PUERTO RICO COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY

2005


Dendroica petechia; L. Miranda


Atlantea tulita, A. Molina


Anolis cuvieri; www.kingsnake.com


Eleutherodactylus juanriveroi; L. Villanueva

Department of Natural and Environmental Resources
San Juan, Puerto Rico

PUERTO RICO COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY

2005

Miguel A. García

José A. Cruz-Burgos

Eduardo Ventosa-Febles

Ricardo López-Ortiz

ACKNOWLEDGMENTS

Financial support for the completion of this initiative was provided to the Puerto Rico Department of Natural and Environmental Resources (DNER) by U.S. Fish and Wildlife Service (USFWS) Federal Assistance Office. Special thanks to Mr. Michael L. Piccirilli, Ms. Nicole Jiménez-Cooper, Ms. Emily Jo Williams, and Ms. Christine Willis from the USFWS, Region 4, for their support through the preparation of this document.

Thanks to the colleagues that participated in the Comprehensive Wildlife Conservation Strategy (CWCS) Steering Committee: Mr. Ramón F. Martínez, Mr. José Berríos, Mrs. Aida Rosario, Mr. José Chabert, and Dr. Craig Lilyestrom for their collaboration in different aspects of this strategy.

Other colleagues from DNER also contributed significantly to complete this document within the limited time schedule: Ms. María Camacho, Mr. Ramón L. Rivera, Ms. Griselle Rodríguez Ferrer, Mr. Alberto Puente, Mr. José Sustache, Ms. María M. Santiago, Mrs. María de Lourdes Olmeda, Mr. Gustavo Olivieri, Mrs. Vanessa Gautier, Ms. Hana Y. López-Torres, Mrs. Carmen Cardona, and Mr. Iván Llerandi-Román. Also, special thanks to Mr. Juan Luis Martínez from the University of Puerto Rico, for designing the cover of this document.

A number of collaborators participated in earlier revisions of this CWCS: Mr. Fernando Nuñez-García, Mr. José Berríos, Dr. Craig Lilyestrom, Mr. Miguel Figuerola and Mr. Leopoldo Miranda. A special recognition goes to the authors and collaborators of the supporting documents, particularly, Regulation No. 6766, Law 241-New Wildlife Law of Puerto Rico and the Puerto Rico Critical Wildlife Areas.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure **Page**

EXECUTIVE SUMMARY

Conservation of biological diversity is a major challenge faced by federal, state, and private environmental organizations. This task is particularly difficult as these entities seek to harmonize urban development with the protection of natural resources. Economic growth and lofty living standards commonly rank higher in most people's values than wildlife and forests.

Major threats to Puerto Rico's living resources are habitat loss, poaching and over-exploitation, and invasive exotic species. The conservation of the Puerto Rican biota is a great challenge to which the Department of Natural and Environmental Resources (DNER) is strongly committed as a large proportion of our species are found nowhere else in the world. Thus, a local extinction represents a reduction of the earth's biological diversity.

Traditionally, species facing extinction and game species have received some level of protection to ensure their existence for ethical, aesthetical, or economic purposes. Funding available through existing legislation has allowed the implementation of recovery plans for endangered species and management of game species as they are of great importance to certain groups of citizens. However, most species are not hunted nor are under imminent risk of disappearance. Unsurprisingly, this group of animals, traditionally known as non-game species, has remained relatively ignored by state agencies. Likewise, the status of most Puerto Rican native wildlife, including most invertebrates (ca. 5,847 species), is mostly unknown. The lack of funding to determine their population status and distribution has delayed the development of priority actions and proactive management to avoid the endangerment of these species. Paradoxically, this great biodiversity component receives considerable attention from academic institutions due to their scientific importance.

In Puerto Rico, current management priorities for wildlife and fisheries resources have been guided by the principal federal funding sources that support the majority of the conservation efforts. These are the Federal Assistance in Wildlife and Sportfish Restoration Program, the Endangered Species Program (Section 6), and limited Commonwealth funds. Nevertheless, states and territories requested the USA Congress to provide adequate and reliable funding to assess and manage populations of non-game resources before reaching an endangered or threatened status. In 2001, the Congress identified such funding sources, but conditioned its support to the development of a Comprehensive Wildlife Conservation Strategy (CWCS). This document is a blueprint for the conservation of species and habitats with greatest conservation need. It also sets priorities for funding allocation.

In September 2003, the Puerto Rico DNER, through the Bureau of Fisheries and Wildlife (BFW), initiated the development of the CWCS for Puerto Rico. The initial proposal sought an external resource to complete this task. However, this plan was modified because the only bid received was much higher than available funding. Thus, the BFW delegated the production of the CWCS to its own staff, an initiative that finally began a year later (October 2004).

The backbones of this CWCS are the list of the species of greatest conservation need (SGCN) and the section about critical wildlife areas (CWA). Our strategy emphasizes the study and conservation of species classified as Data Deficient (DD). This category identifies species whose status is of concern but data to support a current classification is lacking and need to be obtained. The habitat component incorporates two aspects: identification and protection. For such purposes, the CWCS involved the participation of several programs including the Natural Heritage Program, and the Puerto Rico Gap Project.

The Fisheries and Wildlife Strategic Plan (DNER 1996), the Regulation to Govern the Threatened and Endangered Species of the Commonwealth of Puerto Rico

(DRNA 2004), the Puerto Rico Critical Wildlife Areas (Ventosa-Febles et al. 2005a), the Puerto Rico Waterfowl Focus Areas (Ventosa-Febles et al. 2005b), and the Puerto Rico Gap Project provided the groundwork to generate the Puerto Rico CWCS. Without these documents, the completion of a strategy in such a short period of time would certainly have turned impossible. Another source of information concerning SGCN was the Puerto Rico and Virgin Islands Bird Conservation Plan (Núñez-García and Hunter 2000). In this draft plan, the authors identified historical and present habitat threats, conservation opportunities, and management strategies to protect priority resident and migratory birds. They assigned priority rankings for resident and migratory birds based on the Partners in Flight prioritization process (Hunter et al. 1993, Carter et al. 2000). Habitat requirements and biological information available were used to identify specific landscape bird population objectives and habitat conservation opportunities. In most cases, endangered resident species served as "umbrellas" to design conservation strategies and establish population objectives for other resident and migratory priority bird groups.

Active collaboration between DNER, the US Fish and Wildlife Service, universities, and several NGOs was the key to produce a first draft of the CWCS. A PDF version of this document was available for public revision and comments at the DNER website (www.drna.gobierno.pr).

The main goals of this CWCS are:

1. To identify and address the greatest conservation needs of Puerto Rico's fish and wildlife.

2. To prioritize efforts on species with the greatest conservation needs.

3. To allow DNER to work independently and in partnership to conserve, enhance and protect Puerto Rico's diverse, but not necessarily rare or at risk, fish and wildlife species and habitats.

4. To improve DNER's ability to address present and future challenges and opportunities to conserve fish and wildlife species and their habitats.

5. To integrate monitoring and management of hunted and non hunted species.

Chapter 1
INTRODUCTION

I. Background

Puerto Rico, the smallest (8,892 km^2) and most eastward (18º 15'North/66º 30' West) of the Greater Antilles, is surrounded by the Atlantic Ocean and the Caribbean Sea (Cruz and Boswell 1997). A varied topography, soils and climate produce distinct life zones (Ewel and Whitmore 1973) and several vegetation associations, ranging from high elevation dwarf cloud forest to alluvial swamps, and mangrove forest ecosystems. Physical features include rugged karst regions and one of the world's longest underground riverine cave networks and associated wildlife. The sharp variations of topography and climate over relatively reduced area produce a diverse assembly of localized habitat types and species. These assemblages are characterized by relatively high endemism, reduced population numbers, restricted occupation of specialized ecological niches and, consequently, a high degree of vulnerability to disturbance.

Puerto Rico has been degraded over the past 3 to 4 centuries as the swelling human population has increased the use of its natural and environmental resources, transforming significantly the landscape. In fact, the total human population increased 3.7 times during the 20^{th} century (Cruz and Boswell 1997). This population growth is inserted in a dramatic economical shift from agriculture (ca. 1930-1950) to industry (López et al. 2001). These demographic and economical changes resulted in a major deforestation during the first half of the past century. However, a remarkable recovery of the forest (6 to 34%) occurred later on these lands (Birdsey and Weaver 1987). Presently, these abandoned agricultural lands have been replaced by rapid urbanization (López et al. 2001), which coupled with invasive exotic species has impacted negatively the local biota and their habitat. The current mosaic of land use and conditions represents

a conservation challenge aimed at harmonizing habitat and species conservation in managed and undisturbed ecosystems.

Around 5,847 native wildlife species are currently known to Puerto Rico. Of these, 51 are reptiles (Rivero 1998), 18 amphibians (Rivero 1998), 5,573 insects (Torres and Medina-Gaud 1998), 190 birds (Raffaele 1989) and 15 mammals. Most of these species are considered non-game, and are under a low state of awareness on the part of the government and the general public. Unless a biodiversity issue exists, as in the case of threatened or endangered (T/E) forms, non-game species lack the public constituency needed to support basic research and management. As a result, the population status and distribution of most non-game, non-listed species are unknown, preventing the establishment of priority actions and management strategies.

Puerto Rico harbors only 7 species of native freshwater fishes and all are threatened by habitat modification, pollution and overfishing. However, there are 24 established nonindigenous fish species. Many of them like the Peacock Bass (*Cichla ocellaris*) the Channel Catfish (*Ictalurus punctatus*) and the Largemouth Bass (*Micropterus salmoides*) were introduced to reservoirs for sportfishing. Considerable habitat loss for freshwater fishes and invertebrates has resulted from water withdrawal from streams for domestic and industrial purposes, river canalization, and dam constructions. Habitat loss will worsen as human population grows and demand for water resources increases; recent periods of severe water shortage have already highlighted this problem (Lugo et al. 2004).

Inshore marine wildlife has declined as growing human population has increased pollution levels and the amount of fish harvested (Regulation No. 6766). Fisheries resources also have been harmed due to habitat destruction, particularly in the critical mangrove estuaries that serve as nurseries for fishes and their food (Wiley and Vilella 1998).

Consistent with the source-of-funds scheme, work on threatened and endangered species of federal concern has been characterized by annual grants from the United State Fish and Wildlife Service (USFWS) appropriation; which has been used for field research, propagation, and general coordination. Overall, recovery efforts are demonstrating encouraging results, but with 61 species falling under the Federal Endangered Species Act as of 1994, rigorous prioritization is obligatory. These 61 species are comprised of 5 mammals, 2 amphibians, 8 birds, 10 reptiles, and 36 plants.

State-listed species, whose conservation and recovery is mandated under the Regulation to Govern the Threatened and Endangered Species in the Commonwealth of Puerto Rico (Regulation No. 6766), have not been well protected, unless they are also included in the Federal list. The Commonwealth list includes 135 species (DRNA 2004). Of these, 8 are mammals, 9 amphibians, 27 birds, 17 reptiles, 20 invertebrates and 48 plants. In addition, 2 species of groupers, 1 mullet, 2 species of seahorses and 1 arthropod are considered threatened.

With the creation of the Department of Natural Resources (DNR) in 1972, the Puerto Rican government established the first administrative structure for the conservation of the natural resources of the island. In 1983, amendments (Article 5 of Law No. 23) further enabled the DNR to acquire, restore and manage habitats. Later, the Reorganization Plan Number 1 of 1993 renamed and restructured the DNR as the Department of Natural and Environmental Resources (DNER) and adopted the following mission:

To implement public policy and programs related to sustainable ecological development, utilization, exploitation, management, conservation and protection of the natural, environmental, and energy resources of Puerto Rico for present and future generations.

In Puerto Rico, management priorities for wildlife and fisheries resources have been sharply delineated by conditionality of the three principal federal funding sources that support the majority of our management efforts. These are the Federal Assistance in Wildlife, Sportfish Restoration Programs, and the Endangered Species Program. Today, DNER struggles to fulfill its fish and wildlife conservation responsibilities and provide for recreation and education on a very limited budget. While user fees and taxes paid by hunters and anglers have primarily financed management and restoration efforts for many years, these funds are mostly used for conservation of game species and are not sufficient to address the needs of the other species.

The consequences of inadequate funding are striking as more than 1,000 species are currently listed under the Endangered Species Act with hundreds more in the pipeline. For several years, the states have asked the US Congress to provide adequate and reliable funding to help reverse this trend and prevent species from becoming endangered. Congress responded by providing one-time state funding in the form of the Wildlife Conservation and Restoration Program in Fiscal Year 2001, and again with funding in 2002 via the State Wildlife Grants (SWG) Program.

This short-term funding is viewed by many as an important national recognition that fish and wildlife science is now concerned with whole communities of wildlife. By completing a Comprehensive Wildlife Conservation Strategy (CWCS) for Puerto Rico, DNER has the opportunity to fulfill its mission, incorporate the management of all species into new and existing programs, build valuable partnerships, and perhaps gain more secure, long-term funding that will prove as important and revolutionary as the Federal Sport Fish and Wildlife Restoration Acts. This strategy is in fact, a requirement to maintain eligibility to receive SWG funding.

II. Objective

The objective of this CWCS is (1) to identify the status of the species and their habitats, (2) to identify conservation priorities for these species and their habitats, and (3) to establish a regular monitoring process aimed at updating the previous two objectives. The CWCS considers the broad range of Puerto Rico's wildlife with appropriate emphasis placed on species/habitat with the greatest conservation needs, especially on Data Deficient (DD) species. The strategy also contemplates the funding available for the conservation of those species.

III. Expected Results and Benefits

The Puerto Rico CWCS will:

- Identify and address the greatest conservation needs of Puerto Rico's fish and wildlife.
- Prioritize efforts on species with greatest conservation needs.
- Allow DNER to work in partnership to conserve, enhance and protect Puerto Rico's diverse, but not necessarily rare or at risk, fish and wildlife species.
- Improve DNER ability to address present and future challenges and opportunities.
- Integrate monitoring and management of game and non-game species.

IV. Approach

Puerto Rico DNER developed this strategy using its own staff. However, stakeholders, the Academia, local and federal agencies, and the general public participated in the completion of the document. Authors employed the Guiding Principles for States to Consider in Developing Comprehensive Wildlife Conservation Plans for the State Wildlife Grant, and Wildlife Conservation and Restoration Programs. In addition, authors addressed broad wildlife conservation needs statewide, and provided specific and regional observations that focus on key habitats. Due to the need of actively involve internal (DNER

staff) as well as external audiences (citizens, stakeholders and constituents) from across the Island in the development of the CWCS, several participation processes were conducted within the DNER and in various communities island wide.

This CWCS fully addresses the following 8 required elements:

Element 1: Inventory

Information on the distribution and abundance of wildlife species, including low and declining populations as the State Fish and Wildlife Agency deems appropriate, that are indicative of the diversity and health of the State's wildlife.

Element 2: Condition

Description of the locations and relative condition of key habitats and community types essentials to conservation of species identified in Element 1.

Element 3: Threats

Descriptions of problems which may adversely affect species identified in Element 1 or their habitats, and priority research and survey effort needed to identify factors which may assist in restoration and improved conservation of these species and habitats.

Element 4: Actions

Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions.

Element 5: Monitoring

Proposed plans for monitoring species identified in Element 1 and their habitats, for monitoring the effectiveness of the conservation actions proposed in Element 4 and for adapting these conservation actions to respond appropriately to new information or changing conditions.

Element 6: Review

Descriptions of procedures to review the State Comprehensive Wildlife Conservation Strategy at intervals not exceeding ten years.

Element 7: Coordination

Plans for coordinating the development, implementation, review, and revision of the CWCS with federal, state, and local agencies.

Element 8: Public Participation

Involvement of general public in the development of the conservation strategy and resulting actions.

The Fisheries and Wildlife Strategic Plan (DNER 1996), the Puerto Rico Critical Wildlife Areas (Ventosa-Febles et al. 2005a), the Puerto Rico Waterfowl Focus Areas (Ventosa-Febles et al. 2005b), and the Puerto Rico Gap Analysis Project (ongoing) were used to support this CWCS. These documents provided detailed information about wildlife species and their habitat. Therefore, the use of these documents is recommended as reference for further information. Likewise Law No. 241 – The New Wildlife Law of Puerto Rico of August 15, 1999, and its Regulations (No. 6766 and No. 6765; DRNA 2004) provided the legal framework to protect the Puerto Rican wildlife resources and their habitats. These documents should be appropriately consulted when in-depth knowledge of a lawful issue is required.

Chapter 2
SPECIES OF CONSERVATION PRIORITY - ELEMENT 1

The New Wildlife Law of Puerto Rico (Law No. 241 of August 15, 1999) and its Regulations (Regulation No. 6765, for the Conservation and Management of Wildlife, Exotic Species and Hunting in the Commonwealth of Puerto Rico, and Regulation No. 6766, to Govern the Threatened and Endangered Species of the Commonwealth of Puerto Rico), are the legal framework that empowers DNER to protect the wildlife resources of Puerto Rico (DRNA 2004).

Species of conservation priority were originally listed in Regulation No. 6766 (Table 1). This regulation presented an updated species list with their respective level of endangerment. However, our CWCS includes an improved list of species of greatest conservation need (SGCN), using recently available source of information (e.g., Núñez-García and Hunter 2000, among others; Table 2). Some of this species will be recommended for listing under Regulation No. 6766.

Information about threats, population numbers, current distribution, and reason for categorization are included for each species. The DNER adapted the following five categories from the International Union for the Conservation of Nature (IUCN) Red List (1994) to classify those priority species (Table 1). See appendix I for detailed category definitions.

1. Critically Endangered (CR): A critically endangered species faces an extremely high risk of extinction in the wild in the immediate future.
2. Endangered (EN): A species is endangered when it is not CR, but faces a very high risk of extinction in the wild in the near future.

3. Vulnerable (VU): A species is vulnerable when it is not CR or EN, but it faces a high risk of extinction in the wild in a foreseeable future.
4. Low Risk (LR): A species is at low risk when, after an evaluation, it did not satisfy any of the previous categories (CR, EN, or VU) and it is not Data Deficient.
5. Data Deficient (DD): A species fall under to this category when there is not enough information for a direct or indirect assessment of its risk of extinction based on its distribution and/or population status. Some aspects of the ecology of a species in this category may be well studied and its biology might be well known, but appropriate data about its abundance and distribution may be lacking. Therefore, Data Deficient is not a threat category.

Table 1. Number of species per each taxon included in Regulation No. 6766 as species of conservation priority.

Taxon	CR	EN	VU	DD	LR	Total
Amphibians	3	1	4	1	0	**9**
Birds	7	5	5	9	1	**27**
Reptiles	3	6	3	5	0	**17**
Marine Mammals	0	1	1	0	0	**2**
Terrestrial Mammals	0	0	3	2	1	**6**
Fresh Water Fish **Marine Fish**	2	1	1	0	0	**4**
Terrestrial Invertebrates **Fresh Water Invertebrates**	2	0	1	8	8	**19**
Marine Invertebrates **Plants**	30	15	3	0	0	**48**
Total	**47**	**29**	**21**	**25**	**10**	**132**

SPECIES AND ACTIONS FOR PRIORIZATION

Conservation actions and funding allocation are ranked according to the level of endangerment of the taxon. Critically endangered species receive the highest conservation priority, followed by endangered, vulnerable and low risk (Figure 1). Data deficient species are important because they could be included into any of the previous categories after proper evaluation. However, DNER is strongly concerned about Data Deficient (DD) species (Table 2), which comprise the majority of SGCN. Thus, we seek to encourage and facilitate research on this group. Interestingly, a large portion of the DD species is considered non-game. The lack of information about non-game species is related principally to the scarcity of funds to determine basic population parameters and threats, although the academia and some NGOs have partially filled this knowledge gap.

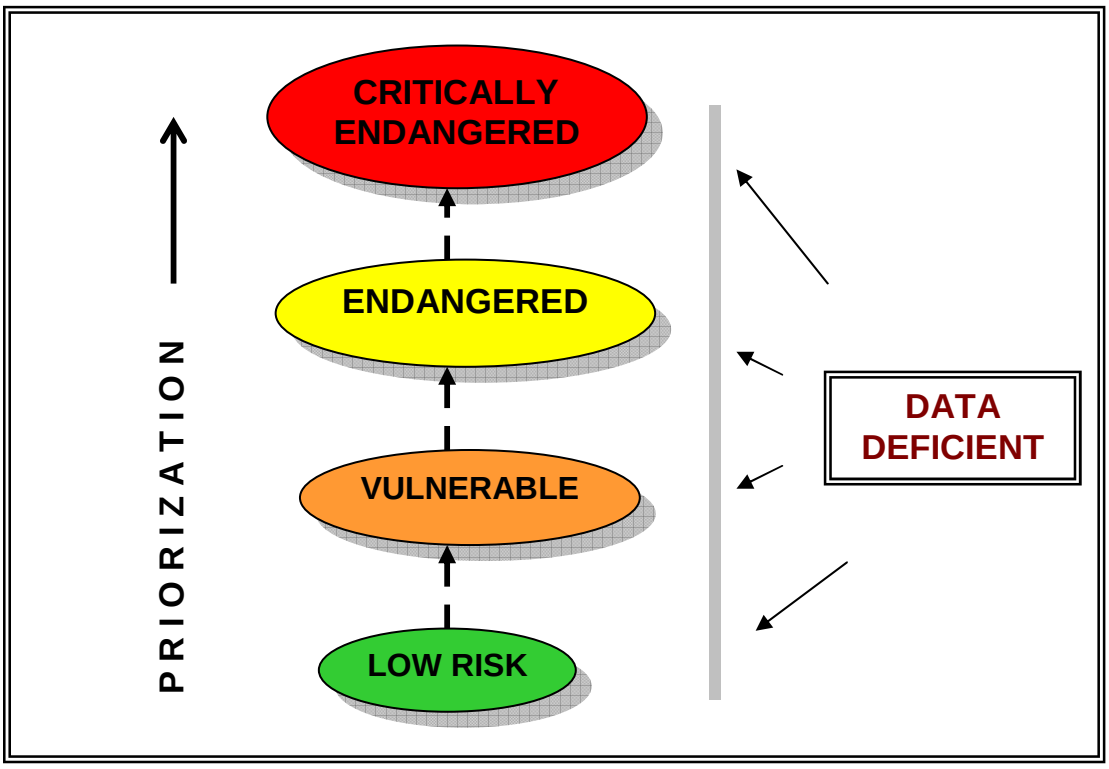

Figure 1. Scheme of species and actions of conservation priorization.

Table 2. Number of species per taxon included in the CWCS as species of greatest conservation need (SGCN). Plants (*) where not included as required by the funding source guidelines.

Taxon	CR	EN	VU	DD	LR	Total
Amphibians	4	1	4	6	0	**15**
Birds	10	5	7	58	2	**82**
Reptiles	3	6	3	8	0	**20**
Marine Mammals	0	4	1	12	0	**17**
Terrestrial Mammals	0	0	2	10	1	**13**
Fresh Water Fish **Marine Fish**	2	1	2	27	0	**32**
Terrestrial Invertebrates **Fresh Water Invertebrates** **Marine Invertebrates**	3	0	2	14	7	**26**
Plants	*	*	*	*	*	*****
Total	**22**	**17**	**21**	**135**	**10**	**205**

The following list details information related to species of greatest conservation need (SGCN) for Puerto Rico. Letters E, N, M, and I next to the scientific name indicate if the species is endemic, native, migratory, or introduced, respectively. Please refer to Appendix I for other letters definition.

STATUS AND PROTECTION OF SPECIES OF GREATEST CONSERVATION NEED (SGCN)

Marine Mammals

1. Family:	Balaenopteridae
Scientific Name:	*Balaenoptera acutorostrata* (N)
Common Name:	Minke Whale
Habitat:	Pelagic
Population Estimate:	Unknown
Reasons for Designation:	Overhunting
Category:	Data Deficient (DD)

2. Family:	Balaenopteridae
Scientific Name:	*Megaptera novaeangliae* (M)
Common Name:	Humpback Whale
Habitat:	Ocean, open water
Population Estimate:	In Puerto Rico between 150 and 200 individuals
Reasons for Designation:	Overhunting
Category:	Vulnerable (VU)

3. Family:	Balaenopteridae
Scientific Name:	*Balaenoptera borealis* (M)
Common Name:	Sei Whale
Habitat:	All ocean basins
Population Estimate:	Unknown
Reasons for Designation:	Overhunting
Category:	Endangered (EN)

4. Family:	Balaenopteridae
Scientific Name**:**	*Balaenoptera physalus* (M)
Common Name:	Fin Whale
Habitat:	Pelagic
Population Estimate:	Unknown
Reasons for Designation:	Overhunting
Category:	Endangered (EN)

5. Family:	Delfinidae
Scientific Name:	*Globicephala macrorhynchus* (N)
Common Name:	Short-Finned Pilot Whale
Habitat:	Continental shelf break, slope waters, areas of high topographic relief
Population Estimate:	Unknown

Reasons for Designation:	Fisheries interaction, entanglements, mass strandings, incidental bycatch
Category:	Data Deficient (DD)

6. Family:	Delfinidae
Scientific Name:	*Grampus griseus* (N)
Common Name:	Risso's Dolphin
Habitat:	Steep shelf edge between 400 and 1,000 m deep
Population Estimate:	Unknown
Reasons for Designation:	Fisheries interaction, entanglement
Category:	Data Deficient (DD)

7. Family:	Delfinidae
Scientific Name:	*Orcinus orca* (M)
Common Name:	Killer Whale
Habitat:	Within 800 km of continental coast
Population Estimate:	Unknown
Reasons for Designation:	Although presently not considered at risk, it could fall into this category
Category:	Data Deficient (DD)

8. Family:	Delfinidae
Scientific Name:	*Pseudorca crassidens* (N)
Common Name:	False Killer Whale
Habitat:	Pelagic, close to shore in oceanic Islands
Population Estimate:	Unknown
Reasons for Designation:	Deaths do to ingestion of discarded plastic, high level of toxins in tissues
Category:	Data Deficient (DD)

9. Family:	Delfinidae
Scientific Name:	*Stenella coeruleoalba* (N)
Common Name:	Striped Dolphin
Habitat:	Pelagic, insular slope,
Population Estimate:	Unknown
Reasons for Designation:	Incidental kills in fishery
Category:	Data Deficient (DD)

10. Family:	Delfinidae
Scientific Name:	*Stenella frontalis* (N)
Common Name:	Atlantic Spotted Dolphin
Habitat:	Shallow gently sloping waters of insular shelf, and the shelf break
Population Estimate:	Unknown
Reasons for Designation:	Incidental kills in fishery
Category:	Data Deficient (DD)

11. Family:	Delfinidae
Scientific Name:	*Stenella longirostris* (N)
Common Name:	Spinner Dolphin
Habitat:	Pelagic waters
Population Estimate:	Unknown
Reasons for Designation:	Incidental kills in fishery
Category:	Data Deficient (DD)

12. Family:	Delfinidae
Scientific Name:	*Steno bredanensis* (N)
Common Name:	Rough-toothed Dolphin
Habitat:	From shallow coastal to pelagic waters
Population Estimate:	Unknown
Reasons for Designation:	Habitat degradation

Category:	Data Deficient (DD)

13. Family:	Delfinidae
Scientific Name:	*Tursiops truncatus* (N)
Common Name:	Bottlenose Dolphin
Habitat:	From shallow to pelagic waters, over insular shelf and along shelf break
Population Estimate:	South-west coast of Puerto Rico: 314 individuals
Reasons for Designation:	Fisheries interaction, entanglement, ingestion of plastic, habitat degradation
Category:	Data Deficient (DD)

14. Family:	Physeteridae
Scientific Name:	*Physeter macrocephalus* (N)
Common Name:	Sperm Whale
Habitat:	Waters deeper than 1,000 m, close to oceanic islands
Population Estimate:	Unknown
Reasons for Designation:	Overhunting
Category:	Endangered (EN)

15. Family:	Physeteridae
Scientific Name:	*Kogia breviceps* (N)
Common Name:	Pygmy Sperm Whale
Habitat:	Mid to deep waters
Population Estimate:	Unknown
Reasons for Designation:	Ingestion of ocean debris such as plastic bags, occasional ship strikes
Category:	Data Deficient (DD)

16. Family:	Trichechidae
Scientific Name:	*Trichechus manatus* (N)

Common Name:	West Indian Manatee
Habitat:	Shore areas including river outlets
Population Estimate:	Between 150 and 200 individuals
Reasons for Designation:	Low populations numbers
Category:	Endangered (EN)

17. Family:	Ziphiidae
Scientific Name:	*Ziphius cavirostris* (N)
Common Name:	Cuvier's Beaked Whale
Habitat:	Open ocean, mesopelagic
Population Estimate:	Unknown
Reasons for Designation:	Military practices (strandings)
Category:	Data Deficient (DD)

Terrestrial Mammals

18. Family:	Molossidae
Scientific Name:	*Tadarida brasiliensis* (N)
Common Name:	Brazilian Free Tailed Bat
Habitat:	Hot caves
Population Estimate:	Unknown
Reasons for Designation:	Habitat loss - limited hot caves availability
Category:	Low Risk (LR) almost vulnerable (CA)

19. Family:	Molossidae
Scientific Name:	*Molossus molossus* (N)
Common Name:	Velvety Free-Tailed Bat
Habitat:	Mostly associated to human settlements
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range

Category:	Data Deficient (DD)

20. Family:	Mormoopidae
Scientific Name:	*Mormoops blainvillii* (N)
Common Name:	Antillean Ghost-faced Bat
Habitat:	Hot caves
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD). Listed as low risk by IUCN

21. Family:	Mormoopidae
Scientific Name:	*Pteronotus parnellii* (N)
Common Name:	Parnell's Mustached Bat
Habitat:	Humid and warm caves
Population Estimate:	Unknown. It is considered uncommon in Puerto Rico
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

22. Family:	Mormoopidae
Scientific Name:	*Pteronotus quadridens* (N)
Common Name:	Sooty Mustached Bat
Habitat:	Deep recesses of hot caves
Population Estimate:	Unknown. Over 140,000 in Cucaracha Cave, Aguadilla
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

23. Family:	Noctilidae
Scientific Name:	*Noctilio leporinus* (N)
Common Name:	Fishing Bat
Habitat:	Hot caves

Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range. Habitat loss, limited hot caves availability
Category:	Data Deficient (DD)

24. Family:	Phyllostomatidae
Scientific Name:	*Stenoderma rufum*
Common Name:	Red Fruit Bat
Habitat:	Hot caves
Population Estimate:	Unknown
Reasons for Designation:	Habitat loss, limited hot caves availability Endemic Genus of the Antilles
Category:	Vulnerable (VU): A1 (c)

25. Family:	Phyllostomatidae
Scientific Name:	*Erophylla sezekorni* (N)
Common Name:	Brown Flower Bat
Habitat:	Hot caves
Population Estimate:	Unknown
Reasons for Designation:	Habitat loss - limited hot caves availability
Category:	Vulnerable (VU): A1 (c)

26. Family:	Phyllostomatidae
Scientific Name:	*Artibeus jamaicensis* (N)
Common Name:	Jamaican Fruit Bat
Habitat:	Caves ranging from some that are shallow and well lighted to those that are deep and totally dark
Population Estimate:	Unknown. It is found in a wide range of caves than any other bat species
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

27. Family:	Phyllostomatidae
Scientific Name:	*Brachyphylla cavernarum*
Common Name:	Cave Bat
Habitat:	Hot caves
Population Estimate:	Unknown
Reasons for Designation:	Habitat loss - limited hot caves availability
	Endemic Genus of the Antilles
Category:	Data Deficient (DD)

28. Family:	Phyllostomatidae
Scientific Name:	*Monophyllus redmani* (N)
Common Name:	Greater Antillean Long Tongued Bat
Habitat:	Hot caves
Population Estimate:	Unknown
Reasons for Designation:	Habitat loss - limited hot caves availability
Category:	Data Deficient (DD)

29. Family:	Vespertilionidae
Scientific Name:	*Eptesicus fuscus* (N)
Common Name:	Big Brown Bat
Habitat:	Shallow caves and cave like structures, such as abandoned tunnels and culverts under roads
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

30. Family:	Vespertilionidae
Scientific Name:	*Lasiurus borealis* (N)
Common Name:	Red Bat
Habitat:	Various species of tree, including oaks, sweetgum, and tulip tree

Population Estimate: Unknown
Reasons for Designation: Suspected reduction in number/range
Category: Data Deficient (DD)

Birds

31. Family: Accipitridae
Scientific Name: *Accipiter striatus venator* (E)
Common Name: Sharp Shinned Hawk
Habitat: High elevation forests
Population Estimate: Less than 140 individuals
Reasons for Designation: Habitat loss and degradation, limited distribution
Category: Critically Endangered (CR): C2 (a)

32. Family: Accipitridae
Scientific Name: *Buteo platypterus brunnescens* (E)
Common Name: Broad Winged Hawk
Habitat: Dense forests
Population Estimate: Less than 150 individuals
Reasons for Designation: Habitat loss and degradation, limited distribution
Category: Critically Endangered (CR): C2 (a)

33. Family: Accipitridae
Scientific Name: *Falco peregrinus tundrius* (M)
Common Name: Peregrine Falcon
Habitat: Cays and rocks near the coast line, also in forests
Population Estimate: Unknown
Reasons for Designation: Few sightings
Category: Critically Endangered (CR) D

34. Family:	Anatidae
Scientific Name:	*Dendrocygna arborea* (N)
Common Name:	West Indian Whistling Duck
Habitat:	Freshwater forested wetlands and lagoons
Population Estimate:	About 100 individuals
Reasons for Designation:	Habitat loss and degradation, illegal hunting, and illegal egg collection
Category:	Critically Endangered (CR): A1 (a, b, c); B1, B2 (a, b c, d); C1; C2 (a); D; E

35. Family:	Anatidae
Scientific Name:	*Nomonix dominicus* (M)
Common Name:	Masked Duck
Habitat:	Fresh water and brackish water bodies, with floating vegetation
Population Estimate:	Less than 100 individuals
Reasons for Designation:	Habitats loss and degradation
Category:	Endangered (EN): C2 (a); D; E

36. Family:	Anatidae
Scientific Name:	*Oxyura jamaicensis* (N)
Common Name:	Ruddy Duck
Habitat:	Fresh water and brackish water bodies, more than three meters deep
Population Estimate:	About 1,500 individuals
Reasons for Designation:	Habitat loss and degradation, illegal hunting
Category:	Vulnerable (VU): D1; D2

37. Family:	Anatidae
Scientific Name:	*Anas bahamensis* (N)
Common Name:	White Cheeked Pintail

Habitat:	Mangrove, brackish and freshwater swamps
Population Estimate:	About 1,500 individuals
Reasons for Designation:	Habitat loss and degradation, illegal hunting, duckling depredation, and stealing of clutches
Category:	Vulnerable (VU): C2 (a); D1; D2; E

38. Family:	Anhingidae
Scientific Name:	*Fregata magnificens* (R)
Common Name:	Magnificent Frigatebird
Habitat:	Over bays, inshore waters and offshore cays
Population Estimate:	Unknown
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

39. Family:	Apodidae
Scientific Name:	*Cypseloides niger* (M)
Common Name:	Black Swift
Habitat:	Mountains, less frequently lowlands and coastal areas
Population Estimate:	Unknown. Uncommon breeding resident
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

40. Family:	Aramidae
Scientific Name:	*Aramus guarauna* (N)
Common Name:	Limpkin
Habitat:	Grassy freshwater wetlands, wooded floodplains, upland wet forest
Population Estimate:	Unknown. Uncommon on Hispaniola and presumed extirpated from Puerto Rico
Reason for Designation:	Probably overhunting and habitat destruction

Category:	Critically Endangered (CR)

41. Family:	Ardeidae
Scientific Name:	*Egretta rufescens* (M)
Common Name:	Reddish Egret
Habitat:	Primarily shallow, protected coastal waters, but also swamps edges
Population Estimate:	Unknown. Uncommon on Jamaica, rare on Hispaniola and very rare on Puerto Rico
Reason for Designation:	Habitat degradation
Category:	Data Deficient (DD)

42. Family:	Ardeidae
Scientific Name:	*Ixobrychus exilis* (N)
Common Name:	Least Bittern
Habitat:	Dense emergent vegetation of freshwater swamps, often with cattails, but also occurs in mangrove channels
Population Estimate:	Unknown. Fairly common in Puerto Rico, very rare in the Virgin Islands
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

43. Family:	Caprimulgidae
Scientific Name:	*Caprimulgus noctitherus* (E)
Common Name:	Puerto Rican Nightjar/Puerto Rican Whip Poor Will
Habitat:	Southwest dry forests with continuous canopy
Population Estimate:	About 1,500 individuals
Reasons for Designation:	Habitat destruction, contamination and limited distribution
Category:	Endangered (EN): B1; B2 (c, e)

44. Family:	Charadridae
Scientific Name:	*Charadrius alexandrinus* (M)
Common Name:	Snowy Plover
Habitat:	Mud and salt flats
Population Estimate:	About 40 individuals
Reasons for Designation:	Habitat loss
Category:	Critically Endangered (CR): D

45. Family:	Charadridae
Scientific Name:	*Charadrius melodus* (M)
Common Name:	Piping Plover
Habitat:	Mud and salt flats, sandy beaches
Population Estimate:	Unknown
Reasons for Designation:	Habitat loss
Category:	Critically Endangered (CR): D

46. Family:	Charadridae
Scientific Name:	*Charadrius wilsonia* (N)
Common Name:	Wilson’s Plover
Habitat:	Primarily on borders of salt ponds
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Critically Endangered (CR): D

47. Family:	Columbidae
Scientific Name:	*Patagioenas inornata wetmorei* (E)
Common Name:	Plain Pigeon
Habitat:	Secondary forests of east-central Puerto Rico
Population Estimate:	About 3,000 individuals

Reasons for Designation:	Habitat loss and degradation, limited distribution, and overhunting
Category:	Endangered (EN): B3 (a, b, c)

48. Family:	Columbidae
Scientific Name:	*Patagioenas leucocephala* (N)
Common Name:	White-crowned Pigeon
Habitat:	Coastal plains, moist forests, mangroves in the north and east of the Island
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

49. Family:	Columbidae
Scientific Name:	*Geotrygon chrysia* (N)
Common Name:	Key West Quail Dove
Habitat:	Costal forests
Population Estimate:	Unknown
Reasons for Designation:	Limited distribution, few sightings, and illegal hunting
Category:	Data Deficient (DD)

50. Family:	Columbidae
Scientific Name:	*Geotrygon montana* (N)
Common Name:	Ruddy Quail Dove
Habitat:	Dense forest and shade coffee plantations in the hills and mountains, but also locally on the coast
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range. Few sightings
Category:	Data Deficient (DD)
51. Family:	Columbidae
Scientific Name:	*Geotrygon mystacea* (N)

Common Name:	Bridle Quail Dove
Habitat:	Dense mountain forest with thick understory, also locally in coastal forests
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range. Few sightings
Category:	Data Deficient (DD)

52. Family:	Cuculidae
Scientific Name:	*Coccyzus minor* (N)
Common Name:	Mangrove Cuckoo
Habitat:	Dry scrub, mangroves, shade coffee plantations, and most areas with substantial forests or thickets except for high mountains
Population Estimate:	Unknown. Fairly common resident throughout West Indies, uncommon in Cuba
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

53. Family:	Cuculidae
Scientific Name:	*Saurothera vieilloti* (E)
Common Name:	Puerto Rican Lizard-Cuckoo
Habitat:	Haystack hills of the north coast, shade coffee plantations, all mountainous areas with thick forests, dry coastal forest in the vicinity of Guánica
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

54. Family:	Emberizidae
Scientific Name:	*Dendroica angelae* (E)
Common Name:	Elfin Wood Warbler

Habitat:	High montane moist forests (elevation between 370 and 1,030 m)
Population Estimate:	About 300 pairs
Reasons for Designation:	Suspected reduction in number/range, limited distribution and few sightings
Category:	Vulnerable (VU): C2 (a)

55. Family:	Emberizidae
Scientific Name:	*Dendroica petechia* (N)
Common Name:	Yellow Warbler
Habitat:	Primarily mangroves and coastal scrub forest
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, brood parasitism by Shiny Cowbird (*Molothrus bonariensis*)
Category:	Vulnerable (VU): C2 (a)

56. Family:	Emberizidae
Scientific Name:	*Ammodramus savannarum* (N)
Common Name:	Grasshopper Sparrow
Habitat:	Savanna plains and open fields
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, limited distribution and few sightings
Category:	Data Deficient (DD)

57. Family:	Emberizidae
Scientific Name:	*Dendroica adelaidae* (E)
Common Name:	Adelaide’s Warbler
Habitat:	Dry coastal scrubland and thickets and, to a lesser extent, moist limestone forests in haystack hills

Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

58. Family:	Emberizidae
Scientific Name:	*Dendroica caerulescens* (M)
Common Name:	Black-throated Blue Warbler
Habitat:	Forests, forest edges and woodlands primarily in the mountains, but also in moist to wet lowlands, infrequently in dry forests
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

59. Family:	Emberizidae
Scientific Name:	*Dendroica discolor* (M)
Common Name:	Prairie Warbler
Habitat:	Dry coastal forest, thickets, pastures with scattered trees, mangroves and gardens
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

60. Family:	Emberizidae
Scientific Name:	*Dolichonyx oryzivorus* (M)
Common Name:	Bobolink
Habitat:	Rice fields, fresh water marshes, pastures and areas where grass is seeding
Population Estimate:	Unknown. Uncommon in Puerto Rico
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

61. Family:	Emberizidae
Scientific Name:	*Euphonia musica* (N)
Common Name:	Antillean Euphonia
Habitat:	Dense forests from dry lowlands to wet mountain tops, particularly those with mistletoe
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

62. Family:	Emberizidae
Scientific Name:	*Geothlypis trichas* (M)
Common Name:	Common Yellowthroat
Habitat:	Wet grassy and brushy areas usually on the edges of freshwater swamps, ponds or canals
Population Estimate:	Unknown. Common in the Greater Antilles, rare in the Virgin and Cayman Islands
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

63. Family:	Emberizidae
Scientific Name:	*Loxigilla portoricensis* (E)
Common Name:	Puerto Rican Bullfinch
Habitat:	Particularly dense mountains forests, but also dry coastal thickets and infrequently in mangroves
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

64. Family:	Emberizidae
Scientific Name:	*Mniotilta varia* (M)

Common Name:	Black and White Warbler
Habitat:	Forests and wooded areas at all elevations
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

65. Family:	Emberizidae
Scientific Name:	*Nesospingus speculiferus* (E)
Common Name:	Puerto Rican Tanager
Habitat:	Primarily undisturbed mountain forests, but also on disturbed secondary growth forests
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, limited distribution
Category:	Data Deficient (DD)

66. Family:	Emberizidae
Scientific Name:	*Parula americana* (M)
Common Name:	Northern Parula
Habitat:	Primarily dry forests and scrub in lowlands, but also in moist mountain forests
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

67. Family:	Emberizidae
Scientific Name:	*Seiurus aurocapillus* (M)
Common Name:	Ovenbird
Habitat:	Principally woodlands and primary forest floor, often near streams or pools
Population Estimate:	Unknown

Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

68. Family:	Emberizidae
Scientific Name:	*Seiurus motacilla* (M)
Common Name:	Louisiana Waterthrush
Habitat:	Edges of flowing fresh water, often at higher elevations. Also sinkhole lakes in karst zones, and standing pools of rain water
Population Estimate:	Unknown. Common in the Greater Antilles, rare in the Virgin Island
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

69. Family:	Emberizidae
Scientific Name:	*Seiurus novaboracensis* (M)
Common Name:	Northern Waterthrush
Habitat:	Most often the borders of standing water, primarily saline and brackish, in or near mangroves and coastal scrub forests
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

70. Family:	Emberizidae
Scientific Name:	*Setophaga ruticilla* (M)
Common Name:	American Redstart
Habitat:	Usually forests and woodlands from the coast to the mountains, also gardens and shrubby areas
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range

Category:	Data Deficient (DD)

71. Family:	Emberizidae
Scientific Name:	*Spindalis portoricensis* (E)
Common Name:	Puerto Rican Stripe-headed Tanager
Habitat:	Woodlands and forests
Population Estimate:	Common and widespread, occurs at all elevations
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

72. Family:	Emberizidae
Scientific Name:	*Vireo altiloquus* (N)
Common Name:	Black-whiskered Vireo
Habitat:	Forest of all types, and at all elevations, woodlands, mangroves, tall understory and gardens
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

73. Family:	Emberizidae
Scientific Name:	*Vireo latimeri* (E)
Common Name:	Puerto Rican Vireo
Habitat:	Secondary forests
Population Estimate:	Unknown. Not enough data
Reasons for Designation:	Suspected reduction in number/range, exotic species introduction, and Shiny Cowbird parasitism
Category:	Vulnerable (VU)
74. Family:	Fringillidae
Scientific Name:	*Carduelis cucullata* (I)
Common Name:	Red Siskin
Habitat:	Open areas with grass

Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, limited distribution, few sightings and capture, endangered in Venezuela
Category:	Data Deficient (DD)

75. Family:	Haematopodidae
Scientific Name:	*Haematopus palliatus* (N)
Common Name:	American Oystercatcher
Habitat:	Typically stony beaches and rocky headlands of offshore islands and cays
Population Estimate:	Unknown
Reasons for Designation:	Restricted exclusively to a relatively scarce habitat type
Category:	Low Risk (LR)

76. Family:	Hirundinidae
Scientific Name:	*Pterochelidon fulva* (N)
Common Name:	Cave Swallow
Habitat:	Principally over fields, wetlands, around cliffs and in towns
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

77. Family:	Icteridae
Scientific Name:	*Agelaius xanthomus* (E)
Common Name:	Yellow-shouldered Blackbird
Habitat:	Mangroves in south and southwestern Puerto Rico
Population Estimate:	About 1,000 individuals

Reasons for Designation:	Habitat loss and degradation, brood parasitism by the Shiny Cowbird
Category:	Endangered (EN):B1; B3; C2 (a)

78. Family:	Icteridae
Scientific Name:	*Icterus dominicensis* (E)
Common Name:	Black-cowled Oriole
Habitat:	Mature secondary forests, coffee plantations, and urban areas
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range. Shiny cowbird parasitism
Category:	Data Deficient (DD)

79. Family:	Laridae
Scientific Name:	*Sterna dougalli* (N)
Common Name:	Roseate Tern
Habitat:	San Juan Harbor and Culebra Island
Population Estimate:	About 1,000 individuals
Reasons for Designation:	Reduced population, affected by human activities, predation by exotic and native species, and limited nesting sites
Category:	Vulnerable (VU): D1; D2

80. Family:	Laridae
Scientific Name:	*Anous stolidus* (N)
Common Name:	Brown Noddy
Habitat:	Far offshore
Population Estimate:	Unknown. Not enough data
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

81. Family:	Laridae
Scientific Name:	*Sterna antillarum* (N)
Common Name:	Least Tern
Habitat:	Calm water in low energy shores, nest in sandy beaches
Population Estimate:	About 300 individuals
Reasons for Designation:	Suspected reduction in number/range, few sightings
Category:	Data Deficient (DD)

82. Family:	Pelecanidae
Scientific Name:	*Pelecanus occidentalis* (N)
Common Name:	Brown Pelican
Habitat:	Harbors, cays, lakes, lagoons and estuaries
Population Estimate:	About 2,000 individuals
Reasons for Designation:	Low reproductive success and high juvenile mortality
Category:	Endangered (EN): C2 (a)

83. Family:	Phaethontidae
Scientific Name:	*Phaethon aethereus* (N)
Common Name:	Red-billed Tropicbird
Habitat:	Pelagic except when visiting sea cliffs for nesting
Population Estimate:	Unknown. Common in the Virgin Islands, uncommon and very local resident in Culebra Island
Reason for Designation:	Restricted nesting areas (rocky crevices on sea cliffs) due to introduced predators
Category:	Data Deficient (DD)

84. Family:	Phaethontidae
Scientific Name:	*Phaethon lepturus* (N)
Common Name:	White-tailed Tropicbird

Habitat:	Pelagic except when visiting sea cliffs for nesting
Population Estimate:	Unknown
Reason for Designation:	Restricted nesting areas (rocky crevices on sea cliffs) due to introduced predators
Category:	Data Deficient (DD)

85. Family:	Picidae
Scientific Name:	*Melanerpes portoricensis* (E)
Common Name:	Puerto Rican Woodpecker
Habitat:	From coastal plantations to mountain forest. Most common on hills and lower mountain areas including shade coffee plantations
Population Estimate:	Unknown. However, common in Puerto Rico and rare in Vieques Island
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

86. Family:	Podicipedidae
Scientific Name:	*Podilymbus podiceps* (N)
Common Name:	Pied-billed Grebe
Habitat:	Primarily fresh water, also brackish and hypersaline lagoons
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

87. Family:	Podicipedidae
Scientific Name:	*Puffinus iherminieri* (N)
Common Name:	Audubon’s Shearwater
Habitat:	Offshore islands. Pelagic
Population Estimate:	Unknown

Reasons for Designation:	Suspected reduction in number/range
Category:	Critically Endangered (CR)

88. Family:	Podicipedidae
Scientific Name:	*Tachybaptus dominicus* (N)
Common Name:	Least Grebe
Habitat:	Brackish and fresh water bodies, preferably with some vegetation
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, few sightings
Category:	Data Deficient (DD)

89. Family:	Psittacidae
Scientific Name:	*Amazona vittata vittata* (E)
Common Name:	Puerto Rican Parrot
Habitat:	Luquillo Experimental Forest
Population Estimate:	About 35 individuals in the wild, and 160 in captivity
Reasons for Designation:	Habitat loss, reduced population numbers
Category:	Critically Endangered (CR): B1; B3; D

90. Family:	Rallidae
Scientific Name:	*Fulica caribaea* (N)
Common Name:	Caribbean Coot
Habitat:	Brackish or freshwater swamps, marshes with sparse vegetation
Population Estimate:	About 1,000 individuals
Reasons for Designation:	Habitat degradation, illegal hunting
Category:	Vulnerable (VU) A1 (a, b, c); D

91. Family:	Rallidae

Scientific Name:	*Laterallus jamaicensis* (N)
Common Name:	Black Rail
Habitat:	Grassy marsh edges
Population Estimate:	Unknown
Reason for Designation:	Suspected reduction in number/range, limited distribution, few sightings
Category:	Data Deficient (DD)

92. Family:	Rallidae
Scientific Name:	*Porzana flaviventer* (M)
Common Name:	Yellow Breasted Crake
Habitat:	Freshwater marshes
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat degradation
Category:	Data Deficient (DD)

93. Family:	Rallidae
Scientific Name:	*Rallus longirostris* (N)
Common Name:	Clapper Rail
Habitat:	Salt marshes and mangroves
Population Estimate:	Unknown
Reason for Designation:	Habitat degradation, illegal hunting
Category:	Data Deficient (DD)

94. Family:	Scolopacidae
Scientific Name:	*Calidris canutus* (M)
Common Name:	Red Knot
Habitat:	Sandy tidal flats
Population Estimate:	Unknown, generally rare throughout the West Indies
Reason for Designation:	Suspected reduction in number/range

Category:	Data Deficient (DD)

95. Family:	Scolopacidae
Scientific Name:	*Calidris himantopus* (M)
Common Name:	Stilt Sandpiper
Habitat:	Mudflats and shallow lagoons
Population Estimate:	Unknown, generally uncommon in the West Indies
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

96. Family:	Scolopacidae
Scientific Name:	*Numenius phaeopus* (M)
Common Name:	Whimbrel
Habitat:	Ponds, swamps and marshes
Population Estimate:	Unknown. Generally an uncommon to rare, but regular migrant throughout the West Indies
Reason for Designation:	Suspected reduction in number/range
Category:	Low Risk (LR)

97. Family:	Strigidae
Scientific Name:	*Asio flammeus* (N)
Common Name:	Short-eared Owl
Habitat:	Open lowlands including pastures, short-grass marshlands and savannas
Population Estimate:	Unknown. Uncommon in Puerto Rico
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

98. Family:	Strigidae
Scientific Name:	*Megascops nudipes* (E)
Common Name:	Puerto Rican Screech Owl

Habitat:	All types of forests, from wet and wooded areas of the mountains, to isolated dense tree stands on the coast
Population Estimate:	Unknown. Distribution limited by the availability of trees with adequate roosting and nesting cavities Probably extirpated from Vieques
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

99. Family:	Sulidae
Scientific Name:	*Sula dactylatra* (R)
Common Name:	Masked Bobby
Habitat:	Mostly pelagic except when attending their nests confined to remote areas (i.e., Monito Island)
Population Estimate:	Unknown. The less abundant of the boobies
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

100. Family:	Sulidae
Scientific Name:	*Sula leucogaster* (R)
Common Name:	Brown Bobby
Habitat:	Bay, coastal areas and at sea
Population Estimate:	Unknown
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

101. Family:	Sulidae
Scientific Name:	*Sula sula* (R)
Common Name:	Red-footed Bobby
Habitat:	Pelagic, except when attending their nests
Population Estimate:	Unknown
Reason for Designation:	Suspected reduction in number/range

Category:	Data Deficient (DD)

102. Family:	Todidae
Scientific Name:	*Todus mexicanus* (E)
Common Name:	Puerto Rican Tody
Habitat:	Forested areas, including moist forests on hills and mountains, shade coffee plantations, and dense thickets in the arid lowlands of the south coast
Population Estimate:	Unknown
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

103. Family:	Trochilidae
Scientific Name:	*Anthracothorax dominicus* (N)
Common Name:	Antillean Mango
Habitat:	Clearings and scrubs in both arid and moist areas, also gardens and shade coffee plantations. More frequent on the drier southern coast and haystack hills
Population Estimate:	Unknown
Reason for Designation:	Population reduction on the Virgin Islands Nearly absent from east coast of Puerto Rico
Category:	Data Deficient (DD)

104. Family:	Trochilidae
Scientific Name:	*Anthracothorax viridis* (E)
Common Name:	Green Mango
Habitat:	Mountain forests and coffee plantations
Population Estimate:	Unknown
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

105. Family:	Trochilidae
Scientific Name:	*Chlorostilbon maugaeus* (E)
Common Name:	Puerto Rican Emerald
Habitat:	Primarily mountain forests and edges including shade coffee plantations, but also lowland wooded areas, and mangroves
Population Estimate:	Unknown
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

106. Family:	Trochilidae
Scientific Name:	*Eulampis holosericeus* (N)
Common Name:	Green-throated Carib
Habitat:	Primarily coastal areas
Population Estimate:	Unknown
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

107. Family:	Trochilidae
Scientific Name:	*Orthorynchus cristatus* (N)
Common Name:	Antillean Crested Hummingbird
Habitat:	Primarily lowland openings, gardens, forest edges and especially arid habitats, but also mountain forests
Population Estimate:	Unknown. Resident throughout the Lesser Antilles, Virgin Islands and Puerto Rico’s northeastern coast
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

108. Family:	Tyrannidae
Scientific Name:	*Contopus portoricensis* (E)

Common Name:	Puerto Rican Pewee
Habitat:	Moist forest and woodlands at moderate to low elevations, less frequent in drier habitat near sea level, and in mangroves
Population Estimate:	Unknown. Found almost exclusively in the western two-thirds of the island
Reason for Designation:	Suspected reduction in number/range, limited distribution
Category:	Data Deficient (DD)

109. Family:	Tyrannidae
Scientific Name:	*Elaenia martinica* (N)
Common Name:	Caribbean Elaenia
Habitat:	Woodlands, scrub and forests, primarily in dry lowlands
Population Estimate:	Unknown
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

110. Family:	Tyrannidae
Scientific Name:	*Myiarchus antillarum* (E)
Common Name:	Puerto Rican Flycatcher
Habitat:	Wooded areas, including mangrove borders, arid scrub, coffee plantations, haystack hills and mountain forests, except for the higher slopes
Population Estimate:	Unknown
Reason for Designation:	Limited distribution, population decline as a result of habitat destruction
Category:	Data Deficient (DD)

111. Family:	Tyrannidae

Scientific Name:	*Tyrannus caudifasciatus* (N)
Common Name:	Loggerhead Kingbird
Habitat:	Dry and wet woodlands, pine and broadleaf forests, shade coffee plantations, mangrove swamps and open areas with scattered trees from lowlands to mid-elevations
Population Estimate:	Unknown. Common in the Greater Antilles
Reason for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

Reptiles

112. Family:	Boidae
Scientific Name:	*Epicrates monensis granti* (N)
Common Name:	Puerto Rican Bank Boa/Virgin Island Boa
Habitat:	Trees with continuous canopy in Subtropical dry forest, sometimes in more mesic habitats
Population Estimate:	Unknown
Reasons for Designation:	Reduction in number/range, fragmented distribution
Category:	Critically Endangered (CR): A2 (a, b, c, d, e)

113. Family:	Boidae
Scientific Name:	*Epicrates monensis monensis* (E)
Common Name:	Mona Island Boa
Habitat:	Trees with continuous canopy in Subtropical dry forest and coastal cliffs
Population Estimate:	Unknown
Reasons for Designation:	Few sightings, feral mammals predation
Category:	Endangered (EN): A2 (a, b, c, d, e)

114. Family:	Boidae
Scientific Name:	*Epicrates inornatus* (E)
Common Name:	Puerto Rican Boa
Habitat:	Island-Wide up to 1,150 m of elevation
Population Estimate:	Unknown
Reasons for Designation:	Habitat destruction and incidental killing
Category:	Vulnerable (VU): A2 (c, e)

115. Family:	Cheloniidae
Scientific Name:	*Chelonia mydas* (N)
Common Name:	Green Sea Turtle
Habitat:	Marine grass prairies, and coral reefs, nest on sandy beaches
Population Estimate:	Unknown
Reasons for Designation:	Habitat destruction, pollution, and illegal fishing
Category:	Endangered (EN): A1 (a, b, c, d)

116. Family:	Cheloniidae
Scientific Name:	*Eretmochelys imbricata* (N)
Common Name:	Hawksbill Sea Turtle
Habitat:	Coral reefs, nests on sandy beaches
Population Estimate:	Unknown. About 275 juveniles and 800 reproductive individuals in Mona Island coral reefs
Reasons for Designation:	Habitat destruction, pollution, and illegal fishing
Category:	Endangered (EN): A1 (a, b, c, d)

117. Family:	Dermochelydae
Scientific Name:	*Dermochelys coriacea* (N)
Common Name:	Leatherback Sea Turtle
Habitat:	Open water of the North Atlantic Ocean
Population Estimate:	Unknown

Reasons for Designation:	Habitat destruction, pollution, and illegal fishing
Category:	Endangered (EN): A1 (a, b, c, d)

118. Family:	Emydidae
Scientific Name:	*Trachemys stejnegeri* (N)
Common Name:	Puerto Rican Slider
Habitat:	Ponds, lakes and rivers
Population Estimate:	Unknown
Reasons for Designation:	Potential hybridization with *Chrysemys scripta elegans*
Category:	Data Deficient (DD)

119. Family:	Gekkonidae
Scientific Name:	*Sphaerodactylus micropithecus* (E)
Common Name:	Monito Island Gecko
Habitat:	Under rocks and tree trunks on the rocky plateau
Population Estimate:	Unknown. Mean density of 0.45 individuals/m^2 on adequate habitats
Reasons for Designation:	Limited distribution and few sightings
Category:	Critically Endangered (CR): B1; B2 (b, e)

120. Family:	Gekkonidae
Scientific Name:	*Sphaerodactylus levinsi* (E)
Common Name:	Desecheo Island Gecko
Habitat:	Subtropical Dry forest, under leaf litter, rocks, and tree trunks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, limited distribution and few sightings
Category:	Data Deficient (DD)

121. Family:	Gekkonidae
Scientific Name:	*Sphaerodactylus gaigae* (E)
Common Name:	Pandura's Gecko
Habitat:	Under leaf litter, rocks, and tree trunks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, few sightings
Category:	Data Deficient (DD)

122. Family:	Iguanidae
Scientific Name:	*Cyclura cornuta stejnegeri* (E)
Common Name:	Mona Island Iguana
Habitat:	Grass and bushy areas in the Subtropical dry forest
Population Estimate:	About 2,500 individuals
Reasons for Designation:	High juvenile mortality, low population density, limited distribution
Category:	Endangered (EN): A2 (c, e); B2 (c, e) C1

123. Family:	Polychotridae
Scientific Name:	*Anolis roosevelti* (E)
Common Name:	Culebra's Giant Lizard
Habitat:	Mature forest -canopy
Population Estimate:	Known only from Culebra Island. Probably extinct
Reasons for Designation:	Not seen or collected since 1932
Category:	Critically Endangered (CR): B1; B3 (a)

124. Family:	Polychotridae
Scientific Name:	*Anolis cooki* (E)
Common Name:	Dry Forest Lizard
Habitat:	Grass and bushy areas in the Subtropical dry forest
Population Estimate:	Unknown
Reasons for Designation:	Limited distribution

Category:	Endangered (EN): B2 (a, b, c, d, e)

125. Family:	Polychotridae
Scientific Name:	*Anolis cuvieri* (E)
Common Name:	Giant Lizard/Giant Anole
Habitat:	Upland forests and karst
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, limited distribution
Category:	Data Deficient (DD)

126. Family:	Polychotridae
Scientific Name:	*Anolis poncensis* (E)
Common Name:	Southern Garden Lizard
Habitat:	Grass and bushy areas in Subtropical dry forest
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, limited distribution
Category:	Vulnerable (VU): B1; B2 (a, b, c, d, e); D2

127. Family:	Polychotridae
Scientific Name:	*Anolis occultus* (E)
Common Name:	Puerto Rican Twig Anole, Pygmy Anole
Habitat:	Upland forests
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

128. Family:	Teiidae
Scientific Name:	*Ameiva wetmorei* (N)
Common Name:	Southern Ground Lizard

Habitat:	Subtropical dry forests
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

129. Family:	Scincidae
Scientific Name:	*Mabuya mabouya sloani* (N)
Common Name:	Slippery Back Skink
Habitat:	Subtropical dry and moist forests, under leaf litter, rocks, and tree trunks
Population Estimate:	Unknown
Reasons for Designation:	Limited distribution and few sightings
Category:	Vulnerable (VU): A1 (a, c, e)

130. Family:	Typhlopidae
Scientific Name:	*Typhlops monensis* (E)
Common Name:	Mona Island Blind Snake
Habitat:	Subtropical dry forest, under rocks and tree trunks
Population Estimate:	Unknown. Not enough data
Reasons for Designation:	Suspected reduction in number/range, few sightings
Category:	Data Deficient (DD)

131. Family:	Typhlopidae
Scientific Name:	*Typhlops granti* (N)
Common Name:	Grant's Blind Snake
Habitat:	Subtropical dry forest, under rocks and tree trunks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, few sightings
Category:	Data Deficient (DD)

Amphibians

132. Family:	Bufonidae
Scientific Name:	*Peltophryne lemur* (E)
Common Name:	Puerto Rican Crested Toad
Habitat:	Rock crevices
Population Estimate:	Unknown
Reasons for Designation:	Habitat loss
Category:	Northern population: Critically Endangered (CR): A1 (a, c, e); B2 (a, b, c, d, e); D Southern population: Endangered (EN): A1 (a, c, e); B2 (c)

133. Family:	Leptodactylidae
Scientific Name:	*Eleutherodactylus eneidae* (E)
Common Name:	Eneida Coqui/Mottled Coqui
Habitat:	Forest elevations between 300-1,152 m, road slopes, and mossy tree trunks of less than 1 m high, on the ground or on palm leaves and trunks, tree ferns or bushes
Population Estimate:	Unknown. Probably extinct
Reasons for Designation:	Not sighted/detected since 1984
Category:	Critically Endangered (CR): A1 (a, c); A2 (c, d, e); B1; E

134. Family:	Leptodactylidae
Scientific Name:	*Eleutherodactylus jasperi* (E)
Common Name:	Golden Coqui
Habitat:	Forest bromeliads
Population Estimate:	Unknown. Probably extinct

Reasons for Designation: Not sighted/detected since 1981
Category: Critically Endangered (CR): A1 (a, c); A2 (a, b, c, d, e); B1; E

135. Family: Leptodactylidae
Scientific Name: *Eleutherodactylus karlschmidti* (E)
Common Name: Webbed Footed Coqui/Tree Hole Coqui
Habitat: Elevations between 45-630 m, mountains, rocks, and rocks associated with rivers, in holes between rocks near waterfalls, and rocks surface sprayed by water
Population Estimate: Unknown. Probably extinct
Reasons for Designation: Habitat loss, limited distribution, and few sightings
Category: Critically Endangered (CR): A1 (a, c); B1; B2 (a, b, c, d); E

136. Family: Leptodactylidae
Scientific Name: *Eleutherodactylus juanriveroi* (E)
Common Name: Plain Coqui
Habitat: Wet grassy lowlands in the Toa Baja Municipality
Population Estimate: Unknown. Recently discovered
Reasons for Designation: Extremely restricted distribution. Great threat from urban development and pollution
Category: Critically Endangered (CR): A1 (a, b, c,d,e); A2 (b, c, d, e); B1; C2(a,b), D

137. Family: Leptodactylidae
Scientific Name: *Eleutherodactylus cooki* (E)
Common Name: Cave Coqui/Rock Frog/Demon of Puerto Rico
Habitat: Caves, crevices and grottoes, between 91-303 m in elevation
Population Estimate: Unknown

Reasons for Designation:	Suspected reduction in number/range, habitat loss and limited distribution
Category:	Vulnerable (VU): B2 (a, b, c)

138. Family:	Leptodactylidae
Scientific Name:	*Eleutherodactylus locustus* (E)
Common Name:	Locustus Coqui/Warty Coqui
Habitat:	Open areas, and in the periphery of moist-dense forests with wide leaves, under leaf litter, tree trunks, and roots
Population Estimate:	Unknown
Reasons for Designation:	Loss of two populations from Luquillo Experimental Forest: one in the Dwarf Forest (Mount Britton), and the other on road 191. Limited distribution and few sightings
Category:	Vulnerable (VU): B1; D1

139. Family:	Leptodactylidae
Scientific Name:	*Eleutherodactylus richmondi* (E)
Common Name:	Richmond's Coqui/Mahogany Coqui
Habitat:	Elevations between 40 and 158 m, on the ground of moist and wet forests
Population Estimate:	Unknown. About 100 individual/ha in occupation area
Reasons for Designation:	Reduction in number/range
Category:	Vulnerable (VU): B1; D2

140. Family:	Leptodactylidae
Scientific Name:	*Eleutherodactylus portoricensis* (E)
Common Name:	Puerto Rican Mountain Coqui/Forest Coqui
Habitat:	High montane forest, over 180 m in elevation

Population Estimate:	Unknown. Around 800 individuals/ha in occupation area
Reasons for Designation:	Suspected and documented reduction in number/range
Category:	Vulnerable (VU): B2; C1

141. Family:	Leptodactylidae
Scientific Name:	*Eleutherodactylus brittoni* (E)
Common Name:	Grass Coqui
Habitat:	Open meadows, young sugarcane fields and other grasses
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

142. Family:	Leptodactylidae
Scientific Name:	*Eleutherodactylus gryllus* (E)
Common Name:	Cricket Coqui
Habitat:	Mesic forests, along forest edges or openings; diurnal retreats to bromeliads and under moss on rocks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

143. Family:	Leptodactylidae
Scientific Name:	*Eleutherodactylus hedricki* (E)
Common Name:	Hedrick’s Coqui
Habitat:	Elevations between 457 and 1,158 m, dense moist forests with broad leaves, tree trunk cavities and cracks, and tree branches

Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, limited distribution, and few sightings
Category:	Data Deficient (DD)

144. Family:	Leptodactylidae
Scientific Name:	*Eleutherodactylus monensis* (E)
Common Name:	Mona Island Coqui
Habitat:	Found on walls of shallow caves containing water, sinkholes, under galvanized sheets covering water reservoirs, bromeliads and vegetation
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in numbers
Category:	Data Deficient (DD)

145. Family:	Leptodactylidae
Scientific Name:	*Eleutherodactylus unicolor* (E)
Common Name:	Burrowing Coqui
Habitat:	Altitudinal distribution above about 674 to 1,045 m Under moss, rocks, and roots in elfin forest in Sierra de Luquillo
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range
Category:	Data Deficient (DD)

146. Family:	Leptodactylidae
Scientific Name:	*Eleutherodactylus wightmanae* (E)
Common Name:	Wrinkled Frog
Habitat:	Altitudinal distribution 308 to 1,189 m. Mesic upland forest, on the ground under rocks, dead trunks, and forest debris

Population Estimate: Unknown
Reasons for Designation: Suspected reduction in number/range
Category: Data Deficient (DD)

FRESHWATER FISHES

147. Family: Anguillidae
Scientific Name: *Anguilla rostrata* (N)
Common Name: American Eel
Habitat: Rivers and creeks
Population Estimate: Unknown
Reasons for Designation: Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category: Data Deficient (DD)

148. Family: Atherinidae
Scientific Name: *Malanorhinus boeki* (N)
Common Name: Pejerrey Lagunero
Habitat: Rivers and creeks
Population Estimate: Unknown
Reasons for Designation: Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category: Data Deficient (DD)

149. Family: Eleotridae
Scientific Name: *Dormitator maculatus* (N)
Common Name: Fat Sleeper
Habitat: Rivers and creeks
Population Estimate: Unknown
Reasons for Designation: Suspected reduction in number/range, habitat loss,

	pollution, and overfishing
Category:	Data Deficient (DD)
150. Family:	Eleotridae
Scientific Name:	*Eleotris pisonis* (N)
Common Name:	Spinycheek Sleeper
Habitat:	Rivers and creeks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

151. Family:	Eleotridae
Scientific Name:	*Eleotris amblyopsis* (N)
Common Name:	Sleeper
Habitat:	Rivers and creeks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

152. Family:	Eleotridae
Scientific Name:	*Erotelis smaragdus* (N)
Common Name:	Emerald Sleeper
Habitat:	Rivers and creeks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

153. Family:	Eleotridae
Scientific Name:	*Gobiomorus dormitor* (N)

Common Name:	Bigmouth Sleeper
Habitat:	River, creeks and dams
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

154. Family:	Eleotridae
Scientific Name:	*Guavina guavina* (N)
Common Name:	Guavina
Habitat:	Rivers and creeks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

155. Family:	Gobiesocidae
Scientific Name:	*Gobiesox nudus* (N)
Common Name:	Renacuajo de Río
Habitat:	Rivers and creeks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

156. Family:	Gobiidae
Scientific Name:	*Awaous banana* (N)
Common Name:	River Goby
Habitat:	Rives and creeks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss,

	pollution, and overfishing
Category:	Data Deficient (DD)
157. Family:	Gobiidae
Scientific Name:	*Sicydium plumieri* (N)
Common Name:	Cetí
Habitat:	Rivers and creeks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

158. Family:	Gobiidae
Scientific Name:	*Sicydium punctatum* (N)
Common Name:	Sirajo
Habitat:	Rivers and creeks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range. Habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

159. Family:	Haemulidae
Scientific Name:	*Pomadasys crocro* (N)
Common Name:	Burro
Habitat:	Rivers and creeks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

160. Family:	Mugilidae
Scientific Name:	*Joturus pichardi* (N)

Common Name:	Hognose mullet
Habitat:	Rivers and creeks, larval stage found in rocky bottoms with strong currents, sometimes in calm waters
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Critically Endangered (CR): C2 (b), D

161. Family:	Mugilidae
Scientific Name:	*Agonostomus monticola* (N)
Common Name:	Mountain Mullet
Habitat:	Rivers and creeks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

162. Family:	Paralichthyidae
Scientific Name:	*Citharichthys uhleri* (N)
Common Name:	Tapaculo
Habitat:	Rivers and creeks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

163. Family:	Syngnathidae
Scientific Name:	*Microphis brachyurus* (N)
Common Name:	Short-tail River Pipefish
Habitat:	Rivers and creeks

Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

164. Family:	Syngnathidae
Scientific Name:	*Pseudophalus mindii* (N)
Common Name:	Flautín de Agua Dulce
Habitat:	Rivers and creeks
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

SALTWATER FISHES

165. Family:	Centropomidae
Scientific Name:	*Centropomus ensiferus* (N)
Common Name:	Sword-spine Snook
Habitat:	Coastal pelagic species, anadromous, inhabits brackish and near freshwater areas
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, it is reported to be caught by commercial and recreational fishers
Category:	Data Deficient (DD)

166. Family:	Centropomidae
Scientific Name:	*Centropomus parallelus* (N)
Common Name:	Fat Snook

Habitat:	Coastal pelagic species, anadromous, inhabits brackish and near freshwater areas
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, it is reported to be caught by commercial and recreational fishers
Category:	Data Deficient (DD)

167. Family:	Centropomidae
Scientific Name:	*Centropomus pectinatus* (N)
Common Name:	Tarpon Snook
Habitat:	Coastal pelagic species, anadromous, inhabits brackish and nearly freshwater areas
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, it is reported to be caught by commercial and recreational fishers
Category:	Data Deficient (DD)

168. Family:	Centropomidae
Scientific Name:	*Centropomus mexicanus* (N)
Common Name:	Mexican Snook
Habitat:	Coastal pelagic species, anadromous, inhabits brackish and nearly freshwater areas
Population Estimate:	Unknown
Reasons for Designation:	First report of this species in Puerto Rico was in 1995, rarest among the snook species of PR
Category:	Data Deficient (DD)

169. Family:	Ginglymostomatidae
Scientific Name:	*Ginglymostoma cirratum* (N)
Common Name:	Nurse Shark

Habitat:	Very common inshore, around mangrove keys, on rocky reefs, and on sand flats
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, overfishing during mating in shallow waters
Category:	Vulnerable (VU): A1 (d), A2 (d)

170. Family:	Grammatidae
Scientific Name:	*Gramma loreto* (N)
Common Name:	Fairy Basslet
Habitat:	Found at depths ranging from few meters to 61 m, commonly found in caves or beneath ledges
Population Estimate:	Unknown
Reasons for Designation:	Highly prized in the aquarium trade, the most caught and imported fish species in Puerto Rico
Category:	Data Deficient (DD)

171. Family:	Megalopidae
Scientific Name:	*Megalops atlanticus* (N)
Common Name:	Tarpon
Habitat:	Coastal waters, bays, estuaries, and mangrove lined lagoons within tropical, suptropical, and temperate climates
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, it is reported to be caught by commercial and recreational fishers
Category:	Data Deficient (DD)

172. Family:	Mullidae
Scientific Name:	*Pseudupeneus maculatus* (N)
Common Name:	Spotted Goatfish

Habitat:	Inhabits shallow waters, usually not deeper than 50 m, especially over sand and rock bottoms in reef areas, juveniles are often found on sea grass beds
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, overfishing, and habitat loss and degradation
Category:	Data Deficient (DD)

173. Family:	Mullidae
Scientific Name:	*Mulloidichthys martinicus* (N)
Common Name:	Yellow Goatfish
Habitat:	Inhabits shallow waters, especially over sand in reef areas, less frequently over rock or coral ground
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, overfishing, and habitat loss and degradation
Category:	Data Deficient (DD)

174. Family:	Serranidae
Scientific Name:	*Epinephelus itajara* (N)
Common Name:	Goliath Grouper
Habitat:	Juveniles: mangrove lagoons Adults: coral reefs
Population Estimate:	Unknown. Uncommon, few sightings in the south coast (Peñuelas area)
Reasons for Designation:	Suspected reduction in number/range, overfishing
Category:	Critically Endangered (CR): A1 (a, b, d)

175. Family:	Serranidae
Scientific Name:	*Epinephelus striatus* (N)
Common Name:	Nassau Grouper

Habitat:	Coral reefs
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, overfishing
Category:	Endangered (EN): A1 (a, d)

176. Family:	Scaridae
Scientific Name:	*Scarus guacamaia* (N)
Common Name:	Rainbow Parrotfish
Habitat:	Coral reefs
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, possible overfishing due to its value in the ornamental, commercial and recreational industry
Category:	Data Deficient (DD)

177. Family:	Scaridae
Scientific Name:	*Sparisoma* spp (N)
Common Name:	Parrotfishes
Habitat:	Coral reefs
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, increase fishing pressure due to diminishing populations of more valued commercial species
Category:	Data Deficient (DD)

178. Family:	Sciaenidae
Scientific Name:	*Equetus lanceolatus* (N)
Common Name:	Jackknife
Habitat:	Usually found in deep water
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, highly valued

	as ornamental
Category:	Data Deficient (DD)

179. Family:	Syngnathidae
Scientific Name:	*Hippocampus* spp. (N)
Common Name:	Sea Horse
Habitat:	From shore to 15 m deep, associated with soft coral, mangroves, sea grass or Sargassum
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, overfishing due to its ornamental attractiveness
Category:	Vulnerable (VU): A1 (d)

INVERTEBRATES

180. Order:	Gastropoda
Scientific Name:	*Cittarium pica* (N)
Common Name:	West Indian Topshell
Habitat:	Rocky intertidal area, there is a zonation between larger and smaller individuals
Population Estimate:	Unknown. Average of 260 topshells/m^2 on suitable habitat
Reasons for Designation:	Overfishing, low recruitment
Category:	Data Deficient (DD)

181. Order:	Octopoda
Scientific Name:	*Octopus spp.* (possibly six species of this genus) (N)
Common Name:	Octopus
Habitat:	Depending on the species, inhabit shallow sea grass beds and sand flats, other species are common in

	shallow water coral reefs
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, some species are commercially exploited for food and others are exploited for aquarium trade
Category:	Data Deficient (DD)

182. Family:	Atyidae
Scientific Name:	*Typhlatya monae* (E)
Common Name:	Mona's Cave Shrimp
Habitat:	Ponds inside caves
Population Estimate:	Unknown
Reasons for Designation:	Restricted to two localities: Mona Island and Guánica Forest
Category:	Critically Endangered (CR): A1 (a, c)

183. Family:	Diadematidae
Scientific Name:	*Diadema antillarum* (N)
Common Name:	Long-spined Sea Urchin
Habitat:	Most common on rocky bottoms
Population Estimate:	Unknown
Reasons for Designation:	In early 1990's, populations were basically wiped out throughout the Caribbean, presumably by a disease
Category:	Data Deficient (DD)

184. Family:	Gammaridae
Scientific Name:	*Alloweckellia gurnee* (E)
Common Name:	Blind Amphipod/Fresh Water Cave Shrimp
Habitat:	Caves
Population Estimate:	Unknown
Reasons for Designation:	Extremely limited distribution

Category:	Critically Endangered (CR): B1

185. Family:	Gecarcinidae
Scientific Name:	*Gecarcinus lateralis* (N)
Common Name:	Mona/Monito/Little-land Crab
Habitat:	In holes no more than 3 ft deep, usually no more than 300 m from the coast
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, few sightings
Category:	Data Deficient (DD)

186. Family:	Gecarcinidae
Scientific Name:	*Gecarcinus ruricola* (N)
Common Name:	Purple Land Crab
Habitat:	Dry zones, under rocks, tree trunks or holes not too deep, in higher elevations than other terrestrial crab species. Can be found in shady areas a few kilometers inland
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, few sightings, very rare in Puerto Rico, common in Mona and Monito Islands
Category:	Vulnerable (VU): A1 (a,c,d); A2 (c,d)

187. Family:	Gecarcinidae
Scientific Name:	*Cardisoma guanhumi* (N)
Common Name:	Common Land Crab
Habitat:	Mangrove areas, grassland, coastal forests, in holes below the water table but no more than 8 ft deep
Population Estimate:	Unknown

Reasons for Designation:	Habitat loss and overfishing
Category:	Low Risk (LR): conservation dependant (cd)

188. Family:	Grapsidae
Scientific Name:	*Aratus pisonii* (N)
Common Name:	Mangrove Crab
Habitat:	Mangrove areas
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss
Category:	Data Deficient (DD)

189. Family:	Grapsidae
Scientific Name:	*Goniopsis cruentata* (N)
Common Name:	Mangrove Root Crab
Habitat:	Mangrove swamps adjacent to estuaries
Population Estimate:	Unknown
Reasons for Designation:	Habitat loss, limited distribution, commercial exploitation due to reduction in *Cardisoma guanhumi*
Category:	Low Risk (LR): near threatened (nt)

190. Family:	Ocypodidae
Scientific Name:	*Uca leptodactyla* (N)
Common Name:	Fiddler Crab
Habitat:	River bank outlets, and sandy shorelines with few mud areas
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, and overfishing
Category:	Data Deficient (DD)

191. Family:	Ocypodidae
Scientific Name:	*Uca thayeri* (N)
Common Name:	Fiddler Crab
Habitat:	Muddy areas in mangrove swamps, sand or in river mouths
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, and destruction
Category:	Data Deficient (DD)

192. Family:	Ocypodidae
Scientific Name:	*Uca vocator* (N)
Common Name:	Fiddler Crab
Habitat:	Muddy areas in mangrove swamps, sand or in river outlets
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, and destruction
Category:	Data Deficient (DD)

193. Family:	Ocypodidae
Scientific Name:	*Uca major* (N)
Common Name:	Fiddler Crab
Habitat:	Salt flats near mangroves or in river outlets
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss and destruction
Category:	Low Risk (LR): conservation dependant (cd)

194. Family:	Ocypodidae
Scientific Name:	*Ucides cordatus* (N)

Common Name:	Swamp Ghost Crab
Habitat:	Mangrove areas and swamps, in holes up to 2 ft deep
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, limited distribution and overfishing
Category:	Low Risk (LR): near threatened (nt)

195. Family:	Palaemonidae
Scientific Name:	*Macrobrachium acanthurus* (N)
Common Name:	Shrimp
Habitat:	Rivers, creeks and ponds
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

196. Family:	Palaemonidae
Scientific Name:	*Macrobrachium faustinum* (N)
Common Name:	Shrimp
Habitat:	Rivers, creeks, and ponds
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Data Deficient (DD)

197. Family:	Palaemonidae
Scientific Name:	*Macrobrachium heterochirus* (N)
Common Name:	Shrimp
Habitat:	Rivers, creeks and ponds
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss,

	pollution, and overfishing
Category	Data Deficient (DD)
198. Family:	Palaemonidae
Scientific Name:	*Macrobrachium carcinus* (N)
Common Name:	River Shrimp
Habitat:	Ponds and spaces under rocks in freshwater bodies and shore areas at elevations of 610 m, fallen leaves accumulated in pond bottoms, and in river caves
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss and overfishing
Category:	Low Risk (LR): conservation dependant (cd)

199. Family:	Palaemonidae
Scientific Name:	*Macrobrachium crenulatum* (N)
Common Name:	Shrimp
Habitat:	Rivers, creeks and ponds
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, habitat loss, pollution, and overfishing
Category:	Low Risk (LR) almost threatened (ca)

200. Family:	Palinuridae
Scientific Name:	*Panulirus laevicauda* (N)
Common Name:	Green Lobster
Habitat:	Reef caves and cracks, and rocky areas
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, limited and localized distribution
Category:	Vulnerable (VU): B1

201. Family:	Pseudothelpusidae
Scientific Name:	*Epilobocera sinuatifrons* (E)
Common Name:	Buruquena
Habitat:	River edges, and caves, low water rivers, and creeks
Population Estimate:	Unknown
Reasons for Designation:	Limited distribution, habitat loss, pollution, and over fishing, introduction of exotic species
Category:	Low Risk (LR): conservation dependant (cd)

202. Family:	Sabellidae
Scientific Name:	*Sabellastarte magnifica* (N)
Common Name:	Magnificent Feather Duster
Habitat:	Reefs, sand and gravel bottoms, piling and wrecks, often grows from coral heads
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, highly valued in the aquarium trade
Category:	Data Deficient (DD)

203. Family:	Sabellidae
Scientific Name:	*Bispirina brunnea* (N)
Common Name:	Social Feather Duster
Habitat:	Reefs, prefer areas with low water movement
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, highly valued in the aquarium trade
Category:	Data Deficient (DD)

204. Family:	Sabellidae
Scientific Name:	*Spirobranchius giganteus* (N)

Common Name:	Christmas Tree Worm
Habitat:	Reefs areas, tubes usually encased in living coral
Population Estimate:	Unknown
Reasons for Designation:	Suspected reduction in number/range, highly valued in the aquarium trade
Category :	Data Deficient (DD)

205. Family:	Nymphalidae
Scientific Name:	*Atlantea tulita* (E)
Common Name:	Butterfly
Habitat:	Open areas in association with the plant *Oplonia spinosa* (Acanthaceae)
Population Estimate:	Unknown
Reasons for Designation:	Extremely restricted distribution
Category:	Critically Endangered (CR): B1; B2 (d)

Chapter 3
HABITAT REQUIREMENTS AND INFORMATION NEEDS FOR PRIORITY SPECIES (ELEMENTS 2 & 3)

Most of the information related to the species included on the Species of Greatest Conservation Need (SGCN) list was compiled as part of the revision conducted between 2002 and 2003 of Regulations No. 6765 and 6766. A first draft of this list was produced by the Bureau of Fisheries and Wildlife staff which was later revised by the scientific community, general public and interested non-governmental organizations. The final product was a comprehensive accomplishment, more broad and updated than the USFWS list of threatened and endangered (T/E) species for Puerto Rico.

Research to understand the natural history of priority species, habitat requirements, demographics, activity patterns, and home ranges is needed to develop conservation and management plans. DNER has been gathering biological/habitat information and monitoring game species that are currently hunted (e.g., Scaly-naped Pigeon *Patagioenas squamosa*) or have the potential to be hunted (e.g., White-crowned Pigeon *Patagioenas leucocephala*) or are listed as T/E species in Puerto Rico. However, the long-term conservation of biological diversity of Puerto Rico would benefit from a comprehensive, spatially based bank of information of its wildlife and associated habitats. Several approaches are currently ongoing or completed within DNER or through interagency collaboration.

Puerto Rico GAP Analysis

The ongoing Puerto Rico Gap Analysis (PR-GAP) is a spatially based project designed to provide comprehensive species/habitat information. Gap analysis was developed as a proactive coarse-filter approach to protect biodiversity (Scott et al. 1987 and 1993). The PR-GAP will provide an overview of the island's biological diversity, serve as a benchmark for landscape conservation

approaches and provide resource managers with a tool to set up conservation priorities (e.g., land acquisition). This project is a joint effort among the DNER, the U.S. Forest Service International Institute of Tropical Forestry (IITF), the North Carolina Cooperative Fish and Wildlife Research Unit (NCSU), and the U.S. Geological Survey Biological Resources Division.

The Gap Analysis seeks to identify "gaps" (i.e., vegetation types or species not adequately represented in areas managed for long term maintenance of natural systems) that may be filled through changes in land management practices. GAP researchers use terrestrial vertebrates and vegetation alliances as indicators of, or surrogates for, biodiversity (Austin and Margules 1986, Scott et al. 1993, National Gap Analysis Program 1994, Csuti and Kiester 1996, Noss and Cooperrider 1994, Jennings 1996). Digital maps containing these elements of diversity are overlaid in a GIS with maps of areas managed for biodiversity and land ownership to identify those that are underrepresented in the existing network of areas.

a. Land Cover – IITF, in coordination with DNER, developed a semi-automated process to create a Landsat-7 ETM+ image mosaic based on 2001-2003 satellite imagery that is 97.5% cloud and cloud-shadow free (Martinuzzi et al. 2003a). Initial classification includes mapping the extent of four classes of urban cover in Puerto Rico (Martinuzzi et al. 2003b). Urban cover comprises nearly 15% of the land surface of Puerto Rico, and the urban forest and low- and high- intensity urban land cover classes are important in both our habitat modeling, and in understanding the dynamics of land cover changes and threats to habitat sustainability and biodiversity. Vegetation descriptions have been compiled from the plant community, and later organized into a hierarchical structure along gradients of climate, substrate, and topographic position (Gould et al. 2003a). The analysis includes an updated map of the physiography of Puerto Rico (Gould et al. 2003b), and an analysis and a map of the landforms (slope position) of Puerto Rico (Martinuzzi et al. 2003c) (Figure 2).

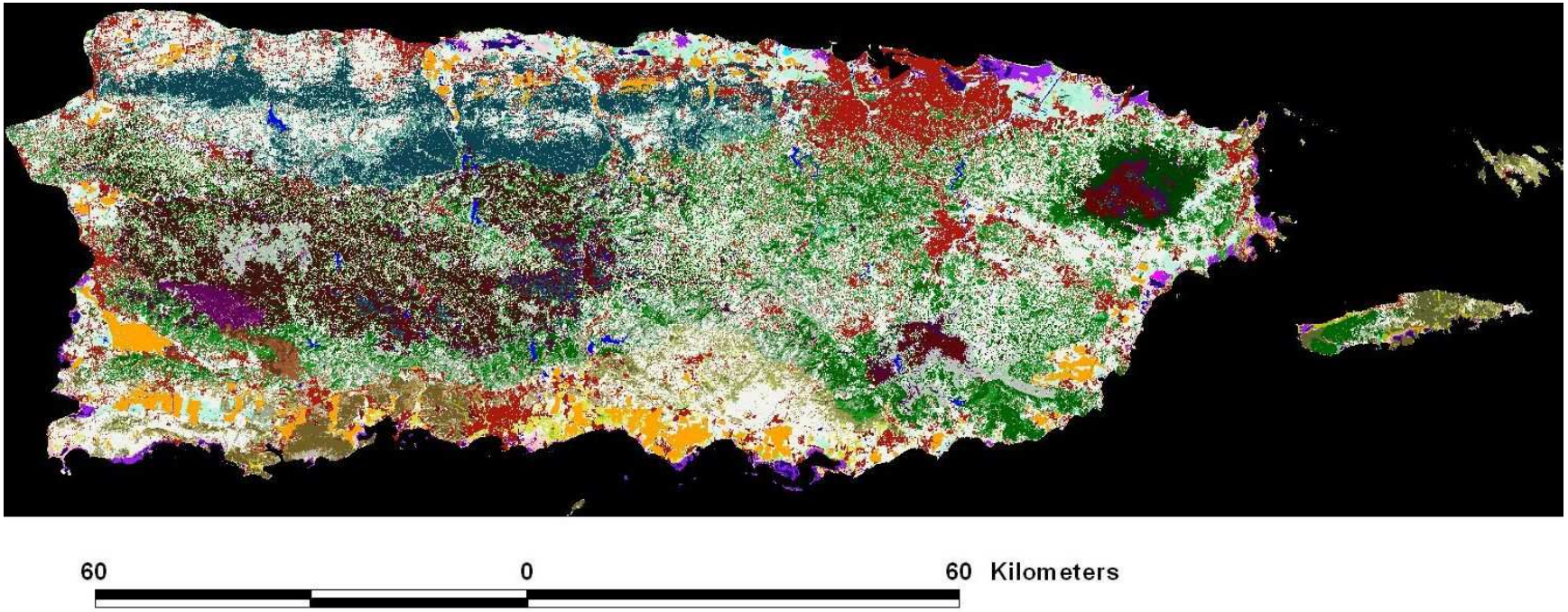

Figure 2. Puerto Rico Land Cover 2004. Data obtained from Gould et al. 2007.

b. Animal Modeling – The original list of 437 vertebrate species has gone through expert review and now the list consists of 426 vertebrate species known to occur across Puerto Rico or its offshore islands. A large proportion of Puerto Rico's vertebrate fauna is composed of species dependent upon aquatic and/or coastal-marine habitats. Therefore, DNER is developing the relational database model with the understanding that the aquatic and marine species are important components of the landscape and have good potential for gap analysis after the completion of the terrestrial PR-GAP. A subset of 168 species was identified to be included in the terrestrial component of the gap analysis. This list contains those species considered endemic, resident, breeding migrants, and species of conservation concern that have become established through human introductions (e.g., Small Indian Mongoose *Herpestes javanicus*) or range expansion (e.g., Hispaniolan Parrot *Amazona ventralis*). The PR-GAP adopted a modification of the U.S. Forest Service's Forest Inventory and the Analysis hexagon grid of the Caribbean as the minimum mapping unit for creating species' geographic range maps. The smaller hexagon size (24 km^2) was considered as a valid scale for representing species distribution while considering the challenge of representing Puerto Rico's diverse and heterogeneous landscape. The Puerto Rico Ornithological Society assisted in the development of field survey methods for a Breeding Bird Atlas for Puerto Rico and to incorporate PR-GAP data, maps, and analyses into the Atlas. Peer revisions of species geographic range maps are currently in progress (Figure 3).

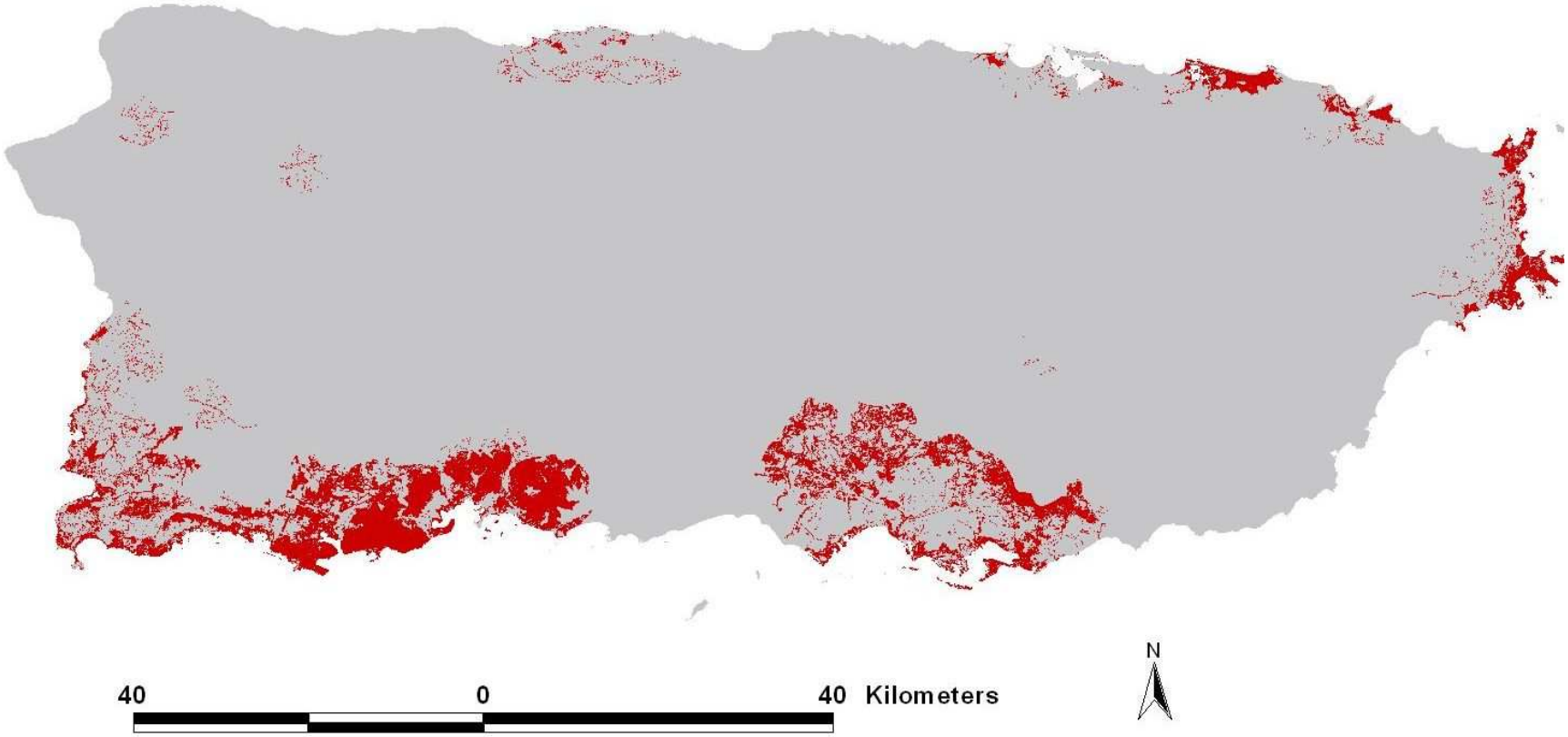

Figure 3. Example of a geographic range map for the endangered Yellow-shouldered Blackbird *Agelaius xanthomus*. Data obtained from Gould et al. 2007.

c. Land Stewardship Mapping – DNER is currently establishing an interagency collaborative effort to update an existing, but incomplete, land stewardship layer of Puerto Rico. To date, we have identified a total of 21 public land managers (Figure 4). Land management areas will be identified contacting land managers to determine management policies, classifying land parcels into the management strategies used in the GAP program, and developing a land management geospatial database in order to facilitate the final GAP analyses.

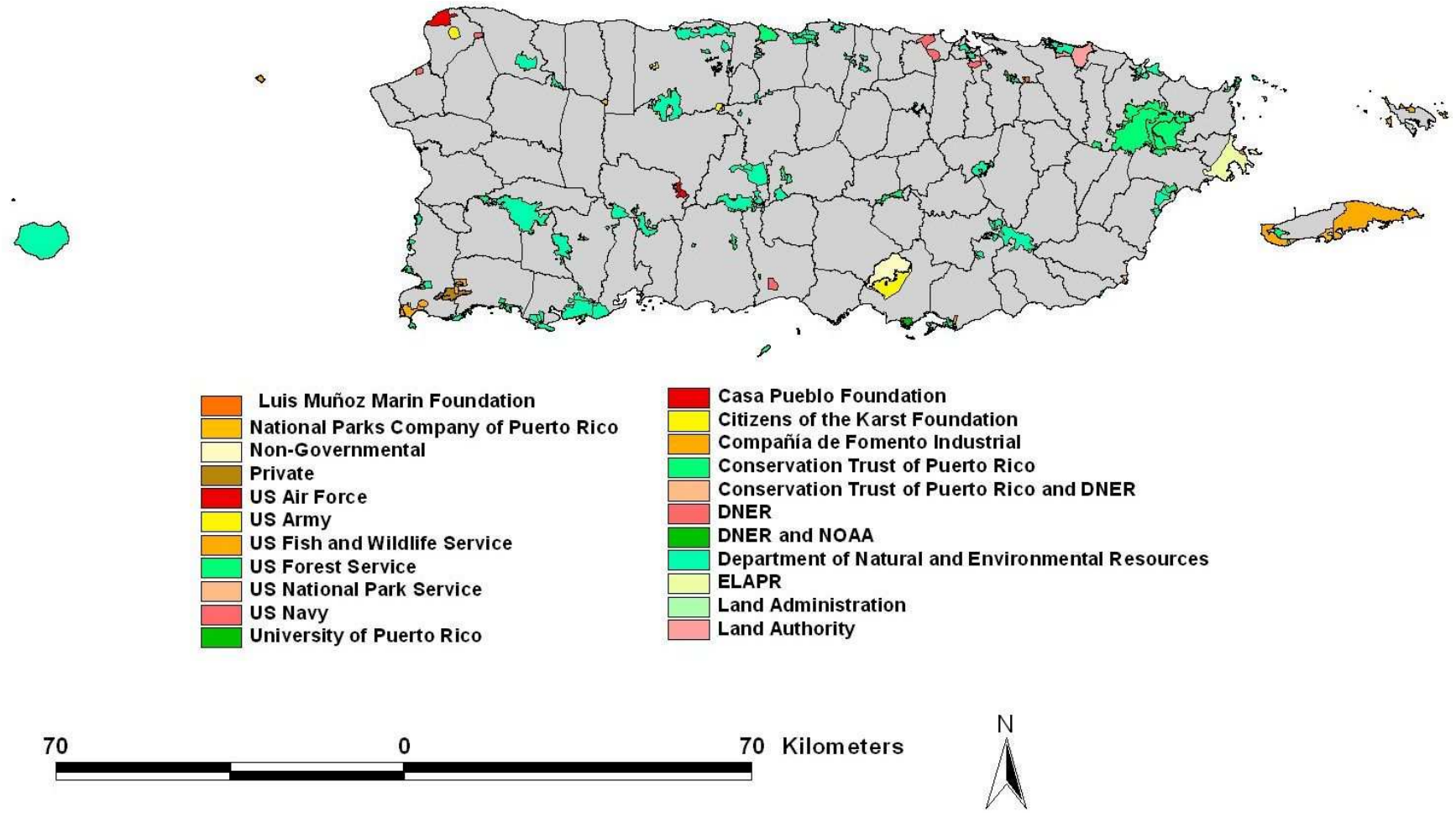

Figure 4. Puerto Rico Land Stewardship. Data obtained from Gould et al. 2007

DNER Natural Heritage Program

DNER's Natural Heritage Program (NHP) maintains a conservation data center of species of concern or critical elements (Figure 5). This information is available to other DNER divisions, partners, and general public. The conservation data center employs a full time manager who maintains updated maps of species distribution, and provides technical assistance to use the data bank. Relevant data is obtained mostly from other DNER units, federal institutions, and the academia.

Critical elements according to NHP are not limited to federally or locally listed species. Species important to the Puerto Rican heritage (e.g., Common Coqui *Eleutherodactylus coqui*), or some endemics (e.g., Mona Island Gecko *Sphaerodactylus monensis*) although very abundant, are considered critical elements for this unit.

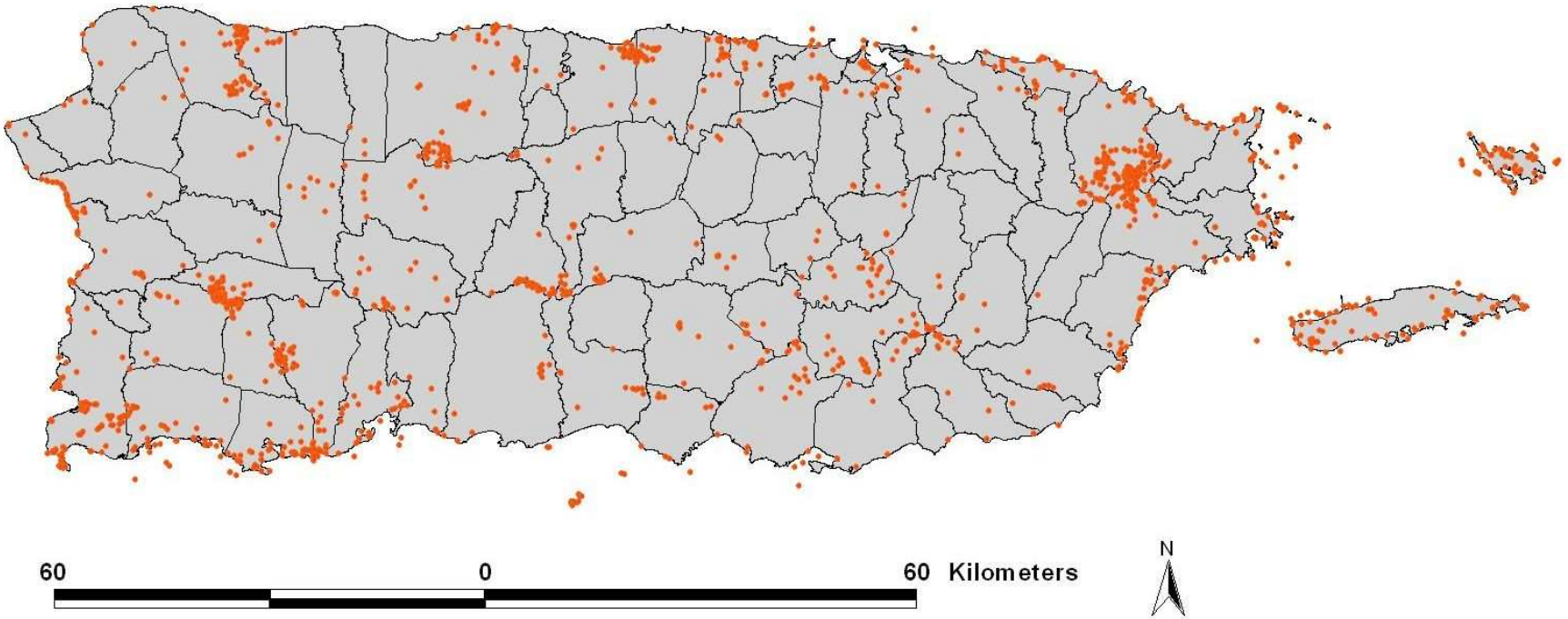

Figure 5. Natural Heritage Program critical elements distribution. This map does not illustrate Mona, Monito, Desecheo and Caja de Muerto Islands.

Chapter 4
IDENTIFYING STRESSORS/THREATS TO PUERTO RICO'S WILDLIFE (ELEMENT 3)

The Caribbean region is one of the world's biodiversity hotspots (Myers et al. 2000). Historically, the landscape of Puerto Rico has undergone widespread deforestation. In fact, by the 1930's only 6-15% of the surface area of the island was covered by forest. Forest conversion had profound effects on the resident avifauna, our largest group of terrestrial vertebrates. It is believed that forest destruction precipitated the extinction of the Culebra Island race of the Puerto Rican Parrot (*Amazona vittata gracilipes*), and the extirpation of the White-necked Crow (*Corvus leucognaphalus*) (Raffaele 1983, Snyder et al. 1987). The distribution of presently endangered species like the Broad-winged Hawk (*Buteo platypterus brunnescens*), Sharp-shinned Hawk (*Accipiter striatus venator*), and the Puerto Rican Nightjar (*Caprimulgus noctitherus*) became restricted due to habitat destruction (Raffaele 1983). The distribution of other more common forest dependant species such as the Puerto Rican Tanager (*Nesospingus speculiferus*) was also limited by the accelerated forest conversion. Nevertheless, the species-habitat relationships for many species are not straightforward; hence, more integrated approaches to conservation are necessary.

Many members of island bird communities tend to be ecological generalists and opportunistic species (Ricklefs and Cox 1978, Abbot 1980, Terborgh 1980, Blondel 1985). These attributes lead to unsuspected ecological resiliency in many instances (Lugo 1988). Indeed, it has been postulated that these traits may have ameliorated extinction rates of resident avifauna in Puerto Rico during the 20th century (e.g., Brash 1987). In addition, some agricultural activities such as the cultivation of shade coffee in the mountains may have served as surrogate refugia for some of the more plastic flora and fauna.

Towards the latter part of the 20th century, forested acreage increased in Puerto Rico to about 35% (Birdsey and Weaver 1982). This encouraging trend was driven primarily by a socio-economic transition from an agrarian to an industrialized society. Although gains in forested habitats must have been beneficial to many elements of the island's biodiversity, the reality is that Puerto Rico's increasing human population is reverting this trend through urbanization (López et al. 2001). The human population of Puerto Rico increased almost 3.7 times from 1899 to 1992, causing an increment in the number of settlements (Cruz-Báez and Boswell 1997). In 2000, the population of the island was estimated at 3.8 million people with a density of 1,112 persons per square mile (U.S. Census Bureau 2000). A significant part of urban expansion on the island has been the product of a suburbanization process, or the outward physical expansion of urban areas toward rural areas (Cruz-Báez and Boswell 1997).

Habitat loss and fragmentation also has increased the threat that stochastic events like hurricanes and tropical storms pose to plants and animals on the island (e.g., Wiley and Wunderle 1993). The Puerto Rican Parrot (*Amazona vittata*) is probably the best example of a species affected when habitat is reduced and fragmented, and is impacted by hurricanes. Historically, this species was widespread and abundant throughout Puerto Rico. However, due to habitat loss, it is now restricted to the Luquillo mountains (USFWS 1987). Thus, a direct hit by a hurricane to these mountains can put the entire wild parrot population (ca. 35 individuals) at risk (Wiley and Vilella 1998). In fact, about half of the wild parrot population disappeared when hurricane Hugo struck the Luquillo forest in 1989 (Vilella and García 1995). Because hurricanes are natural disturbances that cannot be controlled, it is essential to restore habitats and reduce fragmentation in order to decrease the damage that such disturbances can cause to wildlife populations.

Freshwater marshes and forested wetlands (e.g., mangroves and *Pterocarpus* sp.) were largely reduced due to crop production and deforestation for fuel-wood and charcoal (Lugo and Brown 1988a). These activities reduced the *Pterocarpus*

(Swamp Bloodwood) swamps in Puerto Rico to only 14 stands, occurring scattered throughout the island, and caused the loss of 50% of the mangrove forest (Carrera and Lugo 1978, Cintrón 1983). Other threats to remaining mangrove forests and other coastal wetlands include draining, dredging, siltation, eutrophication, dumping, tourism impact, housing, and road construction (Martínez et al. 1979, Lugo and Brown 1988a). In Puerto Rico, the total area of wetlands has been estimated at approximately 5,779 ha, which represents about 50% of the original extent of wetlands on the island (Martínez et al. 1979, Lugo and Brown 1988b).

Wetland reduction has resulted in the fragmentation of what once was an extensive and continuous coastal corridor. Wetlands in the eastern Caribbean region are rare and severely degraded ecosystems (Martínez et al. 1979). These ecosystems also are small relative to those of North America, which make them vulnerable to destruction (Lugo and Brown 1988b). Furthermore, due to the land use history in Puerto Rico, most of the remaining coastal wetlands are marginal habitat for most waterbirds. To date, dense stands of invasive vegetation (e.g., *Typha dominguensis*) have developed after sugarcane production ceased in coastal plains. That densely overgrown vegetation may limit access by waterbirds, either for feeding or nesting (Weller and Fredrickson 1974, Kaminski et al. 1985).

Habitat degradation and colonization by invasive species may jeopardize what is left of natural areas that serve as wildlife habitat. Landscape changes are taking place rapidly and are particularly important because most development is occurring on private lands, which comprise 85% of the total area of Puerto Rico. Thus, it is not surprising that most fish and wildlife resources are found on private properties, underscoring the importance to protect those areas. Government agencies like DNER have the responsibility of regulating land use practices that may jeopardize the fish and wildlife resources of the island. Implementation of pro-active conservation practices on private land, and evaluating and submitting

ecologically sound recommendations on development projects is imperative to conserve our island-wide wildlife populations.

Another particular predicament for native wildlife communities and species of conservation priority is the introduction of invasive exotic species. Many studies have documented the negative effects of such species, which have resulted in losses of native species, changes in community structure and function, and even alterations of the physical structure of the system (Money and Drake 1986, Drake et al. 1989). For example, introductions of domestic cats (*Felis catus*) resulted in detrimental effects, including extinctions, on native prey populations (Ebenhard 1988). In Puerto Rico, there are already established a number of exotic species whose negative effects on native fauna have been documented (Camacho-Rodríguez et al. 1999, García et al. 2001 and 2002).

Nonetheless, there are many other introduced species (e.g., Green iguana [*Iguana iguana*], Australian Red Claw crawfish [*Cherax quadricarinatus*], Yellow-crowned parrot [*Amazona amazonica*], feral pigs [*Sus scrofa*] and goats [*Capra hircus*] on Mona Island, White-tailed deer [*Odocoileus virginianus*] on Culebra Island, and Bottlebrush tree [*Melaleuca quinquenervia*]) that potentially affect the native flora and fauna of Puerto Rico. Also, exotic bird species may be vectors of diseases that could negatively affect native fauna, especially those classified as vulnerable or endangered (Camacho-Rodríguez et al. 1999). However, the impact of these species has not been comprehensively quantified. Due to the potential establishment of exotic animals imported as pets, DNER regulates through Regulation No. 6765, all wildlife species introductions and breeding. This document presents several lists that establish the following criteria:

1. Low Risk Species that can be imported without a permit.
2. Established Exotic Species that can be captured for exportation.
3. Exotic species that can be bred with or without authorization.

There are major threats/stresses that currently affect our wildlife (Table 3). Most of them are well known like urban development but others are more subtle like the installation of power lines.

Table 3. Threat categories and classes used for Puerto Rico Critical Wildlife Conservation Strategy.

Threat Category	Threat Class
Habitat Conversion: Intentional conversion of natural habitat that is detrimental to wildlife use and survival by causing loss or degradation of wildlife habitat and available forage.	Housing and urban development
	Agricultural practices
	Recreational areas
	Intentional fires
	Illegal dumping areas
	Wetland filling
Transportation and Infrastructure: Development of corridors/passages that increases wildlife mortality and fragmentation of wildlife habitat.	Roads
	Pier and harbor
	Power lines, aqueducts, gas ducts
	Wind power plants
Abiotic Resources Use: Extraction or use of rocks, minerals, and water that causes direct or indirect negative impacts to wildlife habitats.	Land cover removal for construction material (e.g., sand, limestone, other rocks)
	Water use
	Drilling (wells)
Consumptive Use of Biological Resources: Harvest or use of plant and animal populations in a manner that negatively impacts wildlife distributions and fitness, or the ecosystem.	Forest and woodland management
	Grazing
	Collection
	Illegal hunting and fishing practices
Non-consumptive Resources Use: Activities that have an incidental, but negative impact on wildlife and their habitats.	Motor-powered recreation
	Non-motorized recreation
Pollution: Introduction and spread of unwanted matter and energy into ecosystems from point and non-point sources that causes increased mortality of wildlife and degradation of their habitats and available forage.	Solid waste
	Waste or residual materials
	Chemicals and toxins
	Eutrophicants substances
	Noise pollution
Invasive Species: Introduction and/or spread of unwanted exotic and native organisms into ecosystems that increases wildlife predation, competition, and reduced fitness or cause loss of wildlife habitat.	Invasive plants
	Invasive animals
	Pathogens

Chapter 5
CONSERVATION STRATEGIES FOR PUERTO RICO CWCS (ELEMENT 4)

Development of a Strong Private Lands Program

During the last decade it has become increasingly evident that private landowners play a critical role in the conservation of fish and wildlife resources, particularly listed species. Since many species inhabit private lands, several conservation initiatives through private land programs have been developed at the federal level (e.g., Partners for Fish and Wildlife (PFW), Wetland Reserve Program). Similar actions led by the Commonwealth are limited (e.g., land acquisition, reforestation, designation of Natural Reserves and Forests). The PFW program has been the main program for private land habitat restoration in the Caribbean. However, limited resources restrict its development and the opportunities to benefit fish and wildlife resources. The USDA Natural Resources Conservation Service also manages well-funded conservation programs (e.g., Environmental Quality Incentive Program, Wildlife Habitat Incentive Program). There are other federal programs to which Puerto Rico has access that could be implemented on the island. For example, DNER is currently working on the first Programmatic Safe Harbor Agreement with the USFWS for the conservation of the Puerto Rican Plain Pigeon. Programs like this will strongly support all recovery efforts of many other federal and Commonwealth trust species. With the development of multiple recovery projects for endangered species in Puerto Rico (e.g., the establishment of a second wild population of the Puerto Rican Parrot in northern Puerto Rico), a strong private lands program is critical for the success of these initiatives. Still, the absence of a formal program at the Commonwealth level makes it difficult to promote a successful relationship between DNER and landowners. However, DNER has recently established a technical assistance program regarding wildlife and their habitats. Here, a team of biologists, with up to date knowledge of wildlife conservation, will effectively help and support on-the-ground implementation of both federal and Commonwealth private land programs. The main objectives of this program are:

- To provide landowners with updated management information and techniques to sustain and enhance wildlife habitats on their properties.
- To review projects proposed by government and private entities that would potentially affect wildlife resources, and to provide technical advice to minimize the negative impacts that such projects may cause.

Strengthening of the Existing Natural Heritage Program

Law 150 of 1988 formally vested authority for habitat acquisition in the National Heritage Division. The National Heritage Division was authorized to administer the NHP, which was funded with an initial appropriation of $2,000,000 under the 1988 enabling legislation, and given the mandate for:

- Establishing criteria for state government acquisition of natural habitats within Puerto Rico;
- Developing a priority list of critical habitats for acquisition, according to these criteria;
- Acquisition, transfer and classification (e.g., Natural Reserve, Sanctuary, etc.) to state control of lands containing priority habitats;
- Developing and coordinating supplementary support, such as NGOs funding, for habitat acquisition and management.

The NHP workplan includes land acquisition projects and other technical studies as priority activities. The latter includes development of an ecological land-use management plan, development of a natural areas databank, assessing the feasibility of sourcing outside funding, identification of natural areas within state-owned properties and land-titling analyses. The NHP also establishes actual boundaries within formally designated state protected areas.

Identification of Waterfowl Focus Areas

Another conservation strategy is the identification of Puerto Rico's Waterfowl Focus Areas (PRWFA), as part of the Atlantic Coast Joint Venture (ACJV). The ACJV is a partnership focused on the conservation of habitat for native birds in the Atlantic Flyway of the United States from Maine south to Puerto Rico and the Virgin Islands. The joint venture is a partnership of 17 states and 1 commonwealth: Maine, New Hampshire, Vermont, New York, Massachusetts, Rhode Island, Connecticut, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida and Puerto Rico. With the addition of Puerto Rico in 2001, the joint venture boundary evolved to match the entire U.S. Atlantic Flyway boundary.

The main purpose of the ACJV is to develop and maintain a strong scientific foundation for planning, implementing and evaluating conservation actions and to work together to identify and conserve the key breeding, migration and wintering habitats for priority bird species in the Atlantic Flyway. The joint venture was originally formed as a regional partnership focused on the conservation of waterfowl and wetlands under the North American Waterfowl Management Plan of 1986. The ACJV has since broadened its focus to the conservation of habitats for all birds consistent with major national and continental bird conservation plans and the North American Bird Conservation Initiative (ACJV 2004).

Wetlands in Puerto Rico are threatened. As mentioned before, the economy of the island has evolved from one based on agriculture to an economy sustained on urban development (i.e., construction) and industry. Nonetheless, human-made ponds initially constructed for irrigation purposes were left abandoned and became a new habitat for water birds. These artificial ponds were deep enough to benefit waterfowl species such as Ruddy Ducks, and other diver species. Today, some of these ponds, mainly those in the south of the island, are critical habitat for the Ruddy duck, a vulnerable species in Puerto Rico, as well as for many other migrant species. Protection of these ponds is imperative in order to save this species from local extinction.

The PRWFA were selected based on the presence of wetlands and lagoons optimal for the occurrence of migratory waterfowl, and for the intense use of these habitats by birds. This includes optimum habitat for these species to feed and roost. Twenty primary areas were selected, including lagoons in Vieques and Culebra Islands. Also, the areas were selected according to their importance as habitat that supported migratory, rare, and endangered waterfowl such as Black Duck (*Anas rubripes*), Blue-winged Teal (*Anas discors*), Masked Duck (*Nomonyx dominicus*), West Indian Whistling Duck (*Dendrocygna arborea*), and White-cheeked Pintail (*Anas bahamensis*), among others. The study also included a list of other migratory, native, endemic, and exotic bird species reported in selected areas. Some of the references used were documents available at DNER, such as literature about important lagoons on the island (Negrón-González 1986, Scott and Carbonell 1986, Ortiz-Rosas and Quevedo-Bonilla 1987), the status of the waterfowl (Chabert et al. 1984, Bonilla et al. 1992, NOAA et al. 2000), and the Critical Wildlife Areas documents (Raffaele and Duffield 1979, Cardona and Rivera 1988, Ventosa-Febles et al. 2005a).

The PRWFA document identifies and describes what DNER classifies as main waterfowl areas in Puerto Rico (Figure 6 and Table 4, Ventosa-Febles et al. 2005b). DNER and other agencies that through their ministerial duties approve endorsements or permits need to be aware that their action does not jeopardize those sites recognized as Waterfowl Focus Areas.

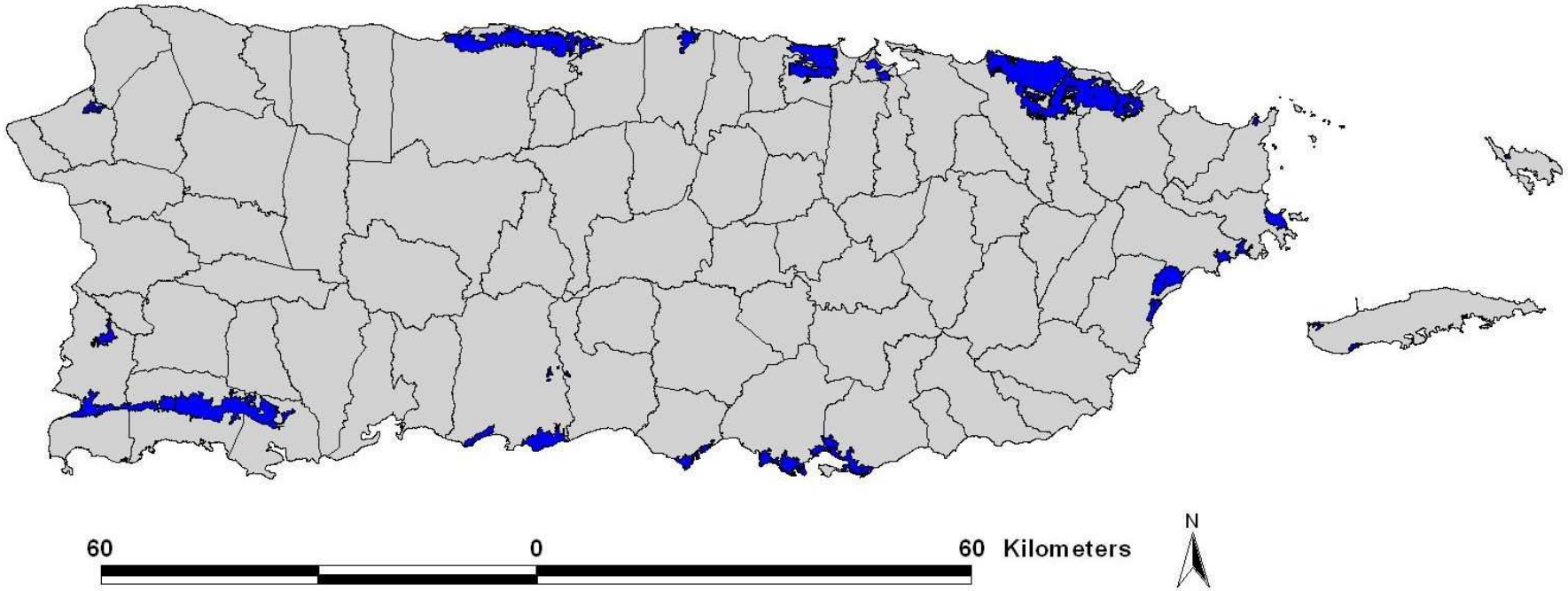

Figure 6. Puerto Rico Waterfowl Focus Areas (Ventosa-Febles et al. 2005b).

Table 4. Puerto Rico Waterfowl Focus Areas, Sub-Focus Areas and Municipalities.

Focus Area	Sub-Focus Area	Municipality
Caño Tiburones	None	Arecibo and Barceloneta
Hacienda La Esperanza	None	Manatí
Cibuco Swamp	None	Vega Baja
El Mameyal	None	Dorado
Las Cucharillas Marsh	None	Cataño, Guaynabo and Bayamón
Torrecillas Lagoon	Piñones and Torrecilla Alta	Loíza
Aguas Prietas	None	Fajardo
Ceiba Mangrove Forest and Lagoons	None	Ceiba
Culebra Island Lagoons	Flamenco Lagoon, Zoni Lagoon and Cornelio Lagoon	Culebra Island
Vieques Island Lagoons	Kiani Lagoon Complex, Playa Grande Lagoon, Chiva Swamp and Yanuel Lagoon	Vieques Island
Humacao Natural Reserve	None	Naguabo and Humacao
Punta Arenas, Mar Negro, Bahía de Jobos and Punta Pozuelo	None	Salinas and Guayama
Punta Petrona	None	Santa Isabel
El Tuque/Punta Cucharas/ Salinas Lagoon	None	Ponce
La Esperanza/ Cabuyón Mangrove	None	Ponce
Serrallés Lagoons Complex	None	Ponce
Cartagena Lagoon	None	Lajas
Boquerón Wildlife Refuge	None	Cabo Rojo
Cuevas Lagoon	None	Cabo Rojo
Cayures	None	Añasco

Identification of Critical Wildlife Areas

Another conservation strategy is the identification and description of Puerto Rico's Critical Wildlife Areas (CWA). The CWA fulfills one of the most fundamental responsibilities of DNER: to provide comprehensive information on important wildlife and habitat resources in Puerto Rico and its offshore islands. This wildlife and habitat information is used by local governments, state and federal agencies, private landowners and consultants for land use planning purposes. This document seeks to protect critical wildlife habitat from degradation due to incompatible land uses. Wildlife species have differential capabilities to cope with human encroachment, thus, careful planning is needed to ensure that important wildlife habitats are not destroyed and that wildlife/human conflicts are minimized or eliminated.

The first version of the CWA was published twenty six years ago. To date, some or the original CWA are degraded, therefore they were lowered in rank or removed from the list. Others, which maintain their wildlife value, were recommended to be kept in that category or upgraded and sought their conservation. Most Commonwealth forests, refuges, and reserves, as well as other areas, were included in the 2005 CWA document (Table 5; Figure 7). Each CWA was evaluated in relation to its faunal composition following the criteria used by Raffaele and Duffield (1979):

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 were the presence of species of limited distribution and/or game species. These categories are similar to those from Cardona and Rivera (1988):

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 (DRNA 2004).
3) Species of importance for hunting, even though their hunting is prohibited, and do not belong to the above categories.
4) Aquatic, wading and shorebirds, migratory or resident, which largely depend on coastal habitats up to about one kilometer inland.

The latest version of the Puerto Rico CWA (2005) has significantly improved its format. For each area, the following information is provided: Area Description, Ownership/Protection, Special Recognition, Wildlife (Birds, Reptiles, Amphibians, Mammals, Fishes, and Invertebrates), Critical Plants, Threats, Conservation Recommendations, References, and Maps.

The municipality, boundaries, geographic location, and land cover (hectares) of each CWA were identified for each area description. Also, a description of the topography, life zone and plant associations are given for each area. The owner and/or administrator, and any actual or potential protection were identified in the Ownership/Protection section. In the Special Recognition segment it was mentioned if the area was previously classified as a CWA or if it had any other recognition (e.g., Forest, Reserve, Important Bird Area, National Estuary, etc.). Also, its present classification in terms of wildlife importance was included. The 1979 and 1988 documents were followed for classifying areas as of primary or secondary importance to wildlife.

Inventories available in the literature, forest or land manager's wildlife checklist, and census conducted by project personnel or other DNER researcher or by the Puerto Rico Ornithological Society Inc. were documented for the wildlife segment. Agricultural or domesticated species were not considered as wildlife. 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 NatureServe (2005). Wildlife considered in this document includes birds, reptiles, amphibians, mammals, fish, and invertebrates. Exotic species were also mentioned. Inventories of plants of special concern (rare, threatened or endangered) were included.

Past and current threats of each CWA, along with recommendations, are included in the Threats and Conservation Recommendations sections. These sections seek to identify main threats to the integrity of the CWAs, and recommend actions to protect and conserve wildlife habitat. The following methodology was used to accomplish this task: field observation, photo interpretation (IKONOS satellite images 2002), land manager interviews, 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 reports, memos, and checklist, among others.

For each area, two types of maps were included. The first map uses the USFWS National Wetland Inventories, the Puerto Rico Roads, and the Puerto Rico Forest and Reserve layers (Figure 8). The second map is the corresponding IKONOS satellite image (using the same projection) of the CWA (Figure 9). Also, municipality boundaries, Priority Areas for Conservation, and other reference data are shown.

Table 5. Puerto Rico Critical Wildlife Areas (2005) and their respective locality (Municipalities).

AREA	LOCALITY
1- Cucharilla's Marsh	Cataño
2- Buchanan Haystack Hills and Fort Buchanan Pond	Bayamón
3- Torrecillas Swamp System-Piñones-Vacía Talega	Carolina-Loíza-Canóvanas
4- Barrio Borinquen, Trujillo Alto Lake, Bairoa Lake La 25, and Gurabo River Mouth	Trujillo Alto-Caguas-Gurabo
5- Baja Swamp and Herrera River Mouth	Río Grande
6- Ensenada Comezón	Río Grande
7- Río Mar, North of Road # 968	Río Grande
8- Luquillo Mountains	Luquillo
9- San Miguel, La Paulina and El Convento Natural Area	Luquillo-Fajardo
10- Laguna Grande, Laguna Aguas Prietas and adjacent areas	Fajardo
11- Fajardo Coast Line	Fajardo
12- La Cordillera Natural Reserve	Fajardo
13- Flamenco Peninsula	Culebra
14- Flamenco Lagoon	Culebra
15- Cornelius Lagoon	Culebra
16- Resaca Mountain	Culebra
17- Resaca Beach	Culebra
18- Brava Beach	Culebra
19- Larga Beach and Zoní Lagoon	Culebra
20- Maillux Lagoon	Culebra
21- Puerto del Manglar	Culebra
22- Los Caños	Culebra
23- Cementerio Bay	Culebra
24- Culebra's Surrounding Islets	Culebra
25- Vieques west coast	Vieques
26- Ensenada Honda Mangrove	Vieques
27- Yanuel Lagoon	Vieques
28- Chiva Swamp	Vieques
29- Tapón Bay	Vieques

Table 5 (Continued). Puerto Rico Critical Wildlife Areas (2005) and their respective locality (Municipalities).

AREA	LOCALITY
30- Ferro Bay, Mosquito Bay, and Sombe Bay	Vieques
31- East tip of Vieques and Conejo Cay	Vieques
32- Roosevelt Roads Naval Base	Ceiba
33- Ceiba State Forest	Fajardo, Ceiba and Naguabo
34- Humacao Natural Reserve	Humacao
35- Pandura Mountain Range	Yabucoa-Maunabo
36- Palmas Pond	Arroyo
37- Carite State Forest	Cayey
38- Cerro El Gato and Associated Areas	Cayey
39- Cidra Lake	Cidra
40- Aguirre State Forest, Punta Pozuelo, Cayos Caribe and Mar Negro	Guayama-Salinas-Santa Isabel
41- Punta Arenas	Salinas
42- Salinas Training Area	Salinas
43- Punta Petrona Mangroves and Caracoles	Santa Isabel
44- Cabuyón Mangrove and Fríos Cays	Ponce
45- Caja de Muertos Complex	Ponce-Juana Díaz-Santa Isabel
46- Serrallés Lakes	Juana Díaz-Ponce
47- Toro Negro State Forest	Ciales-Jayuya-Orocovis
48- Las Salinas Lagoon, El Tuque	Ponce
49- Monte Guilarte State Forest	Adjuntas-Guayanilla-Peñuelas-Yauco
50- Punta Verraco, Cerro Toro and Punta Ventana	Guayanilla
51- Guayanilla Hills	Guayanilla
52- Guánica Lagoon	Guánica
53- Guánica State Forest	Guánica
54- San Jacinto Salt Flats and Tamarind Lagoon	Guánica
55- Susúa State Forest and Adjacent Lands	Yauco-Sabana Grande
56- La Parguera Natural Reserve	Lajas
57- Cartagena Lagoon	Lajas
58- Boquerón State Forest	Cabo Rojo

Table 5 (Continued). Puerto Rico Critical Wildlife Areas (2005) and their respective locality (Municipalities).

AREA	LOCALITY
59- Boquerón Wildlife Refuge	Cabo Rojo
60- Cabo Rojo Salt Flats and Adjacent Areas	Cabo Rojo
61- Punta Guaniquilla Natural Reserve	Cabo Rojo
62- Joyuda Lagoon Natural Reserve	Cabo Rojo
63- Cuevas Lagoon	Cabo Rojo
64- Sabanetas Swamp-Boquilla Channel	Mayagüez
65- Maricao State Forest	Maricao
66- Mona Island	Mona
67- Monito Island	Monito
68- Pozo Hondo Swamp	Añasco
69- Cayures Swamp	Aguada
70- Desecheo Island	Desecheo
71- Barrio Coto	Isabela
72- Guajataca Cliffs	Isabela-Quebradillas-Camuy
73- Guajataca State Forest	Isabela
74- Guajataca Lake	Quebradillas
75- Barrio Cocos and Bellaca Creek	Quebradillas
76- Carrizales Mangroves	Hatillo
77- Tiburones Swamp and La Tembladera Pond	Arecibo
78- Cambalache State Forest	Arecibo
79- Río Abajo State Forest	Arecibo and Utuado
80- Hacienda La Esperanza Natural Reserve	Manatí
81- Tortuguero Lagoon, Cabo Caribe Swamp and Rica Lake	Vega Baja
82- Cibuco Swamp	Vega Baja
83- Vega State Forest	Vega Alta
84- Lakes and Forests of Dorado	Dorado
85- Mogotes Río Lajas y Nevárez	Dorado-Toa Baja
86- El Mameyal	Dorado
87- San Pedro Swamp	Toa Baja

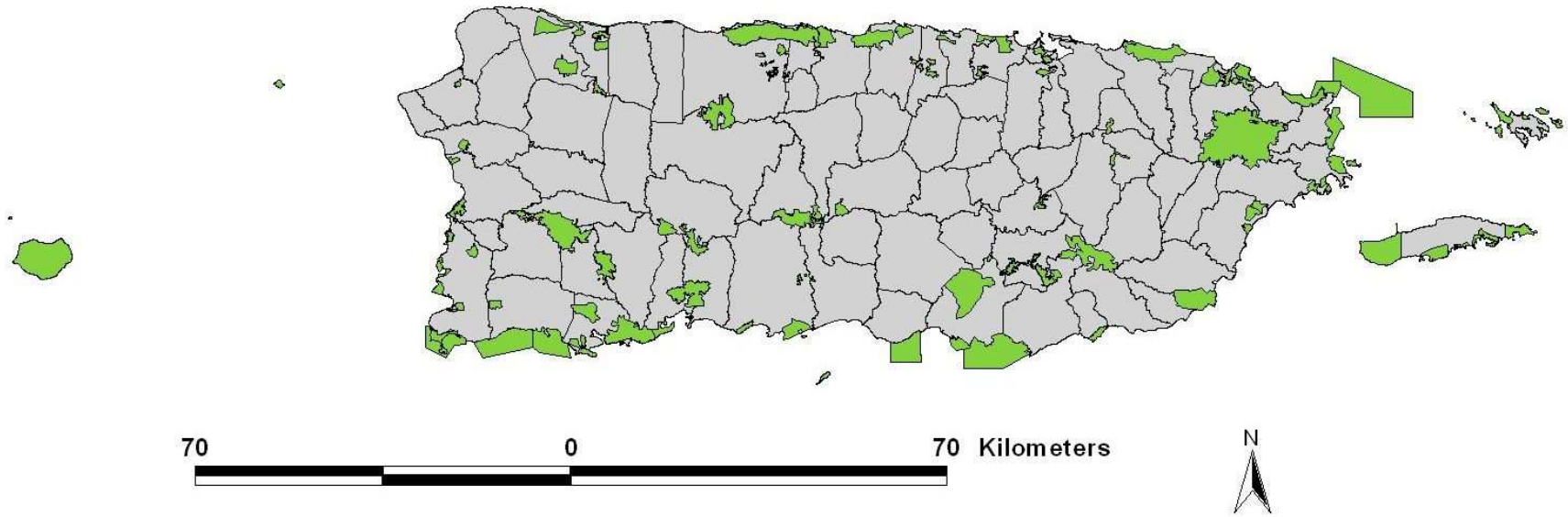

Figure 7. Puerto Rico Critical Wildlife Areas.

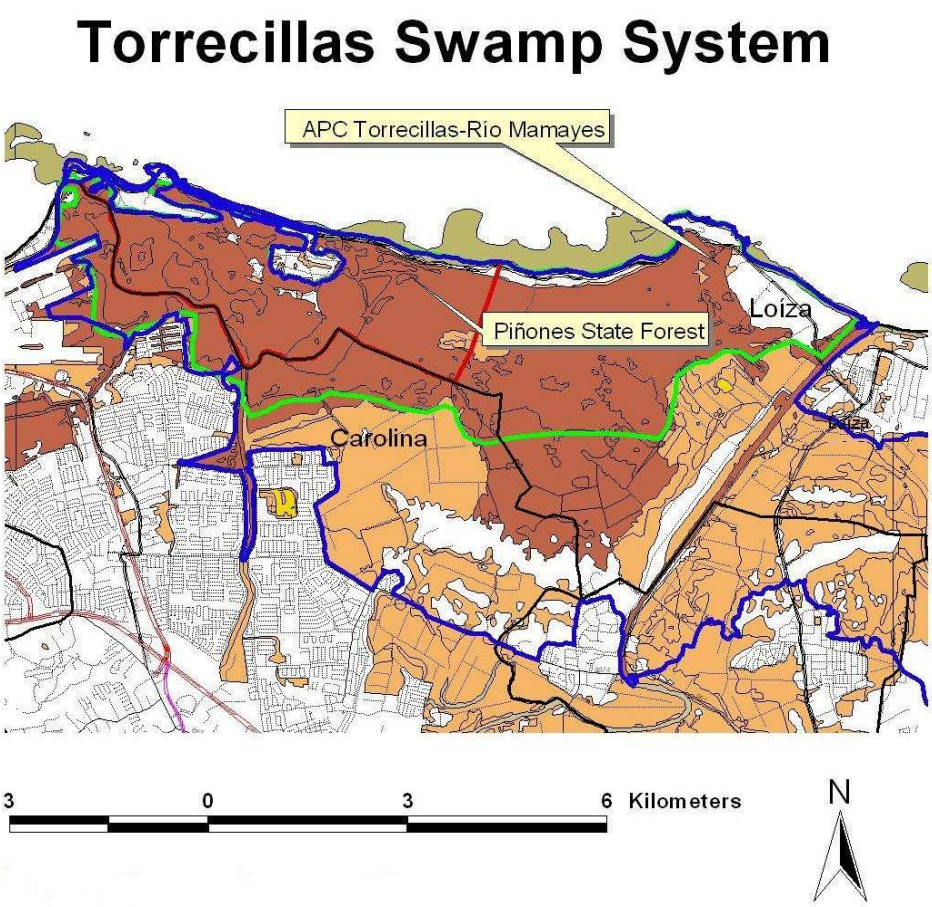

Figure 8. Torrecillas swamp system: an example of a map included in the 2005 Critical Wildlife Areas document. Layers are from the Puerto Rico Planning Board and the National Wetland Inventories 1998.

Torrecillas Swamp System

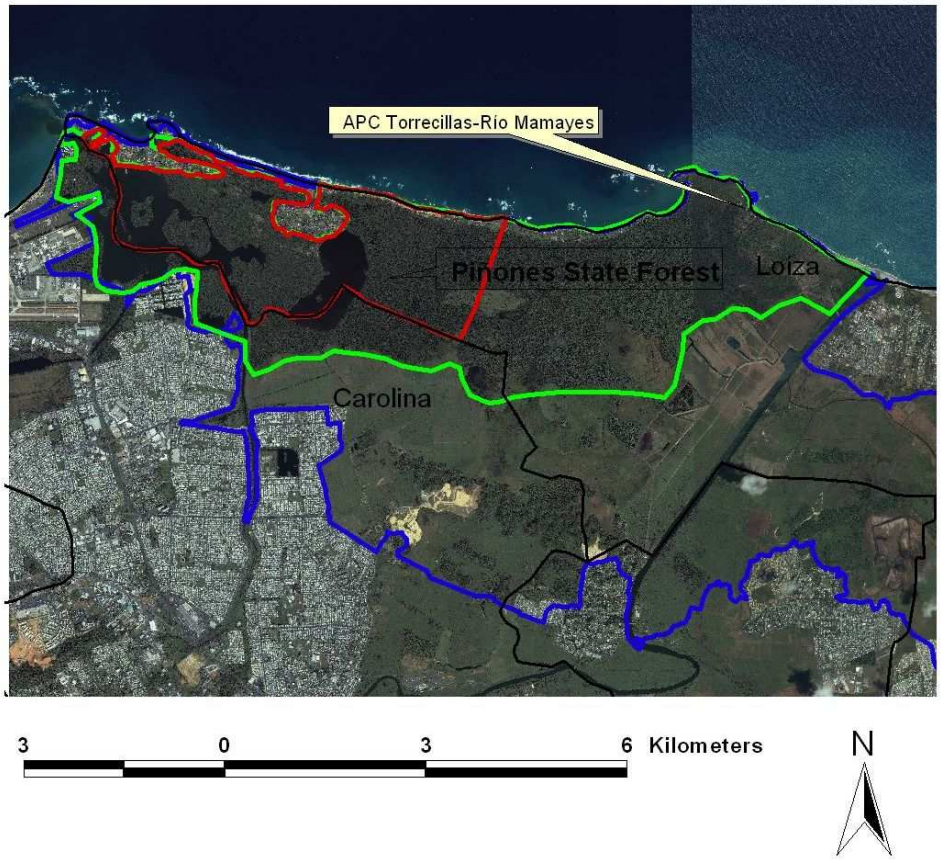

Figure 9. Torrecillas swamp system: an example of a map included in the 2005 Critical Wildlife Areas document. Layers are from the Puerto Rico Planning Board and the IKONOS satellite images 2002.

Comprehensive Land Use Plan

The Office for the Development of the Comprehensive Land Use Plan (PRLUP), assigned to the Puerto Rico Planning Board, is actively working on the development of the strategic land use plan for Puerto Rico (PRPB 2005). The Land Use Planning Law (Law No. 550 of October 3, 2004) mandated the creation of this office, the development of the PRLUP, the creation of an Advisory Committee, and the creation of an Interagency Committee to develop the plan. Below are the current land use designations for Puerto Rico:

Total Protected Natural Areas	**6.80%**
Natural Reserves, Forests and Wildlife Refuges	6.10%
NGOs Land (Puerto Rico Conservation Trust)	0.70%
% Recommended by the United Nations (Brutland Report 1987)	**12%**
% Recommended by The Nature Conservancy for P.R.	**30%**
Total Protected Agricultural Areas	**5.15%**
Agriculture Reserves (AR)	3.80%
PR Land Authority (not included in AR)	0.88%
PR Land Administration (farms not included in AR)	0.47%
Urban Areas (Census 2000)	**19.6%**

The goal of the PRLUP is to identify, evaluate and classify land uses for Puerto Rico in order to:

1. Increase environmental quality and protection of natural resources and agricultural land.
2. Encourage dense, attractive and functional urban areas.
3. Promote economic development by appropriate location and integration of industrial, agricultural, and commercial activities.
4. Match the socioeconomic and physical development to the cultural and geographic features of the Island.

Scope of the PRLUP:

1. Land classification in categories:
    a. Urban Land
    b. Land suitable for development (programmed and not programmed)
    c. Rustic Land (common and protected)
    d. Other Categories.
2. Setting up the Urban Growth Boundary for each municipality.
3. Establishment of categories on protected land (land for agriculture, watersheds protection, risk prone areas, areas of cultural value, etc.).

Elements included in the PRLUP:

1. Sustainability
2. Urban land renewal
3. Intense use of urban land (densification)
4. Redevelopment (urban recycling)
5. Preservation of agricultural land
6. Protect and expand natural areas
7. Identify risk prone areas (floodable and land-slide areas, etc.)

Land Classification and Categories for the PRLUP:

Categories:

1. Urban Land: Land consolidated by buildings and other structures, roads, water supply, electricity, and other infrastructure that serve it up. Most of the social, administrative, and economic activities take place in these lands (Figure 10A).

2. Urban Fringe Land: Land suitable for urbanization and development according to the expected population growth in a period of time:
    a. Programmed: Land served by infrastructure. This land will be developed first.
    b. Not Programmed: Land not served by infrastructure.

3. Rustic Land (Rural): Land that should be protected from urbanization (Figure 10B):
    a. Common: Land that may accommodate growth in the long run.
    b. Specially Protected: Land for conservation, agricultural use, etc.

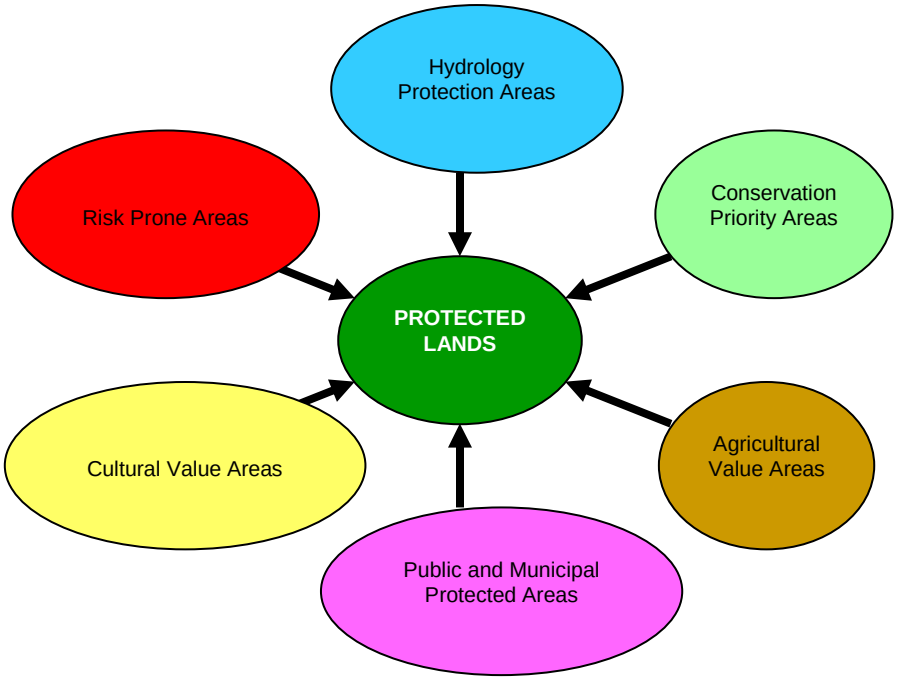

Figure 10A. Urban Land Evaluation Criteria. Data provided by Puerto Rico Land Use Plan 2005.

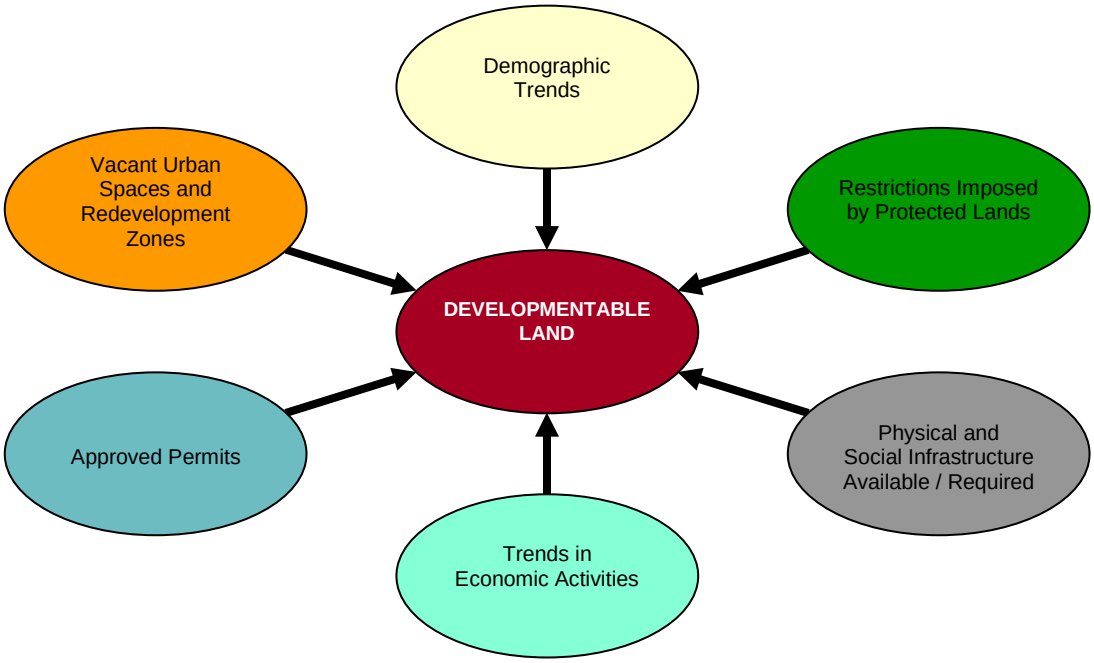

Figure 10B. Protected Land Evaluation Criteria. Data provided by Puerto Rico Land Use Plan 2005.

Chapter 6
HABITATS OF GREATEST CONSERVATION NEED (ELEMENT 2)

Terrestrial Habitats

General

Habitat loss is the major threat to wildlife in terrestrial ecosystems. The most important habitats for conservation have been identified by the Nature Conservancy (Ecoregional Plan for Puerto Rico), and the DNER through the Natural Heritage Program and the Critical Wildlife Areas Initiative. Also, the DNER has almost completed an island-wide comprehensive habitat analysis for the CWCS. This task will be completed in the near future with the final result of the Puerto Rico GAP Analysis Program (PRGAP). This project is developing a landcover/landuse map representing the Puerto Rico landscape, and modeling animal species distribution. PRGAP uses remote sensing and GIS technology, satellite imagery, aerial photograph, and geoclimatic and topographic data to map the land cover units for the Island. Each land cover unit description includes information and references on the composition, structure, and ecology of the dominant plant communities of that unit. Table 6 presents the hierarchical vegetation classification for the PRGAP.

Helmers et al. (2002) found that only 1.2% of lowland moist seasonal evergreen forest or forest/shrub is protected. Some forest types are better protected, including 45 to 68% of cloud forest types and 43 to 80% of the sclerophyllous forest that develop on serpentine substrates. Excluding riparian wetlands, about 20% to 63% of remaining forested or non-forested wetlands receive protection.

Caves

In Puerto Rico exists approximately 2,000 caves, which harbor a great array of species that are totally dependent or are associated to the biotic and abiotic conditions found in that habitat. The formation of caves and caverns in Puerto

Rico occurs mainly due to the weathering of the limestone rock by the underground water or water that filters through rocky ceiling.

Freshwater Habitats

General

Problems with freshwater ecosystems are a major environmental issue in Puerto Rico. Water pollution, siltation of reservoirs, and excessive withdrawals of fresh water from rivers are problems associated with the growing human populations of the Island. Also, unauthorized filling of wetlands is a substantial and continuing problem (U.S. Department of the Interior 1994). Detailed descriptions of the freshwater communities in Puerto Rico are available (U.S. Army Corps of Engineers 1978).

Rivers and Streams

Puerto Rico has about 1,200 rivers, streams, and creeks (Figure 7). None of the rivers are navigable by large vessels (Wiley and Vilella 1998). Only twenty of these rivers have a permanent minimum water flow of at least 0.28 cubic meters per second and are relatively important to the island's fishery. Major river systems are the Río Grande de Loíza (64 km), Bayamón (41 km), La Plata (73 km), Arecibo (64 km), Culebrinas (40 km), and Añasco (65 km). The profile of the streams changes radically from rapidly flowing in the steep mountains to slower and more winding courses across the narrow coastal plain, creating habitats for fishes and other aquatic animals. Many fishes migrate up or downstream to or from saltwater habitats (Wiley and Vilella 1998). Some of the rivers are dammed principally for water uptakes and thus have small lakes along their courses. Also, the majority of the main rivers are either channelized or in process of canalization, mostly for flood control. These constructions obstruct the natural movement of native fishes along the rivers, and are together with pollution, the major threats to these aquatic systems.

Reservoirs

Puerto Rico has no natural inland bodies of fresh water (lakes), therefore 20 reservoirs, varying from 6 to 390 surface hectares, have been constructed for potable water, irrigation, electrical power, and flood control (Figure 11). The larger native shrimps, gobies, and Mountain Mullet may come into some of the reservoirs from the rivers. Several game fish, including Peacock Bass, Largemouth Bass, and Channel Catfish, have been introduced into Puerto Rican reservoirs (Wiley and Vilella 1998), representing the only important freshwater sportfish.

Artificial Freshwater Bodies

Ponds are important habitats in Puerto Rico, almost all are artificial and mostly intended for irrigation, livestock, or aesthetic reasons. Most go dry at some point during the year. Fish are stocked in some of these ponds for sport fishing and for mosquito and weed control. Channels irrigating the sugarcane fields also are important habitats for fishes and aquatic invertebrates.

Lagoons

All of the lagoons have shallow water, usually with mud bottoms, are weedy over large stretches, and if brackish or salty, are surrounded by mangrove forests (Figure 6). Cartagena Lagoon, formerly perhaps the most important wetland in Puerto Rico (Danforth 1926), has been greatly degraded by nearby agricultural practices. This lagoon has recently been acquired by the USFWS and its restoration is proposed. Other important lagoons include Joyuda, San José, Torrecillas, Tortuguero, and Piñones.

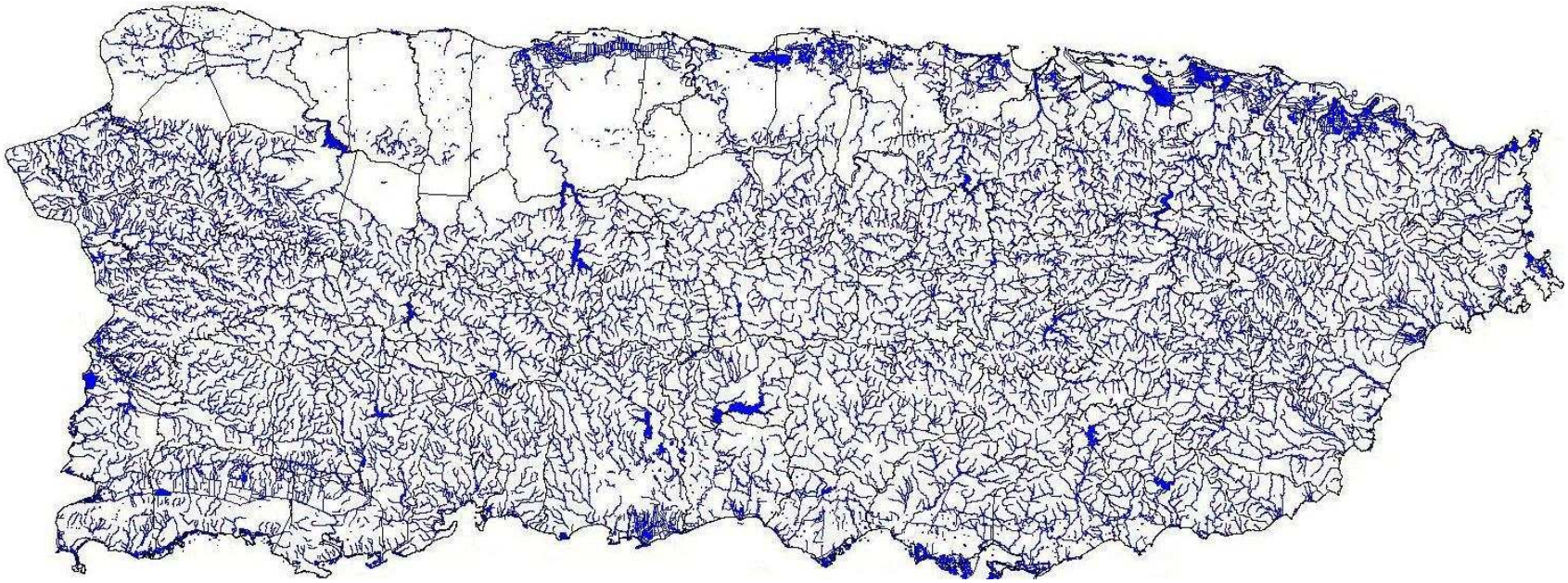

Figure 11. Puerto Rico freshwater habitats.

Initiatives to Identify Areas of Greatest Conservation Need

Natural Heritage Program

Fifty conservation priority areas (covering about 319,631 acres) have been identified by the NHP of the DNER (e.g., the northern karst region; Figure 12). The mechanisms used by the NHP to obtain their objectives are the following:

- Land acquisition by way of purchase, donation, lease, or public land title or management transfer.
- Agreements and Contracts.
- Funding, both recurring and non-recurring.
- Joint projects between the Puerto Rico Natural Heritage Program and NGOs.

Areas of greatest importance for protection of ecosystems and viable populations of native species are shown in Figure 13.

Figure 12. The northern karst region, an area of conservation priority identified by the Puerto Rico Department of Natural and Environmental Resources.

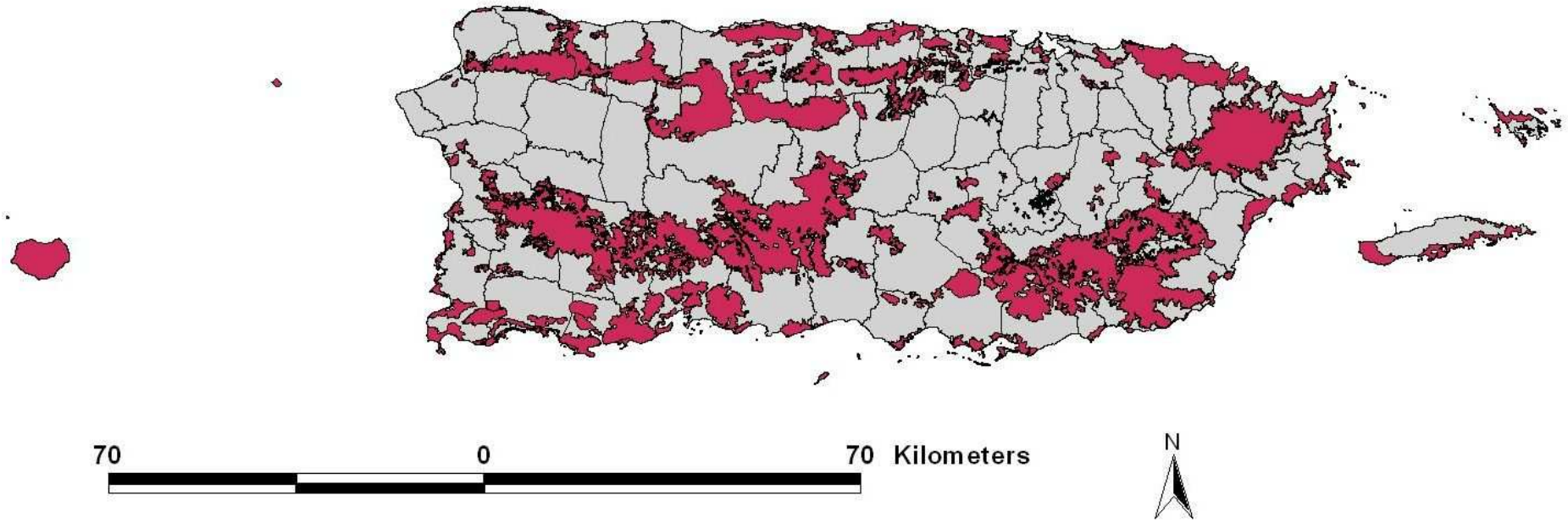

Figure 13. Areas of Conservation Priority identified by Natural Heritage Program.

Table 6. Land cover and land use classification scheme. Draft data obtained from PRGAP.

PRGAP LAND COVER LAND USE (LCLU) CLASSIFICATION SCHEMA (DRAFT - APRIL 2005)

I. Forests and shrublands

(Closed forest: Woody canopy cover > 60% and canopy height > 2.5 m. Open forest: Woody canopy cover 25-60%. Shrubland: Woody canopy cover > 25%, canopy height < 2.5 m)
(Mature forests: > 25 years. Young forests: < 25 years)

		Alliances, *association or community decriptions, a* nd dominant species
	A. Lowland dry forests and shrublands (Subtropical dry lifezone)	
	Limestone substrate	
1	Mature closed forest ("dry forest limestone complex")	
	1.a Mature semideciduous closed forest - limestone ridges and slopes	Bursera simaruba - Bucida buceras
	1.b Mature evergreen closed forest - limestone "arroyos" and "bajuras"	Guaiacum officinalis - Amyris elemifera
2	Mature semideciduous open forest and shrubland	Acacia farnesiana- Prosopis iuliflora
3	Young secondary semideciduous closed forest	Pictetia aculeata - Randia aculeata
4	Shrubland with succulents	Cephalocereus royenii -Melocactus intortus
	Noncalcareous sedimentary, alluvial and volcanic substrates	
5	Mature semideciduous closed forest	*Guapira fragrans - Bourreria succulenta* comm. (Gould 2005)
6	Young secondary semideciduous closed forest	Bucida busera, Leucaena leucocephala, Erythroxylum brevipes
7	Semideciduous open forest and shrubland	Leucaena leucocephala, Erythroxylum brevipes
	B. Lowland moist forests and shrublands (Subtropical moist lifezone)	
	Northern limestone substrate	
8	Mature closed forest ("mogote complex")	
	8.a Mature closed forest - mogote cliffs	Clusia rosea - Gaussia attenuata
	8.b Mature closed forest - mogote tops and upper slopes	Bucida buceras - Clusia rosea
	8.c Mature closed forest - mogote side slopes	Thouinia striata - Dendropanax arborea
	8.d Mature closed forest - mogote valleys	Guarea guidonia - Calophyllum calabasa
9	Young secondary closed forest	Spathodea campanulata-Andira inermis
10	Open forests and shrubland	Spathodea campanulata, Leucaena leucocephala, Tabebuia heterophylla, Andira inermis
	Noncalcareous sedimentary, alluvial and volcanic substrates	
11	Mature evergreen closed forest	*Manilkara bidentata - Faramaea occidentalis* comm. (Gould 2005), Ocotea leucoxylon, Hymanaea courbaril
12	Young secondary evergreen closed forest	Tabebuia heterophylla - Andira inermis
13	Young secondary semideciduous closed forest	Guapira fragrans - Bourreria succulenta (windward side of coastal hills in NE PR)
14	Open forests and shrubland	Leucaena leucocephala
	C. Subtropical and lower montane wet and rain forests (Subtropical and lower montane wet and rain lifezones)	
	Serpentine ultramaphic substrate	
15	Evergreen closed forest	Podocarpus coriaceus, Micropholis chrysophyloides
16	Evergreen open forest and shrubland	Leucaena leucocephala
	Non serpentine substrate	
17	Mature evergreen Tabonuco closed forest	Tabonuco forests (Weaver 1994). *Dacroydes excelsa-Tetragastris balsamifera* comm. (Gould 2005), Micropholis chrysophylloides, Buchenavia capitata
18	Mature evergreen Sierra palm closed forest	Sierra palm forest (Weaver 1994). *Prestoea montana-Cecropia schreberiana* comm. (Gould 2005)
19	Mature evergreen tall cloud closed forest	Palo colorado forest (Weaver 1994). *Cyrilla racemiflora-Micropholis garciniifolia* comm. (Gould 2005)
20	Mature evergreen elfin cloud closed forest	Elfin woodland (Weaver 1994) *Tabebuia rigida-Eugenia borinquensis* comm. (Gould 2005)
21	Young secondary evergreen closed forest	Ocotea leucoxylum, Tabebuia heterophylla, Micropholis chrysophylloides, Buchenavia capitata
22	Evergreen open forest and shrubland	Tabebuia heterophylla, Cyathea arborea
	D. Flooded forests (Forested wetlands)	
	Saline substrate	
23	Mangrove forest and shrubland ("mangrove complex")	Mangrove habitat = mangrove forest, salt and mud flat, and saline water
	23.a Fringe mangrove	*Rhizophora mangle* comm. (Cintrón *et al.* 1978)
	23.b Basin mangrove	*Laguncularia racemosa - Conocarpus erectus* comm., *Avicennia germinans* comm. (Cintrón et al. 1978), *Avicennia germinans-Laguncularia racemosa* comm. (Gould 2005)
	23.c Dwarf mangrove	*Rhizophora mangle* comm. (Cintrón et al. 1978)
	Nonsaline substrate	
24	*Pterocarpus* swamp	*Pterocarpus officinalis - Acrostichium aureum* comm. (Gould 2005)
25	Other flooded open forest and shrubland	Machaerium sp.
	E. Urban forests	
26	Managed and unmanaged forests surrounded by development	

Table 6 (continued). Land cover and land use classification scheme. Draft data obtained from PRGAP.

F. *Roadside forests*		
27	Lowland closed and open forests	Albezia procera, Albezia lebbek, Leucaena leucocephala
28	Submontane and lower montane closed and open forests	Cyathea arborea, Bambusa vulgaris
G. *Riparian and shoreline forests*		
29	Lowland forests	Bambusa vulgaris
30	Submontane and lower montane forests	Prestoea montana, Bambusa vulgaris,
31	Beach strand forest and shrubland	Coccoloba uvifera, coco nucifera, Terminalia cattapa
II. Grasslands and herbaceous vegetation		
(Less than 25% woody vegetation dominated by graminoid or non graminoid herbaceous vegetation)		
A. *Non flooded grasslands and pastures*		
32	Dry grasslands and pastures (subtropical dry lifezone)	Andropogon bicornis
33	Moist grasslands and pastures (subtropical and lower montane wet and rain lifezones)	Panicum maximum
34	Managed grasslands (parks and urban grasslands)	
B. *Flooded grasslands and pastures*		
Saline		
35	Emergent herbaceous wetlands	Typha domirgensis, Phragmitis communis
36	Seasonally-flooded herbaceous wetlands	
Nonsaline		
37	Emergent herbaceous wetlands	
38	Seasonally-flooded herbaceous wetlands	
III. Agricultural lands		
39	Hay and row crops	Pineapple (*Ananas comosus*), sugar cane (*Saccharum officinarum*), row crops
40	Woody agriculture and plantations	Coffea arabica, Mangifera indica, Coco nucifera, Musa spp., Citrus spp.
IV. Shorelines and barrens		
41	Rocky cliffs and shelves	
42	Gravel beaches and stony shoreline	
43	Fine to coarse sandy beaches, mixed sand and gravel beaches	*Sesuvium portulacastrum - Batis maritima* (Dansereau 1966)
44	Salt and mudflats	
45	Salt production	
V. Developed/built-up lands		
46	High-density developments	
47	Low-density development	
48	Artificial barrens	
VI. Water		
49	Freshwater	
50	Saline water	
51	Aquaculture - shrimp ponds	

Critical Wildlife Areas

The third source of information used in lieu of a comprehensive statewide landscape analysis is the target species found in those zones classified as a CWA. The CWA effort identifies areas within Puerto Rico that are necessary to perpetuate the existence of species of special interest for DNER. Also, the CWA identify public lands as priorities for conservation, lands which DNER considers important wildlife habitat. Table 7 shows target species found in each CWA. Below (Figure 14) is the Plain Coqui (*Eleutherodactylus juanriveroi*), which was recently discovered (2005) in northern P.R. DNER is currently in the process of designating critical habitat for this species.

Figure 14. Plain Coqui (*Eleutherodactylus juanriveroi*).

Table 7. Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
1- Cucharilla's Marsh, Cataño	White cheeked pintail-*Anas bahamensis* Ruddy duck-*Oxyura jamaicensis* Caribbean coot-*Fulica caribaea* Yellow shouldered blackbird-*Agelaius xanthomus* West Indian whistling duck-*Dendrocygna arborea* Masked duck-*Nomonyx dominicus* Brown pelican-*Pelecanus occidentalis* Grasshopper sparrow-*Ammondramus savannarum* Black cowled oriole-*Icterus dominicensis* Puerto Rican Vireo-*Vireo latimeri* Piping plover-*Charadrius melodus* Peregrine falcon-*Falco peregrinus*
2- Buchanan Haystack Hills and Fort Buchanan Pond, Bayamón	Ruddy duck-*Oxyura jamaicensis* Black cowled oriole-*Icterus dominicensis* Puerto Rican boa-*Epicrates inornatus* Puerto Rican slider-*Trachemys stejnegeri*
3- Torrecillas Swamp System-Piñones-Vacía Talega, Carolina-Loíza-Canóvanas	Brown pelican-*Pelecanus occidentalis* Least tern-*Sterna antillarum* West Indian whistling duck-*Dendrocygna arborea* Masked duck-*Nomonyx dominicus* Caribbean coot-*Fulica caribaea* White crowned pigeon-*Patagioenas leucocephala* Yellow shouldered blackbird-*Agelaius xanthomus* Black cowled oriole-*Icterus dominicensis* Puerto Rican boa-*Epicrates inornatus* Leatherback sea turtle-*Dermochelys coriacea* Hawksbill turtle-*Eretmochelys imbricata* West Indian manatee-*Trichechus manatus* Juey palancú-*Cardisoma guanhumi* Camarón palaí-*Macrobrachium carcinus* Mangrove crab-*Aratus pisoni* Cangrejo de mangle-*Goniopsis cruentata*
4- Bo. Borinquen, Trujillo Alto Lake, Bairoa Lake La 25 and Gurabo River Mouth, Trujillo Alto-Caguas-Gurabo	Caribbean coot-*Fulica caribaea* Least grebe-*Tachybaptus dominicus* Puerto Rican plain pigeon-*Patagioenas inornata* West Indian whistling duck-*Dendrocygna arborea*
5- Baja Swamp and Herrera River Mouth, Río Grande	White cheeked pintail-*Anas bahamensis* West Indian whistling duck-*Dendrocygna arborea* Ruddy duck-*Oxyura jamaicensis* Masked duck-*Nomonyx dominicus* Juey palancú-*Cardisoma guanhumi*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
6- Ensenada Comezón, Río Grande	Brown pelican-*Pelecanus occidentalis* Caribbean coot-*Fulica caribaea* Piping plover-*Charadrius melodus* White crowned pigeon-*Patagioenas leucocephala* Nassau grouper-*Epinephelus striatus* Juey palancú-*Cardisoma guanhumi* Mangrove root crab-*Goniopsis cruentata* Zambuco-*Ucides cordatus* Mangrove crab-*Aratus pisoni*
7- Street # 968, Río Mar, Rio Grande	Virgin Island tree boa-*Epicrates monensis granti*
8- Luquillo Mountains, Luquillo	Sharp shinned hawk-*Accipiter striatus* Broad winged hawk-*Buteo platypterus* Puerto Rican parrot-*Amazona vittata* Puerto Rican Vireo-*Vireo latimeri* Puerto Rican boa-*Epicrates inornatus* Puerto Rican coqui-*Eleutherodactylus portoricensis* Ground coqui-*Eleutherodactylus richmondi* Tree hole coqui-*Eleutherodactylus hedricki* Mottled coqui-*Eleutherodactylus eneidae* Web footed coqui-*Eleutherodactylus karlschmidti* Free tailed bat-*Tadarida brasiliensis* Cave bat-*Brachyphylla cavernarum* Greater Antillean long tongued bat-*Monophyllus redmani* Red fruit bat-*Stenoderma rufum*
9- San Miguel, La Paulina and El Convento Natural Area, Luquillo-Fajardo	West Indian whistling duck-*Dendrocygna arborea* Masked duck-*Nomonyx dominicus* Ruddy duck-*Oxyura jamaicensis* Puerto Rican plain pigeon-*Patagioenas inornata* White crowned pigeon-*Patagioenas leucocephala* Brown pelican-*Pelecanus occidentalis* Least grebe-*Tachybaptus dominicus* Caribbean coot-*Fulica caribaea* White cheeked pintail-*Anas bahamensis* Least tern-*Sterna antillarum* Snowy plover-*Charadrius alexandrinus* Piping plover-*Charadrius melodus* Roseate tern-*Sterna dougalli* Grasshopper sparrow-*Ammondramus savannarum* Puerto Rican Vireo-*Vireo latimeri* Black cowled oriole-*Icterus dominicensis* Virgin Island tree boa-*Epicrates monensis granti* Leatherback sea turtle-*Dermochelys coriacea* Hawksbill turtle-*Eretmochelys imbricata*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
	Puerto Rican slider-*Trachemys stejnegeri* West Indian manatee-*Trichechus manatus* *Schoepfia arenaria* Cobana negra *Stahlia-monosperma* Beautiful goetzea-*Goetzea elegans* Bloodwoodtree-*Pterocarpus officinalis*
10- Laguna Grande, Laguna Aguas Prietas and adjacen areas, Fajardo	Brown pelican-*Pelecanus occidentalis* White crowned pigeon-*Patagioenas leucocephala* Caribbean coot-*Fulica caribaea* *White cheeked pintail-Anas bahamensis* Ruddy duck-*Oxyura jamaicensis*
11- Fajardo Coast Line, Fajardo	Green sea turtle-*Chelonia mydas* Leatherback sea turtle-*Dermochelys coriacea* Hawksbill turtle-*Eretmochelys imbricata* Yellow shouldered blackbird-*Agelaius xanthomus* West Indian manatee-*Trichechus manatus*
12- La Cordillera Natural Reserve, Fajardo	Roseate tern-*Sterna dougalli* Brown pelican-*Pelecanus occidentalis* White cheeked pintail-*Anas bahamensis* Roseate tern-*Sterna dougalli* Virgin Island tree boa-*Epicrates monensis granti* Hawksbill turtle-*Eretmochelys imbricata* Green sea turtle-*Chelonia mydas* Slippery backed mabuya-*Mabuya mabouya*
13- Flamenco Peninsula, Culebra Island	Slippery backed mabuya-*Mabuya mabouya* Roseate tern-*Sterna dougalli*
14- Flamenco Lagoon, Culebra Island	White cheeked pintail-*Anas bahamensis* Ruddy duck-*Oxyura jamaicensis* Caribbean coot-*Fulica caribaea* Least grebe-*Tachybaptus dominicus* White crowned pigeon-*Patagioenas leucocephala*
15- Cornelius Lagoon, Culebra Island	White cheeked pintail-*Anas bahamensis* Ruddy duck-*Oxyura jamaicensis* Masked duck-*Nomonyx dominicus* Brown pelican-*Pelecanus occidentalis*
16- Resaca Mountain, Culebra Island	Culebra giant anole-*Anolis roosevelti*
17- Resaca Beach, Culebra Island	Leatherback sea turtle-*Dermochelys coriacea* Hawksbill turtle-*Eretmochelys imbricata*
18- Brava Beach, Culebra Island	Leatherback sea turtle-*Dermochelys coriacea* Hawksbill turtle-*Eretmochelys imbricata*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
19-Larga Beach and Zoní Lagoon, Culebra Island	Leatherback sea turtle-*Dermochelys coriacea* Hawksbill turtle-*Eretmochelys imbricate* Brown pelican-*Pelecanus occidentalis* White cheeked pintail-*Anas bahamensis* Ruddy duck-*Oxyura jamaicensis* Caribbean coot-*Fulica caribaea* Peregrine falcon-*Falco peregrinus*
20- Mailux Lagoon, Culebra Island	White cheeked pintail-*Anas bahamensis*
21- Puerto del Manglar, Culebra Island	Brown pelican-*Pelecanus occidentalis* White crowned pigeon-*Patagioenas leucocephala* Roseate tern-*Sterna dougalli*
22- Los Caños, Culebra Island	White crowned pigeon-*Patagioenas leucocephala* White cheeked pintail-*Anas bahamensis*
23- Cementerio Bay, Culebra Island	White crowned pigeon-*Patagioenas leucocephala*
24- Culebra's Surrounding Cays, Culebra Island	Roseate tern-*Sterna dougalli* Slippery backed mabuya-*Mabuya mabouya* Hawksbill turtle-*Eretmochelys imbricata* Green sea turtle-*Chelonia mydas*
25- Vieques west coast, Vieques Island	White crowned pigeon-*Patagioenas leucocephala* White cheeked pintail-*Anas bahamensis* West Indian whistling duck-*Dendrocygna arborea* Leatherback sea turtle-*Dermochelys coriacea* Hawksbill turtle-*Eretmochelys imbricata* Green sea turtle-*Chelonia mydas* Loggerhead turtle-*Caretta caretta* West Indian manatee-*Trichechus manatus* Cobana negra-*Stahlia monosperma* Thoma's lidflower-*Calyptranthes thomasiana*
Kiani Lagoon, Vieques Island	White cheeked pintail-*Anas bahamensis* Ruddy duck-*Oxyura jamaicensis* West Indian whistling duck-*Dendrocygna arborea* White crowned pigeon-*Patagioenas leucocephala* Brown pelican-*Pelecanus occidentalis*
Playa Grande Lagoon, Vieques Island	White crowned pigeon-*Patagioenas leucocephala* White cheeked pintail-*Anas bahamensis* Ruddy duck-*Oxyura jamaicensis* Cobana negra-*Stahlia monosperma* Beautiful goetzea-*Goetzea elegans*
26- Ensenada Honda Mangrove, Vieques Island	West Indian manatee-*Trichechus manatus* Cobana negra-*Stahlia monosperma*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
27- Yanuel Lagoon, Vieques Island	White crowned pigeon-*Patagioenas leucocephala* White cheeked pintail-*Anas bahamensis* Cobana negra-*Stahlia monosperma*
28- Chiva Swamp, Vieques Island	White cheeked pintail-*Anas bahamensis* Least tern-*Sterna antillarum*
29- Tapón Bay, Vieques Island	White crowned pigeon-*Patagioenas leucocephala* White cheeked pintail-*Anas bahamensis*
30- Ferro Bay, Mosquito Bay and Sombe Bay Vieques Island	Brown pelican-*Pelecanus occidentalis* White cheeked pintail-*Anas bahamensis* West Indian manatee-*Trichechus manatus* Peregrine falcon-*Falco peregrinus*
31- East tip of Vieques and Conejo Cay Vieques Island	White cheeked pintail-*Anas bahamensis* Roseate tern-*Sterna dougalli* Brown pelican-*Pelecanus occidentalis* Hawksbill turtle-*Eretmochelys imbricata* Leatherback sea turtle-*Dermochelys coriacea* Green sea turtle-*Chelonia mydas*
32- Roosevelt Roads Naval Base, Ceiba	West Indian whistling duck-*Dendrocygna arborea* Least grebe-*Tachybaptus dominicus* White cheeked pintail-*Anas bahamensis* Brown pelican-*Pelecanus occidentalis* Yellow shouldered blackbird-*Agelaius xanthomus* Ruddy duck-*Oxyura jamaicensis* White crowned pigeon-*Patagioenas leucocephala* West Indian manatee-*Trichechus manatus* Green sea turtle-*Chelonia mydas* Hawksbill turtle-*Eretmochelys imbricata*
33- Ceiba State Forest, Fajardo, Ceiba and Naguabo	Brown pelican-*Pelecanus occidentalis* Yellow shouldered blackbird-*Agelaius xanthomus*
34- Humacao Natural Reserve, Humacao	Caribbean coot-*Fulica caribaea* Least tern-*Sterna antillarum* Least grebe-*Tachybaptus dominicus* Brown pelican-*Pelecanus occidentalis* West Indian whistling duck-*Dendrocygna arborea* Masked duck-*Nomonyx dominicus* Ruddy duck-*Oxyura jamaicensis* White crowned pigeon-*Patagioenas leucocephala* Peregrine falcon-*Falco peregrinus* Leatherback sea turtle-*Dermochelys coriacea* Hawksbill turtle-*Eretmochelys imbricate* Yellow Breasted crake-*Porzana flaviventer*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
	Loggerhead turtle-*Caretta caretta* Puerto Rican slider-T*rachemys stejnegeri* Juey palancú-*Cardisoma guanhumi* Mangrove root crab-*Goniopsis cruentata* Cangrejo violinista-*Uca thayeri*
35- Pandura Mountain Range, Yabucoa-Maunabo	Brown pelican-*Pelecanus occidentalis* White crowned pigeon-*Patagioenas leucocephala* Puerto Rican plain pigeon-*Patagioenas inornata* Puerto Rican Vireo-*Vireo latimeri* Black cowled oriole-*Icterus dominicensis* Puerto Rican demon-*Eleutherodactylus cooki*
36- Palmas Pond, Arroyo	Brown pelican-*Pelecanus occidentalis* Ruddy duck-*Oxyura jamaicensis* Masked duck-*Nomonyx dominicus* Caribbean coot-*Fulica caribaea* Least tern-*Sterna antillarum*
37- Carite State Forest, Cayey	Elfin wood warbler-*Dendroica angelae* Sharp shinned hawk-*Accipiter striatus* Broad winged hawk-*Buteo platypterus* Key west quail dove-*Geotrygon chrysia* Puerto Rican Vireo-*Vireo latimeri* Black cowled oriole-*Icterus dominicensis* Puerto Rican boa-*Epicrates inornatus* Golden coqui-*Eleutherodactylus jasperi* Puerto Rican coqui-*Eleutherodactylus portoricensis* Ground coqui-*Eleutherodactylus richmondi* Eneida's coqui-*Eleutherodactylus eneidae* Warty coqui-*Eleutherodactylus locustus* Tree hole coqui-*Eleutherodactylus hedricki* Web footed coqui-*Eleutherodactylus karlschmidti*
38- Cerro El Gato and Associated Areas, Cayey	Golden coqui-*Eleutherodactylus jasperi*
39- Cidra Lake / Cidra	Puerto Rican plain pigeon-*Patagioenas inornata*
40- Aguirre State Forest, Punta Pozuelo, Cayos Caribe & Mar Negro, Guayama-Salinas-Santa Isabel	Brown pelican-*Pelecanus occidentalis* White cheeked pintail-*Anas bahamensis* Least tern-*Sterna antillarum* Roseate tern-*Sterna dougalli* Least grebe-*Tachybaptus dominicus* Black cowled-oriole-*Icterus dominicensis* White crowned pigeon-*Patagioenas leucocephala* Peregrine falcon-*Falco peregrinus* Puerto Rican plain pigeon-*Patagioenas inornata* Puerto Rican Vireo-*Vireo latimeri* Grasshopper sparrow-*Ammondramus savannarum*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
	Leatherback sea turtle-*Dermochelys coriacea* Green sea turtle-*Chelonia mydas* Hawksbill turtle-*Eretmochelys imbricata* West Indian manatee-*Trichechus manatus* Fishing bat-*Noctilio leporinus* Nassau grouper-*Epinephelus striatus* Jewfish-*Epinephelus itajitara*
41- Punta Arenas, Salinas	Brown pelican-*Pelecanus occidentalis* White cheeked pintail-*Anas bahamensis*
42- Salinas Training Area, Salinas	Key west quail dove-*Geotrygon chrysia* Black cowled oriole-*Icterus dominicensis* Erubia-*Solanum drymophilum*
43- Punta Petrona Mangroves and Caracoles Cay, Santa Isabel	Brown pelican-*Pelecanus occidentalis* White cheeked pintail-*Anas bahamensis* Ruddy duck-*Oxyura jamaicensis* Green sea turtle-*Chelonia mydas* West Indian manatee-*Trichechus manatus*
44- Cabuyón Mangrove and Fríos Cays, Ponce	Brown pelican-*Pelecanus occidentalis* Caribbean coot-*Fulica caribaea* White cheeked pintail-*Anas bahamensis* Snowy plover-*Charadrius alexandrinus* White crowned pigeon-*Patagioenas leucocephala* Grasshopper sparrow-*Ammondramus savannarum*
45- Caja de Muertos Complex, Ponce-Juana Díaz-Santa Isabel	Brown pelican-*Pelecanus occidentalis* Least tern-*Sterna antillarum* Roseate tern-*Sterna dougalli* Peregrine falcon-*Falco peregrinus* Green sea turtle-*Chelonia mydas* Hawksbill turtle-*Eretmochelys imbricata* Grant's blind snake-*Typhlops granti* Cook lizard-*Anolis cooki* Jueyita de tierra-*Gecarcinus lateralis* Juey morado-*Gecarcinus ruricola* Juey de mangle-*Aratus pisonii*
46- Serrallés Lakes, Juana Díaz-Ponce	Ruddy duck-*Oxyura jamaicensis* Caribbean coot-*Fulica caribaea* Least grebe-*Tachybaptus dominicus* Black cowled oriole-*Icterus dominicensis* Brown pelican-*Pelecanus occidentalis*
47- Toro Negro and Tres Picachos State Forest, Ciales-Jayuya-Orocovis	Sharp shinned hawk-*Accipiter striatus* Puerto Rican Vireo-*Vireo latimeri* Black cowled oriole-*Icterus dominicensis* Cave bat-*Brachyphylla cavernarum*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
	Long tongued bat-*Monophyllus redmani* Red fruit bat-*Stenoderma rufum* Brown flower bat-*Erophylla sezekorni* Slippery backed mabuya-*Mabuya mabouya* Tree hole coqui-*Eleutherodactylus hedricki* Ground coqui-*Eleutherodactylus richmondi* Eneida's coqui-*Eleutherodactylus eneidae* Camarón palaí-*Macrobrachium carcinus* Camarón-*Macrobrachium crenulatum* Camarón-*Macrobrachium faustinum* Camarón-*Macrobrachium heterochirus* Buruquena-*Epilobocera suinuatifrons*
48- Las Salinas Lagoon, El Tuque, Ponce	White cheeked pintail-*Anas bahamensis* Brown pelican-*Pelecanus occidentalis* Peregrine falcon-*Falco peregrinus* Puerto Rican Vireo-*Vireo latimeri* Black cowled oriole-*Icterus dominicensis* Dryland grass anole-*Anolis poncensis*
49- Monte Guilarte State Forest, Adjuntas-Guayanilla-Peñuelas-Yauco	Sharp shinned hawk-*Accipiter striatus* Puerto Rican Vireo-*Vireo latimeri* Key west quail dove-*Geotrygon chrysia* Black cowled oriole-*Icterus dominicensis* Red fruit bat-*Stenoderma rufum* Cave bat-*Brachyphylla cavernarum* Eneida's coqui-*Eleutherodactylus eneidae* Puerto Rican coqui-*Eleutherodactylus portoricensis* Puerto Rican boa-*Epicrates inornatus* West Indian walnut-*Juglans jamaicensis* Puerto Rican manac-*Calyptronoma rivalis*
50- Punta Verraco, Cerro Toro and Punta Ventana, Guayanilla	Brown pelican-*Pelecanus occidentalis* Puerto Rican nightjar-*Caprimulgus noctitherus*
51- Guayanilla Hills, Guayanilla	Puerto Rican nightjar-*Caprimulgus noctitherus* Bariaco-*Trichilia triacantha*
52- Guánica Lagoon, Guánica	Puerto Rican nightjar-*Caprimulgus noctitherus* Yellow breasted crake-*Porzana flaviventer* West Indian whistling duck-*Dendrocygna arborea* White cheeked pintail-*Anas bahamensis* Ruddy duck-*Oxyura jamaicensis*
53- Guánica State Forest, Guánica	Key west quail dove-*Geotrygon chrysia* Puerto Rican nightjar-*Caprimulgus noctitherus* White crowned pigeon-*Patagioenas leucocephala* Black cowled oriole-*Icterus dominicensis*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
	Puerto Rican Vireo-*Vireo latimeri* Bridled quail dove-*Geotrygon mystacea* Puerto Rican crested toad-*Bufo lemur* Slippery backed mabuya-*Mabuya mabouya* Grant's blind snake-*Typhlops granti* Juey morado-*Gecarcinus ruricola* Camarón troglobita de *Mona-Typhlatya monae* Bariaco-*Trichilia triacantha*
54- San Jacinto Salt Flats and Tamarind Lagoon, Guánica	Brown pelican-*Pelecanus occidentalis* White cheeked pintail-*Anas bahamensis* Roseate tern-*Sterna dougallii*
55- Susúa State Forest and Adjacent Lands, Yauco-Sabana Grande	Key west quail dove-*Geotrygon chrysia* Puerto Rican nightjar-*Caprimulgus noctitherus* Puerto Rican Vireo-*Vireo latimeri* Black cowled oriole-*Icterus dominicensis* Cobana negra-*Stahlia monosperma* Pelos del Diablo-*Aristida portoricensis*
56- La Parguera Natural Reserve, Lajas	Puerto Rican nightjar-*Caprimulgus noctitherus* Yellow shouldered blackbird-*Agelaius xanthomus* Brown pelican-*Pelecanus occidentalis* Least tern-*Sterna antillarum* Puerto Rican Vireo-*Vireo latimeri* Hawksbill turtle-*Eretmochelys imbricata* Green sea turtle-*Chelonia mydas* Leatherback sea turtle-*Dermochelys coriacea* West Indian manatee-*Trichechus manatus*
57- Cartagena Lagoon, Lajas	Yellow shouldered blackbird-*Agelaius xanthomus* Caribbean coot-*Fulica caribaea* Least grebe-*Tachybaptus dominicus* Peregrine falcon-*Falco peregrinus* Ruddy duck-*Oxyura jamaicensis* West Indian whistling duck-*Dendrocygna arborea* White cheeked pintail-*Anas bahamensis* Masked duck-*Nomonyx dominicus* Broad winged hawk-*Buteo platypterus* Least tern-*Sterna antillarum* White crowned pigeon-*Patagioenas leucocephala* Key west quail dove-*Geotrygon chrysia* Black cowled oriole-*Icterus dominicensis* Puerto Rican Vireo-*Vireo latimeri* Yellow breasted crake-*Porzana flaviventer* Grasshopper sparrow-*Ammondramus savannarum*
58- Boquerón State Forest	Yellow shouldered blackbird-*Agelaius xanthomus*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
Cabo Rojo	Brown pelican-*Pelecanus occidentalis* West Indian whistling duck-*Dendrocygna arborea* White cheeked pintail-*Anas bahamensis* Ruddy duck-*Oxyura jamaicensis* Caribbean coot-*Fulica caribaea* Least tern-*Sterna antillarum* White crowned pigeon-*Patagioenas leucocephala* Black cowled oriole-*Icterus dominicensis* Grasshopper sparrow-*Ammondramus savannarum* Yellow breasted crake-*Porzana flaviventer* Piping plover-*Charadrius melodus* West Indian manatee-*Trichechus manatus* Cook lizard-*Anolis cooki* Free tailed bat-*Tadarida brasiliensis* Bariaco-*Trichilia triacantha*
59- Boquerón Wildlife Refuge, Cabo Rojo	Least grebe-*Tachybaptus dominicus* Brown pelican-*Pelecanus occidentalis* West Indian whistling duck-*Dendrocygna arborea* White cheeked pintail-*Anas bahamensis* Masked duck-*Nomonyx dominicus* Ruddy duck-*Oxyura jamaicensis* Peregrine falcon-*Falco peregrinus* Caribbean coot-*Fulica caribaea* White crowned pigeon-*Patagioenas leucocephala* Black cowled oriole-*Icterus dominicensis* Grasshopper sparrow-*Ammondramus savannarum* Yellow shouldered blackbird-*Agelaius xanthomus* Fishing bat-*Noctilio leporinus* West Indian manatee-*Trichechus manatus* Swamp ghost crab-*Ucides cordatus* Juey palancú-*Cardisoma guanhumi* Mangrove root crab-*Goniopsis cruentata*
60- Cabo Rojo Salt Flats and Adjacent Areas, Cabo Rojo	Snowy plover-*Charadrius alexandrinus* Piping plover-*Charadrius melodus* Yellow shouldered blackbird-*Agelaius xanthomus* Least tern-*Sterna antillarum* White cheeked pintail-*Anas bahamensis* Roseate tern-*Sterna dougalli* Green sea turtle-*Chelonia mydas* Hawksbill turtle-*Eretmochelys imbricata* Leatherback sea turtle-*Dermochelys coriacea* Woodbury's stopper-*Eugenia woodburyana* Chase's threeawn-*Aristida chaseae* Cobana negra-*Stahlia monosperma*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
61- Punta Guaniquilla Natural Reserve, Cabo Rojo	Least grebe-*Tachybaptus dominicus* Brown pelican-*Pelecanus occidentalis* West Indian whistling duck-*Dendrocygna arborea* Ruddy duck-*Oxyura jamaicensis* Peregrine falcon-*Falco peregrinus* White cheeked pintail-*Anas bahamensis* Least tern-*Sterna antillarum* Cobana negra-*Stahlia monosperma* Bariaco-*Trichilia triacantha*
62- Joyuda Lagoon Natural Reserve, Cabo Rojo	Ruddy duck-*Oxyura jamaicensis* Black cowled oriole-*Icterus dominicensis* Brown pelican-*Pelecanus occidentalis*
63- Cuevas Lagoon, Cabo Rojo	White cheeked pintail-*Anas bahamensis* Ruddy duck-*Oxyura jamaicensis* Masked duck-*Nomonyx dominicus*
64- Sabanetas Swamp-Boquilla Channel, Mayagüez	Leatherback sea turtle-*Dermochelys coriacea* Hawksbill turtle-*Eretmochelys imbricata* West Indian manatee-*Trichechus manatus* West Indian whistling duck-*Dendrocygna arborea* Caribbean coot-*Fulica caribaea* Brown pelican-*Pelecanus occidentalis* Least tern-*Sterna antillarum* Roseate tern-*Sterna dougalli* Black cowled oriole-*Icterus dominicensis* Swamp ghost crab-*Ucides cordatus* Mangrove root crab-*Goniopsis cruentata* Juey de mangle-*Aratus pisonii*
65- Maricao State Forest, Maricao	Sharp shinned hawk-*Accipiter striatus* Broad winged hawk-*Buteo platypterus* White crowned pigeon-*Patagioenas leucocephala* Black cowled oriole-*Icterus dominicensis* Puerto Rican Vireo-*Vireo latimeri* Puerto Rican manac-*Calyptronoma rivalis* Higüero de Sierra-*Crescentia portoricensis* Orquid-*Cranichis ricartii* *Gesneria pauciflora* Palo de Rosa-*Ottoschulzia rhodoxylon*
66- Mona Island	Yellow shouldered blackbird-*Agelaius xanthomus* White crowned pigeon-*Patagioenas leucocephala* Peregrine falcon-*Falco peregrinus* West Indian whistling duck-*Dendrocygna arborea* Sharp shinned hawk-*Accipiter striatus* Key west quail dove-*Geotrygon chrysia* Higo Chumbo-*Harrisia portoricensis*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
	Slippery backed mabuya-*Mabuya mabouya* Mona Island ground iguana-*Cyclura cornuta stejnegeri* Mona blind snake-*Typhlops monensis* Mona boa-*Epicrates monensis monensis* Hawksbill turtle-*Eretmochelys imbricata* Green sea turtle-*Chelonia mydas* Fishing bat-*Noctilio leporinus* Humpback whale-*Megaptera novaeangliae* Camarón troglobita de Mona-*Typhlatya monae* Juey morado-*Gecarcinus ruricola* Jueyita de tierra-*Gecarcinus lateralis*
67- Monito Island	Yellow shouldered blackbird-*Agelaius xanthomus* Brown pelican-*Pelecanus occidentalis* Slippery backed mabuya-*Mabuya mabouya* Monito's gecko-*Sphaerodactylus micropithecus* Higo Chumbo-Harrisia portoricensis
68- Pozo Hondo Swamp, Añasco	West Indian whistling duck-*Dendrocygna arborea*
69- Cayures Swamp, Aguada	Masked duck-*Nomonyx dominicus* West Indian whistling duck-*Dendrocygna arborea* Brown pelican-*Pelecanus occidentalis* Caribbean coot-*Fulica caribaea*
70- Desecheo Island	Brown pelican-*Pelecanus occidentalis* White crowned pigeon-*Patagioenas leucocephala* Peregrine falcon-*Falco peregrinus* Slippery backed mabuya-*Mabuya mabouya* Desecheo's gecko-*Sphaerodactylus levinsi* Higo chumbo-*Harrisia portoricensis*
71- Barrio Coto, Isabela	Puerto Rican boa-*Epicrates inornatus* Beautiful goetzea-*Goetzea elegans* Puerto Rican crested toad-*Peltophryne lemur* *Auerodendron pauciflorum*
72- Guajataca Cliffs, Isabela-Quebradillas-Camuy	White tailed tropicbird-*Phaeton aethereus* (nesting) Bridled tern-*Sterna anaethetus* (nesting)
73- Guajataca State Forest, Isabela	Key west quail dove-*Geotrygon chrysia* White crowned pigeon-*Patagioenas leucocephala* Bridled quail dove-*Geotrygon mystacea* Sharp shinned hawk-*Accipiter striatus* Black cowled oriole-*Icterus dominicensis* Puerto Rican Vireo-*Vireo latimeri* Puerto Rican boa-*Epicrates inornatus* Slippery backed-*Mabuya mabouya* Grant's blind snake-*Typhlops granti* Crested toad-*Peltophryne lemur* Long tongued bat-*Monophyllus redmani* Vahl's boxwood-*Buxus vahlii*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
	Palo de Rosa-*Ottoschulzia rhodoxylon* Ausú-*Myrcia paganii* Uvillo-*Eugenia haematocarpa* Spider-*Schoepfia arenaria* St. Thomas prickly-ash-*Zanthoxylum thomasianum* Beautiful goetzea-*Goetzea elegans* Erubia-*Solanum drymophilum* *Daphnopsis helleriana* Palo de Nigua-*Cornutia obovata*
74- Guajataca Lake, Quebradillas	Key west quail dove-*Geotrygon chrysia* Brown pelican-*Pelecanus occidentalis* Broad winged hawk-*Buteo platypterus* White crowned pigeon-*Patagioenas leucocephala* Ruddy duck-*Oxyura jamaicensis* Caribbean coot-*Fulica caribaea* Puerto Rican Vireo-*Vireo latimeri* Black cowled oriole-*Icterus dominicensis* Puerto Rican boa-*Epicrates inornatus* Puerto Rican slider-*Trachemys stejnegeri* Fishing bat-*Noctilio leporinus*
75- Barrio Cocos and Bellaca Creek, Quebradillas	Crested toad-*Peltophryne lemur* Beautiful goetzea-*Goetzea elegans* Puerto Rican boa-*Epicrates inornatus*
76- Carrizales Mangroves, Hatillo	Least grebe-*Tachybaptus dominicus* Brown pelican-*Pelecanus occidentalis* Grasshopper sparrow-*Ammondramus savannarum* West Indian whistling duck-*Dendrocygna arborea* Puerto Rican slider-*Trachemys stejnegeri*
77- Tiburones Swamp and La Tembladera Pond, Arecibo	Least grebe-*Tachybaptus dominicus* Brown pelican-*Pelecanus occidentalis* West Indian whistling duck-*Dendrocygna arborea* White cheeked pintail-*Anas bahamensis* Masked duck-*Nomonyx dominicus* Ruddy duck-*Oxyura jamaicensis* Peregrine falcon-*Falco peregrinus* Caribbean coot-*Fulica caribaea* Roseate tern-*Sterna dougalli* Least tern-*Sterna antillarum* White crowned pigeon-*Patagioenas leucocephala* Key west quail dove-*Geotrygon chrysia* Black cowled oriole-*Icterus dominicensis* Grasshopper sparrow-*Ammondramus savannarum* Yellow shouldered blackbird-*Agelaius xanthomus*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
78- Cambalache Forest, Arecibo	Puerto Rican boa-*Epicrates inornatus* Red fruit bat-*Stenoderma rufum* Cave bat-*Brachyphylla cavernarum* Beautiful goetzea-*Goetzea elegans* Palo de Ramón-*Banara vanderbiltii* Palo de Rosa-*Ottoschulzia rhodoxylon* Black cowled oriole-*Icterus dominicensis* Puerto Rican Vireo-*Vireo latimeri*
79- Río Abajo State Forest, Arecibo	Broad winged hawk-*Buteo platypterus* White crowned pigeon-*Patagioenas leucocephala* Puerto Rican Vireo-*Vireo latimeri* Black cowled oriole-*Icterus dominicensis* Puerto Rican boa-*Epicrates inornatus*
80- La Esperanza Natural Reserve, Manatí	Ruddy duck-*Oxyura jamaicensis* White cheeked pintail-*Anas bahamensis* West Indian whistling duck-*Dendrocygna arborea* Brown pelican-*Pelecanus occidentalis* Roseate tern-*Sterna dougalli* Peregrine falcon-*Falco peregrinus* Grasshopper sparrow-*Ammondramus savannarum* White crowned pigeon-*Patagioenas leucocephala* Masked duck-*Nomonyx dominicus* Caribbean coot-*Fulica caribaea* Black cowled oriole-*Icterus dominicensis* Puerto Rican Vireo-*Vireo latimeri* Puerto Rican slider-*Trachemys stejnegeri* Puerto Rican boa-*Epicrates inornatus*
81- Tortuguero Lagoon, Cabo Caribe Swamp and Rica Lake, Vega Baja	Least grebe-*Tachybaptus dominicus* Caribbean coot-*Fulica caribaea* Brown pelican-*Pelecanus occidentalis* Ruddy duck-*Oxyura jamaicensis* Key west quail dove-*Geotrygon chrysia* White crowned pigeon-*Patagioenas leucocephala* West Indian whistling duck-*Dendrocygna arborea* Bridled quail dove-*Geotrygon mystacea* Yellow breasted crake-*Porzana flaviventer* Puerto Rican boa-*Epicrates inornatus* Puerto Rican Senna-*Chamaecrista glandulosa var. Mirabilis*
82- Cibuco Swamp, Vega Baja	Brown pelican-*Pelecanus occidentalis* Least grebe-*Tachybaptus dominicus* Peregrine falcon-*Falco peregrinus* White crowned pigeon-*Patagioenas leucocephala* West Indian whistling duck-*Dendrocygna arborea*

Table 7 (Continued). Data Deficient, Vulnerable, Endangered or Critically Endangered species found in each CWA of Puerto Rico.

AREA	ENDANGERED AND VULNERABLE SPECIES
	Ruddy duck-*Oxyura jamaicensis* White cheeked pintail-*Anas bahamensis* Roseate tern-*Sterna dougalli* Puerto Rican Vireo-*Vireo latimeri* Long tongued bat-*Monophyllus redmani* Juey palancú-*Cardisoma guanhumi* Mangrove root crab-*Goniopsis cruentata* Juey de mangle-*Aratus pisonii* Swamp ghost crab-*Ucides cordatus* Juey morado-*Gecarcinus ruricola*
83- Vega State Forest, Vega Alta	Key west quail dove-*Geotrygon chrysia* Black cowled oriole-*Icterus dominicensis* Puerto Rican Vireo-*Vireo latimeri* Cobana negra-*Stahlia monosperma*
84- Lakes and Forests of Dorado	White crowned pigeon-*Patagioenas leucocephala* Brown pelican-*Pelecanus occidentalis* Caribbean coot-*Fulica caribaea* Hawksbill turtle-*Eretmochelys imbricata* Juey palancú-*Cardisoma guanhumi* Bloodwoodtree-*Pterocarpus officinalis*
85- Mogotes Río Lajas y Nevárez, Toa Baja	Key west quail dove-*Geotrygon chrysia* Puerto Rican boa-*Epicrates inornatus* Slippery backed mabuya-*Mabuya mabouya* Palo de Ramón-*Banara vanderbiltii* *Daphnopsis helleriana*
86- El Mameyal, Toa Baja	West Indian whistling duck-*Dendrocygna arborea*
87- San Pedro Swamp, Toa Baja	West Indian whistling duck-*Dendrocygna arborea* White crowned pigeon-*Patagioenas leucocephala* Puerto Rican boa-*Epicrates inornatus* Juey palancú-*Cardisoma guanhumi* Green sea turtle-*Chelonia mydas* Loggerhead turtle-*Caretta caretta*

Other sources of information

Wildlife conservation areas selection, forest types and land cover geographic shape, location, and description

Several studies were used to select and describe wildlife conservation areas and their habitats. These studies provided geographic information about priority conservation areas (Figure 15), critical wildlife areas (Figure 16), wildlife-protected areas (Figure 17), forest type and land cover. Some of the priority conservation areas and critical wildlife areas are within the wildlife-protected areas managed and protected by DNER.

A map layer with wildlife conservation areas (Figure 18) was obtained by merging the geographic location of the priority conservation areas, critical wildlife areas and wildlife protected areas (Figure 17). Then, the Puerto Rico mainland forest types and land cover layers were clipped from this map (Helmer et al. 2002). Figures 19 to 25 present the geographic shape and locations of each of the different forest types and land cover as described by Helmer et al. (2002) within the wildlife conservation areas. With the information and analysis of our natural protected areas, DNER could focus conservation efforts according to the habitat types of interest.

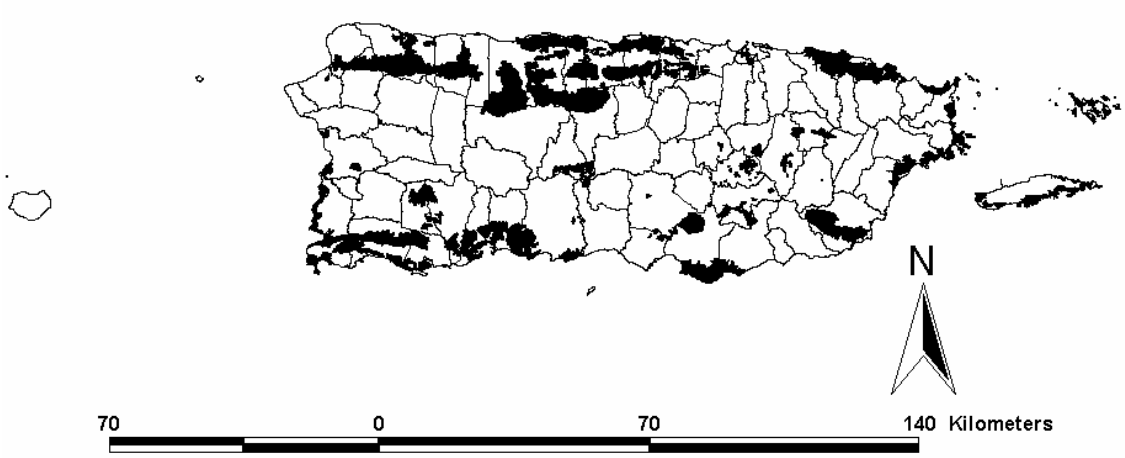

Figure 15. Marine and terrestrial priority conservation areas.

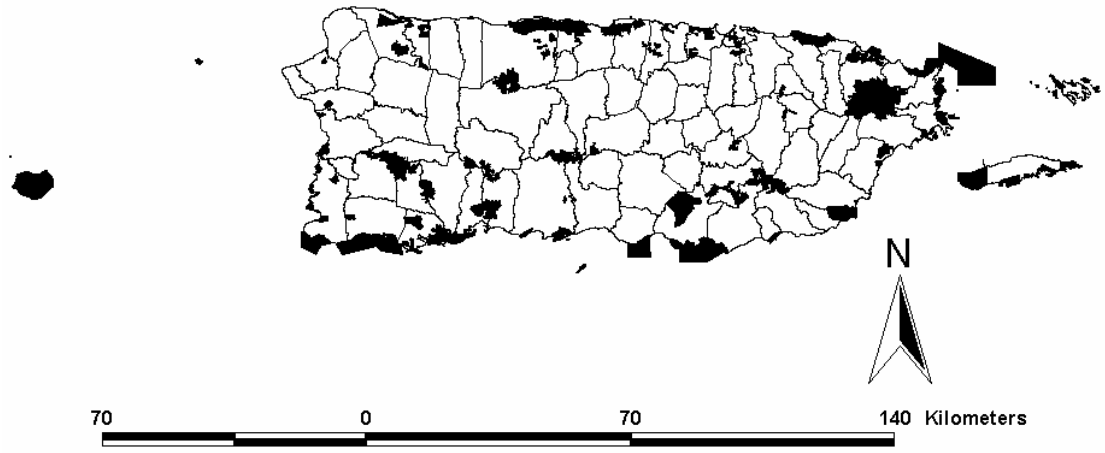

Figure 16. Critical Wildlife Areas and Waterfowl Focus Areas (marine and terrestrial).

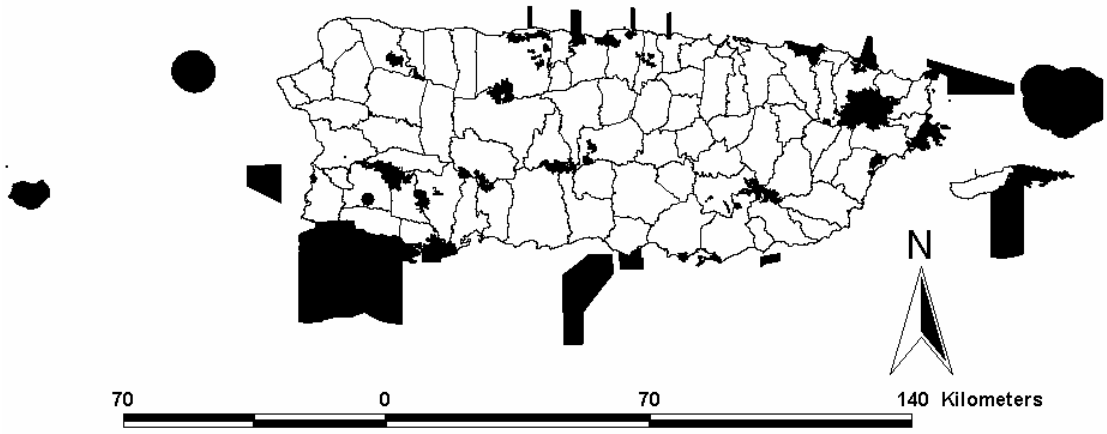

Figure 17. Marine and terrestrial wildlife protected areas.

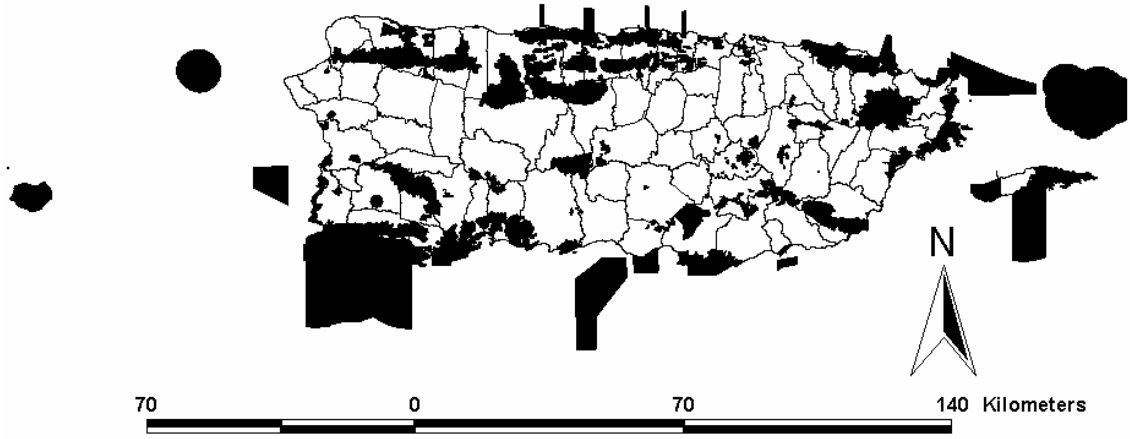

Figure 18. Marine and terrestrial wildlife conservation areas.

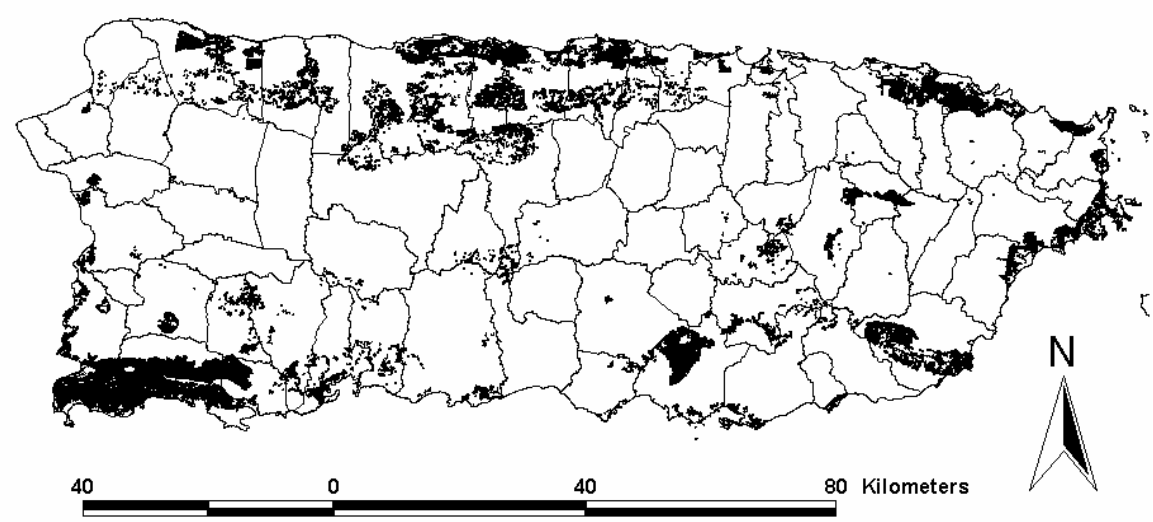

Figure 19. Agricultural lands for conservation that include active sun/shade coffee, submontane and lower montane wet forest/shrub, hay and pasture, among others.

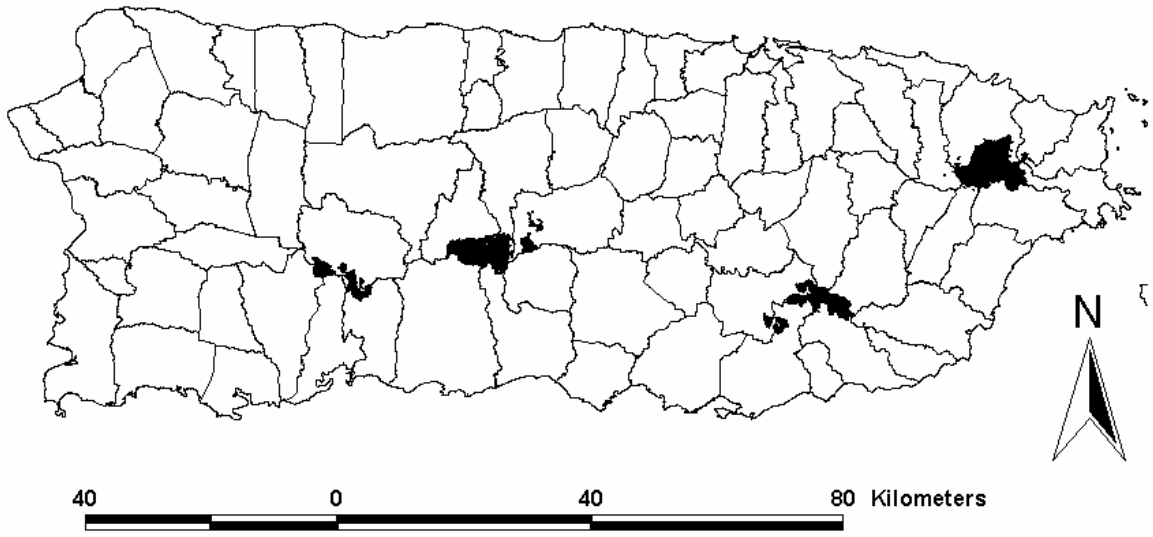

Figure 20. Lower montane wet evergreen forest for conservation that include tall and palm cloud forest, or elfin and palm cloud forest.

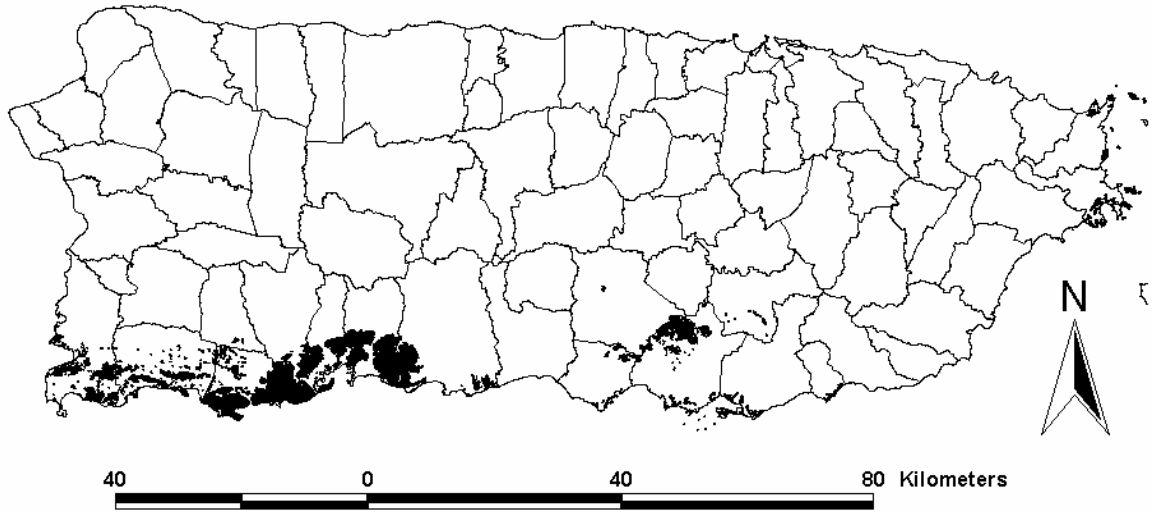

Figure 21. Lowland areas for conservation that include dry and moist, mixed seasonal evergreen sclerophyllous forest, dry mixed evergreen drought-deciduous shrubland with succulents, dry semideciduous forest, and dry semideciduous woodland/shrubland.

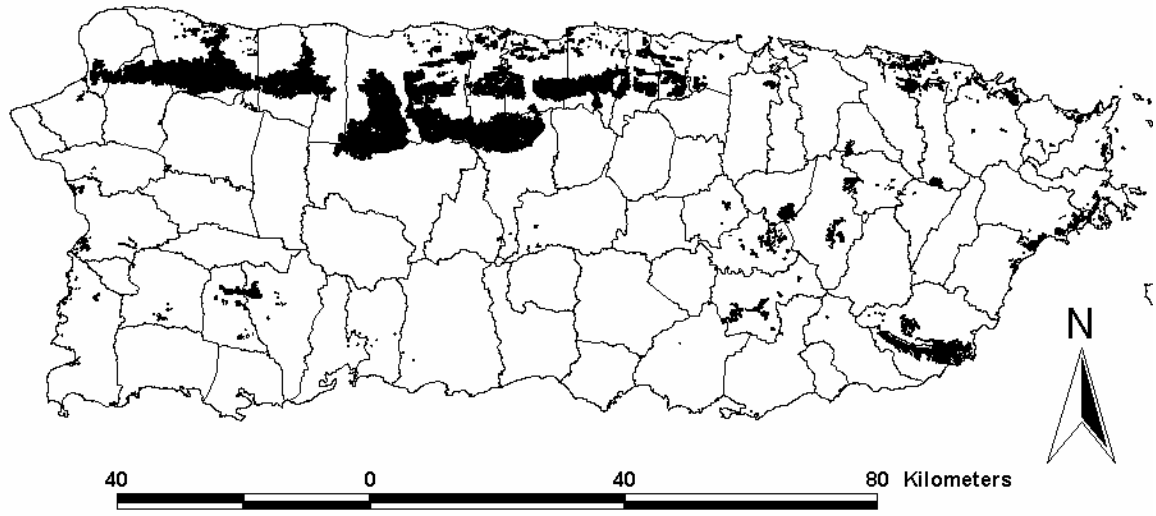

Figure 22. Lowland moist areas for conservation that include coconut palm forest, evergreen hemisclerophyllous shrubland, seasonal evergreen and semi-deciduous forest, seasonal evergreen and semi-deciduous forest/shrub, seasonal evergreen forest, seasonal evergreen forest/shrub, semi-deciduous forest/shrub and semi-deciduous forest.

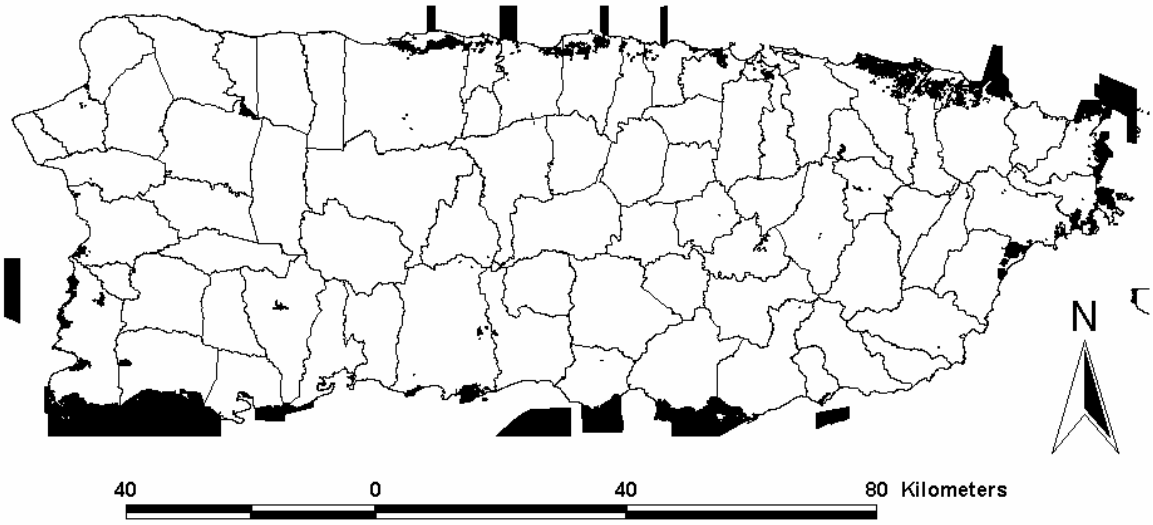

Figure 23. Wetlands (marine and terrestrial; dark zones) for conservation that include emergent (including seasonally flooded pasture), salt and mud flats, Seasonally flooded rainforest, Tidal and semi-permanently flooded evergreen, sclerophyllous forest, tidally flooded evergreen dwarf-shrubland and forb vegetation, and water.

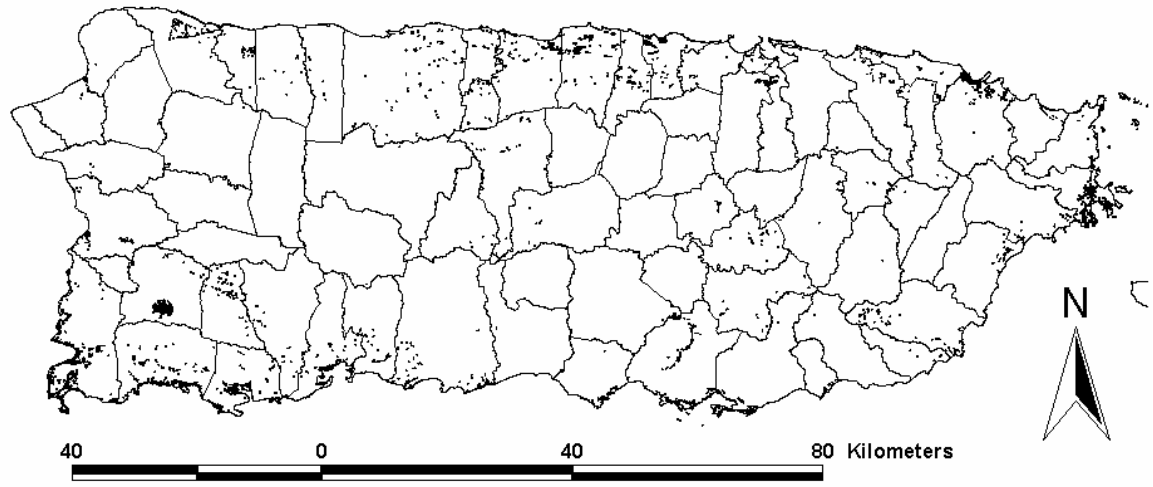

Figure 24. Deforested areas for conservation that include quarries and salt mines, sand and rock, and urban and barren areas.

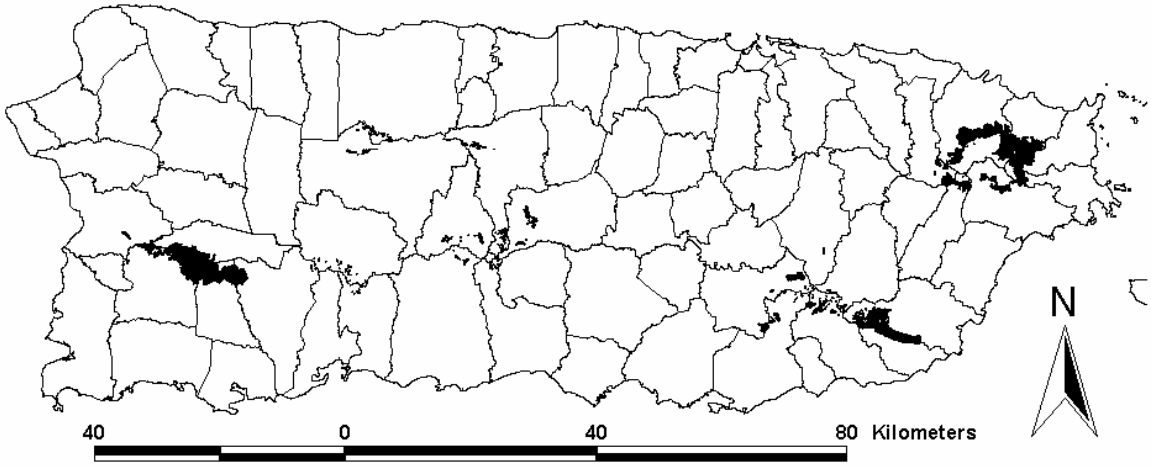

Figure 25. Submontane areas for conservation that include lower montane wet evergreen forest/shrub and active/abandoned shade coffee, lower montane wet evergreen sclerophyllous forest, lower montane wet evergreen sclerophyllous forest/shrub, and wet evergreen forest.

Chapter 7
MONITORING AND ADAPTATION OF CONSERVATION ACTIONS (ELEMENT 5)

Monitoring is an essential element for the success of this Comprehensive Wildlife Conservation Strategy. Understanding ongoing activities, their outcomes, and the effectiveness of those outcomes will allow DNER and other conservation partners to adapt to changing conditions and new knowledge. Our monitoring strategy is built upon existing efforts conducted by DNER and other entities to monitor individual wildlife species populations, and to identify, protect, and manage important habitats on the Island.

Monitoring the success of conservation actions, and changes in land use and habitat conditions will provide information for managers to improve conservation actions and optimize investments. Results from monitoring and evaluation efforts also may be used to effectively communicate conservation achievements to obtain support for programs with decision-makers such as legislators, funding organizations, non-profit organizations, and the general public.

MONITORING APPROACHES

Wildlife Permits

The New Wildlife Law of Puerto Rico mandates that all related wildlife activities need to be regulated by DNER. The Terrestrial Resources Division (TRD) of DNER is the office in charge of granting permits for scientific investigations, collections, importation, and exportation of wildlife, and education. One of the conditions of each permit is a report of authorized activities. These reports provide updated information on the status of studied species, and also inform DNER about programs being conducted by non-governmental organizations or individuals to educate the public about the conservation of wildlife resources.

Regulation No. 6766 specifically mandates a five year revision of the priority species list. It also dictates the preparation of recovery plans within a year for species listed as critically endangered, two years for endangered species, and three years for threatened species.

Game Species

The TRD has monitored game species populations for over 15 years through ground and aerial counts, and harvest data. Game species in Puerto Rico include migratory waterfowl, columbids, feral goats and pigs. However, other non-game species such as native and resident waterfowl (e.g., White-cheeked pintail, West Indian whistling duck), and columbids (i.e., Puerto Rican Plain Pigeon) are also surveyed. These surveys are an important tool for continued monitoring of these priority species.

Threatened and Endangered (T/E) Species

Commonwealth and federal legislation mandate the monitoring of T/E species. The DNER allocates monitoring priorities according to the level of endangerment of the species. Nevertheless, limited funding restricts the number of species that may be effectively monitored. To cope with the lack of adequate resources, the DNER has established cooperative agreements with the academia, the federal agencies, NGO's, and more recently, with private landowners.

Habitat Conservation and Protection

Wildlife habitat is evaluated and characterized according to the categories established in Regulations No. 6765 and 6766. The DNER Secretary designates endangered and threatened species habitat as Critical Habitat (CH) or Critical Essential Habitat (CEH). The CEH can not be modified unless a change in designation is supported by scientific data. For instance, a CH may be modified only if the proposed action has a vital public interest and there is no other option. Any alteration to a CH will require a mitigation of at least a 3:1 proportion with habitat of same or higher ecological value.

The DNER-TRD evaluates the potential impact that development will have on our wildlife species and their habitats. Personnel from this Division provide technical guidance about proposed actions in accordance with regulations. The action to be implemented will depend upon the habitat designation (Table 8).

Table 8. Wildlife habitat categories and actions proposed to deter habitat loss.

Habitat Category	Protection	Action
Critical Essential	Endangered/Threatened Species (only known locality)	No Modification
Critical	Endangered/Threatened Species (Natural or Historical distribution) (Reintroduction Potential)	Restricted Modification Requires a 3:1 or higher habitats compensation (mitigation)
Irreplaceable	All Wildlife	No Net Loss
Essential	All Wildlife	No Net Loss or in situ or adjacent 1:1 compensation
High Ecological Value	All Wildlife	No Net Loss or in situ or adjacent 1:1 compensation
Ecological Value	All Wildlife	No Impact or in situ, adjacent or off-site 1:1 compensation
High Potential	All Wildlife	Mitigation through habitat enhancement land acquisition
Low Potential	All Wildlife	Mitigation through habitat enhancement and other actions that improve habitat conditions

Technical Assistance for Wildlife Conservation in Puerto Rico

The TRD is conducting a project to provide landowners with up-to-date management information and techniques to sustain and enhance wildlife habitats on their properties. Another objective of this initiative is to review projects proposed by government and private entities that would potentially affect wildlife resources and provide technical advice to minimize the negative impacts of such projects. A matrix to categorize habitats proposed for modification was developed by the TRD and other DNER units staff. Habitat categories go from irreplaceable to habitats with low potential of being transformed into a higher

category habitat (Table 8). Management and restoration of target habitats such as wetlands, shade coffee plantations and tropical hardwood forests, as well as riparian habitats are the focus of this project. Monitoring is accomplished by recording the number of private landowners consulted, number of actual restoration and/or management projects developed, and the number of acres and/or kilometers enhanced, restored or protected.

Safe Harbor Agreements

The Safe Harbor Program is a recent conservation strategy that will be implemented by the DNER to monitor and manage species of concern on private lands. At present the TRD is working on the first Programmatic Safe Harbor Agreement with the USFWS for the conservation of the Puerto Rican Plain Pigeon (*Patagioenas inornata*, PRPP) to encourage voluntary PRPP habitat maintenance and enhancement by landowners. This agreement will increase both the amount of habitat available to PRPP and the ability of DNER to monitor this species. Programs like this will support recovery efforts of many other federal and commonwealth trust species. With the development of multiple recovery projects for endangered species in Puerto Rico (e.g., the establishment of a second wild population of the Puerto Rican parrot in northern Puerto Rico), a strong private land program is critical for the success of these initiatives. Monitoring will be achieved through regular visits to enrolled properties to ensure compliance with the agreement. Also, the DNER, possibly with the assistance of the USFWS, will monitor the covered species to ascertain the number of individuals occurring on enrolled lands.

Natural Heritage Program

The DNER's Natural Heritage Program is in charge of identifying lands for conservation throughout the Island. Once identified, the properties are prioritized for acquisition. This approach is another tool for conserving land to benefit wildlife species. This program also keeps a list of critical species, which includes both plants and animals. This list is regularly updated.

Puerto Rico Conservation Trust

The Puerto Rico Conservation Trust is a private non-profit organization that currently manages 14 reserves (~13,000 acres) throughout the island. This entity monitors habitat as it relates to native habitat preservation and restoration. This organization also educates the public on the conservation of natural resources.

Ciudadanos del Carso

Ciudadanos del Carso is a private non-profit organization whose mission is the acquisition of land, particularly in the karst region of Puerto Rico, for protection and conservation. This organization monitor habitat as it relates to native habitat preservation and restoration. Ciudadanos del Carso also educates the public on the conservation of natural resources, and collaborates with other environmental organizations and government agencies in projects and studies related to the conservation of the karst region.

Adaptive Management

The Puerto Rico CWCS does not pretend to be a fixed set of conservation strategies and goals. The main objective of this plan is to establish DNER priorities for the conservation of wildlife species and their habitat in Puerto Rico. Once conservation actions are implemented, it is important to evaluate their outcome and determine whether such actions were successful or not. Maintaining a loop between monitoring and management actions, will help to correct for the uncertainty resulting from management. Continued feedback among cooperators (e.g., DNER, stakeholders, academia, and general public) will be necessary to fill gaps of information related to particular conservation actions and propose alternatives to improve project organization and budgeting. Conservation priorities should have the flexibility to switch to alternate actions if necessary.

Monitoring and conservation measures have been identified for many wildlife species in recovery or management plans. As previously mentioned, regular systematic surveys are conducted by DNER for some avian taxa. Also, the Audubon Society conducts annual Christmas Bird Counts in southwestern and eastern Puerto Rico. However, most species require additional surveys, analysis, and conservation measures. For example, terrestrial invertebrates have not been adequately monitored, except for some studies on specific species.

It is recognize that the monitoring phase might be time consuming and expensive. Thus, probably there will be a need to set limits on the number of species and habitats monitored. However, through this program, the DNER is expecting to encourage the participation of other parties (e.g., Universities, Conservation Organizations) by funding research projects leading to provide information on the status of SGCN, particularly data deficient species and habitats.

Specific long-term success of the CWCS conservation actions will be evaluated through different approaches: gained scientific knowledge related to SGCN and their habitats, number of funded and completed projects of conservation priority, net increase in acreage of key habitats conserved through acquisition, restoration, or mitigation as mandated by Law No. 241, increase of partnership and public involvement resulting in protection of wildlife resources, reduction or elimination of threats to SGCN and priority habitats, long-term reduction in the number of SGCN and threats.

Portals of Information on the DNER Web Page

The development of web site within the DNER web page is recommended to facilitate sharing up-to-date information related to current research findings, and monitoring data on species and habitats.

Chapter 8
REVISIONS TO THE CWCS – 10 YEARS (ELEMENT 6)

The DNER will conduct internal evaluations and revisions of the CWCS every 2.5 years to adaptively address conservation priorities within the 10-years timeframe (Table 9). Changes of priorities will be based on variations in landscape and environmental conditions, and on wildlife and habitat responses to such variations and to implemented conservation actions. Performance reports for Federal Assistance projects and State Wildlife Grant funds, Wildlife Permits reports and in-house updates to the species priority list (a Mandate under Regulation No. 6766) will be used to document progress on activities related to the CWCS.

A detailed evaluation of the CWCS will be performed every 5 years to assess progress on conservation strategies, species status, and stressors that significantly affect wildlife and habitats. Input from partners and the general public will be requested during this evaluation. Specific partners and stakeholders previously identified will be asked to participate in the 5-years review along with DNER staff. This mid-term evaluation will allow corrections to the strategy within the anticipated 10-year timeframe.

Table 9. Planned Critical Wildlife Conservation Strategy timeframe 2004-2014.

FY 01	**FY 02**	**FY 03-04**	**FY 05**	**FY 06-09**	**FY 10**
July 1st, 2004 – June 30, 2005	July 1st, 2005 – June 30, 2006	July 1st, 2006 – June 30, 2008	July 1st, 2008 – June 30, 2009	July 1st, 2009 – June 30, 2012	July 1st, 2012 – June 30, 2013
↓	↓	↓	↓	↓	↓
CWCS Preparation	CWCS Completion and Implementation	CWCS Implementation	CWCS Implementation	CWCS Implementation	CWCS Mid-Term Evaluation

Chapter 9
COORDINATION OF DEVELOPMENT, IMPLEMENTATION, REVIEW, AND REVISION OF THE PLAN-STRATEGY WITH FEDERAL, STATE, AND LOCAL AGENCIES AND INVOLVEMENT OF GENERAL PUBLIC IN THE CWCS (ELEMENTS 7 & 8)

History

The DNER initiated the development of the CWCS in September, 2003. The initial proposal pursued an external resource to develop the strategy, but the bid received exceeded available funding. Thus, in October, 2004 the Bureau of Fisheries and Wildlife DNER created a steering committee to coordinate and complete this CWCS.

Coordination

Although the Puerto Rico CWCS was completed in-house, it was supported by a number of initiatives conducted before and during the development of the strategy. One document of particular importance was Regulation No. 6766. This regulation contains a table of our SGCN, including their status and threats. Between 2001 and 2002, a group of experts and stakeholders was engaged as a committee to develop recommendations for Regulation No. 6766. Two public hearings were held on December 18, 2001 and March 20, 2002 to seek public input about the list of SGCN included in this Regulation.

Other initiatives include the Critical Wildlife Areas document (2005), the Waterfowl Focus Areas documents (2005), and the Strategic Plan for Fisheries and Wildlife (PRDNER 1996). All of these documents have been subject to revision by both private and public (State and Federal) agencies and organizations, providing and exchanging valuable information and input on each one. Thus, these entities provided indirect input in the development of the CWCS.

Agencies and Organizations that Provided Input:

State Agencies:

P.R. Department of Natural and Environmental Resources (several units)

P.R. Environmental Quality Board

Federal Agencies:

U.S. Fish and Wildlife Service

U.S. Forest Service

Private Conservation Organizations:

Puerto Rico Conservation Trust

Puerto Rican Ornithological Society

Ciudadanos del Carso

Natural History Society of Puerto Rico

Stakeholders:

DNER Advisory Committee (members of this committee includes representatives from: P.R. Department of Natural and Environmental Resources, U.S. Fish and Wildlife Service, Interamerican University, Ciudadanos del Carso, Puerto Rico Hunters Association.

Academia:

University of Puerto Rico- Humacao Campus

The draft of the Puerto Rico CWCS was posted on the DNER web page for revision. State and federal agencies as well as other partners were asked to review the document and submit their comments in order to incorporate those into the final document. Partners were encouraged to integrate SGCN, habitat, and conservation actions identified in the CWCS into their plans and programs, and also to collaborate with the DNER on the implementations of these actions.

Literature Cited:

Abbot, I. 1980. Theories dealing with the ecology of land birds on Islands. Ad. Ecol. Res. 11: 329-371.

Atlantic Coast Joint Venture. 2004. Atlantic Coast Joint Venture Strategic Plan. 26 pp.

Austin, M. P., and C. R. Margules. 1986. Assessing representativeness. *In*: Wildlife conservation evaluation, M.B. Usher, ed. Chapman and Hall, Ltd., London. 394 p.

Birdsey, R. A. and P. L. Weaver. 1982. The forest resources of Puerto Rico. USDA Resources bulletin SO-85, October 1982. South. For. Exp. Station, New Orleans, LA. 59 pp.

Birdsey, R. A. and P. L. Weaver. 1987. Forest area trends in Puerto Rico. Resource Bulletin SO-85. U. S. Department of Agriculture Forest Service, Southern Forest Experiment Station, New Orleans, LA.

Blondel, J. 1985. Habitat selection in island versus mainland birds. Pp. 477-517. *In:* M. L. Cody (ed.). Habitat selection in birds. Academic Press, Inc. San Diego, CA.

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.

Brash, A. R. 1987. The history of avian extinction and forest conservation on Puerto Rico. Biol. Cons. 39: 97-111.

Camacho-Rodríguez, María, J. Chabert-Llompart and M. López-Flores. 1999. Guía para la identificación de las aves exóticas establecidas en Puerto Rico. Departamento de Recursos Naturales y Ambientales, División de Recursos Terrestres. 52 pp.

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., and A. E. Lugo. 1978. Los sistemas de mangles de Puerto Rico. Departamento de Recursos Naturales, Programa de la Zona Costanera, San Juan, P. R. 102 pp.

Carter, M. F., W. C. Hunter, D. N. Pashley, and K. V. Rosenberg. 2000. Setting conservation priorities for landbirds in the United States: the Partnership In Flight approach. Auk 117: 541-548.

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.

Cintrón, B. B. 1983. Coastal freshwater swamp forests: Puerto Rico's most endangered ecosystem? Pages 249-282. *In* A. E. Lugo, editor. Los bosques de Puerto Rico. Institute of Tropical Forestry, USDA Forest Service, Rio Piedras, P.R.

Cruz-Báez, A. D., and T. D. Boswell. 1997. Atlas de Puerto Rico. The Cuban American Council, Inc., Miami, FL. 202 pp.

Csuti, B. and A. R. Kiester. 1996. Hierarchical gap analysis for identifying priority areas for biodiversity. *In*: Gap analysis: A landscape approach to biodiversity planning, J.M. Scott et al. eds. American Society for Photogrammetry and Remote Sensing, Bethesda, Maryland. 320 p.

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.

Drake, J. A., H. A. Mooney, F. di Castri, R. H. Groves, F. J. Kruger, M. Rejmanek, and M. Williamson. 1989. Biological invasions: A global perspective. John Wiley and Sons, New York.

Ebenhard, T. 1988. Introduced birds and mammals and their ecological effects. Sweden Wildlife Research 13: 1-107.

Ewel, J. J. and J. L. Whitmore. 1973. The ecological life zones of Puerto Rico and the U.S. Virgin Islands. Forest Service Research paper ITF-18. U.S. Department of Agriculture, Forest Service, Institute of Tropical Forestry. Rio Piedras, Puerto Rico.

García, M. A., C. E. Diez, and A. O. Alvarez. 2001. The impact of feral cats on Mona island wildlife. Caribbean Journal of Science 37: 1-2.

_____, _____, and _____. 2002. Eradication of *Rattus rattus* from Monito Island. Pages 116-119. *In* D. Veitch, and M. Clout, eds. Turning the tide: The eradication of invasive species. IUCN SSC Invasive Species Specialist Group/Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, United Kingdom.

Gould, W., S. Martinuzzi , and O. Ramos. 2003a. Image analysis and land cover mapping for Puerto Rico Poster presented at the National GAP Annual Meeting, October 6-9, 2003 Fort Collins Colorado.

_____, B. Fevold, G. González , and S. Martinuzzi. 2003b. Hierarchical vegetation classification for the Puerto Rico Gap Analysis Project: Integrating climate, substrate, topography, and species composition in a land cover map legend. Poster presented at the National GAP Annual Meeting, October 6-9, 2003. Fort Collins Colorado.

Gould, W., Alarcón, C., Fevold, B., Jiménez, M. E., Martinuzzi, S., Potts, G., Solórzano, M., and Ventosa, E. 2007. Puerto Rico Gap Analysis Project. USGS. Moscow, ID. 100 pp.

Helmer, E. H., Ramos, O., T. del Mar López, M. Quiñones, and W. Diaz. 2002. Mapping the Forest Type and Land Cover of Puerto Rico, a Component of the Caribbean Biodiversity Hotspot. Caribbean Journal of Science. 38: 3-4.

Hunter, W. C., M. F. Carter, D. N. Pashley, and K. Barker. 1993. The Partners In Flight prioritization scheme. Pp. 109-119. *In*: D. Finch and P. Stangel (eds), Status and management of Neotropical migratory birds. USDA General Technical Report RM-229, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

ITIS. 2005. Integrated Taxonomic Information System. Smithsonian Institution/NMNH MRC – 0180. Washington, DC 20560-0180. URL: http://www.itis.usda.gov/

IUCN. 1994. IUCN Red List Categories, IUCN, Gland, Switzerland.

Jennings, M. D. 1996. Nomenclature and mapping units for gap analysis land cover data. *In*: Gap Analysis: A landscape approach to biodiversity planning. J.M. Scott et al. eds. American Society of Photogrammetry and Remote Sensing, Bethesda, Maryland. 320 p.

Kaminski, R. M., H. R. Murkin, and C. E. Smith. 1985. Control of cattail and bulrush by cutting and flooding. Pages 253-262. *In* H. H. Prince and F. M. D'Itri, editors. Coastal wetlands. Lewis Publishing, Inc., Chelsa, Mi.

Little, E. L., R. O. Woodbury and F. H. Wadsworth. 1974. Trees of Puerto Rico and the Virgin Islands. Second Vol. U. S. Dept of Agric. Handbook no. 449. 1024 pp.

López, T. del Mar, T.M. Aide, and J.R. Thomlinson. 2001. Urban expansion and the loss of prime agricultural lands in Puerto Rico. Ambio 30: 49-54.

Lugo, A. E. 1988. Estimating reductions in the diversity of tropical forest species. Pp. 58-70. *In* E. O. Wilson (ed.), Biodiversity National Academy Press, Washington, D.C. 521 pp.

_____, and S. Brown. 1988a. Evaluation of functional predictors to wetlands of Caribbean islands. Acta Científica 2(2-3): 48-61.

_____, and S. Brown. 1988b. The wetlands of Caribbean islands. Acta Científica 2(2-3): 48-61.

Lugo, A. E., T.del M. López, O. Ramos y L. Vélez. 2004. Urbanización de los terrenos en la periferia de El Yunque. U.S.D.A., Forest Service. Gen. Tech. Report WO-66

Martínez, R., G. Cintrón, and L. A. Encarnación. 1979. Mangroves in Puerto Rico: a structural inventory. Final Report NOAA Coastal Zone Management. Puerto Rico Department of Natural Resources, San Juan, P.R. 149 pp.

Martinuzzi, S., W. Gould, and O. Ramos. 2003a. Cloud and cloud shadow removal in the creation of a cloud-free composite Landsat ETM scene in tropical landscapes. Poster presented at the National GAP Annual Meeting, October 6-9, 2003, Fort Collins, Colorado.

_____, _____, and _____. 2003b. Urban cover estimates from image analysis and land cover mapping of Puerto Rico. Presented at the 2nd Congreso de Ecourbanismo, Centro de Bellas Artes, November 18-19, 2003 Caguas, Puerto Rico.

_____, _____, and _____. 2003c. Integrating remote sensing and GIS for land cover mapping and analysis in the Karst area. Presented at the Second Symposium of Karst Research, September 27, 2003 University in Bayamón Puerto Rico.

Money, H. A., and J. A. Drake. 1986. Ecology of biological invasions of North America and Hawaii. Springer-Verlag, New York.

Myers, N. R. A. Mittermeir, C. G. Mittermeier, G. A. B. da Fonseca, and J. Ke. 2000. Biodiversity hotspots for conservation priorities. Nature 403: 853-858.

National Gap Analysis Program. 1994. A handbook for gap analysis. Moscow, Idaho, USA.

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.

NatureServe Organization. 2005. 1101 Wilson Boulevard 15th Floor, Arlington, VA 22209. URL: http://www.natureserve.org/

Negrón-González, L. 1986. 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.

Noss, R.F, and A.Y. Cooperrider. 1994. Saving nature's legacy. Island Press, Washington, D.C. 420 p.

Núñez-García, F. and W.C. Hunter. 2000. Puerto Rico and the U.S. Virgin Islands Bird Conservation Plan. Version 1.0. USFWS, 1875 Century Boulevard, Atlanta, Georgia. 76 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.

Puerto Rico Department of Natural and Environmental Resources. 1996. Strategic plan of the fish and wildlife natural resources. Government of Puerto Rico, San Juan, P.R.

Puerto Rico Planning Board. 2005. Puerto Rico Land Use Plan. www.oput.gobierno.pr

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.

_____. 1983. A guide to the birds of Puerto Rico and the Virgin Islands. Fondo Educativo Interamericano, San Juan, Puerto Rico. 225 pp.

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

Ricklefs, R. E. and G. W. Cox. 1978. Stage and taxon cycle, habitat distribution and population density in the avifauna of the West Indies. Amer. Nat. 112: 875-895.

Rivero, J.A. 1998. Los anfibios y reptiles de Puerto Rico. Segunda Edición Revisada. Editorial de la Universidad de Puerto Rico. 510 pp.

Scott, D. A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge

Scott, J. M., B. Csuti, J.D. Jacobi, and J.E. Estes. 1987. Species richness. BioScience 37(11): 782-787.

_____, F. Davis, B. Csuti, R. Noss. B. Butterfield, C. Groves, H. Anderson, S. Caicco, F. D'erchia, T. C. Edwards, Jr., J. Ulliman, and R. G. Wright. 1993. Gap Analysis: A geographic approach to protection of biological diversity. Wildl. Monogr. 123 pp.

Snyder, N. F. R., J. W. Wiley and C. B. Kepler. 1987. The parrots of Luquillo: natural history and conservation of the Puerto Rican Parrot. Western Foundation of Vertebrate Zoology. Los Angeles, California.

Terborgh, J. W. 1980. The conservation status of Neotropical migrants: present and future: Pp. 21-30. *In* A. Keast and E. S. Morton. Migrant birds in the Neotropics: ecology, behavior, distribution and conservation. Smithsonian Institution press. Washington, D.C.

Torres, J.A., Medina Gaud, S. 1998. Los insectos de Puerto Rico. Acta Científica 12(1-3): 3-41.

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.

US Army Corps of Engineers. 1978. "Preliminary Guide to Wetlands of Puerto Rico," Technical Report Y-78-3, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

U. S. Census Bureau. 2000. http://www.census.gov/census2000/states/pr.html.

U.S. Fish & Wildlife Service. 1987. Recovery plan for the Puerto Rican parrot, *Amazona vittata*. U. S. Fish and Wildlife Service, Atlanta, Ga. 69 pp.

Ventosa-Febles, E., M. Camacho-Rodríguez, J. L. Chabert-Llompart, J. Sustache-Sustache, D. Dávila-Casanova. 2005a. Puerto Rico Critical Wildlife Areas. P.R. Department of Natural and Environmental Resources, Terrestrial Resources Division, San Juan, P.R. 383 pp.

Ventosa-Febles, E., M. Camacho-Rodríguez, J. L. Chabert-Llompart, J. Sustache-Sustache, D. Dávila-Casanova. 2005b. Puerto Rico Waterfowl

Focus Areas. Puerto Rico Department of Natural and Environmental Resources; North American Waterfowl Management Plan and Atlantic Coast Joint Venture. 95 pp.

Vilella, F. J., and E. R. García. 1995. Post-hurricane management of the Puerto Rican parrot. Pages 618-621. *In* J. A. Bissonette and P. R. Krausman, editors. Integrating people and wildlife for a sustainable future. Proceedings of the first international wildlife management congress. The Wildlife Society, Bethesda, Md.

Weller, M. W., and L. H. Fredrickson. 1974. Avian ecology of a managed glacial marsh. Living Bird 12: 269-291.

Wiley, J. W., and J. M. Wunderle. 1993. The effects of hurricanes on birds, with special reference to Caribbean islands. Bird Conservation 3: 319-349.

_____, and F. J. Vilella. 1998. Caribbean Islands. Pages 315-349. *In* M. J. Mac, P. A. Opler, C. E. Puckett Haecker, and P. D. Doran, editors. Status and trends of the nation's biological resources. 2 vols. U. S. Department of the Interior, U. S. Geological Survey, Reston, Va.

APPENDIX I

CATEGORIES AND DEFINITIONS

Critically Endangered (CR): A taxon is Critically Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing an extremely high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of ≥90% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
   (a) direct observation
   (b) an index of abundance appropriate to the taxon
   (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
   (d) actual or potential levels of exploitation
   (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.
2. An observed, estimated, inferred or suspected population size reduction of ≥80% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.
3. A population size reduction of ≥80%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.
4. An observed, estimated, inferred, projected or suspected population size reduction of ≥80% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 100 km², and estimates indicating at least two of a-c:

a. Severely fragmented or known to exist at only a single location.
b. Continuing decline, observed, inferred or projected, in any of the following:
(i) extent of occurrence
(ii) area of occupancy
(iii) area, extent and/or quality of habitat
(iv) number of locations or subpopulations
(v) number of mature individuals.
c. Extreme fluctuations in any of the following:
(i) extent of occurrence
(ii) area of occupancy
(iii) number of locations or subpopulations
(iv) number of mature individuals.

2. Area of occupancy estimated to be less than 10 km^2, and estimates indicating at least two of a-c:
a. Severely fragmented or known to exist at only a single location.
b. Continuing decline, observed, inferred or projected, in any of the following:
(i) extent of occurrence
(ii) area of occupancy
(iii) area, extent and/or quality of habitat
(iv) number of locations or subpopulations
(v) number of mature individuals.
c. Extreme fluctuations in any of the following:
(i) extent of occurrence
(ii) area of occupancy
(iii) number of locations or subpopulations
(iv) number of mature individuals.

C. Population size estimated to number fewer than 250 mature individuals and either:

1. An estimated continuing decline of at least 25% within three years or one generation, whichever is longer, (up to a maximum of 100 years in the future) OR
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):
(a) Population structure in the form of one of the following:
(i) no subpopulation estimated to contain more than 50 mature individuals, OR
(ii) at least 90% of mature individuals in one subpopulation.

(b) Extreme fluctuations in number of mature individuals.

D. Population size estimated to number fewer than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer (up to a maximum of 100 years).

ENDANGERED (EN): A taxon is Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a very high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of ≥70% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
   (a) direct observation
   (b) an index of abundance appropriate to the taxon
   (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
   (d) actual or potential levels of exploitation
   (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.
2. An observed, estimated, inferred or suspected population size reduction of ≥50% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.
3. A population size reduction of ≥50%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.
4. An observed, estimated, inferred, projected or suspected population size reduction of ≥50% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 5,000 km², and estimates indicating at least two of a-c:
    a. Severely fragmented or known to exist at no more than five locations.
    b. Continuing decline, observed, inferred or projected, in any of the following:
        (i) extent of occurrence
        (ii) area of occupancy
        (iii) area, extent and/or quality of habitat
        (iv) number of locations or subpopulations
        (v) number of mature individuals.
    c. Extreme fluctuations in any of the following:
        (i) extent of occurrence
        (ii) area of occupancy
        (iii) number of locations or subpopulations
        (iv) number of mature individuals.
2. Area of occupancy estimated to be less than 500 km², and estimates indicating at least two of a-c:
    a. Severely fragmented or known to exist at no more than five locations.
    b. Continuing decline, observed, inferred or projected, in any of the following:
        (i) extent of occurrence
        (ii) area of occupancy
        (iii) area, extent and/or quality of habitat
        (iv) number of locations or subpopulations
        (v) number of mature individuals.
    c. Extreme fluctuations in any of the following:
        (i) extent of occurrence
        (ii) area of occupancy
        (iii) number of locations or subpopulations
        (iv) number of mature individuals.

C. Population size estimated to number fewer than 2,500 mature individuals and either:

1. An estimated continuing decline of at least 20% within five years or two generations, whichever is longer, (up to a maximum of 100 years in the future) OR
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):
    (a) Population structure in the form of one of the following:
        (i) no subpopulation estimated to contain more than 250 mature individuals, OR

(ii) at least 95% of mature individuals in one subpopulation.

(b) Extreme fluctuations in number of mature individuals.

D. Population size estimated to number fewer than 250 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer (up to a maximum of 100 years).

VULNERABLE (VU): A taxon is Vulnerable when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of ≥50% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
   (a) direct observation
   (b) an index of abundance appropriate to the taxon
   (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
   (d) actual or potential levels of exploitation
   (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.
2. An observed, estimated, inferred or suspected population size reduction of ≥30% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.
3. A population size reduction of ≥30%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.
4. An observed, estimated, inferred, projected or suspected population size reduction of ≥30% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 20,000 km², and estimates indicating at least two of a-c:
    a. Severely fragmented or known to exist at no more than 10 locations.
    b. Continuing decline, observed, inferred or projected, in any of the following:
        (i) extent of occurrence
        (ii) area of occupancy
        (iii) area, extent and/or quality of habitat
        (iv) number of locations or subpopulations
        (v) number of mature individuals.
    c. Extreme fluctuations in any of the following:
        (i) extent of occurrence
        (ii) area of occupancy
        (iii) number of locations or subpopulations
        (iv) number of mature individuals.
2. Area of occupancy estimated to be less than 2,000 km², and estimates indicating at least two of a-c:
    a. Severely fragmented or known to exist at no more than 10 locations.
    b. Continuing decline, observed, inferred or projected, in any of the following:
        (i) extent of occurrence
        (ii) area of occupancy
        (iii) area, extent and/or quality of habitat
        (iv) number of locations or subpopulations
        (v) number of mature individuals.
    c. Extreme fluctuations in any of the following:
        (i) extent of occurrence
        (ii) area of occupancy
        (iii) number of locations or subpopulations
        (iv) number of mature individuals.

C. Population size estimated to number fewer than 10,000 mature individuals and either:

1. An estimated continuing decline of at least 10% within 10 years or three generations, whichever is longer, (up to a maximum of 100 years in the future) OR
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):
    (a) Population structure in the form of one of the following:

(i) no subpopulation estimated to contain more than 1000 mature individuals, OR
(ii) all mature individuals are in one subpopulation.

b) Extreme fluctuations in number of mature individuals.

D. Population very small or restricted in the form of either of the following:

1. Population size estimated to number fewer than 1,000 mature individuals.
2. Population with a very restricted area of occupancy (typically less than 20 km^2) or number of locations typically five or fewer such that it is prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and is thus capable of becoming Critically Endangered or even Extinct in a very short time period.

E. Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years

Lower Risk (LR) - A species is at lower risk when, after an evaluation, it did not satisfy any of the categories of Critically Endangered, Endangered or Vulnerable, and it is not Data Deficient. Species included in the category of lower risk can be divided in three sub-categories:

1. Conservation Dependant (dc) - Species that are the center of a continuous conservation program of taxonomic or habitat specificity, focused on a particular species, which would be classified into one of the previous categories if the program ends within a period of five year.
2. Almost Threatened (ca) - Species that can not be classified as Conservation Depended, but are close to be classified as Vulnerable.
3. Lower Concern (lc) - Species that can not be classified as Conservation Depended or Almost Threatened.

Data Deficient (DD) - A species belongs to the category of Data Deficient when the information is not adequate for a direct or indirect evaluation of risk of extinction, over the base of distribution and/or condition of the population. A species in this category could be well studied, and its biology might be well known, but appropriate data about its abundance and distribution may be lacking. Therefore, data Deficient is not a threat or risk category. Including a species in this category indicates that more information is required, and it is recognized that future investigations could determine that a threatened classification can be appropriate. It is important to make a conscious use of all data available. In many cases caution is advised when selecting between Data Deficient and a threatened condition. If it is suspected that the distribution of a species is

relatively restricted, and a considerable period of time has passed since the last time the species was registered, then the threatened condition could be well justified.

APPENDIX II

LIST OF ACRONYMS

ACJV – Atlantic Coast Joint Venture

CH – Critical Habitat

CR – Critically Endangered

CWA – Critical Wildlife Areas

CWCS – Comprehensive Wildlife Conservation Strategy

DD – Data Deficient

DNER – Department of Natural and Environmental Resources

DNR – Department of Natural Resources

E – Endemic

CEH – Critical Essential Habitat

EN - Endangered

FY – Fiscal Year

I - Introduced

IITF – International Institute of Tropical Forestry

ITIS - Integrated Taxonomic Information System

LR – Low Risk

M - Migratory

N - Native

NCSU – North Carolina State University

NGO – Non-governmental Organization

NHP – Natural Heritage Program

PFW – Partners for Fish and Wildlife

PRCT – Puerto Rico Conservation Trust

PR-GAP – Puerto Rico Gap Analysis Project

PRLUP – Puerto Rico Land Use Plan

PRPP – Puerto Rican Plain Pigeon

PRWFA – Puerto Rico Waterfowl Focus Area

SGCN – Species of Greatest Conservation Need

SWG – State Wildlife Grants

T/E – Threatened and Endangered Species

TRD – Terrestrial Resources Division

USFWS – United States of America Fish and Wildlife Service

VU – Vulnerable

WCRP – Wildlife Conservation and Restoration Program