring in the island, but illegal hunting still occurring in the surrounding waters. Evidence of these activities (turtle shells and bones) can be found in Berbería Cay (Carlos Cianchini, Caja de Muerto Refuge Manager, pers. comm.).

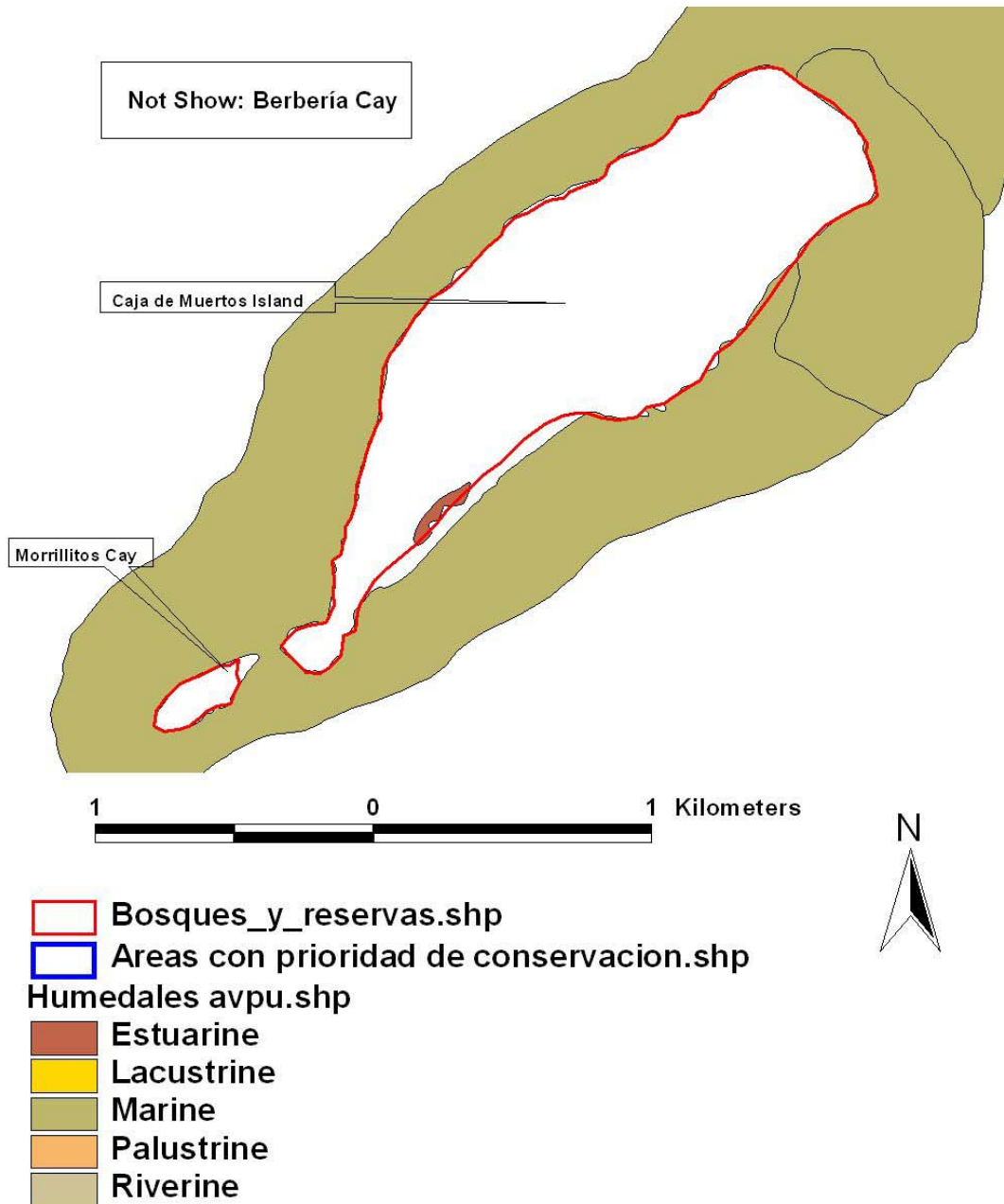
Conservation Recommendations:

The proposed recommendations for its management are given in Villamil et al. (1980). The personnel of the DNER located in the Caja de Muertos Island Natural Reserve need to be equipped with boats and other materials, important for the law enforcement and management in the island. The education program should be improved to attract more researchers to the island. It is suggested that the mangroves on Caja de Muertos should be made a restricted zone; zones for recreational activities should be established; collection of marine organisms should be prohibited. Anchoring should be limited to certain sites and spear fishing prohibited.

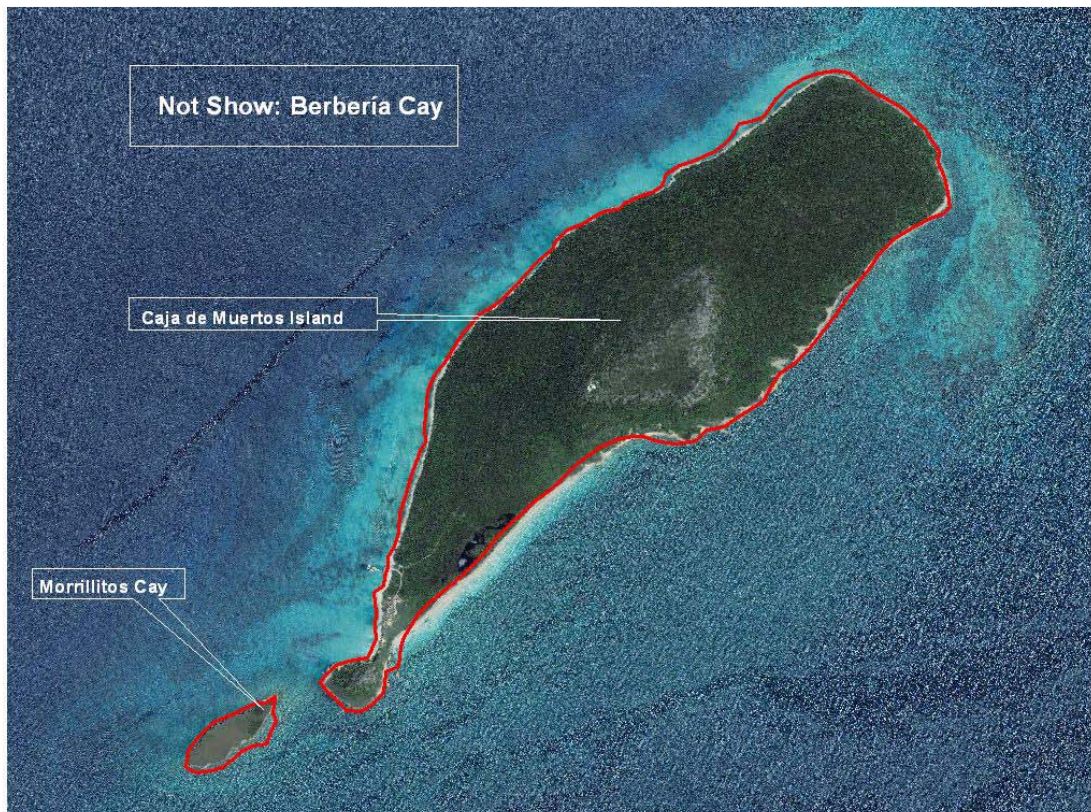
References:

- Calderón Díaz, A. 1993. Estudio de población y anidaje de Tortugas marinas en Isla de Caja de Muertos. XIX Simposio de los Recursos Naturales. Departamento de Recursos Naturales, Estado Libre Asociado de Puerto Rico. Pp 71-75.
- Díaz-Díaz, C. A. 1983. Los Mamíferos de Puerto Rico. En Compendio Enciclopédico de los Recursos Naturales. Vol. I. Departamento de Recursos Naturales. Estado Libre Asociado de Puerto Rico. Área de Investigaciones Científicas. San Juan, Puerto Rico. 220 pp.
- Villamil, J.; M. Canals, S. Silander; M. del Llano; R. Martínez, A. García, A. Molinares; J. González, E. Questell, M. Pérez , M. Vélez; V. Mestey and R. Pérez. 1980. Suplemento Técnico para la Reserva Natural Caja de Muertos. Estado Libre Asociado de Puerto Rico. Departamento de Recursos Naturales. Área de Investigaciones Científicas. 246 pp.

Caja de Muertos Complex



Caja de Muertos Complex



1 0 1 Kilometers



-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

46- Serrallés Lagoons Complex, Juana Díaz-Ponce

Area Description:

The Serrallés Lagoons Complex (SLC) are located at 18°04'N, 66°33'W, 10 km northwest Ponce. It covers an area of 6 km² between the Cerrillos and Callado sectors in the municipalities of Ponce and Juana Díaz. It is at 100 m sea level and its cover an area of more than 100 ha. Specifically, Lago Ponceña, Lago Vista Alegre, Lago Moline, Lagos # 1, 2 and 5 and the lake located at southeast Hacienda Ana María compose the SLC. The SLC is considered as primary for native waterfowl.

The SLC consist of open water areas, with emergent and submerging vegetations that offer feeding and refuge areas for waterfowl. Those lakes are manmade for irrigation purposes for the sugar cane industry. For this reason, it can be exposed to high water level fluctuations or completely drainage. The maintenance and undergrowth control in the outlying areas of the dams will avoid the proliferation of grasses that can provide breeding areas.

Ownership/Protection:

All of the lakes are in private ownership.

Special Recognition:

The Natural Heritage of the DNER classified the lagoon as a Priority Area for Conservation. These lagoons are the most important habitat for Ruddy ducks in the south portion of the Island. In 1979, Raffaele and Duffield considered SLC an area of prime importance to our native waterfowl. The DNER classified the SLC as one of the Puerto Rico Waterfowl Focus Area (Ventosa et al. 2005). Today, this area maintains the same category, because it's still an important area for native waterfowl.

Wildlife:

Birds

Fifty one bird species have been reported in SLC: Ruddy duck *Oxyura jamaicensis* (Raffaele and Duffield 1979; Chabert et al 1984); Caribbean Coot *Fulica caribaea* (Bonilla et al 1992), Lesser scaup *Aythya affinis* (Ventosa et al 2004); Least grebe *Tachybaptus dominicus* (Bonilla 20004); Mallard duck *Anas platyrhynchos*, Pied-billed grebe *Podilymbus podiceps*, Brown pelican *Pelecanus occidentalis*, Great egret *Ardea alba*, Cattle egret *Bubulcus ibis*, Green heron *Butorides virescens*, Snowy egret *Egretta thula*, Tricolored heron *E. tricolor*, Black-crowned night heron *Nycticorax nycticorax*, Common moorhen *Gallinula chloropus*, Red-tailed hawk *Buteo jamaicensis*, Osprey *Pandion haliaetus*, American kestrel *Falco sparverius*, Turkey vulture *Cathartes aura*, Black-necked stilt *Himantopus mexicanus*, Rock pigeon *Columba livia*, Common ground dove *Columbina passerina*, Scaly-naped pigeon *Patagioenas squamosa*, Ringed turtle-dove *Streptopelia risoria*, White-winged dove *Zenaida asiatica*, Zenaida dove *Zenaida aurita*, Peach faced lovebird *Agapornis roseicollis*, Mangrove cuckoo *Coccyzus minor*, Smooth-billed ani *Crotophaga ani*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Puerto Rican Tody *Todus mexicanus*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Gray kingbird *Tyrannus dominicensis*, Caribbean Martin *Progne dominicensis*, Cave swallow *Petrochelidon fulva*, Northern mockingbird *Mimus polyglottos*, Black-whiskered vireo *Vireo altiloquus*, Adelaide's warbler *Dendroica adelaidae*, Prairie warbler *D. discolor*, Northern parula *Parula americana*, Bananaquit *Coereba flaveola*, Puerto Rican Spindalis *Spindalis portoricensis*, Antillean

Euphonia *Euphonia musica*, Greater Antillean oriole *Icterus dominicensis*, Shiny cowbird *Molothrus bonariensis*, Greater Antillean Grackle *Quiscalus niger*, House sparrow *Passer domesticus*, Bronze mannikin *Lonchura cucullata*, Nutmeg mannikin *L. punctulata* (Data provided by SOPI 2004).

Threats:

Because sugar cane industry is not active at this moment, these ponds are under drainage pressure for urban developing.

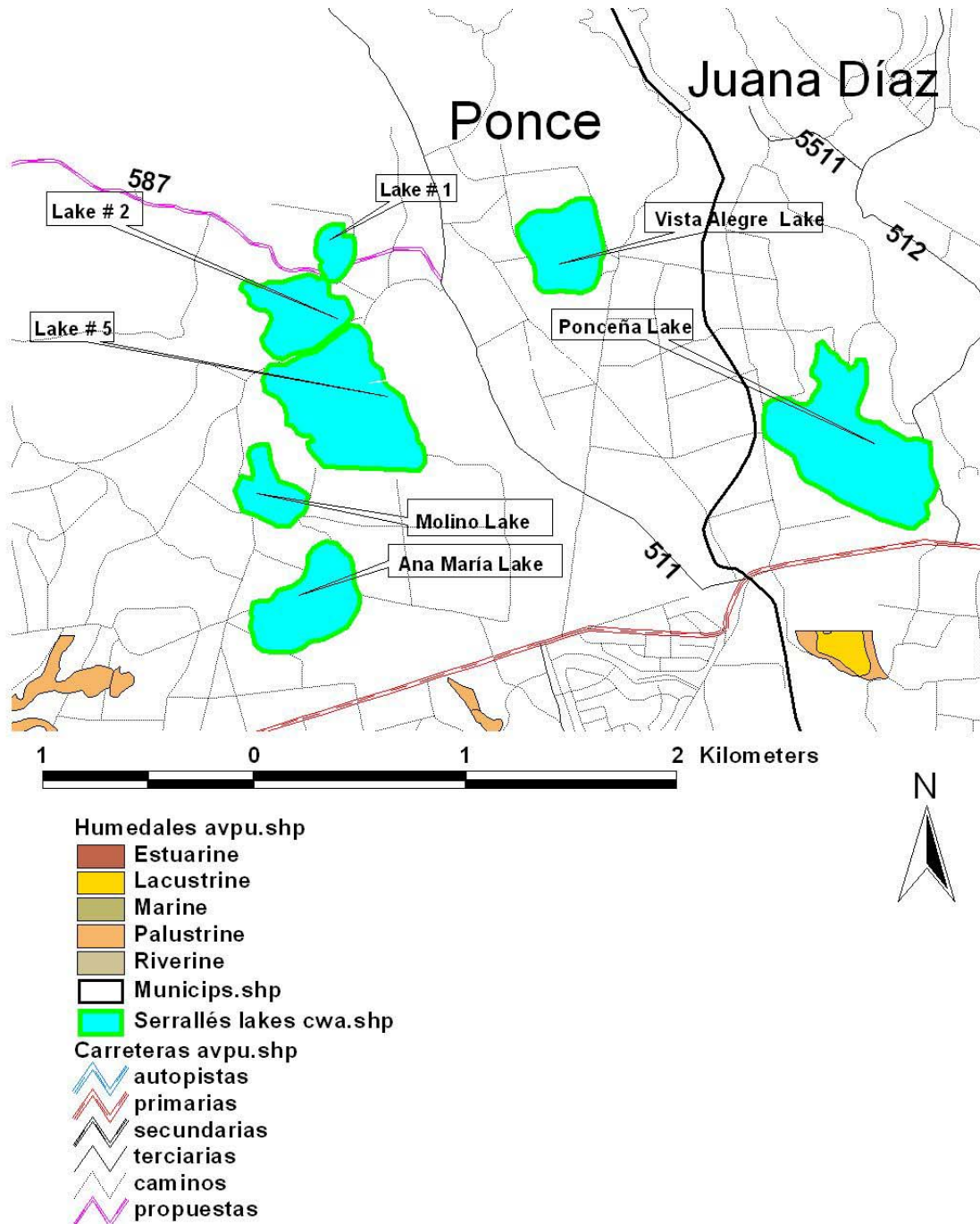
Conservation Recommendations:

Weed control in the ponds fringe will provide waterfowl nesting areas. A “lease agreement” with the owners will help in the conservation of this important waterfowl area.

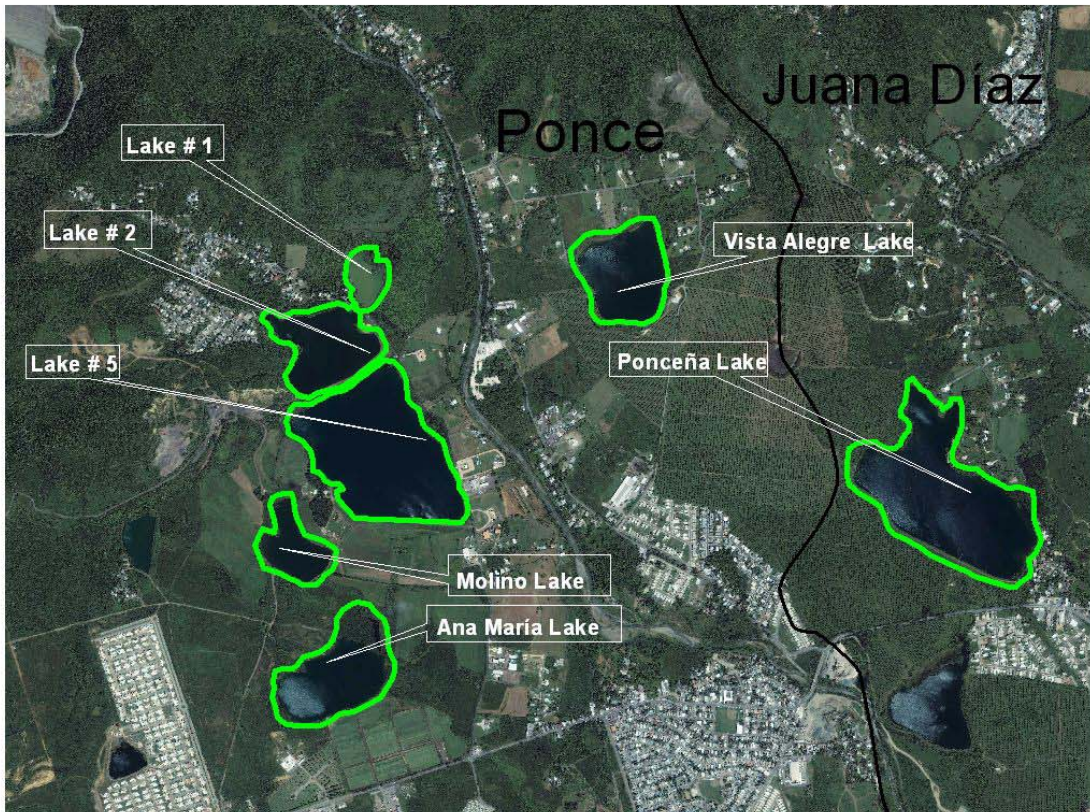
References:


- Bonilla, G. 2004. Distribution and Population Density of Resident Aquatic Birds in Puerto Rico. Annual Interim Report. Draft. 11pp.
- Bonilla, G.; M. Vázquez, y E. Berríos. 1992. Status, estimado poblacional y distribución de cuatro aves acuáticas nativas en Puerto Rico. Departamento de Recursos Naturales de Puerto Rico. Simposio XVIII de los Recursos Naturales de Puerto Rico. Vol. XVIII.
- Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.
- Ortiz-Rosas, P. and V. Quevedo-Bonilla. 1987. Áreas con prioridad para la conservación en Puerto Rico. Programa Pro-Patrimonio Natural. Estado Libre Asociado de Puerto Rico, Departamento Recursos Naturales. 217 pp.
- Ventosa, Eduardo A.; M. Camacho, J.L. Chabert, J. Sustache and D. Dávila. 2005. Puerto Rico Waterfowl Focus Areas Puerto Rico Department of Natural and Environmental Resources; North American Waterfowl Management Plan and Atlantic Coast Joint Venture. 82 pp.

Serrallés Lakes



Serrallés Lakes



-  Municipals.shp
-  Serrallés lakes cwa.shp

47- Toro Negro State Forest, Ciales-Jayuya-Ponce-Juana Diaz-Orocovis, Puerto Rico

Area Description:

The Toro Negro State Forest (TNSF) cover an area of 3159 ha in seven separate tracts and is located in the municipalities of Ciales, Jayuya, Ponce, Juana Díaz and Orocovis, in the moist mountains of the Central Cordillera (Geraldo Hernández, TNSF Manager, pers. comm.). The entire forest is especially critical for soil and water conservation. Cerro La Punta (1338 m), the highest peak in Puerto Rico, is located in the western section of the forest and the lowest elevation is found at the south edge of the forest near Inabón Falls, approximately 440 m.

The Sierra Palm *Prestoea montana* covers the largest area of all forest type in TNSF, while the dwarf forest domain in the higher peaks. *Caimitillo Buchenavia sp.* and *Micropholis sp.* are dominant species in the lower montane zonal vegetation association. At lower elevations, the Tabonuco type *Dacryoides excelsa* is the dominant species in the subtropical wet life zone (DNR 1976).

The forest is located in two different life zones: subtropical very humid forest and very humid lower montanous forest. The topography is uneven with steep cliffs and waterfalls. Seven rivers are located in the forest: 1-Río Indalecia 2-Río Guayo 3-Río Inabón 4-Río Anón 5-Río Matrullas 6-Río Saliente 7-Río Toro Negro. Two lakes are located in the forest: 1-Lago Guineo 2-Lago Matrullas (Silander et al 1986). Others rivers located in the forest are: Jauca, Veguita, Caricaboa, Saliente, Salientito, Matrullas, and Guineo rivers (Geraldo Hernández, pers. comm.).

Ownership/Protection:

In 1934, the Puerto Rico Reconstruction Administration buys the lands in order to create the Forest. In 1942, the Department of the Interior transfers the lands to the Federal Department of Agriculture and the lands where administered by the U.S. Forest Service. In 1961, the forest was transferred to the Commonwealth of Puerto Rico. Actually, the TNSF is administered by the DNER, Forest Service Division.

Special Recognition:

The area was declared a Federal Forest in 1934 and a State Forest in 1961 (Silander et al 1986). Raffaele and Duffield (1979) recognized TNSF as a CWA of primary importance. In 2004, BirdLife International and SOPI recognized TNSF as an Important Bird Area. Today, we still recognized TNSF as a prime wildlife area.

Wildlife:

Birds

Thirty six bird species have been reported in Toro Negro Forest: Sharp-shinned hawk *Accipiter striatus*, Green heron *Butorides virescens*, Cattle egret *Bubulcus ibis*, Red-tailed hawk *Buteo jamaicensis*, Scaly-naped pigeon *Patagioenas squamosa*, Ruddy quail-dove *Geotrygon montana*, Puerto Rican Screech owl *Megascops nudipes*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Green mango *Anthracothorax viridis*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Barn swallow *Hirundo rustica*, Northern mockingbird, *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Black-throated blue warbler *Dendroica caerulescens*, Elfin wood warbler *D. angelae*, Yellow rumped warbler *D. coronata*, Northern parula *Parula americana*, Black and white warbler *Mniotilta varia*, Bananaquit *Coereba flaveola*, Puerto Rican tanager *Nesospingus speculiferus*, Puerto Rican Spindalis *Spindalis portoricensis*, Greater Antillean Oriole *Icterus dominicensis*, Puerto Rican Bullfinch

Loxigilla portoricensis, Black-faced grassquit *Tiaris bicolor*, Common gallinule *Gallinula chloropus*, Zenaida dove *Zenaida aurita*, Common ground dove *Columbina passerina*, Puerto Rican Vireo *Vireo latimeri*, Black-whiskered vireo *V. altiloquus*, Red-legged thrush *Turdus plumbeus*, Lincoln's sparrow *Melospiza lincolnii*, Osprey *Pandion haliaetus*, Antillean Euphonia *Euphonia musica* (Silander et al. 1986; DNER 2004; SOPI 2004).

Reptiles

Yellow bearded anole *Anolis gundlachi*, Emerald anole *A. evermanni*, Upland grass anole *A. krugii*, Puerto Rican giant anole *A. cuvieri*, Puerto Rican Pygmy anole *A. occultus*, Klauber's dwarf gecko *Sphaerodactylus klauberi*, Common dwarf gecko *S. macrolepis*, Puerto Rican Racer *Alsophis portoricensis*, Puerto Rican worm lizard *Amphisbaena caeca*, Puerto Rican ground lizard *Ameiva exsul*, Slippery-backed mabuya *Mabuya mabouya sloanii*, Puerto Rican slider *Trachemys s. stejnegeri* (Silander et al. 1986; DNER 2004).

Amphibians

Grass coqui *Eleutherodactylus brittoni*, Tree hole coqui *E. hedricki*, Ground coqui *E. richmondi*, Cricket coqui *E. gryllus*, Melodus coqui *E. wightmanae*, Antillean coqui *E. antillensis*, Puerto Rican coqui *E. portoricensis*, Common coqui *E. coqui*, Eneida's coqui *E. eneidae*, White-lipped frog *Leptodactylus albilabris*, Giant toad *Bufo marinus* (Silander et al. 1986; DNER 2004).

Mammals

Black rat *Rattus rattus*, Norway rat *R. norvegicus*, Small Indian mongoose *Herpestes auro-punctatus*, House mouse *Mus musculus*, Parnell's Moustached bat *Pteronotus parnellii portoricensis*, Puerto Rican long-tongued bat *Monophyllus redmani portoricensis*, Antillean fruit-eating bat *Brachyphylla cavernarum*, Jamaican fruit-eating bat *Artibeus jamaicensis*, Desmarest's fig-eating bat *Stenoderma rufum*, Buffy flower bat *Erophylla sezekorni*, Big brown bat *Eptesicus fuscus*.

Fish

Plumier's stone-biting goby *Sicydium plumieri*, Mountain mullet *Agonostomus monticola*, Fathead minnow *Pimephales promelas*.

Invertebrates

Atya lenipes, *A. innocuous*, *A. scabra*, *Macrobachium carcinus*, *M. crenulatum*, *M. faustinum*, *M. heterochirus*, *Epibolocera sinuatifrons*.

Critical Plants:

Woodbury et al. (1975) report a total of 74 species classified as rare or endangered.

Threats:

Some threats are: illegal dumping, vegetation theft, discharge of use waters, among others. Roads, communication antennas, recreational facilities construction urban development and agricultural practices around forest boundaries, has resulted in substantial habitat alteration and fragmentation in several public forests (G. Hernández pers. comm.). Some of the traditional nesting areas for the Puerto Rican sharp-shinned hawk in TNSF lie near recreational facilities (Cruz and Delannoy 1986). Increased pressure for recreation from a growing human population could bring about frequent and regular human disturbance near nest sites (USFWS 1997).

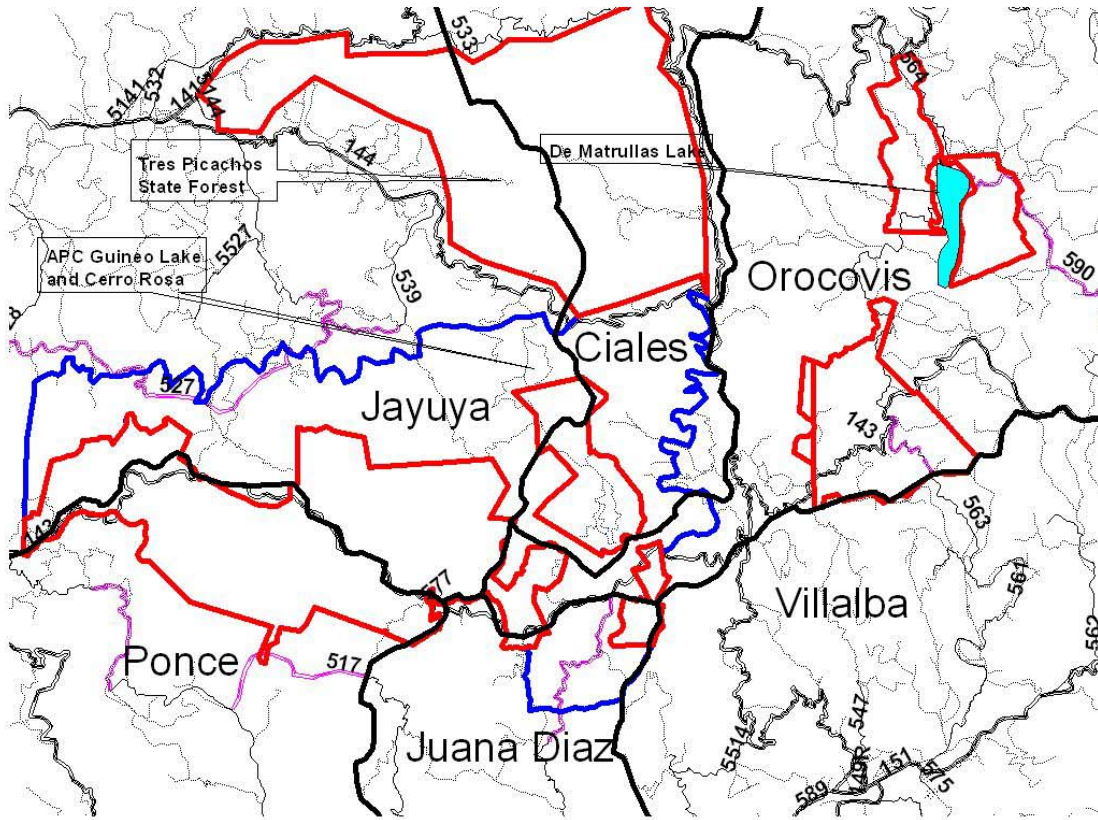
Conservation Recommendations:










Management plans should be developed for the protection of the Sharp-shinned hawk and their habitat in Toro Negro. These plans should include the habitat management used by the species. This includes areas with potential habitat that can be enhanced for future uses by the hawks (USFWS 1997). Others recommendations mentioned by the Forest Manager Mr. G. Hernández: 1-Establishment of conservation, management and tourist areas 2-Construction of necessary facilities for visitors 3-Establishment of management plan for the forest hydrology 4-Create a complete flora inventory 5-Establishment of a camping ground in disturbed areas 5-In the “Cuerpo de Voluntarios” facilities, create a Ecotourism Center.

References:

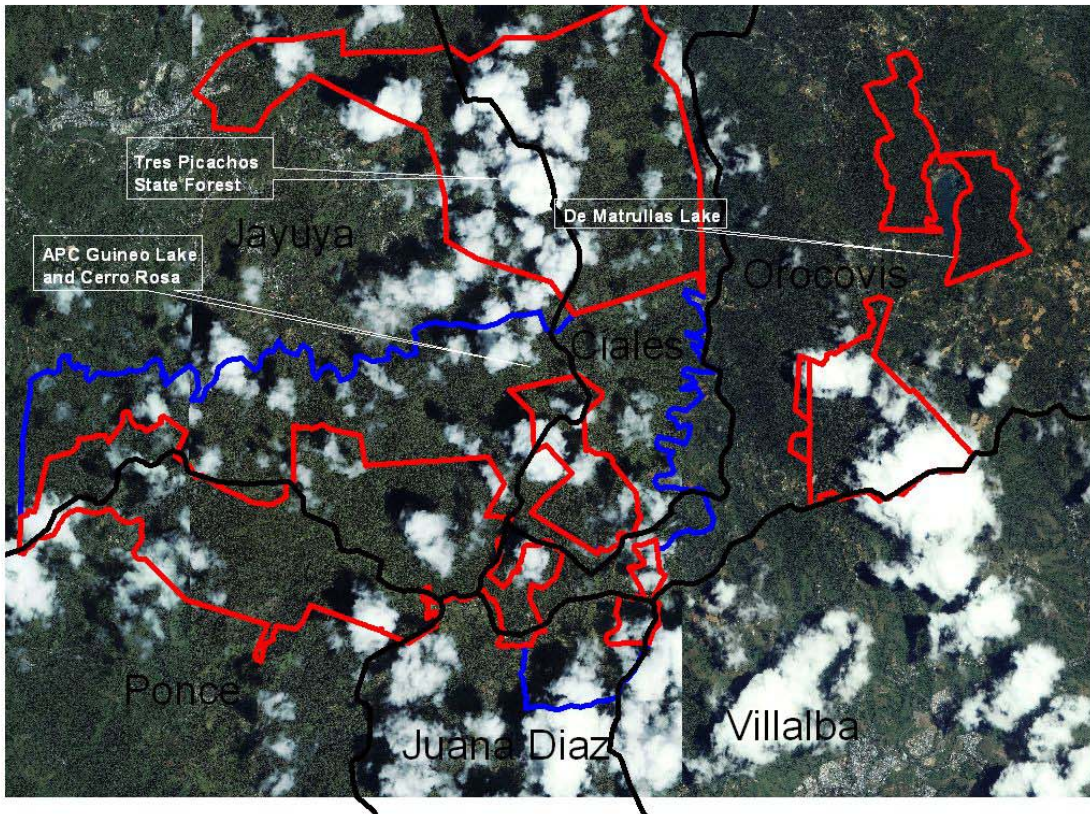
- Cruz, A. and C.A. Delannoy. 1986. Status, breeding biology and conservation needs of the Puerto Rican sharp-shinned hawk, *Accipiter striatus venator*. Final report submitted to the U.S. Fish and Wildlife Service as specified in work contract no. 14-16-0004-82-031.
- Department of Natural Resources. 1976. The Master Plan for the Commonwealth Forests of Puerto Rico. Prepared for the Bureau of Outdoor Recreation by Area of Planning and Evaluation of Resources Division of Forest Planning.
- Department of Natural and Environmental Resources. 2004. List of Vertebrates of Toro Negro State Forest. Unpublished data provided by Mr. Luis Maldonado, DNER Biologist.
- U.S. Fish and Wildlife Service. 1997. Puerto Rican Broad-winged hawk and Puerto Rican sharp-shinned hawk Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, Georgia. 30 pp.

Toro Negro State Forest



-  Municipios.shp
-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp
- Carreteras avpu.shp
 -  autopistas
 -  primarias
 -  secundarias
 -  terciarias
 -  caminos
 -  propuestas

Toro Negro State Forest



-  Municips.shp
-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

Area Description:

Salinas Lagoon is located at 17° 58' 16" N and 66° 40' 15" W, at 6 km west of the town of Ponce, in the Punta Cucharas sector (Negrón González, 1986), in the littoral and sub littoral zone, south of Barrio Canas, in the municipality of Ponce, near the public beach El Tuque. It is a coastal plain with elevations at sea level from 0 to 10 m. Annual precipitation and average temperature is 89.2 and 26.4°C respectively. It has an extension of 35 ha, forest (mangroves and coastal) and different types of wetlands, including estuarine and palustrine. There are also, extensive areas of sand dunes covered by herbs and grass.

Ownership/Protection:

This area is in private ownership.

Special Recognition:

In June of 2004, the DNER prepared a document about the natural value of this area. The purpose of this manuscript is to start the documentation in order to declare this area as the Punta Cucharas Natural Reserve. The DNER classified the Salinas Lagoon as one of the Puerto Rico Waterfowl Focus Area (Ventosa et al. 2005). Today, using the description of the natural composition of Las Salinas Lagoon, this area is classified for the first time a CWA of primary importance.

Wildlife

Five endemics bird species and six migratory birds had been identified in the proposed natural area. The endangered Peregrine Falcon and the Brown Pelican uses this wetland. Four species of resident's egrets and 4 species of resident's herons are also present. Eleven species of sandpipers feed on this wetland (DRNA 2004).

Birds

Fifty six birds species are identified: Belted kingfisher *Ceryle alcyon*, White-cheeked pintail *Anas Bahamensis*, Blue-winged teal *A. discors*, Great egret *Ardea alba*, Great blue heron *A. herodias*, Cattle egret *Bubulcus ibis*, Little blue heron *Egretta caerulea*, Snowy egret *E. thula*, Tricolored heron *E. tricolor*, Yellow-crowned night heron *Nyctanassa violacea*, Antillean nighthawk *Chordeiles gundlachi*, Turkey vulture *Cathartes aura*, Semipalmated plover *Charadrius semipalmatus*, Wilson's plover *C. wilsonia*, Black-billed plover *Pluvialis squatarola*, Bananaquit *Coereba flaveola*, Common ground dove *Columbina passerine*, White-winged dove *Zenaida asiatica*, Smooth-billed ani *Crotophaga ani*, Adelaide's warbler *Dendroica adelaidae*, Yellow warbler *D. petechia*, Cap may warbler *D. tigrina*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Northern waterthrush *Seiurus noveboracensis*, Black-faced grassquit *Tiaris bicolor*, Red-tailed hawk *Buteo jamaicensis*, Peregrine falcon *Falco peregrinus*, American kestrel *F. sparverius*, Magnificent Frigatebird *Fregata magnificens*, Greater Antillean Oriole *Icterus dominicensis*, Troupial *I. icterus*, Shiny cowbird *Molothrus bonariensis*, Greater Antillean Grackle *Quiscalus niger*, Laughing gull *Larus atricilla*, Mockingbird *Mimus polyglottos*, Red-legged thrush *Turdus plumbeus*, Osprey *Pandion haliaetus*, Brown pelican *Pelecanus occidentalis*, Clapper rail *Rallus longirostris*, Black-necked stilt *Himantopus mexicanus*, Spotted sandpiper *Actitis macularia*, Ruddy turnstone *Arenaria interpres*, Stilt sandpiper *Calidris himantopus*, Western sandpiper *C. mauri*, Pectoral sandpiper *C. melanotos*, Least sandpiper *C. minutilla*, Semipalmated sandpiper *C. pusilla*, Willet *Catoptrophorus*

semipalmatus, Short-billed dowitcher *Limnodromus griseus*, Lesser yellowlegs *Tringa flavipes*, Solitary sandpiper *T. solitaria*, Puerto Rican Spindalis *Spindalis portoricensis*, Puerto Rican Tody *Todus portoricensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Gray kingbird *Tyrannus dominicensis*, Puerto Rican Vireo *Vireo latimeri* (DRNA 2004).

Reptiles

Seven reptiles were reported; from these, two were endemic (one vulnerable) and five were native: Brook's house gecko *Hemidactylus brookii*, Common dwarf gecko *Sphaerodactylus macrolepis*, Roosevelt's dwarf gecko *S. roosevelti*, Crested anole *Anolis cristatellus*, Common grass anole *A. pulchellus*, Dryland grass anole *A. poncensis*, Puerto Rican ground lizard *Ameiva exsul* (DRNA 2004).

Amphibians

Tree amphibians are reported: Giant toad *Bufo marinus*, Common coqui *Eleutherodactylus coqui*, White-lipped frog *Leptodactylus albilabris* (DRNA 2004).

Mammals

Black rat *Rattus rattus*, Norway rat *R. norvegicus*, House mouse *Mus musculus*, Small Indian mongoose *Herpestes auropunctatus*, Dog *Canis familiaris* (DRNA 2004).

Threats:

Aerial photos show that some dunes were heavily impacted for land cover extraction. Over 70% of the sand dunes were removed. Now there is a series of saline ponds with apparent connection with the sea. Some industrial and commercial developments are proposed close to this area.

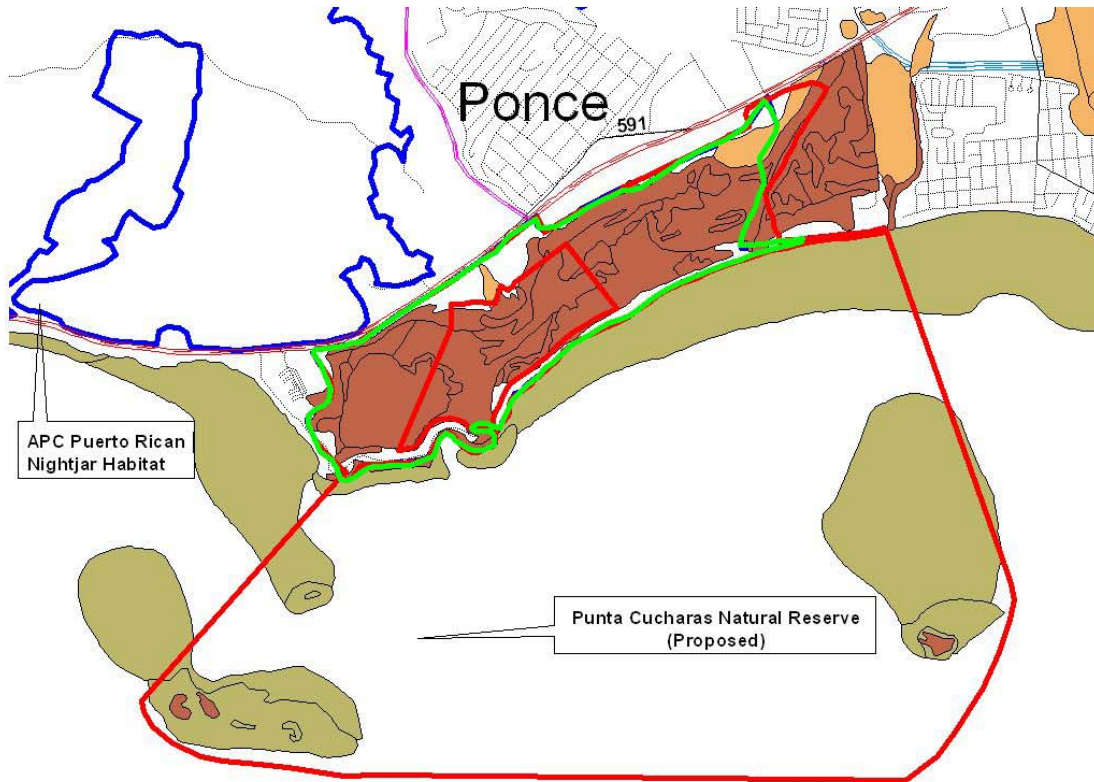
Conservation Recommendations:

This area should be designated as Punta Cucharas Natural Reserve and elaborate a Management Plan. Some management recommendations are to restore the natural hydrology of the area and to reforest the zone with mangroves in the lagoons and woody species in the coastal forest.

References:

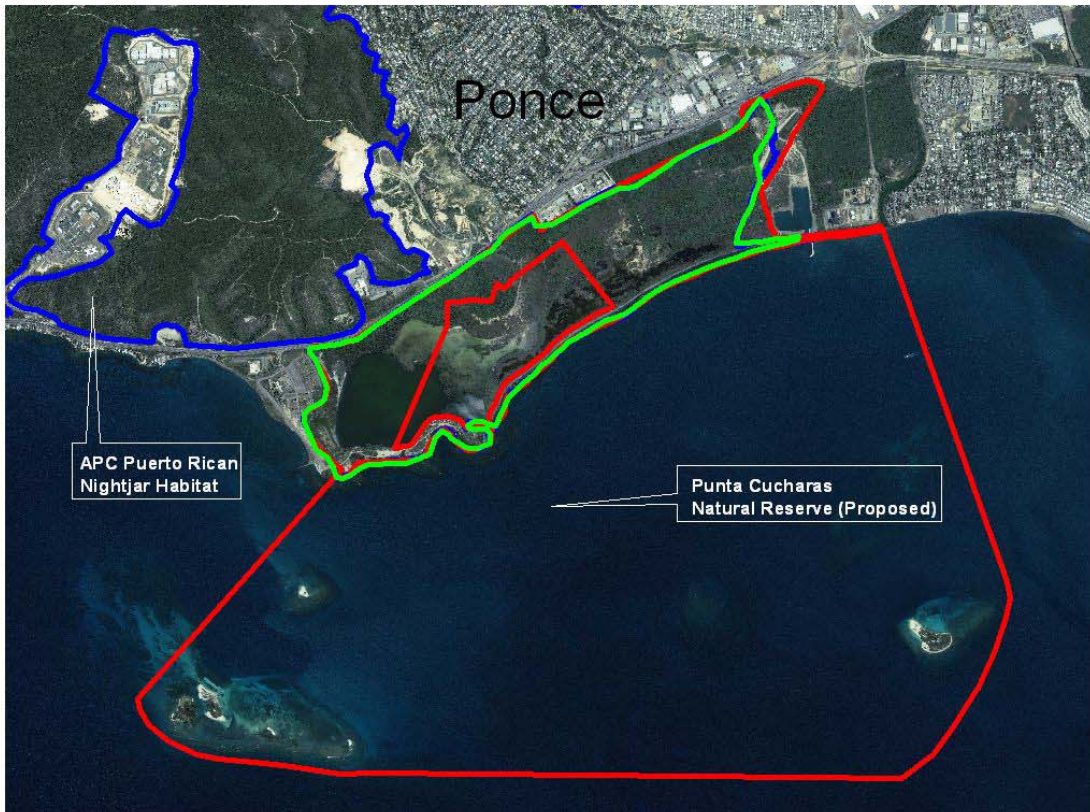
- Departamento de Recursos Naturales y Ambientales. 2004. Informe sobre valor natural Área Natural Punta Cucharas, Barrio Canas, Ponce. Área de Planificación Integral, División de Patrimonio Natural.
- Ventosa, Eduardo A.; M. Camacho, J.L. Chabert, J. Sustache and D. Dávila. 2005. Puerto Rico Waterfowl Focus Areas. Puerto Rico Department of Natural and Environmental Resources; North American Waterfowl Management Plan and Atlantic Coast Joint Venture. 82 pp.

Las Salinas Lagoon, El Tuque



- El tuque cwa.shp
- Punta cucharas.shp
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Areas con prioridad de conservacion.shp

Las Salinas Lagoon, El Tuque



1 0 1 2 3 Kilometers



- El tuque cwa.shp
- Punta cucharas.shp
- Areas con prioridad de conservacion.shp

49- Monte Guilarte State Forest, Adjuntas-Guayanilla-Peñuelas-Yauco, Puerto Rico

Area Description:

With elevations ranging from 760 m to 1205 m, Monte Guilarte State Forest (MGSF) is located between the municipalities of Adjuntas, Guayanilla, Peñuelas and Yauco, and it is divided in six segments. The whole area comprehends 1, 873.3 ha (4,766 cuerdas). From the year 2000 to 2004, the DNER has acquired 442.7 ha (1,126.27 cuerdas) to extend the forest, and still plan to expand the forest, buying in the near future new lands (Rubén Padrón pers. comm.). The forest lays in the lower montane wet and subtropical wet forest (Ewel and Whitmore 1973). Four vegetation associations are recognized: Sierra palm (upper slopes), Dwarf forest-type vegetation (high peaks), Eucalyptus and other plantations in the lower slopes and valleys (Moreno 1980).

MGSF is between 762 to 1,204 m at sea level. The importance of the forest lies in the presence of basins: The entire area is a watershed: twelve rivers travel in the forest (Padrón Vélez 2001). The four major rivers are: Río Grande de Arecibo, Río Grande de Añasco, Río Guayanilla and Río Grande (Silander et al. 1986). These rivers gave energy to the hydroelectric of the municipalities of Peñuelas and Yauco, nourishing with fresh water the municipalities nearby (Rubén Padrón pers. comm.).

The major attraction of the forest lies in the presence of the two trails available: Silla Calderón trail and Monte Guaraguao trail (Monte Guilarte trail), in which visitors can admire the canopy of the forest (Rubén Padrón, pers. comm.). There are also rustic facilities to stay overnight that include cabins with beds, bathrooms and barbecue areas.

The list of trees in the MGSF is of 227 species (Padrón 2001). These species are divided in two zones: Sierra Palm Forest *Prestoea montana* among with Caimitillo *Micropholis spp.* and the Tabaiba *Sapium laurocerasum*. An evergreen forest with low trees with small leaves characterizes the highest peaks, such as *Tabebuia scumanniana* and *Ocotea spatulata*. In the whole forest visitors can admire also plantations of Eucalyptus tree and Capá prieto (Vidal and Padrón 2001).

Among the endemic tree species reported are: Helecho gigante de Sierra *Cyathea bryophila*, Helecho *C. dryopteroides*, Helecho gigante espinoso *C. portoricensis*, Royal palm *Roystonea borinquena*, Areca palm *Chrysalidocarpus lutescens*, Manaca palm *Calyptronoma causiarum*, Puerto Rican hat palm *Sabal causiarum*, Fragrant higuillo *Piper blattarum*, Ortegón *Coccoloba swartzii*, Uvera *C. pyriformis*, Moralón *C. rugosa*, Jaguilla *Magnolia portoricensis*, Nemocá *Ocotea moshata*, Tetas de burra *Hirtella rugosa*, Almendrillo *Byrsonimia wadsworthii*, Cedro macho *Hyeronima clusoides*, Acebo *Ilex sintenisis*, Palo de Ramón *Banara vanderbiltii*, Majagua brava *Daphnopsis philippiana*, Ceboruquillo *Thouinia striata*, Maga *Montezuma speciosissima*, Guayabota *Eugenia stahlia*, Guasabara *E. eggersii*, Copiosa *E. stwardsonii* (Padrón 2001).

Special Recognition:

The area was established as a Forest in 1935 (Silander et al. 1986). In 2004, BirdLife International and SOPI recognized MGSF as an Important Bird Area. For the first time MGSF is recognize as a CWA of primary importance.

Wildlife:

Birds

Sixty one bird species have been reported in the MGSF: the vulnerable Sharp-shinned hawk *Accipiter striatus* (nesting), Red-tailed hawk *Buteo jamaicensis*, Scaly-naped pigeon

Patagioenas squamosa, Mangrove cuckoo *Coccyzus minor*, Green mango *Anthracothorax viridis*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Puerto Rican Vireo *Vireo latimeri*, Black-whiskered vireo *V. altiloquus*, Red-legged thrush *Turdus plumbeus*, Pearly-eyed thrasher *Margarops fuscatus*, Black-throated blue warbler *Dendroica caerulescens*, Black-throated green warbler *D. virens*, Bananaquit *Coereba flaveola*, Puerto Rican Spindalis *Spindalis portoricensis*, Antillean Euphonia *Euphonia musica*, Black-faced grassquit *Tiaris bicolor*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Greater Antillean Oriole *Icterus dominicensis*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Puerto Rican Screech owl *Megascops nudipes* (Moreno, 1980; SOPI 2004). Turkey vulture *Cathartes aura*, American kestrel *Falco sparverius*, White-crowned heron *Patagioenas leucocephala*, Zenaida dove *Zenaida aurita*, White-winged dove *Zenaida asiatica*, Common ground dove *Columbina passerina*, Ruddy quail-dove *Geotrygon montana*, Key west quail-dove *Geotrygon chrysis*, Short-eared owl *Asio flammeus*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Pewee *Contopus portoricensis*, Cave swallow *Petrochelidon fulva*, Caribbean Martin *Progne dominicensis*, Black and white warbler *Mniotilta varia*, Northern parula *Parula americana*, Elfín wood warbler *Dendroica angelae*, Cape may warbler *D. tigrina*, Northern waterthrush *Seiurus noveboracensis*, Louisiana Waterthrush *Seiurus motacilla*, Ovenbird *Seiurus aurocapilla*, American Redstart *Setophaga ruticilla*, Puerto Rican tanager *Nesospingus speculiferus*, Cattle egret *Bubulcus ibis*, Green heron *Butorides virescens*, Northern mockingbird *Mimus polyglottos*, Shiny cowbird *Molothrus bonariensis*, Adelaide's warbler *Dendroica adelaidae*, Blackpoll warbler *D. striata*, Black-throated green warbler *D. virens*, Snowy egret *Egretta thula*, Great egret *Ardea alba*, Yellow-faced grassquit *Tiaris olivacea*, Greater Antillean Grackle *Quiscalus niger*, Orange cheeked waxbill *Estrilda melpoda* (Rubén Padrón Data 2002-2005).

Reptiles

Puerto Rican pygmy anole *Anolis occultus*, Upland grass anole *A. krugii*, Yellow bearded anole *A. gundlachi*, Emerald anole *A. evermanni*, Puerto Rican giant anole *Anolis cuvieri*, Puerto Rican galliwasp *Diploglossus pleei*, Puerto Rican boa *Epicrates inornatus* (DRNA 1998).

Amphibians

Mottled coqui *Eleutherodactylus eneidae*, Common coqui *E. coqui*, Grass coqui *E. brittoni*, Puerto Rican coqui *E. portoricensis* (DRNA 1998).

Mammals

Red fruit bat *Stenoderma rufum* (DRNA, 1998). Puerto Rican longed-tongued bat *Monophyllus redmani portoricensis*, Insular long-tongued bat *M. plethodon frater*, Jamaican fruit-eating bat *Artibeus jamaicensis*, Antillean fruit-eating bat *Brachyphylla cavernarum* (Moreno, 1980).

Critical plants:

Woodbury et al. (1975) listed 31 rare or endangered plant species: 17 trees; 7 shrubs, 4 herbs; and 3 epiphytes. Three plant species are classified as critical elements: West Indian walnut *Juglans jamaicensis*, Palo de Ramón *Banara vanderbiltii*, *Nephelea portoricensis* (DRNA 1998).

Threats:

As in other forest in Puerto Rico, special use permits have been granted for various purposes including housing and agriculture.

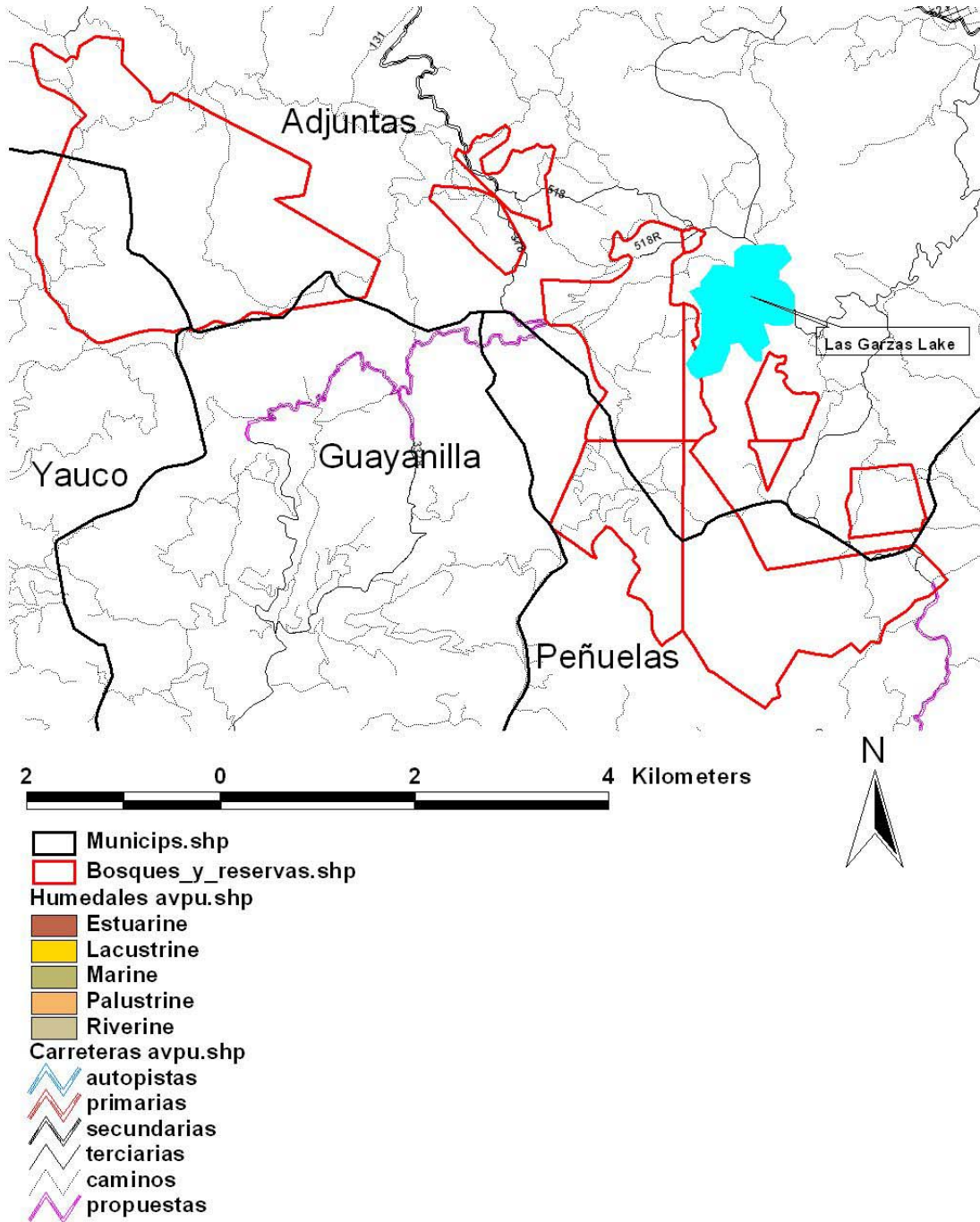
Conservation Recommendations:

To acquire the terrains that comprehends the abandoned coffee plantations within the forest boundaries. To acquire the terrains between the six patches that comprehends the Guilarte State Forest to make a single unit. To maintain the reforestation activities with native trees such as the endangered Matabuey *Goetzega elegans*, the vulnerable Puerto Rican manac palm *Calyptrionoma rivalis*, Moralón *Coccoloba pubescens*, Ortegón *Coccoloba swartzii*, Caobilla *Podocarpus coriaceus*, Capá prieto *Cordia alliodora*, Ausubo *Manilkara bidentata* and Cedar tree *Cedrela odorata* among others to augment the biodiversity of the forest (Rubén Padrón pers. comm.).

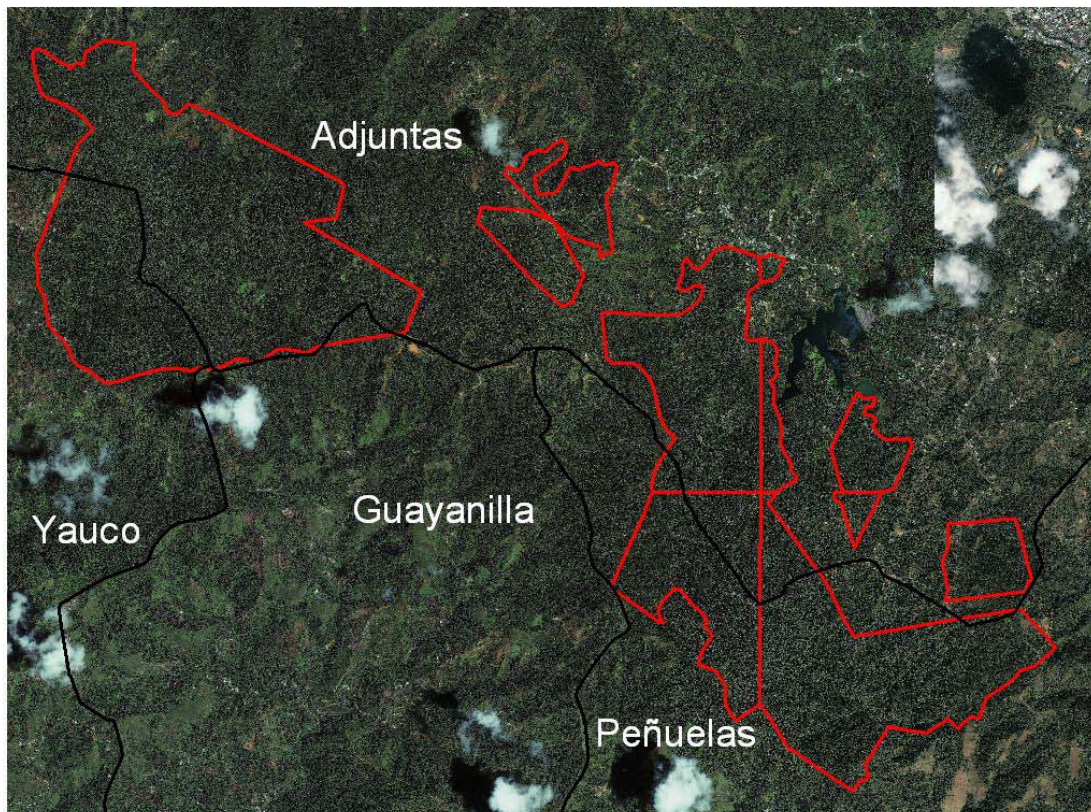
References:



- DRNA. 1998. Bosque Estatal de Guilarte. Hoja Informativa del Departamento de Recursos Naturales y Ambientales, Negociado del Servicio Forestal. Redacción y diseño: Nydia Y. Reyes, Rossana Vidal, Rubén Padrón.
- Ewel, J.J., and J.L. Whitmore. 1973. The ecological life zones of Puerto Rico and the U.S. Virgin Islands. U.S. Dept. Agric. For. Serc. Res. Pub. ITF-18. Rio Piedras, P.R. 71 pp
- Moreno, Jorge A. 1980. Wildlife Management Plan for Monte Guilarte Forest. Puerto Rico Department of Natural Resources, Scientific Research Division, San Juan, P.R.
- Padrón Vélez, R. 2001. Algunos datos de siembra de árboles en el Bosque de Guilarte y revisión de la lista preliminar de sus árboles. XXIV Simposio de Recursos Naturales. Departamento de Recursos Naturales y Ambientales. San Juan, Puerto Rico. Pp. 14-33.
- Vidal, R. and R. Padrón. 2001. Bosque Estatal de Guilarte. Hoja Informativa del Departamento de Recursos Naturales y Ambientales. Negociado del Servicio Forestal Orienta. San Juan.

Monte Guilarte State Forest



Monte Guilarte State Forest



-  Municips.shp
-  Bosques_y_reservas.shp

50- Punta Verraco, Cerro Toro and Punta Ventana, Guayanilla, Puerto Rico

Area Description:

The area is located along the southern coast of Puerto Rico, south the town of Guayanilla. The elevation between the site ranges from about sea level to more than 80 m. For a floristic composition and structure of the vegetation, see Areces 2003.

Punta Verraco has an area of 125 ha and consists almost entirely of dry forest with a canopy of about 4-8 m and includes some areas of cactus and low scrub. A mangrove swamp (about 10 ha) borders it to the north, and the Caribbean Sea to the south. Cerro Toro is slightly less forested and scrubbier than Punta Verraco. It has an area of 46 ha. Punta Verraco and Cerro Toro are grouped together on the eastern side of the area. They are separated from Punta Ventana by an ancient floodplain of the Yauco River. Cerro Toro is a dry forest, with a similar composition of Punta Ventana and Punta Verraco on the top. Punta Ventana has taller and dense dry forest (like the adjacent Guánica State Forest). This forest, with an area of 79 ha, borders the Guánica State Forest. Between Cerro Toro and Punta Ventana, there is a beach, sand dunes, scrub vegetation, and flat lands consisting of Salicornia marsh and bare dirt/mud. In recent decades, these forests were harvested for fence stakes, supports for fruit trees, and wood for charcoal production (González 2003; Guarnaccia 2004).

Ownership/Protection:

All of the properties are privately owned by WindMar RE.

Special Recognition:

In previous documents, this area was named as Lluveras. Raffaele and Duffield (1979) classified this CWA of secondary importance. Then, Cardona and Rivera (1988) upgrade the status to primary. In 2004, BirdLife International and SOPI recognized Punta Verraco as an Important Bird Area. These areas support the highest population of the endangered Puerto Rican Nightjar. Kerlinger (2003) calculate the mean abundance of one nightjar every 7.6 ha. Today, we recognized Punta Verraco, Cerro Toro and Punta Ventana as a prime wildlife area.

Wildlife:

Birds

Forty-one bird species are reported: in the mangrove areas: Brown pelican *Pelecanus occidentalis*, Osprey *Pandion haliaetus*, Little blue heron *Egretta caerulea*, Snowy egret *E. thula*, Tricolored heron *E. tricolor*, Great egret *Ardea alba*, Common moorhen *Gallinula chloropus*, Black-necked stilt *Himantopus mexicanus*, Spotted sandpiper *Actitis macularia*, Stilt sandpiper *Calidris himantopus*, Belted kingfisher *Ceryle alcyon*, Yellow warbler *Dendroica petechia*, Bank swallow *Riparia riparia*, and Cave swallow *Petrochelidon fulva*. In the beach area and adjacent marsh: Sanderling *Calidris alba*, Semipalmated sandpiper *C. pusilla*, Semipalmated plover *Charadrius semipalmatus*, Lesser yellowlegs *Tringa flavipes*, and Royal terns *Sterna maxima*. In the Punta Verraco forest: White-winged dove *Zenaida asiatica*, Common ground dove *Columbina passerina*, Mangrove cuckoo *Coccyzus minor*, Puerto Rican Nightjar *Caprimulgus noctitherus*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Flycatcher *Myiarchus antillarum*, Black and white warbler *Mniotilta varia*, Adelaide's warbler *Dendroica adelaidae*, Prairie warbler *D. discolor*, Indigo bunting *Passerina cyanea*, Puerto Rican Bullfinch *Loxigilla portoricensis*, and Brown pelican *Pelecanus occidentalis*. In farm fields near, east of the area: Red-tailed hawk *Buteo jamaicensis*, Turkey vulture *Cathartes aura*, Gray kingbird *Tyrannus dominicensis*, Northern mockingbird *Mimus polyglottos*, Bananaquit

Coereba flaveola, Yellow-faced grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, Shiny cowbird *Molothrus bonariensis*, Greater Antillean *Quiscalus niger* grackle, and Red-faced Bishop *Euplectes franciscanus* (Kerlinger, 2003).

Threats:

In the 1970's, Texaco cleared a 3.1 ha section of dry forest on Punta Verraco to quarry limestone in order to construct a causeway to Verraco peninsula for its proposed refinery. This action degraded 10 ha of mangroves by restricting water flow (González 2003; Guarnaccia 2004).

The land use surrounding the Punta Verraco, Cerro Toro and Punta Ventana includes heavy industrial (two electric power plants, liquid natural gas terminal, and defunct oil refinery), agricultural (Tropical Fruit), and conservation uses (Guánica State Forest). In 1999 this area was proposed for a large-scale transshipment facility known as the Port of the Americas. Today, the main threat is the habitat modification resulting from the WindMar Project (commercial wind energy project). The clearing of dry forest habitat to site access roads and wind tower base may result in the displacement of some of the Puerto Rican Nightjars that occurs in this CWA.

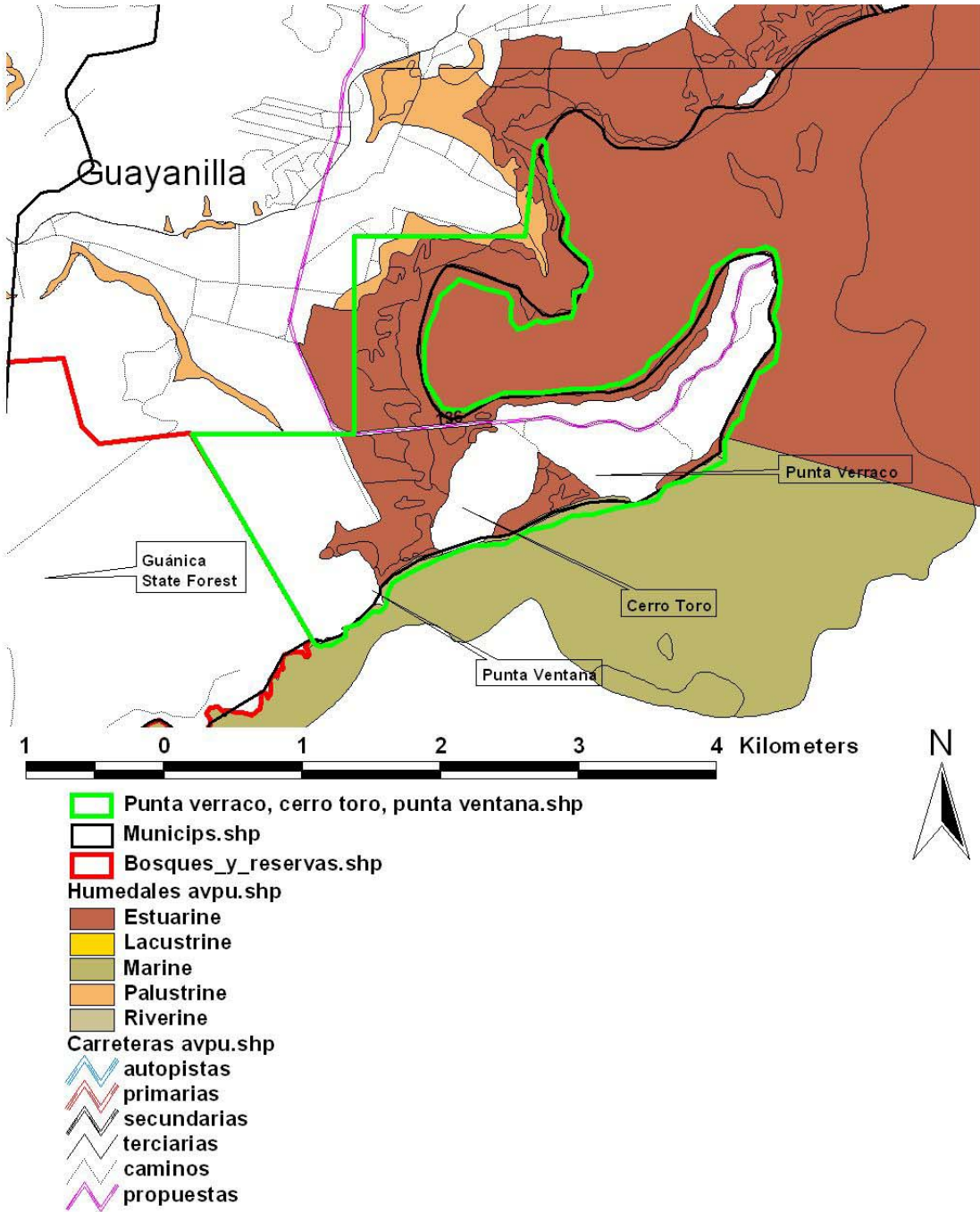
Conservation Recommendations:

It is important that, if this project will be approved, measures such as mitigations and reforestation actions should be undertaken. Federal and State agencies should monitor to minimize impacts of the habitat and population of the endangered Puerto Rican Nightjar.

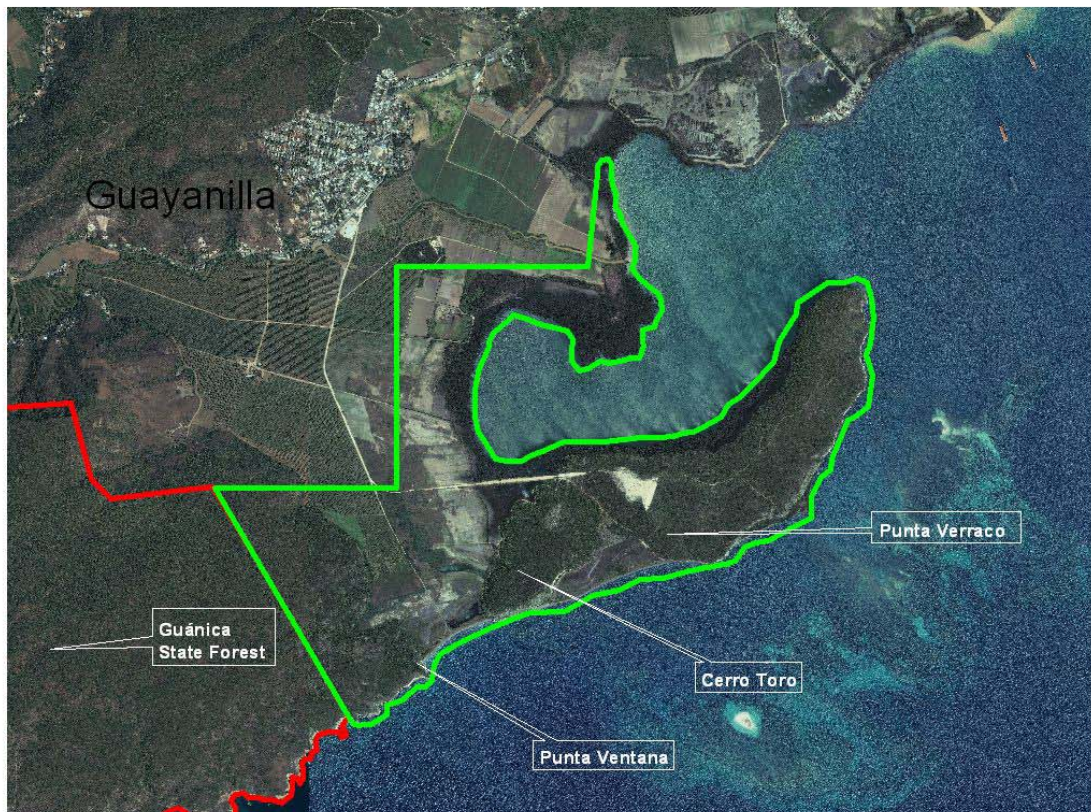
References:

- Areces, Alberto. 2003. Consideraciones sobre la flora y vegetación del área de Punta Verraco/Ventana, Guayanilla, Puerto Rico. Consultant's Report. 20 pp.
- González, Victor L. 2003. Proyecto WindMar RE, Guayanilla, Puerto Rico. Memorial Explicativo. WindMar Renewable Energy, Inc. Calle Granada 2429 Punta las Marías, San Juan, P.R.
- Kerlinger, Paul. 2003 Phase I avian risk assessment for the WindMar RE Project, Guayanilla, Puerto Rico. Report prepared for: WindMar Renewable Energy, Inc. Victor González, President. Curry & Kerlinger, L.L.C. P.O. Box 453, Cape May Point, NJ 08212
- Guarnaccia, John. 2004. Habitat Conservation Plan, WindMar RE Project, Guayanilla, Puerto Rico. Prepared for WindMar Renewable Energy, Inc. Victor González, President. Guarnaccia Associates, 1407 Finntown Road, Waldoboro, ME 04572.

Punta Verraco, Cerro Toro and Punta Ventana



Punta Verraco, Cerro Toro and Punta Ventana



-  Punta verraco, cerro toro, punta ventana.shp
-  Bosques_y_reservas.shp

51- Guayanilla Hills, Guayanilla, Puerto Rico

Area Description:

Guayanilla Hills are located southwestern Puerto Rico, about 8 km east of Guánica and 2 km from the coast in the subtropical dry forest life zone. The dominant plant community is a semideciduous coastal limestone forest as described by Cintrón and Beck (1977) and Lugo et al. (1978).

Since the past century, the lowland valleys surrounding the hills have been cleared and converted to agriculture. Above the valleys, the forest of the Guayanilla Hills does not appear to have been disturbed recently, although it was selectively lumbered and cut for charcoal during the 1800's (Vilella and Zwank 1987).

Ownership/Protection:

The Puerto Rico Energy Power Authority (PREPA) owns most of the lands. Others lands are privately own.

Special Recognition:

Raffaele and Duffield (1979) recognized Guayanilla Hills as one of the island's prime wildlife areas, due to the presence of the endangered Puerto Rican Nightjar. In 2004, BirdLife International and SOPI recognized the Guayanilla Hills as an Important Bird Area. Today, it stills an important habitat for the endangered Puerto Rican Nightjar and continues to be classified as a prime CWA.

Wildlife:

The second most important population of the endangered Puerto Rican Nightjars *Caprimulgus noctitherus* (263 individuals) exist in these hills, followed by the Guánica population (324) (Vilella and Zwank 1987).

Critical Plants:

In the area of Barrio Cedro, one individual of the endangered *Trichilia triacantha* (Bariaco) is present (Ventosa 1997).

Threats:

At present, privately owned forests occupied by nightjars are being rapidly converted to other uses. Forests are being cleared outside protected areas for agriculture, housing, road construction, resort development and industry. Other threats could be the construction of trails in the area for the maintenance of the PREPA power lines. The Small Indian mongoose *Herpestes auro punctatus*, a potential predator of nightjars, prefers open disturbed areas (Vilella and Zwank 1993). Also, because roads surround much of the hills, the area is subject to periodic fires.

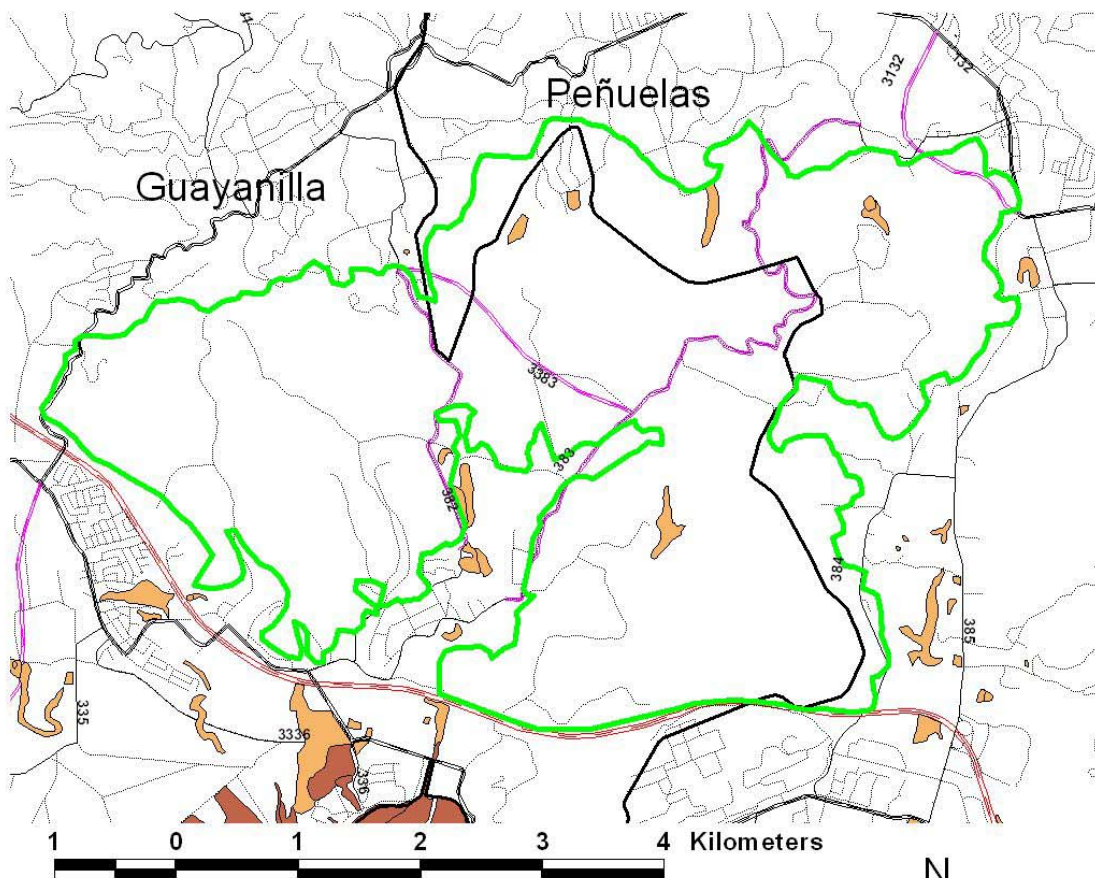
Conservation Recommendations:

Because the Guayanilla Hills continue to be an important area for the endangered Puerto Rican Nightjar, this area should be declared a critical habitat for the specie. The protection of the non-public habitat of the nightjar and a public education program should start to protect these private lands. Acquisition of approximately 1500 ha of dry forest would insure the protection of the best nightjar habitat found within this region (Vilella and Zwank, 1993a). Also, a reintroduction program for the endangered Bariaco should be implemented.

References:

- Cintrón, B.B., and B. F. Beck. 1977. Isolation of a plant community by karst processes in southwestern Puerto Rico. *Natl. Speleol. Soc. Bull.* 39: 73-79.
- Lugo, A. E., J.A. Gonzales-Liboy, B. Cintrón, and K. Dugger. 1978. Structure, productivity, and transpiration of a subtropical dry forest in Puerto Rico. *Biotropica* 10: 278-291.
- Ventosa Febles, E. A. 1997. Ecology and Reproductive Biology of *Trichilia triacantha* Urb. (Meliaceae). M.S. Thesis. University of Puerto Rico, Mayagüez Campus.
- Vilella, F.J., and P.J. Zwank. 1987. Density and distribution of the Puerto Rican Nightjar in the Guayanilla Hills. *Carib. J. Sci.* 23(2): 238-242.
- _____. 1993. Ecology of the small Indian mongoose in a coastal dry forest of Puerto Rico where sympatric with the Puerto Rican Nightjar. *Carib. J. Sci.* 29: 24-29.
- _____. 1993a. Geographic distribution and abundance of the Puerto Rican Nightjar. *J. Field Ornithol.*, 64(2): 223-238.

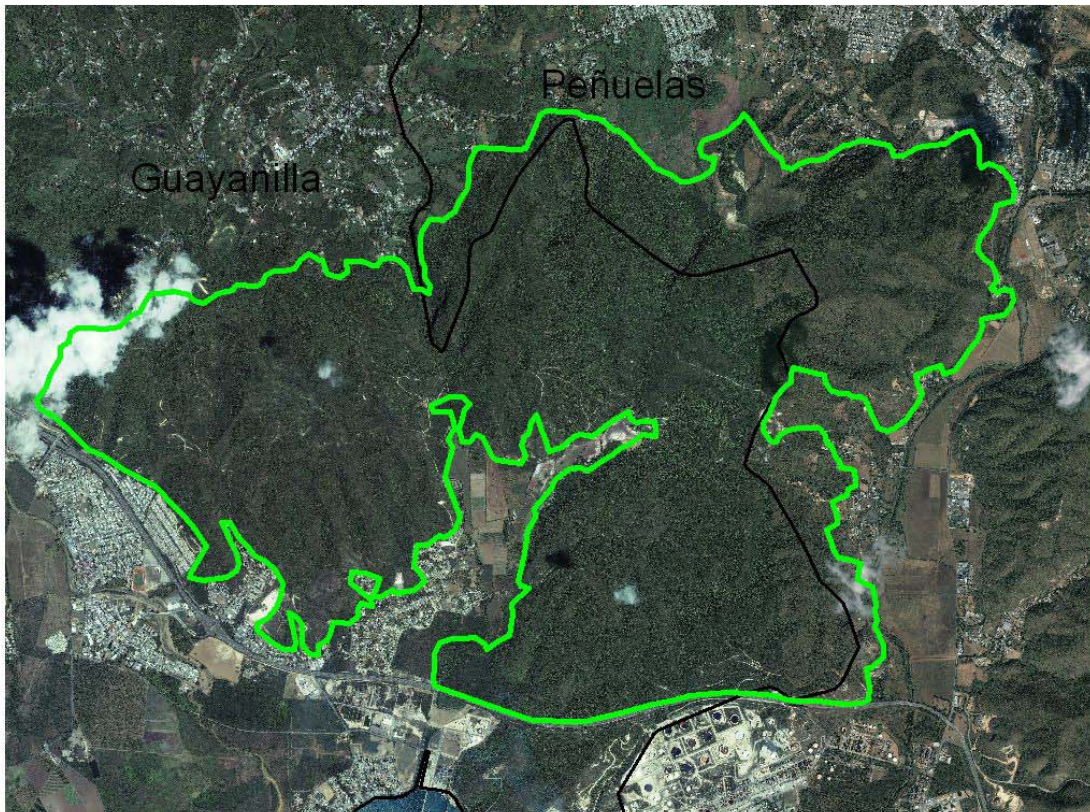
Guayanilla Hills



- Guayanilla hills cwa.shp
- Municipios.shp
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas



Guayanilla Hills



-  Guayanilla hills cwa.shp
-  Municip.sshp

Area Description:

Guánica Lagoon was the biggest natural freshwater wetland and lagoon located in Barrio Arena in the municipality of Guánica, in southwestern Puerto Rico (DRNA 1997). Prior to drainage, the Laguna Guánica system consisted of two major components; Laguna Guánica, a shallow open water body, and Ciénaga El Anegado, a freshwater herbaceous marsh dominated by cattail *Typha dominguensis*. These wetlands were drained in 1955 as part of an agricultural development project in the Lajas Valley.

The earliest aerial photography available for Guánica Lagoon and El Anegado dated from 1936. The open-water areas of the lagoon shown on that photo cover approximately 405 ha. Río Loco is visible entering the lagoon on the east side of the photo, and discharge to Bahía Guánica by a separate channel about 150 m south of the entrance point. Sugarcane was the predominant irrigated crop, and sugarcane fields are evident around the periphery of the lagoon.

The lagoon historically received water from two sources. The 145 km² watershed within Lajas Valley drained through El Anegado and hence into the lagoon. The portion of the Río Loco watershed above the lagoon also contributed water, in excess of irrigation diversions by rivers intakes. The lagoon discharged through the downstream channel of Río Loco and thence into Bahía Guánica. Given the straight-line (canal-like) configuration of the Río Loco channel entering Guánica Lagoon; it is apparent that the river was artificially diverted into the lagoon, presumably to use the lagoon as a natural reservoir to retain Río Loco flood flows (Morris and Associates 1999).

Anderson (1977) reported that both Ciénaga El Anegado and Guánica Lagoon were areas of ground water discharge, in addition to being surfacing depressions that collected surface water runoff. Thus, water was historically contributed to the lagoon and its associated wetlands from both surface and subsurface sources. Both wetland areas were characterized by saline soils, typical of areas where rainfall is low, evaporation is high, and drainage is poor.

In 1955, a 29 km long drainage canal was constructed to promote the development of agriculture in the Lajas Valley. This canal effectively drained the Guánica Lagoon water to the Lajas Valley for irrigation from Lago Loco to the Boquerón area (Morris and Associates 1998). Due to the high salinity soils, agriculture activities have been impossible (USDA 2000).

The DNER desires to study the feasibility of restoring water levels in the Guánica Lagoon area to re-establish natural wetland conditions and functions insofar as possible, restoring the lagoon and its associated peripheral wetlands as a freshwater wildlife habitat. Two feasible restoration alternatives have been considered to restore water level in the former Guánica Lagoon: 1-Restore North Side of Lagoon only- Under this alternative a 2.7 mile long dike is constructed along the north side of the existing Lajas Valley drainage canal. This alternative was found to be of relatively low cost (\$1.0 million). The proposed long dike is a structure that poses a significant flood hazard in the case of failure. This alternative is the one that produces the smallest restoration benefits. 2-Restore Near-Natural Conditions (Complete Lagoon Restoration)- Under this alternative a water control structure is installed at the eastern end of the lagoon, immediately downstream of the confluence between Río Loco and the Lajas Valley irrigation canal. This structure will raise the water level to 3.4m in both Lajas Valley drainage canal and the lagoon, thereby flooding the lagoon. It will also raise ground water levels in the upstream El Anegado area, where it is expected to cause water logging of soils. It has the advantage of creating the highest restoration benefits. It will also have the largest land use impacts, including some agricultural impacts, although none of the soils impacted under this

alternative are classified as having high agricultural productivity. The cost was estimated in \$2.8 million, which includes land acquisition (Morris and Associates 1999).

Ownership/Protection:

In the terrains that used to lay the lagoon there is a total of nine properties, of which five are private and four are public. In El Anegado there are a total of 35 properties of which 30 are privates and five are public. The DNER suggestions are to restore first the lagoon and then to study the possibility to integrate El Anegado. This due to the viability to acquire the terrains (Letter from P. Gelabert, DNER Secretary to N. Burgos, President of the PR Planning Board 1994).

Special Recognition:

Raffaele (1979) recognize the Guánica Lagoon a primary area for wildlife based on its potential for restoration for waterfowl and fresh water marsh birds. Cardona and Rivera (1988) classified this area as of secondary importance to wildlife based on its potential for restoration. Recently the DNER has sponsored some studies to restore this area for wildlife habitat, recreational fishing and ecotourism (Morris and Associates 1998 and 1999). Until the completion of the possible restoration, we concurred with Cardona and Rivera to recognize this area as one of secondary importance to wildlife.

Wildlife:

Published faunal descriptions for Guánica Lagoon and El Anegado are limited to the bird fauna and are primarily found in Wetmore (1916), Beatty (1931) and Danforth (1931). Oral history accounts by older residents in the area mention that the types of fish and crustaceans formerly caught in the lagoon included Tarpon fish *Megalops atlanticus*, Snook *Centropomus undecimalis*, Pluma fish *Calamus pennatula*, White mullet *Mugil curema*, Guavina *Guavina guavina*, Chopas, Sardines, Shrimps and Land crabs. The lagoon was also used for waterfowl hunting, plus passive enjoyment of the lagoon's beauty (Morris and Associates 1999).

The Natural Heritage Division of the DNER was consulted and it was determined that there are three listed rare species in the watershed of Guánica Lagoon: *Cuscuta indecora*, *Jacquinia revoluta* and *Leptocereus quadricotatus*. Also listed, as inside of the lagoon watershed was the endangered Puerto Rican Nightjar *Caprimulgus noctitherus*. Over 70 rare and endangered plant and animal species are listed to habitat the Lajas Valley and its surrounding forests and bays. Historical records indicate that even more of the currently listed species, mostly birds, used to habitat the Guánica Lagoon area prior to its drainage. It is expected that these species will benefit from the lagoon restoration (Morris and Associates 1999).

Some of the birds that used to live in the Guánica Lagoon: Common gallinule *Gallinula chloropus*, Killdeer *Charadrius vociferus*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Puerto Rican Tody *Todus mexicanus*, Red eyed vireo *Vireo olivaceus*, Yellow warbler *Dendroica petechia*, Black-necked stilt *Himantopus mexicanus*, Yellow breasted crane *Porzana flaviventer*, Great blue heron *Ardea herodias*, Pied-billed grebe *Podilymbus podiceps*, Great egret *Ardea alba*, Green heron *Butorides virescens*, Wilson's plover *Charadrius wilsonia* (CIIES 1990). West Indian Whistling duck *Dendrocygna arborea* was observed in 1878, and then was regularly observed in 1982-1983 (Island Resource Foundation and Bird Life International 2004); American black duck *Anas rubripes*, Blue-winged teal *A. discors*, White checked pintail *A. bahamensis*. In Anegado Lagoon: Glossy ibis *Plegadis falcinellus* (Barnes 1936). Ruddy duck *Oxyura jamaicensis*, used to be the commonest duck (Potts 1927). There are also historical reports of the presence of Glossy ibis *Plegadis falcinellus*, Northern pintail *Anas*

acuta, Green-winged teal *A. crecca*, American coot *Fulica americana*, Short-eared owl *Asio flammeus* and Gray breasted tree duck *Dendrocygna autumnalis* in Anegado Lagoon; and Tundra swan *Cygnus columbianus*, American coot and Green-winged teal in Guánica Lagoon (Ventura Barnés 1947).

Threats:

Actually, the terrains were the Guánica Lagoon used to be, were declared an Agriculture Reserve by the Puerto Rico Department of Agriculture. Unfortunately, these terrains are not as fertile to produce agricultural products (Morris and Associates 1999). The actual use of the terrains is for cattle grazing and for the production of hay (Morris and Associates 1998).

Conservation Recommendations:

The government of Puerto Rico should try to complete the lagoon restoration for the benefit of the wildlife, the general public and ecotourism.

References:

- Anderson, H. R. 1977. Ground Water in the Lajas Valley, Puerto Rico. USGS Water Resources Investigations, San Juan. Pp. 68-76.
- Beatty, H. A. 1931. Notes on birds observed at Guánica Lagoon, Puerto Rico. J. Dept. Ag. P. R. 15: 19-32.
- Barnes, V. 1936. New Records for the Puerto Rican Avifauna. General Notes. Auk Vol. LIII. July. Pp. 350-351.
- Cardona, J. E. 1991. Suplemento Técnico de Información Viabilidad de Restauración de la Laguna Guánica y El Anegado en Guánica y Lajas, Puerto Rico. Departamento de Recursos Naturales, Área de Investigaciones Científicas.
- Centro de Información, Investigación y Educación Social (CIIES). 1990. Erase una vez una laguna... O la increíble y triste historia de la desaparición innecesaria de la Laguna de Guánica. 4 pp.
- Danforth, S. T. 1931. Puerto Rican Ornithological Records. Jour. Dept. Agric., San Juan.
- Island Resource Foundation and Bird Life International. 2004. Threatened and Endangered Birds of the Insular Caribbean. West Indian Whistling duck *Dendrocygna arborea*. A service for biodiversity conservation in the Eastern Caribbean. www.irf.org/bdendr.htm
- Morris, G. L. and Associates. 1998. Hallazgos del Estudio Hidrológico-Hidráulico para la Restauración de la Laguna Guánica. Preparado para: Departamento de Recursos Naturales y Ambientales. 13 pp.
- _____. 1999. Guánica Lagoon Hydrology and Restoration Prepared for: Department of Natural and Environmental Resources. Funded by U.S. Environmental Protection Agency. Wetland Protection Program. 100 pp.

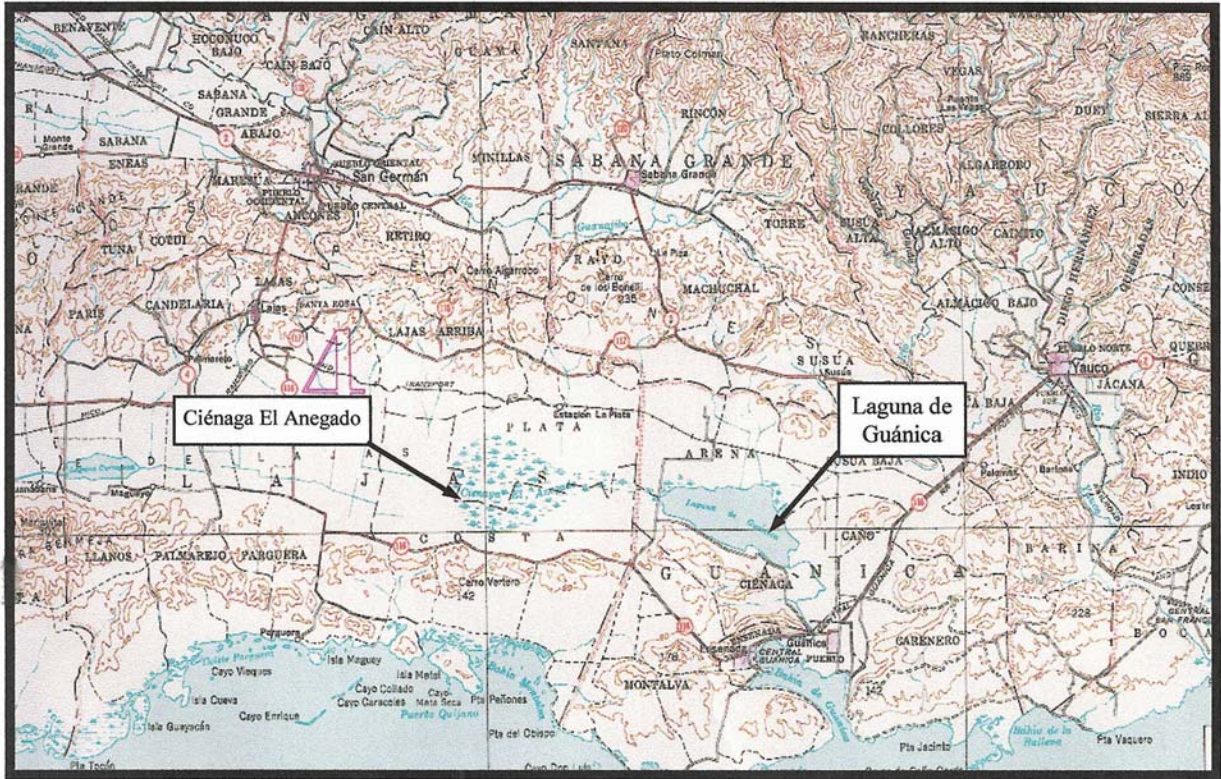
Potts, F. A. 1927. Notes on Porto Rican Birds. General Notes. Auk Vol. XLIV. January. Pp. 120-121.

USDA. 2000. Effects of the Proposed Guánica Lagoon Restoration on Agricultural Land. Proposed Plan of Work. Lajas Valley, Lajas, Puerto Rico. Requested by the Secretary of Agriculture Hon. Miguel Muñoz-Muñoz, Ph. D. 13 pp.

Ventura Barnés, J. 1947. Additions to the Puerto Rican Avifauna with notes on little known species. Auk Vol. 64. Pp. 400-406.

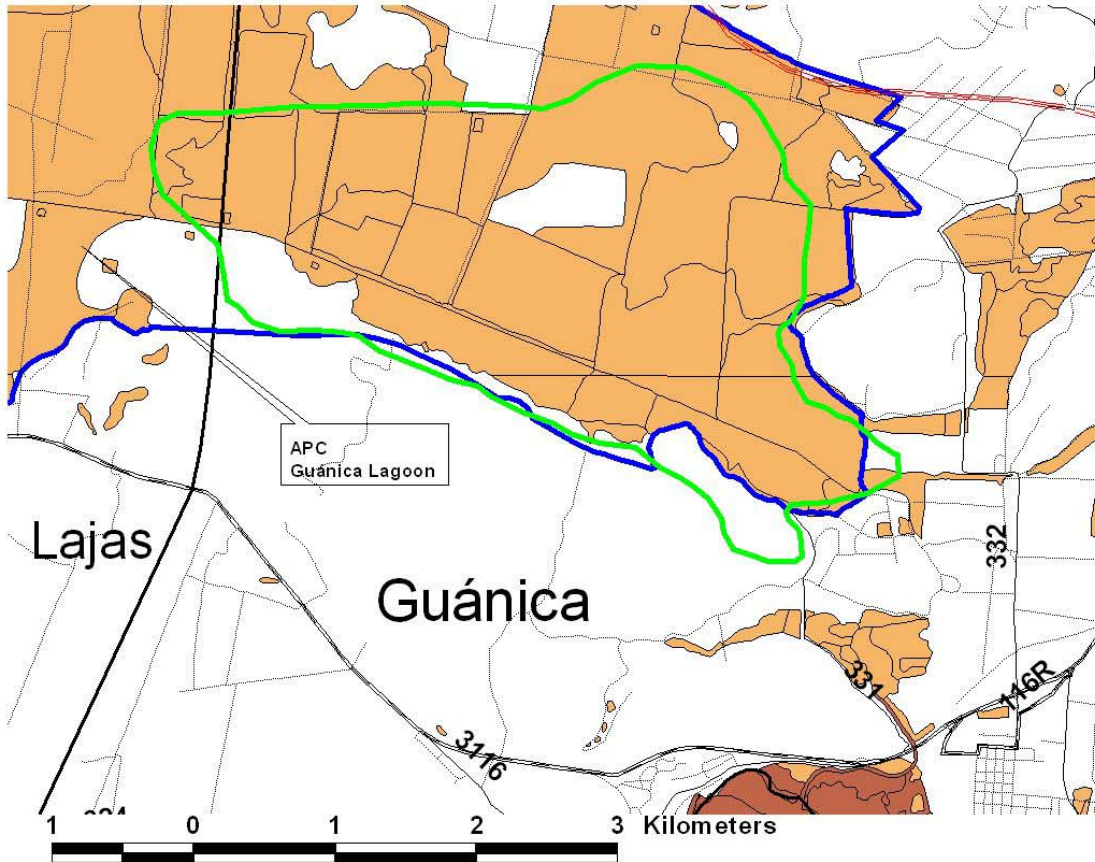
Wetmore, A. 1916. Birds of Porto Rico. U. S. Dept. Ag. Bull. 326, Washington, D.C.

Guánica Lagoon



Map obtained from Morris, G. L. and Associates, 1998.

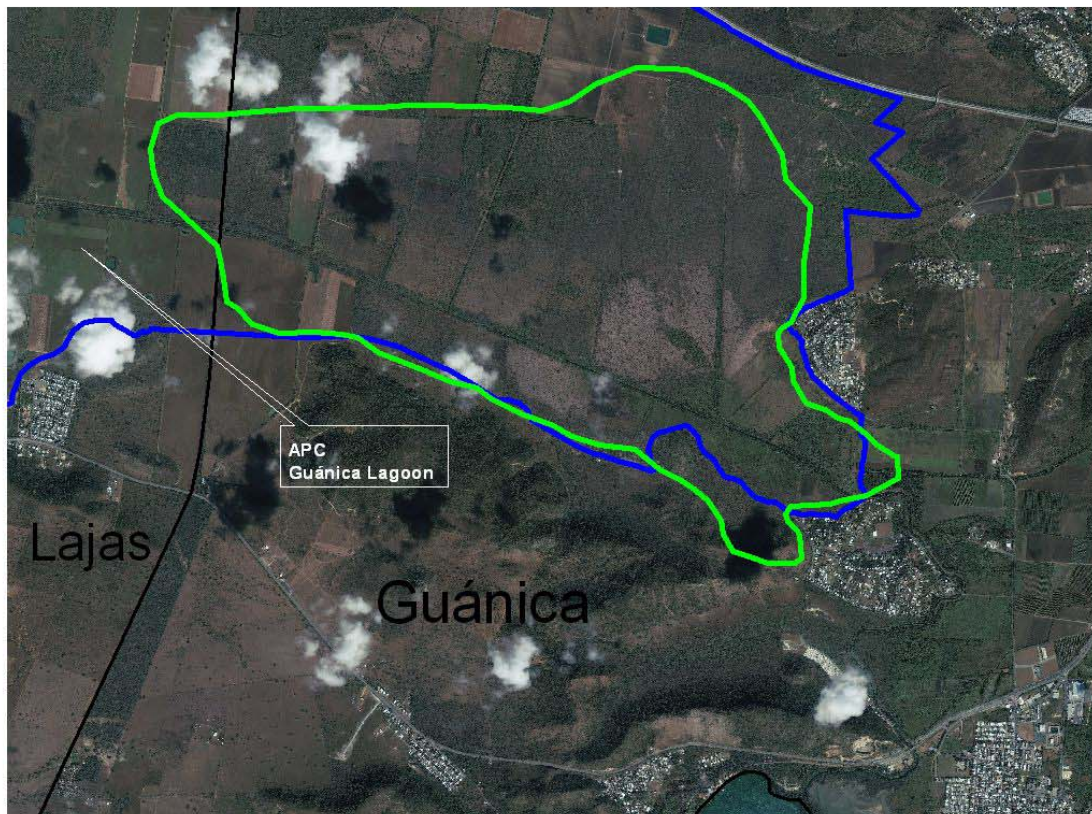
Guánica Lagoon



- Guánica lagoon.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Areas con prioridad de conservacion.shp
- Municips.shp
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine



Guánica Lagoon



-  Guánica lagoon.shp
-  Areas con prioridad de conservacion.shp
-  Municipios.shp

53- Guánica State Forest and Adjacent Lands, Guayanilla-Yauco-Guánica, Puerto Rico

Area Description:

The Guánica State Forest (GSF) lies in the southwestern part of Puerto Rico. The area is classified in the Subtropical Dry Forest Life Zone, a water-limited life zone (Ewel and Whitmore 1973). The forest and is composed of two portions, which together total about 4,000 ha (Murphy and Lugo, 1990), and includes about 500 species of vascular plants in 85 families (Quevedo et al. 1990). The point of the highest elevation is 228 m above sea level. Guánica Bay separates the eastern and western parts of the forest. Steep cliffs like rocks guard the entrance to the Bay. Rainfall is scarce, averaging 25 to 30 inches per year (DNR 1976).

GSF lies in the subtropical dry life zone and it is described as one of the best type of this vegetation in the tropics. Different types of scientific research are conducted in this Forest due to the presence of high diversity (Silander et al 1986).

The type of vegetation is varied and includes: mangroves; natural salt marsh; beaches; rocks and cactus; spiny forest; dry forest; evergreen forest; plantations and grass (DRN 1981). More recently, the DNER prepared a document to propose to the government the extension of the limits of the forest to include Ballena Bay (Bahía Ballena) due to the ecological importance of the area and to the presence of critical elements of the flora and fauna of Puerto Rico (DRNA 1996). The DNER is proposing the extension of the Forest since 1976 in the The Master Plan for the Commonwealth Forests of Puerto Rico.

Ownership/Protection:

The GSF is a public land administered by the DNER. The adjacent lands are privately owned.

Special Recognition:

The area was declared a Forest in 1919. In 1981 was declared as a Biosphere Reserve by the UNESCO in recognition of its value as one of the best preserved dry forest in the world (Silander et al 1986). The GSF is also considered a Natural Reserve (DRNA 1996). Cardona ad Rivera (1988) included Bahía Ballena as part of the Puerto Rico Critical Coastal Wildlife Areas. Bahía Ballena fulfills the requirements to be included in the National Register of places with archeological values due to the Indian petroglyph find in the place (DRNA 1996). In 2004, Bird Life International and SOPI recognized GSF as an Important Bird Area. The GSF is known to support the only remaining breeding population of the endangered Puerto Rican Crested toad. Today, the GSF and adjacent land are recognized as a primary wildlife area.

Wildlife:

Birds

Forty seven bird species have been reported in GSF: Turkey vulture *Cathartes aura*, Red-tailed hawk *Buteo jamaicensis*, American kestrel *Falco sparverius*, Zenaida dove *Zenaida aurita*, Common ground dove *Columbina passerina*, Key west quail-dove *Geotrygon chrysis*, Ruddy quail-dove *G. montana*, Mangrove cuckoo *Coccyzus minor*, Yellow-billed cuckoo *C. americanus*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Smooth-billed ani *Crotophaga ani*, Puerto Rican Nightjar *Caprimulgus noctitherus*, Common nighthawk *Chordeiles minor*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Antillean Mango *Anthracothorax dominicus*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Puerto Rican Flycatcher *Myiarchus antillarum*, Puerto Rican lesser Antillean Pewee *Contopus portoricensis*,

Cave swallow *Petrochelidon fulva*, Caribbean Martin *Progne dominicensis*, Northern mockingbird *Mimus polyglottos*, Pearly eye thrasher *Margarops fuscatus*, Red-legged thrush *Turdus plumbeus*, Puerto Rican Vireo *Vireo latimeri*, Black-whiskered vireo *V. altiloquus*, Bananaquit *Coereba flaveola*, Adelaide's warbler *Dendroica adelaidae*, Yellow shouldered blackbird *Agelaius xanthomus*, Troupial *Icterus icterus*, Greater Antillean Oriole *Icterus dominicensis*, Greater Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, Antillean Euphonia *Euphonia musica*, Puerto Rican Spindalis *Spindalis portoricensis*, Yellow-faced grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, Puerto Rican Bullfinch *Loxigilla portoricensis*, American Redstart *Setophaga ruticilla*, Caribbean elaenia *Elaenia martinica*, Ovenbird *Seiurus aurocapilla*, Black and white warbler *Mniotilta varia*, Northern parula *Parula americana*, Prairie warbler *Dendroica discolor*, Prothonotary warbler *Protonotaria citrea* (Hill, 1975; DRN 1981). Magnificent frigatebird *Fregata magnificens*, Scaly-naped pigeon *Patagioenas squamosa*, White-crowned pigeon *P. leucocephala*, Bridled quail-dove *Geotrygon mystacea*, White-winged pigeon *Zenaida asiatica*, Puerto Rican Screech owl *Megascops nudipes*, West Indian night hawk *Chordeiles gundlachi*, Caribbean elaenia *Elaenia martinica*, Barn swallow *Hirundo rustica*, Black-throated blue warbler *Dendroica caerulescens*, Bobolink *Dolichonyx oryzivorus*, Greater Antillean Oriole *Icterus dominicensis*, Grasshopper sparrow *Ammodramus savannarum* (Hernández-Prieto 1993).

Reptiles

Roosevelt's Dwarf-Gecko *Sphaerodactylus roosevelti*, Nichol's Dwarf gecko *S. nicholsi*, Greater Antillean Leaf-toed gecko *Phyllodactylus wirshingi*, Crested anole *Anolis cristatellus*, Barred anole *A. stratulus*, Common grass anole *A. pulchellus*, Cook's anole *A. cooki*, Dryland grass anole *A. poncensis*, Puerto Rican Ground lizard *Ameiva exsul*, Blue-tailed ground lizard *A. wetmorei*, Slippery-backed mabuya *Mabuya mabouya sloanei*, Brook's house gecko *Hemidactylus brookii* Puerto Rican Racer *Alsophis portoricensis prymnus*, North American Worm lizard *Amphisbaena xera*, Garden snake *Arrhyton exiguum*, Grant's Blind snake *Typhlops granti*, Richard's Blind snake *T. richardi platycephalus*.

Amphibians

Puerto Rican Crested toad *Bufo lemur*, Puerto Rican Cooki *Eleutherodactylus coqui*, Antillean Frog *E. antillensis*, Whistling frog *E. cochranae*, Giant toad *Bufo marinus*, White-lipped frog *Leptodactylus albilabris*

Invertebrates

Gecarcinus ruricola, *Thyphlatya monae*

Critical Plants:

The GSF support the most important population of the endangered *Trichilia triacantha* ("Bariaco"), with a know population of 101 individuals (Ventosa 1997). New individuals within the forests had been discovered by the forest manager (M. Canals pers. comm.). Other critical plants are: *Leptocereus quadricostatus*, Brown nicker *Caesalpinia portoricensis*, Puerto Rico Stoper *Eugenia bellonis*, *Polygala cowellii*, *Linociera holdridgii*, *Epidendrum krugii*, *Erithalis revolute*, *Mitracarpus maxwelleae*, *M. polycladus*, *Randia portoricensis*, *Priva portoricensis*, *Ruppia anomala*, *Cordia rupicola*, *Portulaca caulerpoides*.

Threats:

In the past, part of the forest was cut for charcoal and fence posts production. Since 1930's the forest was protected from disruptive activities. In some areas (i.e., Barina), cutting and soil removal activities occurs within the forest properties. Proposals to establish paved roads through the forest and development of adjacent private land threaten Guánica Forest (Vilella and Zwank 1993). Also, because of the proximity of roads to the forest, the area is subject to periodic fire.

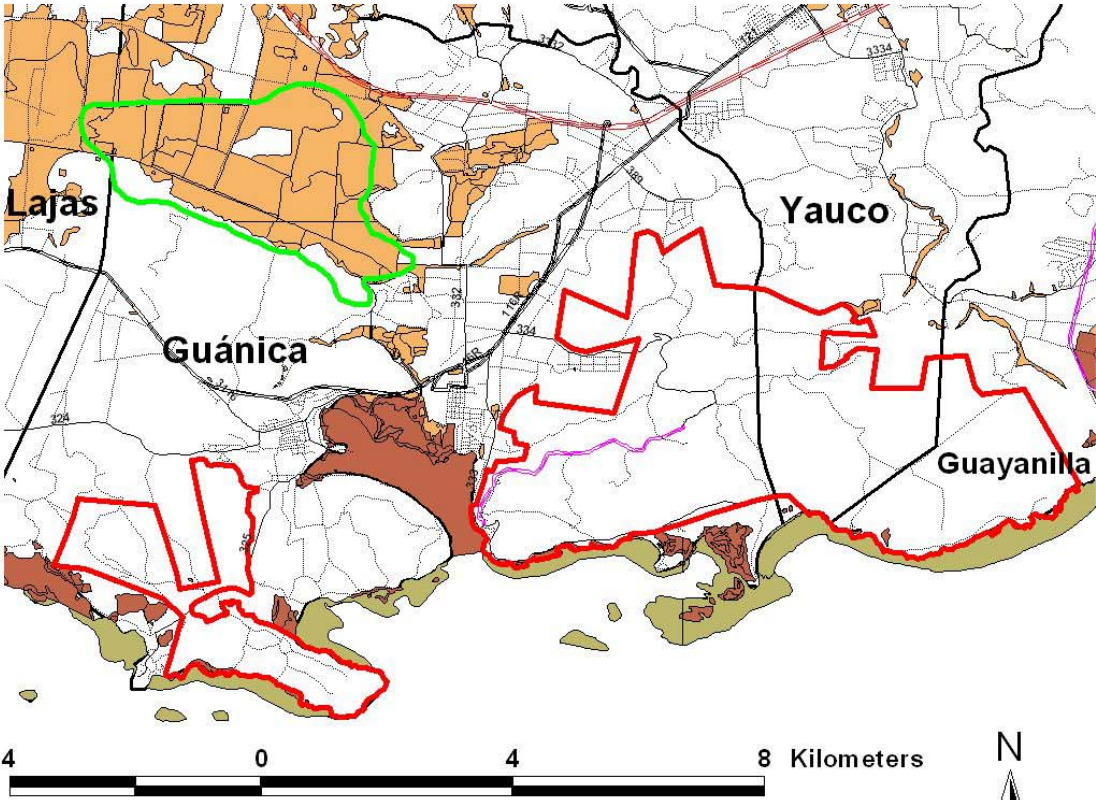
Conservation Recommendations:

The Commonwealth of Puerto Rico should start some efforts (i.e., leasing, mitigation, management agreement) to incorporate the adjacent lands to the properties of the GSF.

References:

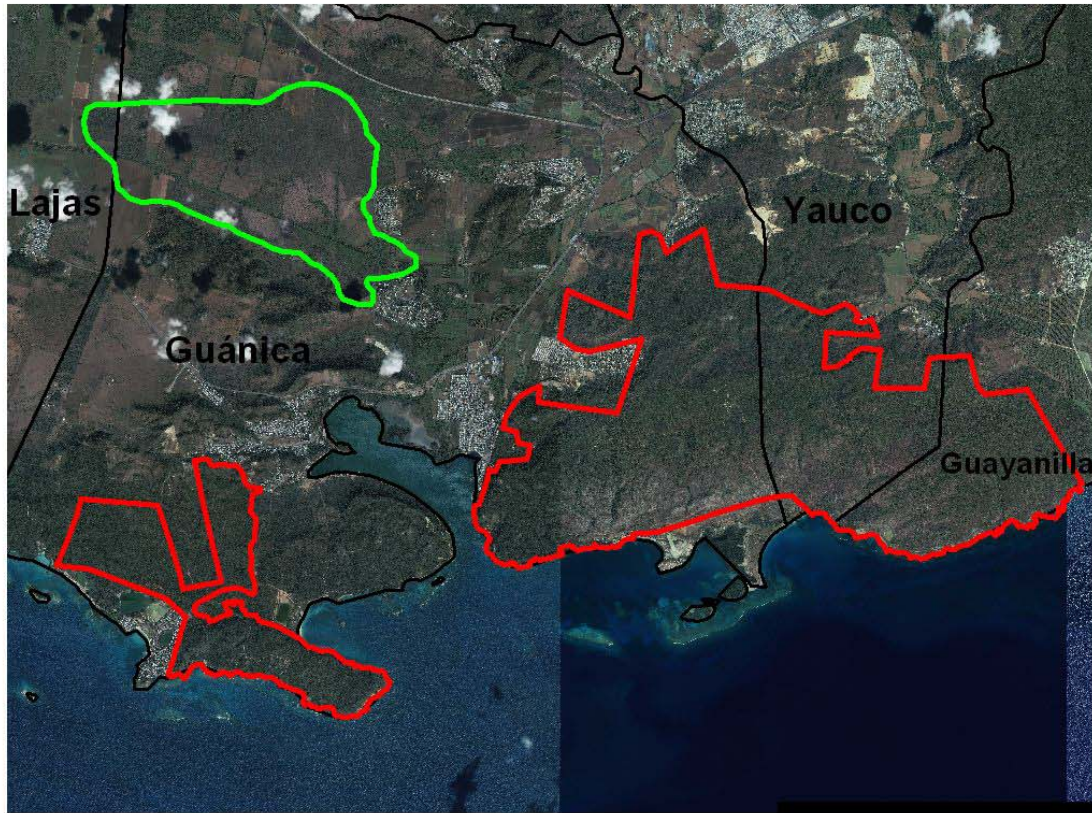
- Department of Natural Resources. 1976. The Master Plan for the Commonwealth Forests of Puerto Rico. Prepared for the Bureau of Outdoor Recreation by Area of Planning and Evaluation of Resources Division of Forest Planning.
- _____. 1981. Documento de Designación Reserva Natural Bosque Estatal de Guánica. Programa de Manejo de la Zona Costanera.
- Departamento de Recursos Naturales y Ambientales. 1996. Documento de Designación para la Extensión de la Reserva Natural del Bosque Estatal de Guánica. Segmento Ballena. Área de Planificación Integral. División de Patrimonio Natural. 63 pp.
- Ewel, J.J., and J.L. Whitmore. 1973. The ecological life zones of Puerto Rico and the U.S. Virgin Islands. U.S. Dept. Agric. For. Serc. Res. Pub. ITF-18. Rio Piedras, P.R. 71 pp.
- Henández-Prieto, E. N. 1993. Ecological Comparison of the Landbird Fauna of Two Subtropical Dry Forests in the West Indies. A thesis submitted to the Faculty of the Graduate School of the University of Colorado in partial fulfillment of the requirements for the degree of Doctor in Philosophy. Department of Environmental, Population and Organismic Biology. 406 pp.
- Hill, L. H. 1975. Unit Plan for the Management of the Guánica Forest Reserve. Department of Natural Resources. Forestry Task Force. 57 pp.
- Murphy, P.G. and A.E. Lugo. 1990. Dry forest of the tropics and subtropics: Guánica forest in context. *Acta Científica* 4: 15-24.
- Quevedo, V., S. Silander, and R. Woodbury. 1990. Plantas críticas y en peligro de extinción en el Bosque de Guánica. *Acta Científica* 4: 137-150.
- Ventosa Febles, E. A. 1997. Ecology and Reproductive Biology of *Trichilia triacantha* Urb. (Meliaceae). M.S. Thesis. University of Puerto Rico, Mayagüez Campus.
- Vilella, F.J., and P.J. Zwank. 1993. Ecology of the small Indian mongoose in a coastal dry forest of Puerto Rico where sympatric with the Puerto Rican Nightjar. *Carib. J. Sci.* 29: 24-29.

Guánica State Forest



- Bosques_y_reservas.shp
- Guánica lagoon.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine
 - Municipios.shp

Guánica State Forest



-  Guánica lagoon.shp
-  Bosques_y_reservas.shp
-  Municipios.shp

54- San Jacinto Salt Flats and Tamarindo Lagoon, Guánica, Puerto Rico

Area Description:

The San Jacinto Salt Flats (SJSF) is located east of the Guánica State Forest (GSF), south of road 333, and close to the Copamarina Hotel in Guánica. This area is subject of low rainfall and dries up seasonally.

Tamarindo Lagoon is located in the east side of the GSF, close to the breeding ponds of the endangered Puerto Rican Crested toad.

Ownership/Protection:

As recommended by Moreno and Pérez (1980), the SJSF was recently incorporated to the Guánica State Forest (GSF) as a Mitigation Plan (M. Canals pers. comm.). The Tamarindo Lagoon is also part of the GSF, administered by the DNER.

Special Recognition:

The SJSF was first included as a CWA in the 1980 Supplement to the Critical Wildlife Areas by Moreno and Pérez because it supports a number of migratory and resident shorebirds. Cardona and Rivera (1988) recognized this as a primary wildlife area. Today, although the area is now incorporated to the GSF lands, is somewhat degraded. Until some progress in terms of administration and protection of the wildlife resources is done, we classified the SJSF as one of secondary importance.

Because of its size, Tamarindo Lagoon was classified by Moreno and Pérez (1980) a secondary wildlife area. Today, Tamarindo Lagoon is a feeding ground of the vulnerable White-cheeked pintail and the hills surrounding the lagoon are habitat for the endangered Puerto Rican Nightjars. We upgrade this lagoon as a primary for wildlife.

Wildlife:

Birds in San Jacinto Salt Flats:

Red knot *Calidris canutus*, American Golden plover *Pluvialis dominica*, Whimbrel *Numenius phaeopus*, Great blue heron *Ardea herodias* (Moreno and Pérez, 1980). Brown pelican *Pelecanus occidentalis*, White-cheeked pintail *Anas bahamensis*, Blue-winged duck *A. discors* Common moorhen *Gallinula chloropus*, American coot *Fulica americana*, Roseate tern *Sterna dougallii*, Sandwich tern *S. sandvicensis*, Royal tern *S. maxima* (Cardona and Rivera, 1988). Magnificent frigatebird *Fregata magnificens*, Wilson's plover *Charadrius wilsonia*, Semipalmated plover *C. semipalmatus*, Black-necked stilt *Himantopus mexicanus*, Greater yellowlegs *Tringa melanoleuca*, Lesser yellowlegs *T. flavipes*, Sanderling *Calidris alba*, Semipalmated sandpiper *C. pusilla*, Ruddy turnstone *Arenaria interpres*, White-winged dove *Zenaida asiatica*, Common ground dove *Columbina passerina*, Northern mockingbird *Mimus polyglottos*, Yellow warbler *Dendroica petechia*, Bananaquit *Coereba flaveola*, Greater Antillean Grackle *Quiscalus niger*, Troupial *Icterus icterus*, House sparrow *Passer domesticus* (Terrestrial Resources data 2004).

Birds in Tamarindo Lagoon:

Turkey vulture *Cathartes aura*, American kestrel *Falco sparverius*, Killdeer *Charadrius vociferus*, Black-necked stilt *Himantopus mexicanus*, Stilt sandpiper *Calidris himantopus*, Lesser yellowlegs *Tringa flavipes*, Least sandpiper *Calidris minutilla*, Puerto Rican Flycatcher *Myiarchus antillarum*, Gray kingbird *Tyrannus dominicensis*, Cave swallow *Petrochelidon fulva*, Adelaide's warbler *Dendroica adelaidae*, Puerto Rican Bullfinch *Loxigilla portoricensis*,

Troupial *Icterus icterus*, White-cheeked pintail *Anas bahamensis* (Terrestrial Resources data 2004).

Threats:

Because the SJSF is adjacent of a hotel, parking lot and housing, this leads to the accumulation of garbage and deforestation along the edges. The Tamarindo Lagoon appears to be well protected.

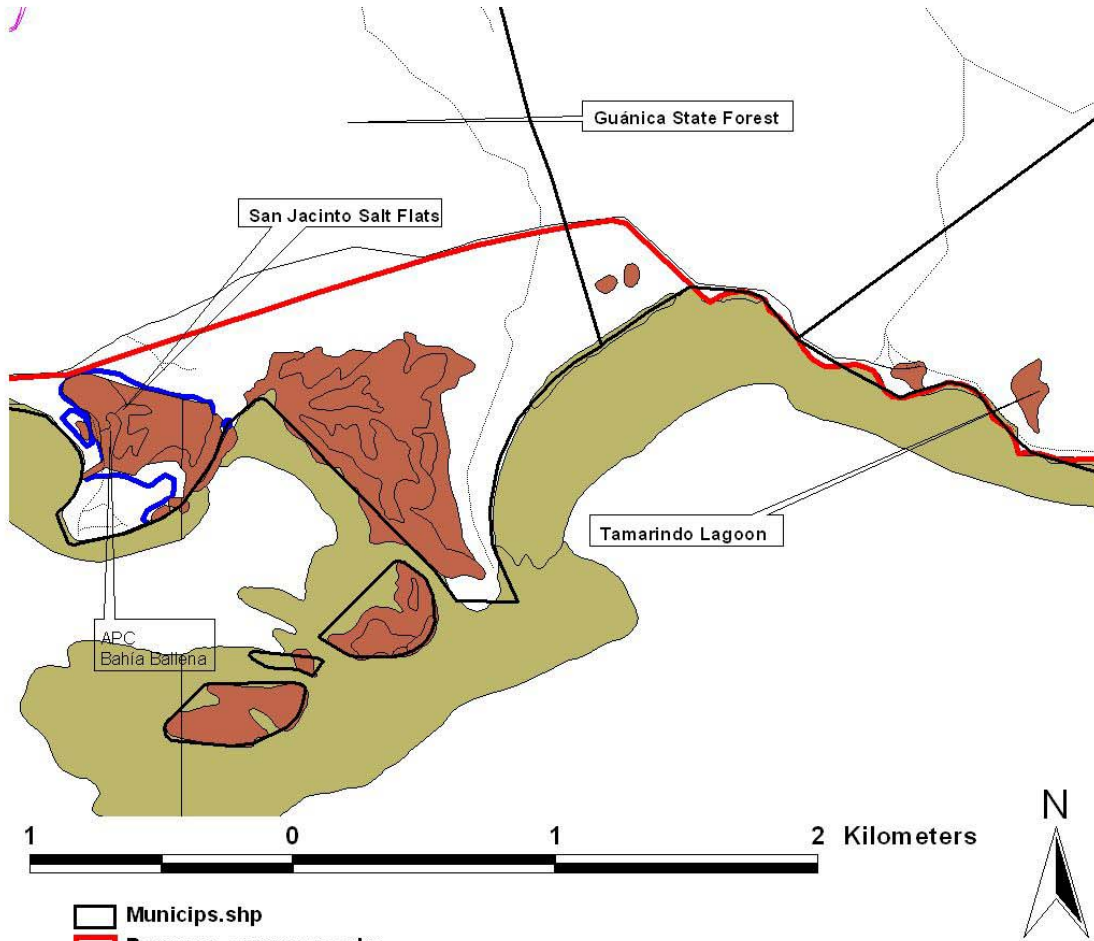
Conservation Recommendations:

In the SJSF, efforts must be made to prevent additional damage to this area. An education campaign should start in order to educate the tourist and locals about the importance of this saltflats and the incorporation of this land to the GSF property.

References:

None

San Jacinto Salt Flats and Tamarindo Lagoon



- Municipios.shp
- Bosques_y_reservas.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine
- Areas con prioridad de conservacion.shp

San Jacinto Salt Flats and Tamarindo Lagoon



-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

55- Susúa State Forest and Adjacent Lands, Yauco-Sabana Grande, Puerto Rico

Area Description:

The Susúa State Forest (SSF) has 1325 ha and is located in the municipalities of Yauco and Sabana Grande. The elevation varies from 80 to 473 m; the highest elevation is found in the northeast corner of the forest. It lies between the humid Central Cordillera and the dry coastal plains typical of the south coast. The forest represents a climatic transition zone and a combination of volcanic and serpentine soils (DNR 1976) and is in the subtropical moist forest life zone (Ewel and Whitmore 1973).

Originating at the headwaters of Río Loco, water flows through the Susúa Forest to Loco Dam and from there is distributed to agricultural lands in the Lajas Valley (DNR 1976). The Forest is the origin of four rivers: Río Loco, Río Coco, Río Cañas, Quebrada Grande (Silander et al 1986).

Ownership/Protection:

The SSF is a public land administered by the DNER.

Special Recognition:

It was declared a Forest in 1943 (Silander et al. 1986). Raffaele (1979) recognized this area as a prime for wildlife because it supports a small population of the endangered Puerto Rican Nightjar. In 2004, BirdLife International and SOPI recognized SSF as an Important Bird Area. This area is known to support a high endemism in plants and birds species. Because SSF has one of the few populations of the Puerto Rican Nightjar, we recognized this forest a prime wildlife area.

Wildlife:

Birds

Fifty-five bird species have been reported in the SSF: Yellow-crowned night heron *Nyctanassa violacea*, Green heron *Butorides virescens*, Cattle egret *Bubulcus ibis*, Red-tailed hawk *Buteo jamaicensis*, American kestrel *Falco sparverius*, Osprey *Pandion haliaetus*, Turkey vulture *Cathartes aura*, Zenaida dove *Zenaida aurita*, White-winged dove *Z. asiatica*, Common ground dove *Columbina passerina*, Scaly-naped pigeon *Patagioenas squamosa*, Key west quail-dove *Geotrygon chrysis*, Ruddy quail-dove *G. montana*, Scaly-naped pigeon *Patagioenas squamosa*, Yellow-billed cuckoo *Coccyzus americanus*, Mangrove cuckoo *C. minor*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Puerto Rican Nightjar *Caprimulgus noctitherus*, Common nighthawk *Chordeiles minor*, Antillean nighthawk *C. gundlachii*, Puerto Rican Screech owl *Megascops nudipes*, Short-eared owl *Asio flammeus*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Antillean Mango *Antracothorax dominicus*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Puerto Rican Flycatcher *Myiarchus antillarum*, Puerto Rican lesser Antillean Pewee *Contopus portoricensis*, Caribbean elaenia *Elaenia martinica*, Caribbean Martin *Progne dominicensis*, Cave swallow *Petrochelidon fulva*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Red-legged thrush *Turdus plumbeus*, Puerto Rican Vireo *Vireo latimeri*, Black-whiskered vireo *V. altiloquus*, Black and white warbler *Mniotilta varia*, Black-throated blue warbler *Dendroica caerulescens*, Adelaide's warbler *D. adalaidae*, Ovenbird *Seiurus aurocapillus*, Hooded warbler *Wilsonia citrina*, Bananaquit *Coereba flaveola*, Antillean Euphonia *Euphonia musica*, Puerto Rican Spindalis *Spindalis portoricensis*, Shiny cowbird *Molothrus bonariensis*, Greater

Antillean Oriole *Icterus dominicensis*, Troupial *I. icterus*, Orange cheeked waxbill *Estrilda melpoda*, Puerto Rican Bullfinch *Loxigilla portoricensis*, House sparrow *Passer domesticus*, Yellow-faced grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, American Redstart *Setophaga ruticilla* (Silander et al., 1986; L. Rosado 2003 unpublished data; J. Mercado et al., 2004 unpublished data).

Reptiles

Puerto Rican ground lizard *Ameiva exsul*, Blue tailed ground lizard *A. wetmorei*, Crested anole *Anolis cristatellus*, Common grass anole *A. pulchellus*, Upland grass anole *A. krugii*, barred anole *A. stratulus*, Common dwarf gecko *Sphaerodactylus macrolepis* (Silander et al. 1986).

Amphibians

Antillean coqui *Eleutherodactylus antillensis*, Common coqui *E. coqui*, Whistling frog *E. cochranae*, Grass coqui *E. brittoni*, Wrinkled frog *E. wightmanae*, Cochran's coqui *Leptodactylus albilabris*, Giant toad *Bufo marinus* (Silander et al. 1986).

Critical Plants:

Susúa State Forest has a high endemism in plant species. From these, six are endangered species (*Croton impressus*, *Aristida portoricensis*, *Linociera holdridgii*, *Polygala cowellii*, *Polygala portoricensis*, and *Canthoxylum bifoliatum*). Other rare endemic present in the forest is *Scolosanthus grandifolius*. Also, there are six non-endemic endangered species: *Tillandsia pruinosa*, *Cyperus nanus* var. *subtenuis*, *Paspalum rupestre*, *Guapira discolor*, *Linociera axilliflora*, *Piriqueta viscosa* (Silander et al. 1986).

Threats:

The SSF appears to be well protected and no threats are reported, although during period of drought this area can be threat by sporadic fire.

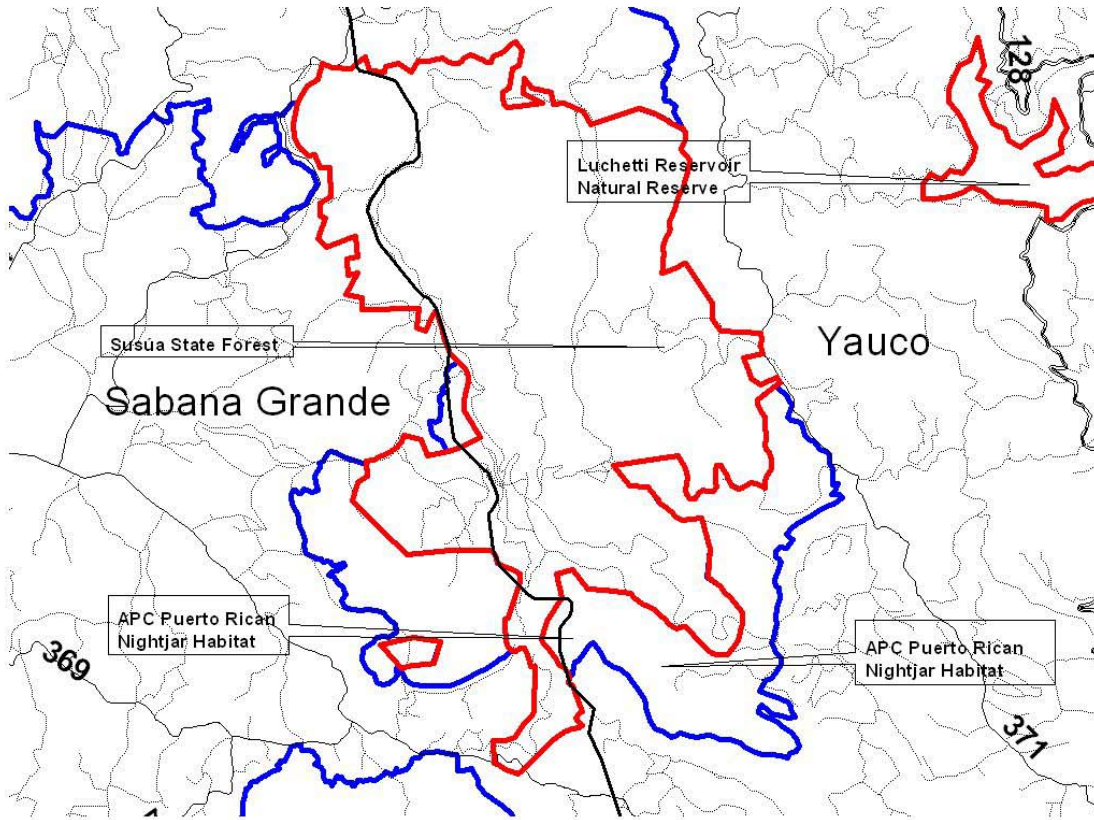
Conservation Recommendations:

Because this area can be subject to periodic fires, management should be address for the protection of endangered plants species.

References:

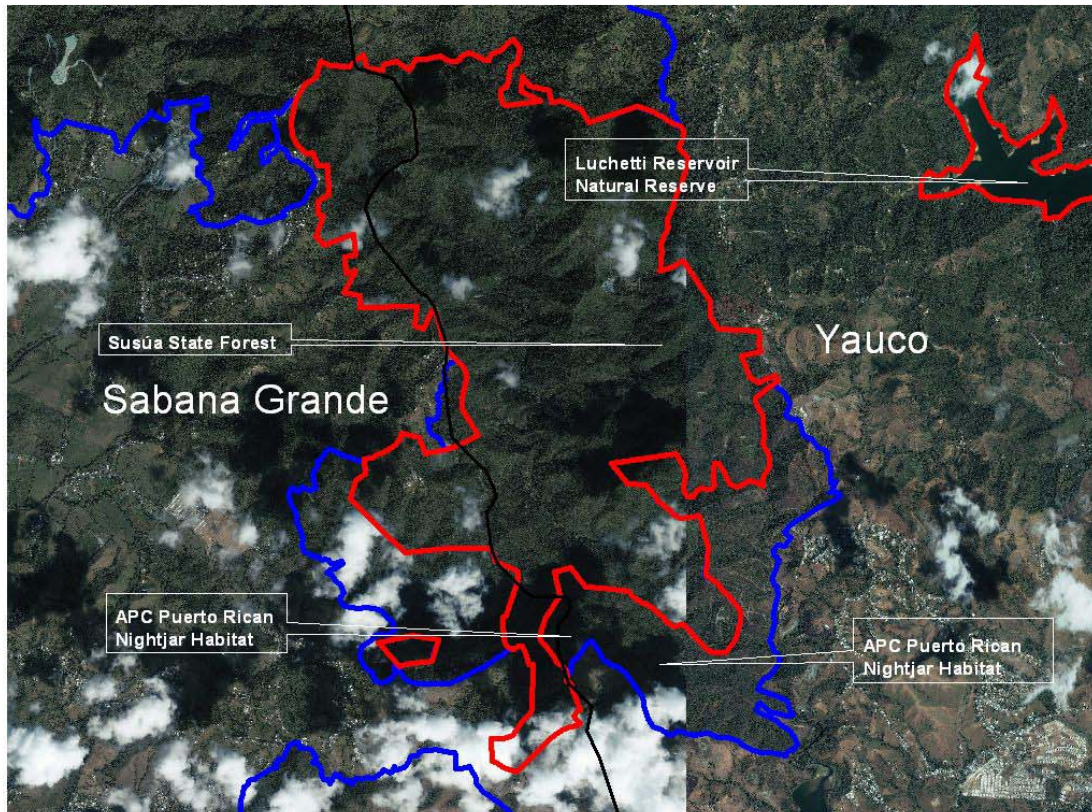
- DNR. 1976. The Master Plan for the Commonwealth Forests of Puerto Rico. Prepared for the Bureau of Outdoor Recreation by Area of Planning and Evaluation of Resources Division of Forest Planning.
- Ewel, J.J., and J.L. Whitmore. 1973. The ecological life zones of Puerto Rico and the U.S. Virgin Islands. U.S. Dept. Agric. For. Serc. Res. Pub. ITF-18. Rio Piedras, P.R. 71 pp.
- Mercado, J., Y. Pérez, M. Anderson and W. Cordero. 2004. Censo de aves de Susúa. Unpublished data provide by Ms. Wetsy Cordero, Forest Manager.
- Rosado, Luis. 2003. Inventario de aves en el Bosque Estatal de Susúa. Sabana Grande, Puerto Rico. Unpublished data provided by Ms. Wetsy Cordero, Forest Manager.

Susúa State Forest and Adjacent Lands






- Municipios.shp
- Bosques_y_reservas.shp
- Carreteras avpu.shp**
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Areas con prioridad de conservacion.shp

Susúa State Forest and Adjacent Lands



1 0 1 2 3 4 Kilometers



-  Municips.shp
-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

56- La Parguera Natural Reserve, Lajas, Puerto Rico

Area Description:

The La Parguera Natural Reserve (LPNR) is located in the southwest of Puerto Rico (17°58'N, 67°04'W). The area includes the following islands and cays: Cayo San Cristóbal, Cayo Laurel, Cayo Media Luna, Cayo Mario, Cayo Enrique, Cayo Turrumotte, Cayo Corral, Isla la Gata, Cayo Caracoles, Cayo Majimo and Cayo Caballo and Ahogado. Bahía Fosforescente (a mangrove-bordered bay on the mainland situated to the east of Parguera) and Isla Magueyes (south of the town) are also included.

Although the majority area of the Reserve is the Lajas municipality, some terrains are also located in Guánica and in Cabo Rojo. This Natural Reserve is located between Boquerón State Forest and Guánica State Forest. There are no rivers in this area; therefore, runoff is the only local source of terrestrial sediment to the marine system. Mountain chains produce a rain shadow effect resulting in a sub-tropical dry forest (Ewel and Whitmore 1973).

The unique beauty and natural resources of La Parguera have historically attracted both tourists and fishermen. In 1945 the area experienced its first invasion of new residents when a Social Program Administration formed a rural community in the area. Project “Parcelas” gave the working class land and materials for built their own homes (Krausse 1994). Development was limited, mangrove and utilities, and the people stands were extensive, and salt flats buffered the mangroves from anthropogenic affects. The small village became the center of commercial fishing for the local market. Turtle grass, *Thalassia testudinum*, is the predominant seagrass at La Parguera. *Thalassia* grows well on both muddy and sandy bottoms where its roots and rhizomes can establish a good holdfast for the plant (Hertler, 2002).

Ownership/Protection:

The LPNR is a public land administered by the DNER. The Puerto Rico Conservation Trust has purchased a large portion of land surrounding the bioluminescent bay in La Parguera for conservation purposes. Despite this, development in La Parguera are continues to damage critical marine habitats.

Special Recognition:

The area is designated as a Natural Reserve since September 1979. The presence of the unique marine resources of southwest Puerto Rico motivated NOAA to include a 226.5 km² parcel of marine waters off of southwest Puerto Rico, including La Parguera, as part of the National Marine Sanctuary Program. This program, established in 1972, protects unique marine environments for recreation, science, education, aesthetic and historic purposes (<http://www.sanctuaries.nos.noaa.gov>). In addition to the Commonwealth and Federal laws and regulations, this designation as a sanctuary extended protection to important marine communities such as mangroves and seagrasses.

In 1987 the DNER and the US Army Corps of Engineers, still recognizing the importance of the natural resources in this area, signed an agreement providing for strict pollution control and declared La Parguera a Natural Wildlife Reserve, with the intention of creating a natural area. However, in 1995, the Puerto Rico Planning Board rezoned La Parguera, southwest Puerto Rico, as a tourist zone. In 2004, BirdLife International and SOPI recognized LPNR as an Important Bird Area.

Wildlife:

Birds

Puerto Rican Nightjar *Caprimulgus noctitherus*, Yellow shouldered blackbird *Agelaius xanthomus*, Brown pelican *Pelecanus occidentalis*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Flycatcher *Myiarchus antillarum*, Adelaide's warbler *Dendroica adelaidae*, Mangrove cuckoo *Coccyzus minor*, Troupial *Icterus icterus*, Red-tailed hawk *Buteo jamaicensis*, Ground dove *Columbina passerina*, Least tern *Sterna antillarum*, Great blue heron *Ardea herodias*, Green heron *Butorides virescens*, Little blue heron *Egretta caerulea*, Snowy egret *E. thula*, Turkey vulture *Cathartes aura*, Semipalmated plover *Charadrius semipalmatus*, Wilson's plover *C. wilsonia*, Magnificent frigatebird *Fregata magnificens*, Pearly-eyed thrasher *Margarops fuscatus*, Northern mockingbird *Mimus polyglottos*, Black-necked stilt *Himantopus mexicanus*, Spotted sandpiper *Actitis macularia*, Ruddy turnstone *Arenaria interpres*, Stilt sandpiper *Calidris himantopus*, Semipalmated sandpiper *C. pusilla*, Short billed dowitcher *Limnodromus griseus*, Whimbrel *Numenius phaeopus*, Zenaida dove *Zenaida asiatica*, Smooth-billed ani *Crotophaga ani*, Bananaquit *Coereba flaveola*, Yellow warbler *Dendroica petechia*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Shiny cowbird *Molothrus bonariensis*, Greater Antillean Grackle *Quiscalus niger*, Northern waterthrush *Seiurus noveboracensis*, Puerto Rican striped headed tanager *Spindalis portoricensis*, Lesser yellowlegs *Tringa flavipes*, Gray kingbird *Tyrannus dominicensis*, Puerto Rican Vireo *Vireo latimeri* (DRNA 2000). There are also historical consistent reports by several local hunters of the presence of Greater flamingo *Phoenicopterus ruber* (Ventura Barnés 1947). There is a report of an irregular bird visitor in Turrumotte cay: Pomarine jaeger *Stercorarius pomarinus* (Williams and Bunckley 1992).

Reptiles

Nichol's dwarf gecko *Sphaerodactylus nicholsi* Cook's anole *Anolis cooki*, Crested anole *A. cristatellus*, Puerto Rican Ground lizard *Ameiva exsul*, Blue-tailed ground lizard *A. wetmorei*, (DRNA 2000). Marine turtles (Hawksbill, Green and Leatherback) are reported in the LPNR (DRNA 1994).

Mammals

The endangered Antillean manatee *Trichechus manatus* frequently visited these waters (DRNA 1994). Feral monkeys: Rhesus *Macaca mulatta* and Patas *Erythrocebus patas* are reported in the north hills, principally in Sierra Bermeja (DRN 1983).

Threats:

The shallow marine system at LPNR is increasingly impacted by changes in land use. Rapidly escalating development is outpacing the ability of existing upland flora, salt flats, and mangroves to intercept sediment and nutrient runoff flowing toward the adjacent marine system (Hertler 2002). Increased deforestation on La Parguera limestone hills, proposed resort development, domestic waste discharge and proximity to major industrial areas give cause for concern (Goenaga and Cintrón 1979).

Some of the problems that affect the area are: the construction of docks and houses in the Terrestrial Maritime Zone; presence of floating structures in the Natural Reserve areas; air pollution, illegal dumps, excess of lightening, anchorage of boats, deforestation and erosion, communities near the Reserve, Rhesus and Patas monkeys, noise pollution, water pollution, soil pollution, among others.

A recent rezoning of La Parguera, southwest Puerto Rico, as a tourist zone has resulted in an imbalance between development and appropriate resource management. Development

associated with tourism is destroying the sub-tropical dry forest and adding pressure on the marine resources through increased boat traffic and marine structures. Declining water quality and benthic community health are two of the impacts seen in LPNR associated with these land use changes.

Conservation Recommendations:

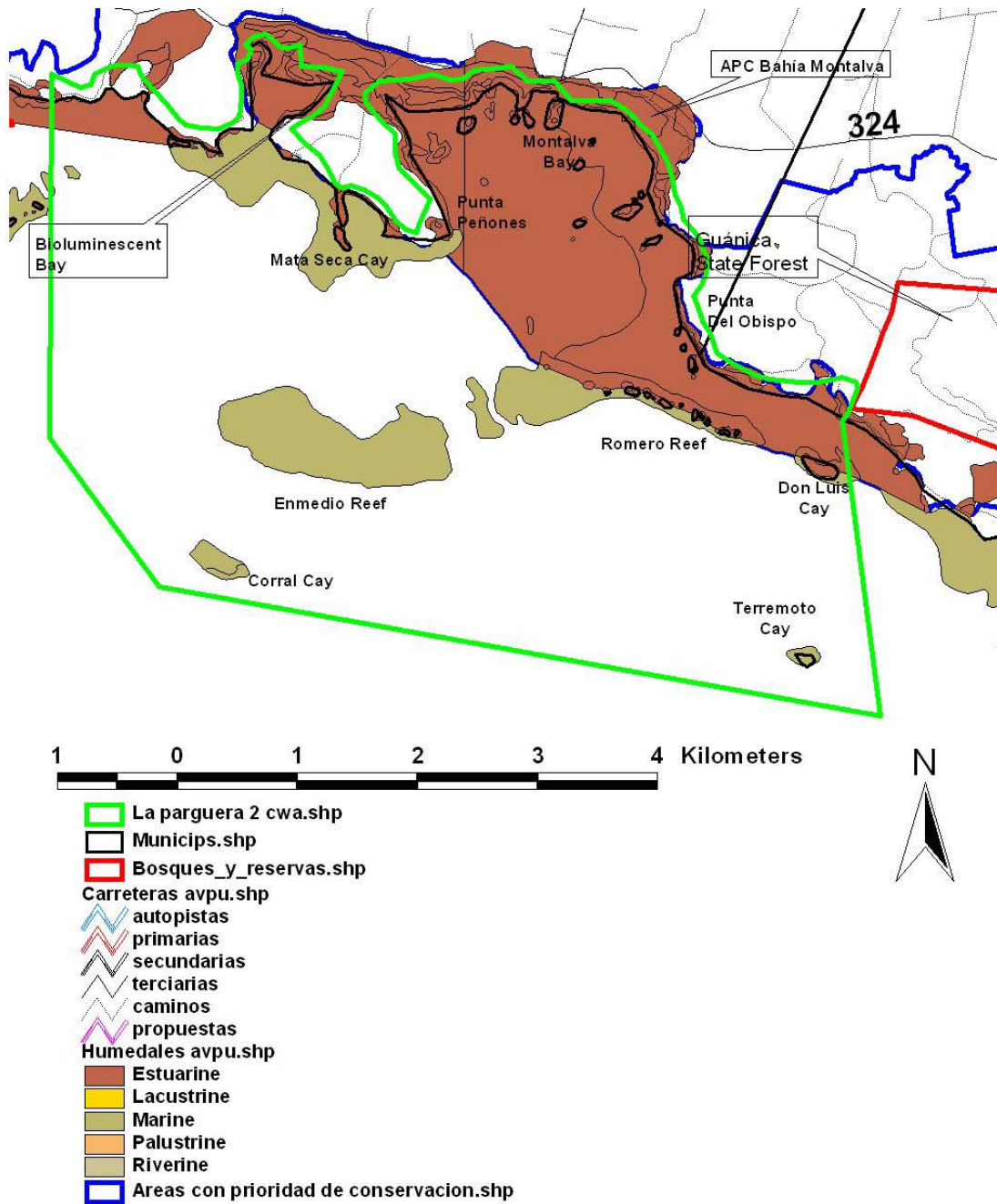
Scientific input is required for essentially all aspects of integrated coastal management. Without the governmental and local support, LPNR will be subject to continued environmental degradation.

Changes in the zoning, such as that in La Parguera, should be a communal process that proceeds from general agreement on the goals for use of land resources in the area and includes scientific data. The resources that attract tourists to La Parguera are being threatened. Local and state agencies must be educated as to the present situation in La Parguera (Hertler 2002).

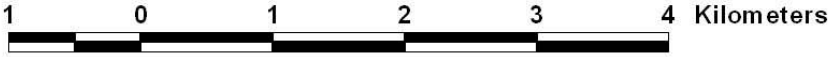
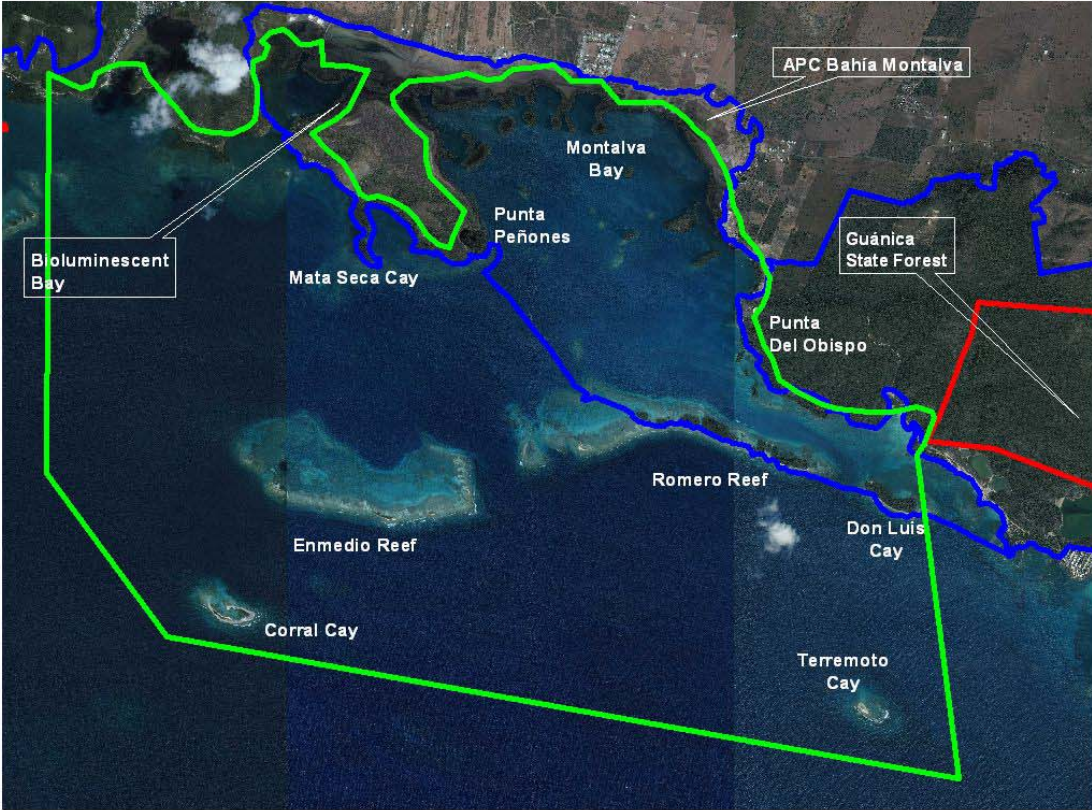
References:

- Departamento de Recursos Naturales. 1983. Suplemento Técnico para el Plan de Manejo de la Reserva Natural de la Parguera. Área de Investigaciones Científicas, División de Asesoramiento Técnico, por C. Díaz, B. Cintrón, M. Del Llano y J. Toro. 125 páginas.
- _____. 1983. Suplemento técnico para el área de planificación suroeste (sector La Parguera). Primera revisión. División de Asesoramiento Técnico, Área de Investigaciones Científicas. Preparado por: C.A. Díaz, B. Cintrón, M. Del Llano, J. Toro McCown. 18 pp.
- _____. 1984. Reserva Natural La Parguera. División de Planificación de Recursos Costeros, por M. Cardona. 75 páginas.
- Departamento de Recursos Naturales y Ambientales. 1994. Borrador Plan de Manejo del Área de Planificación Especial del Suroeste, Sector La Parguera. Secretaría Planificación Integral, División Recursos Terrestres.
- _____. 2000. Documento de Designación para la extensión de la Reserva Natural La Parguera. Secretaría Auxiliar de Planificación Integral. División de Planificación de Recursos Terrestres. San Juan, Puerto Rico.
- Ewel, J. J., Whitmore, J. L. (1973). The ecological life zones of Puerto Rico and the U.S. Virgin Islands. Forest Service Research Publication. ITF-18, USDA.
- Goenaga, C. and G. Cintrón. 1979. Inventory of the Puerto Rican Coral Reefs. Department of Natural Resources, San Juan, P.R.
- Hertler, Heidi. 2002. The implications of resource management in La Parguera, Puerto Rico. Ph. D. Thesis. Drexel University.
- Ventura Barnés, J. 1947. Additions to the Puerto Rican Avifauna with notes on little known species. Auk Vol. 64. Pp. 400-406.

La Parguera Natural Reserve (East)

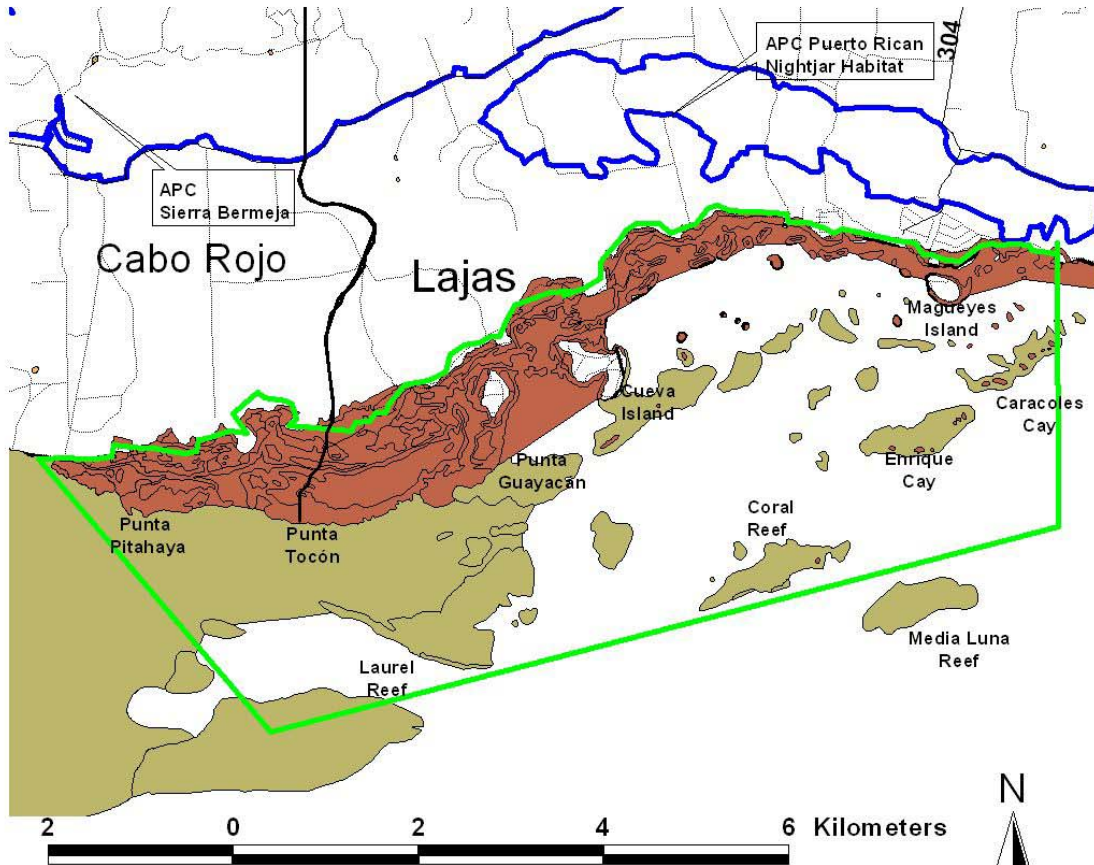


La Parguera Natural Reserve (East)



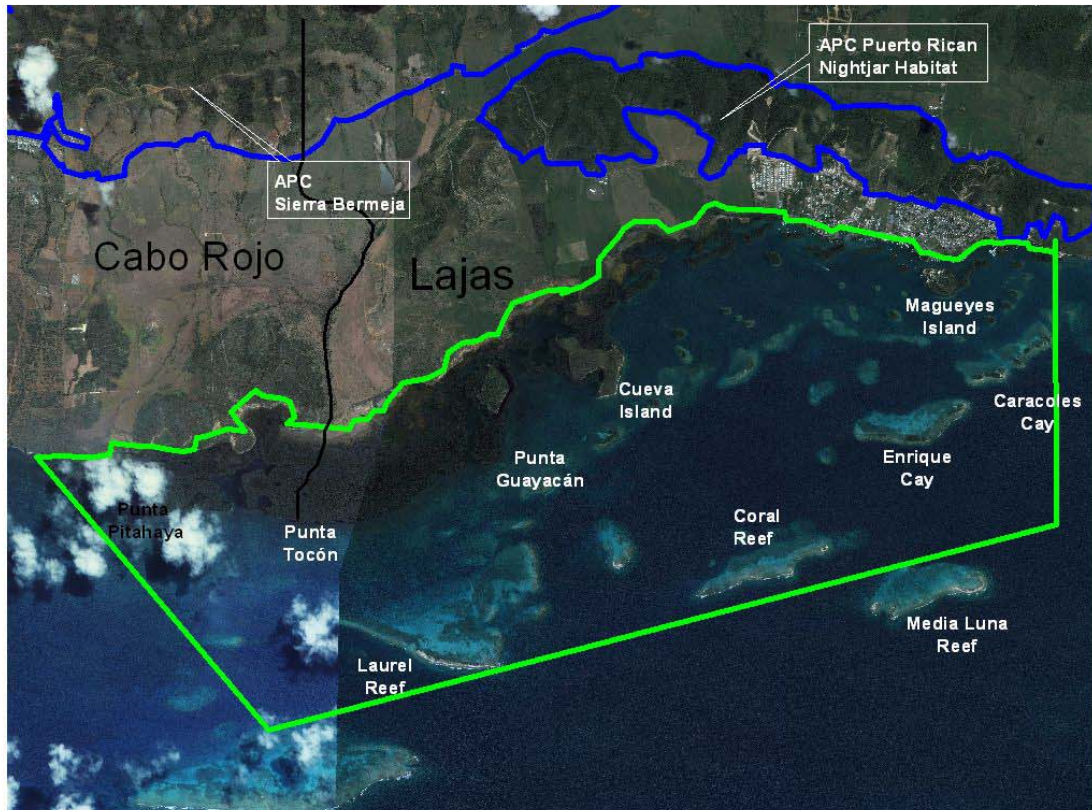
- La parguera 2 cwa.shp
- Bosques_y_reservas.shp
- Areas con prioridad de conservacion.shp

La Parguera Natural Reserve (West)





- La parguera west.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine
- Areas con prioridad de conservacion.shp
- Municipios.shp

La Parguera Natural Reserve (West)



2 0 2 4 6 Kilometers



-  La parguera west.shp
-  Areas con prioridad de conservacion.shp

57- Cartagena Lagoon, Lajas, Puerto Rico

Area Description:

Cartagena Lagoon is located in the Lajas Valley floodplain north of the Sierra Bermeja Mountain Range, in the southwester coast, on route 305, near Hacienda Desengaño, in Maguayo, south of road 101. It has an area of 325 ha with an altitude of 10 m from sea level (Scott and Carbonell 1986). In addition to the lagoon, there are uplands that include pastureland, abandoned sugar cane fields, and 106.4 ha in the foothills of the Sierra Bermeja. These hills, geologically the oldest in the Caribbean, protect native forest with many endemic plant species.

Cartagena Lagoon is a freshwater wetland fed mainly by precipitation runoff (Graves 1991). Because the wetland is shaped like shallow bowl, when pool levels are high, more area is covered by water and the excess flows over the lip of the bowl. When pool levels recede, the area the water occupies decreases, and water ceases flowing out of the bowl (USFWS 2004). Historically, this lagoon was said to have supported perhaps more ducks than the entire Island presently does. Danforth (1926) describe the lagoon as “the most important breeding ground for the resident waterfowl as well as the most important refuge for migrant waterbirds in Porto Rico. It also supplies food for thousands of other birds. There is probably no other spot in the Island where so large an assemblage of birds of so many species can be found”.

Cartagena Lagoon, formerly perhaps the most important wetland in Puerto Rico (Danforth 1926), has been greatly degraded by nearby agricultural practices. The lagoon suffered deterioration following the agricultural development of the Lajas Valley in the 1950's and the conversion of the area from a polyculture to one of almost exclusive culture of sugarcane. Open water areas are minimal, and the area's importance as a hunting ground has declined. It is currently of little use to many of the species the area was known for. Higher, more regular water levels combined with introduced nutrients allow cattail *Typha domingensis* to dominate and complete exclude other plant species, and is the major reason for development of a thick layer of peat (Kushland 1990).

The present lagoon is a remnant of what was once a large open expanse of water and one of the most important freshwater habitats for migrating waterfowl and aquatic birds in Puerto Rico. Due to agricultural practices, about 90 percent of the lagoon is covered with cattail. Still inside this distress picture, Cartagena Lagoon still one of the most important natural system in the southwest Puerto Rico (Toro and Chabert 1986).

Ownership/Protection:

Since 1989 Cartagena Lagoon is under the ownership of the U.S. Fish and Wildlife Service and it is administered under Caribbean Island National Wildlife Refuges Office. In 1996, the U. S. Department of the Interior Fish and Wildlife Service acquired a 110 ha property near the Cartagena Lagoon called La Tinaja for the protection of wildlife habitat. The area contains 50% shrubs, 43% open canopy forest and 7% pastures (Weaver and Chinae 2003).

The Caribbean Islands National Wildlife Refuge Complex plans to restore a 400 acre wetland located at the Laguna Cartagena National Wildlife Refuge in Lajas (USFWS 2004). The USFWS acquired Laguna Cartagena in 1989 under long-term lease with a Congressional mandate to restore it for the benefit of wildlife (USFWS 2004). Since 1992, the USFWS is working in a necessary restoration plan for the benefit of wildlife (Earsom et al 2002).

Special Recognition:

Laguna Cartagena was established as a National Wildlife Refuge in 1989. The DNER classify it as a Priority Area for Conservation. It was recognized as a CWA in 1979 primary

because of its historic importance for wildlife. In the 1988, it was recognized as a primary wildlife area because of its restoration potential. Today, Cartagena Lagoon still a primary wildlife area.

Wildlife:

More than half of Puerto Rico's bird species have been recorded at one time or another from the area and the adjacent Sierra Bermeja. Actually there is evidence of the presence of one hundred and forty four bird species. Historically, this lagoon was said to have supported the largest population of ducks in the entire Island (Cardona and Rivera 1988). Danforth (1926) describe the lagoon as "the most important breeding ground for the resident waterfowl as well as the most important refuge for migrant waterbirds in Porto Rico. It also supplies food for thousands of other birds. There is probably no other spot in the Island where so large an assemblage of birds of so many species can be found".

The primary species noted at Laguna Cartagena are secretive marsh birds and shorebirds. Historically, over 100,000 shorebirds used the lagoon during migration, as did the resident Wilson's plover *Charadrius wilsonia*. There are reports of the presence of Reddish egret *Egretta rufescens* and Glossy ibis *Plegadis falcinellus* (Ventura Barnés 1947; Colón 1983; Raffaele 1989); Gray breasted tree duck *Dendrocygna autumnalis*, Northern pintail *Anas acuta* and American coot *Fulica americana* (Ventura Barnés 1947). Laguna Cartagena is a Critical Habitat for the Yellow-shouldered blackbird *Agelaius xanthomus*. Other birds that use the Cartagena Lagoon includes: Black rail *Laterallus jamaicensis*, Yellow-breasted crake *Porzana flaviventer*, Sora *P. carolina*, Caribbean Coot *Fulica caribaea*, Ring-necked duck *Aythya collaris*, (Colón-López 2001); Least grebe *Tachybaptus dominicus* (Colón 1983; Ventosa et al 2004); Peregrine falcon *Falco peregrinus*, Tundra swan *Cygnus columbianus*, Osprey *Pandion haliaetus*, Ruddy duck *Oxyura jamaicensis* (Colón 1982); West Indian Whistling duck *Dendrocygna arborea* (Colón 1983; Fred Shaffner 2003; pers. obsv.); Pied-billed grebe *Podilymbus podiceps*, Olivaceous cormorant *Phalacrocorax olivaceus*, Magnificent frigatebird *Fregata magnificens*, American bittern *Botaurus lentiginosus*, Least bittern *Ixobrychus exilis*, Great blue heron *Ardea herodias*, Cattle egret *Bubulcus ibis*, Green heron *Butorides virescens*, Little blue heron *Egretta caerulea*, Snowy egret *E. thula*, Tricolored heron *E. tricolor*, Great egret *Ardea alba*, Black-crowned night heron *Nycticorax nycticorax*, Yellow-crowned night heron *Nyctanassa violacea*, Fulvous whistling duck *Dendrocygna bicolor*, White cheeked pintail *Anas bahamensis*, Black duck *A. rubripes*, Green-winged teal *A. crecca*, Blue-winged teal *A. discors*, American wigeon *A. americana*, Northern Shoveler *A. clypeata*, Lesser scaup *Aythya affinis*, Masked duck *Oxyura jamaicensis*, Turkey vulture *Cathartes aura*, Northern harrier *Circus cyaneus*, Red-tailed hawk *Buteo jamaicensis*, Puerto Rican Broad-winged hawk *B. platypterus*, Merlin *Falco columbarius*, American kestrel *F. sparverius*, Purple gallinule *Porphyryula martinica*, Common moorhen *Gallinula chloropus*, Jacana *Jacana spinosa*, Killdeer *Charadrius vociferus*, Lesser golden plover *Pluvialis dominica*, Black-bellied plover *P. squatarola*, Ruddy turnstone *Arenaria interpres*, Common snipe *Gallinago gallinago*, Whimbrel *Numenius phaeopus*, Upland sandpiper *Bartramia longicauda*, Spotted sandpiper *Actitis macularia*, Solitary sandpiper *Tringa solitaria*, Greater yellowlegs *T. melanoleuca*, Lesser yellowlegs *T. flavipes*, Pectoral sandpiper *Calidris melanotos*, White-rumped sandpiper *C. fuscicollis*, Least sandpiper *C. minutilla*, Semipalmated sandpiper *C. pusilla*, Stilt sandpiper *C. himantopus*, Red knot *C. canutus*, Western sandpiper *C. mauri*, Short billed dowitcher *Limnodromus griseus*, Hudsonian godwit *Limosa haemastica*, Willet *Catoptrophorus semipalmatus*, Black-necked stilt *Himantopus mexicanus*, Laughing gull *Larus atricilla*, Herring gull *L. argentatus*, Gull billed tern *Sterna nilotica*, Least tern *S. antillarum*, Sandwich tern *S. sandvicensis*, Black tern *Chlidonias niger*,

White-crowned pigeon *Patagioenas leucocephala*, Scaly-naped pigeon *P. squamosa*, White-winged dove *Zenaida asiatica*, Mourning dove *Z. macroura*, Key west quail-dove *Geotrygon chrysis*, Mangrove cuckoo *Coccyzus minor*, Yellow-billed cuckoo *C. americanus*, Smooth-billed ani *Crotophaga ani*, Puerto Rican Screech owl *Megascops nudipes*, Short-eared owl *Asio flammeus*, Chuck will's widow *Caprimulgus carolinensis*, Common nighthawk *Chordeiles minor*, Black swift *Cypseloides niger*, Antillean Mango *Anthracothonax dominicus*, Puerto Rican mango *A. viridis*, Puerto Rican Emeralds *Chlorostilbon maugaeus*, Belted kingfisher *Ceryle alcyon*, Puerto Rican todody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Yellow-billed sapsucker *Sphyrapicus varius*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Puerto Rican Flycatcher *Myiarchus antillarum*, Puerto Rican lesser Antillean Pewee *Contopus portoricensis*, Caribbean elaenia *Elaenia martinica*, Tree swallow *Tachycineta bicolor*, Bank swallow *Riparia riparia*, Barn swallow *Hirundo rustica*, Cave swallow *Petrochelidon fulva*, Caribbean Martin *Progne dominicensis*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Red-legged thrush *Turdus plumbeus*, Puerto Rican Vireo *Vireo latimeri*, Black-whiskered vireo *V. altiloquus*, Red eyed vireo *V. olivaceus*, Bananaquit *Coereba flaveola*, Black and white warbler *Mniotilta varia*, Worm eating warbler *Helmitheros vermivorus*, Northern parula *Parula americana*, Cape may warbler *Dendroica tigrina*, Black-throated blue warbler *D. caerulescens*, Yellow warbler *D. petechia*, Yellow rumped warbler *D. coronata*, Black-throated green warbler *D. virens*, Adelaide's warbler *D. adelaidae*, Bay breasted warbler *D. castaena*, Blackpoll warbler *D. striata*, Palm warbler *D. palmarum* Prairie warbler *D. discolor*, Common yellowthroat *Geothlypis trichas*, American Redstart *Setophaga ruticilla*, Northern waterthrush *Seiurus noveboracensis*, Louisiana Waterthrush *S. motacilla*, Kentucky Warbler *Oporornis formosus*, Hooded warbler *Wilsonia citrina*, Canada warbler *W. canadiensis*, Antillean Euphonia *Euphonia musica*, Puerto Rican tanager *Nesospingus speculiferus*, Greater Antillean Grackle *Quiscalus niger*, Greater Antillean Oriole *Icterus dominicensis*, Troupial *I. icterus*, Bobolink *Dolichonyx oryzivorus*, Shiny cowbird *Molothrus bonariensis*, Pin-tailed whydah *Vidua macroura*, Napoleon weaver *Euplectes franciscanus*, Orange cheeked waxbill *Estrilda melpoda*, Red eared waxbill *Estrilda troglodytes*, Strawberry finch *Amandava amandava*, Hooded weaver *Lonchura cucullata*, Black headed nun *L. malacca*, Silverbill *L. malabarica*, Grasshopper sparrow *Ammodramus savannarum*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Indigo bunting *Passerina cyanea*, Black-faced grassquit *Tiaris bicolor*, Yellow-faced grassquit *T. olivacea* (Colón 1983). Recent sightseen report (2005) the engandered West Indian Wisthling Duck *Dendrocygna arborea* in the lagoon (M. Rodriguez pers. comm)

Threats:

Do to past agricultural practices; most of the lagoon is now choked with vegetation that impedes the normal flow of water and restricts nesting and feeding for waterfowl. The primary threat to this area now is a boom in housing development and second home construction. Also, intentional fire and illegal dumping occur in the refuge.

Conservation Recommendations:

The primary conservation recommendations are to protect additional areas within the Lajas Valley from residential developments, allowing restoration of the large Lajas Valley ecosystem to proceed. The major recommendation for Cartagena Lagoon is to restore water management capabilities, remove cattail, and increase the amount of open water in the lagoon (similar to historical area).

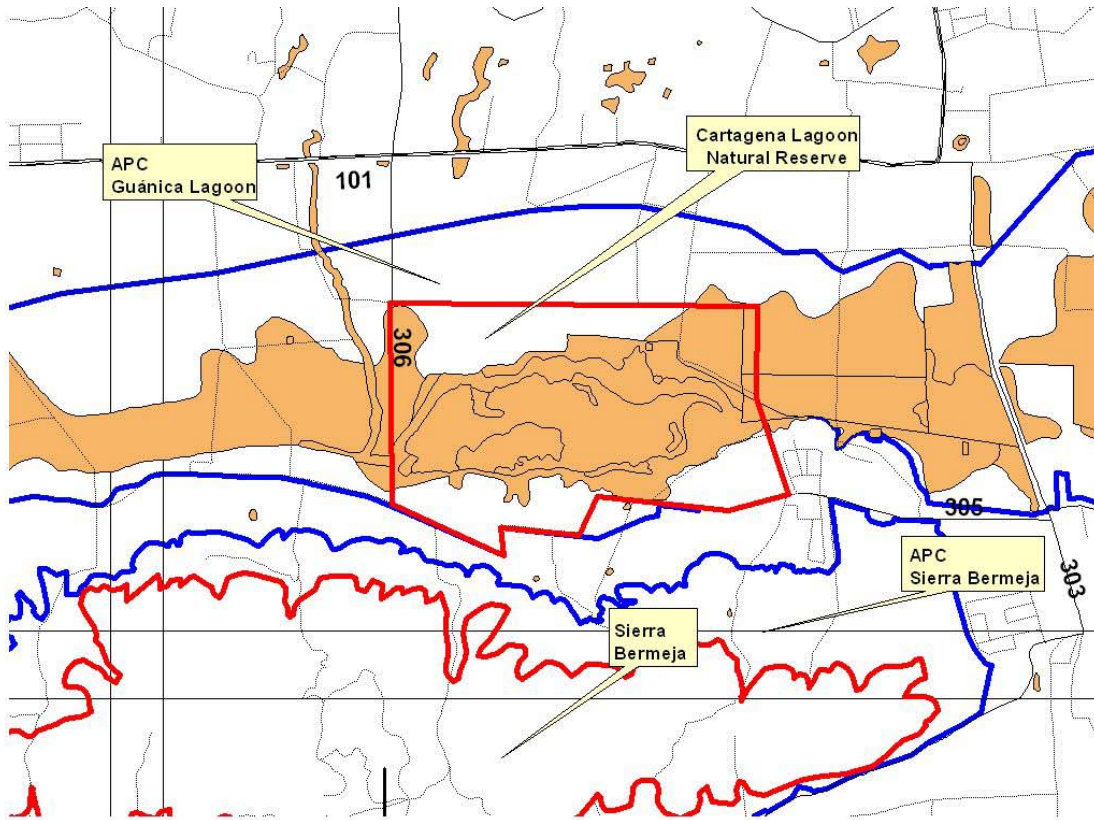
In 1995, the USFWS initiated a challenge-cost-share restoration project. The objective of this effort is to restore and maintain this locally important wetland ecosystem for the benefit of endangered species and migratory birds. To date, accomplishments include construction of a water control structure, removal of some vegetation using a dragline, and partial completion of a water diversion canal in the lagoon.

References:

- Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.
- Colón, H. E. 1982. La importancia de la Laguna Cartagena para la preservación de especies de aves amenazadas en Puerto Rico. Noveno Simposio de Recursos Naturales. Compendio de Ponencias presentadas en el Noveno Simposio de Recursos Naturales. Pp. 145-152.
- Colón, J. 1983. Lista de la Avifauna Reportada en Laguna Cartagena en Suplemento Técnico para la Designación de la Reserva Natural de Laguna Cartagena. Preparado por Julio Toro y José Chabert. 1986. Departamento de Recursos Naturales. Área de Investigaciones Científicas. División de Asesoramiento Técnico. Pp. 43-48.
- Colón López, S. 2001. Observaciones en Arecibo y Lajas. El Bien-te-veo. Vol. IV, Núm. III.
- Danforth, S. T. 1926. An ecological study of Cartagena Lagoon, with special reference to the birds. Jour. Dept. Agric. P.R. 10:1-30.
- Díaz, C.; Cintrón, B.; del Llano, M.; García-Moll, A.; Molinares, A.; Toro, J. and E. Vázquez. 1984. Suplemento Técnico para el Plan de Manejo de la Reserva Natural de Laguna Cartagena, Lajas, Puerto Rico. Departamento de Recursos Naturales. Área de Investigaciones Científicas. División de Asesoramiento Técnico. 16 pp.
- Earsom, S. D.; Schwalgerl J. and S. Silander. 2004. Draft Laguna Cartagena National Wildlife Refuge Wetland Restoration Plan. USFWS. 18 pp.
- Graves, R. P. 1991. Ground water resources in Lajas Valley, Puerto Rico. USGS Water Resources Investigations Report 89-4182. San Juan, Puerto Rico.
- Kushlan, J. A. 1990. Freshwater marshes. Chapter 10. In Myers, R. L. and J. J. Ewel, eds. Ecosystems of Florida. University of Central Florida Press, Orlando. Pp. 324-363
- Ortiz-Rosas, P. and V. Quevedo-Bonilla. 1987. Áreas con prioridad para la conservación en Puerto Rico. Programa Pro-Patrimonio Natural. Estado Libre Asociado de Puerto Rico, Departamento Recursos Naturales. 217 pp.
- Raffaele H. A. 1989. A guide to the Birds of Puerto Rico and the Virgin Islands. Revised edition. Princeton University Press. 254 pp.

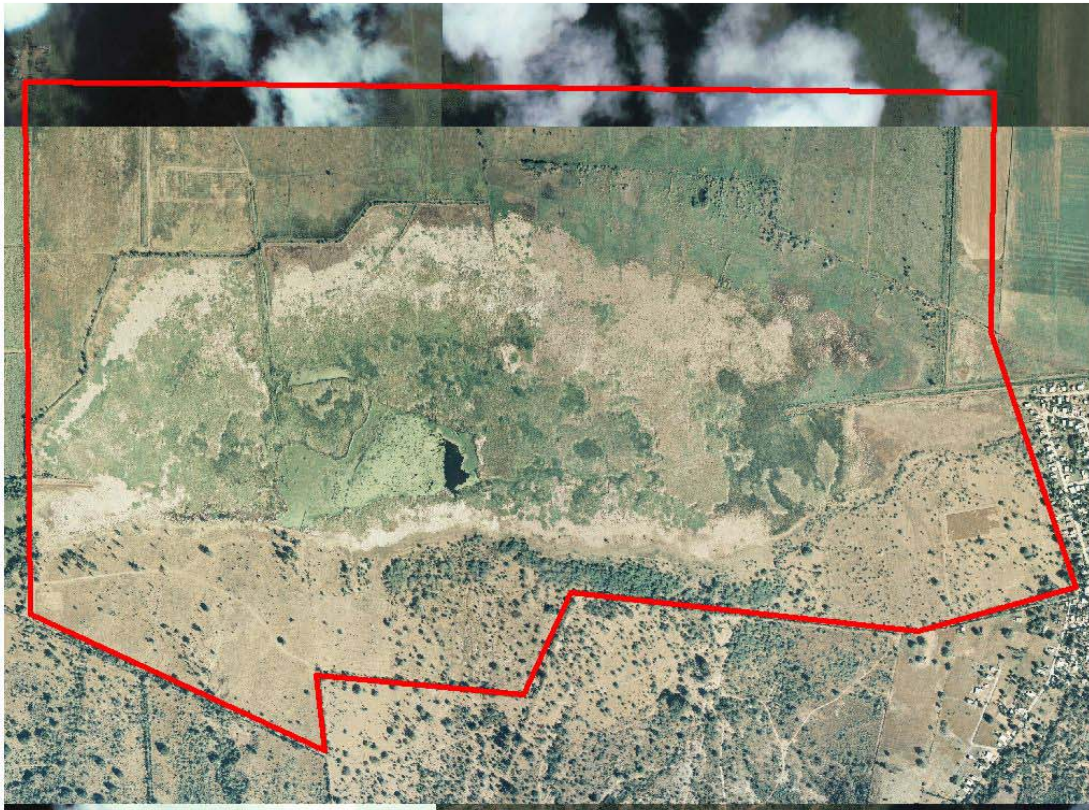
- Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge.
- Toro McCown, J. and J. L. Chabert. 1986. Suplemento Técnico para la Designación de la Reserva Natural de Laguna Cartagena. Departamento de Recursos Naturales. Área de Investigaciones Científicas. División de Asesoramiento Técnico. 69 pp.
- U.S. Fish and Wildlife Service. 2003. Laguna Cartagena National Wildlife Refuge. Southeast Region 4. <http://southeast.fws.gov/LagunaCartagena/index.html>
- _____. 2004. Cabo Rojo and Laguna Cartagena National Wildlife Refuge's Bird List.
- _____. 2004. Draft Environmental Assessment Wetland Restoration Laguna Cartagena Nacional Wildlife Refuge, Puerto Rico. Caribbean Islands National Wildlife Refuge Complex, Boquerón. 31 pp.
- Ventosa, Eduardo A.; M. Camacho, J.L. Chabert, J. Sustache and D. Dávila. 2005. Puerto Rico Waterfowl Focus Areas Puerto Rico Department of Natural and Environmental Resources; North American Waterfowl Management Plan and Atlantic Coast Joint Venture. 82 pp.
- Ventura Barnés, J. 1947. Additions to the Puerto Rican Avifauna with notes on little known species. Auk Vol. 64. Pp. 400-406.
- Weaver, P.L. and J.D. Chinea. 2003. Secondary subtropical dry forest at the La Tinaja tract of the Cartagena Lagoon National Wildlife Refuge, Puerto Rico. Carib. J. Sci.. 39: 273-285.

Cartagena Lagoon



- ▭ Bosques_y_reservas.shp
- ▭ La parguera west.shp
- Carreteras avpu.shp
 - ▬ autopistas
 - ▬ primarias
 - ▬ secundarias
 - ▬ terciarias
 - ▬ caminos
 - ▬ propuestas
- Humedales avpu.shp
 - ▭ Estuarine
 - ▭ Lacustrine
 - ▭ Marine
 - ▭ Palustrine
 - ▭ Riverine
- ▭ Prdoqq_ik.shp
- ▬ Areas con prioridad de conservacion.shp

Cartagena Lagoon



0.6 0 0.6 Kilometers



 **Bosques_y_reservas.shp**

58- Boquerón State Forest, Lajas, Cabo Rojo and Mayagüez, Puerto Rico

Area Description:

Boquerón State Forest (BSF) is located between the municipalities of Lajas, Cabo Rojo and Mayagüez. It is divided in twelve segments, which includes: Bahía Montalva (upland) Pitahaya forest, Los Molinos, lands of El Faro, Boquerón, Puerto Real, Guaniquilla (mangroves of Villa Taína), Villa La Mela Mangroves, Barrio Miradero (Punta Ostiones), Cayo Ratonés, Joyuda Lagoon Mangroves, and Guanajibo Mangroves (E. Ávila pers. comm.). Recent forest measurements show a total land cover of 1,876 ha (E. Ávila pers. comm.). Mostly of the forest is considered a wetland dependent on the tides. The vegetation that domain is black mangrove (Silander et al., 1986). Six types of habitats are found in this forest: islets, coastal mangrove, fringe mangroves salinas dry forests, and *Thalassia* beds (DRNA 1998).

Ownership/Protection:

The BSF are public lands, administered by the DNER.

Special Recognition:

The area was declared a Forest in 1918, and in 1943, two islets were added: Guayacán and Cuevas island (Silander et al. 1986). During 1999, the complete forest boundaries were measured, resulting in an increase of public land delimitation (E. Ávila pers. comm.). In 2004, BirdLife International and SOPI recognized BSF as an Important Bird Area. For the first time, the complete area is recognized a CWA of primary importance.

Wildlife:

Birds

The area is an important habitat for the endangered Yellow-shouldered blackbird *Agelaius xanthomus*. The most important breeding population of this endangered species occurs within the Pitahaya Forest (part of the BSF). This species breed and roost on the mangrove system from Pitahaya through Parguera. One hundred seventeen bird species have been identified for the area: Pied-billed grebe *Podilymbus podiceps*, Brown pelican *Pelecanus occidentalis*, Frigatebird *Fregata magnificens*, Great blue heron *Ardea herodias*, Great egret *A. alba*, Green heron *Butorides virescens*, Tricolored heron *Egretta tricolor*, Little blue heron *E. caerulea*, Cattle egret *Bubulcus ibis*, Black-crowned night heron *Nycticorax nycticorax*, Least bittern *Ixobrychus exilis*, American bittern *Botaurus lentiginosus*, Glossy ibis *Plegadis falcinellus*, West Indian Whistling duck *Dendrocygna arborea*, Fulvous whistling duck *D. bicolor*, White-checked pintail *Anas bahamensis*, Green-winged teal *A. crecca*, Blue-winged teal *A. discors*, American wigeon *A. americana*, Northern Shoveler *A. clypeata*, Ring-necked duck *Aythya collaris*, Lesser scaup *A. affinis*, Ruddy duck *Oxyura jamaicensis*, Turkey vulture *Cathartes aura*, Red-tailed hawk *Buteo jamaicensis*, Osprey *Pandion haliaetus*, Merlin *Falco columbarius*, American kestrel *F. sparverius*, Northern bobwhite *Colinus virginianus*, Clapper rail *Rallus longirostris*, Sora rail *Porzana carolina*, Purple gallinule *Porphyryula martinica*, Common moorhen *Gallinula chloropus*, American coot *Fulica americana*, Caribbean Coot *F. caribaea*, Semipalmated plover *Charadrius semipalmatus*, Wilson plover *C. wilsonia*, Killdeer *C. vociferus*, Black-necked stilt *Himantopus mexicanus*, Ruddy turnstone *Arenaria interpres*, Common snipe *Gallinago gallinago*, Whimbrel *Numenius phaeopus*, Spotted sandpiper *Actitis macularia*, Solitary sandpiper *Tringa solitaria*, Greater yellowlegs *T. melanoleuca*, Lesser yellowlegs *T. flavipes*, Willet *Catoptrophorus semipalmatus*, Stilt sandpiper *Calidris himantopus*, Pectoral sandpiper *C. melanotos*, Least sandpiper *C. minutilla*, Semipalmated

sandpiper *C. pusilla*, Western sandpiper *C. mauri*, Short billed dowitcher *Limnodromus griseus*, Ringed billed gull *Larus delawarensis*, Gull billed tern *Sterna nilotica*, Common tern *S. hirundo*, Least tern *S. antillarum*, Royal tern *S. maxima*, Sandwich tern *S. sandvicensis*, White-crowned pigeon *Patagioenas leucocephala*, Zenaida dove *Zenaida aurita*, White-winged dove *Z. asiatica*, Common ground dove *Columbina passerina*, Monk parakeet *Myiopsitta monachus*, Mangrove cuckoo *Coccyzus minor*, Yellow-billed cuckoo *C. americanus*, Smooth-billed ani *Crotophaga ani*, Short-eared owl *Asio flammeus*, Antillean nighthawk *Chordeiles gundlachi*, Antillean Mango *Anthracothorax dominicus*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Puerto Rican lesser Antillean Pewee *Contopus portoricensis*, Caribbean Martin *Progne dominicensis*, Purple martin *P. subis*, Bank swallow *Riparia riparia*, Barn swallow *Hirundo rustica*, Cave swallow *Petrochelidon fulva*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Red-legged thrush *Turdus plumbeus*, Black-whiskered vireo *Vireo altiloquus*, Black and white warbler *Mniotilta varia*, Prothonotary warbler *Protonotaria citrea*, Northern parula *Parula americana*, Yellow warbler *Dendroica petechia*, Magnolia warbler *D. magnolia*, Cape may warbler *D. tigrina*, Yellow rumped warbler *D. coronata*, Yellow-throated warbler *D. dominica*, Blackpoll warbler *D. striata*, Prairie warbler *D. discolor* Palm warbler *D. palmarum*, Northern waterthrush *Seiurus noveboracensis*, Louisiana Waterthrush *S. motacilla*, Common yellowthroat *Geothlypis trichas*, Hooded warbler *Wilsonia citrina*, American Redstart *Setophaga ruticilla*, Bananaquit *Coereba flaveola*, Orange cheeked waxbill *Estrilda melpoda*, Warbling silverbill *Lonchura malabarica*, Bronze manikin *L. cucullata*, Shiny cowbird *Molothrus bonariensis*, Grater Antillean Grackle *Quiscalus niger*, Greater Antillean Oriole *Icterus dominicensis*, Tropical *I. icterus*, Puerto Rican Spindalis *Spindalis portoricensis*, Yellow-faced grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, Indigo bunting *Passerina cyanea*, Grasshopper sparrow *Ammodramus savannarum* (Silander et al 1986).

Guanajibo Mangroves

Located in the south of the town of Mayagüez, Guanajibo mangrove is a large mangrove that has a small fresh water swamp bordering it (Raffaele and Duffield 1979).

Birds at Guanajibo Mangroves

These mangroves are areas where the Brown pelican *Pelecanus occidentalis* has made attempts to nest (Collazo and Klaas 1986; USFWS 1995). There is also the presence of Cattle egret *Bubulcus ibis*, Roosting site of Cave swallow *Petrochelidon fulva* and the Yellow breasted crane *Porzana flaviventer* frequents the fresh water swamp (Raffaele and Duffield 1979).

Reptiles

The endangered Hawksbill sea turtle *Eretmochelys imbricata* frequently uses sandy beaches of the Boquerón sector. These areas constitute a nesting area for the turtle. Other endangered reptile is the Cook's anole *Anolis cooki* (DRNA 1998a).

Mammals

West Indian manatee *Trichechus manatus* feeds on the *Thalassia* beds found in Boquerón sector. The shallow and calm waters of the Rincón Lagoon (also know as Caño Boquerón) offer a perfect refuge for the manatee. The near threatened Brazilian free-tailed bat *Tadarida brasiliensis* is found in the Boquerón sector (DRNA 1998a).

Fish

A study of fish abundance realized in 1995 by the Laboratorio de Investigaciones Pesqueras of the DNER, report a total of 77 species in the Laguna de Rincón. From these, 23 species were of commerce importance. Some of them are the Balao *Hemiramphus balao*, Crevalle jack *Caranx hippos*, Hores-eye jack *C. latus*, Arrayao Lane snapper *Lutjanus synagris*, Mojarra *Eucinostomus argenticus*, Big-eye mojarra *E. Havana* and Painted mackerel *Scomberomorus regalis*.

Critical Plants:

Violet tree *Polygala cowelii*, Fall panic *Panicum dichotomiflorum*, Raichie *Waltheria calcicola*, Lance wood *Oxandra lanceolata*, Water nymph *Najas marinas*, Threelobe rosemallow *Hibiscus trilobus*, Beefree *Guapira discolor*, Fewflower hairsedge *Bulbostylis pauciflora*, Bariaco *Trichilia triacantha* and *Sthalia monosperma*.

Threats:

The urban sprawl, tourism development and recreational uses in the BSF boundaries are the mayor threats in the area. Others threats are illegal dumping, arson fires, illegal deforestation, illegal ducking construction and the excessive garbage disposal in various recreational areas (E. Ávila pers comm.).

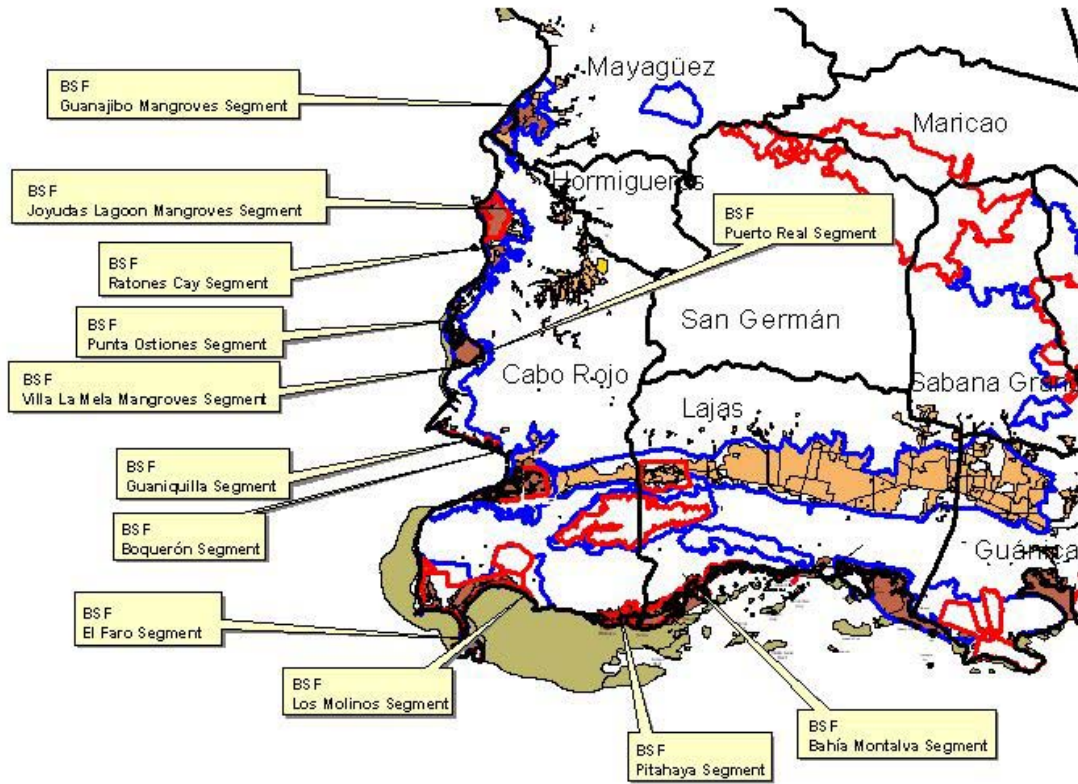
Conservation Recommendations:

Forest boundaries should be completed clarified; there are some measures points not clear at this time. This issue could produce misunderstood of land ownership in future developments plan. Land uses close to the BSF should be evaluated in terms of the management criteria developed in the “Plan de manejo para el área de planificación especial de suroeste, sector Boquerón” document (DRNA 1998a).

References:

- Collazo, J. A. and E. E. Klaas. 1986. Recovery plan for the Brown pelican *Pelecanus occidentalis* in Puerto Rico and the US Virgin Islands. 40 pp.
- DRNA. 1998. Bosque de Boquerón. Hoja informativa del DRNA; Servicio Forestal Orienta.
- _____. 1998a. Plan de manejo para el área de planificación especial de suroeste, sector Boquerón. Gobierno de Puerto Rico. Preparado por G. I. Fuentes y M. Rivera. Borrador. 75 pp.
- USFWS. 1995. Species account: Brown pelican. Division of Endangered Species endangered.fws.gov/i/b/sab2s.html

Boquerón State Forest



10 0 10 20 Kilometers



- Municips.shp
- Bosques_y_reservas.shp
- Areas con prioridad de conservacion.shp
- Humedales avpu.shp**
- Estuarine
- Lacustrine
- Marine
- Palustrine
- Riverine

59- Boquerón Wildlife Refuge, Cabo Rojo, Puerto Rico

Area Description:

The Boquerón Wildlife Refuge (BWR) is located in road # 301, km. 1.1 of Boquerón, at 18°01'N, 67°10'W; 20 km south Mayagüez. The BWR is a 252.02 ha facility established on the southwest coast in 1963 as a waterfowl hunting and sport fishing refuge. The objective of the refuge is restoration, conservation, management and enhancement of waterfowl and fisheries resources.

It is a manmade water impoundment located at the western end of the Lajas Valley at the discharge point of the Lajas Valley West Main Drainage Canal. The impoundment was constructed to replace the loss of the wetland habitat caused by the eutrophication of Cartagena Lagoon and the loss of the natural lagoons, Guánica and Anegado that were being drained for agriculture purposes at the time (DRNA 1998). The area where the BWR is located was originally a basin mangrove forest and a small salt flat subject to tidal and seasonal Lajas Valley runoff flooding (U.S. Army Corps of Engineers 2001).

The BWR impoundment presents typical characteristics of a tropical brackish-water lagoon. It is surrounded by three dikes converging at almost right angles to one another to form three sides of a square. On the fourth side, upland from the south, no dike is necessary. The impoundment vegetation consists mainly of mangroves (50%) and cattail (20%) *Typha domingensis*, the dominant fresh water plant. The four species of mangroves are presented in this CWA: red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa*) and button mangrove *Conocarpus erectus* (only found in the east dike). Robust submerged plant communities (about 10%) *Ruppia* sp. and *Najas* sp. are responsible in part for the refuge's high wildlife value. The remainders 20% are open areas for birds (DRNA 1999).

Ownership/Protection:

The BWR is under the ownership of the Commonwealth of Puerto Rico and the DNER, Refuge and Natural Reserve Division administer it.

Special Recognition:

The BWR was designated in 1964 by the Department of Agriculture. Originally, it was part of the Boquerón State Forest. This wetland is a wildlife management area of the DNER. In 1979 and in 1988 (Raffaele and Duffield; Cardona and Rivera, respectively), the BWR was classified a CWA of primary importance. This refuge is recognized as an important waterfowl hunting ground. The number of hunter visits average about 600 per year (I. Alameda pers. comm.). Also is recognized by the DNER as an important recreational fishing area (DRNA 1998).

Wildlife

Birds

The most common hunting species are Blue-winged teal *Anas discors*, Common Moorhen *Gallinula chloropus* and Common Snipe *Gallinago gallinago*. During winter season, this refuge serves as roosting and feeding grounds of a high numbers of migratory birds (DRNA 1998). This refuge supports at least six bird species endemic to Puerto Rico, and it supports 32 species that nest within refuge boundaries. One hundred and forty four bird species have been reported in the Boquerón Wildlife Refuge: Least grebe *Tachybaptus dominicus*, Pied-billed grebe *Podilymbus podiceps* Brown pelican *Pelecanus occidentalis*, Magnificent frigatebird

Fregata magnificens, Great blue heron *Ardea herodias*, Great egret *A. alba*, Snowy egret *Egretta thula*, Little blue heron *E. caerulea*, Tricolored heron *E. tricolor*, Cattle egret *Bubulcus ibis*, Green heron *Butorides virescens*, Black-crowned heron *Nycticorax nycticorax*, Yellow-crowned heron *Nyctanassa violacea*, Least bittern *Ixobrychus exilis*, American bittern *Botaurus lentiginosus*, Glossy ibis *Plegadis falcinellus*, Fulvous whistling duck *Dendrocygna bicolor*, West Indian Whistling duck *D. arborea*, Muscovy duck *Cairina moschata*, American wigeon *Anas americana*, White-cheeked pintail *A. bahamensis*, Northern Shoveler *A. clypeata*, Northern pintail *A. acuta*, Green-winged teal *A. crecca*, Ring-necked duck *Aythya collaris*, Lesser scaup *A. affinis*, Masked duck *Nomonyx dominica*, Ruddy duck *Oxyura jamaicensis*, Turkey vulture *Cathartes aura*, Osprey *Pandion haliaetus*, Red-tailed hawk *Buteo jamaicensis*, Northern harrier *Circus cyaneus*, American kestrel *Falco sparverius*, Merlin *F. columbarius*, Peregrine falcon *F. peregrinus*, Northern bobwhite *Colinus virginianus*, Clapper rail *Rallus longirostris*, Sora *Porzana carolina* Yellow-breasted crake *P. flaviventer*, Purple gallinule *Porphyryla martinica*, American coot *Fulica americana*, Caribbean Coot *F. caribaea*, Black-bellied plover *Pluvialis squatarola*, Semipalmated sandpiper *Charadrius semipalmatus*, Wilson's plover *C. wilsonia*, Killdeer *C. vociferus*, Black-necked stilt *Himantopus mexicanus*, Greater yellowlegs *Tringa melanoleuca*, Lesser yellowlegs *T. flavipes*, Solitary sandpiper *T. solitaria*, Willet *Catoptrophorus semipalmatus*, Spotted sandpiper *Actitis macularia*, Semipalmated sandpiper *Calidris pusilla*, Western sandpiper *C. mauri*, Least sandpiper *C. minutilla*, Pectoral sandpiper *C. melanotos*, Stilt sandpiper *C. himantopus*, Whimbrel *Numenius phaeopus*, Ruddy turnstone *Arenaria interpres*, Short-billed dowitcher *Limnodromus griseus*, Ring-billed gull *Larus delawarensis*, Sandwich tern *Sterna sandvicensis*, Royal tern *S. maxima*, Common tern *S. hirundo*, Least tern *S. antillarum*, Gull-billed tern *S. nilotica*, Rock pigeon *Columba livia*, White-crowned pigeon *Patagioenas leucocephala*, White-winged dove *Zenaida asiatica*, Zenaida dove *Z. aurita*, Common ground dove *Columbina passerina*, Monk parakeet *Myiopsitta monachus*, Yellow-billed cuckoo *Coccyzus americanus*, Mangrove cuckoo *C. minor*, Smooth-billed ani *Crotophaga ani*, Puerto Rican Screech owl *Megascops nudipes*, Short-eared owl *Asio flammeus*, Chuck-will's-widow *Caprimulgus carolinensis*, Antillean nighthawk *Chordeiles gundlachi*, Black swift *Cypseloides niger*, Antillean Mango *Anthracothorax dominicus*, Green mango *A. viridis*, Purple-throated carib *Eulampis holosericeus*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Puerto Rican Tody *Todus mexicanus*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Puerto Rican lesser Antillean Pewee *Contopus portoricensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Purple martin *Progne subis*, Caribbean Martin *P. dominicensis*, Bank swallow *Riparia riparia*, Cave swallow *Petrochelidon fulva*, Barn swallow *Hirundo rustica*, Red-legged thrush *Turdus plumbeus* Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Black-whiskered vireo *Vireo altiloquus*, Northern parula *Parula americana*, Yellow warbler *Dendroica petechia*, Prairie warbler *D. discolor*, Palm warbler *D. palmarum*, Blackpoll warbler *D. striata*, Magnolia warbler *Dendroica magnolia*, Cape may warbler *D. tigrina*, Yellow-rumped warbler *D. coronata*, Yellow-throated warbler *D. dominica*, Black and white warbler *Mniotilta varia*, American Redstart *Setophaga ruticilla*, Prothonotary warbler *Protonotaria citrea*, Ovenbird *Seiurus aurocapilla*, Northern waterthrush *S. noveboracensis*, Louisiana Waterthrush *S. motacilla*, Common yellowthroat *Geothlypis trichas*, Hooded warbler *Wilsonia citrine*, Bananaquit *Coereba flaveola*, Puerto Rican stripe-headed tanager *Spindalis portoricensis*, Black-faced grassquit *Tiaris bicolor*, Yellow-faced grassquit *T. olivacea*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Grasshopper sparrow *Ammodramus savannarum*, Indigo bunting *Passerina cyanea*, Yellow-shouldered blackbird *Agelaius xanthomus*, Greater

Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, Black-cowled oriole *Icterus dominicensis*, Troupial *I. icterus*, Baltimore Oriole *I. galbula*, House sparrow *Passer domesticus*, Red bishop *Euplectes franciscanus*, Orange-cheeked waxbill *Estrilda melpoda*, Red avadavat *Amandava amandava*, Warbling silverbill *Lonchura malabarica*, Bronze mannikin *L. cucullata*, Nutmeg mannikin *L. punctulata*, Chestnut mannikin *L. malacca* Pin-tailed whydah *Vidua macroura*, Greater flamingo *Phoenicopterus ruber*, Roseate spoonbill *Ajaia ajaja* (unpublished bird data performed by Julio Rodríguez, former Boquerón Wildlife Refuge Manager 1990; Iris Alameda, Forest Manager pers. comm.).

Reptiles

Puerto Rican slider *Trachemys stejnegeri*, Red-eared slider *T. scripta*, Puerto Rican Ground Lizard *Ameiva exsul*, Common grass anole *Anolis pulchellus*, Cook's anole *A. cooki*, Crested anole *A. cristatellus*, Green iguana *Iguana iguana* (DRN 1981; Iris Alameda, Forest Manager pers. comm.).

Amphibians

White-lipped frog *Leptodactylus albilabris*, Bullfrog *Rana catesbeiana*, Giant toad *Bufo marinus*, Common coqui *Eleutherodactylus coqui*, Antillean frog *E. antillensis* (DRN, 1981; Iris Alameda, Forest Manager pers. comm.).

Mammals

Black rat *Rattus rattus*, Small Indian mongoose *Herpestes auropunctatus*, Greater bulldog bat *Noctilio leporinus*, Rhesus monkey *Macaca mulatto*, and West Indian manatee *Trichechus manatus* (DRN 1981; Iris Alameda, Forest Manager pers. comm.).

Fish

Negrón (1986) report 15 species in the Laguna Rincón. The more common species were: Mozambique tilapia *Tilapia mossambica*, Common snook *Centropomus undecimales*, White mullet *Mugil curema*, Hourse-eye jack *Caranx latus*, and Tarpons *Megalops atlanticus* (DRN, 1982).

Invertebrates

Crustacean

Blue crab *Callinectes sapidus*, Dana swimming crab *C. danae*, Shelligs *C. ornatus*, Swamp ghost crab *Ucides cordatus*, Blue land crab *Cardisoma guanhumi*, Marsh fiddler *Uca sp.*, Mangrove root crab *Goniopsis cruentata*, Mangrove tree crab *Aratus pisionii*, Dark shore crab *Pachygrapsus gracilis*, Humic marsh crab *Armases ricordi*, *A. roberti*.

Threats:

Over the years, sedimentation and exclusion of salt water have caused cattails to become a problem. A culvert and sluice gate system start to alleviate this problem. In recent years dense freshwater vegetation reached cover values greater than 35 percent of the entire refuge. Concurrent with this rapid loss of open water habitat was a drastic decrease in the abundance and diversity of the aquatic bird species in the refuge. Recently, these events had become again a problem for the refuge (Iris Alameda, Forest Manager pers. comm). The nutrient-rich drainage outflows produce eutrophic conditions at the Boquerón Wildlife Refuge. This nutrient-rich freshwater runoff incites cattail, water hyacinth and water lily growth, provoking eutrophication

of the water. Other threat is the illegal land crab trapping within the refuge and exotics species, such as mongoose, iguanas and rhesus monkey (Iris Alameda, Forest Manager pers. comm.).

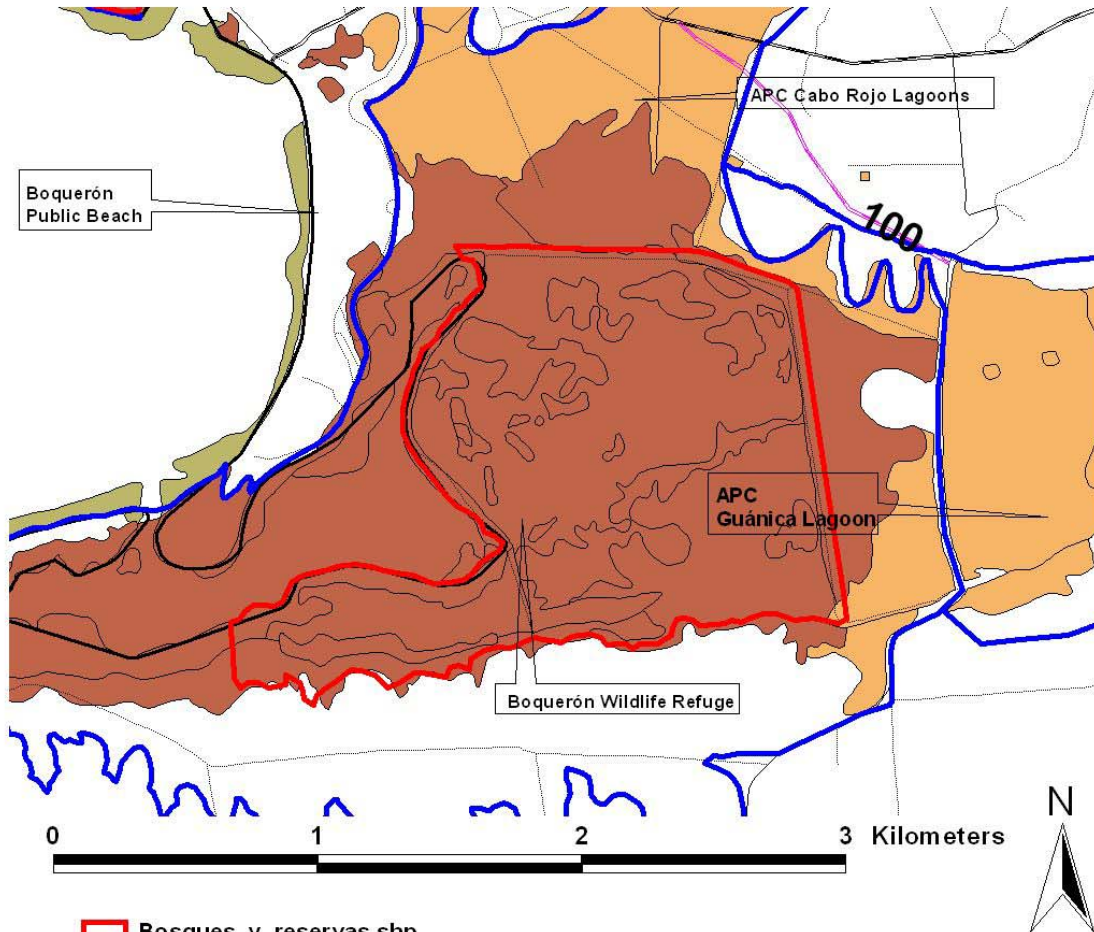
Conservation Recommendations:

This CWA needs some modifications in order to allow a shift of the Refuge from a constant level, high nutrient freshwater system highly supportive to cattails to a more natural system with variable levels of water, periodic inputs of both fresh water and salt water and less susceptible to dominance by cattails. Open water waterfowl habitat and fishery habitat should be maintained and improved. Active management of the Refuge would be easier than under current conditions, but it is not expected that the system would be entirely self-sustaining (Iris Alameda, Forest Manager pers. comm.; U.S. Army Corps of Engineers 2001).

References:

- Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. DRN, Área de Investigaciones Científicas. 46 pp.
- Departamento de Recursos Naturales. 1982. Plan para el manejo del Refugio de Aves de Boquerón. Proyecto FW-6-1. DRN, Area de Planificación, Sección de Pesca y Vida Silvestre. 49 pp.
- Departamento de Recursos Naturales y Ambientales. 1996. Plan estratégico de los recursos naturales de pesca y vida silvestre. Borrador. Gobierno de Puerto Rico, DRNA, Administración de Recursos Naturales, Negociado de Pesquería y Vida Silvestre.
- _____. 1998. Plan de manejo para el área de planificación especial de suroeste, sector Boquerón. Gobierno de Puerto Rico. Preparado por G. I. Fuentes y M. Rivera. Borrador. 75 pp.
- _____. 1999. Refugio de Vida Silvestre de Boquerón. División de Reservas Naturales y Refugios de Vida Silvestre, DRNA. Folleto informativo. Revisado por Aleida Cruz Alonso.
- Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge.
- U.S. Army Corps of Engineers. 2001. Section 206 Preliminary Restoration Plan, Boquerón Wildlife Refuge, Puerto Rico. USCE, South Atlantic Division, Jacksonville District. 8 pp.

Boquerón Wildlife Refuge



- Bosques_y_reservas.shp
- Areas con prioridad de conservacion.shp
- Municipios.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

Boquerón Wildlife Refuge



- Bosques_y_reservas.shp
- Areas con prioridad de conservacion.shp
- Municips.shp

60- Cabo Rojo Salt Flats and Adjacent Areas, Cabo Rojo, Puerto Rico

Area Description:

The Cabo Rojo National Wildlife Refuge on the southwestern side of Puerto Rico was established in 1974 when 238 ha of land were obtained from the Central Intelligence Agency as an upland buffer for the Cabo Rojo Salt Flats (a potential Western Hemisphere Shorebird Reserve) and its potential value as habitat for migratory birds.

In 1999, a total of 505 ha of salt flats, previously under private ownership were purchased and added to the Refuge for a grand total of 743 ha. Areas purchased by the USFWS and the National Resources Conservation Service Wetland Reserve Program includes: Fraternidad and Candelaria Lagoons and coastlines along Bahía Sucia and Bahía Salinas. Fraternidad and Candelaria, two large, shallow lagoons, form the most notable feature of the saltflats. These two lagoons are separated from the Caribbean Sea by narrow strips of land covered with scrub forest (USFWS 1993).

The CRSF are also an important source for salt extraction for humane use. This industry has served as an important employment source for a numerous generations for the Pole Ojea community (Tossas-Cavallieri, 2001). At present, Fraternidad and Candelaria are being used as holding or storage ponds for commercial salt production. The disturbances caused by salt production operations, however, are localized in time and space and apparently have not reduced the wildlife carrying capacity of the area (USFWS 1993).

Ownership/Protection:

The Land and Water Conservation Fund and the Wetland Reserve Program of the U. S. Department of Agriculture's Natural Resource Conservation Service (NRCS) purchased the land located in southwestern Puerto Rico to become part of the National Wildlife Refuge. This purchase will allow the USFWS to conserve and protect the single most important point of convergence for migratory shorebirds in Puerto Rico and the U.S. Virgin Islands (USFWS 1999).

In partnership with the USFWS, the DNER acquired additional portions of the salt flats for conservation. The DNER area includes Combate Beach, the southern coastline of Bahía Salinas and 30.6 ha of upland property. This purchase, utilizing Puerto Rico Highway Authority mitigation funds, in conjunction with existing DNER holdings along the coast will afford more protection to the resources and link vital habitat fragments.

Special Recognition:

The U.S. Fish & Wildlife Service officially designated the CRSF a Resource Category 1, which is the highest possible ranking that can be given to a wetland area and implies that the area is considered unique and irreplaceable on a national or ecoregional basis. The CRSF was recognized as a prime wildlife area by Raffaele and Duffield (1979) and by Cardona and Rivera (1988). In 2004, BirdLife International and SOPI recognized the CRSF as an Important Bird Area. Today, this wetland maintains its classification of a primary CWA.

Wildlife:

The CRSF is the most important site for migratory shorebirds. Actually, more than 40,000 birds depend of the CRSF to complete its migratory cycle (DRNA 1998). Many birds find their way to the refuge while migrating between North and South America. These birds use

the refuge during the cooler months, while resident species are here year-round. It is highly valued habitat for doves and pigeons.

The majority of the CRSF remains undeveloped and serves as an important stopover and wintering area for thousands of shorebirds. The salt flats are positioned in the Atlantic flyway and is a vital nesting ground for the Snowy plover, Least tern, Wilson's plover, Black-necked stilt, and Killdeer. The area and its adjacent waters also provide resting and feeding habitat for several threatened and endangered species such as the Piping plover, Peregrine falcon, Yellow-shouldered blackbird, Brown pelican, Manatee and several species of sea turtles. Indeed, no fewer than 118 bird species have been recorded for the area. The coastline, mangroves, seagrass beds, and offshore coral reefs next to the area are prime fish habitat, and are considered special aquatic sites. In addition, the seagrass beds provide feeding habitat for Sea turtles and Manatees (USFWS 1999).

Birds

The saltflats support the only known breeding population of the Snowy plover *Charadrius alexandrinus* in the Island. There is also presence of migrant Piping plover *C. melodus*, endemic Yellow shouldered blackbird *Agelaius xanthomus* and Least tern *Sterna antillarum* (Cardona and Rivera 1988). The saltflats are also an important nesting habitat for Wilson's plover *Charadrius wilsonia*, Killdeer *C. vociferous*, Black-necked stilt *Himantopus mexicanus*. There are also historical records of the presence of Greater flamingo *Phoenicopterus ruber* in the mud flats close to Boquerón and Mourning dove *Zenaida macroura* in the cactus covered area in the vicinity of Faro de Cabo Rojo (Ventura Barnés 1947); White cheeked pintail *Anas bahamensis*, Roseate tern *Sterna dougallii*, Royal tern *S. maxima*, Common tern *S. hirundo* (USFWS 1993).

Reptiles

The seagrasses provide habitat for Green sea turtle *Chelonia mydas*, Hawksbill turtle *Eretmochelys imbricata* and Leatherback turtle *Dermochelys coriacea* (USFWS 1993).

Fishery Resources

The usually hypersaline lagoons and saltflats provide habitat for invertebrates such as fiddler crabs and land crabs. The bays seaward of the lagoons, Bahía Salinas and Bahía Sucia, have important fishery resources, including both Finfish and Queen conch *Strombus gigas* (USFWS 1993).

Critical Plants:

Some plants species identified by the DNER as critical elements are; Dwarf saltwort *Salicornia bigelovii*, Pitahaya *Leptocereus quadricostatus*, Woodbury's stopper *Eugenia woodburyana*, West Indian milkwort *Polygala hecatantha* and Chase's threeawn *Aristida chaseae*, Cobana negra *Sthalia monosperma* (DRNA, 1998).

Threats:

As a result of the zone classification by the PR Planning Board, some areas around the CRSF are subject to different developments. Future projects allowed in this area are for example resorts and hotels improvements. Also, possible road pavement could increase vehicular traffic and provoke an alteration in such fragile ecosystem. Illegal hunting is also a threat for wildlife in the CRSF.

Conservation Recommendations:

Buffer zones between the CRSF and private properties should be established, mainly in areas subject to tourist and/or urban developments.

References:

Departamento Recursos Naturales y Ambientales. 1998. Plan de manejo para el área de planificación especial de suroeste, sector Boquerón. Gobierno de Puerto Rico. Preparado por G. I. Fuentes y M. Rivera. Borrador. 75 pp.

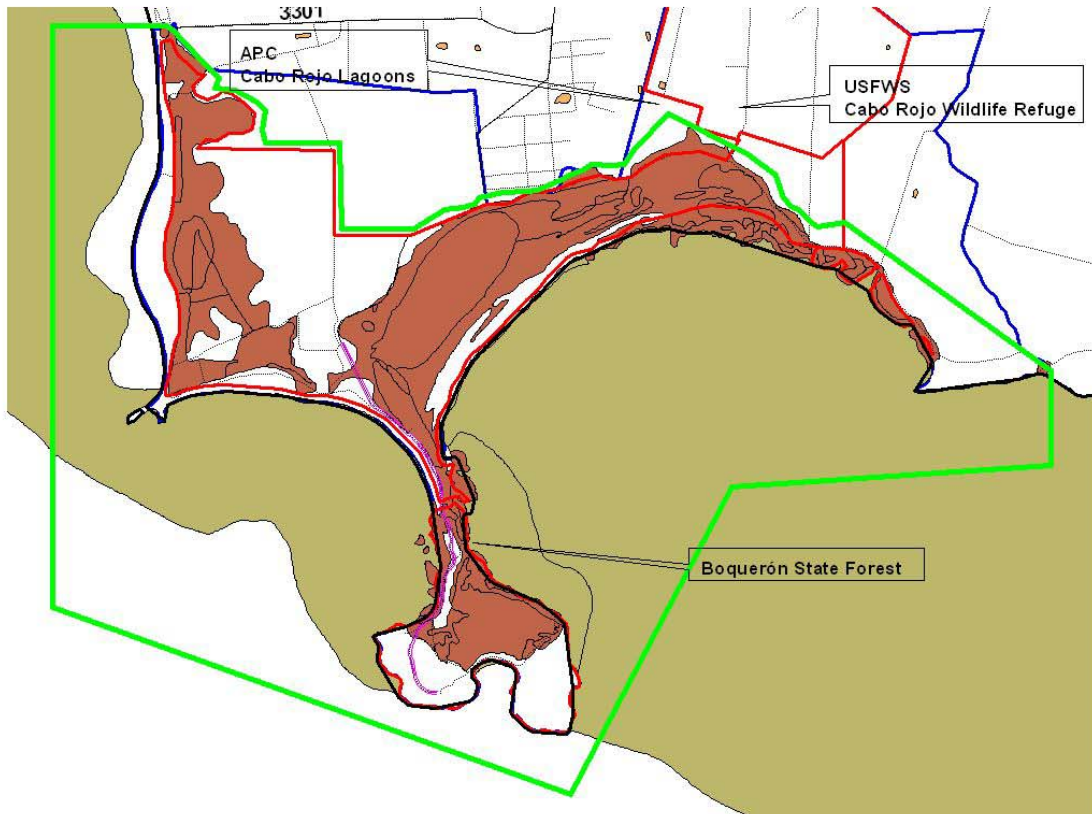
Tossas-Cavalliery, A.G. 2001. Importancia de las Salinas de Cabo Rojo para las aves residentes y migratorias de Puerto Rico. El Bien-te-veo. Volumen III Número 5 Sociedad Ornitológica Puertorriqueña.

USFWS. 1993. Proposed Expansion of Cabo Rojo National Wildlife Refuge, Boquerón, Puerto Rico. Final Environmental Assessment. United States Department of the Interior. Fish and Wildlife Service, Southeast Region. 17pp.

USFWS. 1999. Cabo Rojo Salt Flats become part of National Wildlife Refuge. Press Release #: R99-82 October 14, 1999. <http://southeast.fws.gov/news/1999/r99-082.html>. 4 pp.

Ventura Barnés, J. 1947. Additions to the Puerto Rican Avifauna with notes on little known species. Auk Vol. 64. Pp. 400-406.

Cabo Rojo Salt Flats and Adjacent Areas

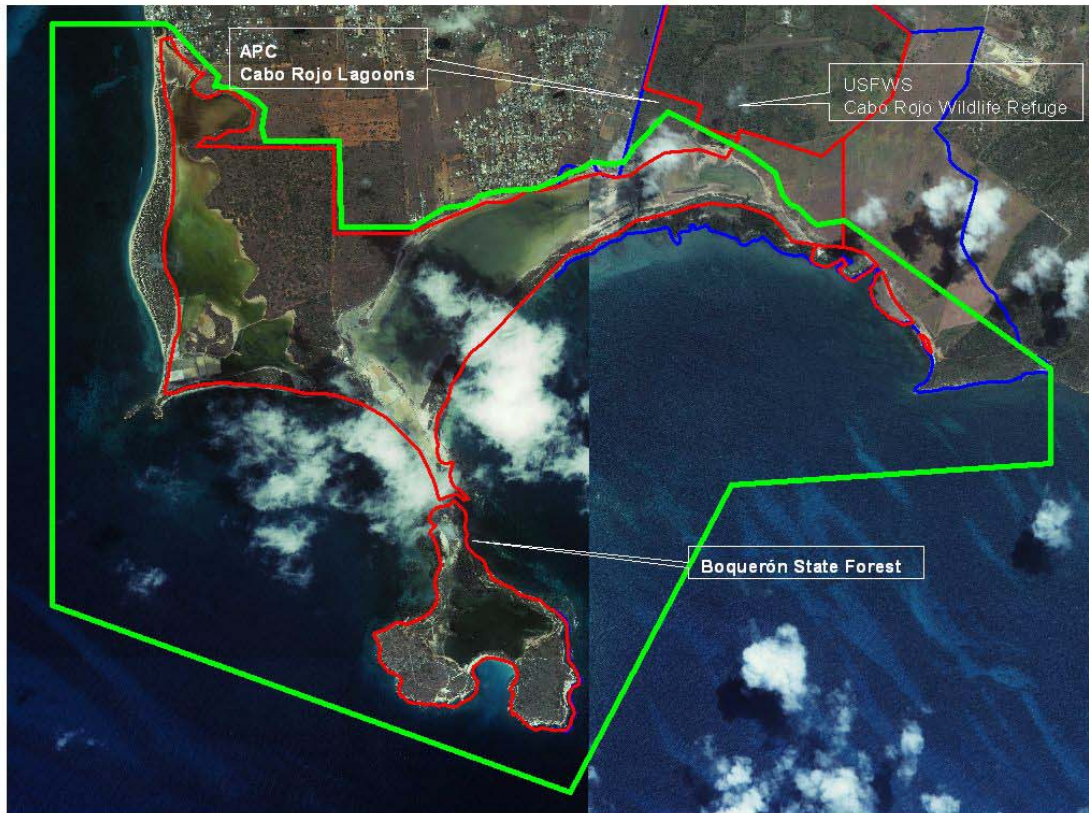


1 0 1 2 3 4 Kilometers

- █ Cabo rojo salt flat & adjacent areas.shp
- Municips.shp
- Bosques_y_reservas.shp
- Carreteras avpu.shp
 - ▬ autopistas
 - ▬ primarias
 - ▬ secundarias
 - ▬ terciarias
 - ▬ caminos
 - ▬ propuestas
- Humedales avpu.shp
 - █ Estuarine
 - █ Lacustrine
 - █ Marine
 - █ Palustrine
 - █ Riverine
- Areas con prioridad de conservacion.shp



Cabo Rojo Salt Flats and Adjacent Areas



- Cabo rojo salt flat & adjacent areas.shp
- Bosques_y_reservas.shp
- Areas con prioridad de conservacion.shp

61- Punta Guaniquilla Natural Reserve, Cabo Rojo

Area Description:

The Punta Guaniquilla Natural Reserve (PGNR) is located on the southwestern coast of Puerto Rico (18°02'41"N and 67°12'06"W) in barrio Pedernales of the municipality of Cabo Rojo. It covers 152 ha and consists of upland and wetland habitat as small coastal areas. Its boundaries are the Canal de Guanajibo to the west, the Boquerón State Forest to the south, PR road # 307 to the east, and the Buyé Public Beach to the north. It is divided in seven main vegetation types: pastures, shrublands, woodlands, forest, marsh, beach and beach thickets. Pastures are the dominant vegetation type, with an estimated 48% or 72.7 ha but like shrublands (8.5%), they result from human related activities such as livestock grazing, agriculture and woodcutting. Woodlands occupy the second place with 21.6%. Forests, the expected dominant vegetation type, occupy only 6.7% of the reserve. For a complete floral composition on the PGNR, see Vázquez and Kolterman, 1998.

The area is distinguished by the presence of two lagoons that cover approximately 13 ha. The main lagoon covers an estimated 9.5 ha and the second 4.6, but both can dry out during long dry periods (Vázquez and Kolterman 1998). These lagoons are considered important wildlife habitat for aquatic avian species. Another wetland habitat in the PGNR is a variable-size marsh of about 2.6 ha located at the northeast border of the Reserve. Elevation ranges from sea level up to 46 m in Cerro Guaniquilla (Vázquez and Kolterman 1998).

There is also the presence of several giant limestone rocks in the lagoons that make the area one of the most scenic areas in Puerto Rico (Raffaele and Duffield 1979). The presence of these unique promontories gave the area a high aesthetic value. Various caves are found in the PGNR, one of them is Cueva Cofresí (Quevedo-Bonilla 2000).

Ownership/Protection:

The Conservation Trust of Puerto Rico has administered this reserve since 1976. Access to the Reserve is restricted, and although it is protected from urban development and deforestation, part of the property (38.9 ha) is rented for cattle grazing.

Special Recognition:

The PGNR was recommended to be designated as a critical habitat for some rare and endangered plant species (Vázquez and Kolterman 1998). The lagoons are considered important wildlife habitat for aquatic avian species in Puerto Rico. The limestone rocks formations are recognized as one of the most scenic areas in Puerto Rico (Raffaele and Duffield 1979). Today, the PGNR continue to be recognized as a prime CWA.

Wildlife

Sixty eight bird species have been reported in the PGNR: Pied-billed grebe *Podilymbus podiceps*, Least grebe *Tachybaptus dominicus*, Brown pelican *Pelecanus occidentalis*, Magnificent frigatebird *Fregata magnificens*, Cattle egret *Bubulcus ibis*, Little blue heron *Egretta caerulea*, Snowy egret *E. thula*, Tricolored heron *E. tricolor*, Great blue heron *Ardea herodias*, Great egret *A. alba*, Common moorhen *Gallinula chloropus*, Green heron *Butorides virescens*, West Indian Whistling duck *Dendrocygna arborea*, Blue-winged teal *Anas discors*, Ruddy duck *Oxyura jamaicensis*, Turkey vulture *Cathartes aura*, Red-tailed hawk *Buteo jamaicensis*, Osprey *Pandion haliaetus*, American kestrel *Falco sparverius*, Merlin *F. columbarius*, Peregrine falcon *F. peregrinus*, Black-necked stilt *Himantopus mexicanus*, Semipalmated plover *Charadrius semipalmatus*, Black-bellied plover *Pluvialis squatarola*,

Greater yellowlegs *Tringa melanoleuca*, Lesser yellowlegs *T. flavipes*, Stilt sandpiper *Calidris himantopus*, Willet *Catoptrophorus semipalmatus*, Spotted sandpiper *Actitis macularia*, Ruddy turnstone *Arenaria interpres*, Royal tern *Sterna maxima*, Sandwich tern *S. sandvicensis*, Rock pigeon *Columba livia*, Common ground dove *Columbina passerina*, White-winged dove *Zenaida asiatica*, Zenaida dove *Z. aurita*, Mangrove cuckoo *Coccyzus minor*, Puerto Rican Lizard cuckoo *Saurothera vieillotii*, Smooth-billed ani *Crotophaga ani*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Green mango *Anthracothorax dominicus*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Caribbean elaenia *Elaenia martinica*, Gray kingbird *Tyrannus dominicensis*, Cave swallow *Petrochelidon fulva*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Red-legged thrush *Turdus plumbeus*, Adelaide's warbler *Dendroica adelaidae*, Palm warbler *D. palmarum*, Prairie warbler *D. discolor*, Magnolia warbler *D. magnolia*, Yellow warbler *D. petechia*, Black and white warbler *Mniotilta varia*, Northern parula *Parula americana*, Northern waterthrush *Seiurus noveboracensis*, Bananaquit *Coereba flaveola*, Great Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, Troupial *Icterus icterus*, Black-faced grassquit *Tiaris bicolor*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Nutmeg mannikin *Lonchura punctulata*, Bronze mannikin *L. cucullata*, *Estrilda melpada* (Tossas 2001). There is also the presence of White cheeked pintail *Anas bahamensis*, and the White-winged dove *Zenaida asiatica* nest in these mangroves (Cardona and Rivera 1988). Puerto Rican Flycatcher *Myiarchus antillarum*, Least tern *Sterna antillarum* (Terrestrial Resources Division Data 2004).

Critical Plants:

Rare species such as *Cynometra portoricensis* and *Santhoxylum flavum*, *Goussia attenuate*, *Stahlia monosperma* and *Oxandra lanceolata* are reported. Two endemics, rare and endangered trees species: *Polygala cowellii* and *Trichilia triacantha*, are located adjacent to the Reserve (Vázquez and Kolterman 1998).

Threats:

Illegal hunting of pigeons, doves and waterfowl threatens the wildlife in this Reserve.

Conservation Recommendations:

Developments near these lagoons should be carefully restricted, the access improved and the area developed for picnicking and sightseeing (Raffaele and Duffield 1979). An interpretative trails project could provide opportunities to contemplate the different natural systems in this CWA, including the observation of the wildlife in its natural habitat. This project could provide to the visitors and residents of Cabo Rojo an excellent recreational activity and enjoyment of one of the Puerto Rico's natural areas.

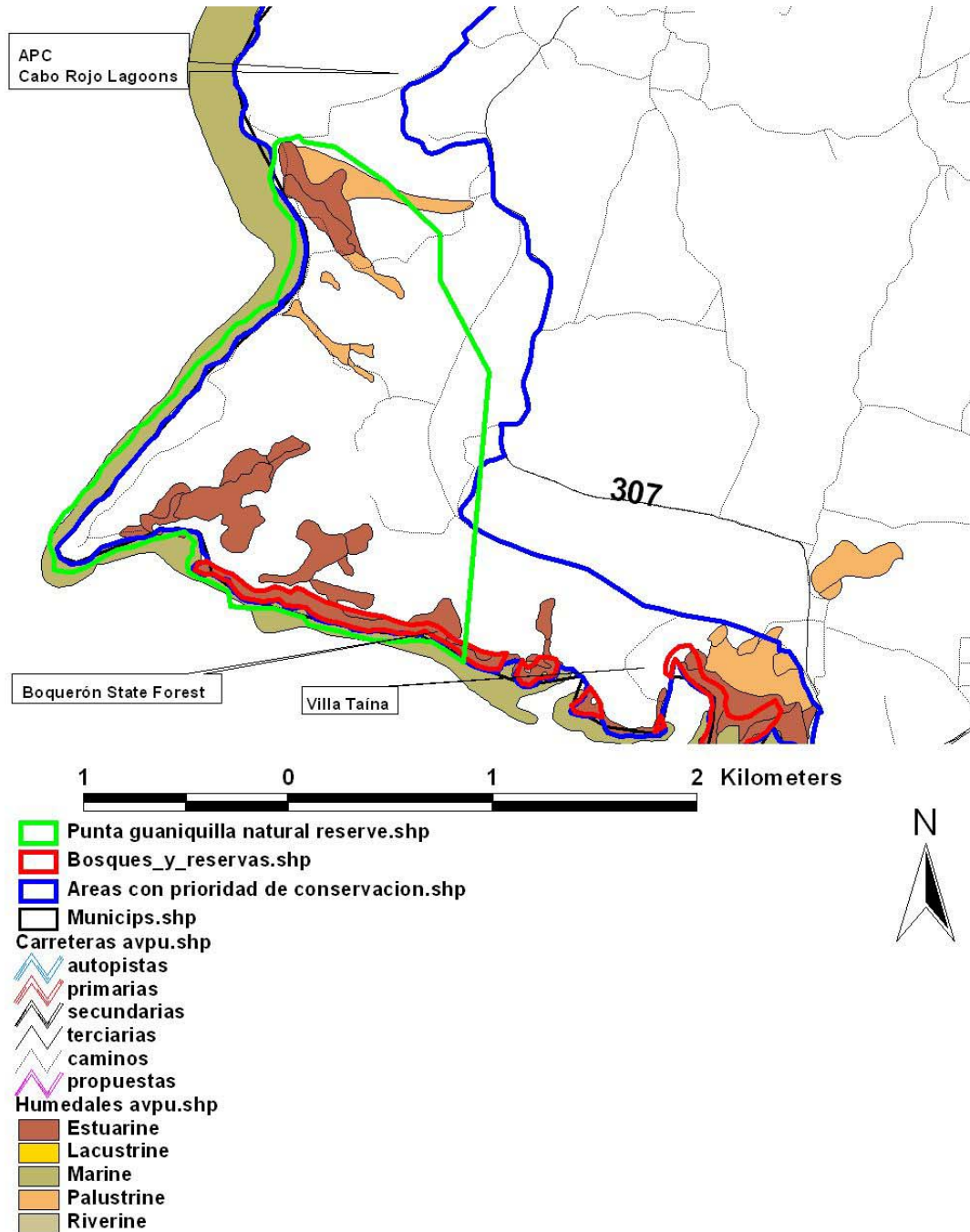
References:

- Collazo, J. A. 1986. Guaniquilla Reserve Inventory Plan. The Conservation Trust of Puerto Rico. 11 pp.
- Quevedo Bonilla, V.; Vélez Ruth, H.; Díaz-Rivera, C. and F. Silva. 2000. Informe Técnico Composición Natural Punta Guaniquilla, Cabo Rojo, Puerto Rico. Departamento de Recursos Naturales y Ambientales, Área de Planificación Integral, División de Patrimonio Natural.

Tossas Cavallieri, A.G. 2001. Lista de especies de aves observadas en Punta Guaniquilla, Cabo Rojo durante los censos navideños de 1996-2000. Dept. Biología, UPR, Río Piedras, P.R. 3 pp.

Vázquez, O.J. and D. Kolterman. 1998. Floristic composition and vegetation types of the Punta Guaniquilla Natural Reserve-Cabo Rojo, Puerto Rico. *Carib. J. Sci.* 34: 265-279.

Punta Guaniquilla Natural Reserve



Punta Guaniquilla Natural Reserve



- Punta guaniquilla natural reserve.shp
- Bosques_y_reservas.shp
- Areas con prioridad de conservacion.shp

62- Joyuda Lagoon Natural Reserve, Cabo Rojo

Area Description:

The Joyuda Lagoon Natural Reserve (JLNR) is located on the west coast of the municipality of Cabo Rojo (18⁰ 07' 57" N and 67⁰ 10' 24" W). It is bordered on the north by sand and swamp deposits, on the northeast and east by the Sabana Alta Ridge, and on the south by extensive cattail swamps. The low lying Sabana Alta ridge of hills in the east and northeast cuts the lagoon from regional drainage, creating a watershed only twice the area of the lagoon, limiting freshwater sources to being dominated by direct rainfall on the lagoon (Odum and Munroe 1993)

The JLNR, covering 318 ha, consists of Laguna Joyuda and part of its drainage basin, mangrove wetlands and associated lowlands, Laguna Atolladero, and Cayo Ratones and its associated marine ecosystems including coral reefs and seagrass meadows (García Muñiz 1993). It is a small tropical estuary almost completely surrounded by mangroves, including the four species most prevalent in the Neotropics: red *Rhizophora mangle*, black *Avicennia germinans*, white *Laguncularia racemosa*, and buttonbush *Conocarpus erectus* (Odum and Munroe 1993)

Joyuda Lagoon has a maximum length and width of about 2 km and 1 km, respectively, and is connected to the ocean by means of narrow and shallow channels nearly 0.5 km long (Carvajal et al. 1980; Pérez et al. 1981). The lagoon perimeter is almost completely bordered by mangrove forest 15 to 20 m wide (Carvajal et al. 1980).

It is composed of salty water and there is a small channel that connects with the sea, also it receives rainwater (DRN 1982). The construction of a small drainage ditch that discharges right at the seaward side of the channel is unknown. However, the flow of this ditch is small most of the time and should enter the lagoon only on the flood tides, if at all. Most of the freshwater inputs to the lagoon come from intermittent tributaries that flow from the eastern periphery of the lagoon (García Muñiz 1993).

The lagoon is periodically bioluminescent, depending on variations in salinity (Carvajal-Zamora 1976). There is evidence of marine organisms such as *Pyrodinium bahamensis* and *Mnemiopsis* sp. that gives the bioluminescent to the lagoon (DRN, 1982). The occurrence of this natural phenomenon in the Lagoon makes it one of a high natural value (DRNA, 1998). The lagoon has to the east side soils rich in nickel and iron deposits (DRN, 1982; Negrón González 1986). Small patches of the seagrass *Thalassia testudinum* and *Ruppia maritima* exist in the lagoon, but most of the bottom is un-vegetated (Stoner, 1988).

Ownership/Protection:

The Joyuda Lagoon belongs to the Commonwealth of PR and it is for the public use

Special Recognition:

In 1980, the Joyuda Lagoon system was designated by the Puerto Rico Planning Board as a Natural Reserve based on the Coastal Zone Management Plan developed by the DNER (DRN, 1982). This is so because of the great ecological, scientific, recreational, and economic value recognized to the system by the government of Puerto Rico (García Muñiz, 1993). The area was first recognized a CWA by Moreno and Pérez (1980). Then in 1988, Cardona and Rivera classified this CWA of secondary importance. Using available recent data and observations, the JLNR continue to be recognized a CWA of secondary importance.

Wildlife

Birds

Fifty-two bird species have been reported in Joyuda Lagoon: Ruddy duck *Oxyura jamaicensis*, Purple gallinule *Porphyryla martinica* (Moreno and Pérez, 1980; Cardona and Rivera, 1988). Laughing gull *Larus atricilla*, Brown pelican *Pelecanus occidentalis*, Green heron *Butorides virescens*, Belted kingfisher *Ceryle alcyon* (Cardona and Rivera 1988). Cattle egret *Bubulcus ibis*, Purple martin *Progne subis* (DRN 1982). Frigate bird *Fregata magnificens*, Great blue heron *Ardea herodias*, Great egret *A. alba*, Little blue heron *Egretta caerulea*, Tricolored heron *E. tricolor*, Cattle egret *Bubulcus ibis*, Yellow-crowned night heron *Nyctanassa violacea*, Osprey *Pandion haliaetus*, Red-tailed hawk *Buteo jamaicensis*, Merlin *Falco columbarius*, Clapper rail *Rallus longirostris*, Lesser yellowlegs *Tringa flavipes*, Spotted sandpiper *Actitis macularia*, Sandwich tern *Sterna sandvicensis*, White-winged dove *Zenaida asiatica*, Common ground dove *Columbina passerina*, Mangrove cuckoo *Coccyzus minor*, Smooth-billed ani *Crotophaga ani*, Antillean Mango *Anthracothorax viridis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Black-whiskered vireo *Vireo altiloquus*, Caribbean Martin *Progne dominicensis*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Northern parula *Parula americana*, Yellow warbler *Dendroica petechia*, Magnolia warbler *D. magnolia*, Yellow rumped warbler *D. coronata*, Prairie warbler *D. discolor*, Black and white warbler *Mniotilta varia*, American Redstart *Setophaga ruticilla*, Prothonotary warbler *Protonotaria citrea*, Hooded warbler *Wilsonia citrina*, Bananaquit *Coereba flaveola*, Black-faced grassquit *Tiaris bicolor*, Greater Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, Greater Antillean Oriole *Icterus dominicensis*, Troupial *I. icterus*, Orange cheeked waxbill *Estrilda melpoda*, Quaker parakeet *Myiopsitta monachus*, Canary winged parakeet *Brotogeris versicolurus* (Data provided by SOPI 2004).

Fish

Forty-one fish species have been reported in Joyuda Lagoon. Among them: *Bairdiella rochus* (most abundant species) (Negrón González 1986), Robalo, Sabalo, Pargo, Picua, Mero sapo, Cubera, Mojarra *Diapterus rhombeus*, Espelúa, Corvino, Jarea *Mugil curema*, Liza (DRN 1982); Lenguado *Archiurus lineatus*, Macleco *Bairdiella ronchus*, Mojarra *Diapterus plumieri*, Barracuda *S. barracuda* (García 1981).

Threats:

Discharge of fill material into the Lagoon, introduction of exotic animals such as geese, horses, turkeys, etc affect the wildlife in the Lagoon (FWS 1997, communication to the US Army Corps Re: 199601517). There is an ever-increasing demand for residential and recreational activities especially near the coastline, including the JLNR. Residential dwellings increasing on the eastern slopes with new families and expanding parking lots of seafood restaurants located on the western sand banks are some other threats affecting JLNR (Odom and Munroe 1993). Also illegal soil extraction and junk deposition occurs in the boundaries of the JLNR.

Conservation Recommendations:

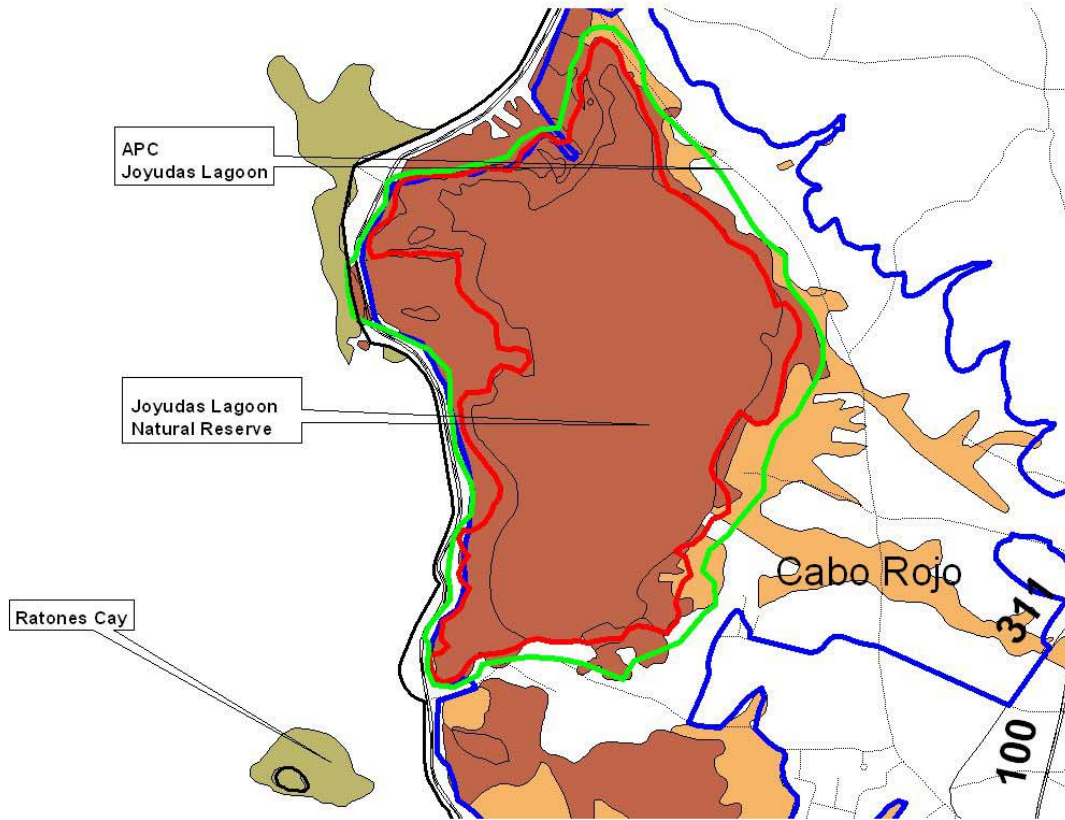
To develop a management plan for the area and to denegate any kind of permit for tourist developments such as Resorts or Mega Hotels. Residential and recreational activities must be regulated and controlled to prevent hydrological changes and/or environmental damage

to the system. Other recommendation is the creation in Joyuda of the Management Office for Laguna Joyuda Natural Reserve (see DRNA 1998, page 49, for more recommendations).

References:

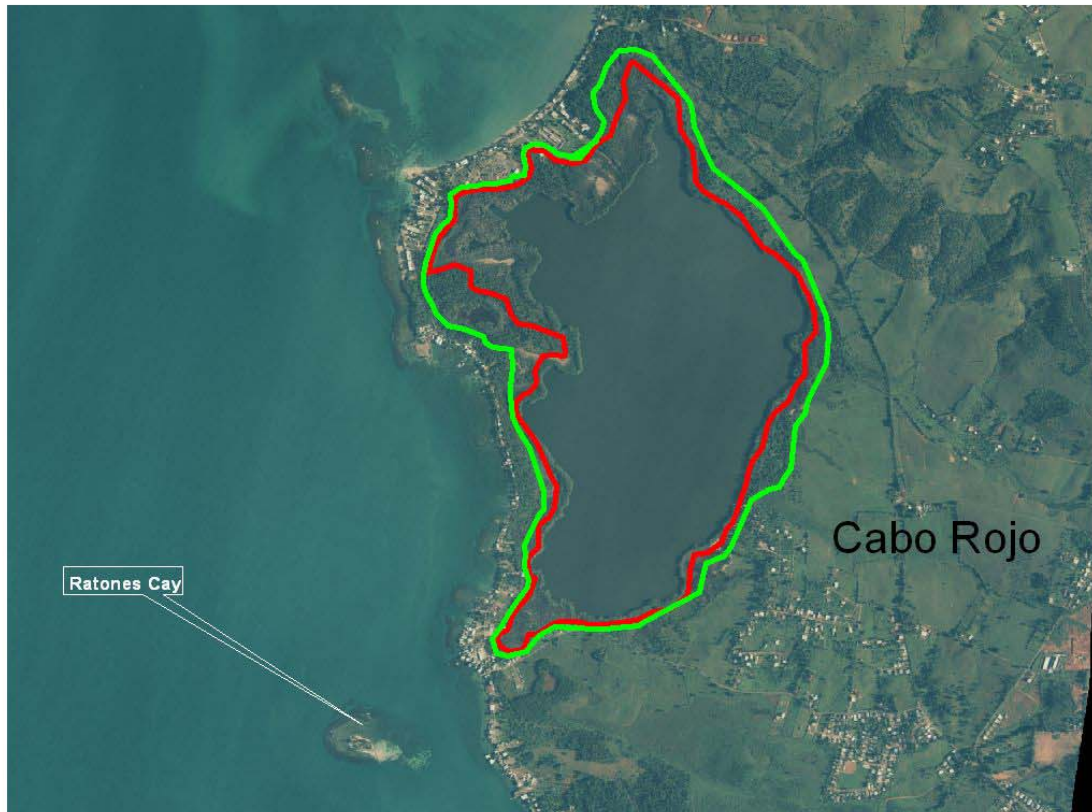
- Carvajal-Zamora, J. R. 1976. Factores que afectan la bioluminiscencia en algunos sistemas estuarinos y marinos de Puerto Rico. En Tercer Simposio de Recursos Naturales. Departamento de Recursos Naturales. San Juan, Puerto Rico. p. 18-25.
- Carvajal, J. R., G. Cintrón and M. A. Pérez. 1980. Estudio de la Laguna de Joyuda: Un Ecosistema Marino. Final report, Section 306, Coastal Zone Management Program, Department of Natural Resources, San Juan, Puerto Rico. 94 pp.
- Center for Energy and Environment Research. 1985. Joyuda Research Bibliography. By Marine Ecology Division. University of Puerto Rico- U. S. Department of Energy. 23 pp.
- Departamento de Recursos Naturales. 1982. Reserva Natural Laguna Joyuda. Programa de Manejo de la Zona Costanera. San Juan, Puerto Rico.
- Departamento Recursos Naturales y Ambientales. 1998. Plan de manejo para el área de planificación especial de suroeste, sector Boquerón. Gobierno de Puerto Rico. Preparado por G. I. Fuentes y M. Rivera. Borrador. 75 pp.
- García, J. R. 1981. Ecological Aspects of the Community of Fishes in Joyuda Lagoon. Octavo Simposio de Recursos Naturales. Departamento de Recursos Naturales. San Juan, Puerto Rico. Pp. 60-77.
- García Muñiz, I. 1993. The environment of the Laguna Joyuda regional ecosystem. Acta Científica 7: 3-20.
- Gómez, F. 1984. Perspective on assessing the hydrology of Laguna Joyuda. Workshop on Joyuda Lagoon: CEER, Mayagüez, Puerto Rico. June 12, 1984..
- Odum, H.T., and M. Munroe. 1993. Simulation of the Laguna Joyuda ecosystem in western Puerto Rico. Acta Científica 7: 3-20.
- Pérez, M.A., M del Llano, and C. Laboy. 1981. Suplemento técnico para la Reserva Natural Laguna Joyuda y terrenos asociados. Coastal Zone Management Program Task 11.1, Department of Natural Resources, San Juan, Puerto Rico. 187 pp.
- Stoner, A. W. 1988. A survey ground for four tropical *Penaeus* species: Laguna Joyuda, Puerto Rico. Mar. Ecol. Prog. Ser. 42: 133-141.



Joyudas Lagoon Natural Reserve



- Municipios.shp
- Joyudas lagoon cwa.shp
- Bosques_y_reservas.shp
- Areas con prioridad de conservacion.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

Joyudas Lagoon Natural Reserve



-  Joyuda lagoon cwa.shp
-  Joyuda lagoon natural reserve.shp

63- Cuevas Lagoon, Cabo Rojo

Area Description:

The Cuevas Lagoon is located in the southwestern part of the Island, near roads 103 and 311, municipality of Cabo Rojo, with approximately 271 ha. It is used principally for cattle grazing. Water levels vary greatly, and the surrounding areas become inundated during heavy rains. Ruddy Ducks and migrant Blue-winged Teal are relatively common in winter.

The area is hunted intensively, especially near road 103. There had been reported as formerly supporting the West Indian Whistling Duck. Small numbers of the Whistling Duck, the Ruddy and the Bahamas duck were observed using Cuevas Lagoon at irregular intervals. The area is of some importance to migrant and resident threatened waterfowl.

Ownership/Protection:

This area is in private ownership.

Special Recognition:

In the 1979, this area was classified a CWA of secondary importance because the habitat alteration during those years (Raffaele and Duffield). In 1988, Cardona and Rivera upgraded the status of this area to primary.

Recent waterfowl aerial census data reports high numbers of wintering species (D. Ramos pers. comm.). Today, because this area continues to sustain high numbers of species important for hunting (mainly waterfowl, native and migrant), we recognized the Cuevas Lagoon of primary importance for wildlife.

Wildlife

No birds inventory others than waterfowl, are available. The Pied-billed Grebe *Podilymbus podiceps*, the Common moorhen *Gallinula chloropus* and the Common Snipe *Gallinago gallinago* are reported. Blue-winged teal *Anas discors*, White-checked pintail *A. bahamensis*, Northern Shoveler *A. clypeata*, Green-winged teal *A. crecca*, Ruddy duck *Oxyura jamaicensis*, Ring-necked duck *Aythya collaris*, Lesser scaup *A. affinis*, Masked duck *Nomonyx dominica* (D. Ramos pers. comm.).

Threats:

Constant drainage for cattle and long periods of drought are the main threats of the lagoon. Some activities such as landfill for urban development around the lagoon boundaries are occurring.

Conservation Recommendations:

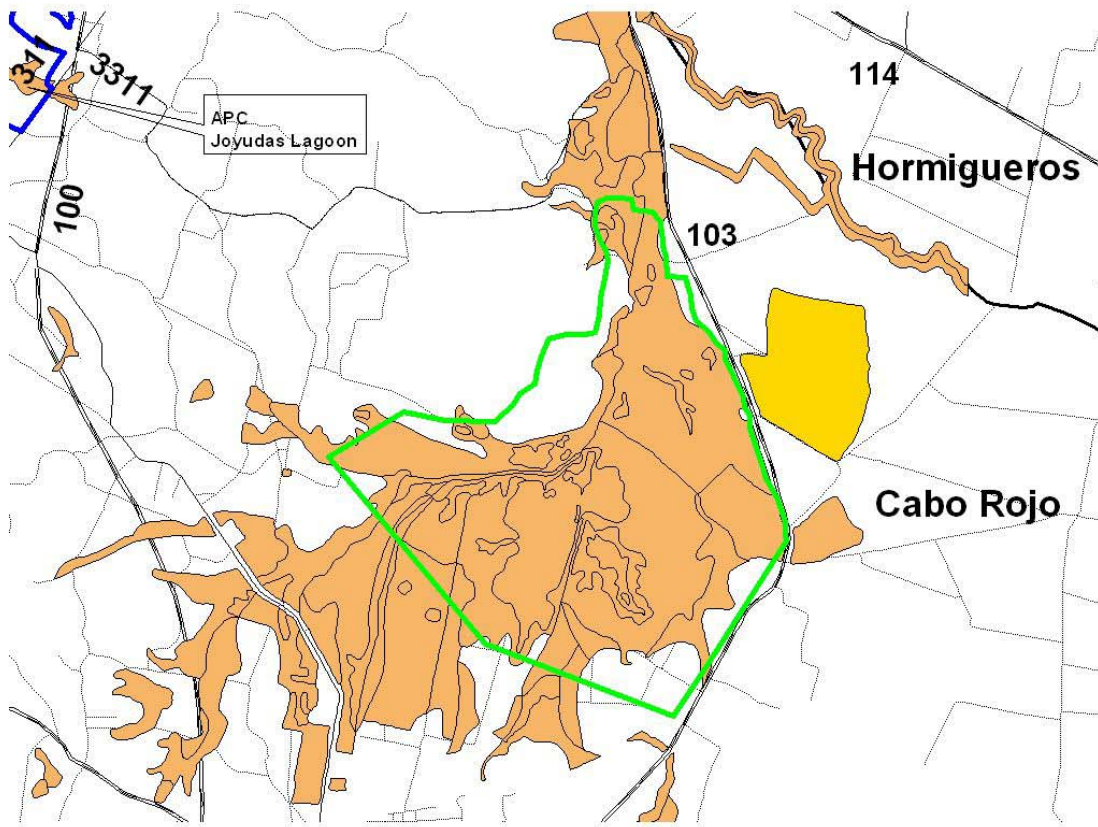
The Puerto Rico Commonwealth should acquire the property in order to restore this important waterfowl wetland.

References:

Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.

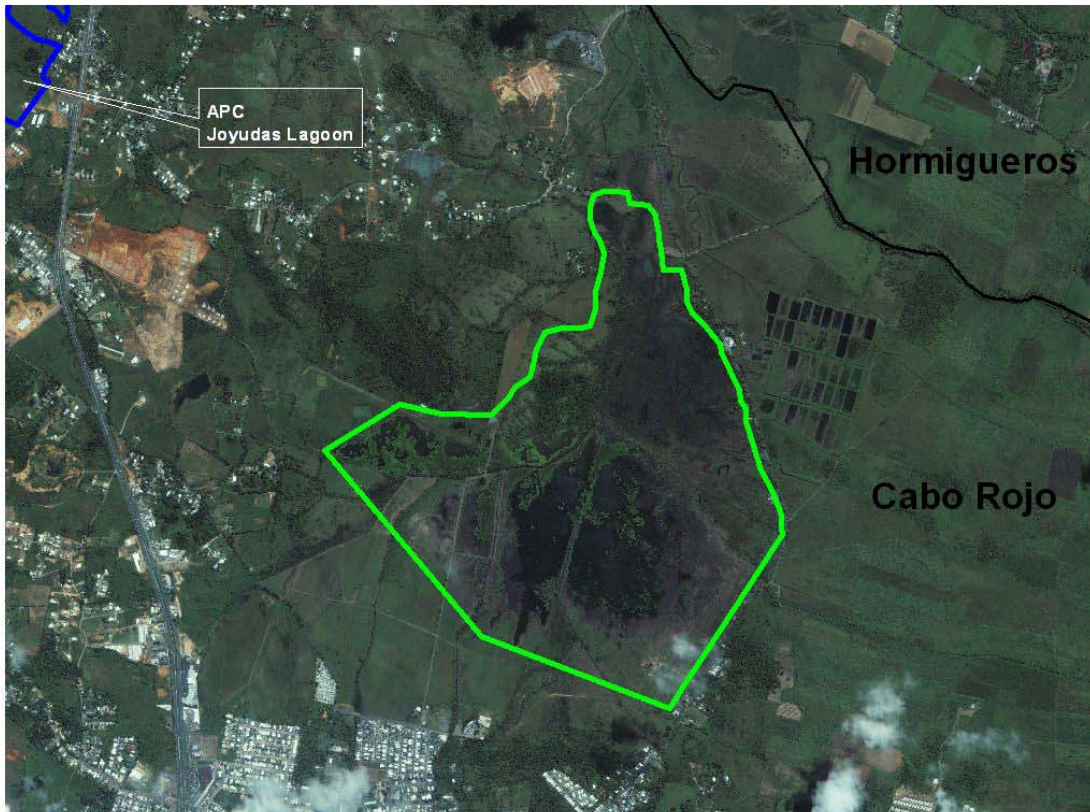
National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, U.S. Coast Guard, Departamento de Recursos Naturales y Ambientales, and U.S. Department of the Interior. 2000. Sensitivity of Coastal and Inland Resources to Spilled Oil; Puerto Rico Atlas. Published in Seattle, Washington. Hazardous Materials Response Division of NOAA.

Cuevas Lagoon



- Cuevas lagoon.shp
- Areas con prioridad de conservacion.shp
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine
- Municips.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas

Cuevas Lagoon



-  Cuevas lagoon.shp
-  Municipis.shp
-  Areas con prioridad de conservacion.shp

64- Sabanetas Swamp / Caño Boquilla, Mayagüez

Area Description:

The Sabanetas Swamp/Caño Boquilla is an estuarine wetland located on the west coast of Puerto Rico, in the City of Mayagüez in the area of Playa Grande, 1.9 Km south to the mouth of Río Grande de Añasco. This CWA of 162-202 ha includes a canal, mangrove swamps, palustrine marshes and brackish estuarine swamp forest. It was designated as a Natural Reserve in 2002, because it harbors several stands of *Pterocarpus officinalis* and mangroves, a rare association of a wetland in the west side of the Island. The area also supports fishes and crustaceans of commercial and recreational value. The beaches nearby are a nesting site for endangered marine turtles.

Ownership/Protection:

The Sabanetas Swamp is composed by public (47.2 ha) and private lands. Lands within the ecologically valuable area of Caño Boquilla are all in private property. This makes those lands prone to development, even if they are not suitable for that purpose.

Special Recognition:

This wetland is on DNER's List of Protection Priorities for High Value Natural Areas, but most of the wetland and buffer acreage is privately owned. The DNER recognized this wetland as a CWA because the presence of a colony of the threatened West Indian Whistling ducks (Raffaele and Duffield 1979; Cardona and Rivera 1988). In 2002 the area was declared a Natural Reserve. Today, the Caño Boquilla still conserves its natural value, sustaining important population of native, endemics, rare, residents and migratory birds. Also, it supports various species of reptiles, fish, crustaceans, mollusk, and marine mammals. Using recent faunal data, this CWA is upgraded as a primary area for wildlife.

Wildlife

Caño Boquilla is home to 71 bird species, as well as reptiles, amphibians, fish and crustaceans of commercial and recreational value, mollusks, and marine mammals. From the 71 bird species reported, 25.3% are migratory (Delannoy 2002). The local seashore is ideal for nesting of the endangered Leatherback *Dermochelys coriacea* and Hawksbill *Eretmochelys imbricata* sea turtles; the endangered West Indian Manatee *Trichechus manatus* has also been sighted close to the seashore.

Birds

Seventy two bird species have been reported in Caño La Boquilla in Mayagüez: West Indian Whistling duck *Dendrocygna arborea* (accidental), Caribbean Coot *Fulica caribaea*, Common moorhen *Gallinula chloropus*, Great blue heron *Ardea herodias*, Great egret *A. alba* (Cardona and Rivera 1988). Pied-billed grebe *Podilymbus podiceps*, Brown pelican *Pelecanus occidentalis*, Magnificent frigatebird *Fregata magnificens*, Snowy egret *Egretta thula*, Little blue heron *E. caerulea*, Tricolored heron *E. tricolor*, Green heron *Butorides virescens*, Yellow-crowned night heron *Nyctanassa violacea*, Black-crowned night heron *Nycticorax nycticorax*, Roseate spoonbill *Ajaia ajaja*, Osprey *Pandion haliaetus*, Red-tailed hawk *Buteo jamaicensis*, American kestrel *Falco sparverius*, Black-bellied plover *Pluvialis squatarola*, Killdeer *Charadrius vociferus*, Black-necked stilt *Himantopus mexicanus*, Spotted sandpiper *Actitis macularia*, Ruddy turnstone *Arenaria interpres*, Semipalmated plover *Charadrius semipalmatus*, Solitary sandpiper *Tringa solitaria*, Sanderling *Calidris alba*, Semipalmated

sandpiper *C. pusilla*, Royal tern *Sterna maxima*, Sandwich tern *S. sandvicensis*, Least tern *S. antillarum*, Roseate tern *S. dougallii*, Laughing gull *Larus atricilla*, Rock pigeon *Columba livia*, Scaly-naped pigeon *Patagioenas squamosa*, White-winged dove *Zenaida asiatica*, Zenaida dove *Z. aurita*, Common ground dove *Columbina passerina*, Mangrove cuckoo *Coccyzus minor*, Smooth-billed ani *Crotophaga ani*, Puerto Rican Screech owl *Megascops nudipes*, Antillean Mango *Anthracothorax dominicus*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Puerto Rican Flycatcher *Myiarchus antillarum*, Caribbean Martin *Progne dominicensis*, Barn swallow *Hirundo rustica*, Cave swallow *Petrochelidon fulva*, Red-legged thrush *Turdus plumbeus*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Black-whiskered vireo *Vireo altiloquus*, Northern parula *Parula americana*, American Redstart *Setophaga ruticilla*, Common yellowthroat *Geothlypis trichas*, Black and white warbler *Mniotilta varia*, Yellow-throated warbler *Dendroica dominica*, Black-throated blue warbler *D. caerulescens*, Northern waterthrush *Seiurus noveboracensis*, Bananaquit *Coereba flaveola*, Puerto Rican Spindalis *Spindalis portoricensis*, Black-faced grassquit *Tiaris bicolor*, Greater Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, Greater Antillean Oriole *Icterus dominicensis*, Troupial *I. icterus*, Red bishop *Euplectes franciscanus*, Nutmeg mannikin *Lonchura punctulata*, Chestnut mannikin *L. malacca*, Orange cheeked waxbill *Estrilda melpoda*, Pin-tailed whydah *Vidua macroura*, (Delannoy 2002). Others birds reported are: Kentucky Warbler *Oporornis formosus*, Hooded warbler *Wilsonia citrina* and the Ovenbird *Seiurus aurocapilla* (SOPI 2003).

Reptiles

Puerto Rican giant anole *Anolis cuvieri*, Crested anole *A. cristatellus*, Barred anole *A. stratulus*, Common grass anole *A. pulchellus*, Puerto Rican ground lizard *Ameiva exsul*, Leatherback sea turtle *Dermochelys coriacea*, Hawksbill sea turtle *Eretmochelys imbricata* (Cardona and Rivera 1988; Villamil et al. 1981).

Mammals

West Indian manatee *Trichechus manatus*, Short-finned pilot whale *Globicephala macrorhynchus*, Killer whale *Orcinus orca*, and Sperm whale *Physeter macrocephalus*. Stranding individuals of *Kogia breviceps* are documented front of the Maní community. Some dolphins observed are the Atlantic spotted dolphin *Stenella frontalis* and the Spinner dolphin *S. longirostris* (DRNA 2002).

Fish

Caribbean puffer *Sphaeroides greebel*, Swordspine snook *Centropomus ensiferus*, Common snook *C. undecimalis*, Fat snook *C. parallelus*, Tarpon *Megalops atlanticus*, White mullet *Mugil curema*, Liza *M. liza*, Crevalle jack *Caranx hippos*, Horse-eye jack *C. latux*, Spinycheek sleeper *Eleotris pisonis*, Brazilian mojarra *Eugerres brasillianus*, Striped mojarra *E. plumieri*, Bigmouth sleeper *Gobiomorus dormitor*, Guavina *Guavina guavina*, Bonefish *Albula culpes*, Mozambique mouth-breeder *Oreochromis mossambicus*, Fat sleeper *Dormitator maculatus*, Timicu *Strongylura timicu*, Frillfin goby *Bathygobius soporator*, Snapper *Lutjanus sp.*, Atlantic anchoveta *Centengraulis edentulus*, Anchovy *Anchoa sp.* (Villamil et al. 1981; DRNA 2002).

Invertebrates

Crustacean:

Blue land crab *Cardisoma guanhumi*, Swamp ghost crab *Ucides cordatus*, Mangrove root crab *Goniopsis cruentata*, Mangrove tree crab *Aratus pisonii*, *Xyphocaris elongata*, Dana swimming crab *Callinectes danae*, Atlantic ghost crab *Ocypode quadrata* Mole crab *Hippa cubensis*, (Villamil et al. 1981; DRNA 2002).

Echinoderms:

Sand dollar *Mellita lata*.

Mollusk:

Toothed donax *Donax denticulatus*, Snail *Thiara granifera*, Virgin nerite *Nerita virginia*

Threats:

The land that covers the natural system of Caño Boquilla has been under development pressures. These pressures have been occurred in both private and public lands. Some threats are: urban and industrial development, zoning changes, parcel segregation, illegal housing construction, land fill in the wetland, mangrove cutting, and illegal dumping (DRNA 2002).

Conservation Recommendations:

Tasks related to future land acquisition efforts include identification of parcels needing protection, surveying and title searches, development of acquisition priorities, examination of acquisition mechanisms, and preparation of a management plan. For the development of a management plan, private groups should be included, such as Mayagüezanos por la Salud y Ambiente, Municipality of Mayagüez, University of Puerto Rico (Mayagüez Campus) and the Sabanetas community. The Environmental Quality Board should amend the Puerto Rico Waters Standards Regulations, in order to recommend a more restricted classification for the waters present in the Natural Reserve. This includes the principal channel of Caño Boquilla, lateral channels, and the river mouth. Also should be included the littoral portion delimited as Natural Reserve, the areas where sea turtles have been documented (between the river mouths of Río Guanajibo to the Río Grande de Añasco) (DRNA 2002).

References:

Delannoy, Carlos A. 2002. Perfil ecológico de la avifauna del sistema natural Caño Boquilla, Mayagüez, Puerto Rico. *In*: Documento de Designación Reserva Natural Caño Boquilla, Mayagüez, P.R. Departamento de Recursos Naturales y Ambientales, Área de Planificación Integral. 51 pp.

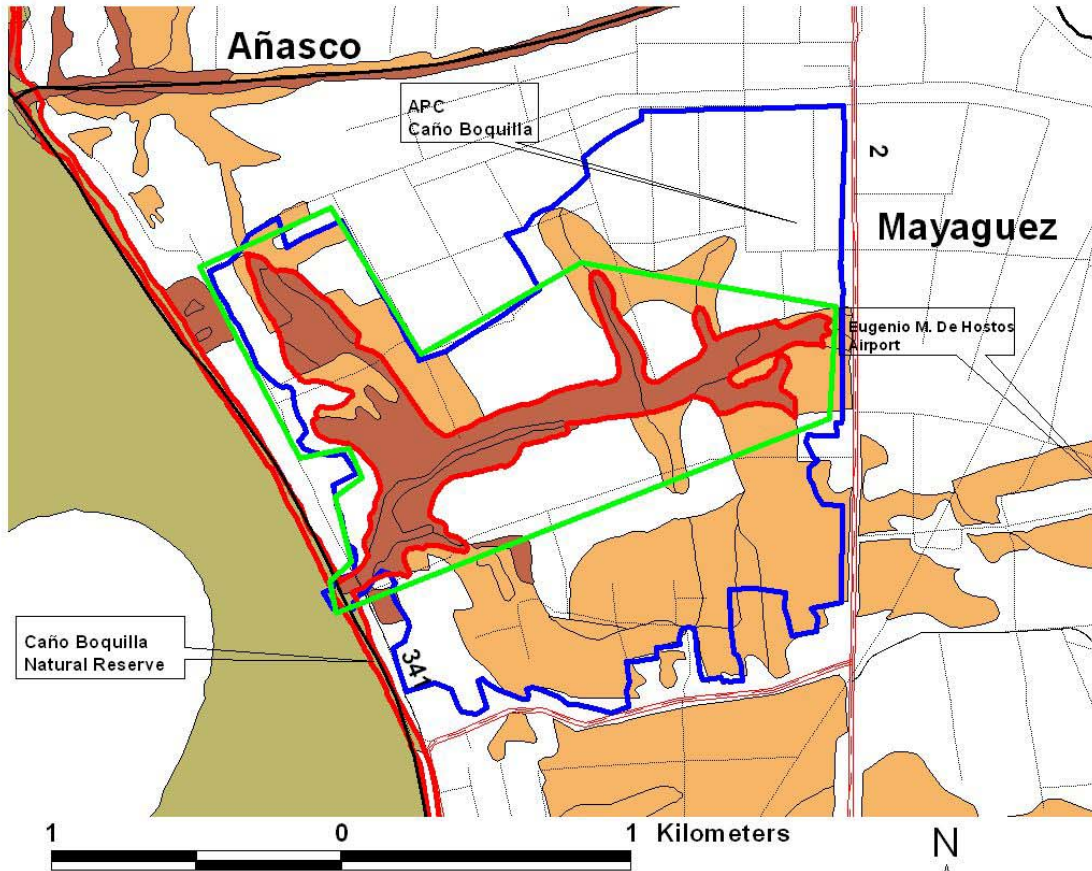
Departamento Recursos Naturales y Ambientales. 2002. Documento de Designación Reserva Natural Caño Boquilla, Mayagüez. DRNA, Área de Planificación Integral. 51 pp.

Estado Libre Asociado de Puerto Rico. 2002. Resolución PU-002-02-29-01 Aprobando la Designación del Área de Reserva Natural Caño Boquilla en el Municipio de Mayagüez. Oficina de la Gobernadora, Junta de Planificación.

SOPI. 2003. Avistamientos en la Caño La Boquilla, Lagunas de Coloso en Aguada, Playas de Isabela, Bahía de Puerto Real, Cabo Rojo y el Seco en Mayagüez. *In*: El Bien-te-veo. Sociedad Ornitológica Puertorriqueña Vol VI, Núm. I: 5-6.

Villamil, J.; Colón, J. A; del Llano, M.; Pérez, M. e I. Corujo. 1981. Suplemento de Información Técnica para la Designación de la Reserva Natural Caño La Boquilla, Mayagüez, Puerto Rico. Área de Investigaciones Científicas, Departamento de Recursos Naturales, San Juan.

Sabanetas Swamp - Caño Boquilla



- ▭ Sabanetas swamp-caño boquilla.shp
- Municips.shp
- Bosques_y_reservas.shp
- Areas con prioridad de conservacion.shp
- Carreteras avpu.shp
 - ▬ autopistas
 - ▬ primarias
 - ▬ secundarias
 - ▬ terciarias
 - ▬ caminos
 - ▬ propuestas
- Humedales avpu.shp
 - ▭ Estuarine
 - ▭ Lacustrine
 - ▭ Marine
 - ▭ Palustrine
 - ▭ Riverine

Sabanetas Swamp - Caño Boquilla



1 0 1 Kilometers



- Sabanetas swamp-caño boquilla.shp
- Bosques_y_reservas.shp
- Areas con prioridad de conservacion.shp

65- Maricao State Forest, Mayagüez-San Germán-Maricao-Sabana Grande, Puerto Rico

Area Description:

The Maricao State Forest (18° 09' N, 66° 59' W) lies at the western end of the Cordillera Central in western Puerto Rico and is divided into two separate segments comprising 4150 ha (largest Commonwealth forest) with elevations ranging from 15m to 900 m (Silander et al., 1986). It is located in the municipalities of Mayagüez, San Germán, Maricao and Sabana Grande. The mean annual temperature is 71.2 °F and precipitation of 235 cm (Cruz and Delannoy 1986; Delannoy 1997). Three of the six island life zones occur in Maricao State Forest: subtropical moist, wet, and lower montane wet forest (Delannoy 1997).

Over 85% of the soils in Maricao forest are derived from serpentine which is excessively permeable, well drained, and droughty. These soils are considered one of the poorest in Puerto Rico for agricultural production due to their extremely low water holding capacity, low fertility, and complex of elements that may be toxic or at least suppress plant growth. Physical properties peculiar to these soils allow them to absorb unusually large amounts of water, yet cause moisture loss more rapidly than other clays in Puerto Rico, producing a unique dry condition, in spite of high rainfall (Delannoy 1997). The peculiarity of the vegetation that grows in the serpentine soils is that exhibits a very unique and varied species composition, and a unique physiognomy and structure. Usually these areas are centers of endemism and restricted distributions (Figueroa 1981).

Five vegetation associations have been delineated in three bioclimatic life zones. A dwarfed vegetation of evergreen, small-leaved species occupies the narrow ridges, peaks, and summits exposed to strong winds are probably unique to Puerto Rico. Along the ridges, and towards the windward slopes, large cushions of the rare reindeer moss form a unique element of the forest floor. Plantations occupy 15 to 20% of the forest land area. The most common timber trees planted are eucalyptus *Eucalyptus robusta*, María *Calophyllum calaba* and Pino Hondureño *Pinus caribaea* (Delannoy 1992).

The headwaters of Río Guanajibo (Río Cruces, Cupeyes, Caín, Maricao and Rosario) and Río Grande de Añasco (Ríos Potrero and Bonelli) are located within the boundaries of the Maricao Forest (DNR 1976).

Among the great tree biodiversity of the Maricao State Forest, scientist has found 368 tree species; 71 of them endemics. Some of the endemic tree species found in the forest are: Coyor palm *Aiphanthes acanthophylla*, Uvero de fuego *Coccoloba pyrifolia*, Uvero de monte *C. sintenisii*, Ortégón *C. rugosa*, Royal palm *Roystonea borinquena*, Puerto Rican hat palm *Sabal causiarum*, Manaca palm *Calyptronoma rivalis*, Fragrant higuillo tree *Piper blattarum*, Palo de cera *Myrica holdrigeana*, Jaguey prieto *Ficus sintenisii*, Jaguilla *Magnolia portoricensis*, Canela tree *Licaria brittoniana*, Laurel paloma *Ocotea portoricensis*, Teta de burra *Hirtella rugosa*, Tortugo prieto *Ravenia urbanii*, Aceitillo simarrón *Simarouba tulae*, Almendrillo *Byrsonima wadsworthii*, Cedro macho *Hyeronima clusoides*, Palo de violeta *Polygala cowellii*, Palo de cruz *Rheedia portoricensis*, Majagua brava *Daphnopsis philippiana*, Camasey racimoso *Miconia pacyphylla*, Jusillo *Calycogonium squaulosum*, Alheli *Plumeria krugii*, Muñeco tree *Cordia borinquensis*, the endangered Matabuey *Goetzea elegans* (Padrón Velez and Ricart 1995). The most significant flowering period in the forest occurs during the first dry season, usually in the month of June (Ricart and Padón Vélez 1967).

Among some of the fascinating characteristics of the Maricao State Forest is the wide variety of orchids. Seventy-nine species have been identified (Ricart and Padrón 1990).

Ownership/Protection:

The Maricao State Forest is a public land administered by the DNER.

Special Recognition:

The area was declared a Forest in 1919 (Silander et al 1986). Raffaele and Duffield, (1979), recognized this forest as one of Puerto Rico's prime wildlife area. Maricao State Forest is also recognized as an important habitat for the endangered Sharp-shinned hawk (Delannoy, 1997). In 2004, BirdLife International and SOPI recognized Maricao State Forest as an Important Bird Area. Because this forests support one of the only two population of the vulnerable Elfin wood warbler *Dendroica angelae* (Delannoy and Anadón, 2004), and also its provide adequate requisites for nesting and foraging of the endangered Sharp-shinned hawk *Accipiter striatus venator* (Delannoy, 1997), we recognized Maricao State Forests as a primary CWA.

Wildlife

Seventy bird species have been identified in the Maricao State Forest. Among them: Turkey vulture *Cathartes aura*, Sharp-shinned hawk *Accipiter striatus*, Red-tailed hawk *Buteo jamaicensis*, Puerto Rican Broad-winged hawk *B. platypterus*, American kestrel *Falco sparverius*, White-crowned pigeon *Patagioenas leucocephala*, Scaly-naped pigeon *P. squamosa*, Zenaida dove *Zenaida aurita*, Common ground dove *Columbina passerina*, Ruddy quail-dove *Geotrygon montana*, Mangrove cuckoo *Coccyzus minor*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Puerto Rica screech owl *Megascops nudipes*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Antillean Mango *Anthracothorax viridis*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Puerto Rican Flycatcher *Myiarchus antillarum*, Puerto Rican lesser Antillean Pewee *Contopus portoricensis*, Cave swallow *Petrochelidon fulva*, Caribbean Martin *Progne dominicensis*, Red-legged thrush *Turdus plumbeus*, Puerto Rican Vireo *Vireo latimeri*, Black-whiskered vireo *V. altiloquus*, Bananaquit *Coereba flaveola*, Black and white warbler *Mniotilta varia*, Northern parula *Parula americana*, Elfin wood warbler *Dendroica angelae*, Magnolia warbler *D. magnolia*, Cape may warbler *D. tigrina* which was also historical recorded as one of the most abundant species during winter seasons of 1941, 1942 and 1943 in the eastern section of the mountains of Maricao (Ventura Barnés 1947), Black-throated blue warbler *D. caerulescens*, Northern waterthrush *Seiurus noveboracensis*, Louisiana Waterthrush *S. motacilla*, Ovenbird *S. aurocapillus*, American Redstart *Setophaga ruticilla*, Greater Antillean Oriole *Icterus dominicensis*, Puerto Rican tanager *Nesospingus speculiferus*, Puerto Rican Spindalis *Spindalis portoricensis*, Antillean Euphonia *Euphonia musica*, Black-faced grassquit *Tiaris bicolor*, Puerto Rican Bullfinch *Loxigilla portoricensis* (Silander et al 1986).

Critical Plants

Tabonuco tree *Dacryoides excelsa* (one individual in the Forest), *Sloanea verteriana*, *Lunania ekmandi* (only three individuals), *Margaritaria nobilis* (two individuals), *Gesneria pauciflora* (endemic to Maricao), *Brunfelsia densifolia* (endemic to Maricao), *Ravenia urbanii* (three individuals), *Solanum gutberiana*, *Crescentia portoricensis* (endemic from Maricao and Susúa), *Ottoschulzia rhodoxylon* (endangered), *Calyptranthes krugii*, *C. puduncularis*, *C. woodburyi*, *C. portoricensis* (Data provided by R. Padrón 2005).

Threats:

Timber harvest and management practices are likely to have negative effects on Sharp-shinned hawk if the vegetation structural features are not maintained (Delannoy 1997). Recreational activities and structures resulted in human disturbance near Sharp-shinned hawk active nest (Delannoy 1997). Constructions of power and communications structures are others threats in Maricao State Forest. Delannoy (1997) report 2.6 ha of Sharp-shinned hawk habitat loss due of maintenance of access road by the Puerto Rico Energy Power Authority.

Conservation Recommendations:

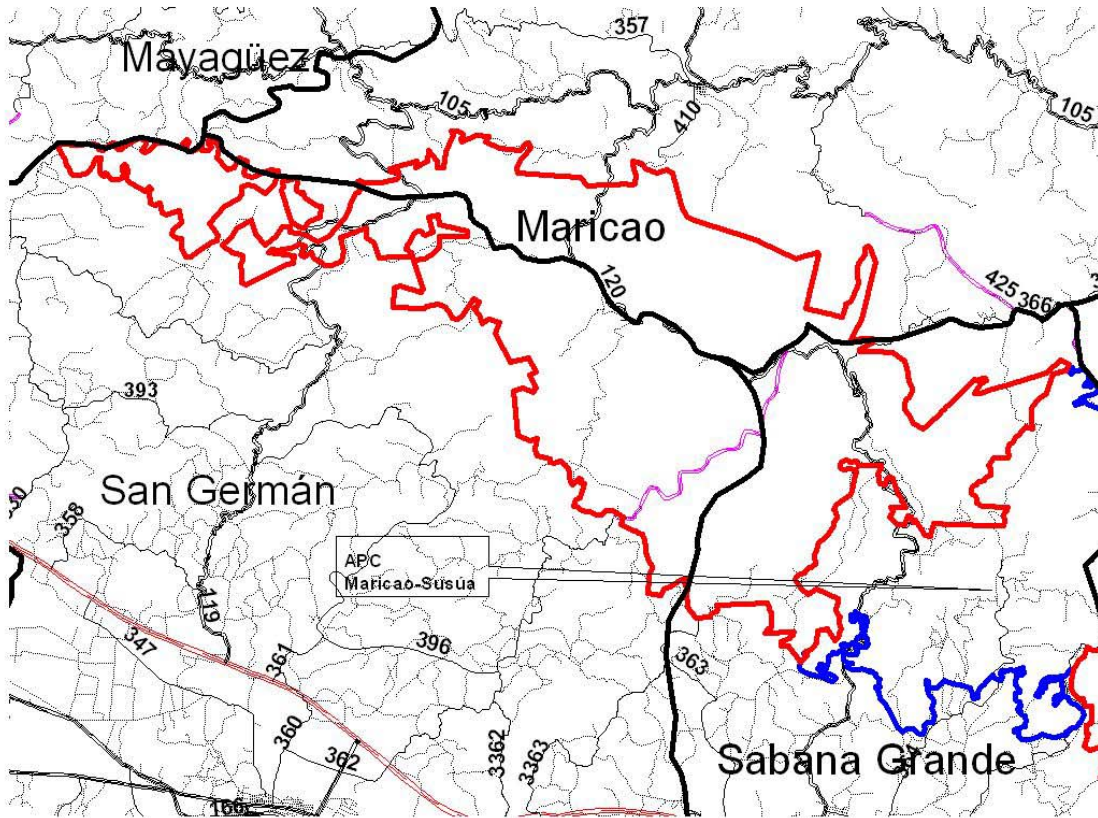
Habitat loss and fragmentation should be kept to a minimum in the lands surrounding Maricao State Forest. Management practices that promote the restoration or conservation of existing corridors between Maricao, Guánica and other forested lands occupied by the Puerto Rican Vireo *Vireo latimeri* are highly recommended to facilitate the dispersal of individuals among populations (Tossas 2001 and 2002). For recommendations for the conservation of the Sharp-shinned hawk, see Delannoy 1997.










References:

- Cruz, A., and C.A. Delannoy. 1986. Status, breeding biology and conservation needs of the Puerto Rican Sharp-shinned Hawk (*Accipiter striatus venator*). Fin. Rep. Submitted to the U.S. Fish and Wildlife Service as specified in work contract no. 14-16-0004-82-047.
- Delannoy, C.A. 1992. Status surveys of the Puerto Rican Sharp-shinned hawk (*Accipiter striatus venator*) and Puerto Rican Broad-winged hawk (*Buteo platypterus brunnescens*). Final status report. Department of Biology, University of Puerto Rico, Mayagüez, P.R. 32 pp.
- _____. 1997. Status of the Broad-winged Hawk and Sharp-Shinned Hawk in Puerto Rico. Carib. J. Sci. 33(1-2):21-33.
- _____ and V. Anadón. 2004. Distribution, habitat and density of the Elfin-woods Warbler (*Dendroica angelae*) in Puerto Rico. Natural Resources Department Permission No. 03-IC-016. Biology Department, University of Puerto Rico, Mayagüez, Puerto Rico.
- Department of Natural Resources. 1976. The Master Plan for the Commonwealth Forests of Puerto Rico. Prepared for the Bureau of Outdoor Recreation by Area of Planning and Evaluation of Resources Division of Forest Planning.
- Figueroa, J. C. 1981. Caracterización y estructura de dos bosques en pluvial sobre suelos serpentinos en Maricao, Puerto Rico. Octavo Simposio de Recursos Naturales. Departamento de Recursos Naturales. Pp. 27-42.
- Padrón Vélez, R. and J. Ricart. 1995. Borrador. Lista Preliminar de los Árboles en el Bosque de Maricao (1974-1995). 21 pp.
- Ricart, J. L. and R. Padrón Vélez. 1967. Estacionalidad de floración y fructificación en un bosque subtropical muy húmedo del montano bajo de Puerto Rico. Science-Ciencia. Sección Universidad Católica de Puerto Rico. Vol. 14-Núm. 1. Invierno. Pp. 5-9.

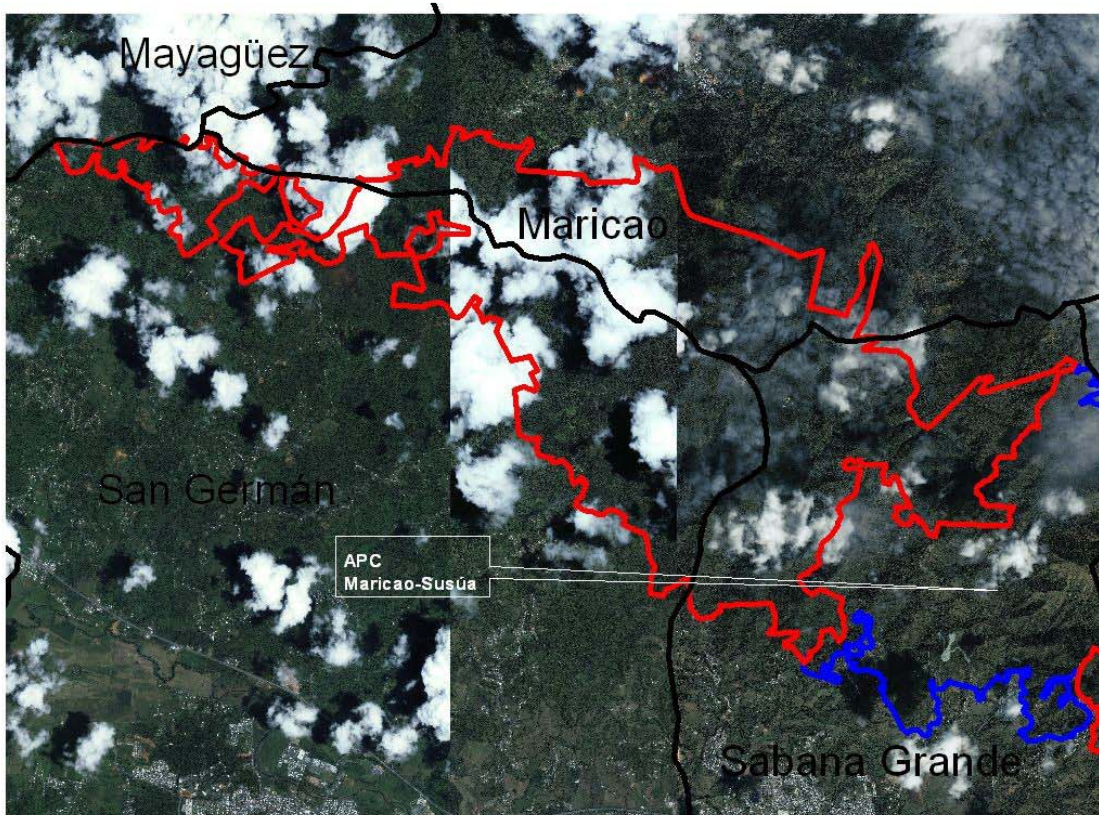
- _____ and _____. 1990. Lista preliminar de la Familia Orchidaceae en el Bosque Estatal de Maricao. Decimosexto Simposio de Recursos Naturales. Departamento de Recursos Naturales. San Juan, Puerto Rico. Pp. 144-154.
- Tossas, A. G. 2001. Aspects of the breeding biology and recommendations for the management of the Puerto Rican Vireo in Maricao State Forest. XXIV Simposio de Recursos Naturales. Departamento de Recursos Naturales y Ambientales. Pp. 34-44.
- _____. 2002. Puerto Rican Vireo demography in a montane habitat, with metapopulations implications. Ph.D. Thesis. University of Puerto Rico, Graduate School, Río Piedras Campus. 82 pp.
- Ventura Barnés, J. 1947. Additions to the Puerto Rican Avifauna with notes on little known species. Auk Vol. 64. Pp. 400-406.




Maricao State Forest



-  Municipios.shp
-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp
- Carreteras avpu.shp
 -  autopistas
 -  primarias
 -  secundarias
 -  terciarias
 -  caminos
 -  propuestas

Maricao State Forest



-  Municipios.shp
-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

66- Mona Island, Puerto Rico

Area Description:

Mona Island is located in the latitude 18° 3-8'N and longitude 67° 51-57'W; 68 km to the southwest of Higüeras tip (Rincón municipality); 74 km to the southwest of Mayagüez; 48 km to the southwest of Desecheo Island and 60 km to the southeast of Espada tip in Dominican Republic. Mona Island has an area of 5519 ha and contains 32.2 km of coast. Due to the location of Mona Island and the dangerous crossing of Mona Channel, the intervention of man has been minimal. This condition has propitiated to the conservation of fauna endemic to the island

This semi-arid island is a karst plateau made up of stratified limestone and dolomite rocks with an elevation between 40 to 60 m above sea level. The majority of the coastal zone area is composed of cliffs. Near the surface periphery of the cliffs there is an area of 60 to 80 ha of caves. Numerous karst features, including a series of flank margin caves, literally ring the periphery of the island (Frank et al., 1998). In the late 1880s and early 1900s, ~150,000 metric tons of guano were commercially mined from caves on the island (Frank and Benson, 1998).

Mona island contain 7.2 Km of sandy beaches located in the southern half of the island (Diez and Van Dam 2004). The beaches of Mona are whiter than those of Puerto Rico (JCA 1973). The average precipitation is 79 cm per year. The soils are sandy and alkaline with low fertility (Morales 1985; Cardona and Rivera, 1988). There are no rivers in Mona Island. There is a very small patch of a mangrove swamp, about 0.5 ha in size. This area serves as habitat for birds and crabs. It is under brackish water and is covered by a thick growth of mangrove trees (Rivera, 1973).

The fauna of Mona is the most unique of any of Puerto Rico's islands (Raffaele and Duffield 1979). From the point of view of animal distribution (terrestrial or inland) Mona Island can be divided into the following ecosystems: 1-Rocky shores 2-Sandy beaches 3-Coastal plains (terrace) 4-Bajuras (sinkholes) 5-Caves 6- Limestone tableland 7-Temporary pools and water reservoirs (Vélez 1973).

In spite of Mona's small size, distance from a large land mass and its low rainfall, it supports a known flora to date of 393 vascular plant species. Mona's flora in the most part is similar to Guánica forest plus a touch of Dominican Republic flora. The distribution pattern shows that 25 species are unique. Four are found only on Mona; sixteen have migrated west only to Mona and not beyond, and four species have migrated east to Mona and not beyond. Approximately eleven percent of the flora is either rare or endangered (Woodbury 1973).

Ownership/Protection:

Mona Islands is publicly owned. The Government of Puerto Rico, through the DNER, owns and manages both Mona and Monito Islands as wildlife reserves (Morales 1985). With a permit obtained from the DNER, the public is allowed to visit Mona Island. During the hunting season on Mona Island, the public (with permit and license) is allowed to hunt pigs and goats.

Special Recognition:

In 1919 Mona was declared an Insular Forest (Naturaleza 1991). It is recognized as a "Unique Natural Area" according to the outstanding natural wonders, the scenic values and scientific importance (JCA 1973). In 1975 was recognized as a National Natural Landmark by the U.S. National Park Service. In 1985, Mona Island was declared Critical Habitat for the Mona Boa, Mona Iguana and the beaches were declared breeding area for the Hawksbill sea turtle. The Puerto Rico Planning Board declared Mona and Monito including the water that surrounds these Islands until an extension of 3 nautical miles a Natural Reserve in 1986. The

Advisory Council on Historic Preservation recognized Mona Island as a National Historic Landmark in 1993. In 1997, the designation of the natural reserve was amended to increase the surrounding water from 3 to 9 nautical miles. During 1998, the surrounding water of Mona and Monito Islands were designated by the U.S. Fish & Wildlife Service as a critical habitat for three species of marine turtles (Hawksbill, Green and Leatherback sea turtles). Also in the same year the Historic Preservation State Office declared Mona Island as a Historic Site. In 2004, BirdLife International and SOPI recognized Mona Island as an Important Bird Area. Today, there is no question that Mona Island is still one of Puerto Rico's prime wildlife areas.

Wildlife:

Birds

Mona Island is one of Puerto Rico's prime wildlife areas. The cliffs around the Island sustain the largest population of breeding White-tailed tropicbird *Phaeton lepturus* in Puerto Rico. A large colony of Red-footed booby *Sula sula* also nest here. A subspecies of the Yellow shouldered blackbird *Agelaius xanthomus monensis* is endemic to Mona and now may be in danger (Raffaele and Duffield 1979); nesting of Sooty tern *Sterna fuscata* and Bridled tern *S. anaethetus*; White-crowned pigeon *Patagioenas leucocephala* (Cardona and Rivera 1988); Common ground dove *Columbina passerina exigua*, White-winged dove *Zenaida asiatica*, Zenaida dove *Z. aurita*, Red-tailed hawk *Buteo jamaicensis*, Magnificent frigatebird *Fregata magnificens*, American kestrel *Falco sparverius*, Yellow-crowned night heron *Nyctanassa violacea*, House sparrow *Passer domesticus* Pearly-eyed thrasher *Margarops fuscatus* (Terrestrial Resources Division Data 2004). Peregrine falcon *Falco peregrinus*, Scaly-naped pigeon *Patagioenas squamosa*, Ruddy quail-dove *Geotrygon montana*, Yellow-billed cuckoo *Coccyzus americanus*, Mangrove cuckoo *C. minor*, Smooth-billed ani *Crotophaga ani*, Short-eared owl *Asio flammeus*, Loggerhead kingbird *Tyrannus caudifasciatus*, Gray kingbird *T. dominicensis*, Pearly-eyed thrasher *Margarops fuscatus*, Northern mockingbird *Mimus polyglottos*, Black-whiskered vireo *Vireo altiloquus*, Puerto Rican Vireo *V. latimeri*, Bobolink *Dolichonyx oryzivorus*, Troupial *Icterus icterus*, Antillean Euphonia *Euphonia musica* (Hernández-Prieto 1993). Audubon's shearwater *Puffinus iherminiere* has been seen in the barren cliffs of the northern side of Mona. Raffaele (1973) reports that there is no doubt that the bird does occur around Mona as it has been recorded offshore many times by biologists. Leach's petrel *Oceanodroma leucorhoa*, Wilson's petrel *Oceanites oceanicus*, Masked booby *Sula dactylatra* (acc.), Great blue heron *Ardea herodias* (acc.), Green heron *Butorides virescens* (acc.), Cattle egret *Bubulcus ibis* (acc.), Tricolored heron *Egretta tricolor* (acc.), Black-crowned night heron *Nycticorax nycticorax* (acc.), American bittern *Botaurus lentiginosus* (acc.), Fulvous tree duck *Dendrocygna bicolor* (acc.), West Indian Whistling duck *D. arborea* (acc.), Blue-winged teal *Anas discors* (acc.), Green-winged teal *A. crecca*, Sharp-shinned hawk *Accipiter striatus* (acc. migrant), Osprey *Pandion haliaetus* (irregular winter visitor), Red jungle fowl *Gallus gallus*, Spotted sandpiper *Actitis macularia*, Solitary sandpiper *Tringa solitaria* (acc.), Greater yellowlegs *T. melanoleuca* (uncommon winter visitor), Lesser yellowlegs *T. flavipes*, Least sandpiper *Calidris minutilla*, Semipalmated sandpiper *C. pusilla*, Stilt sandpiper *C. himantopus* (acc.), Sanderling *C. alba* (uncommon migrant), Black-necked stilt *Himantopus mexicanus*, Laughing gull *Larus atricilla*, Royal tern *Sterna maxima*, Brown noddy *Anous stolidus*, Mourning dove *Zenaida macroura*, Key west quail-dove *Geotrygon chrysia* (apparently now extinct), Smooth-billed ani *Crotophaga ani* (acc.), Chuck will's widow *Caprimulgus carolinensis* (acc.), Common nighthawk *Chordeiles minor* (rare migrant), Black swift *Cypseloides niger* (a rare vagrant), Belted kingfisher *Ceryle alcyon* (uncommon visitor), Yellow-billed sapsucker *Sphyrapicus varius* (uncommon visitor), Puerto Rican Pewee *Contopus*

portoricensis, Caribbean Martin Progne *dominicensis*, Cave swallow *Petrochelidon fulva* (occasional visitant), Barn swallow *Hirundo rustica*, Red-legged thrush *Turdus plumbeus*, White-eyed vireo *Vireo griseus* (acc.), Black and white warbler *Mniotilta varia*, Parula warbler *Parula americana* (uncommon winter migrant), Magnolia warbler *Dendroica magnolia* (uncommon winter visitant), Yellow rumped warbler *D. coronata*, Yellow warbler *D. petechia*, Yellow-throated warbler *D. dominica* (uncommon migrant), Bay breasted warbler *D. castaena* (acc.), Prairie warbler *D. discolor*, Palm warbler *D. palmarum*, Cape may warbler *D. tigrina* (uncommon winter visitant), Black-throated blue warbler *D. caerulescens* (rare winter visitor), Ovenbird *Seiurus aurocapilla* (rare migrant), Northern waterthrush *S. noveboracensis* (rare migrant), Louisiana Waterthrush *S. motacilla* (rare migrant), Connecticut warbler *Oporornis agilis* (rare migrant), Common yellowthroat *Geothlypis trichas* (rare transient), Hooded warbler *Wilsonia citrina* (rare winter resident), American Redstart *Setophaga ruticilla*, Scarlet tanager *Piranga olivacea* (rare migrant) (Raffaele 1973). Others birds not previously reported are the Brown pelican *Pelecanus occidentalis*, Neotropic Cormorant *Phalacrocorax olivaceus*, Merlin *Falco columbarius*, Northern Bobwhite *Colinus virginianus*, Killdeer *Charadrius vociferous*, American Oystercatcher *Haematopus palliatus*, Ruddy turnstone *Arenaria interpres*, Rock dove *Columba livia*, Hispaniola Parakeet *Aratinga chloroptera*, Antillean Nighthawk *Chordeiles gundlachii*, Prothonotary warbler *Protonotaria citrea*, Indigo bunting *Passerina cyanea*, Shiny cowbird *Molothrus bonariensis*, and the Antillean Grackle *Quiscalus niger* (Nieves 2005).

Reptiles

Mona Island ground iguana *Cyclura stejnegeri*, Mona blind snake *Typhlops monensis*, Mona boa *Epicrates monensis*, Puerto Rican Racer *Alsophis portoricensis variegatus*; Nesting of Hawksbill sea turtle *Eretmochelys imbricata*, Nesting of Green sea turtle *Chelonia mydas* (Raffaele and Duffield 1979; Wiewandt 1973). Mona gecko *Sphaerodactylus monensis*, Cosmopolitan house gecko *Hemidactylus mabouia*, Mona ground runner *Ameiva alboguttata*, Arboreal anole lizard *Anolis monensis* (Cardona and Rivera 1988). Mona Island represents one of the most important nesting habitats for the Hawksbill turtle *Eretmochelys imbricata*. Uvero beach is an important area for hawksbill turtle nesting (Parés Jordán et al 1993). The beaches most used by green turtles are Sardinera, Caritas and Mujeres (Diez and Van Dam 2004). The area of Carabinero-Mujeres is an important foraging habitat for the Hawksbill turtle. Here the bottom is rocky with coral and sand patches. The marine sponges *Xetospongia* spp. and *Geodia* sp. were documented in this zone. Also important areas for the Hawksbill turtle are: Sardinera, Monito Island and Espinal-Esperanza marine area (Diez et al 1993). Slippery-backed mabuya *Mabuya mabouya sloanii* (Wiewandt 1973).

Amphibians

Mona coqui *Eleutherodactylus monensis* (Cardona and Rivera 1988). This coqui is the only amphibian known to inhabit Mona and is endemic to the Island (Wiewandt 1973).

Mammals

Pig *Sus crofa*, Goat *Capra hircus* are introduced (Cardona and Rivera 1988). The most common bat apparently is the Buffy colored bat *Mormoops blainvilli*; there is also the Fish eating bat *Noctilio leporinus*. Remains of a large rodent *Isolabodon portoricensis* were reported from the island by Anthony (1926) and later workers, but always in association with Taino archeological sites (Frank and Benson, 1998); Roof rat *Rattus rattus* and House mouse *Mus musculus*, which are common in occupied buildings and garbage dumps (Wiewandt 1973). Feral cats *Felis catus* are also present, but the biologists of the Terrestrial Resources Division are

controlling the population. Surrounding waters are visited by Humpback whales *Megaptera novaeangliae* and Pilot whales *Globicephala macrorhynchus*.

Fish

The list of fishes found in Mona's waters exceeds 270 species. They range from sharks, barracuda, and moray eels to trunkfish's, clingfishes, wrasses, and goatfishes (JCA 1973).

Invertebrates

Crustaceans

Hermit crab *Coenobites clypeatus* is of particular interest because of the locally known spawning migrations that occur in restricted areas at certain times in summer and in connection with a moon phase (JCA 1973; Erdman 1973). Spiny lobster *Panilurus argus*, Coral crab *Carpilius corallinus*, Flat crab *Grapsus grapsus*, Small crab *Armases ricordi*, Fresh water cave shrimp *Typhlata monae*, Ghost crab *Ocypode quadrata*, Juey morado *Gecarcinus ruricola*, Jueyita de tierra *Gecarcinus lateralis* (Erdman 1973).

Spiders

The spider fauna of Mona Island is relatively well known, being the total number of 52 species of spiders now known (Vélez 1973).

Scorpions

Three species of scorpions are reported to Mona Island: *Diplocentrus scaber*, *Isometrus maculatus*, *Centruroides insulanus* (Vélez 1973).

Insects

A total of 526 species of insects are recorded from Mona Island. Of this number, 24 species or 4.6% are endemic to the island; 27 species or 5.1% are also known only from Puerto Rico mainland; 53 species or 10.1%, although known from other West Indian islands or other regions, are not known from Puerto Rico itself; and 422 species or 80.2% are widely ranging forms, occurring in some or in all of the West Indies, or in neighboring regions (Martorell 1973).

Critical Plants:

Woodbury et al. (1977) published the most recent checklist of the island's flora. They estimate that 23% of Mona's floristic diversity is rare and emphasized that intensive temporal sampling should uncover more species. Since 1977, new plant records for Mona Island had been recorded: Liogier (1988), Proctor (1989), Breckon et al. (1998), Liogier and Martorell (2000), and Meléndez-Ackerman et al. (2005).

Threats:

Although comparatively undisturbed at present, the island is extremely vulnerable to any form of development and current visitor use is already having adverse impacts. Mona Passage is an important channel for the passage of ships of commerce. Since the waters are international, it have been rumored that occasionally ships wash out their oil tanks at sea eastward of the Mona Island lighthouse, and the oil drifts up on the Mona beaches (Erdman, 1973). Also, vessels containing radioactive material that travel across Mona Passage, could be a significantly threats to the island and surrounding waters (Myrna Aponte pers. comm.).

Recently, there has been an increasing trend toward the use of the island by the general public because of the availability of transportation and access. This increase of human activities on the island is jeopardizing their unique qualities. Feral cats are a serious threat to the unique Mona Island wildlife (García et al. 2001). Exotic fauna (i.e., goats and pigs), spear fishing and over fishing are some others threats in the island (A. Nieves, Mona Island Refuge Manager pers. comm.).

Conservation Recommendations:

The continue of the exclusion fence (for feral goats and pigs) management techniques prove to be effective to control the predation of iguana's and sea turtles nest by feral pigs (A. Alvarez pers. comm.). The headstarting activities for the Mona Island Iguana prove to be an important conservation project for the iguanas. The recent information and results gathered in the captive breeding program reveals that headstarting activity has been successful in raising iguanas capable of wild adaptation (DNER 2004a). The survival and dispersal information collected so far by radiotelemetry and recaptures of non-implanted released individuals suggest a good adaptation to the wild and high survivability of the iguanas. Furthermore, documented nests made by released headstarted females suggest that normal interactions with other individuals haven't been affected by being raised in captivity (DNER 2004a).

The long-term control of the feral cat population using trapping and hunting is recommended as the best alternatives in the management of this detrimental species (García et al. 2001). The eradication of feral cats in Mona Island could be a long process. In 2003 and 2004, 17 and 21 cats, respectively have been captured. This represents 1 cat every 150 hours. Therefore, personnel from the Eradication of Feral Cats Program continue evaluating the possibility of introducing a feline specific virus (FeLV/FIV) to help with the eradication (DRNA 2004b)

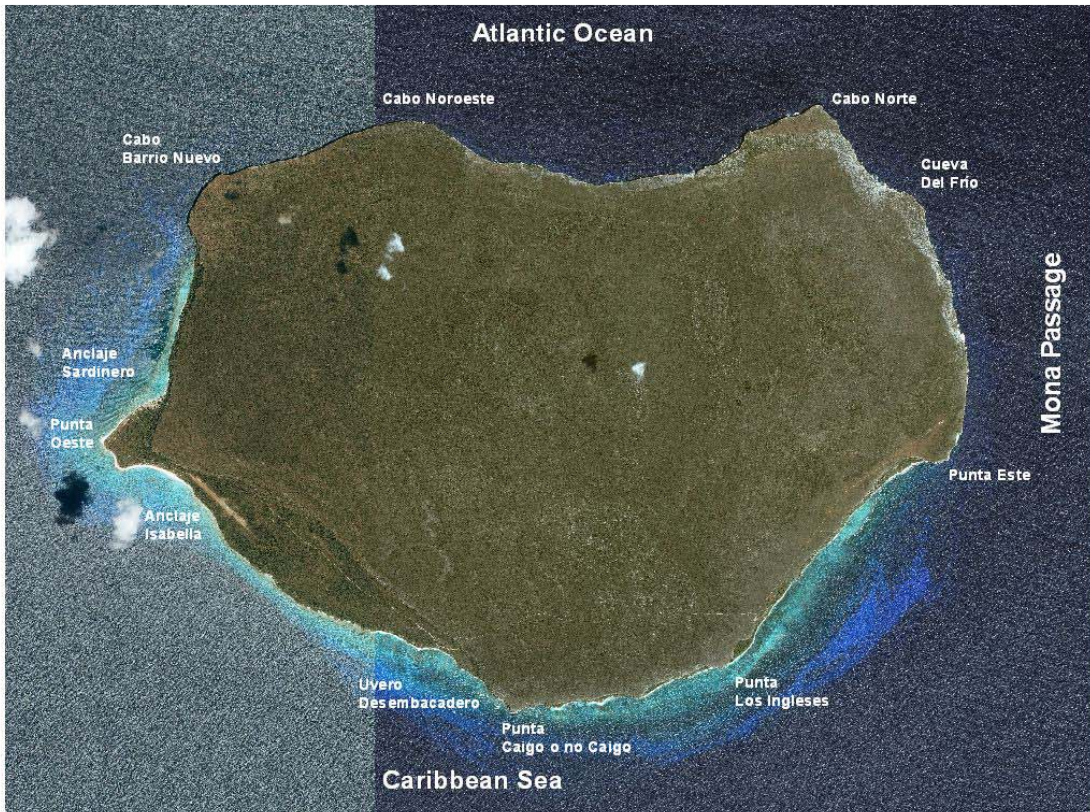
References:

- Breckon, G. J., V. Santiago-Vélez, and D. A. Kolterman. 1998. New plant record for Mona Island, Puerto Rico. *Caribbean Journal of Science* 34: 136-137.
- Diez, C. E.; van Dam, R. and V. P. Vicente. 1993. Estudio de la Ecología Alimentaria del Carey de Concha en Isla de Mona. XIX Simposio de los Recursos Naturales. Departamento de Recursos Naturales. Estado Libre Asociado de P.R. Pp. 77-85.
- Diez, C. and R. P. Van Dam. 2004. Index beach nesting surveys of the hawksbill population at Mona Island, Puerto Rico: Report for 2003. 8 pp.
- Department of Natural and Environmental Resources. 2004a. Headstarting activities for the Mona Island Iguana. Annual Progress Report 2003-2004. E-1-21, Study 16. 6 pp.
- _____. 2004b. The eradication of feral cats in Mona Island. Annual Progress Report 2003-2004. E-1-20, Study 22. 4 pp.
- Erdman, D. S. 1973. Mona Island Terrestrial Crustaceans. Puerto Rico Department of Natural Resources. *In* Mona and Monito Islands an Assessment of their Natural and Historical Resources. Volumen II. Appendix H. Estado Libre Asociado de Puerto Rico. Oficina del Gobernador. Junta de Calidad Ambiental.

- _____. 1973. Pelagic life zone around Mona Island. Puerto Rico Department of Natural Resources. *In* Mona and Monito Islands an Assessment of their Natural and Historical Resources. Volumen II. Appendix E. Estado Libre Asociado de Puerto Rico. Oficina del Gobernador. Junta de Calidad Ambiental.
- Frank, E. F., C. Wicks, J. Mylroie, J. Troester, E.C. Alexander and J.L. Carew. 1998. Geology of Isla de Mona, Puerto Rico. *Journal of Cave and Karst Studies*. Vol. 60(2): 69-72.
- _____ and R. Benson. 1998. Vertebrate paleontology of Isla de Mona, Puerto Rico. *Journal of Cave and Karst Studies*. Vol. 60(2): 103-106.
- García, M.A., C.E. Diez, and A. O. Alvarez. 2001. The impact of feral cats on Mona Island wildlife and recommendations for their control. *Carib. J. Sci.*. Vol 37: 107-108.
- Henández-Prieto, E. N. 1993. Ecological Comparison of the Landbird Fauna of Two Subtropical Dry Forests in the West Indies. A thesis submitted to the Faculty of the Graduate School of the University of Colorado in partial fulfillment of the requirements for the degree of Doctor in Philosophy. Department of Environmental, Population, and Organismic Biology. 406 pp.
- Junta de Calidad Ambiental. 1973. Mona and Monito Islands an Assessment of their Natural and Historical Resources. Volumen I. Estado Libre Asociado de Puerto Rico. Oficina Gobernador. 47 pp.
- Liogier, H. A. 1988. Descriptive flora of Puerto Rico and adjacent islands. Spermatophyta. Vol II. Leguminosae to Anacardiaceae. Editorial Universidad de Puerto Rico, San Juan, Puerto Rico. 481 pp.
- _____ and L. F. Martorell. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. 2nd ed. revised. San Juan: Editorial de la Universidad de Puerto Rico.
- Martorell, L. F. 1973. The Insects of Mona Island. *In* Mona and Monito Islands an Assessment of their Natural and Historical Resources. Volumen II. Appendix J. Estado Libre Asociado de Puerto Rico. Oficina del Gobernador. Junta de Calidad Ambiental.
- Meléndez-Ackerman, E. J., S. Aragón, M. Morales-Vargas, J. Sustache, F. S. Axelrod, C. Fuentes, J. D. Ackerman, M. García, and D. S. Fernández. 2005. Monitoring efforts yield new plant records for Mona Island, Puerto Rico, a tropical dry forest wonderland. Draft.
- Morales, D. 1985. Documento de Designación Reserva Natural de Mona y Monito. Departamento de Recursos Naturales. Programa de Manejo de la Zona Costanera. División Planificación Recursos Terrestres y Costaneros. 32 pp.
- Naturaleza. 1991. Historia de Isla de Mona (Extraído de “Reseña Histórica de la Isla de Mona”, Revista/Review Interamericana 6(4): 587-621, 1976-1977). Mona y Monito. Publicación de la Sociedad de Historia Natural de Puerto Rico, Inc. 53 pp.

- Nieves, Antonio. 2005. Avistamientos de aves por Tony Nieves en Isla de Mona. Data sin publicar. Departamento de Recursos Naturales y Ambientales, Negociado de Reservas Naturales y Refugios, San Juan, Puerto Rico.
- Parés Jordán, D.; Hernández Guzmán, G. M. and M. A. Nieves. 1993 . Tortugas Marinas en la Reserva Natural Isla de la Mona. XIX Simposio de los Recursos Naturales. Departamento de Recursos Naturales. Estado Libre Asociado de Puerto Rico. Pp. 65-70.
- Proctor, G. R. 1989. Ferns of Puerto Rico and the Virgin Islands. Mem. New York Bot. Gard. 53: 1-389.
- _____. 1973. Assessment of Mona Island Avifauna. *In* Mona and Monito Islands an Assessment of their Natural and Historical Resources. Volumen II. Appendix I. Estado Libre Asociado de Puerto Rico. Oficina del Gobernador. Junta de Calidad Ambiental.
- Rivera, Luis H. 1973. Soils of Mona Island. *In* Mona and Monito Islands an Assessment of their Natural and Historical Resources. Volumen II. Appendix C. Estado Libre Asociado de Puerto Rico. Oficina del Gobernador. Junta de Calidad Ambiental.
- Vélez, M. J. 1973. The Terrestrial Arthropoda (Exclusive of Insecta and Crustacea) of Mona Island, Puerto Rico. *In* Mona and Monito Islands an Assessment of their Natural and Historical Resources. Volumen II. Appendix K. Estado Libre Asociado de Puerto Rico. Oficina del Gobernador. Junta de Calidad Ambiental.
- Woodbury, R. O. 1973. The Vegetation of Mona Island. Agricultural Experiment Station. University of Puerto Rico, Río Piedras. *In* Mona and Monito Islands an Assessment of their Natural and Historical Resources. Volumen II. Appendix G. Estado Libre Asociado de Puerto Rico. Oficina del Gobernador. Junta de Calidad Ambiental.

Mona Island



3 0 3 6 Kilometers



67- Monito Island, Puerto Rico

Area Description:

Monito is a small, relatively inaccessible, limestone island that lies about 5 km north-northwest of Mona Island (18° 10'N, 67° 57'W). Its total area is approximately 16 ha. It is composed of jagged upraised limestone, with vertical cliffs up to 66 m high around the entire island. The plateau slopes gently from northeast (66 m) to southwest (25 m), and is partly bounded on the north by a broad swale with several limestone escarpments and small caves (Kepler 1978).

There are no beaches, and the encircling cliffs, roughly 2100 m in length, have been undercut two to five meters by wave action on all sides. A cave, ascending from sea level nearly to the top, cuts deeply into the west coast, and numerous smaller caves penetrate the cliff faces, especially on the north and northwest. In calm weather the top can be reached by climbing the west cliff from a projecting limestone knob, although in the best of conditions this is difficult.

The island is covered by low shrubby vegetation dominated by *Capparis flexuosa* with some small emergent trees of *Ficus citrifolia*, *Pithecellobium unguis-cati*, and *Guapira discolor*. The many sea birds nesting on the island no doubt contribute a good deal of nutrients to the plants. The flora of Monito Island consists of 37 species, 36 genera, and 23 families; the largest families are Cactaceae, Poaceae and Malvaceae. The low number of species, less than 9% of the number for Mona Island, is due to several factors: 1) Monito's small size, less than 0.3% of the area of Mona; 2) its low habitat diversity, in particular the absence of beach habitat, depression or *bajuras*, etc.; and 3) a scarcity of exotic species (Breckon et al. 1998).

Ownership/Protection:

The jurisdiction of the Island belongs to the DNER. The DNER is responsible of the management and protection of Mona and Monito Islands (Morales 1985).

Special Recognition:

Mona and Monito were declared a Natural Reserve, including the water that surrounds these Islands until an extension of 9 nautical miles (A. Nieves pers. comm.). The entire area of Monito Island has been designated as Critical Habitat for the Monito gecko (USFWS 1986). Monito Island harbors the most diverse colony of nesting sea birds in Puerto Rico and the U.S. Virgin Island. It is recognized as the only Puerto Rican island supporting all three West Indian boobies and the Magnificent Frigatebird and is the last stronghold of the latter species in Puerto Rico (Kepler 1978). In 2004, BirdLife International and SOPI recognized Monito Island as an Important Bird Area. Today, Monito Island is still recognized as a primary wildlife area.

Wildlife:

Monito Island harbors a unique fauna, including one of the largest seabird nesting colonies in the West Indies, and an endangered species of gecko (USFWS 1986).

Birds

Rolle et al (1964) made the first faunal notes on Monito Island in an expedition on 31 May 1963. Monito Island harbors the most diverse colony of nesting sea birds in Puerto Rico and the U.S. Virgin Islands. It is one of the outstanding colonies in the West Indies, it possess 50% (nine) of all breeding species in the region. It is the only Puerto Rican island supporting all three West Indian boobies and the Magnificent frigatebird *Fregata magnificens*, and it's the last

stronghold of the latter species in Puerto Rico. This diversity depends upon the island's unique combination of isolation, inaccessibility and habitat diversity (Kepler 1978).

Brown pelican *Pelecanus occidentalis*, White-tailed tropicbird *Phaeton lepturus* (Moreno 1991). Masked booby *Sula dactylatra*, Brown booby *S. leucogaster*, Red footed booby *S. sula*, Magnificent frigatebird, Laughing gull *Larus atricilla*, Bridled tern *Sterna anaethetus*, Sooty tern *S. fuscata*, Brown noddy *Anous stolidus* (Rolle et al. 1964; Kepler 1978). The endangered Yellow-shouldered blackbird *Agelaius xanthomus monensis* is reported in the island (Terrestrial Resources Data 2004).

Reptiles

Mona's anole *Anolis monensis*, Slippery-backed mabuya *Mabuya mabouya sloanei*, Monito gecko *Sphaerodactylus micropithecus* (Moreno 1991).

Mammals

Roof rat *Rattus rattus* (Kepler, 1978)

Invertebrates

Insects

Two species of *Drosophila* were recorded on the island: *D. peninsularis* and *D. nebulosa* (Rolle et al., 1964).

Threats:

The U.S. Air Force used Monito Island as an aerial bombing target after World War II (Wadsworth 1973), and many large impact craters and bomb fragments remain on the plateau. Several cliffs and shelves have been cracked or shattered by impacts, making passage difficult and treacherous to some areas (Kepler 1978). Also, the introduced roof rat threatens bird colonies that use the island for breeding and roosting. The primary threats to the Monito gecko appear to be the possible impact from roof rats and the possibility of habitat destruction on such a small land area (USFWS 1986).

Conservation Recommendations:

In October 1992, the DNER began an eradication program for black rats on Monito Island, encouraged by the successful rat eradication on Cayo Ratones, La Cordillera Natural Reserve (P.R.), and on Steven Cay (US Virgin Islands) (García et al. 2002). Eliminating the rat's detrimental effect on Monito Island will undoubtedly have beneficial results for Monito's native and unique biota (García et al., 2002).

References:

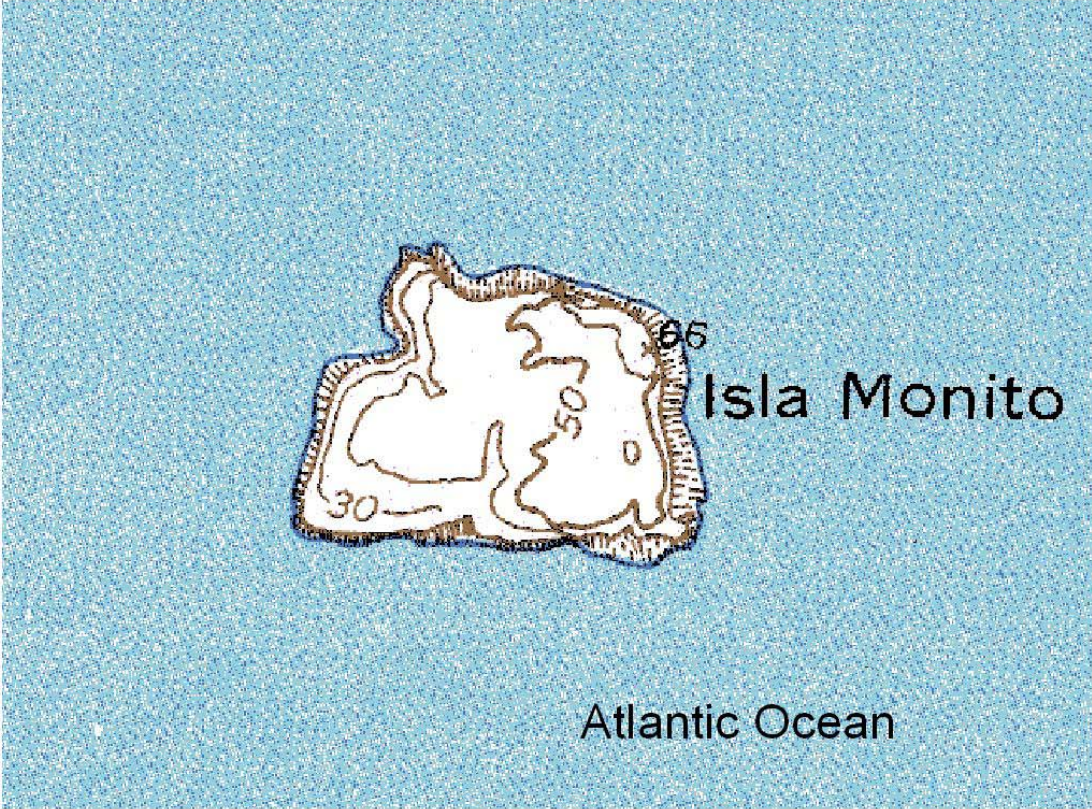
Breckon, G.J., D. A. Kolterman, V. Santiago-Vélez and F. López-Arroyo. 1998. Flora of Monito Island, Puerto Rico: observations and new records. *Carib. J. Scie.* 34: 132-136.

García, M.A., C.E. Diez, and A. O. Álvarez. 2002. The eradication of *Rattus rattus* from Monito Island, West Indies. *In: Turning the tide: the eradication of invasive species.* IUCN SSC invasive species specialist group. IUCN, Gland, Switzerland and Cambridge, UK. Pp 116-119.

Kepler, C. B. 1978. The Breeding Ecology of Sea Birds on Monito Island, Puerto Rico. *Condor.* Vol 80: 72-87.

- Morales, D. 1985. Documento de Designación Reserva Natural de Mona y Monito. Departamento de Recursos Naturales. Programa de Manejo de la Zona Costanera.
- Moreno, J. A. 1991. Islote de Monito. En *Naturaleza. Mona y Monito*. Publicación de la Sociedad de Historia Natural de Puerto Rico, Inc.
- Rolle, F. J., H. Heatwole, R. Levins and F. Torres. 1964. Faunal notes on Monito Island, Puerto Rico. *Carib. J. Sci.* Vol 4: 321-322.
- U.S. Fish and Wildlife Service. 1986. Monito gecko recovery plan. U.S. Fish and Wildlife, Atlanta, Georgia. 18 pp.
- Wadsworth, F.H. 1973. The historical resources of Mona Island. *In* Junta de Calidad Ambiental de Puerto Rico. *Isla de Mona*, Vol. 2, Apéndice N: 1-35.

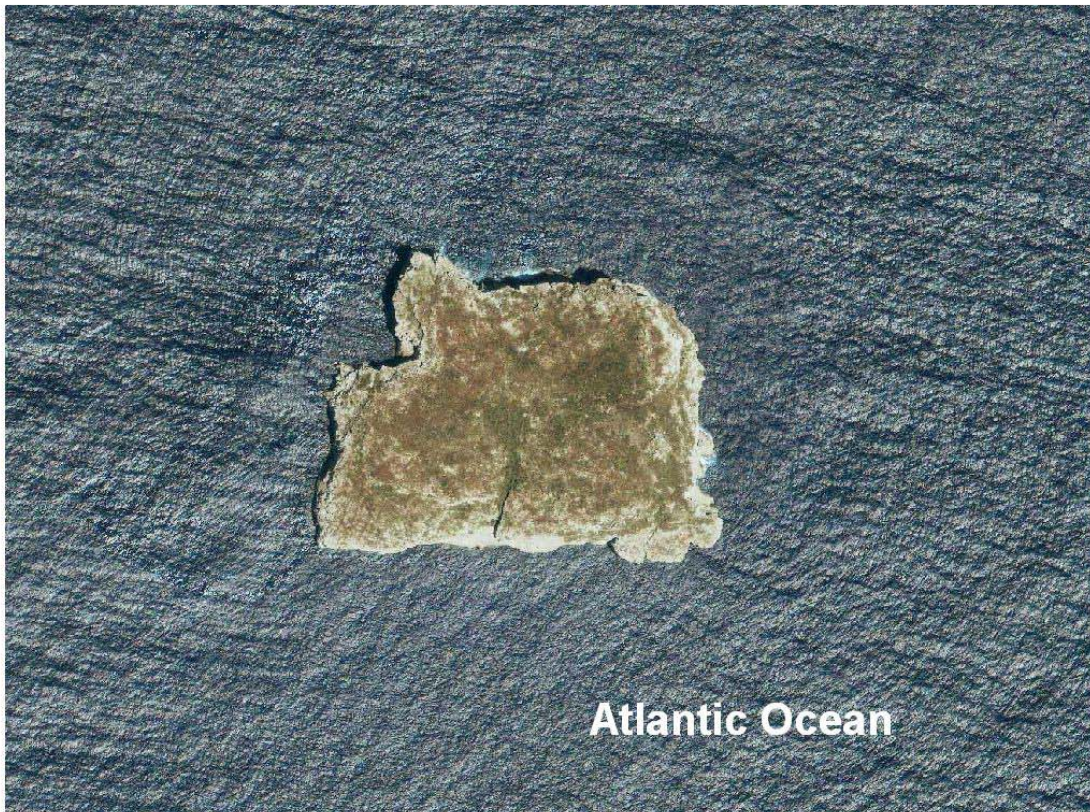
Monito Island



0.3 0 0.3 Kilometers



Monito Island



0.3 0 0.3 Kilometers



68- Pozo Hondo Swamp, Añasco

Area Description:

Located west of Añasco's Municipal Cemetery, it's surrounded by sugarcane plantations and pastures to the east, adjacent to residential units (Cardona and Rivera 1988). It is at 1 km northeast of Central La Igualdad (Mayagüez municipality) and comprehends approximately 177 ha. The dominant vegetation surrounding the lagoon is *Papyrus spp.* and cattails *Typha sp.* (Terrestrial Resources Data 2004).

Ownership/Protection:

This area is on private lands. The wetland is under the federal Clean Water Act protection. In 2002, the municipality of Añasco agreed to purchase and preserves a valuable 17 ha tract of wetlands in Ciénaga Pozo Hondo in accordance of the EPA requirements (U.S. EPA, 2003).

Special Recognition:

This area is recognized as an important hunting ground for waterfowl (D. Ramos pers. comm.). It was first classified as a CWA of secondary importance by Cardona and Rivera (1988). Today, this wetland is now classified as a CWA of primary importance because is the only area in the west where the endangered West Indian Whistling duck is recently reported.

Wildlife:

Birds

In a recent visit performed by project personnel, we observe two individuals of the endangered West Indian Whistling duck *Dendrocygna arborea*, in the swamp. Others birds reported in the same visit are: Cave swallow *Petrochelidon fulva*, Bank swallow *Riparia riparia*, Osprey *Pandion haliaetus*, Great egret *Ardea alba*, Tricolored heron *Egretta tricolor*, Snowy egret *E. thula*, Green heron *Butorides virescens*, Bananaquit *Coereba flaveola*, Northern mockingbird *Mimus polyglottos*, Gray kingbird *Tyrannus dominicensis*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Common ground dove *Columbina passerina*, White-winged dove *Zenaida asiatica*, Smooth-billed ani *Crotophaga ani*, Nutmeg mannikin *Lonchura punctulata*, Orange cheeked waxbill *Estrilda melpoda*, Red bishop *Euplectes franciscanus*, Greater Antillean Grackle *Quiscalus niger* Common gallinule *Gallinula chloropus* (Terrestrial Resources Data 2004).

Amphibians

White-lipped frog *Leptodactylus albilabris*.

Threats:

This wetland is under pressure of illegal filling for development purposes. The Mayor of Añasco have been found liable for repeated violations of federal wetlands protection laws that took place during the construction of a new Route 402/109 connector road and the Añasco Industrial Park in Las Marías Ward (U.S. EPA, 2003). The municipality of Añasco has been recently charged with violating wetlands protections established under the federal Clean Water Act (U.S. EPA 2003).

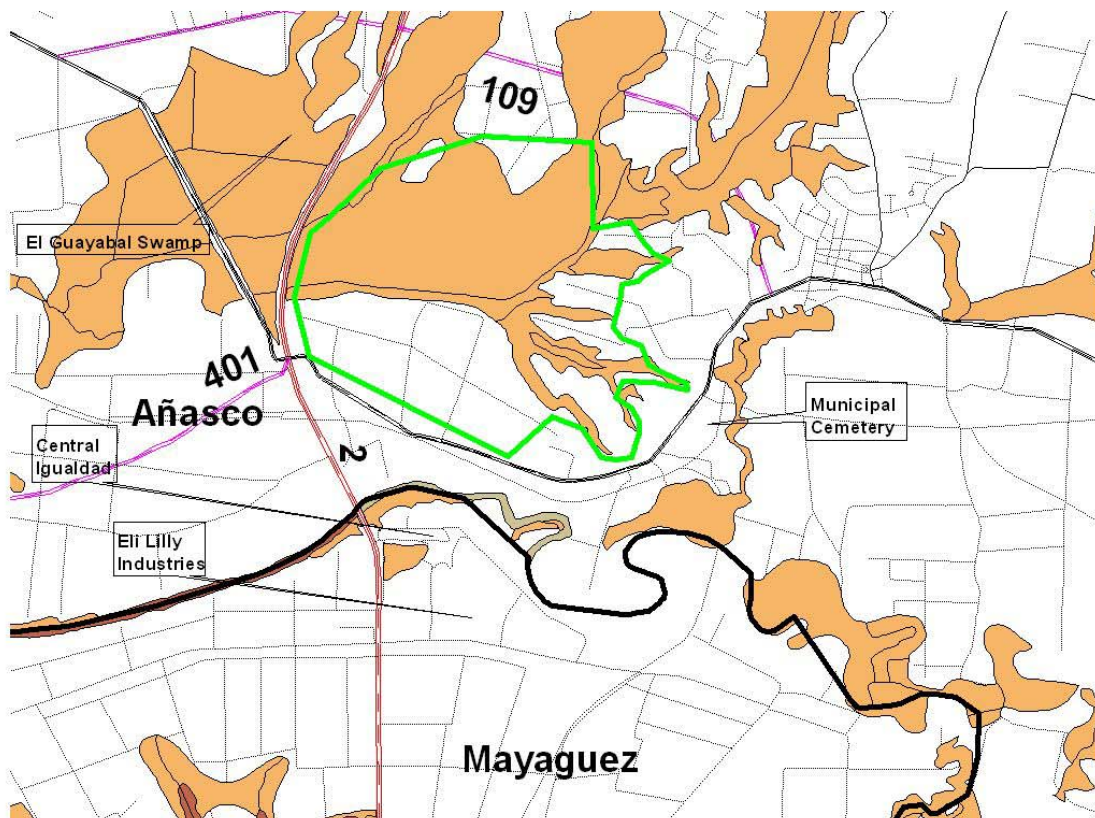
Conservation Recommendations:

In addition to protecting water quality, this wetland provides storm protection, erosion control and food and habitat to numerous fish, birds, and other wildlife, some of them endangered or threatened. The Municipality or State government should acquire this wetland in order to protect this important waterfowl habitat. It is very close (about 3 km) of the Caño Boquilla Natural Reserve, and could be incorporated as part of this reserve.

References:

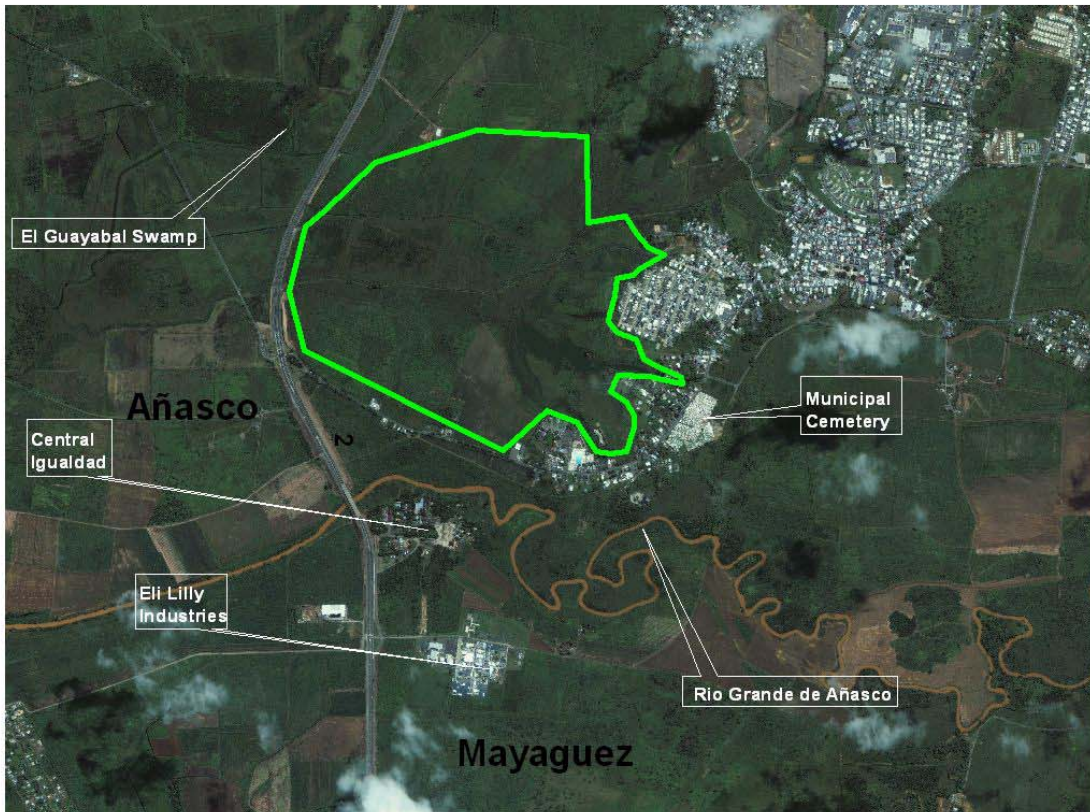
U.S. Environmental Protection Agency. 2003. EPA takes action to protect Puerto Rico's shrinking wetlands. Region 2 news releases.
<http://www.epa.gov/region02/news/2003/03130.htm>

Pozo Hondo Swamp



- ▭ Pozo hondo swamp.shp
- Municips.shp
- Humedales avpu.shp**
- Estuarine
- Lacustrine
- Marine
- Palustrine
- Riverine
- Carreteras avpu.shp**
- ▬ autopistas
- ▬ primarias
- ▬ secundarias
- ▬ terciarias
- ▬ caminos
- ▬ propuestas

Pozo Hondo Swamp



 Pozo hondo swamp.shp

69- Cayures Swamp / Central Coloso, Aguada

Area Description:

The Cayures Lagoon is located within the Coloso Sugar mill and is bounded on its north side by road 115, in Tablonal sector, municipality of Aguada, with approximately 103 ha. It is made up of a series of oxidation ponds operated by the sugar mill and a relatively large pond with abundant open water fringed by cattails.

Ownership/Protection:

The Land Authority of the Commonwealth of Puerto Rico owns the lands encompassing the Cayure area.

Special Recognition:

This area was included in the First Supplement to the Critical Wildlife Areas document (Moreno and Pérez, 1980). The Natural Heritage Program of the DNER classified the lagoon as a Priority Area for Conservation (Ortiz Rosas and Quevedo Bonilla, 1987). Cardona and Rivera (1988) recognize as a prime wildlife area, mainly for the presence of rare waterfowl such as the Masked duck, the West Indian Whistling duck and the Purple Gallinule. In 1999, the Legislature of Puerto Rico declared the Central Coloso a Site of Historical Importance (LexJuris, 2004). Today, the area is still classified as a prime wildlife area.

Wildlife:

Birds

Forty one bird species have been reported in Cayures swamp: Masked duck *Nomonyx dominica*, Ruddy duck *Oxyura jamaicensis*, West Indian Whistling duck *Dendrocygna arborea*, Blue-winged teal *Anas discors*, Mallard duck *A. platyrhynchos*, Ring neck duck *Aythya collaris*, Lesser scaup *A. affinis*, Purple gallinule *Porphyryla martinica*, Common moorhen *Gallinula chloropus*, Brown Pelican *Pelecanus occidentalis*, Pied-billed grebe *Podilymbus podiceps*, Great egret *Ardea alba*, Great blue heron *A. herodias*, Little blue heron *Egretta caerulea*, Snowy egret *E. thula*, Tricolored heron *E. tricolor*, Cattle egret *Bubulcus ibis*, Green heron *Butorides virescens*, Zenaida dove *Zenaida aurita*, Common ground dove *Columbina passerina*, Smooth-billed ani *Crotophaga ani*, Eastern kingbird *Tyrannus tyrannus*, Gray kingbird *T. dominicensis*, Caribbean Martin *Progne dominicensis*, Cave swallow *Petrochelidon fulva*, Northern mockingbird *Mimus polyglottos*, Bananaquit *Coereba flaveola*, Yellow-faced grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, Red bishop *Euplectes franciscanus*, Orange cheeked waxbill *Estrilda melpoda*, Nutmeg mannikin *Lonchura punctulata*, Spotted sandpiper *Actitis macularia*, Red-tailed hawk *Buteo jamaicensis*, Caribbean Coot *Fulica caribaea*, American coot *F. americana*, Black-necked stilt *Himantopus mexicanus*, Osprey *Pandion haliaetus*, White-winged dove *Zenaida asiatica*, Mourning dove *Z. macroura*, Reeve *Philomachus pugnax* (Cardona and Rivera 1988; Rodríguez 2002; SOPI 2003 and 2004; Terrestrial Resources Division Data 2004; Ventosa et al 2004).

Threats:

These habitats are under high pressure for urban development. The oxidation ponds are managed for weed control and their drainage during the duck breeding season affects the successful rearing of young. Although the Coloso Sugar mill is not in operation, the lack of management in the ponds will affect its quality for wildlife species.

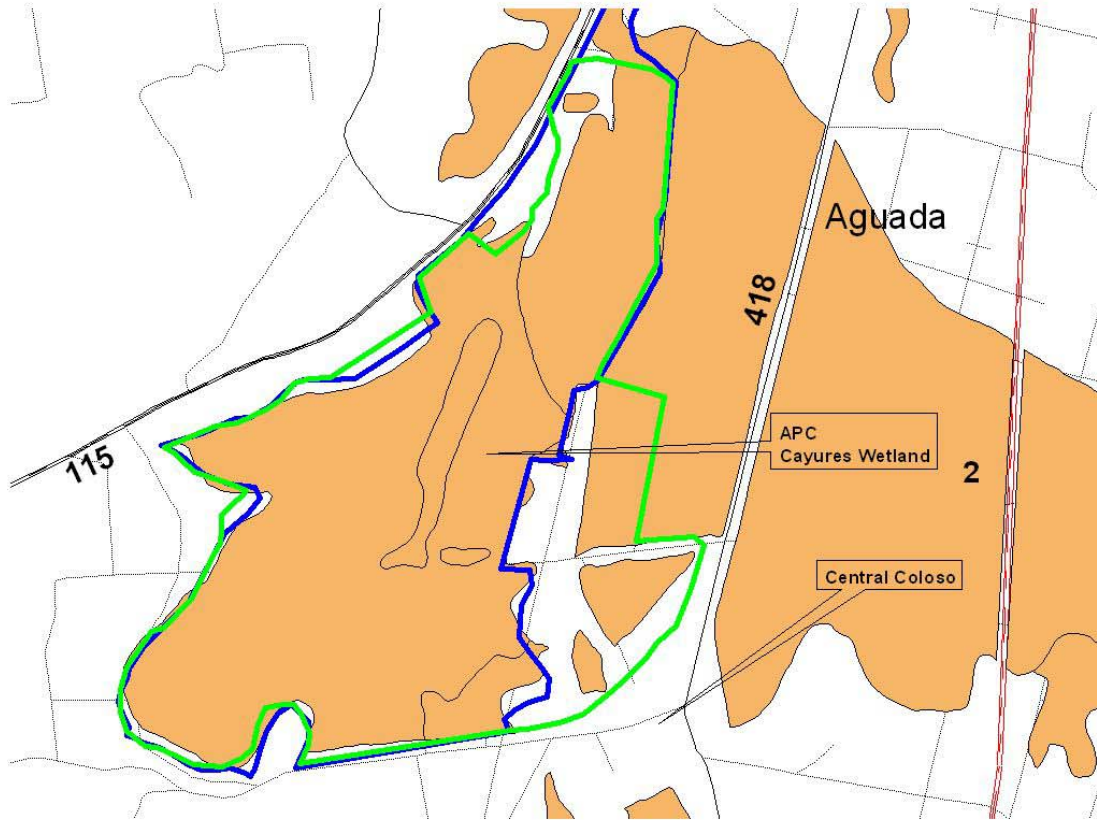
Conservation Recommendations:

The Cayures swamp systems should be acquired by the DNER and an integrated management should be initiated to minimize breeding losses and enhance its value. Since the area is utilized by a number of waterfowl species that occur in Puerto Rico in extremely low numbers, hunting should be prohibited in this area.

References:

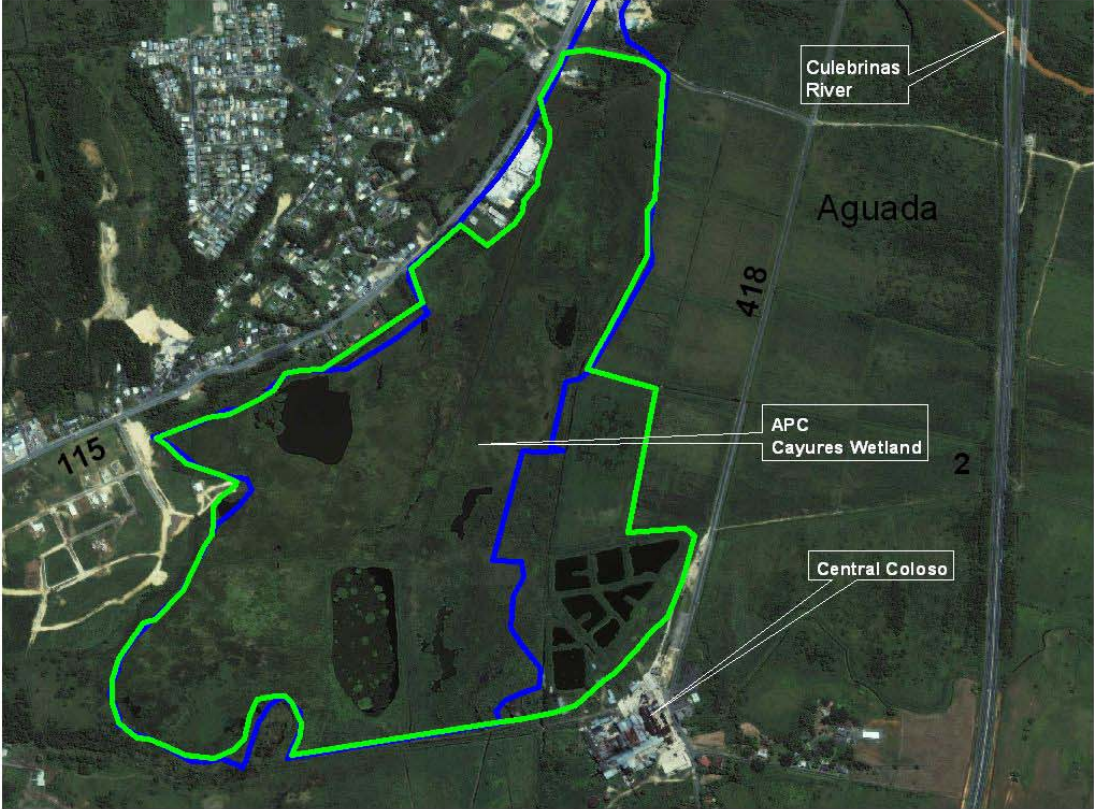
- Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.
- LexJuris Puerto Rico. 2004. Ley Núm 275 del año 1999. P. de la C. 1495 para declarar valor histórico la Central Coloso en Aguada. www.lexjuris.com/LEXLEX/Ley1999/lex99275.
- Muñiz, Luis. 2004. Tabla Datos Viajes Áreas Importantes para Aves. Unpublished data.
- National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, U.S. Coast Guard, Departamento de Recursos Naturales y Ambientales, and U.S. Department of the Interior. 2000. Sensitivity of Coastal and Inland Resources to Spilled Oil; Puerto Rico Atlas. Published in Seattle, Washington. Hazardous Materials Response Division of NOAA.
- Ortiz-Rosas, P. and V. Quevedo-Bonilla. 1987. Áreas con prioridad para la conservación en Puerto Rico. Programa Pro-Patrimonio Natural. Estado Libre Asociado de Puerto Rico, Departamento Recursos Naturales. 217 pp.
- Rodríguez, Rafael. 2002. Playero combatiente en Añasco, y agregaciones de Jilgueros y un Bienteveo anillado en Maricao. *In: El Bient-te-veo*. Vol V No. IV. Page 2.
- SOPI. 2003. Avistamientos en la Caño La Boquilla, Lagunas de Coloso en Aguada, Playas de Isabela, Bahía de Puerto Real, Cabo Rojo y el Seco en Mayagüez. *In: El Bien-te-veo*. Sociedad Ornitológica Puertorriqueña Vol VI, Núm. I: 5-6.

Cayures Swamp



- ▭ Cayures swamp.shp
- ▭ Areas con prioridad de conservacion.shp
- Humedales avpu.shp**
- ▭ Estuarine
- ▭ Lacustrine
- ▭ Marine
- ▭ Palustrine
- ▭ Riverine
- Carreteras avpu.shp**
- ▬ autopistas
- ▬ primarias
- ▬ secundarias
- ▬ terciarias
- ▬ caminos
- ▬ propuestas

Cayures Swamp



0.6 0 0.6 Kilometers



-  Cayures swamp.shp
-  Areas con prioridad de conservacion.shp

70- Desecheo Island, Puerto Rico

Area Description:

Located in the Mona Passage, Desecheo Island is 15 miles west of the northwest corner of Puerto Rico (18°23'N and 67°29'W). This island is a 122 ha mountainous, uninhabited island off the western coast of Puerto Rico. The topography is rough, and the highest elevation is 208 m along the northern ridge. Seasonal deciduous woodland, dominated by *Bursera simaruba* occupies the valleys and lower slopes. Scrub, grass and cactus communities dominate ridges and exposed slopes, especially on the windward, northeastern slopes (Meier et al., 1989). The lack of permanent fresh water and the difficulty of landing by boat have kept Desecheo Island relatively undisturbed by man until recent times (Evans 1989).

Desecheo Island is home to some of the most pristine coral reefs in the Caribbean Sea. Coral formations are found on the continental shelf on the western and southern sides of Desecheo, in a quarter of a mile from shore and exceeding 80 feet in depth (ReefKeeper International 1999). There at least 21 hard coral species present, indicating considerable species richness (ReefKeeper International and Comité ProFondo Marino de Desecheo 1997). Waters are clear and contain low nutrients levels, providing an ideal habitat for coral polyps. Horizontal visibility in these waters normally exceeds 60 feet and sometimes reaches 100 feet or more. Reef surveyed around the Island of Desecheo display a uniform high stony coral cover, with little evidence of sickness or bleaching. The site is also habitat of endangered marine turtles, seabirds and occasionally marine mammals (ReefKeeper International 1999). For a complete natural and political history of the island, see Breckon 2000.

Ownership/Protection:

Desecheo is a land managed by the U.S. Fish and Wildlife Service and public access is restricted.

Special Recognition:

President Taft declared the island in 1912 a U.S. Bird Reserve and Breeding Ground. In 1937 was proclaimed to be maintained as a Forest Reserve and to be preserved for native birds. In 1976, Desecheo Island was transferred from the jurisdiction of the National Institute of Health to the U.S. Fish and Wildlife Service (Department of the Interior) and included in the National Wildlife Refuges System (Evans 1989). Raffaele and Duffield (1979) recognized Desecheo Island as one of Puerto Rico's prime wildlife areas. Cardona and Rivera (1988) classified the island as a CWA of secondary importance. Today, using available and recent information, we upgrade its classification as a primary one.

Wildlife:

Birds

Fifty four bird species have been reported in Desecheo Island: Historically, Brown booby *Sula leucogaster* used to be outnumbered at any other bird species and were distributed through the dense bush on the slopes with an estimate of 8,000 to 10,000 (Wetmore 1918). In 1927, Danforth visit the Island, estimating a population in 15,000 individuals. In 1986-1987 staff from Louisiana State University observed over one hundred boobies roosting and in a mid day visit in 1993, only 15 Brown boobies were sight (Shaffner 1993). Other birds reported in the Island are: Frigatebird *Fregata magnificens*, Red footed booby *Sula sula* (Cardona and Rivera 1988). Brown pelican *Pelecanus occidentalis*, Noddy tern *Anous stolidus*, Laughing gull *Larus atricilla*, Sooty tern *Sterna fuscata*, Bridled tern *S. anaethetus*, Zenaida dove *Zenaida aurita*,

Scaly-naped pigeon *Patagioenas squamosa*, White-crowned pigeon *P. leucocephala*, Black-whiskered vireo *Vireo altiloquus*, Pearly-eyed thrasher *Margarops fuscatus*, American Oystercatcher *Haematopus palliatus*, Common ground dove *Columbina passerina*, Cattle egret *Bubulcus ibis*, Red-tailed hawk *Buteo jamaicensis*, Peregrine falcon *Falco peregrinus*, American kestrel *F. sparverius*, Merlin *F. columbarius*, Osprey *Pandion haliaetus*, Antillean Mango *Anthracothorax dominicus*, Belted kingfisher *Ceryle alcyon*, Caribbean Martin *Progne dominicensis*, Tree swallow *Tachycineta bicolor*, Barn swallow *Hirundo rustica*, Bank swallow *Riparia riparia*, Cave swallow *Petrochelidon fulva*, Mangrove cuckoo *Coccyzus minor*, Yellow-billed cuckoo *C. americanus*, Smooth-billed ani *Crotophaga ani*, Common potoo *Nyctibius griseus*, Alpine swift *Apus melba*, Great blue heron *Ardea herodias*, Great egret *A. alba*, Yellow-crowned night heron *Nyctanassa violacea*, Northern harrier *Circus cyaneus*, Gray kingbird *Tyrannus dominicensis*, Spotted sandpiper *Actitis macularia*, Upland sandpiper *Bartramia longicauda*, Ruddy turnstone *Arenaria interpres*, Northern parula *Parula americana*, Black-throated blue warbler *Dendroica caerulescens*, Palm warbler *D. palmarum*, Blackpoll warbler *D. striata*, Ovenbird *Seiurus aurocapilla*, Northern waterthrush *S. noveboracensis*, Common yellowthroat *Geothlypis trichas*, Hooded warbler *Wilsonia citrina*, Orange cheeked waxbill *Estrilda melpoda*, Bronze mannikin *Lonchura cucullata*, Tropicbird *Phaeton sp.* (Meier et al. 1989); Audubon's shearwater *Puffinus iherminieri* Royal tern *Sterna maxima*, Sandwich tern *S. sandvicensis*, House sparrow *Passer domesticus*, (Shaffner et al. 1993; Earsom 2000).

Reptiles

Slippery-backed mabuya *Mabuya mabouya sloanii* (Meier and Noble 1990); Earsom (2000) reports that “the endemic *Ameiva exsul desecheensis* was abundant in all habitats except for eroding hillsides”. He also reports throughout the island the Desecheo Gecko *Sphaerodactylus levinsi* and in the same trip, Mr. Evans reported seeing a single Slippery-backed mabuya *Mabuya mabouya sloanii*, a vulnerable species. Others reptiles reported in the island, although not seen by Evans (2000), were the Puerto Rican ground lizard *Ameiva exsul alboguttata*, Anole *Anolis desecheensis*, and the Puerto Rican Racer *Alsophis portoricensis*.

Critical Plants:

There is a population of *Harrisia portoricensis* (vulnerable species since 1990) on Desecheo Island (Breckon 1995).

Threats:

Despite the protected status declared by President Taft in 1912, Desecheo Island has been subject to considerable disturbance and modification (Breckon, 2000). In April 1940, the War Department requested the transfer of Desecheo Island to the federal government for use as a bombing and gunnery training range. By the close of World War II, Desecheo Island was under federal jurisdiction and remained so until 1964, when it was declared excess property by the U.S. military (Evans 1989).

In July 1966, the National Institute of Health (NIH) released 57 Rhesus monkeys *Macaca mulatta* on Desecheo from Cayo Santiago to study processes of adaptation (Evans 1989). It is now widely accepted conclusion that the devastation that occurred to the Brown booby nesting colonies during the 1960's through the 1980's was caused primarily by the Rhesus macaques. In 1969, Mr. P. Warshall estimated that monkeys were eating 200 to 300 booby eggs weekly (Morrison 1970). A few monkeys are thought to have remained on the island after the 1988 eradication campaign (sixty six monkeys were removed from the island) (Shaffner et al 1993). This increased population was composed of healthy individuals, in

excellent physical conditions (Evans 1989). By 1979, no seabirds were breeding successfully on Desecheo (Cardona and Rivera 1988). The monkeys also consume the wood pulp of the Almácigo tree *Bursera simaruba* (Evans 1989).

Introduced black rats, feral cats, trespassing humans, and the feral goats all could have significant negative impacts. Rats can cause significant damage to some plants, populations of the smaller ground nesting seabirds, and other small sized wildlife, especially lizards and small birds (Shaffner et al., 1993). Apparently the goats destroy the plants of the island, knocking over the Sebuacán cactus *Chepalocereus royenii* and the tree-cactus *Opuntia moniliformis*, using them either for food or water resource. There is evidence of extensive goat damage to the populations of *Opuntia dillenii* (Breckon 1995). Breckon (2000) reports “the 59 plant species assumed extirpated represent 37% of the island’s flora”. Also, rapid erosion is occurring on all steep slopes, most ridge tops have little vegetation except for mature trees and no seedling were observed (Earsom, 2000). This can be the result of goats feeding on these areas. Breckon (1995) on his letter about goats on Desecheo report “it is rapidly becoming a serious problem directly affecting the survival of the vegetation on Desecheo Island”.

The large numbers of illegal aliens stopping at Desecheo from the Dominican Republic are a major concern, because they spend days on the Island with no food or water and the seabird nests are easily accessible, making eggs and chicks highly vulnerable (Shaffner et al 1993).

Conservation Recommendations:

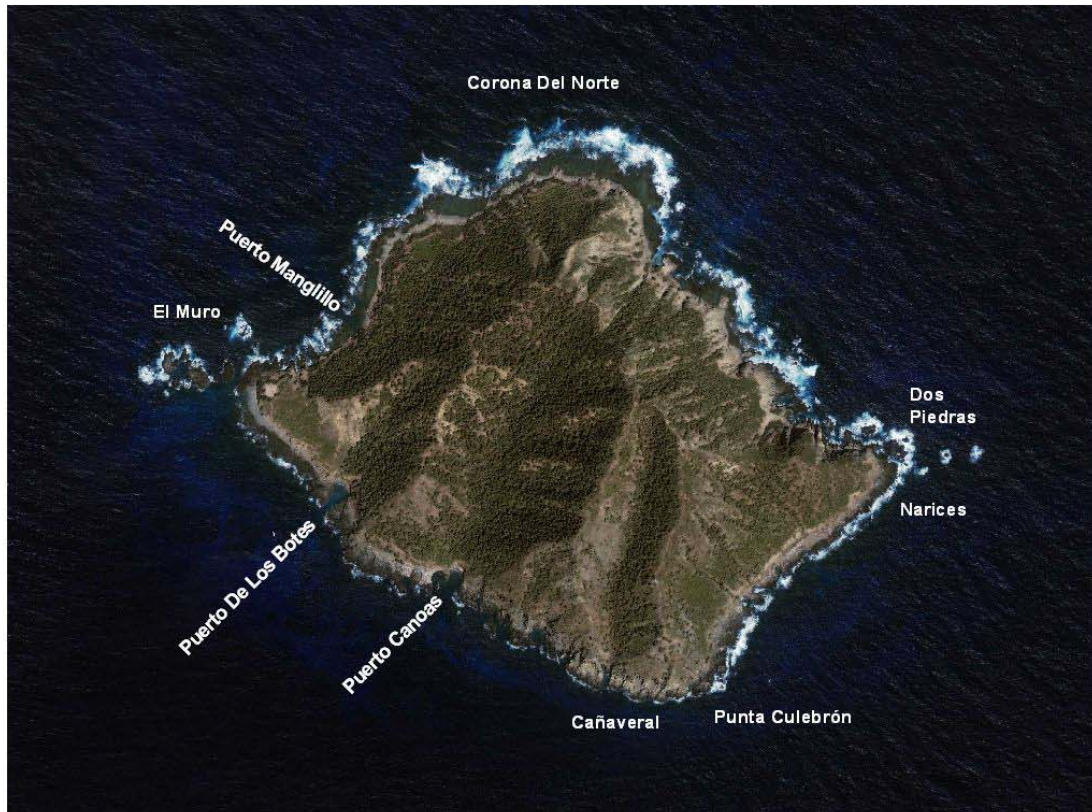
1. Eradication of exotic animals of the Island that affect native wildlife. Prepare and implement a goat and rhesus monkeys eradication plan for the island. Degradation of the flora is expected to continue unless the exotic animals are eliminated (Breckon 2000).
2. Establishment of a marine protected area to maintain the condition of Desecheo coral reefs (ReefKeeper International and Comité ProFondo Marino de Desecheo 1997).
3. Install erosion control structures on the western slopes near the helipad and begin reforestation (Earsom 2000).
4. Establish several long-term vegetation monitoring plots to track changes in biomass and species abundance during and after goat removal (Earsom 2000).

References:

- Breckon, G.J. 1995. Letter to J. P. Oland, Field Supervisor, USFWS, Caribbean Field Office. December 12, 1995.
- Breckon, G.J. 2000. Revision of the Flora of Desecheo Island, Puerto Rico. *Carib. J. Sci.* Vol 36: 177-209.
- Danforth, S. T. 1931. 15, 000 Brown boobies at Desecheo Island. *Puerto Rico Ornithological Records. J. Dept. Agric. P. R.* 15: 88-89.
- Earsom, S. D. 2000. Memorandum to Val Urban CINWRC Project Leader. Caribbean Islands NWR Complex August 04, 2000.
- Evans,, M. A. 1989. Ecology and removal of introduced Rhesus monkeys: Desecheo Island National Wildlife Refuge, Puerto Rico. *PRHSJ* Vol. 8 No. 1. pp 139-156.

- Meier, A. J.; R.E. Noble, and H.A. Raffaele. 1989. The Birds of Desecheo Island, Puerto Rico, including a new record for Puerto Rican Territory. *Carib. J. Sci.*, Vol. 24: 24-29.
- Meier, A. J. and R. E. Noble. 1990. A Range Extension for *Mabuya mabouya* Lacépede (Reptilia: Lacertilia) to Desecheo Island, Puerto Rico. *Carib. J. Sci.*, Vol. 26: 66-67.
- Morrison, J.A. 1970. Letter to the Director, Oklahoma Cooperative Wildlife Research Unit. Rhesus monkey depredation on sea bird nests at Desecheo I., Puerto Rico. August 7, 1970.
- Shaffner, F.; K. Foot; F. López; D. Corales; J. Saliva, J. Oland and S. Rice. 1993. February visit to Desecheo. Internal Memorandum. USFWS. 17 pp.
- ReefKeeper International and Comité ProFondo Marino de Desecheo. 1997. Desecheo's reefs Virtually Pristine. Desecheo ReefMonitor Update. A join effort of ReefKeeper International and the Comité Pro Fondo Marino de Desecheo to protect Desecheo's Island coral reefs. 2 pp.
- ReefKeeper International. 1999. Draft: Commonwealth Marine Natural Reserve Site Nomination. Desecheo Island, Puerto Rico. Nominated by ReefKeeper International. Operation Center, Miami, Florida. 7 pp.
- Wetmore, A. 1918. The Birds of Desecheo Island, Porto Rico. Vol. XXXV. Pp. 333-340.

Desecheo Island



0.6 0 0.6 Kilometers



71- Barrio Coto, Isabela

Area Description:

Rural area located in the municipality of Isabela, in the northwestern coast of Puerto Rico (Cardona and Rivera 1988). These are within the karst region where soils are porous and well-drained and calcareous rocks and fissures are abundant. Barrio Coto comprehend approximately 1076 ha. This north coast area has been identified as the subtropical moist forest life zone by Ewel and Whitmore (1973).

Ownership/Protection:

Private lands under different ownerships.

Special Recognition:

The Barrio Coto was recognized as a primary wildlife area in 1979 (Raffaele and Duffield) and in 1988 (Cardona and Rivera). Because scientists believe it still possible to find the endangered crested toad in this area during the rainy season, and the future plan to reestablish a population of the crested toad, the area is still recognized as a primary CWA.

Wildlife:

Birds

The Bananaquit *Coereba flaveola* was the most frequent bird visitor to the flowers of *Goetzea elegans*; the Antillean Mango hummingbird *Anthracothorax viridis* was observed taking nectar from the flowers; the Stripe headed tanager *Spindalis portoricensis* was observed maneuvering the fruits (Santiago Valentín 1995).

Reptiles

Puerto Rican boa *Epicrates inornatus* (Cardona and Rivera 1988).

Amphibians

In 1967 García Díaz found the endangered Puerto Rican crested toad *Bufo lemur* (Raffaele and Duffield 1979). No specimens have been observed or collected in the area since 1967 (Cardona and Rivera 1988). Recently (2004), the USFWS is sponsoring a scientific study to search for the toad in Barrio Coto (per. com. with Sidmarie Padró, USFWS Biologist).

Critical Plants

There is presence of the endangered Matabuey *Goetzea elegans* growing along the bottom, sides and edges in a more or less linear array of small clusters of the wooded ravine Quebrada Seca, which intersects the Guajataca River on its west side (Santiago Valentín, 1995). The critically endangered *Auerodendron pauciflorum*, endemic to the Isabela Municipality, occurs (about 10 individuals) in Barrio Coto. Roy O. Woodbury first discovered this plant in 1976 (Proctor 1991).

Threats

The area is in continuous degradation with increase development (Cardona and Rivera 1988). It is also affected by considerable rubbish of human origin and frequent cutting to clear the roadsides; disturbance is evident at the base of the mogotes as well as at the top of the limestone plateau on the north side of the road. The slopes of the mogotes are less disturbed and support species typical of northern limestone forests. The most disturbed portion of Quebrada

Seca is where it meets the Guajataca River; the area have been used for many years for cattle grazing; sediments from an existing limestone quarry and rubbish of human origin are frequently found (Santiago Valentín 1995).

On both the northern and southern coasts of Puerto Rico breeding sites of the endangered Puerto Rican crested toad are known to have been destroyed by filling or alteration of drainage patterns (USFWS 1992). Development on the northern coast probably reduced the once more numerous populations. Current limiting factors include the availability of suitable breeding sites, interspecific competition with *Bufo marinus* and predation by species such as mongoose, feral dogs and cats. It have been mentioned that predation by *B. marinus* may occur.

Conservation Recommendations:

Continue to propagate Puerto Rican crested toads suitable for reestablishment in the wild, including in Barrio Coto. The species has been propagated in captivity and an adequate diet has been established (Paine 1984). Based on habitat characterization, potential introduction sites within Barrio Coto should be identified. New sites need to be as remote as practical to minimize the chance of single catastrophic loss (USFWS 1992). The selected site should be acquired by the Commonwealth and/or other Agencies to ensure the protection of the lands.

References:

- Ewel, J.J., and J.L. Whitmore. 1973. The ecological life zones of Puerto Rico and the U.S. Virgin Islands. U.S. Dept. Agric. For. Serc. Res. Pub. ITF-18. Rio Piedras, P.R. 71 pp.
- García-Díaz, J. 1967. Rediscovery of *Bufo lemur* (Cope) and additional records of reptiles from Puerto Rico. *Stahlia*. 10:1-6.
- Paine, F.L. 1984. The husbandry, management & reproduction of the Puerto Rican crested toad (*Bufo lemur*). 8th Annu. Proc. Of the Intl. Herpetological Symposium, Columbus, Ohio. 28 pp.
- Proctor, G. 1991. Puerto Rican plant species of special concern; status and recommendations. Departamento de Recursos Naturales de Puerto Rico. Publicación Científica Miscelánea No. 2. 196 pp.
- Santiago Valentín, E. 1995. Reproductive and Population Ecology of *Goetzea elegans wydler* (Solanaceae or Goetzeaceae). A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Biology. University of Puerto Rico, Mayagüez Campus. 174 pp.
- U.S. Fish and Wildlife Service. 1992. Recovery Plan for the Puerto Rican crested toad (*Peltophryne lemur*). Atlanta, Georgia. 19 pp.

72- Guajataca Cliffs, Isabela-Quebradillas-Camuy

Area Description:

Located in the northwestern coastal portion of Puerto Rico, Guajataca cliffs area is in the North Coast Limestone belt and extends from Isabela to Camuy. The climate is tropical humid. Guajataca cliffs are an important nesting site for the White-tailed tropicbird (Cardona and Rivera 1988). In Puerto Rico this species breeds at a few locations where limestone cliffs drop into the Atlantic Ocean. The sea cliffs at Guajataca are probably the most easily reached breeding site, and allow unparalleled ease of observation (Buckley and Buckley, 1970). This species uses cavities in the Guajataca cliff faces to breed and all that is needed is protection of these cliffs from being destroyed (Raffaele and Duffield, 1979).

Ownership/Protection:

Private lands under different ownerships.

Special Recognition:

Raffaele and Duffield (1979) recognized the Guajataca Cliffs as “the only significant locality on Puerto Rico proper where the White-tailed Tropicbird nest”. They classified it as a primary wildlife area. Cardona and Rivera (1988) also recognized the Guajataca Cliffs a primary wildlife area.

Wildlife:

Birds

White-tailed tropicbird *Phaethon aethereus* and the Bridled tern *Sterna anaethetus*, both breeding (J. Saliva pers. comm.). Cave swallow *Petrochelidon fulva*, Caribbean Martin *Progne dominicensis*, Red-legged thrush *Turdus plumbeus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Cattle egret *Bubulcus ibis*, Great egret *Ardea alba* (Houle 1999).

Threats:

Some construction had been developed in this large area since 1979, although there is no evidence of negative effects to Tropicbirds from increased human disturbances.

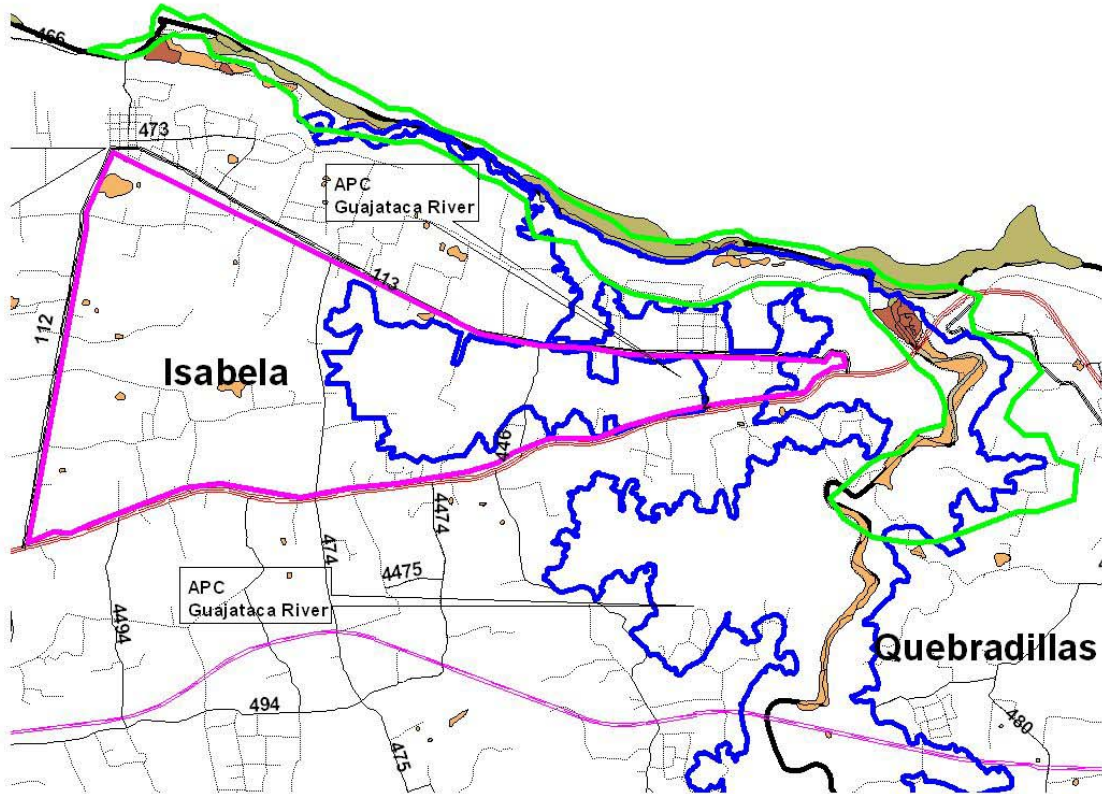
Conservation Recommendations:

One recommendation is to start an education program address to the general public and tourist to minimize the possibility of harassment to the birds and their nest.

References:

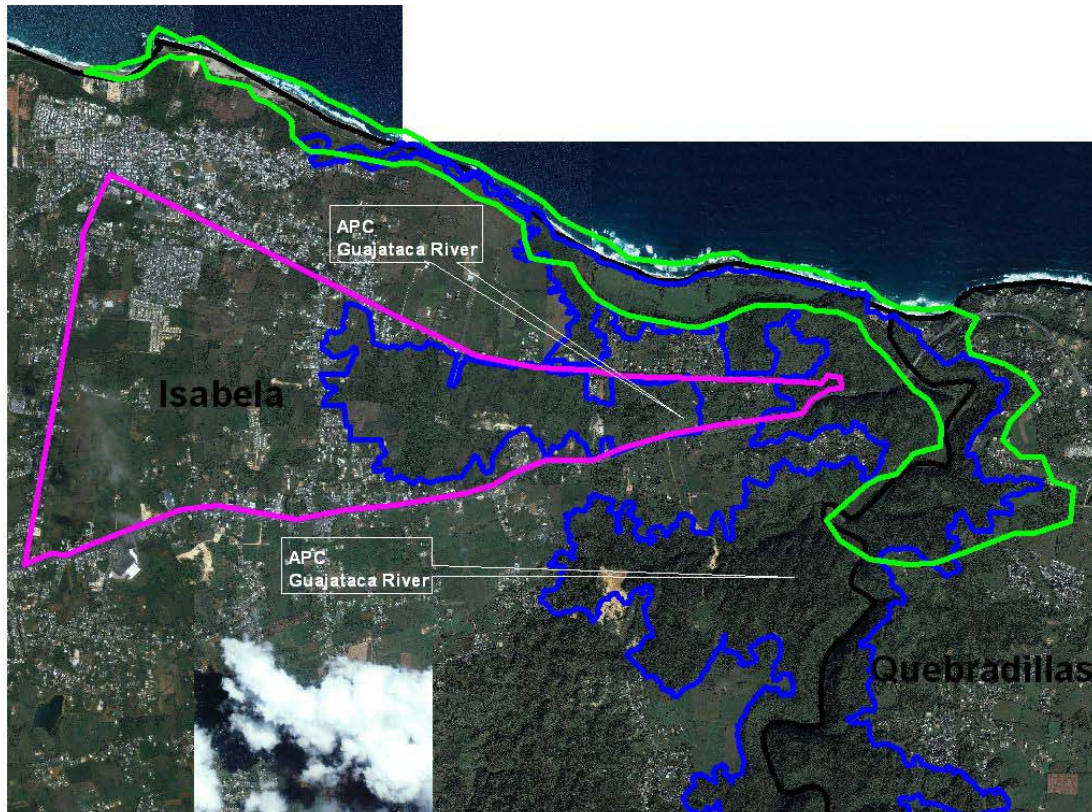
- Buckley, P.A. and F.G. Buckley. 1970. Notes on the distribution of some Puerto Rican birds and on the courtship behavior of White-tailed tropicbirds. *The Condor*, Vol. 72: 483-486.
- Houle, M. 1999. A trip through paradise. *Birding the Americas Trip Report and Planning Repository*, Puerto Rico. April 21-24, 1999.
<http://maybank.tripod.com/Caribbean/PuertoRico-04-99.htm>

Barrio Coto and Guajataca Cliffs (West)





- Barrio coto cwa.shp
- Guajataca cliffs (west) cwa.shp
- Areas con prioridad de conservacion.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine
- Municipios.shp

Barrio Coto and Guajataca Cliffs (West)

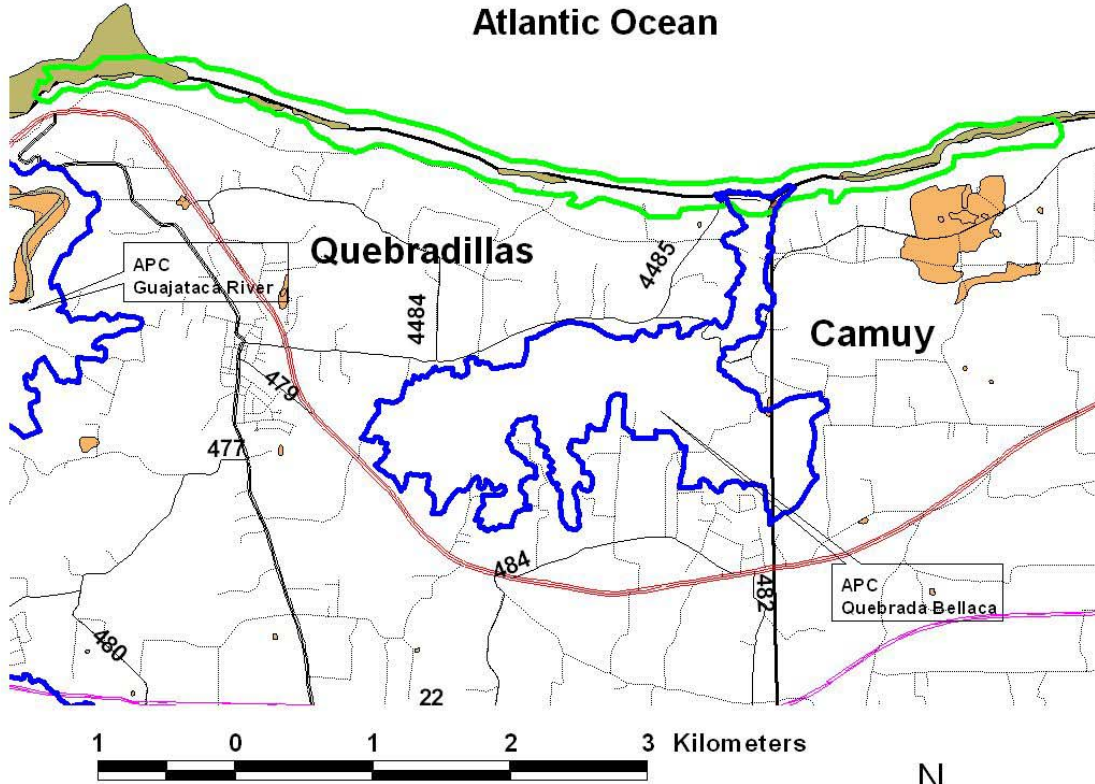


3 0 3 Kilometers



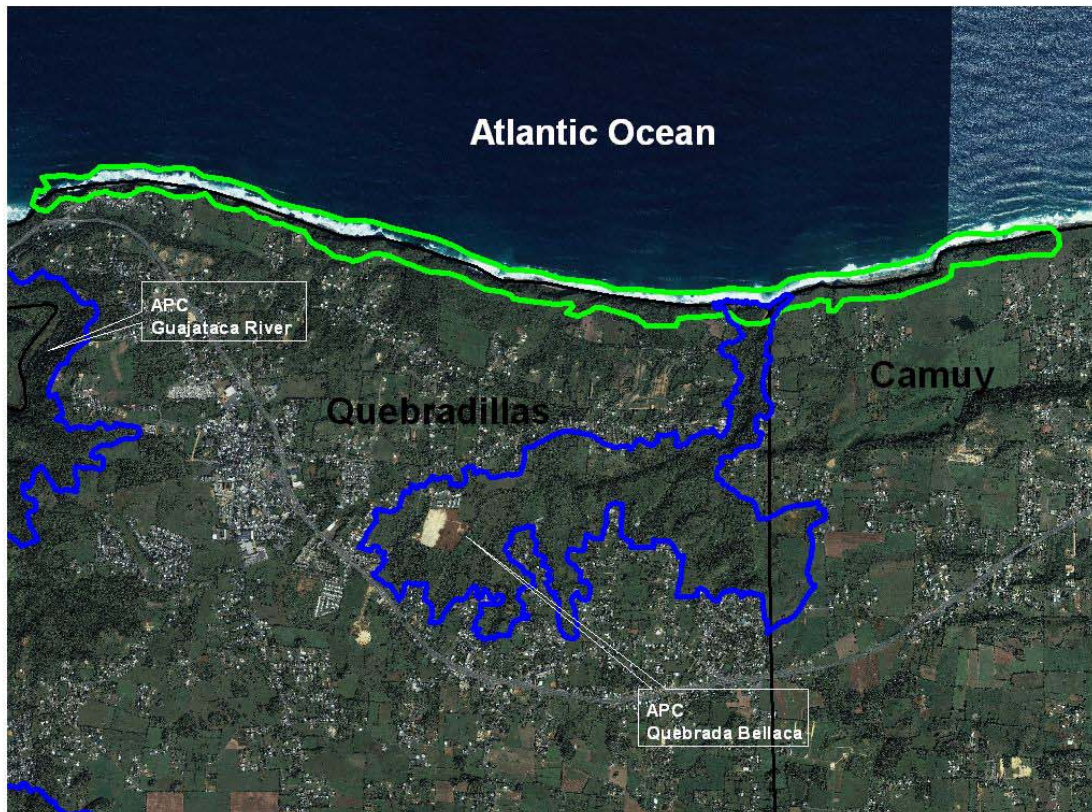
-  Barrio coto cwa.shp
-  Guajataca cliffs (west) cwa.shp
-  Areas con prioridad de conservacion.shp
-  Municips.shp

Guajataca Cliffs (East)






- ▭ Areas con prioridad de conservacion.shp
- ▭ Guajataca cliffs (east) cwa.shp
- Carreteras avpu.shp
 - ▬ autopistas
 - ▬ primarias
 - ▬ secundarias
 - ▬ terciarias
 - ▬ caminos
 - ▬ propuestas
- Humedales avpu.shp
 - ▭ Estuarine
 - ▭ Lacustrine
 - ▭ Marine
 - ▭ Palustrine
 - ▭ Riverine
- Municips.shp

Guajataca Cliffs (East)



1 0 1 2 3 Kilometers



-  Areas con prioridad de conservacion.shp
-  Guajataca cliffs (east) cwa.shp
-  Municipips.shp

73- Guajataca State Forest, Isabela

Area Description:

The Guajataca State Forest (GSF) is located in the northwest section of Puerto Rico in the Municipality of Isabela. The forest spans an area of 954 contiguous ha (2357 cuerdas) with an elevation that goes from about 150 to 349 meters above sea level (J.R. Román Soto, Forest Manager, pers. comm., 2005). The forest has been classified as a Subtropical Moist Forest (Ewel and Whitmore 1973).

The major attraction of the GSF is that it has the largest hiking trail system of all the state forests in Puerto Rico. It is a complex system of 44 km of trails that interconnects and that offers an excellent opportunity to appreciate the biodiversity of the flora and fauna of this unique habitat. All 46 trails are in their natural stages, well maintained, and designed for foot travel only and where outlined by the Civilian Conservation Corps between the 1930 and 1940. In the trails, visitors can admire the understory as well as the canopy in a look out tower. There is also a cave and cavern system in which visitors can admire. One of the caves called Cueva del Viento, is a natural formation of limestone with stalactites, stalagmites, columns and other formations that goes down 15 to 18 feet from the ground, with facilities such as a spiral staircase with a wood handrail, donated recently by the Isabela municipality (J.R. Román Soto, pers. comm.).

The forest is considered an unique natural area because of its tropical karst topography (limestone derived soils) characterized by clusters of sub conical haystack hills (mogotes), separated one from another by rounded or funnel shaped depressions which are know as sinkholes (sumideros). The natural areas of the forest provides habitat to many species of animals and trees species. In this subtropical moist forest two associations of vegetation have been identified: one on the hillside and another on the tops of the limestone hills.

More than 250 plant species had been reported in the forest, from which 40 are endemics. The more represented families are: Leguminosae (23 species), Myrtaceae (14), and Lauraceae (12). There are also reports of the presence of more than 10 orchid species that can be found in the forest (Román Soto 2004b).

The forest administration acquired recently 31.44 ha patch forest (80 cuerdas) in the east side as an Auxiliary Forest that borders the Guajataca River, with a trail that connects the patch with the forest. They also have identified terrains in the west side for acquisition to enlarge the forest terrains. Some of the future plans of the DNER are also to identify all the terrains that can connect with the Río Abajo Forest State Forest to create a corridor that can help with the reintroduction of the Puerto Rican parrot *Amazona vittata* in the central karst region (J.R. Román Soto, pers. comm.).

Ownership/Protection:

The GSF is administrated and managed by the State Forest Service of the DNER.

Special Recognition:

The area was declared a Forest in 1943 (Silander et al 1986). In 2004, BirdLife International and SOPI recognized GSF as an Important Bird Area. For the first time, the Guajataca State forest is recognized as a prime CWA, mainly because it's high endemism and biodiversity.

Wildlife:

Birds

Fifty seven bird species had been recorded in the GSF, from which 13 are endemics: Puerto Rican Woodpecker *Melanerpes portoricensis*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Screech owl *Megascops nudipes*, Puerto Rican Vireo *Vireo latimeri* (DRNA 2003). Turkey vulture *Cathartes aura*, Red-tailed hawk *Buteo jamaicensis*, Scaly-naped pigeon *Patagioenas squamosa*, Zenaida dove *Zenaida aurita*, Key west quail-dove *Geotrygon chrysia*, Ruddy quail-dove *G. montana*, Mangrove cuckoo *Coccyzus minor*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Green mango *Anthracothorax viridis*, Antillean Mango *A. dominicus*, Puerto Rican lesser Antillean Pewee *Contopus portoricensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Black-whiskered vireo *Vireo altiloquus*, Cave swallow *Petrochelidon fulva*, Red-legged thrush *Turdus plumbeus*, Pearly-eyed thrasher *Margarops fuscatus*, Northern parula *Parula americana*, Adelaide's warbler *Dendroica adelaidae*, Black-throated blue warbler *D. caerulescens*, Black and white warbler *Mniotilta varia*, American Redstart *Setophaga ruticilla*, Bananaquit *Coereba flaveola*, Puerto Rican Spindalis *Spindalis portoricensis*, Antillean Euphonia *Euphonia musica*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Shiny cowbird *Molothrus bonariensis*, Troupial *Icterus icterus* (SOPI 2004); Great blue heron *Ardea herodias*, Green heron *Butorides virescens*, Cattle egret *Bubulcus ibis*, Black-crowned night heron *Nycticorax nycticorax*, Merlin *Falco columbarius*, American kestrel *F. sparverius*, White-crowned pigeon *Patagioenas leucocephala*, White-winged dove *Zenaida asiatica*, Common ground dove *Columbina passerina*, Bridled quail-dove *Geotrygon mystacea*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Antillean crested hummingbird *Orthorhyncus cristatus*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Caribbean elaenia *Elaenia martinica*, Northern mockingbird *Mimus polyglottos*, Yellow-throated vireo *Vireo flavifrons*, White-eyed vireo *V. griseus*, Cape may warbler *Dendroica tigrina*, Prairie warbler *D. discolor*, Black and white warbler *Mniotilta varia*, Black-faced grassquit *Tiaris bicolor*, Indigo bunting *Passerina cyanea*, Black-cowled oriole *Icterus dominicensis*, Smooth-billed ani *Crotophaga ani*, Short-eared owl *Asio flammeus*, Puerto Rican sharp-shinned hawk *Accipiter striatus venator* (Román Soto 2004a).

Reptiles

Puerto Rican boa *Epicrates inornatus*, Puerto Rican Racer *Alsophis portoricensis*, Puerto Rican slider *Trachemys s. stejnegeri*, Gecko *Hemidactylus brookii haitianus*, Gecko *Sphaerodactylus macrolepis macrolepis*, Puerto Rican ground lizard *Ameiva exsul*, Slippery-backed mabuya *Mabuya mabouya sloanii*, Puerto Rican galliwasp *Diploglossus pleei*, Puerto Rican giant anole *Anolis cuvieri*, Emerald anole *A. evermanni*, Crested anole *A. cristatellus*, Yellow-bearded anole *A. gundlachi*, Puerto Rican pigmy anole *A. occultus*, Common grass anole *A. pulchellus*, Green iguana *Iguana iguana*, Baker's legless lizard *Amphisbaena bakeri*, North American worm lizard *A. caeca*, Schmidt's worm lizard *A. schmidtii*, Blind snake *Typhlops platycephalus*, Puerto Rican wetland blind *T. rostellatus*, Grant's blind snake *T. granti*, Blind snake *T. hypomethes* (Román Soto 2004a).

Amphibians

Puerto Rican crested toad *Bufo lemur* (extirpated in the forest), White-lipped frog *Leptodactylus albilabris*, Bullfrog *Rana catesbeiana*, Giant toad *Bufo marinus*, Grass coqui *Eleutherodactylus brittoni*, Common coqui *E. coqui*, Antillean frog *E. antillensis*, Whistling frog *E. cochraniae* (Román Soto 2004a).

Mammals

Fig eating bat *Artibeus jamaicensis*, Buffy flower bat *Erophylla sezekorni*, Puerto Rican long-tongued bat *Monophyllus redmani*, Parnell's Moustached bat *Pteronotus parnellii*, Antillean ghost-faced bat *Mormoops blainvilli*

Critical Plants

Vahl's boxwood *Buxus vahlii*, Palo de Rosa *Ottoschulzia rhodoxylon*, Ausu *Myrcia paganii*, Luquillo Mountain stopper *Eugenia haematocarpa*, Arana *Schoepfia arenaria*, St. Thomas pricklyash *Zanthoxylum thomasianum*, Beautiful goetzea *Goetzea elegans*, Erubia *Solanum drymophilum*, *Daphnopsis hellerana*, Nigua *Cornutia obovata* (Román Soto 2004b).

Threats:

Illegal dumping, septic tank close to aquiferous and forest boundaries, intentional fires, urban development close of forest limits (especially in the southeast region) are some threats reported by J.R. Román Soto, DNER Forest Manager. Other threats reported by Mr. Román Soto are: illegal tree cutting inside the forest for fence or handspike materials, illegal hunting (during and outside hunting season), blinds construction in the top of the mogotes for hunting purposes had been found inside forest property. Forest Rangers assigned to Guajataca Forest have actually some limitations in personnel and transportation (Román Soto pers. comm.).

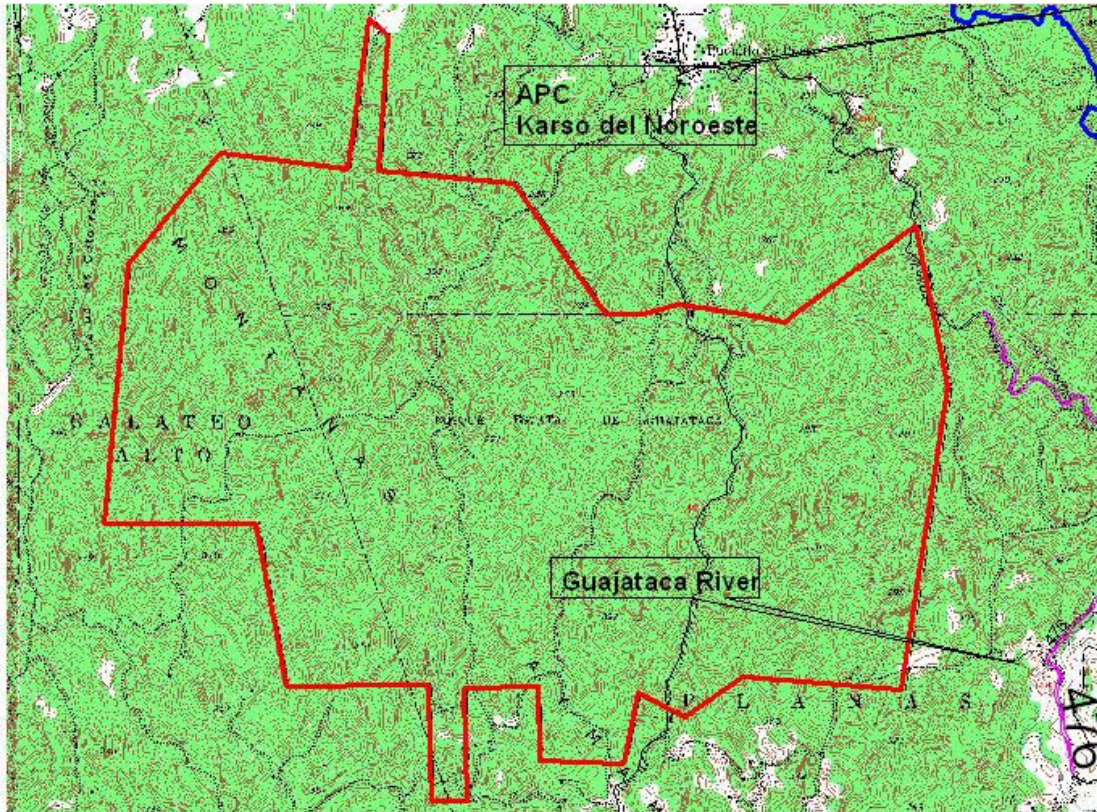
Conservation Recommendations









The Forest boundaries should be clarify and delineated and identified using sing or fences. In others areas, signs should be located to clarified prohibition of garbage dump, hunting, camping, ext. The patrolling hours should be increasing during special hours. Maintenance of trails and roads to prevent forest fires (Román Soto pers. comm.).

References:

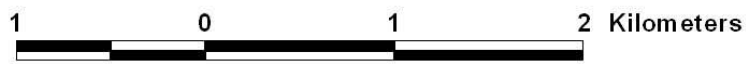
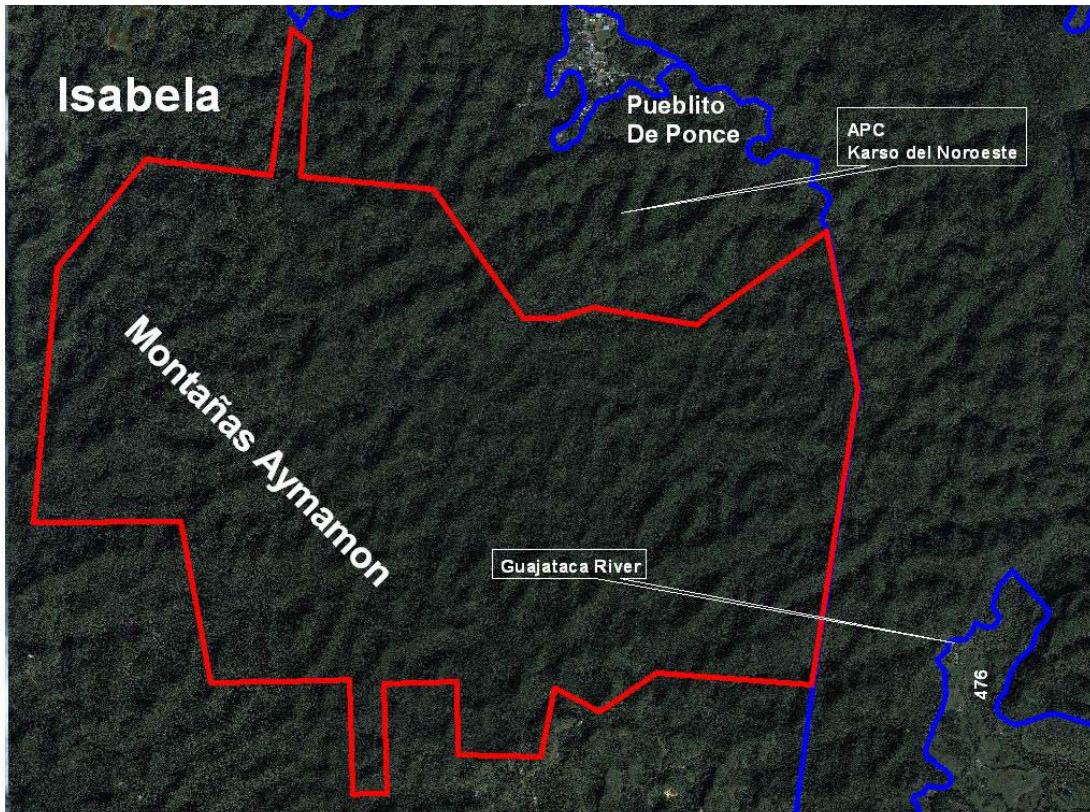
- DRNA. 2003. Bosque Estatal de Guajataca. Desarrollado por la Gerencia de Portales de la Oficina de Gerencia y Presupuesto para el DRNA. www.gobierno.pr/DRNA/.
- Ewel, J.J., and J.L. Whitmore. 1973. The ecological life zones of Puerto Rico and the U.S. Virgin Islands. U.S. Dept. Agric. For. Serc. Res. Pub. ITF-18. Rio Piedras, P.R. 71 pp.
- Román Soto, J. 2004a. Listado de reptiles, anfibios y mamíferos del Bosque Estatal de Guajataca. DRNA, Negociado de Servicio Forestal. Unpublish data.
- _____. 2004b. Flora endémica y en peligro de extinción del Bosque Guajataca. DRNA, Negociado de Servicio Forestal, Bosque de Guajataca. Unpublish data. Revisado por Papo Vives.

Guajataca State Forest



-  Bosques_y_reservas.shp
-  Carreteras.shp
-  autopistas
-  primarias
-  secundarias
-  terciarias
-  caminos
-  propuestas
-  Prioridad_conservacion.shp

Guajataca State Forest



-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

Area Description:

Guajataca Lake is located between the towns of Isabela, San Sebastian, Camuy and Quebradillas in the northwest. It is one of the biggest man made lake in Puerto Rico, built in 1928 by constructing a dam across the river Guajataca (Ferrer 2002). Lake Guajataca was constructed by the Puerto Rico Energy Power Authority (PREPA) primary for the production of energy, also as an irrigation system, and for the production of drinkable water, today still a water reservoir and an area for recreational fisheries (Velázquez 2004).

Ownership/Protection:

The Guajataca dam is owned by the PREPA and provides water for the municipalities of Aguadilla, Isabela, Moca, Aguada and Quebradillas (Ferrer, 2002). The DNER is the Agency that administrates the terrains near by and the lake (Velázquez 2004).

Special Recognition:

Guajataca Lake was first recognized as a CWA in 1980 (Moreno and Pérez). In 1988, the Guajataca Lake was declared a Wildlife Refuge, and in October 1992, the DNER inaugurate the facilities of the area, which includes an access ramp, a fishing club and a pier (Velázquez 2004).

Wildlife:***Birds***

According to Moreno and Pérez (1980), Guajataca Lake has its value centered upon the large numbers of birds which use the area for feeding and resting such as: Little blue heron *Egretta caerulea*, Tricolored heron *E. tricolor*, Great blue heron *Ardea herodias*, Ruddy quail-dove *Geotrygon montana*, Key west quail-dove *G. chrysia*. According to Velázquez (2004) there is also the presence of: Brown pelican *Pelecanus occidentalis*, Pied-billed grebe *Podilymbus podiceps*, Magnificent frigatebird *Fregata magnificens*, the Critically endangered Puerto Rican Broad-winged hawk *Buteo platypterus*, White-crowned pigeon *Patagioenas leucocephala*, Ruddy duck *Oxyura jamaicensis*, Muscovy duck *Cairina moschata*, Osprey *Pandion haliaetus*, Puerto Rican Vireo *Vireo latimeri*, Greater Antillean Oriole *Icterus dominicensis*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Greater Antillean Grackle *Quiscalus niger*, Loggerhead kingbird *Tyrannus caudifasciatus*, Gray kingbird *T. dominicensis*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Common moorhen *Gallinula chloropus*, Caribbean Coot *Fulica caribaea*, White egret *Egretta thula*, Cattle egret *Bubulcus ibis*, Great egret *Ardea alba*, Cave swallow *Petrochelidon fulva*, Caribbean Martin *Progne dominicensis*, Bank swallow *Riparia riparia*, Yellow-faced grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, Antillean Euphonia *Euphonia musica*, Smooth-billed ani *Crotophaga ani*, Belted kingfisher *Ceryle alcyon*, Green heron *Butorides virescens*, Puerto Rican Screech owl *Megascops nudipes*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Mangrove cuckoo *Coccyzus minor*, Bananaquit *Coereba flaveola*, Killdeer *Charadrius vociferus*, Black-necked stilt *Himantopus mexicanus*, Common ground dove *Columbina passerina*, Northern mockingbird *Mimus polyglottos*, Puerto Rican Tody *Todus mexicanus*, White-winged dove *Zenaida asiatica*, Zenaida dove *Z. aurita*, Yellow-crowned night heron *Nyctanassa violacea*, Black-crowned night heron *Nycticorax nycticorax*, Pearly-eyed thrasher *Margarops fuscatus*, Red-legged thrush *Turdus plumbeus*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Least bittern *Ixobrychus exilis* (Velázquez 2004).

Reptiles

Puerto Rican boa *Epicrates inornatus*, Puerto Rican Racer *Alsophis portoricensis*, Garden snake *Arrhyton exiguum*, Green iguana *Iguana iguana*, Puerto Rican Slider *Trachemys stejnegeri* (Velázquez 2004).

Mammals

Fishing bat *Noctilio leporinus* (Velázquez 2004).

Fish

Fresh water fish, such as, Peacock Bass (Tucunare), Large Mouth Bass (Lobina), Red Ear Sunfish, Perch (Chopas), White Catfish (Barbudo), Tilapias (Tilapias) and Threadfin Shad (Cetí ó Sardina de agua dulce) (<http://puertorico.20megsfree.com/photo.html>), Red Devil Fish (a new alien establishment), Pleco, Guavina (only native fish of the pond) (Velásquez, 2004).

Threats:

Deforestation, intentional fires, construction of illegal ramps, illegal deposition of solid wastes, poaching seedlings and plants; and presence of the Caiman, which are eradicated as soon as detected (Velázquez, 2004).

Conservation Recommendations:

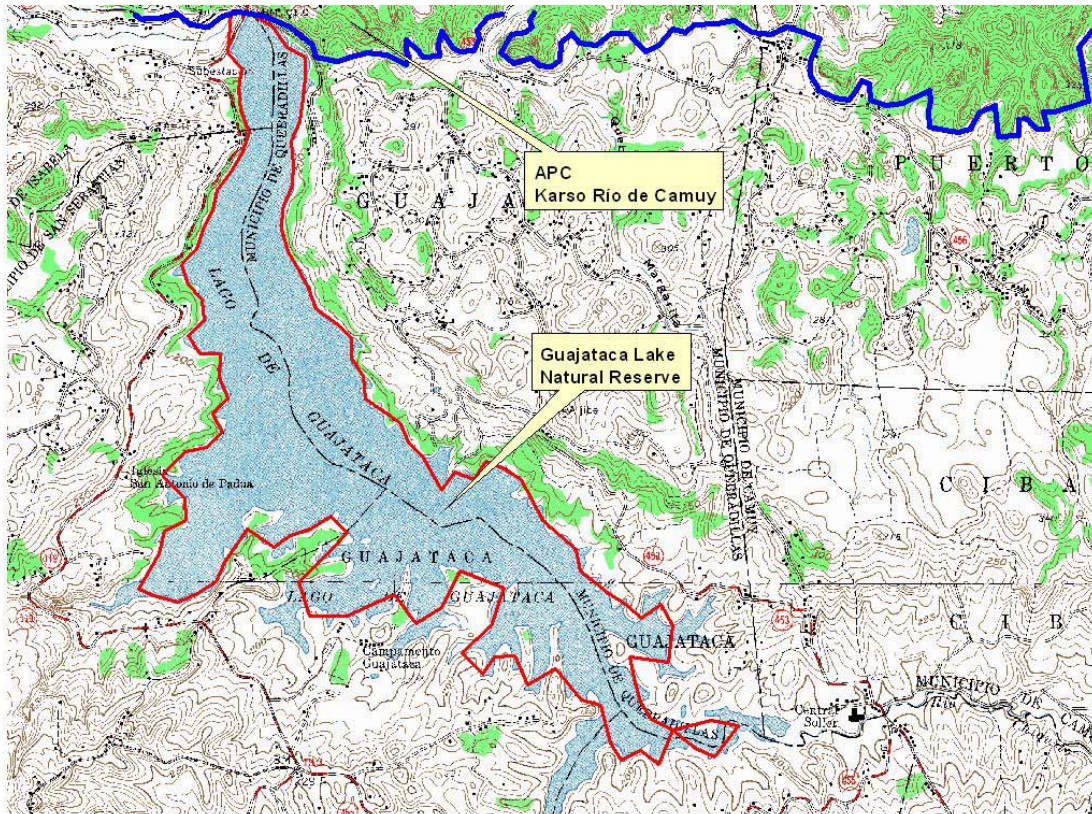
To maintain the scientific research in the Lake, this includes water quality control, roving creel, electro fishing, monitoring the fishing tournaments, fishing clinics and wildlife inventories. To keep vigilance of the area to avoid the actual threats (Velázquez, 2004).



References:

Ferrer, E. 2002. Lago Guajataca, Puerto Rico. http://puerto_rico9.tripod.com/fishing2.htm
<http://puertorico.20megsfree.com/photo.html>

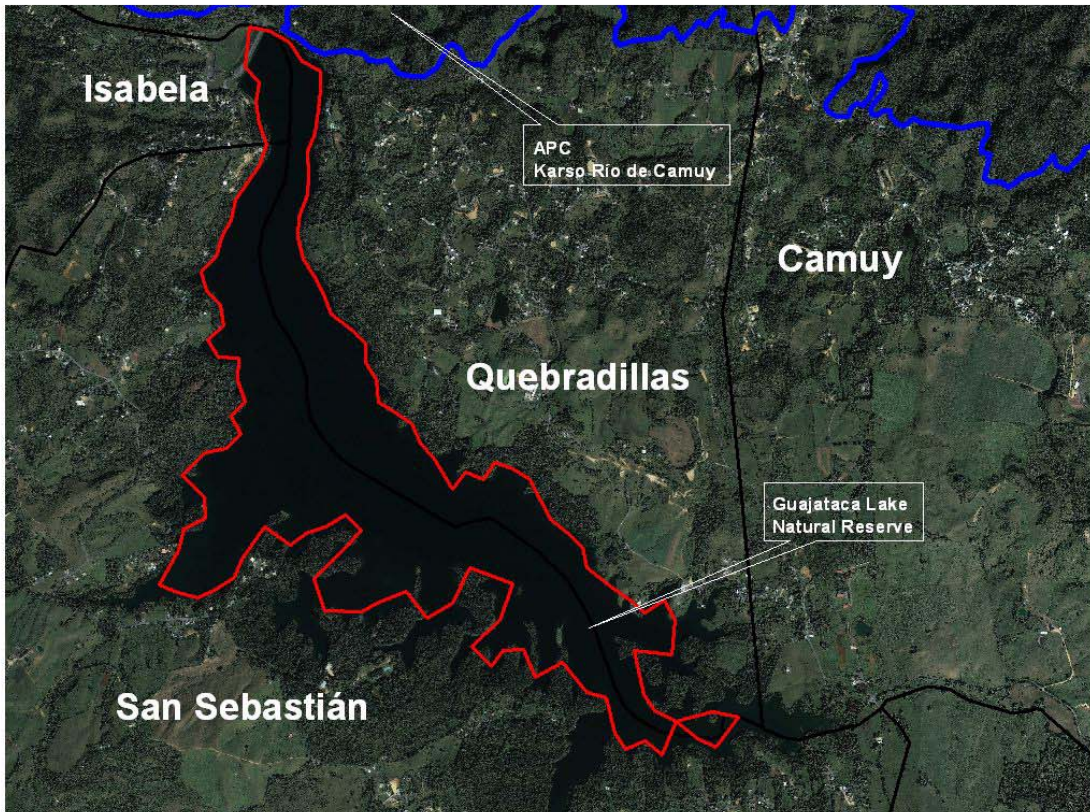
Velázquez, Farel. 2004. Inventario Refugio Vida Silvestre Lago Guajataca. Proyecto para el Fomento y Manejo de la Pesca Recreativa. División Reservas y Refugios. Departamento de Recursos Naturales y Ambientales de Puerto Rico. 18 pp.

Guajataca Lake



-  Bosques_y_reservas.shp
-  Prioridad_conservacion.shp

Guajataca Lake



-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp
-  Municips.shp

75- Barrio Cocos and Bellaca Creek, Quebradillas, Puerto Rico

Area Description:

Barrio Cocos is located in the Municipality of Quebradillas (18°28'25" N, 66°53'15" W), south of road # 2 and west of road # 482. Barrio Cocos is located in the Subtropical wet forest life zone (Ewel and Whitmore 1973), and have an area of 0.3 km wide and 2.4 km long (Ortiz and Quevedo 1987). It is an important area in regards of the presence of the Puerto Rican crested toad *Bufo lemur* (Moreno and Pérez 1980). Fourteen individuals have been collected in Barrio Cocos Camino de Hoyo Brujo (Rivero et al. 1980). The Quebradillas population of the crested toad consists of approximately 25 to 50 individuals. However, no standardized quantitative population estimates have been obtained (USFWS 1992). In the Quebradillas area the *Bufo lemur* have been observed breeding in permanent cattle watering troughs. A disadvantage is the tendency for *Bufo marinus* to congregate there.

Located in the Barrio San José of Quebradillas in the northwest side of Puerto Rico, Bellaca creek is an intermittent stream, which drains into the Atlantic Ocean. The vegetation is a mixture of primary and secondary species with a well-developed woody understory (Santiago Valentín 1995).

Ownership/Protection:

Private lands under different ownerships.

Special Recognition:

Barrio Cocos is recognized as one of the only two separate populations of the endangered Puerto Rican crested toad. This area was first recognized as a CWA in regards the *B. lemur* by Moreno and Pérez (1980). Significant variations in mitochondrial DNA between northern and southern (Guánica) populations suggest that the two populations have been separated for some time (Johnson 1999). Today, because in this area there is a captive bred tadpoles release plan (Puerto Rican Crested Toad Recovery Team 2004), we still recognized Barrio Cocos and Quebrada Bellaca as a prime CWA for the endangered *B. lemur* and the Matabuey *Goetzea elegans*.

Wildlife:

Birds

There's no available birds inventory neither in Barrio Cocos or Quebrada Bellaca. The Bananaquit *Coereba flaveola* was the most frequent bird visitor to the flowers of *Goetzea elegans*; the Antillean Mango hummingbird *Anthracothorax viridis* was observed taking nectar from the flowers; the Stripe headed tanager *Spindalis portoricensis* was observed maneuvering the fruits (Santiago Valentín 1995).

Reptiles

The Puerto Rican Boa *Epicrates inornatus* is common in the area, and the Puerto Rico giant anole *Anolis cuvieri* was observed along the banks of this well forested creek (Cardona and Rivera 1988).

Amphibians

Barrio Cocos and Bellaca creek supports a population of Puerto Rican crested toad *Bufo lemur* (Moreno and Pérez 1980; Cardona and Rivera 1988).

Critical Plants:

There is presence of Matabuey *Goetzea elegans* growing along the bottom, sides and edges of the wooded Bellaca Creek in a more or less linear array of small clusters (Santiago Valentin1995).

Threats:

Agricultural and urban development in this area may have reduced once abundant populations of the Puerto Rican crested toad. Historical breeding sites have been filled or drained for construction, cultivation, and mosquito control (USFWS, 1987). At present, the Barrio Cocos population is threatened by development projects in areas adjacent to and/or including their breeding sites (USFWS, 1992).

The higher areas surrounding the creek have been cleared of trees and converted to pastures for cattle grazing. Within the creek human disturbances in its more inaccessible portions consisted of occasionally cutting a narrow pathway along its floor. In some areas, where the sides of the creek were not as steep, extensive cutting of vegetation has resulted in open clearings and in thickets of vines and shrubs (Santiago Valentin, 1995).

Conservation Recommendations:

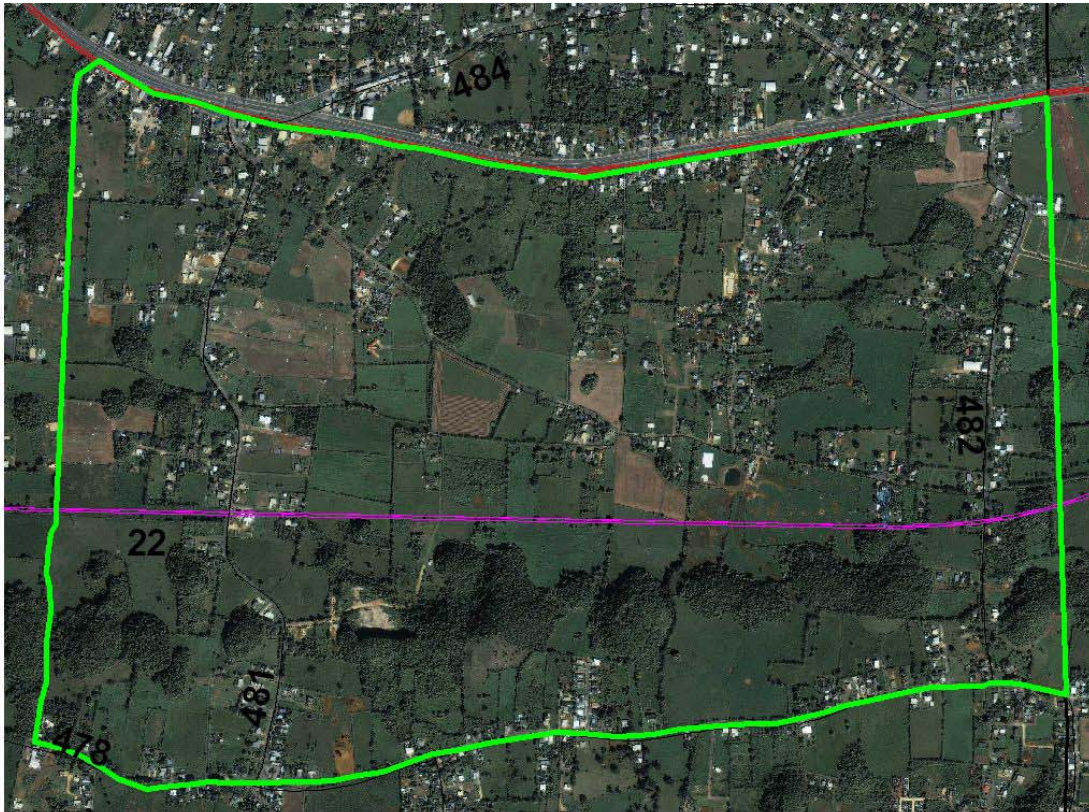
The long-term survival of *B. lemur* depends on protecting existing breeding sites and establishing additional wild populations. Captive breeding provides an additional source of tadpoles and genetically diverse back-up populations (Johnson, 1999). Northern toads have not been seen in Puerto Rico since they were last documented in this area of Quebradillas in 1991 (Johnson, 1999). There are currently northern toads managed by the Puerto Rican Crested Toad Species Survival Plan (SSP) but there are no release sites. The goal of the SSP is to establish self-sustaining populations of the northern race of crested toad once suitable release sites whit ponds are secured (Johnson, 2004). Reintroduction of the *B. lemur* using captive tadpoles should be considered in the Barrio Cocos and the area should be protected. The area may be leased or purchased by the Commonwealth to protect from development.

References:

- Johnson, Bob. 1999. Recovery of the Puerto Rican Crested Toad. Endangered Species Bulletin. Vol 24: 8-9.
- _____. 2004. Letter to the Secretary of the Puerto Rico Department of Natural and Environmental Resources. December 3, 2004.
- Ortiz-Rosas, P. and V. Quevedo-Bonilla. 1987. Áreas con prioridad para la conservación en Puerto Rico. Programa Pro-Patrimonio Natural. Estado Libre Asociado de Puerto Rico, Departamento Recursos Naturales. 217 pp.
- Puerto Rico Crested Toad Conservation Project. 2004. Sapo Concho report 2003-2004. Unpublish data.
- Rivero, J.A., H. Mayorga, E. Estremera and I. Izquierdo. 1980. Sobre el *Bufo Lemur* (Cope) (Amphibia, *Bufo*idae). Carib. J. Sci. 15: 33-40.

- Santiago Valentín, E. 1995. Reproductive and Population Ecology of *Goetzea elegans wydler* (Solanaceae or Goetzeaceae). A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Biology. University of Puerto Rico, Mayagüez Campus. 174 pp.
- U.S. Fish and Wildlife Service. 1987. Endangered and threatened wildlife and plants; determination of threatened status for the Puerto Rican crested toad. Fed. Reg. 52:28828-28831.
- _____. 1992. Recovery Plan for the Puerto Rican crested toad (*Peltophryne lemur*). Atlanta, Georgia. 19 pp.

Barrio Cocos

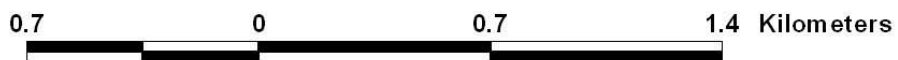
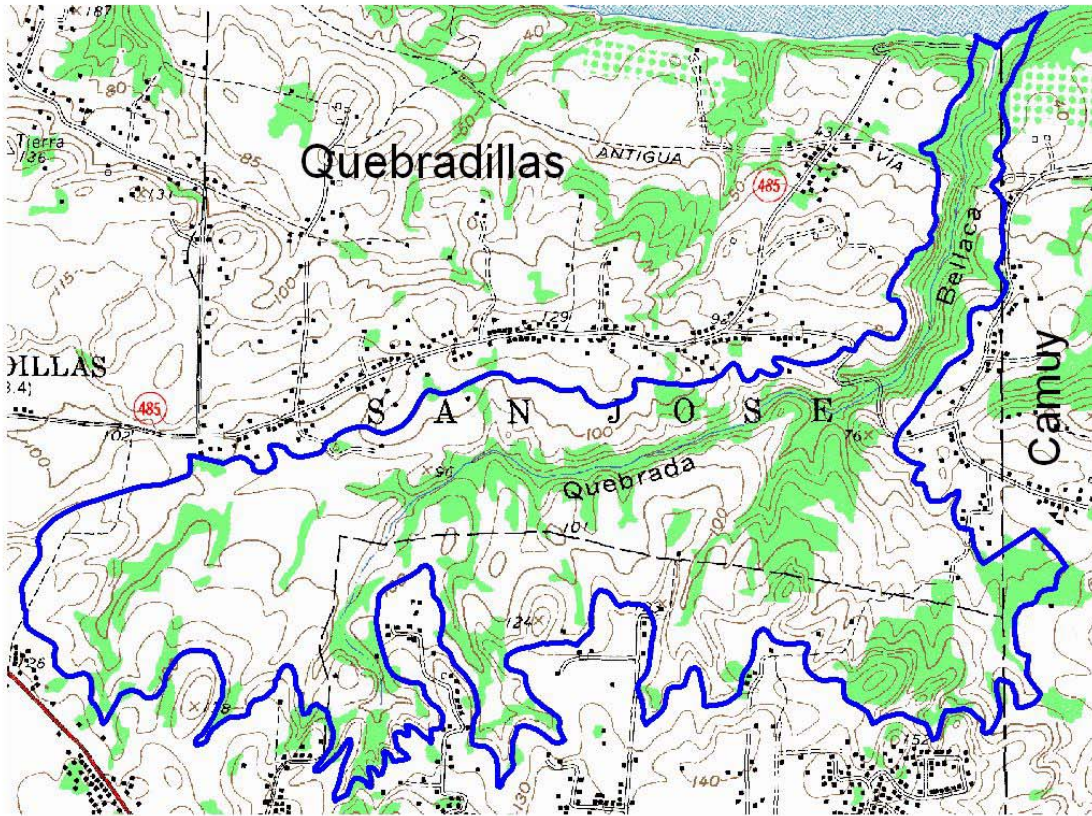



0.6 0 0.6 1.2 Kilometers



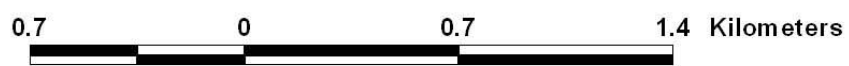
-  Barrio cocos.shp
-  Carreteras avpu.shp
-  autopistas
-  primarias
-  secundarias
-  terciarias
-  caminos
-  propuestas
-  Municips.shp



Quebrada Bellaca



 Prioridad_conservacion.shp

Quebrada Bellaca



-  Areas con prioridad de conservacion.shp
-  Municips.shp

76- Carrizales Mangrove, Hatillo

Area Description:

Located east of the town of Hatillo and south of Punta Maracayo, Carrizales is a small mangrove system that contains coastal lagoons separated of the beach by sand dunes. It comprises approximately 14.77 ha of mangroves (DRNA 1990). The whole area has an extension of 44.02 ha. To the west side of the system, there is a shallow closed mangrove that flow into the sea.

Ownership/Protection:

Private lands under different ownerships.

Special Recognition:

Raffaele and Duffield (1979) and Cardona and Rivera (1988) recognized Carrizales Mangroves a wildlife area of secondary importance, because it formerly supported breeding populations of the endangered West Indian Whistling duck. In 2002, the Natural Heritage Program (DNER) recognized Carrizales Mangroves as a Priority Conservation Area (D. Dávila pers. comm.).

During our field evaluation, no whistling duck were observed, although we observe a rookery of the White and Cattle egret (>100), the threatened Least grebe (13), the endangered Brown Pelican (17), and the rare Puerto Rican slider. Because of this, we recognized Carrizales mangroves as a prime wildlife area.

Wildlife

Birds

Thirty eight bird species had been reported on Carrizales Mangroves: Least grebe *Tachybaptus dominicus*, Pied-billed grebe *Podilymbus podiceps*, Brown booby *Sula leucogaster*, Brown pelican *Pelecanus occidentalis*, Great blue heron *Ardea herodias*, Great egret *A. alba*, Snowy egret *Egretta thula*, Little blue heron *E. caerulea*, Tricolored heron *E. tricolor*, Cattle egret *Bubulcus ibis*, Green heron *Butorides virescens*, Red-tailed hawk *Buteo jamaicensis*, American kestrel *Falco sparverius*, Common moorhen *Gallinula chloropus*, Black-necked stilt *Himantopus mexicanus*, Solitary sandpiper *Tringa solitaria*, Spotted sandpiper *Actitis macularia*, Sanderling *Calidris alba*, Semipalmated sandpiper *C. pusilla*, Ruddy turnstone *Arenaria interpres*, Royal tern *Sterna maxima*, White-winged dove *Zenaida asiatica*, Zenaida dove *Z. aurita*, Common ground dove *Columbina passerina*, Smooth-billed ani *Crotophaga ani*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Northern mockingbird *Mimus polyglottos*, Northern waterthrush *Seiurus noveboracensis*, Bananaquit *Coereba flaveola*, Black-faced grassquit *Tiaris bicolor*, Grasshopper sparrow *Ammodramus savannarum*, Greater Antillean Grackle *Quiscalus niger*, House sparrow *Passer domesticus* (Terrestrial Resources Division Data 2004). West Indian Whistling duck *Dendrocygna arborea*, Lesser golden plover *Pluvialis dominica*, Whimbrel *Numenius phaeopus* (Cardona and Rivera 1988).

Reptiles

Green iguana *Iguana iguana*, Puerto Rican slider *Trachemys stejnegeri* (Terrestrial Resources Division Data 2004).

Amphibians

White-lipped frog *Leptodactylus albilabris* (Terrestrial Resources Division Data 2004).

Threats:

Previous threats reported by Cardona and Rivera (1988) are: storm water sewer pipe of over seven feet in diameter discharging in the western portion of the mangrove; encroachment from urban development around its south east and south central margins; use by off road vehicles destroying vegetation that covers sand dunes separating the area from the ocean to the north. Because surrounding areas are used for cattle grazing, run off water had promote eutrophication in the lagoons. Constructions of recreational facilities by the Hatillo Municipality (housing, pool, camping areas, theme park) are present between both lagoons.

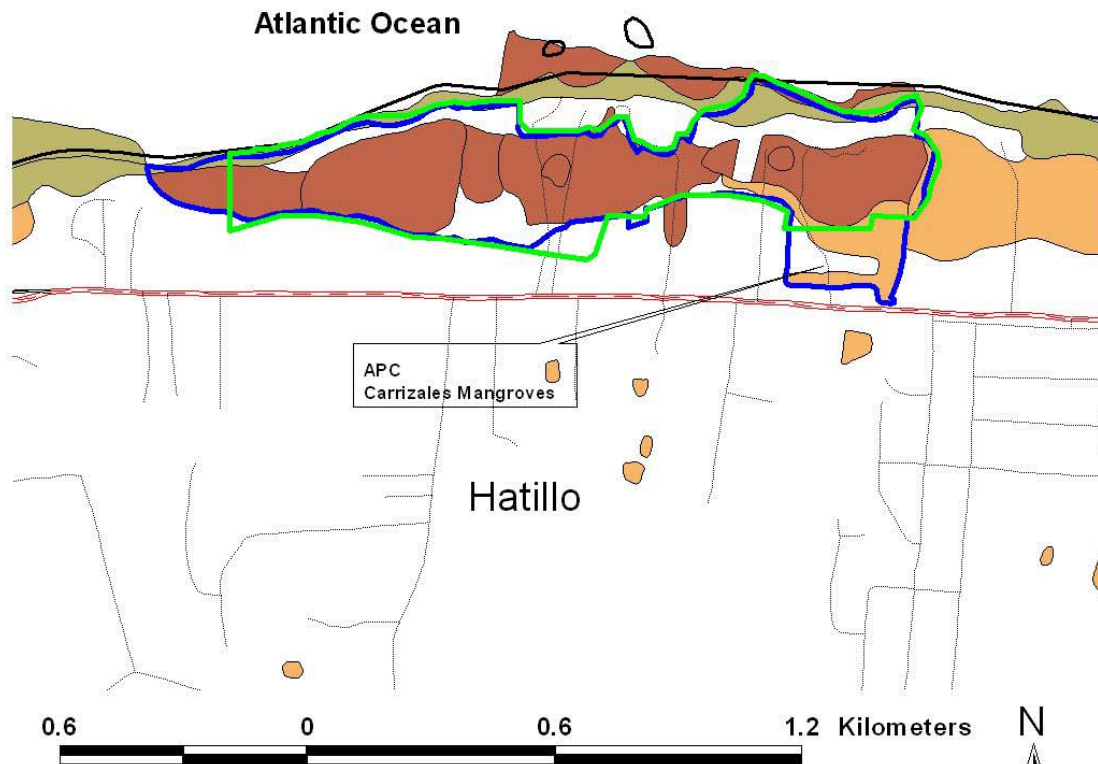
Conservation Recommendations:

The DNER should start some mechanism (i.e., land acquisition, lease) to protect this primary wildlife area.

References:

Departamento de Recursos Naturales y Ambientales. 1990 Inventario de los Manglares de Puerto Rico. Hoja informativa del DRNA. Oficina de Educación y Publicaciones del DRNA, Programa de Manejo de la Zona Costanera de Puerto Rico. 14 pp.

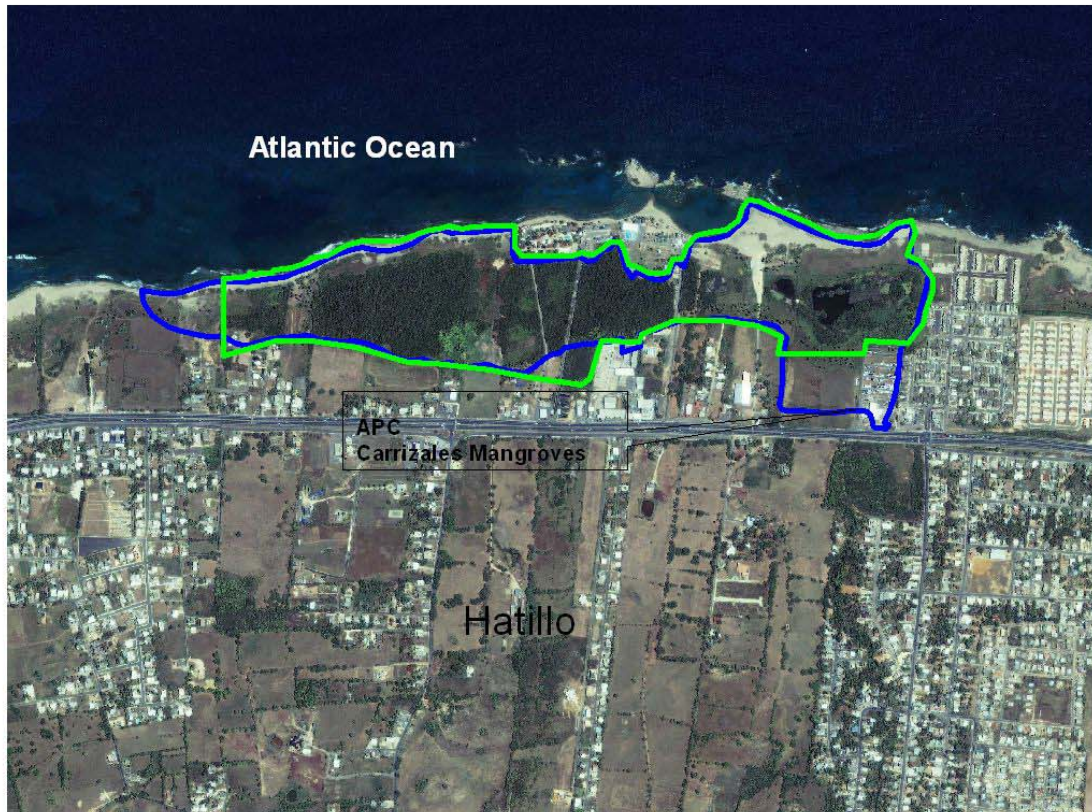
Carrizales Mangroves



- Carrizales mangrove cwa.shp
- Municips.shp
- Areas con prioridad de conservacion.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine



Carrizales Mangroves



-  Carrizales mangrove cwa.shp
-  Areas con prioridad de conservacion.shp

77- Tiburones Swamp and La Tembladera Pond, Arecibo, Puerto Rico

Area Description:

The Caño Tiburones (CT) was once the biggest fresh water wetland in Puerto Rico (60 km²) in the first quarter of the XX century. It is part of the north wetland systems and is considered the most extensive herb swamp of the island. This Natural Reserve consists of estuarine, palustrine and lacustrine wetlands. It is located at 18°28'N, 66°41'W; 60 km west San Juan, in the municipality of Arecibo.

It has an area of 2,266 ha with an altitude at sea level of 0 m. This led to seawater intrusion creating zones of salty and saline waters within the wetland. Saltwater intrusion occurs through several locations along the north coast (J.R. Colón, CT Refuge Manager pers. comm.). Salinity across the wetland varies depending on the location of the intrusion zones, tides, and freshwater precipitation. Fresh water from the karst and salty water from the ocean interact in this transition region, creating a unique habitat for many species.

It is a narrow and long depression about 15 km long by 1.5 km wide. Delimited by the Río Grande de Arecibo, and the Río Grande de Manatí, Caño Tiburones receives fresh water from the karst and salty water from the ocean.

This wetland, the largest in the northern portion of the island, have been drained and modified for agricultural since early last century. An extensive canal and pumping system have been in operation since 1949. Poor yields and soil management difficulties, along with other socioeconomic and political factors have caused the abandonment of cultivation throughout most of the area. The only agricultural activity at present is cattle grazing and hay crops (J.R. Colón, CT Refuge Manager pers. comm.). This area is a superficial coastal lagoon, with large swamps of herbs, and is mainly between fresh and salt water. Some habitats are mangrove forests, herbs swamps, salt flats, dunes and coastal shrub forests.

Ownership/Protection:

Caño Tiburones (2,700 ha) is owned by the Commonwealth of Puerto Rico. The CT Natural Reserve (1,495 ha) is administrated by the DNER and a Management Plan was developed. A conservation easement in the buffer zone of 100 m. has been established in Puerto Rico Land Authority properties around the Reserve (J.R. Colón, CT Refuge Manager pers. comm.).

Special Recognition:

The U.S. Fish and Wildlife Service recognize this wetland as priority under the federal Emergency Wetlands Resources Act of 1986. The DNER has identified the areas as critical for the wildlife and its represent optimal habitat for native, endemic, rare and migratory birds. Also it had been identified as important for waterfowl species. Because the DNER recognize the present and potential possibilities for recreational, educational and ecological development and enhancement of this area, the Commonwealth of Puerto Rico designated the CT as a Natural Reserve in 1998.

Presently, Caño Tiburones is recognized as one of the most important aquifers of the P.R. north coast (J.R. Colón, CT Refuge Manager pers. comm.). In 2004, BirdLife International and SOPI identified Caño Tiburones Reserve as an Important Bird Area. Today, CT continues to be recognized as a prime wildlife area.

Wildlife:

With one hundred and ninety six bird species reported for Caño Tiburones, the area is the swamp with more avian diversity in Puerto Rico: Least grebe *Tachybaptus dominicus*, Pied-billed grebe *Podilymbus podiceps*, White-tailed tropicbird *Phaethon lepturus*, Brown booby *Sula leucogaster*, Brown pelican *Pelecanus occidentalis*, Double-crested cormorant *Phalacrocorax auritus*, Magnificent frigatebird *Fregata magnificens*, Least bittern *Ixobrychus exilis*, Great blue heron *Ardea herodias*, Great egret *A. alba*, Little egret *Egretta garzetta*, Snowy egret *E. thula*, Little blue heron *E. caerulea*, Tricolored heron *E. tricolor*, Cattle egret *Bubulcus ibis*, Green heron *Butorides virescens*, Black-crowned night heron *Nycticorax nycticorax*, Yellow-crowned night heron *Nyctanassa violacea*, Glossy ibis *Plegadis falcinellus*, White ibis *Eudocimus albus*, Snow goose *Chen caerulescens*, Fulvous whistling duck *Dendrocygna bicolor*, West Indian Whistling duck *D. arborea*, Black-bellied whistling-duck *D. autumnalis*, Muscovy duck *Cairina moschata*, American widgeon *Anas americana*, Cinnamon teal *A. cyanoptera*, White-cheeked pintail *A. bahamensis*, Mallard *A. platyrhynchos*, Blue-winged teal *A. discors*, Northern Shoveler *A. clypeata*, Northern pintail *A. acuta*, Green-winged teal *A. crecca*, Canvasback *Aythya valisineria*, Ring-necked duck *A. collaris*, Lesser scaup *A. affinis*, Hooded merganser *Lophodytes cucullatus*, Masked duck *Nomonyx dominicus*, Ruddy duck *Oxyura jamaicensis*, Osprey *Pandion haliaetus*, Red-tailed hawk *Buteo jamaicensis*, Northern harrier *Circus cyaneus*, American kestrel *Falco sparverius* Merlin *F. columbarius* Peregrine falcon *F. peregrinus*, Helmeted guinea fowl *Numida meleagris*, Clapper rail *Rallus longirostris*, Sora rail *Porzana carolina*, Yellow-breasted crake *P. flaviventer*, Purple moorhen *Porphyryla martinica*, Common moorhen *Gallinula chloropus*, American coot *Fulica americana*, Caribbean Coot *F. caribaea*, Black-bellied plover *Pluvialis squatarola* American Golden plover *P. dominica* Semipalmated plover *Charadrius semipalmatus* Wilson's plover *C. wilsonia*, Killdeer *C. vociferus*, American Oystercatcher *Haematopus palliatus* Black-necked stilt *Himantopus mexicanus*, Greater yellowlegs *Tringa melanoleuca*, Lesser yellowlegs *T. flavipes*, Solitary sandpiper *T. solitaria*, Willet *Catoptrophorus semipalmatus*, Spotted sandpiper *Actitis macularia*, Sanderling *Calidris alba*, Semipalmated sandpiper *C. pusilla*, Western sandpiper *C. mauri*, Red knot *C. canutus*, Least sandpiper *C. minutilla* White-rumped sandpiper *C. fuscicollis*, Baird's sandpiper *C. bairdii*, Pectoral sandpiper *C. melanotos*, Curlew sandpiper *C. ferruginea*, Stilt sandpiper *C. himantopus*, Whimbrel *Numenius phaeopus*, Hudsonian godwit *Limosa haemastica*, Ruddy turnstone *Arenaria interpres*, Short-billed dowitcher *Limnodromus griseus*, Long-billed dowitcher *L. scolopaceus*, Ruff *Philomachus pugnax*, Common snipe *Gallinago gallinago*, Laughing gull *Larus atricilla*, Black-headed gull *L. ridibundus*, Ring-billed gull *L. delawarensis*, Herring gull *L. argentatus*, Lesser black-backed gull *L. fuscus*, Great black-backed gull *L. marinus*, Sandwich tern *Sterna sandvicensis*, Royal tern *S. maxima*, Roseate tern *S. dougallii*, Common tern *S. hirundo*, Forster's tern *S. forsteri*, Least tern *S. antillarum*, Bridled tern *S. anaethetus*, Gull-billed tern *S. nilotica*, Caspian tern *S. caspia*, Black tern *Chlidonias niger*, Brown noddy *Anous stolidus*, Black skimmer *Rynchops niger*, Scaly-naped pigeon *Patagioenas squamosa*, Rock pigeon *Columba livia*, White-crowned pigeon *Patagioenas leucocephala*, Ringed turtle-dove *Streptopelia risoria*, White-winged dove *Zenaida asiatica*, Mourning dove *Z. macroura*, Zenaida dove *Z. aurita*, Common ground dove *Columbina passerina*, Key west quail-dove *Geotrygon chrysia*, Ruddy quail-dove *G. montana*, Cherry-headed conure *Aratinga erythrogenys*, White-winged parakeet *Brotogeris versicolurus*, Monk parakeet *Myiopsitta monachus*, Yellow-billed cuckoo *Coccyzus americanus*, Mangrove cuckoo *C. minor*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Smooth-billed ani *Crotophaga ani*, Puerto Rican Screech owl *Megascops nudipes*, Short-eared owl *Asio flammeus*, Chuck-will's-widow *Caprimulgus carolinensis*, Antillean Nighthawk *Chordeiles gundlachii*,

Black swift *Cypseloides niger*, Antillean Mango *Anthracothorax dominicus*, Green mango *A. viridis*, Purple-throated carib *Eulampis holosericeus*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Puerto Rican Tody *Todus mexicanus*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Lesser Antillean Pewee *Contopus portoricensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Caribbean Martin *Progne dominicensis*, Tree swallow *Tachycineta bicolor*, Bank swallow *Riparia riparia*, Cave swallow *Petrochelidon fulva*, Barn swallow *Hirundo rustica*, Red-legged thrush *Turdus plumbeus*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, White-eyed vireo *Vireo griseus*, Puerto Rican Vireo *V. latimeri*, Yellow-throated vireo *V. flavifrons*, Red-eyed vireo *V. olivaceus*, Black-whiskered vireo *V. altiloquus*, Brewster warbler *Vermivora pinus*, Northern parula *Parula americana*, Yellow warbler *Dendroica petechia*, Prairie warbler *D. discolor*, Palm warbler *D. palmarum*, Blackpoll warbler *D. striata*, Magnolia warbler *D. magnolia*, Cape may warbler *D. tigrina*, Black-throated blue warbler *D. caerulescens*, Adelaide's warbler *D. adelaidae*, Yellow-rumped warbler *D. coronata*, Black-throated green warbler *D. virens*, Yellow-throated warbler *D. dominica*, Black and white warbler *Mniotilta varia*, American Redstart *Setophaga ruticilla*, Prothonotary warbler *Protonotaria citrea*, Ovenbird *Seiurus aurocapilla*, Northern waterthrush *S. noveboracensis*, Louisiana Waterthrush *S. motacilla*, Kentucky Warbler *Oporornis formosus*, Common yellowthroat *Geothlypis trichas*, Hooded warbler *Wilsonia citrine*, Canada warbler *Wilsonia canadiensis*, Bananaquit *Coereba flaveola*, Antillean Euphonia *Euphonia musica*, Stripe-headed tanager *Spindalis portoricensis*, Black-faced grassquit *Tiaris bicolor*, Yellow-faced grassquit *T. olivacea*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Grasshopper sparrow *Ammodramus savannarum*, Blue grosbeak *Passerina caerulea*, Indigo bunting *P. cyanea*, Dickcissel *Spiza americana*, Bobolink *Dolichonyx oryzivorus*, Yellow-shouldered blackbird *Agelaius xanthomus*, Greater Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, Black-cowled oriole *Icterus dominicensis*, Troupial *I. icterus*, Baltimore Oriole *I. galbula*, House sparrow *Passer domesticus*, Orange bishop *Euplectes franciscanus*, Orange-cheeked waxbill *Estrilda melpoda*, Red avadavat *Amandava amandava*, Zebra finch *Poephila guttata*, Warbling silverbill *Lonchura malabarica*, Bronze mannikin *L. cucullata*, Nutmeg mannikin *L. punctulata*, Chestnut mannikin *L. malacca*, Pin-tailed whydah *Vidua macroura* (Colón López 2003).

Threats:

This natural wetland have been exposed to contamination by aqueous effluents produced from industrial activities, waste disposal sites, local or municipal sewage, and agricultural activities where pesticides and herbicides are commonly used. The location of the Arecibo Regional Landfill and other illegal dump outs nearby the Caño constitute the additional sources of pollution.

Parts of the area are moderately populated, and others areas are utilized for agriculture. It was formerly a productive wetland, and pumping is still required to maintain it for its present purposes. Poor yields and soil management difficulties, along with other socioeconomic and political factors have caused the abandonment of cultivation throughout most of the area (Cardona, 1991).

Conservation Recommendations:

Avian and aquatic wildlife and the conservation of the aquifer are the priorities objectives for Caño Tiburones (J.R. Colón, CT Refuge Manager pers. comm.). A plan for management of habitat enhancement of 122 ha is described in Cardona 1991. The plan uses salts

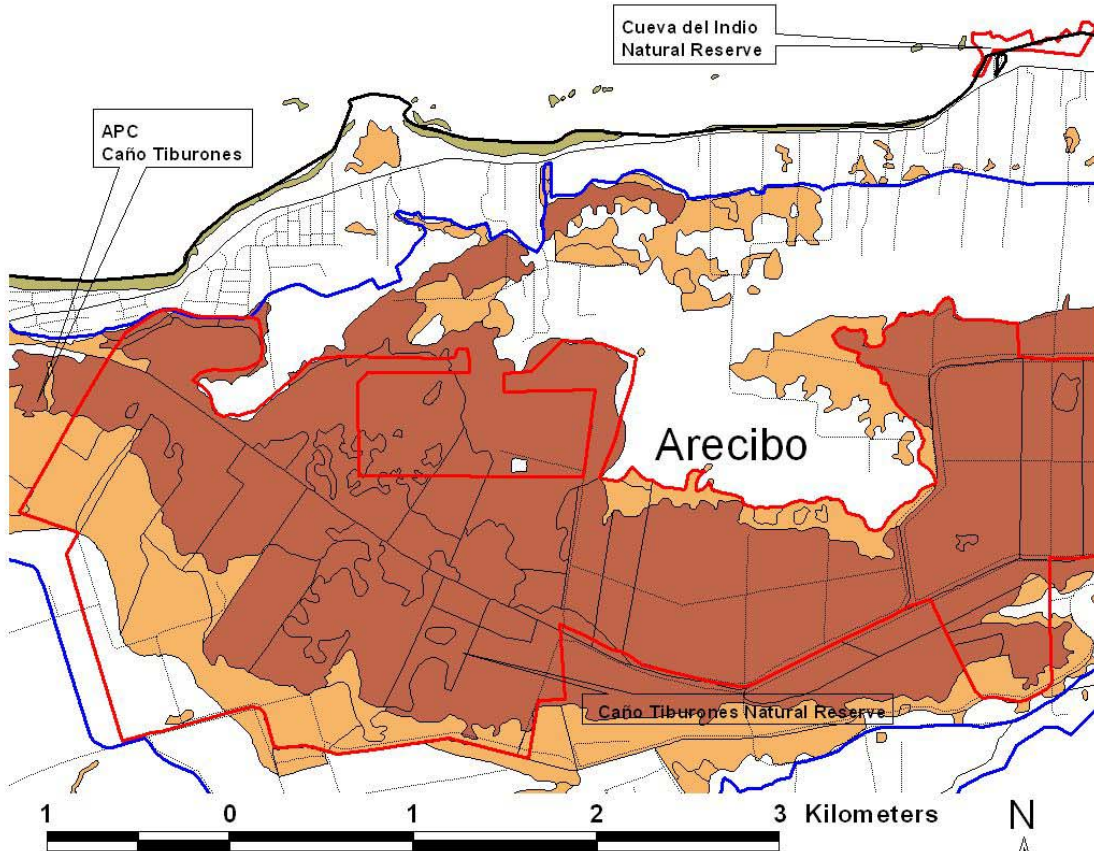
springs to manage salinity levels within the area to reduce the density, or eliminate altogether, existing dense cattail stands.















There is a need to manage this valuable wildlife reserve. A management plan is a most to detain habitat deterioration. Typha and mangrove forest became a dominant plant in the marsh, replacing other vegetation and open areas, and would probably continue to expand vegetative if stable water levels persist. In the absence of active management the march will deteriorate. Careful regulation of the water level should be implanted. The DNER is presently implanting a operational regulation water level plan, designed to magnified the conservation of fresh water into the aquifer and regulate the distribution of plants and other wildlife (J.R. Colón, CT Refuge Manager pers. comm.).

References:

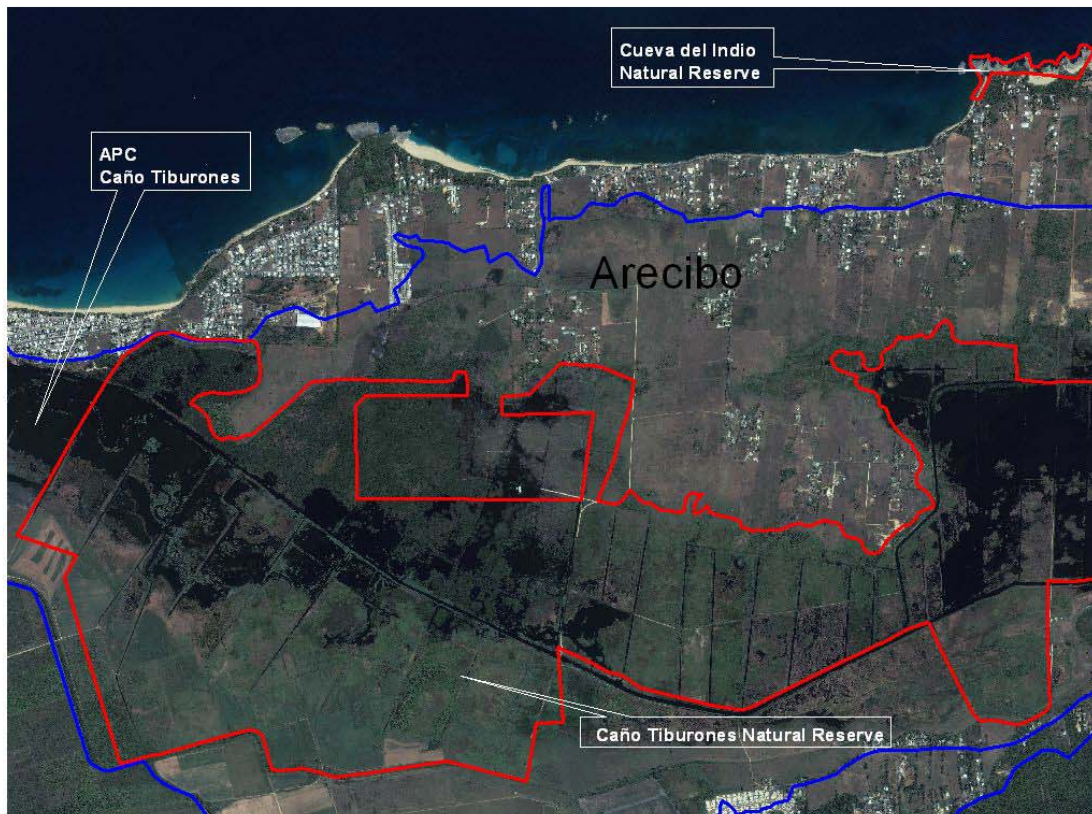
- Cardona, J. E. 1991. Viabilidad de Restauración del Caño Tiburones en Arecibo-Barceloneta, Puerto Rico. Estado Libre Asociado de Puerto Rico, Departamento Recursos Naturales. Programa de Manejo de la Zona Costanera, Área de Investigaciones Científicas. 24 pp.
- Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.
- Colón López, S. A. 2003. Lista de Aves del Caño Tiburones, sus alrededores y del Bosque de Cambalache. Unpublished data.
- Departamento de Recursos Naturales. 1990. Documento de Designación Reserva Natural Caño Tiburones. Borrador. División Recursos Terrestres, Área de Planificación de Recursos. 57 pp.
- Departamento de Recursos Naturales y Ambientales. 1996. Plan estratégico de los recursos naturales de pesca y vida silvestre. Borrador. Gobierno de Puerto Rico, DRNA, Administración de Recursos Naturales, Negociado de Pesquería y Vida Silvestre.
- Salles, R., M del Llano, J. Rodríguez, J. Toro, G. Morris, E. Agosto, and B. Cintrón. 1983. Suplemento Técnico para el plan de manejo de la Reserva Natural de Caño Tiburones. Departamento de Recursos Naturales. División de Asesoramiento Técnico, Área de Investigaciones Científicas. 70 pp.
- Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge.

Caño Tiburones (West)



-  Municipios.shp
-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp
- Carreteras avpu.shp
 -  autopistas
 -  primarias
 -  secundarias
 -  terciarias
 -  caminos
 -  propuestas
- Humedales avpu.shp
 -  Estuarine
 -  Lacustrine
 -  Marine
 -  Palustrine
 -  Riverine

Caño Tiburones (West)

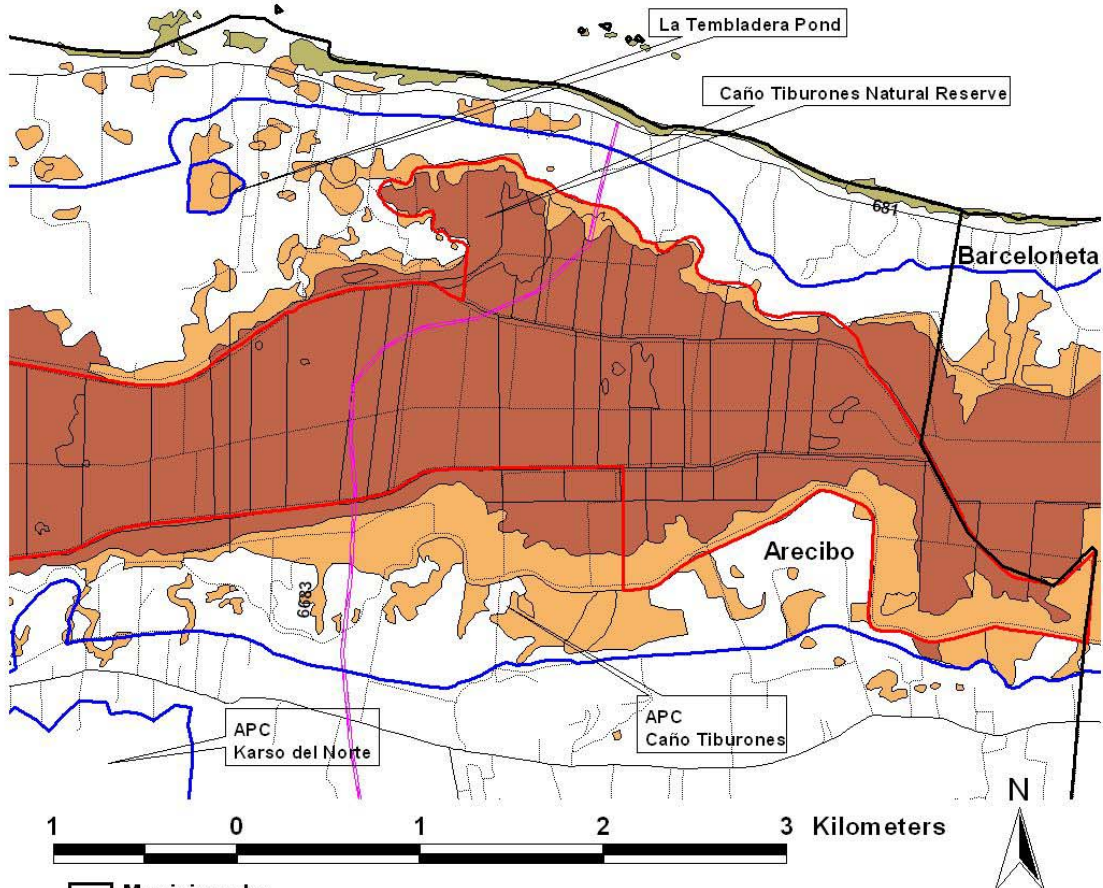


1 0 1 2 3 Kilometers



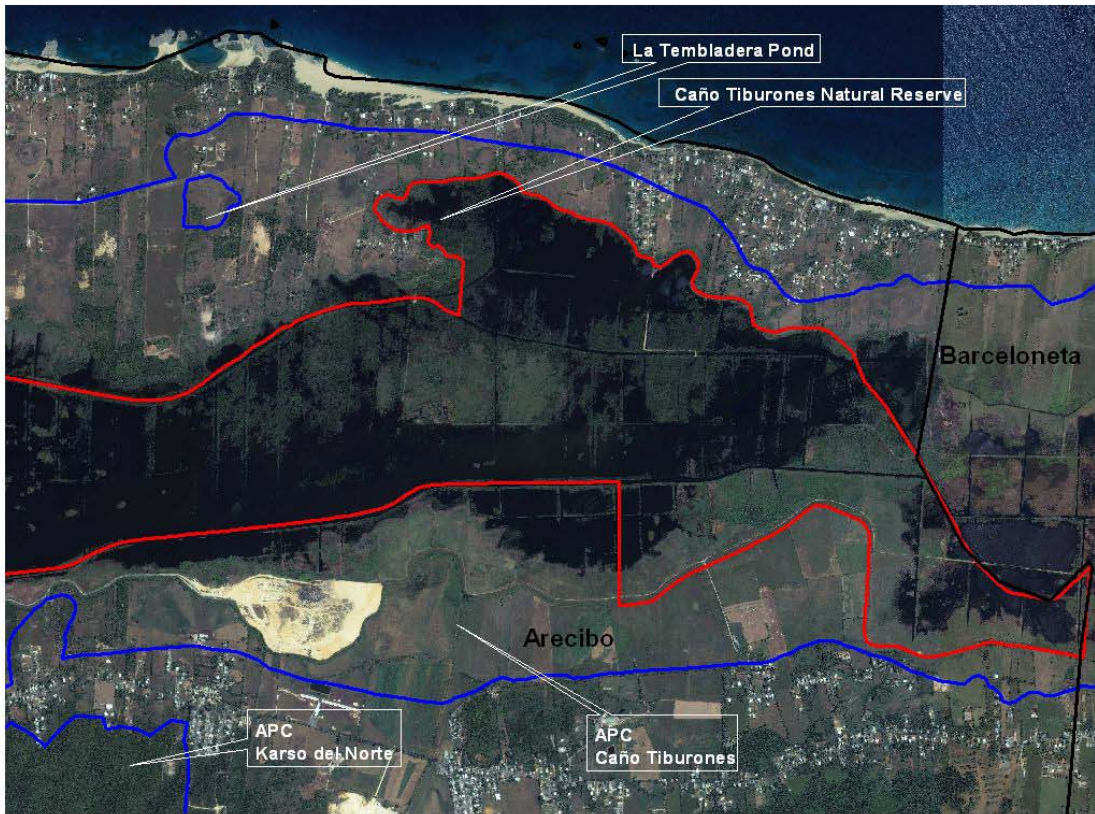
-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

Caño Tiburones (East) and La Tembladera Pond



- Municips.shp
- Bosques_y_reservas.shp
- Areas con prioridad de conservacion.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

Caño Tiburones (East) and La Tembladera Pond



-  Municips.shp
-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

78- Cambalache State Forest, Arecibo-Barceloneta, Puerto Rico

Area Description:

The Cambalache Forest consists of mogotes hills on the north coast limestone of Puerto Rico and covers 413 ha of land. It is located in the subtropical humid forest life zone, between the municipalities of Arecibo and Barceloneta. It is divided in six main segments with an altitude from 5 to 50 m at sea level.

The vegetation on the forest is xerophytes, with about 149 plant species reported, from which 15 are endemics and 10 are classified as endangered.

In addition of its natural values, this forest has some recreational areas such as camping, mountain bikes trails, walking trails, and a plant nursery grounds.

Ownership/Protection:

The Cambalache State Forest is administrated and managed by the Forest Service of the DNER.

Special Recognition:

It was declared a Forest in 1952 (Silander et al 1986). In 1979 it was recognized as a CWA because of the presence of a small tree frog (*Eleutherodactylus ramosi* Rivero) known only from Cambalache Forest and nowhere else in the world (Raffaele and Duffield, 1979). This species was then recognized as a synonymous of *E. cochranæ* (Joglar, 1986).

The Cambalache State Forest is known to support a population of the Desmarest's Fig-eating bat. The International Union for Conservation of Nature and Natural Resources (IUCN) and the DNER classifies the red fig-eating bat as "vulnerable" (category "VU a1c") to extinction (Gannon et al., 2001). This designation indicates that, although not critically endangered at present, the species may be facing a high risk of extinction in the medium-term future. The red fig-eating bat has the smallest geographic distribution of any species of bat that occurs on Puerto Rico and one of the smallest in the Antilles. The IUCN declared the species vulnerable because of a suspected decrease in the already small geographic distribution of this island endemic and because of the devastating effects of hurricanes Hugo and Georges (Gannon et al., 2003). Cambalache State Forest is classified as a prime wildlife area.

Wildlife:

Birds

Forty-four bird species have been reported in the Forest: American kestrel *Falco sparverius*, Red-tailed hawk *Buteo jamaicensis*, Zenaida dove *Zenaida aurita*, Common ground dove *Columbina passerina*, Ruddy quail-dove *Geotrygon montana*, Mangrove cuckoo *Coccyzus minor*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Puerto Rican Screech owl *Megascops nudipes*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Green mango *Anthracothorax viridis*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Puerto Rican Flycatcher *Myiarchus antillarum*, Puerto Rican lesser Antillean Pewee *Contopus portoricensis*, Cave swallow *Petrochelidon fulva*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Barn swallow *Hirundo rustica*, Black-faced grassquit *Tiaris bicolor*, Shiny cowbird *Molothrus bonariensis*, Puerto Rican Vireo *Vireo latimeri*, Black-whiskered vireo *V. altiloquus*, Bananaquit *Coereba flaveola*, Black and white warbler *Mniotilta varia*, Northern parula *Parula americana*, Cape may warbler *Dendroica tigrina*, Black-throated blue warbler *D. caerulescens*, Adelaide's warbler *D. adelaidae*, Blackpoll warbler *D. striata*,

Prairie warbler *D. discolor*, Ovenbird *Seiurus aurocapilla*, American Redstart *Setophaga ruticilla*, Northern waterthrush *Seiurus noveboracensis*, Bronze mannikin *Lonchura cucullata*, Orange cheeked waxbill *Estrilda melpada*, Greater Antillean Oriole *Icterus dominicensis*, Greater Antillean Grackle *Quiscalus niger*, Puerto Rican Spindalis *Spindalis portoricensis*, Yellow-faced grassquit *Tiaris olivacea*, Red-legged thrush *Turdus plumbeus* (Silander et al 1986). Canada warbler *Wilsonia canadensis*, Puerto Rican Bullfinch *Loxigilla portoricensis* (Kapan, 2003, Canabal pers comm.).

Reptiles

Crested anole *Anolis cristatellus*, Common grass anole *A. pulchellus*, Barred anole *A. stratulus*, Puerto Rican ground lizard *Ameiva exsul*, Common dwarf gecko *Sphaerodactylus macrolepis*, Puerto Rican worm lizard *Amphisbaena caeca*, Puerto Rican boa *Epicrates inornatus*, Puerto Rican galliwasp *Diploglossus pleei* (Silander et al 1986).

Amphibians

Common coqui *Eleutherodactylus coqui*, Whistling frog *E. cochranae*, Giant toad *Bufo marinus* (Silander et al 1986).

Mammals

Desmarest's fig-eating bat *Stenoderma rufum* (DRNA 1999), Brown flower bat *Erophylla sezekorni*, Big brown bat *Eptesicus fuscus*, Sooty mustached bat *Pteronotus quadridens*, Antillean fruit-eating bat *Brachyphylla cavernarum*, Jamaican fruit-eating bat *Artibeus jamaicensis* (Gannon 1994).

Critical Plants:

Ten species are reported endangered. Some of them are: Matabuey *Goetzea elegans*, Palo de Ramón *Banara vanderbiltii*, Palo de Rosa *Ottoschulzia rhodoxylon*.

Threats:

The majority of the soils in this area are derived from limestone. This type of soil is highly used for construction materials. Modifications of the mogotes are also threats affecting this forest. Other human activities that negatively affect this forest are: agricultural, cattle, urban and industrial development, roads and contaminations produced by surrounding industrial.

Conservation Recommendations:

Same as Guajataca State Forest.

References:

Department of Natural Resources. 1976. The Master Plan for the Commonwealth Forests of Puerto Rico. Prepared for the Bureau of Outdoor Recreation by Area of Planning and Evaluation of Resources Division of Forest Planning.

DRNA. 1999. Bosque Estatal de Cambalache. Hoja Informativa. Servicio Forestal Orienta. Negociado del Servicio Forestal.

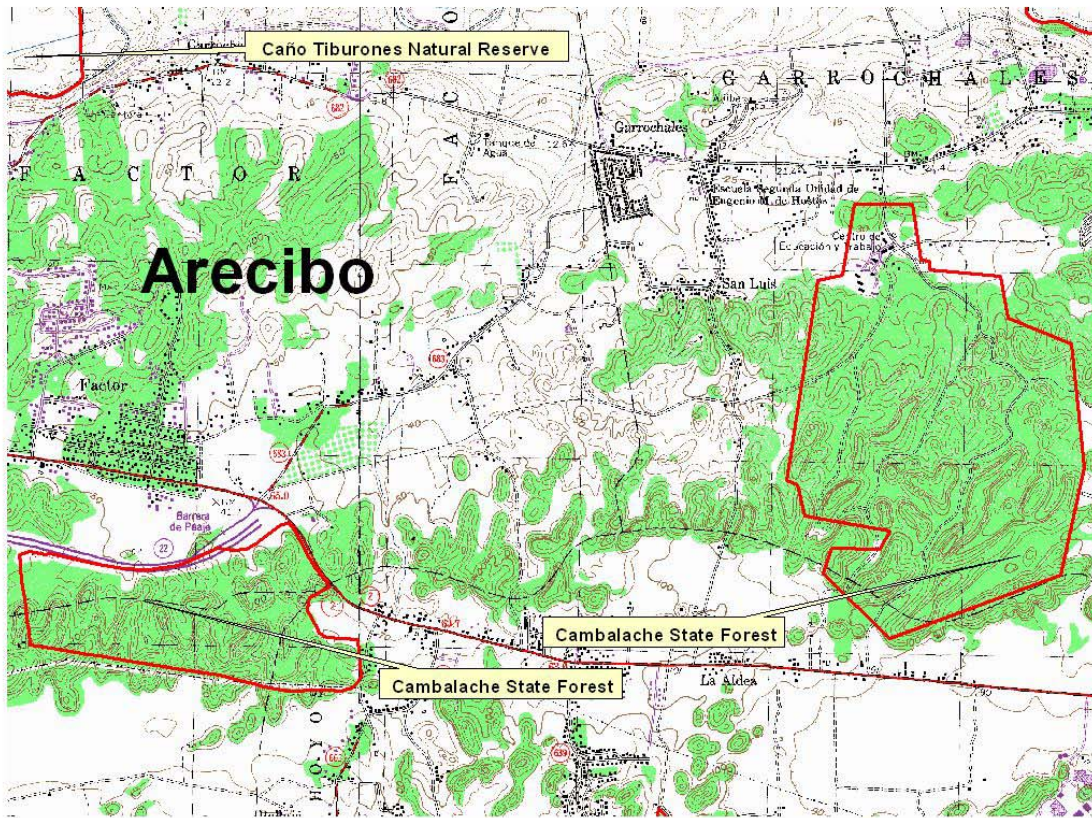
Gannon, M.R. 1994. Letter to Jorge Canabal, Oficial de Manejo, Bosque Estatal de Cambalache. Copy of the report of the bat survey. 14 April 1994.




Gannon, M.R., M. Rodriguez-Duran, A. Kurta, and M.R. Willig. 2003. The Bats of Puerto Rico: An Island Focus and Caribbean Perspective. *In:*
<http://www.biol.ttu.edu/faculty/FacPages/willig/MRWilligpage/Research/Puerto%20Rico/Stenodermarufum.html>

Joglar, R.L. 1986. Sinonimia de *Eleutherodactylus ramosi* Rivero. *Carib. J. Sci.* 22: 123.

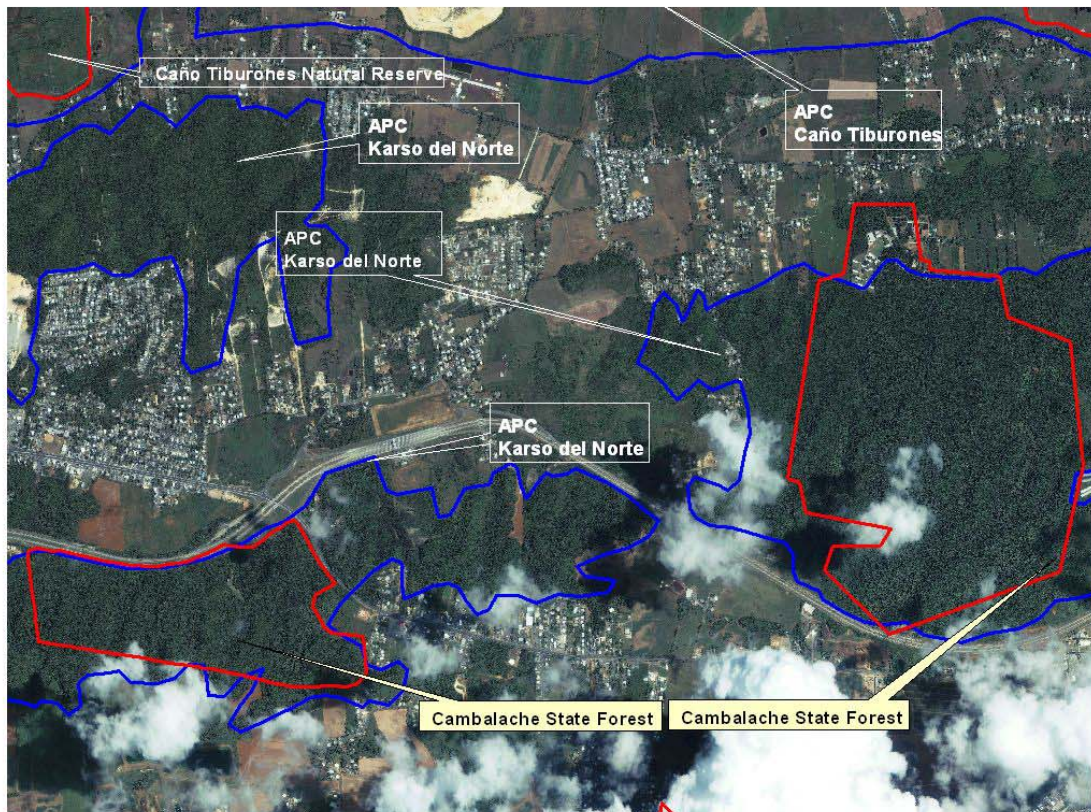
Kapan, D.D. 2003. Avistamientos en Culebra y Cambalache. *In:* El Bien-te-veo. Sociedad Ornitológica Puertorriqueña Vol. VI, Núm. I: 4-5.

Cambalache State Forest (North Segment)



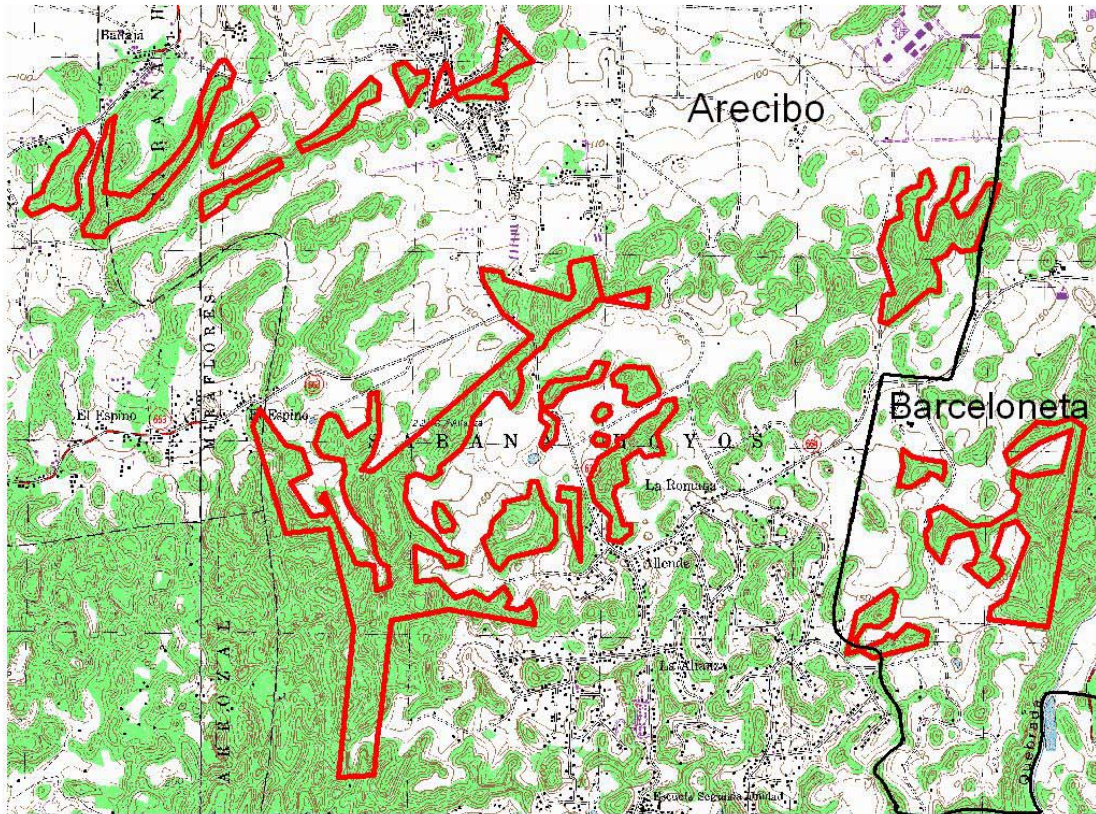
-  Prioridad_conservacion.shp
-  Municipios.shp
-  Bosques_y_reservas.shp


Cambalache State Forest (North Segment)



-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

Cambalache State Forest (South Segment)



-  Municipios.shp
-  Bosques_y_reservas.shp

79- Rio Abajo State Forest, Arecibo-Utuado, Puerto Rico

Area Description:

The Río Abajo State Forest (RASf), with 2284 ha, is located between Dos Bocas Lake and the Tanamá River in the municipalities of Utuado and Arecibo. This moist limestone forest has very irregular topography, subterranean drainage, caves, natural depressions or sinkholes and haystack hills all characteristic of karst geological development. Elevation within the forest ranges between 200m and 424 m.

Life zones consist of two vegetation associations derived from limestone soils: limestone hillside and mogotes top, sinkholes and narrow valleys between the hills (DRN 1976).

Special Recognition:

The area was established as a Forest in 1935 (Silander et al., 1986). In 2004, BirdLife International and SOPI recognized RASf as an Important Bird Area. The karst region of Puerto Rico, and specifically the RASf, has been identified for the reintroduction of the Puerto Rican Parrot outside the Caribbean National Forest (USFWS 1999). Releases of Puerto Rican Parrots in the RASf have been scheduled for February/March, or May/June 2006 (DNER 2004). For the first time, RASf is recognized as a primary CWA.

Wildlife

Birds

Thirty-three bird species have been reported in the RASf: Red-tailed hawk *Buteo jamaicensis*, Puerto Rican Broad-winged hawk *B. platypterus*, Scaly-naped pigeon *Patagioenas squamosa*, Zenaida dove *Zenaida aurita*, Common ground dove *Columbina passerina*, Ruddy quail-dove *Geotrygon montana*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Puerto Rican Screech owl *Megascops nudipes*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Antillean Mango *Anthracothonax viridis*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Puerto Rican Flycatcher *Myiarchus antillarum*, Puerto Rican lesser Antillean Pewee *Contopus portoricensis*, Cave swallow *Petrochelidon fulva*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Red-legged thrush *Turdus plumbeus*, Puerto Rican Vireo *latimeri*, Black-whiskered vireo *V. altiloquus*, Bananaquit *Coereba flaveola*, Greater Antillean Oriole *Icterus dominicensis*, Shiny cowbird *Molothrus bonariensis*, Puerto Rican Spindalis *Spindalis portoricensis*, Antillean Euphonia *Euphonia musica*, Bronze mannikin *Lonchura cucullata*, Black-faced grassquit *Tiaris bicolor*, Yellow-faced grassquit *T. olivacea*, Greater Antillean Grackle *Quiscalus niger*, White-crowned pigeon *Patagioenas leucocephala* (Silander et al 1986).

Reptiles

Crested anole *Anolis cristatellus*, Puerto Rican giant anole *A. cuvieri*, Emerald anole *A. evermanni*, Yellow bearded anole *A. gundlachi*, Upland grass anole *A. krugii*, Common grass anole *A. pulchellus*, Barred anole *A. stratulus*, Green iguana *Iguana iguana*, Puerto Rican ground lizard *Ameiva exsul*, Klauber's dwarf gecko *Sphaerodactylus klauberi*, Brook's house gecko *Hemidactylus brookii*, *Amphisbaena* sp., *Typhlops* sp., Puerto Rican boa *Epicrates inornatus*, Puerto Rican Racer *Alsophis portoricensis* (Silander et al 1986).

Amphibians

Antillean coqui *Eleutherodactylus antillensis*, Common coqui *E. coqui*, White-lipped frog *Leptodactylus albilabris*, Giant toad *Bufo marinus* (in lower elevations) (Silander et al 1986).

Mammals

Bat *Pteronotus quadridens* (Díaz 1983).

Plants

Considering the importance of the Río Abajo State Forest for the reintroduction of the Puerto Rican parrot *Amazona vittata*, the DNR made a study of the presence of trees that can support cavities for the Puerto Rican Parrot to nest. The tree inventory included nineteen species: *Andira inermis*, *Artocarpus altilis*, *Cecropia peltata*, *Clusia rosea*, *Coccoloba pubescens*, *Cupania americana*, *Dendropanax arboreus*, *Erythrina poeppigiana*, *Guarea guidonea*, *Hyeronima chusoides*, *Inga vera*, *Nectandra sintenisii*, *Persea americana*, *Petitia domingensis*, *Sapium laurocerasus*, *Spathodea campanulata*, *Swietenia macrophylla*, *Tamarindus indica* and *Tectona grandis* (Cardona et al 1985).

Threats:

Establishment of exotic bird species in the forest and illegal hunting.

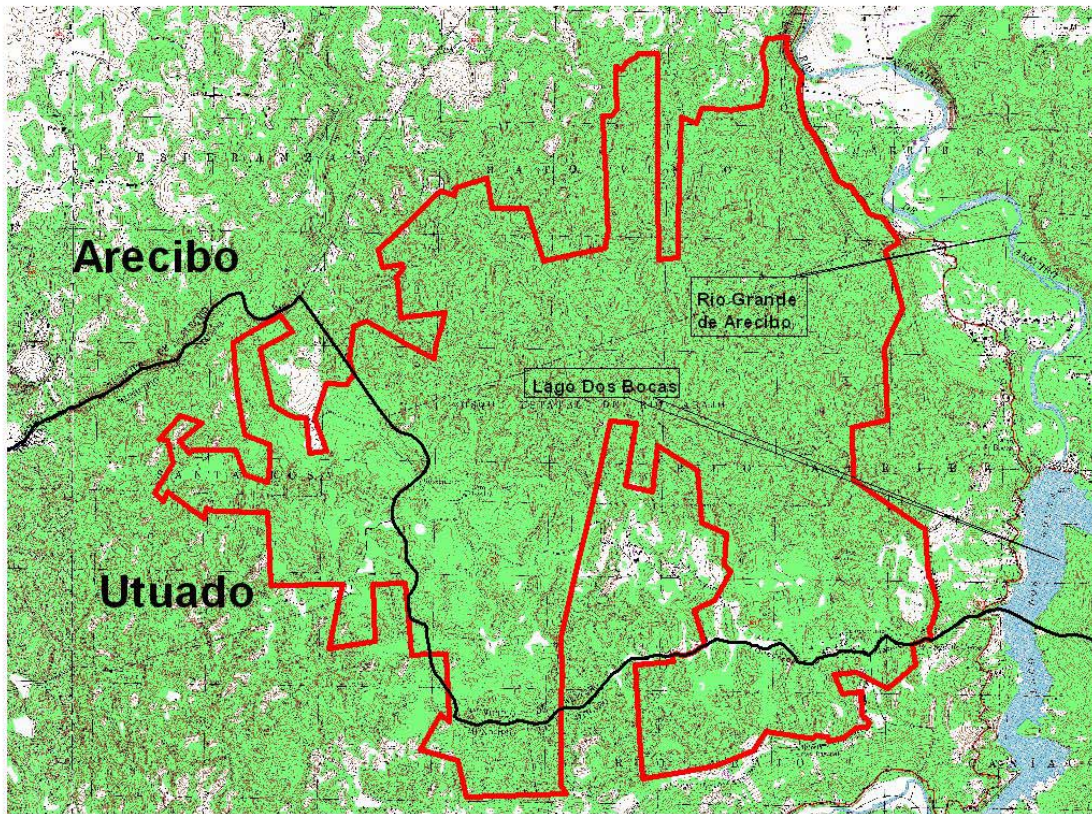
Conservation Recommendations:

Development of a comprehensive forest management plan for the RASF is currently underway. This plan will incorporate specific management practices (e.g., tree plantings, harvest restrictions), which will benefit the reestablishment of a second Puerto Rican Parrot population, and implement monitoring protocols for the selected fauna and flora. The DNER is also studying alternative mechanism to protect, or encourage private owners to protect lands surrounding the reserve (DNER 2004).

References:

- Cardona, J. E.; Rivera, M.; Laboy, C.; and M. Vázquez. 1985. La posible reintroducción de la Cotorra Puertorriqueña *Amazona vittata* al Bosque de Río Abajo: Una evaluación de la disponibilidad de cavidades para su anidamiento. Duodécimo Simposio de Recursos Naturales. Departamento de Recursos Naturales. San Juan, Puerto Rico. Pp. 308-335.
- Department of Natural Resources. 1976. The Master Plan for the Commonwealth Forests of Puerto Rico. Prepared for the Bureau of Outdoor Recreation by Area of Planning and Evaluation of Resources Division of Forest Planning.
- Department of Natural and Environmental Resources. 2004. Reintroduction of the Puerto Rican Parrot in the karst region. Draft Proposal. DNER, Division of Terrestrial Resources. M.A. García, Project Leader. 13 pp.
- Díaz-Díaz, C. A. 1983. Los Mamíferos de Puerto Rico. En Compendio Enciclopédico de los Recursos Naturales. Vol. I. Departamento de Recursos Naturales. Estado Libre Asociado de Puerto Rico. Área de Investigaciones Científicas. San Juan, Puerto Rico. 220 pp.

Rio Abajo State Forest



-  Municipios.shp
-  Bosques_y_reservas.shp

80- Hacienda La Esperanza Natural Reserve, Manatí, Puerto Rico

Area Description:

The Hacienda la Esperanza Natural Reserve (HENR) is located in the north coast of Puerto Rico at 18°27'N, 66°30'W, in Barrio Tierras Nuevas, municipality of Manatí. It is approximately 6.3 km northwest Manatí and 56.3 km west of San Juan. The HENR lies in the north by the Atlantic Ocean, and west is the Río Grande de Manatí. Average of annual precipitation is 1448.2 mm. Average annual temperature is 28.8°C. It covers about 895 ha and is part of the Río Grande de Manatí estuarine system.

In the south of the property there is a wetland between two karst hills that is an important bird habitat; there is a forest, mangroves, cemented dunes and sandy beaches. The historical importance of La Esperanza in Manatí was that it used to be the most rich and advanced sugar hacienda in the last years of the nineteenth-century. There is also evidence that the place was the only indigenous ceremonial center in the coastal zone in the Caribbean because of archeological deposits findings (DRN 1986).

Ownership/Protection:

In 1974 Hacienda La Esperanza was acquired by the Puerto Rico Conservation Trust (PRCT). The majority of the land is owned by the Commonwealth of Puerto Rico (DRNA 2004).

Special Recognition:

It was recognized in 1976 by the National Park Service as a National Monument and added to the National Register of Historic Places. In 1987 was declared a Natural Reserve by the Puerto Rico Planning Board (DRNA 2004). An indigenous ceremonial center was found in the landed property, and because its location and size, is recognized as unique of its kind in all the Caribbean Region (DRNA 2004). For the first time, we recognize HENR a prime wildlife area.

Wildlife:

Currently, the PRCT is performing a wildlife inventory, in order to determine the species diversity using this ecosystem. This data will be available in December 2005 (F. Silva personal comm.).

Birds

One hundred and three bird species have been reported in HENR: Ruddy duck *Oxyura jamaicensis*, Blue-winged teal *Anas discors*, American wigeon *A. americana*, White-checked pintail *A. bahamensis*, Green-winged teal *A. crecca*, Lesser scaup *Aythya affinis*, West Indian Whistling duck *Dendrocygna arborea* (Terrestrial Resources Data, 2004). Brown pelican *Pelecanus occidentalis*, Pied-billed grebe *Podilymbus podiceps*, Least bittern *Ixobrychus exilis*, Roseate tern *Sterna dougallii*, Common Snipe *Gallinago gallinago*, Great egret *Ardea alba*, Snowy egret *Egretta thula*, Black-crowned night heron *Nycticorax nycticorax*, Red-tailed hawk *Buteo jamaicensis*, American kestrel *Falco sparverius*, Merlin *F. columbarius*, Peregrine falcon *F. peregrinus*, Common moorhen *Gallinula chloropus*, Black-bellied plover *Pluvialis squatarola*, American Oystercatcher *Haematopus palliatus*, Black-necked stilt *Himantopus mexicanus*, Ruddy turnstone *Arenaria interpres*, Mangrove cuckoo *Coccyzus minor*, Smooth-billed ani *Crotophaga ani*, Antillean Mango *Anthracothorax dominicus*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Gray kingbird *Tyrannus dominicensis*, Cave swallow *Petrochelidon fulva*, Red-legged thrush *Turdus plumbeus*, Northern

mockingbird *Mimus polyglottos*, Northern parula *Parula americana*, Adelaide's warbler *Dendroica adelaidae*, Yellow warbler *D. petechia*, Prairie warbler *D. discolor*, American Redstart *Setophaga ruticilla*, Northern waterthrush *Seiurus noveboracensis*, Kentucky Warbler *Oporornis formosus*, Common yellowthroat *Geothlypis trichas*, Bananaquit *Coereba flaveola*, Puerto Rican Spindalis *Spindalis portoricensis*, Yellow-faced grassquit *Tiaris olivacea*, Black-faced grassquit *T. bicolor*, Grasshopper sparrow *Ammodramus savannarum*, Greater Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, White-crowned pigeon *Patagioenas leucocephala*, White-winged dove *Zenaida asiatica*, Zenaida dove *Z. aurita*, Mourning dove, *Z. macroura*, Common ground dove *Columbina passerina*, Red bishop *Euplectes franciscanus*, Orange cheeked waxbill *Estrilda melpoda*, House sparrow *Passer domesticus* (Ventosa et al 2004 and SOPI 2004); Great blue heron *Ardea herodias*, Little blue heron *Egretta caerulea*, Yellow-crowned night heron *Nyctanassa violacea*, Fulvous whistling duck *Dendrocygna bicolor*, Masked duck *Nomonyx dominicus* (reported since 1986, but not seen recently), Osprey *Pandion haliaetus*, Clapper rail *Rallus longirostris*, Sora *Porzana carolina*, Purple gallinule *Porphyryla martinica*, American coot *Fulica americana*, Caribbean Coot *Fulica caribaea*, Common morhen Killdeer *Charadrius vociferous*, Greater yellowlegs *Tringa melanoleuca*, Lesser yellowlegs *T. flavipes*, Solitary sandpiper *T. solitaria*, Spotted sandpiper *Actitis macularia*, Sanderling *Calidris alba*, Semipalmated sandpiper *C. pusilla*, Western sandpiper *C. mauri*, Least sandpiper *C. minutilla*, Pectoral sandpiper *C. melanotos*, Gull billed tern *Sterna nilotica*, Scaly-naped pigeon *Patagioenas squamosa*, Ruddy quail-dove *Geotrygon montana*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Puerto Rican Screech owl *Megascops nudipes*, Short-eared owl *Asio flammeus*, Puerto Rican Emerald *Chlorostilbon maugaeus*, Belted kingfisher *Ceryle alcyon*, Puerto Rican Flycatcher *Myiarchus antillarum*, Loggerhead kingbird *Tyrannus caudifasciatus*, Barn swallow *Hirundo rustica*, Pearly-eyed thrasher *Margarops fuscatus*, Puerto Rican Vireo *Vireo latimeri*, Black-whiskered vireo *V. altiloquus*, Black and white warbler *Mniotilta varia*, Ovenbird *Seiurus aurocapilla*, Louisiana Waterthrush *Seiurus motacilla*, Antillean Euphonia *Euphonia musica*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Greater Antillean Oriole *Icterus dominicensis*, Bronze mannikin *Lonchura cucullata*, Nutmeg mannikin *L. punctulata*, Chestnut mannikin *L. malacca*, Pin-tailed whydah *Vidua macroura*, Red avadavat *Amandava amandava* (reported but not seen recently) (DNR 1986).

Reptiles

Nine species of reptiles are recognized in the area: lizard from the Genus *Anolis*, Puerto Rican ground lizard *Ameiva exsul*, Puerto Rican slider *Trachemys stejnegeri stejnegeri*, Puerto Rican Racer *Alsophis portoricensis*, Puerto Rican Boa *Epicrates inornatus* (DRNA 2003).

Amphibians

Four species of amphibians are represented in the HENR: coqui from the Genus *Eleutherodactylus*, Giant toad *Bufo marinus*, White-lipped frog *Leptodactylus albilabris* Bullfrog *Rana catesbeiana* (DRNA 2003).

Fish

The majority of the fish reported on the area is the *Oreochromis mozambicus* (DRNA 2003).

Threats:

Some areas are susceptible for trash and junk deposition and need constant vigilance. Agricultural activities, such as fertilizing and pesticides, can harm the resources (DRN 1986). Illegal capture of the Blue land crab *Cardisoma guanhumi*; tree cutting for charcoal production and to build crab traps; livestock in the property (which the PRCT is trying to eliminate); grass cutting for hay and deposit of solid waste in the beach area (pers. comm. with Mrs. Myrna Robles, Education Coordinator, PRCT).

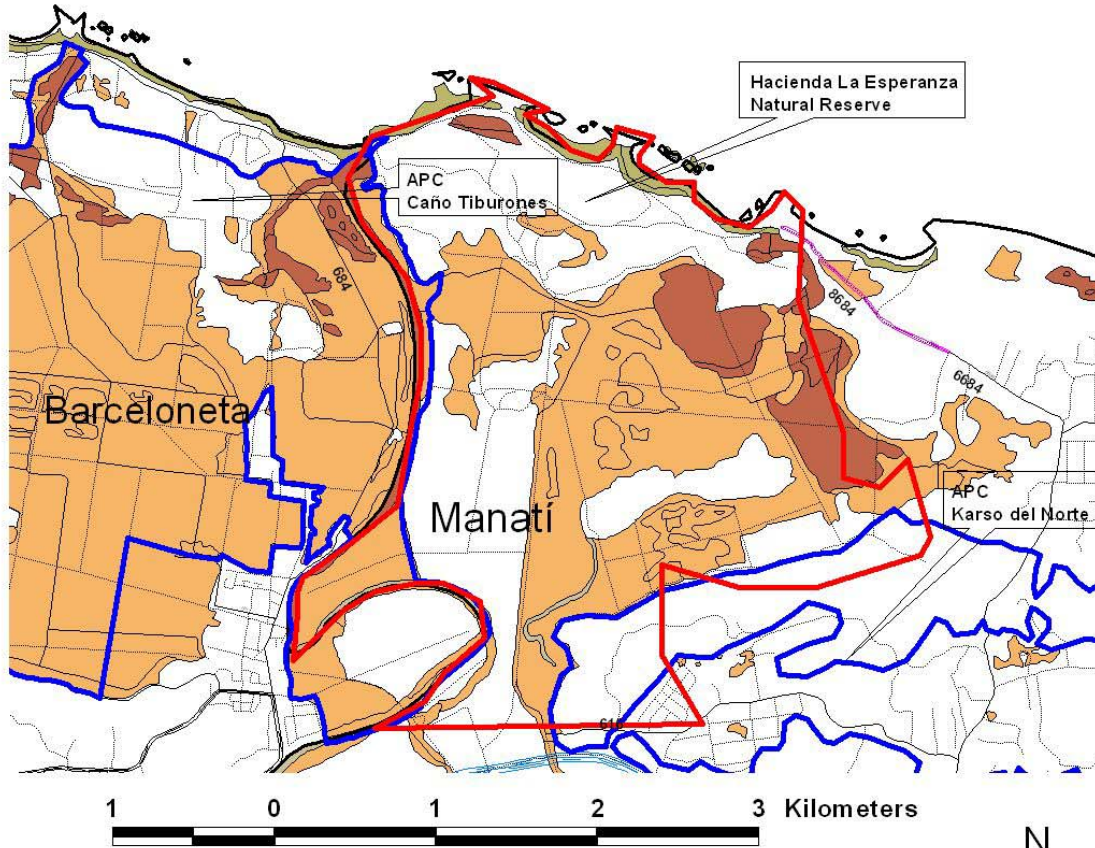
Conservation Recommendations:

To prepare a wetland management plan in order to optimize the lagoon for waterfowl. The PRCT is working in cooperation with the USFWS to protect the mangroves in the property with a mangrove restoration project. Their plans are to plant new seedlings and eventually to fill it with water so it can be managed for migratory and waterfowl bird species. Other management project of the PRCT is the reforestation of the area with native tree species such as Turpentine tree (Almácigo) *Bursera simaruba*, Ortegón *Coccoloba rugosa*, María tree *Calophyllum calaba*, Seagrapes *Coccoloba uvifera* and Florida fiddlewood *Citharexylum fruticosum* among others (Pers. comm. with Mrs. Myrna Robles, Education Coordinator, PRCT).

References:

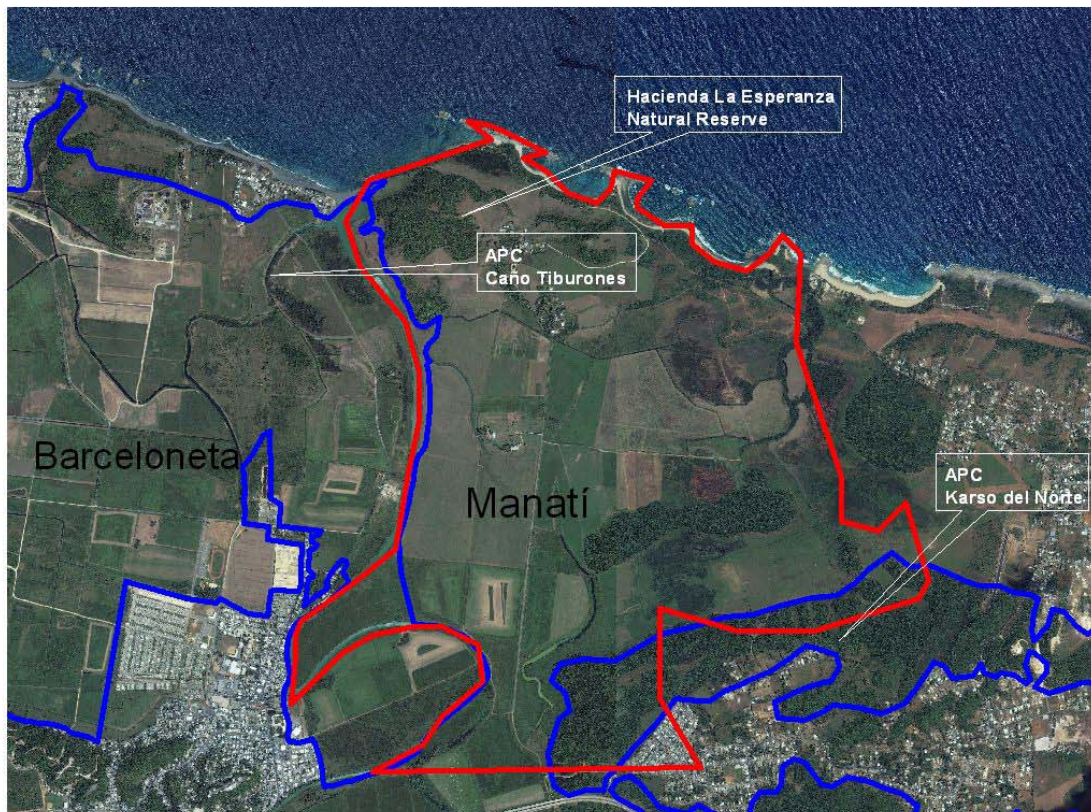
- Departamento de Recursos Naturales. 1986. Documento Designación Reserva Natural Hacienda la Esperanza. Programa de Manejo de la Zona Costanera. 52 pp.
- Departamento de Recursos Naturales y Ambientales. 2004. Reserva Natural Hacienda la Esperanza, Manatí. Desarrollado por la Gerencia de Portales de la Oficina de Gerencia y Presupuesto para el Departamento de Recursos Naturales y Ambientales.
www.gobierno.pr/DRNA/ReservasNaturales/Haciendas/HaciendaEsperanza.
- National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, U.S. Coast Guard, Departamento de Recursos Naturales y Ambientales, and U.S. Department of the Interior. 2000. Sensitivity of Coastal and Inland Resources to Spilled Oil; Puerto Rico Atlas. Published in Seattle, Washington. Hazardous Materials Response Division of NOAA.



Hacienda La Esperanza Natural Reserve



- ▭ Bosques_y_reservas.shp
- ▭ Areas con prioridad de conservacion.shp
- Municipios.shp
- Carreteras avpu.shp
 - ▬ autopistas
 - ▬ primarias
 - ▬ secundarias
 - ▬ terciarias
 - ▬ caminos
 - ▬ propuestas
- Humedales avpu.shp
 - ▭ Estuarine
 - ▭ Lacustrine
 - ▭ Marine
 - ▭ Palustrine
 - ▭ Riverine

Hacienda La Esperanza Natural Reserve



-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

81- Tortuguero Lagoon, Cabo Caribe Swamp and Rica Lake, Manatí-Vega Baja

Area Description:

It is located in the North part of Puerto Rico, between the Cibuco River in Vega Baja and Rio Grande de Manatí in Manatí municipality (18⁰27'42"N and 66⁰26'48"W). It is considered the fresh water body of greater size and importance in Puerto Rico (Lozada and Padín, 1992). The Tortuguero Lagoon is one of the richer and appreciated natural areas of our island. This area distinguishes in Puerto Rico by its fauna and its aquatic flora. In the environments of the Tortuguero Lagoon we can find diversity in types of grounds, like siliceous sand areas, which allow for a great diversity of plants and animals.

Composed of subterranean waters, the Tortuguero Lagoon supports a uniquely diverse flora including endemics, rare and endangered. The Tortuguero Lagoon is connected to Cabo Caribe Swamp through channels. The area is dominated by cattails, open water and channels (Cardona and Rivera 1988).

Habitats around Tortuguero Lagoon can be divided into three different principal wildlife associations: Open Water Association, the Emergent Swamp Plant Association and the Scrub-Thicket Association. Despite the fact that the Open Water Association of Tortuguero Lagoon is frequented only on a limited scale by wildlife, it serves a critical function in maintaining the adjacent Emergent Swamp Plant Association, which is of substantial importance to wildlife (Raffaele 1976). The little frequent conditions of grounds of Tortuguero Lagoon have given origin to a rare and varied vegetal life; around 717 species distributed in 119 families.

Tortuguero Lagoon has an extensive expanse of open, fresh water habitat, which undergoes a very limited fluctuation in water level and is almost totally surrounded by a well-developed Emergent Swamp Plant Association. The combination of these characters is major components of many outstanding areas for waterfowl and other aquatic wildlife. Unfortunately this is not the case for the Open Water Association of Tortuguero Lagoon as this Association is a relatively poor wildlife area. The factor responsible for the dearth of wildlife has not been studied. It is possible that the lack of submerged, aquatic plants available to ducks as a food source is the factor responsible for their near absence. Regardless of the reason, it remains that the Open Water Association of Tortuguero Lagoon supports a rather depurate fauna not only in terms of species diversity, but also species numbers (Raffaele 1976).

Rica Lake, also well known as Laguna Chiquita, is located in the southeastern end of Tortuguero Lagoon. It is much smaller in size because its waters are all of rain and it does not have springs or rivers that provide it. However, this lagoon has some characteristics similar to Tortuguero.

Ownership/Protection:

The Tortuguero Lagoon is a public land of the Commonwealth of Puerto Rico, administered by the DNER, Bureau of Refugees, Reserves and Sanctuaries.

Special Recognition:

It should also be noted that this Association is critical to a number of fresh water plant species (Raffaele 1976). Laguna Rica has been declared as a Bird Sanctuary (DRN 1988) and was recognized as a primary CWA by Raffaele and Duffield (1979) and by Cardona and Rivera (1988). Today, this area maintains its ecological value and continues to be recognized as a prime wildlife area.

Wildlife:

Birds at Tortuguero Lagoon

The Lagoon, by its high and thick aquatic vegetation is dominated by the Enea *Typha dominguensis*, it provides birds a good refuge, place of breeding and continuous food sources. There are 39 species through all the area of the Lagoon, including marshes, wooded hills and areas of shrubs. Of these 39 species, 14 are migratory and the rest is resident in Puerto Rico. Of the residents, four are native.

Least bittern *Ixobrychus exilis*, Least grebe *Tachybaptus dominicus*, Green heron *Butorides virescens*, Caribbean Coot *Fulica caribaea*, Purple gallinule *Porphyryla martinica*, Brown pelican *Pelecanus occidentalis*, Ruddy duck *Oxyura jamaicensis*, Sora *Porzana carolina*, Key west quail-dove *Geotrygon chrysia*, Black-crowned night heron *Nycticorax nycticorax*, Zenaida dove *Zenaida aurita*, White-crowned pigeon *Patagioenas leucocephala* (Cardona and Rivera 1988; Raffaele 1976).

Birds at Cabo Caribe Swamp

Yellow breasted crane *Porzana flaviventer*, Sora rail *Porzana carolina*, Least grebe *Tachybaptus dominicus*, Common moorhen *Gallinula chloropus*, Blue-winged teal *Anas discors*, Common snipe *Gallinago gallinago*, Yellow-crowned night heron *Nycticorax nycticorax*, Green heron *Butorides virescens*, Least bittern *Ixobrychus exilis* (Cardona ad Rivera, 1988).

Birds at Laguna Rica

Laguna Rica, a small lake just south Tortuguero Lagoon is important for wildlife because it harbors waterfowl such as Ruddy duck *Oxyura jamaicensis*, Least grebe *Tachybaptus dominicus*, Pied-billed grebe *Podilymbus podiceps* and Common gallinule *Gallinula chloropus* (Raffaele 1976); West Indian Whistling duck *Dendrocygna arborea*, Bridled quail-dove *Geotrygon mystacea* and Puerto Rican Screech owl *Megascops nudipes* (DRN 1988).

Reptiles in Tortuguero Lagoon

There is great amount of caimans *Caiman crocodiles* in Tortuguero Lagoon. It's believed that was introduced by people who acquired them like mascots in the pet shop, and when grew they threw them to the Lagoon. In fact, neighbors and fishermen of the place have cached several of them with a size up to five feet of length. Its presence has been another factor that has diminished the fauna of the Lagoon.

Puerto Rican boa *Epicrates inornatus* occurs in the haystack hills in the south and three species of sea turtles nest in the sandy beaches in the north of the Lagoon: Leatherback turtle *Dermochelys coriacea*, Hawksbill turtle *Eretmochelys imbricata*, Green turtle *Chelonia mydas* (Cardona and Rivera 1988).

Fish

In the calm waters of the Lagoon we can find around 23 species of fish (Carro 1987). The area is characterized to offer these species a perfect place for its refuge and the raising. Diverse marine species like the "jurel ojón" *Caranx latus*, mojarreta *Dipterous rhombus*, "róbalo" *Centropomus undemalis* and pargos *Lutjanus* sp, have been observed in the channel to the sea. The presence of ovoviviparous fish pertaining to the *Poecilia* gender stands out, one of them better well-known by Guppy *Reticulata poecilla*. These species live between the shore aquatic plants. We can find fish of greater size that are of great interest for the fishermen of the area, like the chopas *Lepomis macrarchirus*, the jarea *Mugil curema*, the *Tilapia mossambicus*,

the guavinas *Dormitor gobiomus* and muniama *Gerres cinereus*. Among native fishes that can be found in the lagoon: Dajao *Agonostomus monticola*, Mojarra *Diapterus plumieri* and Muniama *Gerres cinereus*. In 1986, a population of Lobinas *Micropterus salmoides* was introduced (Carro 1987).

Critical Plants:

There are 144 rare or threatened species, 56 live in fine sands, 110 on organic grounds of marshes and 37 are native species that only exists in the Lagoon. Some of them are the grass *Aristida speciformis*, the vine *Bulbostylis junciformis*, the shrub *Acnida cuspidate* and the fern *Osmunda cinnamomea*. There are also seven carnivorous species from the genus *Ultricularia* and *Drosera*. From the seven endemics species that occurs in the lagoon, the shrub *Chaeachcrysta mirabilis* and the grass *Scleria doradoensis* are limited to Tortuguero (DRN 1988).

Threats:

Invasion of family houses without the government permits; cutting off the flora nearby; indiscriminate construction in the watershed that can change the natural drainage system; deforestation; illegal extraction of siliceous sand; deposition of the contaminated waters by the communities nearby; excessive water extraction; industrial discharge of toxic material; discharge of fertilizers and pesticides into the waters; reduction of the presence of fishes; presence of Caimans living in the waters; proliferation of clandestine dumping grounds; lack of knowledge from the communities of the importance of this Natural Reserve (DRN 1988). Petitions from land owners in the immediacy and from the Puerto Rico Planning Board to change the zoning of the terrains of the Reserve for urbanization purposes; excessive growth of the Southern cattail *Typha domingensis* are others threats (Vidal 2000; Grana 2000; Hernández 2000).

Conservation Recommendations:

The Emergent Swamp Plant Association bordering Tortuguero Lagoon is an important wildlife asset and should be conserved. To insure conservation, careful control of water level, water quality and sedimentation in the Lagoon is critical (Raffaele 1976); maintain a database of the wildlife in the area; develop management plan; avoid new constructions and development projects; install culverts in the rural communities (Lozada and Padín, 1992); clean the excessive growth of Southern cattail (DNR 1988).

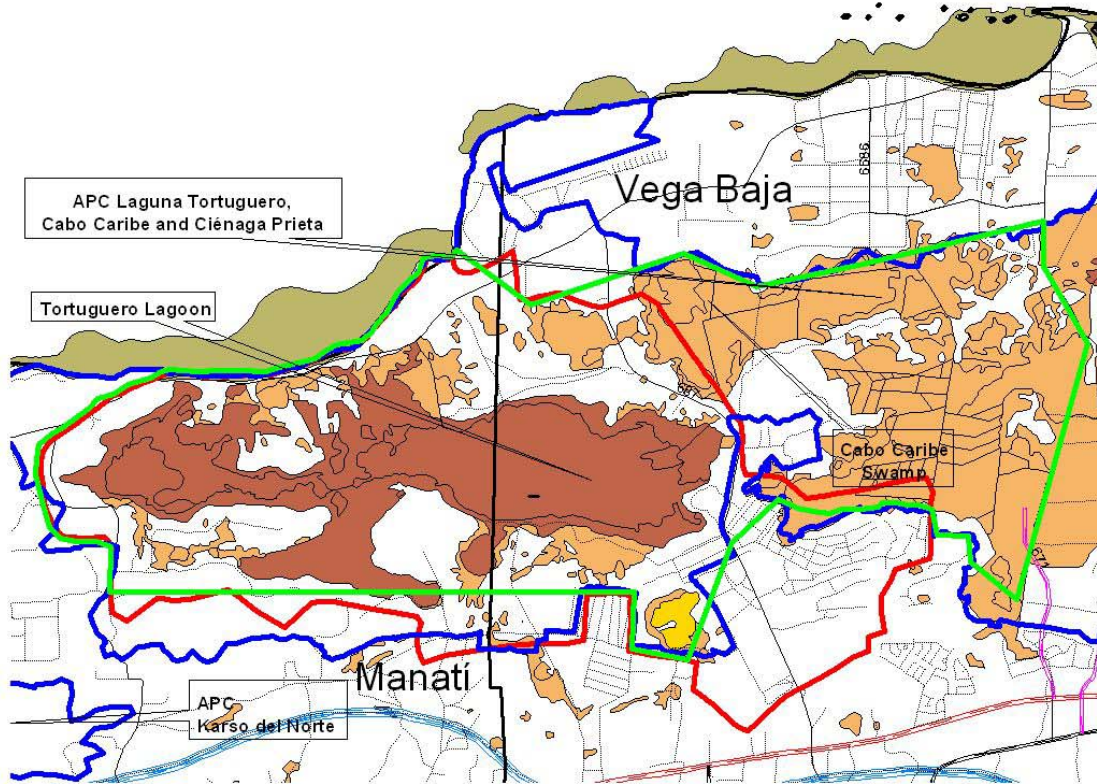
We must avoid the activities that can cause irreparable damages, like the cut of trees, bonfires, sand extraction, unloading polluting liquid agents in the water and the dump of garbage and scrap iron in the surroundings of the Lagoon. The bad use of so important resource could carry in the destruction of the ecosystem.

References:

- Carro, A. E. 1987. Listado de Peces y Observaciones sobre la fauna piscicola en Laguna Tortuguero. Decimotercer Simposio de Recursos Naturales. Departamento de Recursos Naturales. San Juan, Puerto Rico. Pp. 17-24.
- Departamento Recursos Naturales. 1988. Plan de Manejo del Área de Planificación Especial de Laguna Tortuguero. Tomo I. Estado Libre Asociado de Puerto Rico. DRN. Área de Planificación. División de Recursos Terrestres. 111 pp.

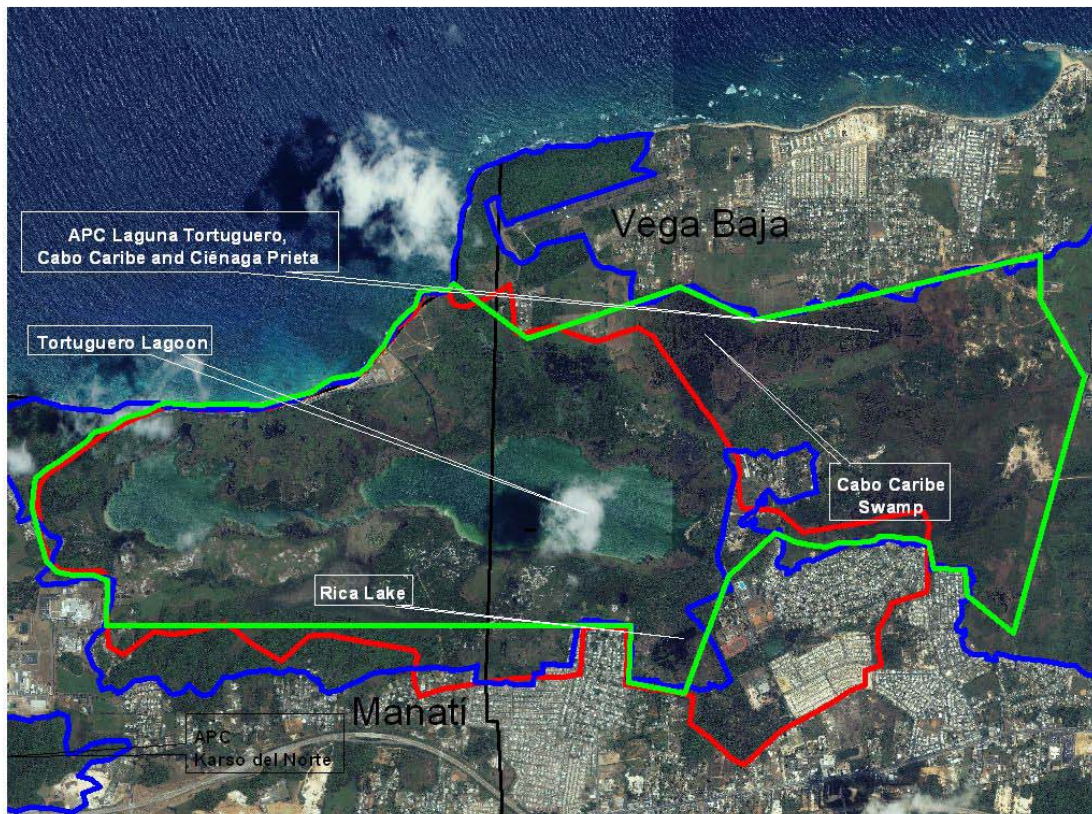
- Grana Raffuci, F. A. 2000. Letter to the DNER Director of Coasts, Reserves and Refugees. Comments of the proposed change of the zoning in Tortuguero Natural Reserve and Report of the field inspection of Finca Piza, Vega Baja. March 21, 2000.
- Hernández Serrano, C. 2000. Letter to DNER Auxiliar Secretary of Integral Planification. Comments on the Documents Submitted by the Puerto Rico Planification Board Related to the Solicitude to Change the B-2 Zoning of a Property that form part of the Hydrographic Watershed of Tortuguero Lagoon. March 27, 2000.
- Lozada Colón, C. R. and C. M. Padín Bibiloni. 1992. Declaración de Zonas Críticas Cuenca Laguna Tortuguero (Resumen Informe Final Tarea 8.1). Departamento de Recursos Naturales. Área de Planificación de Recursos. División de Planificación de Recursos de Agua. Oficina para el Manejo de la Zona Costanera.
- Raffaele, H. A. 1976. Management of Tortuguero Lagoon and Adjacent Areas. Puerto Rico Natural Resources Department. Programa Pro-Patrimonio Natural de Puerto Rico.
- Vidal Rodríguez, R. 2000. Letter to the DNER Auxiliary Secretary of Integral Planification. Solicitude to change the zoning of the terrains of the Tortuguero Natural Reserve. March 12, 2000.

Tortuguero Lagoon, Cabo Caribe Swamp and Rica Lake







- ▭ Tortuguero lagoon, rica lake and cabo caribe cwa.shp
- ▭ Areas con prioridad de conservacion.shp
- ▭ Bosques_y_reservas.shp
- Municipios.shp
- Carreteras avpu.shp
 - ▬ autopistas
 - ▬ primarias
 - ▬ secundarias
 - ▬ terciarias
 - ▬ caminos
 - ▬ propuestas
- Humedales avpu.shp
 - ▭ Estuarine
 - ▭ Lacustrine
 - ▭ Marine
 - ▭ Palustrine
 - ▭ Riverine

Tortuguero Lagoon, Cabo Caribe Swamp and Rica Lake



1 0 1 2 3 4 Kilometers



-  Tortuguero lagoon, rica lake and cabo caribe cwa.shp
-  Areas con prioridad de conservacion.shp
-  Bosques_y_reservas.shp
-  Municipios.shp

82- Cibuco Swamp Vega Baja, Puerto Rico

Area Description:

The Cibuco Swamp (about 271 ha) is located in the north-central coastal municipality of Vega Baja (18°28'N and 66°23'W), where the Cibuco River meets the ocean. The habitats of the area consist of fresh water, lacustrine and estuarine lagoons. The area has open water, dense cattails *Typha domingensis*, stands of the freshwater *Acrosticum sp.* and mangrove forests (Cardona and Rivera 1988; Cardona and Otero 1989). Vegetation of the area was characterized by dense mangrove stands on both sides of the Cibuco River mouth, with the larger stands being located in the west side. Other dominant features included brackish water swamp, freshwater swamp and several stands of leather and bracken fern. An overstory dominated by coconut palms is evidence of former agricultural use in this area (Cardona and Otero 1989).

Some vegetative communities are mangroves, herbaceous swamp, mixed shrub and grass. This area is used for outdoor recreation (hunting and fishing). It is considered good hunting grounds for ducks and other waterfowl. It is an important wildlife area, and has a potential for educational, recreational, and research activities (Ventosa et al. 2005). There is a higher area near the Cibuco River mouth that are formed of limy rocks, where there is the presence of vegetation characteristic of the Puerto Rico karst zone (DRNA 1992).

Ownership/Protection:

The Cibuco Swamp is a public land of the Commonwealth of Puerto Rico, administered by the DNER, Bureau of Refugees, Reserves and Sanctuaries.

Special Recognition:

Raffaele and Duffield (1979) classified Cibuco Swamp as a CWA. In 1982, Cibuco Swamp was recognized in the Puerto Rico Coastal Zone Management Plan because of its ecological importance, among other factors (Cardona and Otero 1989). Cardona and Rivera (1988) recognize it as a prime CWA. In 1993, the DNER designated Cibuco Swamp as a Natural Reserve. Today, this area it's still recognized as a prime CWA.

Wildlife:

Birds in the area

Forty six bird species have been reported in the Cibuco Swamp area: Brown pelican *Pelecanus occidentalis*, Least grebe *Tachybaptus dominicus*, Pied-billed grebe *Podilymbus podiceps*, Peregrine falcon *Falco peregrinus*, White-crowned pigeon *Patagioenas leucocephala*, Yellow-crowned night heron *Nyctanassa violacea*, Common snipe *Gallinago gallinago*, Black-necked stilt *Himantopus mexicanus*, Common moorhen *Gallinula chloropus*, Fulvous whistling duck *Dendrocygna bicolor*, West Indian Whistling duck *D. arborea*, Ruddy duck *Oxyura jamaicensis*, Lesser scaup *Aythya affinis*, Ring-necked duck *A. collaris*, White-checked pintail *Anas bahamensis*, Blue-winged teal *A. discors*, Green-winged teal *A. crecca*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Cattle egret *Bubulcus ibis*, Green heron *Butorides virescens*, Little blue heron *Egretta caerulea*, Greater yellowlegs *Tringa melanoleuca*, Royal tern *Sterna maxima*, Roseate tern *S. dougallii*, Bridled tern *S. anaethetus*, Zenaida dove *Zenaida aurita*, Common ground dove *Columbina passerina*, Mangrove cuckoo *Coccyzus minor*, Smooth-billed ani *Crotophaga ani*, Scissor tailed flycatcher *Tyrannus forficatus*, Puerto Rican Vireo *Vireo latimeri*, Black-whiskered vireo *V. altiloquus*, Red-legged thrush *Turdus plumbeus*, Northern mockingbird *Mimus polyglottos*, Yellow warbler *Dendroica petechia*, Bananaquit *Coereba flaveola*, Puerto Rico stripe headed

tanager *Spindalis portoricensis*, Yellow-faced grassquit *Tiaris olivacea*, Greater Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, House sparrow *Passer domesticus*, Orange cheeked waxbill *Estrilda melpada*, Bronze mannikin *Lonchura cucullata*, Nutmeg mannikin *L. punctulata* (Cardona and Rivera 1988; DRNA 1992; SOPI 2004; Ventosa et al. 2005).

Reptiles

Anolis cristatellus, *A. stratulus*, *A. evermanni*, *A. pulchellus*, *Ameiva exsul*, *Sphaerodactylus macrolepis*, *S. nicholsi*, *Pseudemys terrapin*, *Hemidactylus brookii*, *Caiman crocodiles* (DRNA 1992).

Amphibians

Eleutherodactylus coqui, *E. antillensis*, *E. brittoni*, *E. cochranae*, *Leptodactylus albilabris*, *Bufo marinus*, *Rana catesbeiana* (DRNA 1992)

Mammals

Grater Antillean long tongued bat *Monophyllus redmani*, Fig eating bat *Artibeus jamaicensis* (DRNA 1992).

Fish

Hound fish *Tylosurus crocodilus*, Tilapia *Tilapia mossambica*, *Mugil liza*, *Diapterus rhombeus*, *Micropogonias furnieri* (DRNA 1992).

Invertebrates

Blue land crab *Cardisoma guanhumi*, *Goniopsis cruentata*, *Armases ricordi*, *Aratus pisoni*, *Uca burgesil*, *Uca rapax*, *Ucides cordatus*, *Callinectes sp.*, *Grapsus grapsus*, *Ocypodes albicans*, *Gecarcinus ruricola* (DRNA 1992).

Threats:

The area is under intense pressure for development (Cardona and Otero, 1989). Also urban sprawl and encroachment is occurring in the southwestern portion of the fresh water swamp. Houses are built on stilts in areas formerly occupied by the cattail. Residents accomplish drainage of these areas by digging narrow ditches along the margins of each lot. These procedures result in reduction of the freshwater swamp area and in degradation of the remaining system, also due to direct domestic discharges (Ventosa et al. 2005).

Conservation Recommendations:

To mark the boundaries of the area with fences; to study water quality and to take control of the discharges that pollute the system including Cibuco River, the channels and the soils; produce educational brochures to educate the people about the importance of the area; maintain special vigilance in the hunting season to protect endangered species that can be affected with hunting activities; maintain clean the area and the channels (DRNA 1992).

To eliminate or control contaminant discharges into the Cibuco River and elaborate an educational program about the importance of the Cibuco Swamp at school and community level should be a priority. It is also important to enforce laws and regulations (Ventosa et al. 2005).

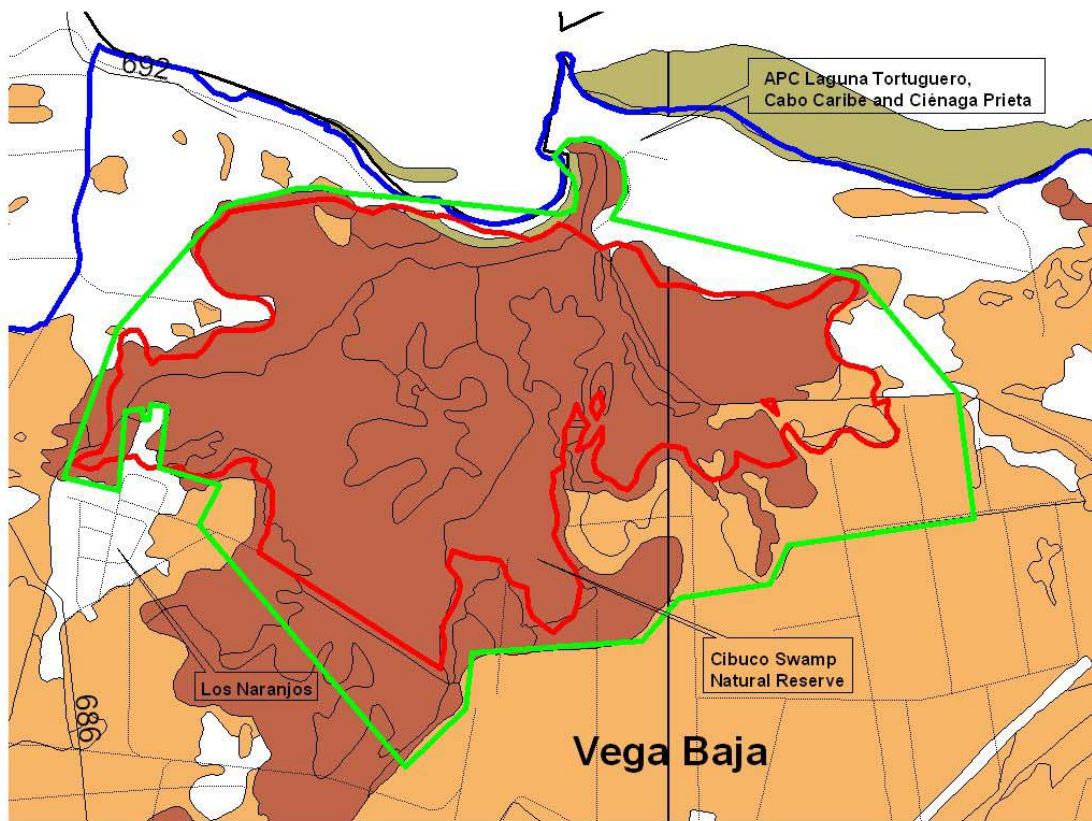
References:

Cardona, J. E. and S.R. Otero. 1989. Suplemento Técnico de Información para la Propuesta Reserva Natural del Pantano Cibuco, Vega Baja, Puerto Rico. Departamento de Recursos Naturales. Programa de Manejo de Zona Costanera. Área de Investigaciones Científicas, San Juan.

Departamento de Recursos Naturales. 1992. Documento de Designación Reserva Natural Pantano Cibuco. Programa de Manejo de la Zona Costanera, Área de Planificación de Recursos, División Recursos Terrestres. 74 pp.

Ventosa, Eduardo A.; M. Camacho, J.L. Chabert, J. Sustache and D. Dávila. 2005. Puerto Rico Waterfowl Focus Areas Puerto Rico Department of Natural and Environmental Resources; North American Waterfowl Management Plan and Atlantic Coast Joint Venture. 82 pp.

Cibuco Swamp

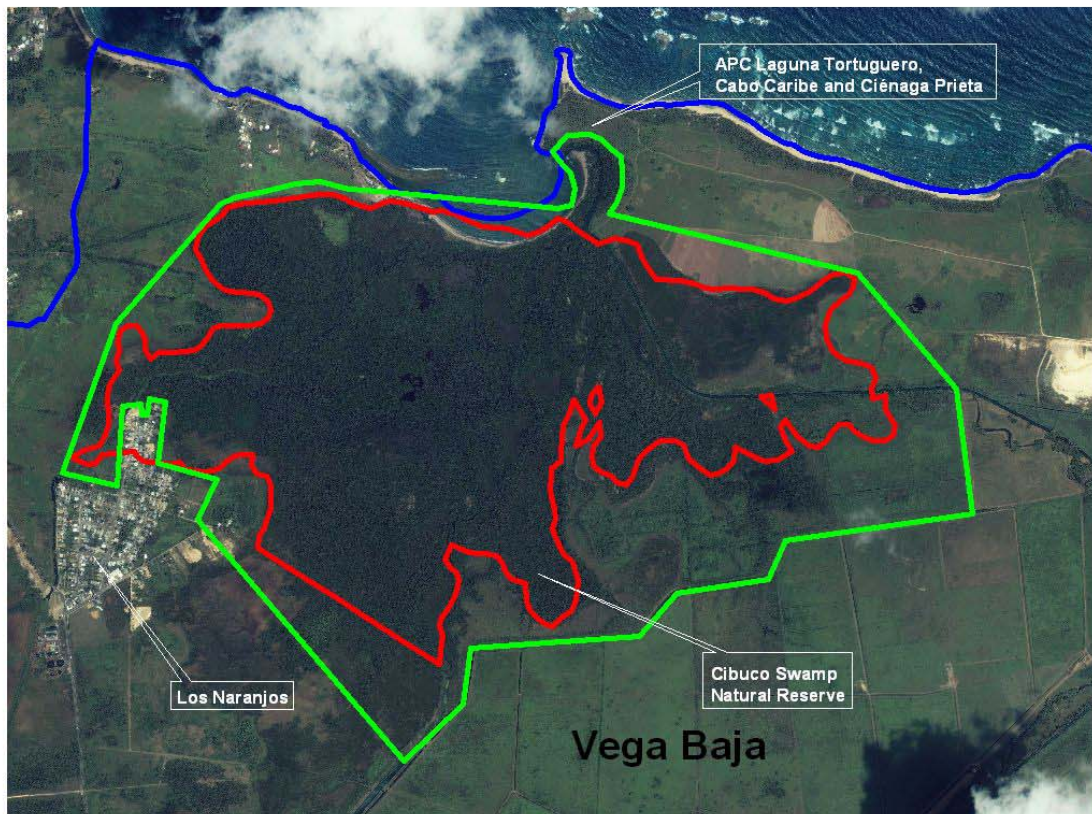


0.9 0 0.9 1.8 Kilometers




- Cibuco swamp cwa.shp
- Areas con prioridad de conservacion.shp
- Municipios.shp
- Bosques_y_reservas.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

Cibuco Swamp



0.9 0 0.9 1.8 Kilometers



-  Cibuco swamp cwa.shp
-  Areas con prioridad de conservacion.shp
-  Bosques_y_reservas.shp
-  Municips.shp

83- Vega State Forest, Vega Baja-Vega Alta, Puerto Rico

Area Description:

Located in the north karst coastal zone in the municipalities of Vega Baja and Vega Alta, the area is subdivided in six segments and it lies in the subtropical humid forest life zone. With elevations ranging from 5 to 50 m (Silander et al 1986), the forest contains approximately 482 ha in size.

Ownership/Protection:

The lands are owned by the Puerto Rico Land Authority and are administered by the DNER, Bureau of Forest Service.

Special Recognition:

The area was declared a Forest in 1952 (Silander et al 1986). For the first time, the Vega State Forest is recognized as a CWA of secondary importance.

Wildlife

Thirty seven bird species have been reported in the Vega State Forest: Puerto Rican lesser Antillean Pewee *Contopus portoricensis*, Bananaquit *Coereba flaveola*, Black-faced grassquit *Tiaris bicolor*, Yellow-faced grassquit *T. olivacea*, Cave swallow *Petrochelidon fulva*, Puerto Rican Lizard cuckoo *Saurothera vieilloti*, Puerto Rican Bullfinch *Loxigilla portoricensis*, Smooth-billed ani *Crotophaga ani*, Red-legged thrush *Turdus plumbeus*, Greater Antillean Grackle *Quiscalus niger*, Ruddy quail-dove *Geotrygon montana*, Key west quail-dove *G. chrysis*, Common ground dove *Columbina passerina*, Mangrove cuckoo *Coccyzus minor*, Barn swallow *Hirundo rustica*, Cattle egret *Bubulcus ibis*, Red-tailed hawk *Buteo jamaicensis*, Scaly-naped pigeon *Patagioenas squamosa*, White-winged dove *Zenaida asiatica*, Zenaida dove *Z. aurita*, Green mango *Anthracothorax viridis*, Antillean Mango *A. dominicus*, Puerto Rican Tody *Todus mexicanus*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Gray kingbird *Tyrannus dominicensis*, Loggerhead kingbird *T. caudifasciatus*, Black-whiskered vireo *Vireo altiloquus*, Puerto Rican Vireo *V. latimeri*, Northern mockingbird *Mimus polyglottos*, Pearly-eyed thrasher *Margarops fuscatus*, Adelaide's warbler *Dendroica adelaidae*, Ovenbird *Seiurus aurocapilla*, Kentucky Warbler *Oporornis formosus*, Puerto Rican Spindalis *Spindalis portoricensis*, Shiny cowbird *Molothrus bonariensis*, Greater Antillean Oriole *Icterus dominicensis* (Silander et al. 1986; SOPI 2004).

Amphibians

Common coqui *Eleutherodactylus coqui*

Reptiles

Alsophis portoricensis, Puerto Rican giant anole *Anolis cuvieri*, Barred anole *A. stratulus*, Common grass anole *A. pulchellus*, Puerto Rican ground lizard *Ameiva exsul*, Common dwarf gecko *Sphaerodactylus macrolepis* (DRNA 1997).

Critical Plants:

Two species are classified as a critical element: Puerto Rico Llume palm *Gaussia attenuata* and Cook's spur *Erythrina eggersii*. Others three species are classified as rare: Medicine vine *Hippocratea volubilis*, Saltwood *Neea buxifolia* and *Pouteria dyctoneura* (DRNA 1997).

Threats:

Some areas area used as illegal dump, for illegal use of agriculture and illegal houses establishment (Silander et al 1986). The Forest Manager (G. Pérez Torres) mentions some resents threats: illegal lands incursion and acquisitions in the forest property, developments projects around forest boundaries, among others.

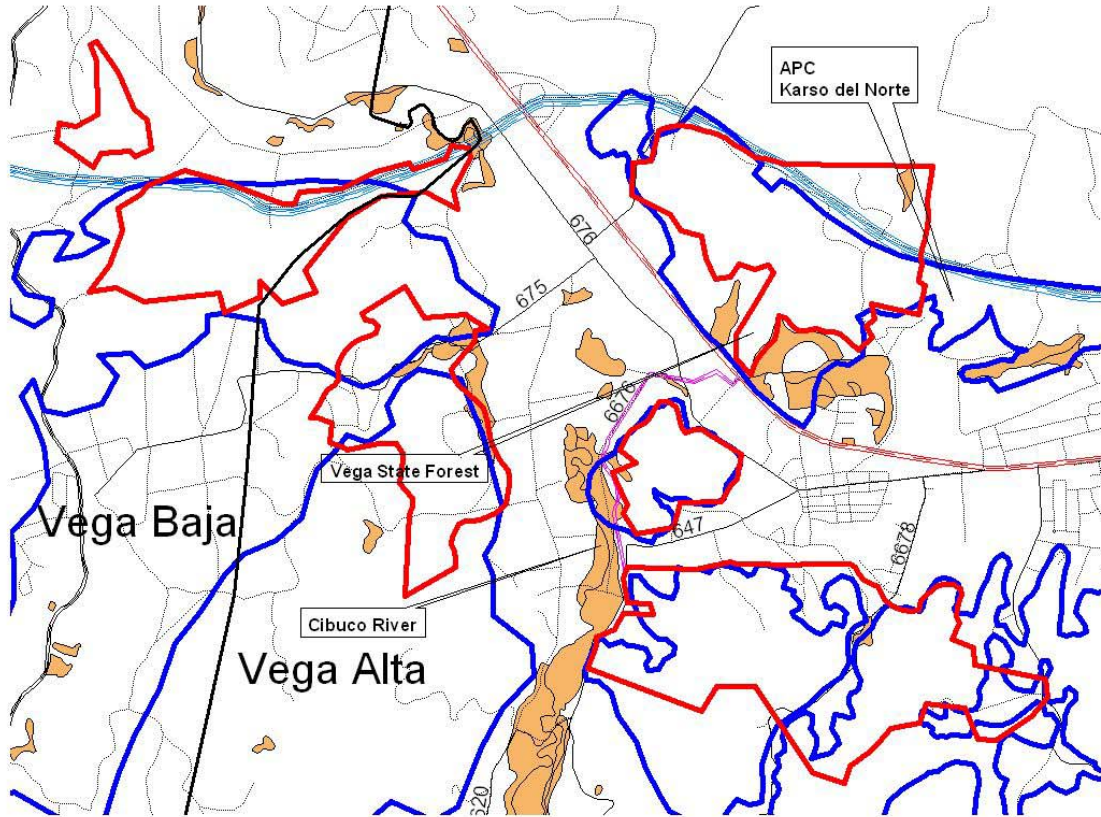
Conservation Recommendations:















Land acquisition around forest limits (G. Pérez pers. comm.), clarification of forest boundaries and to motivate the Municipal governments and landowners for actively applies proper management techniques.

References:

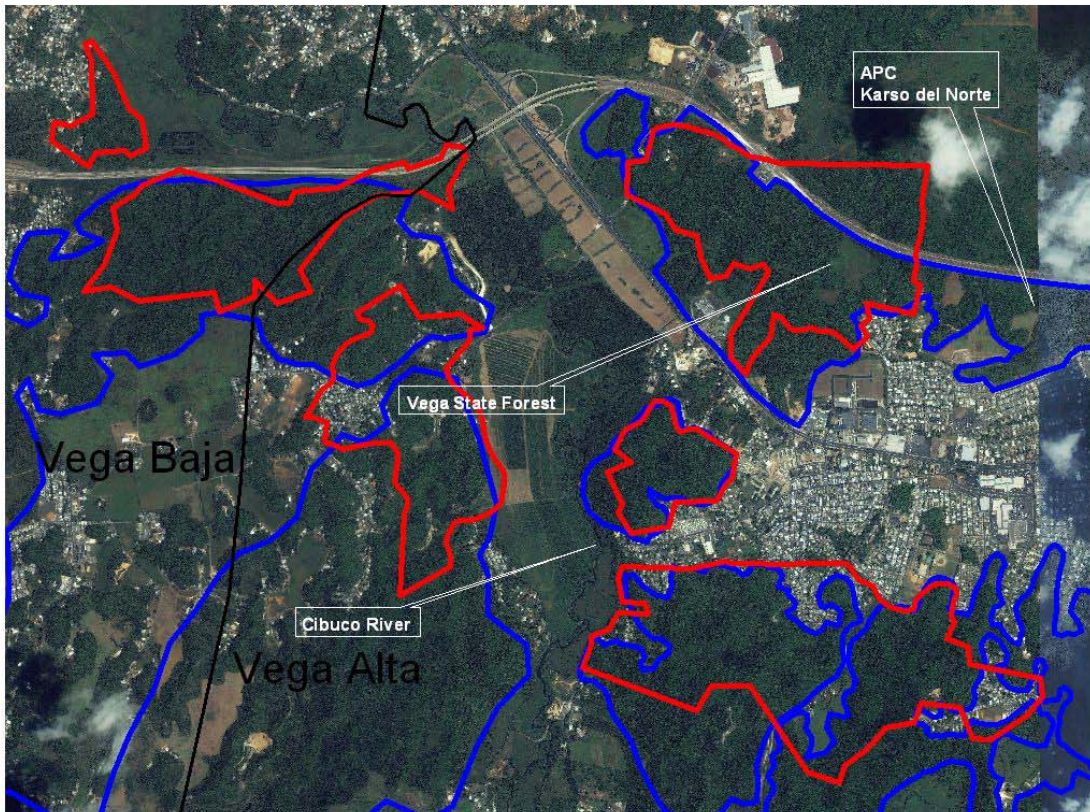
Departamento de Recursos Naturales y Ambientales. 1997. Bosque Estatal de Vega. Hoja Informativa. Servicio Forestal Orienta. Negociado del Servicio Forestal.




Vega State Forest



-  Municipios.shp
-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp
- Carreteras avpu.shp
 -  autopistas
 -  primarias
 -  secundarias
 -  terciarias
 -  caminos
 -  propuestas
- Humedales avpu.shp
 -  Estuarine
 -  Lacustrine
 -  Marine
 -  Palustrine
 -  Riverine

Vega State Forest



-  Municips.shp
-  Bosques_y_reservas.shp
-  Areas con prioridad de conservacion.shp

84- Lakes and Forests of Dorado, Dorado, Puerto Rico

Area Description:

This area is located west of the town of Dorado in the northern part of the island. These areas include the forests, woodland plots, Mata Redonda and other lakes in the property of Dorado Beach Hotel and the lakes south of road 693 on the golf course of the Cerromar Beach Hotel. In the property, there is one of the few remaining stands of *Pterocarpus officinalis* in the island, considered an important habitat for wildlife species.

Ownership/Protection:

The properties are private owned by the Hyatt Dorado Beach Resort and Country Club; and Cerromar Beach Hotel (now know as Hyatt Haciendas del Mar).

Special Recognition:

These lands were recognized as a CWA by Raffaele and Duffield (1979); and by Cardona and Rivera (1988). Moreno and Pérez (1980) agree with its classification of CWA. The Lakes and Forest of Dorado are considered the area with the large number of the threatened White-crowned pigeon in Puerto Rico (Bonilla, 2003). Although the area as a whole has suffered some disturbance and degradation, these lands remains an area of primary wildlife value.

Wildlife:

An on-site inspection of this area was made in March 2004 to corroborate its wildlife values. A total of 40 birds species were recorded for the complete area and the floral composition are represented with 10 species.

Birds at the lagoons

Antillean Grackle *Quiscalus niger*, Bananaquit *Coereba flaveola*, Gray kingbird *Tyrannus dominicensis*, Northern mockingbird *Mimus polyglottos*, Zenaida dove *Zenaida aurita*, White-winged dove *Z. asiatica*, Scaly-napped pigeon *Patagioenas squamosa*, White-crowned pigeon *P. leucocephala*, Red-legged thrush *Turdus plumbeus*, Brown pelican *Pelecanus occidentalis*, Caribbean Coot *Fulica caribaea*, Common moorhen *Gallinula chloropus*, Green heron *Butorides virescens*, Pied-billed grebe *Podilymbus podiceps*, Black-necked stilt *Himantopus mexicanus*, Spotted sandpiper *Actitis macularia*, Killdeer *Charadrius vociferus*, Belted kingfisher *Ceryle alcyon*, Northern waterthrush *Seiurus noveboracensis*, Yellow-crowned night heron *Nyctanassa violacea*, Great blue heron *Ardea herodias*, Great egret *A. alba*, Snowy egret *Egretta thula*, Black-faced grassquit *Tiaris bicolor*, Shiny cowbird *Molothrus bonariensis*, Mangrove cuckoo *Coccyzus minor*, Puerto Rican Woodpecker *Melanerpes portoricensis*, Antillean Mango *Anthracothorax dominicus*, Monk parakeet *Myiopsitta monachus*, Saffron finch *Sicalis flaveola*, Chestnut manikin *Lonchura malacca*, Bronze manikin *L. cucullata*, Nutmeg manikin *Lonchura punctulata*, Pearly-eyed thrasher *Margarops fuscatus*, Parula warbler *Parula americana*, Double crested cormorant *Phalacrocorax auritus*, Cattle egret *Bubulcus ibis*, Lesser scaup *Aythya affinis*, Common ground dove *Columbina passerina*, Smooth-billed ani *Crotophaga ani* (Moreno and Pérez, 1980; Terrestrial Resources Division Data 2004).

Reptiles in the area

Crested anole *Anolis cristatellus*; ground lizard *Ameiva exsul*, nesting of Hawksbill sea turtle *Eretmochelys imbricata* in the beaches of the hotel.

Amphibians

Common coqui *Eleutherodactylus coqui*. The Natural Heritage Program (DNER) has a record from 1982 of the Puerto Rican Crested toad *Bufo lemur* in the Pterocarpus forest in Dorado.

Invertebrates

Blue land crab *Cardisoma guanhumi*.

Species at the Pterocarpus forest

Puerto Rican boa *Epicrates inornatus*, Puerto Rican giant anole *Anolis cuvieri*, White-crowned pigeon *Patagioenas leucocephala* (Cardona and Rivera 1988).

Threats:

There is great pressure for development in the area, including in the remaining stands of *Pterocarpus*. Housing projects and others developments have been occurred around this CWA (south-east), contributing in the degradation of the area as a whole.

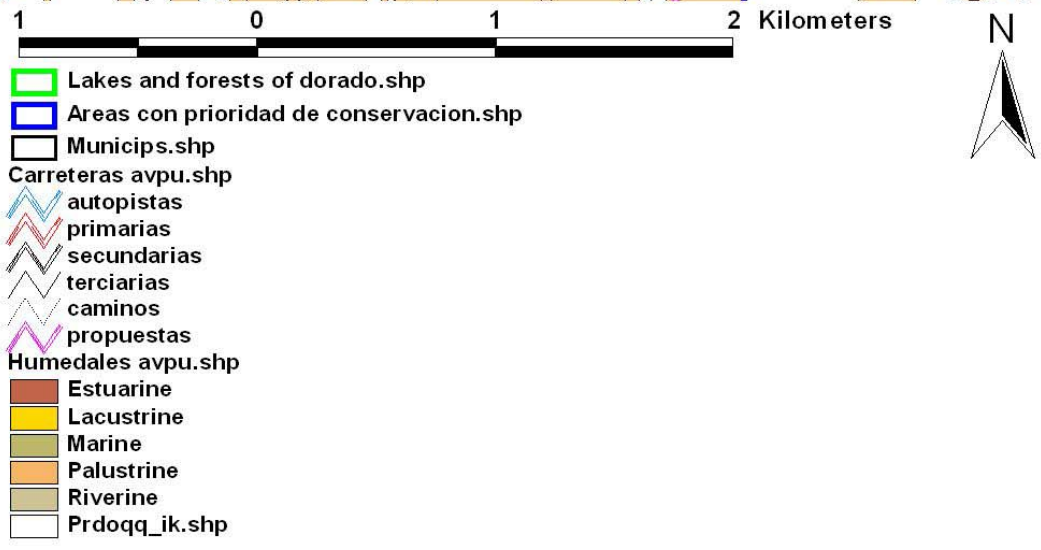
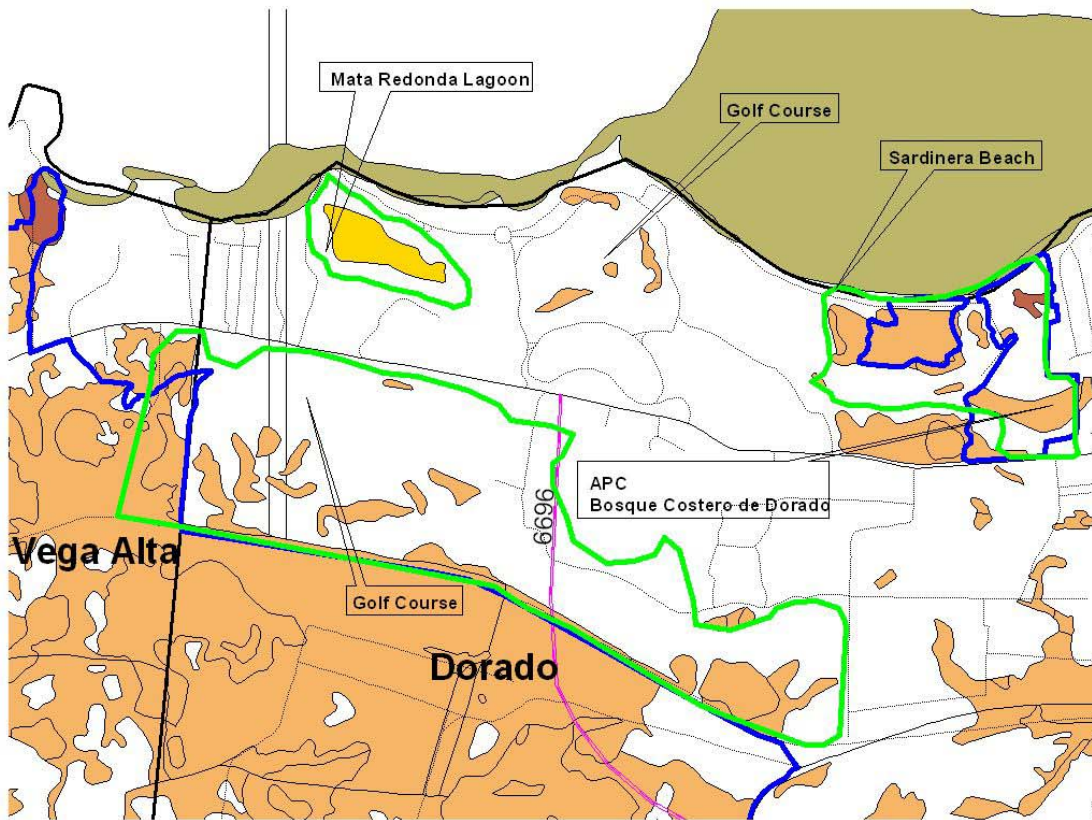
Conservation Recommendations:

In a communication with Mr. Bacilio Cardona Rodríguez (employee for almost 40 years for Hyatt Corp.), he indicates that the company has a tradition for wildlife protection in their properties. He mentions that the wildlife in Dorado has an important benefit for tourist attraction. The forest area together with a buffer zone was proposed for designation as a Natural Reserve by the DNR to the Commonwealth Planning Board (Cardona and Rivera, 1988). This action should be initiated.

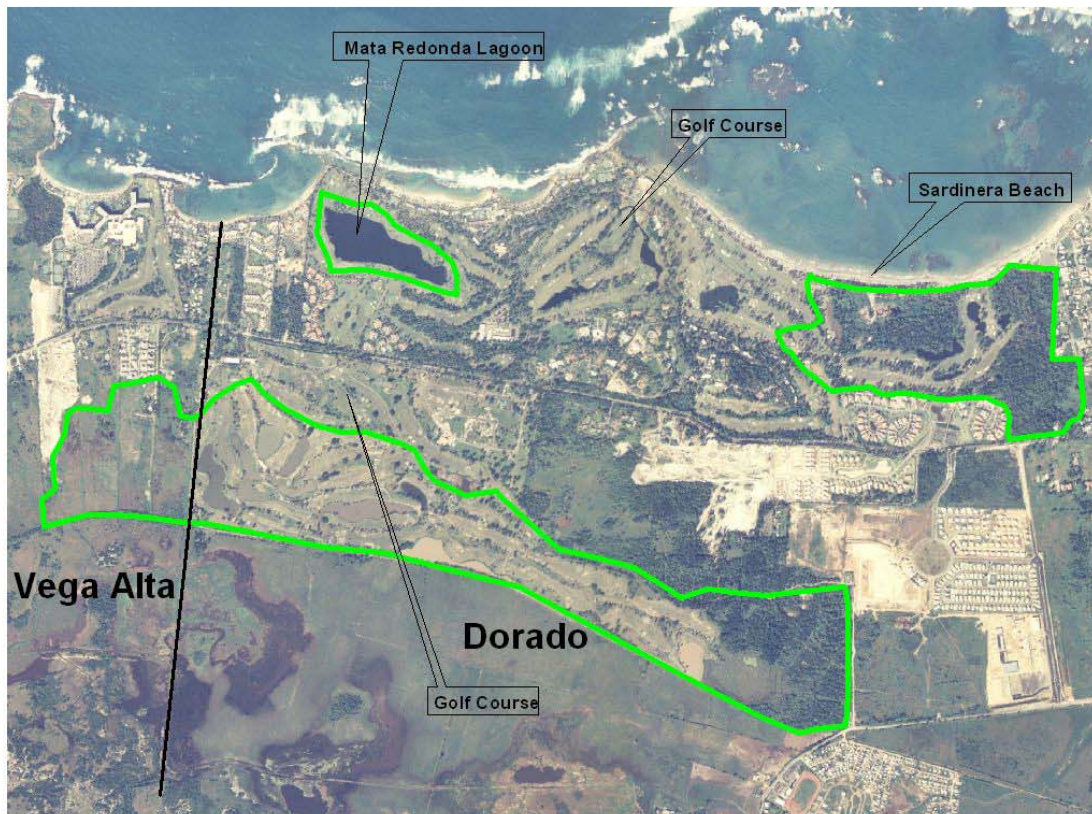
References:

Bonilla, G. 2003. Status, distribution, relative abundance and nesting activities of White-crowned pigeon in Puerto Rico. Final Report Project "White-crowned Pigeon R-2". Department of Natural and Environmental Resources, Terrestrial Resources Division, San Juan, P.R.

Lakes and Forests of Dorado



Lakes and Forests of Dorado



1 0 1 2 Kilometers



 Lakes & forest of dorado and cerromar beach.shp

85- Mogotes Río Lajas and Nevárez, Toa Baja, Puerto Rico

Area Description:

Located in the Municipality of Toa Baja, these areas are part of the north karst belt. At the north is the road PR 2 and in the south is the PR 22. It consists of haystack or mogotes hills, valleys, caves, sink and canyon of approximately 678 ha.

Ownership/Protection:

Different landowners privately own this CWA.

Special Recognition:

In 1980, Moreno and Pérez recognized this area a CWA of secondary importance. The Natural Heritage Program recognizes this area as a Priority Area for Conservation (Ortiz and Quevedo, 1987). Today, because the occurrence of endangered fauna and floral elements, the area is upgraded to primary importance.

Wildlife:

Birds

According to Moreno and Pérez (1980), the area provides excellent habitat for the Key West quail-dove *Geotrygon chrysis*.

Reptiles

The area provides excellent habitat for the endangered Puerto Rican boa *Epicrates inornatus* and for the Puerto Rican giant anole *Anolis cuvieri* (Moreno and Pérez 1980). Quevedo (pers. comm.) indicates the presence of *E. inornatus*, Puerto Rican Galliwasp *Diploglossus pleei*, and the Slippery-backed mabuya *Mabuya mabouya sloanii*.

Critical Plants:

Some plants recognized as critical elements found in this area are: *Othoshulzia rhodoxylon* (J. Sustache pers. comm.), *Banara vanderbiltii*, *Daphnopsis helleriana*, *Tournefortia filiflora*, *Polygala cowellii*, and *Gaussia attenuata* (V. Quevedo pers. comm.).

Threats:

Some areas have been destructed as a result of roads construction and for stone quarry.

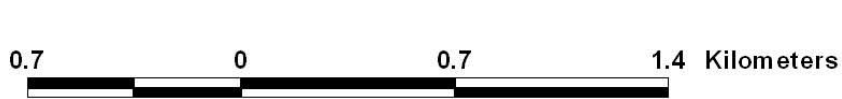
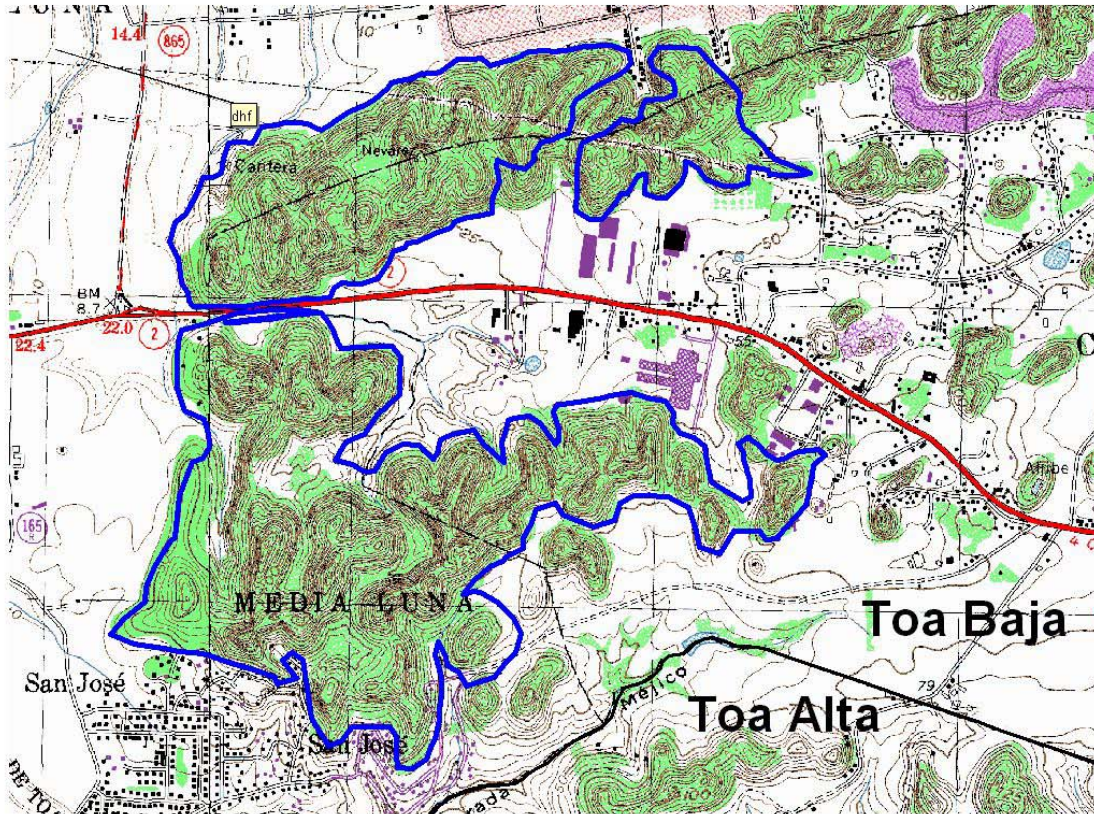
Conservation Recommendations:



This area, as many others mogotes in Puerto Rico, are in extreme danger of being destroyed and need immediate attention. It should be leased or purchased by the Commonwealth to protect it from any development.

References:

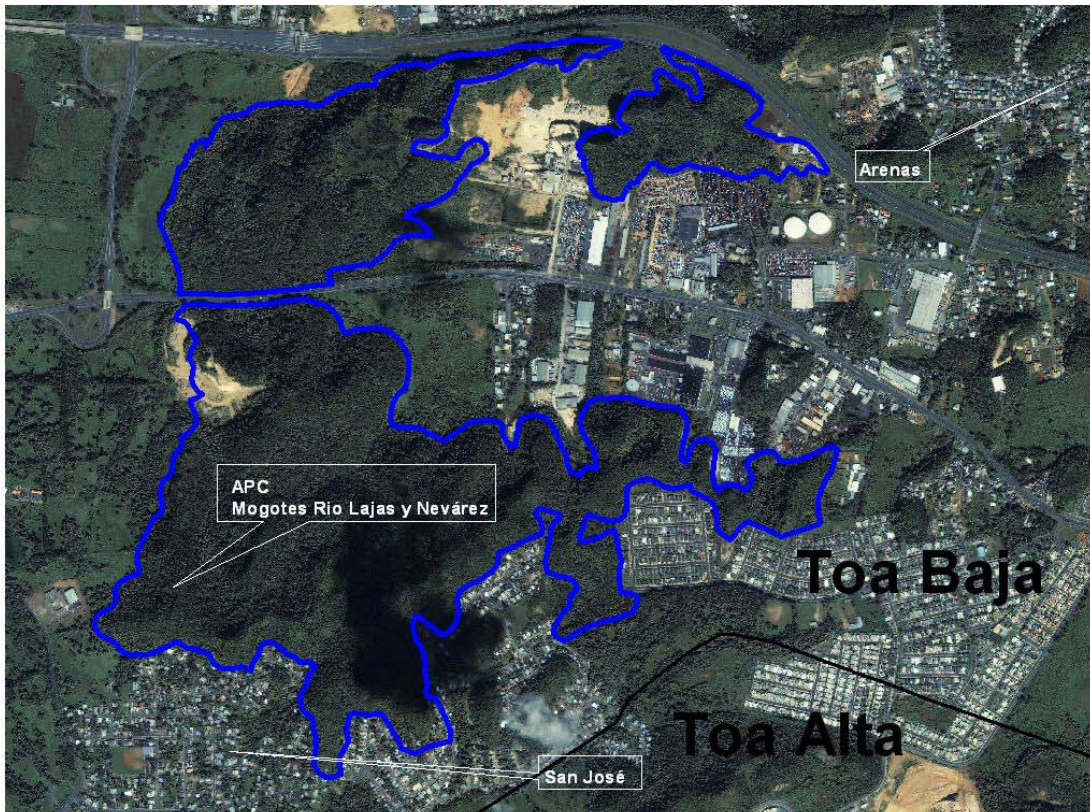
Ortiz-Rosas, P. and V. Quevedo-Bonilla. 1987. Áreas con prioridad para la conservación en Puerto Rico. Programa Pro-Patrimonio Natural. Estado Libre Asociado de Puerto Rico, Departamento Recursos Naturales. 217 pp.

Mogotes Rio Lajas y Nevárez



-  Mogotes rio lajas y nevarez.shp
-  Municipios.shp

Mogotes Rio Lajas y Nevárez



-  Municipios.shp
-  Areas con prioridad de conservacion.shp

Area Description:

This wetland is located south of road 165, Barrio Mameyal, in the municipality of Dorado, with approximately 410 ha. It is close of a shrimp farm called Eureka Marine Products. A mature mangrove forest higher than twenty feet, with some lagoons and saline ponds, dominates the area. Tree species of mangrove are present: red, black and white mangroves. The forest appears to be in healthy condition and apparently, a mitigation project is conducted in some lagoons. This project consist of the sown of Red mangroves in one saline pond.

Among the vegetation present in the area there are pastures, mature Almond trees *Terminalia catappa*, Coconut palms *Cocos nucifera*, Seagrapes *Coccoloba uvifera*, Seaside mahoe *Thespesia populnea*, Wild soursoup *Annona montana*, Pigeon berry *Bourreria succulenta* (Terrestrial Resources Division Data 2004).

Ownership/Protection:

Some part are own by the Puerto Rico Land Authority and others are lease for private use.

Special Recognition:

This area is recognized as an important hunting ground for waterfowl, doves and pigeons (D. Ramos pers. comm.). For the first time, we recognized El Mameyal as a prime CWA.

Wildlife:***Birds***

Thirty bird species have been reported for the area: Common snipe *Gallinago gallinago*, Common moorhen *Gallinula chloropus*, Spotted sandpiper *Actitis macularia*, Semipalmated plover *Charadrius semipalmatus*, Killdeer *C. vociferus*, and the Greater yellowlegs *Tringa melanoleuca* are common in the saline. Zenaida dove *Zenaida aurita*, White-winged dove *Z. asiatica* (roosting and reproduction area), Green heron *Butorides virescens*, Little blue heron *Egretta caerulea*, Tricolored heron *E. tricolor*, Black-crowned heron *Nycticorax nycticorax*, Pied-billed grebe *Podilymbus podiceps*, Least bittern *Ixobrychus exilis*, Great egret *Ardea alba*, Blue-winged teal *Anas discors*, West Indian Whistling duck *Dendrocygna arborea*, Black-necked stilt *Himantopus mexicanus*, Clapper rail *Rallus longirostris*, Common ground dove *Columbina passerina*, Caribbean Martin *Progne dominicensis*, Antillean Mango *Anthracothorax viridis*, Puerto Rican Woodpecker *Melanerpes portoricensis*, American kestrel *Falco sparverius*, Laughing gull *Larus atricilla*, Greater Antillean Grackle *Quiscalus niger*, Shiny cowbird *Molothrus bonariensis*, Smooth-billed ani *Crotophaga ani*, Gray kingbird *Tyrannus dominicensis*, Puerto Rican Flycatcher *Myiarchus antillarum*, Bananaquit *Coereba flaveola*, Red bishop *Euplectes franciscanus* (Terrestrial Resources Division Data 2004).

Threats:

The impact of industrial growth and the urban development on wetlands is a serious concern in the north coast of Puerto Rico. Threats to this region, in general, are remaining attempts to drain and develop the area.

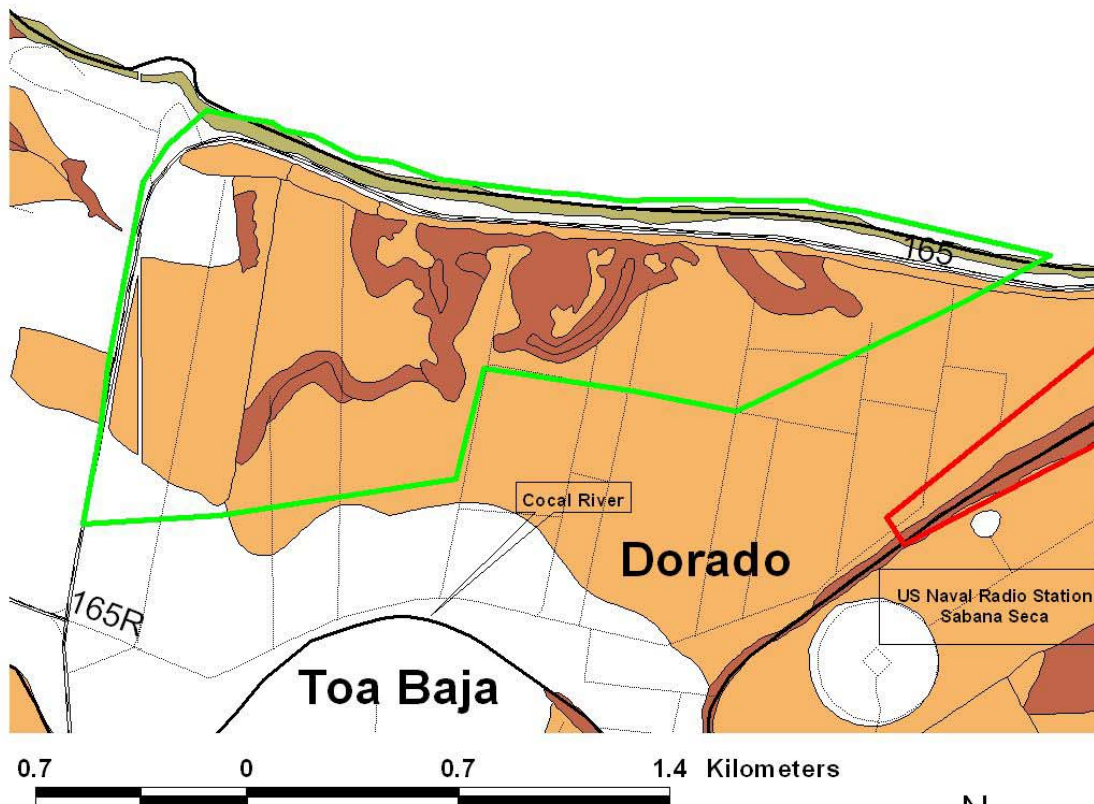
Conservation Recommendations:

The Puerto Rico Commonwealth should acquire the property in order to conserve this important waterfowl wetland.

References:

None available

El Mameyal






-  El mameyal cwa.shp
-  San pedro swamp.shp
-  Municips.shp
- Carreteras avpu.shp
 -  autopistas
 -  primarias
 -  secundarias
 -  terciarias
 -  caminos
 -  propuestas
- Humedales avpu.shp
 -  Estuarine
 -  Lacustrine
 -  Marine
 -  Palustrine
 -  Riverine

El Mameyal



0.7 0 0.7 1.4 Kilometers



-  El mameyal cwa.shp
-  San pedro swamp.shp
-  Municips.shp

87- San Pedro Swamp, Toa Baja

Area Description:

Located within the Sabana Seca Naval Facilities, San Pedro Swamp is a large fresh water system divided in two by PR road #867 (Cardona and Rivera 1988). This marsh covers about 101 ha and is fed by several unnamed streams that flow through the Naval Facilities. There are numerous drainage ditches throughout the marsh. The wetland flows into the Cocal River, which flows along the western border of the Naval Facilities and discharges into the Atlantic Ocean to the north. A canal, Caño el Hato, is east of the site and flows into the Atlantic Ocean. This wetland support communities of grasses, mangroves and Pterocarpus forests that are vitally important to maintaining the health of the coastal and estuarine environment, while the undeveloped uplands of the base are covered by mixed tropical forests. At the southernmost end, limestone hills (mogotes) rise dramatically above the coastal plain. The tropical forests that cover the limestone hills are home to numerous rare and endangered plants and animal species. There is also the presence of at least 88 different caves (Naval Security Group 1995).

Ownership/Protection:

Most of the area is part of the Sabana Seca Naval Facilities, administered by the Naval Security Group Activity. Other lands on the southeastern end are privately owned.

Special Recognition:

In 1979 the area were recognized as a CWA of secondary importance, mainly because the lack of open water that would make them valuable for waterfowl. Cardona and Rivera (1988) upgrade San Pedro Swamp to primary, principally due to the degradation or disappearance of nearly similar areas. In 1995, an archeological survey identified nineteen Pre-Columbian and historic archeological sites on the installation of Sabana Seca Naval Facility (Naval Security Group 1995). By these facts, the site is recognized as one of historical importance. Because the presence of rare and endangered species in this wetland, we recognized San Pedro Swamp as a prime wildlife area.

Wildlife

Twenty one bird species have been reported in the area: Magnificent Frigatebird *Fregata magnificens*, Black-crowned night heron *Nycticorax nycticorax*, Great blue heron *Ardea herodias*, Great egret *A. alba*, Little blue heron *Egretta caerulea*, Tricolored heron *E. tricolor*, Snowy egret *E. thula*, Green heron *Butorides virescens*, Cattle egret *Bubulcus ibis*, Common moorhen *Gallinula chloropus*, White-crowned pigeon *Patagioenas leucocephala*, Killdeer *Charadrius vociferous*, Semipalmated plover *C. semipalmatus*, Greater yellowlegs *Tringa melanoleuca*, Black-necked stilt *Himantopus mexicanus* (Cardona and Rivera 1988). More recently, personnel from the DNER have seen the endangered West Indian Whistling duck *Dendrocygna arborea* in the swamp (Ramos 2002).

Reptiles

The endangered Puerto Rican Boa *Epicrates inornatus* have been sighted in numerous locations on the Naval Station (Naval Security Group Activity, 2004). Other two endangered species, the Green sea turtle *Chelonia mydas* and the Loggerhead sea turtle *Caretta caretta*, are found along the coast (F. López pers. comm.).

Fish

Some species reported in the Cocal River and in the coast are the Grunt, Snook and Tarpon fish (F. López, pers. comm.).

Invertebrates

Blue land crab *Cardisoma guanhumi* are abundant in the San Pedro Swamp and are recreationally harvested from it (Naval Security Group Activity, 2004). These land crabs live along the banks of the Cocal River and in the marsh area. Also, freshwater shrimp migrate through the Cocal River to spawn in the Atlantic Ocean. This shrimps are collected both in the river and on the shores of the Atlantic Ocean (F. López pers. comm.).

Threats:

From the early 1950s through 1970, the U.S. Public Work Department deposited all waste generated at the station at various areas on the south tract. Materials included paints, solvents, waste oil and battery acid. There where also a pest control shop where spills of DDT, lindane, chlordane, 2-4-D and sevin were reported in and around the building (Greenleaf/Telesca and E&E, 1984). In 1984, soil samples showed elevated levels of arsenic, lead, and chlordane (Naval Security Group, 2004). Rain could wash soil contaminants through a drainage ditch to the marsh.

Industrial, commercial and residential development along the wetland impacts fish and wildlife populations and habitats largely through direct losses of habitat and degradations in habitat quality, particularly water quality. Contamination, sewage, storm water and waste discharges, and dredging are all of concern in the San Pedro Swamp aquatic environment. The wetland is reported to have significant water quality problems, particularly in certain areas close to the Naval Facilities.

Conservation Recommendations:

In 1992, an Interagency Agreement was signed by the EPA, the NAVY, and the Commonwealth of Puerto Rico, to identify, investigate, and control the migration of hazardous contaminants at military and other Department of Defense facilities. In 1998, the EPA deleted NSGA Sabana Seca from the National Priorities List.

Particular attention needs to be focused on restoring and protecting the water quality of the San Pedro Swamp and its high value to fish and wildlife populations. Protective measures should include stringent regulatory overview and enforcement of existing Federal, State and local environmental regulations, as well as developing and implementing environmentally planning policies and restoration programs.

References:

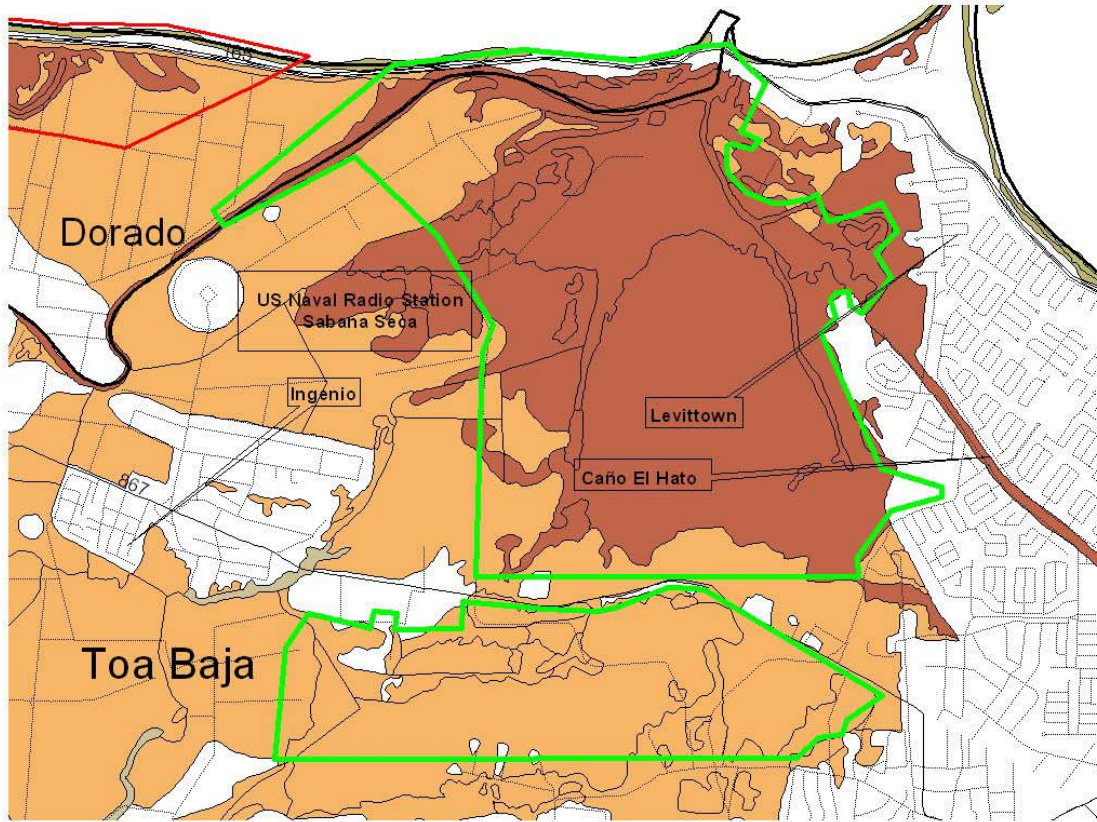
Greenleaf/Telesca & Ecology and Environment. 1984. Initial Assessment Study of Naval Security Group Activity, Sabana Seca and Naval Communications Station, Puerto Rico. Miami: NAVY Assessment and Control of Installation Pollutants (NACIP) Department. Naval Energy and Environmental Support Activity (NAVENENSA).

Naval Security Group. 1995. Cultural Resources Investigations. Naval Security Group Activity, Sabana Seca, Puerto Rico.

_____.2004. NPL Listing History. EPA Region 2, Congressional Dist. 01. EPA ID# PR4170027383. 3 pp.

Ramos, D. 2002. Monitoring of Game Birds in Puerto Rico. Annual Report. Department of Natural and Environmental Resources, Terrestrial Resources Division, San Juan, P.R.

San Pedro Swamp

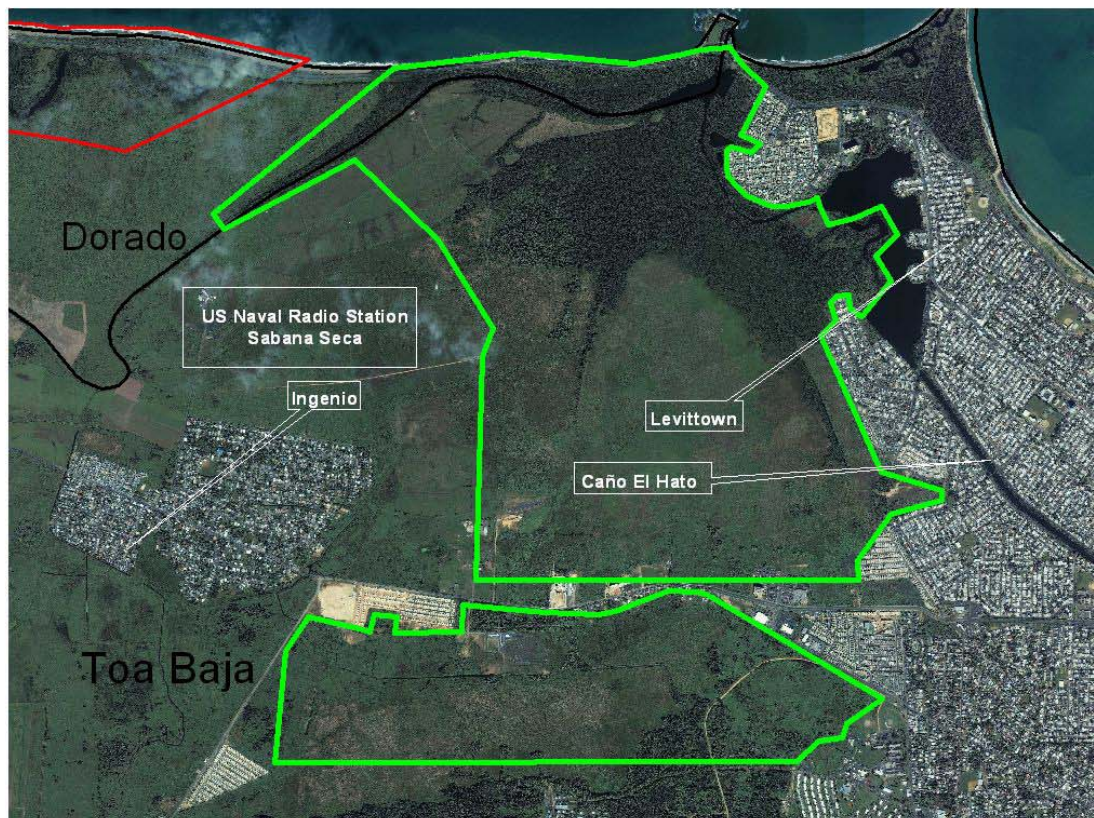





1 0 1 2 3 Kilometers



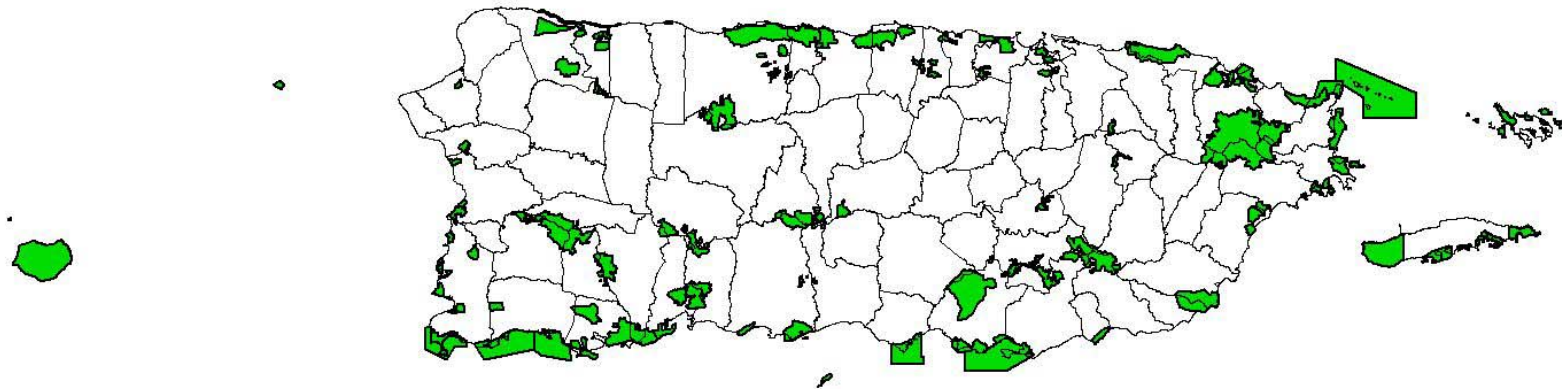
- San pedro swamp.shp
- El mameyal cwa.shp
- Municips.shp
- Carreteras avpu.shp
 - autopistas
 - primarias
 - secundarias
 - terciarias
 - caminos
 - propuestas
- Humedales avpu.shp
 - Estuarine
 - Lacustrine
 - Marine
 - Palustrine
 - Riverine

San Pedro Swamp



-  San pedro swamp.shp
-  El mameyal cwa.shp
-  Municips.shp

Puerto Rico Critical Wildlife Areas
Department of Natural and Environmental Resources
Bureau of Fish & Wildlife
Terrestrial Resources Division
July 2005



□ Municipios.shp
■ Cwa_mosaico4.shp



90 0 90 Kilometers

A horizontal scale bar with three segments. The left segment is labeled '90', the middle segment is labeled '0', and the right segment is labeled '90 Kilometers'.