Cabo Rojo National Wildlife Refuge

Comprehensive Conservation Plan

U.S. Department of the Interior
Fish and Wildlife Service
Southeast Region

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COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL ASSESSMENT

CABO ROJO NATIONAL WILDLIFE REFUGE

Cabo Rojo, Puerto Rico

U.S. Department of the Interior
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Executive Summary

The Fish and Wildlife Service (Service) has prepared this Comprehensive Conservation Plan to guide the management of the Cabo Rojo National Wildlife Refuge in Puerto Rico. The plan outlines programs and corresponding resource needs for the next 15 years, as mandated by the National Wildlife Refuge System Improvement Act of 1997.

Before the Service began planning, it conducted a biological review of the refuge's wildlife and habitat management program and conducted public scoping meetings to solicit public opinion of the issues the plan should address. The biological review team was composed of biologists from federal and state agencies and non-governmental organizations that have an interest in the refuge. The refuge staff held a public scoping meeting and a public meeting to solicit public reaction to the proposed alternatives. Also, a 30-day public review and comment period of the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) was provided. The Draft CCP/EA was made available in both English and Spanish.

The Service developed and analyzed three management alternatives:

- Alternative A was to use existing refuge management practices
- Alternative B proposed an increased Resource Emphasis; and
- Alternative C proposed a Habitat and Public Use Emphasis, and was the Service's Proposed Alternative.

Alternative C was selected as the preferred management action. It proposes a Habitat and Public Use Emphasis. This alternative was developed based on public input and the best professional judgment of the planning team. The objectives and strategies presented in this final CCP were developed as a direct result of the selection of Alternative C.

Under Alternative C, the emphasis will be on improving refuge resources for habitat and wildlife, while support for visitor services programs will be increased. Management efforts will focus on achieving the refuge's primary goals. Activities expanded, or introduced, under this alternative will include: actively managing endangered plant populations, including *Aristida chaseae*, and reducing the occurrence of exotic species; exploring opportunities and alternatives for having the refuge take direct control of managing water levels in the saltwater lagoons; establishing and managing a new and larger nursery to increase reforestation of native tree species in upland areas; restoring additional freshwater and saltwater ponds to increase avian habitat; expanding the use of volunteers to increase habitat restoration activity; and proactively expanding research collaboration with universities.

Management will also provide greater support for visitor services programs, including an emphasis on the following programs: development of a curriculum-based environmental education program; expansion of the role of the Friends Group, to include providing staffing and interpreting services at the new visitor services center scheduled to open in the new headquarters building in 2012; review and update of the refuge's brochures and website, to include offering a Spanish version of the website; update current kiosks and build new kiosks along the trail system; expansion of the volunteer program to also provide assistance with public use activities; seek and develop new partnerships, particularly with regard to trail maintenance; and add additional signage to clarify refuge uses. Additional staff will be required to implement this management action.

I. Background

INTRODUCTION

This Comprehensive Conservation Plan (CCP) for Cabo Rojo National Wildlife Refuge (NWR) was prepared to guide management action and direction for the refuge. Fish and wildlife conservation will receive first priority in refuge management; wildlife-dependent recreation will be allowed and encouraged as long as it is compatible with, and does not detract from, the mission of the refuge or the purposes for which it was established.

A planning team developed a range of alternatives that best met the goals and objectives of the refuge and that could be implemented within the 15-year planning period. The Draft CCP was made available to state and federal government agencies, conservation partners, and the general public for review and comment. The comments from each entity were considered in the development of this CCP, which describes the Fish and Wildlife Service's preferred plan.

PURPOSE AND NEED FOR THE PLAN

The purpose of the CCP is to put forth a management action that best achieves the refuge purpose; attains the vision and goals developed for the refuge; contributes to National Wildlife Refuge System (Refuge System) mission; addresses key problems, issues, and relevant mandates; and is consistent with sound principles of fish and wildlife management.

Specifically, the CCP is needed to:

- Provide a clear statement of refuge management direction;
- Provide refuge neighbors, visitors, and government officials with an understanding of Service management actions on and around the refuge;
- Ensure that Fish and Wildlife Service management actions, including land protection and recreation/education programs, are consistent with the mandates of the Refuge System; and
- Provide a basis for the development of budget requests for operation, maintenance, and capital improvement needs.

FISH AND WILDLIFE SERVICE

The Fish and Wildlife Service (Service) traces its roots to 1871 and the establishment of the Commission of Fisheries involved with research and fish culture. The once-independent commission was renamed the Bureau of Fisheries and placed under the Department of Commerce and Labor in 1903.

The Service also traces its roots to 1886 and the establishment of a Division of Economic Ornithology and Mammalogy in the Department of Agriculture. Research on the relationship of birds and animals to agriculture shifted to delineation of the range of plants and animals so the name was changed to the Division of the Biological Survey in 1896.

The Department of Commerce, Bureau of Fisheries, was combined with the Department of Agriculture, Bureau of Biological Survey, on June 30, 1940, and transferred to the Department of the Interior as the Fish and Wildlife Service. The name was changed to the Bureau of Sport Fisheries and Wildlife in 1956 and finally to the Fish and Wildlife Service in 1974.

The Fish and Wildlife Service, working with others, is responsible for conserving, protecting, and enhancing fish and wildlife and their habitats for the continuing benefit of the American people through Federal programs relating to migratory birds, endangered species, interjurisdictional fish and marine mammals, and inland sport fisheries (142 DM 1.1).

As part of its mission, the Service manages more than 540 national wildlife refuges covering over 95 million acres. These areas comprise the National Wildlife Refuge System, the world's largest collection of lands set aside specifically for fish and wildlife. The majority of these lands, 77 million acres, is in Alaska. The remaining acres are spread across the other 49 states and several United States territories. In addition to refuges, the Service manages thousands of small wetlands, national fish hatcheries, 64 fishery resource offices, and 78 ecological services field stations. The Service enforces federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program that distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state fish and wildlife agencies.

NATIONAL WILDLIFE REFUGE SYSTEM

The mission of the National Wildlife Refuge System, as defined by the National Wildlife Refuge System Improvement Act of 1997 is:

> "...to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

The National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) established, for the first time, a clear legislative mission of wildlife conservation for the Refuge System. Actions were initiated in 1997 to comply with the direction of this new legislation, including an effort to complete comprehensive conservation plans for all refuges. These plans, which are completed with full public involvement, help guide the future management of refuges by establishing natural resources and recreation/education programs. Consistent with the Improvement Act, CCPs serve as guidelines for refuge management for a 15-year period. The Improvement Act states that each refuge shall be managed to:

- Fulfill the mission of the Refuge System;
- Fulfill the individual purposes of each refuge;
- Consider the needs of wildlife first;
- Fulfill requirements of CCPs that are prepared for each unit of the Refuge System;
- Maintain the biological integrity, diversity, and environmental health of the Refuge System; and
- Recognize that wildlife-dependent recreation activities, including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, are legitimate and priority public uses; and allow refuge managers authority to determine compatible public uses.

The following are just a few examples of your national network of conservation lands. Pelican Island National Wildlife Refuge, the first refuge, was established in 1903, for the protection of colonial nesting birds in Florida, such as the snowy egret and the brown pelican. Western refuges were established for American bison (1906), elk (1912), prong-horned antelope (1931), and desert bighorn sheep (1936) after over-hunting, competition with cattle, and natural disasters decimated once-abundant herds. The drought conditions of the 1930s Dust Bowl severely depleted breeding populations of ducks and geese. Refuges established during the Great Depression focused on waterfowl production areas (i.e., protection of prairie wetlands in America's heartland). The emphasis on waterfowl continues today, but also includes protection of wintering habitat in response to a dramatic loss of bottomland hardwoods. By 1973, the Service had begun to focus on establishing refuges for endangered species.

Recreational visits to national wildlife refuges are an important component of this economic activity. In FY 2006, 34.8 million people visited refuges in the lower 48 states for recreation, mostly to observe wildlife in their natural habitats. Their spending generated almost $1.7 billion of sales in regional economies. As this spending flowed through the economy, nearly 27,000 people were employed and $542.8 million in employment income was generated. About 82 percent of total expenditures are generated by non-consumptive activities on refuges. Fishing accounted for 12 percent and hunting 6 percent. Local residents accounted for 13 percent of expenditures, while visitors coming from outside the local area accounted for 87 percent. Refuge recreational spending generated about $185.3 million in tax revenue at the local, county, state, and federal level (Carver and Caudill 2007).

Volunteers continue to be a major contributor to the success of the Refuge System. In 2002, volunteers contributed more than 1.5 million hours on refuges nationwide, a service valued at more than $22 million.

The wildlife and habitat vision for national wildlife refuges stresses that wildlife comes first; that ecosystems, biodiversity, and wilderness are vital concepts in refuge management; that refuges must be healthy and growth must be strategic; and that the Refuge System serves as a model for habitat management with broad participation from others.

The Improvement Act stipulates that comprehensive conservation plans be prepared in consultation with adjoining federal, state, and private landowners, and that the Service develop and implement a process to ensure an opportunity for active public involvement in the preparation and revision (every 15 years) of the plans.

All lands of the Refuge System will be managed in accordance with an approved comprehensive conservation plan that will guide management decisions and set forth strategies for achieving refuge unit purposes. The plan will be consistent with sound resource management principles, practices, and legal mandates, including Service compatibility standards and other Service policies, guidelines, and planning documents (602 FW 1.1).

LEGAL AND POLICY CONTEXT

Legal Mandates, Administrative and Policy Guidelines, and Other Special Considerations

Administration of national wildlife refuges is guided by the mission and goals of the Refuge System, congressional legislation, presidential executive orders, and international treaties. Policies for management options of refuges are further refined by administrative guidelines established by the Secretary of the Interior and by policy guidelines established by the Director of the Fish and Wildlife Service. Select legal summaries of treaties and laws relevant to administration of the Refuge System and management of the Cabo Rojo NWR are provided in Appendix C.

Treaties, laws, administrative guidelines, and policy guidelines assist the refuge manager in making decisions pertaining to soil, water, air, flora, fauna, and other natural resources; historical and cultural resources; research and recreation on refuge lands; and provide a framework for cooperation between Cabo Rojo NWR and other partners, such as the Puerto Rico Department of Natural and Environmental Resources (DNER), and private landowners, etc.

Lands within the Refuge System are closed to public use unless specifically and legally opened. No refuge use may be allowed unless it is determined to be compatible. A compatible use is a use that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge. All programs and uses must be evaluated based on mandates set forth in the Improvement Act. Those mandates are to:

- Contribute to ecosystem goals, as well as refuge purposes and goals;
- Conserve, manage, and restore fish, wildlife, and plant resources and their habitats;
- Monitor the trends of fish, wildlife, and plants;
- Manage and ensure appropriate visitor uses as those uses benefit the conservation of fish and wildlife resources and contribute to the enjoyment of the public; and
- Ensure that visitor activities are compatible with refuge purposes.

The Improvement Act further identifies six priority wildlife-dependent recreational uses. These uses are: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. As priority public uses of the Refuge System, they receive priority consideration over other public uses in planning and management.

Biological Integrity, Diversity, and Environmental Health Policy

The Improvement Act directs the Service to ensure that the biological integrity, diversity, and environmental health of the Refuge System are maintained for the benefit of present and future generations of Americans. The policy is an additional directive for refuge managers to follow while achieving refuge purpose(s) and the Refuge System mission. It provides for the consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on refuges and associated ecosystems. When evaluating the appropriate management direction for refuges, refuge managers will use sound professional judgment to determine their refuges' contribution to biological integrity, diversity, and environmental health at multiple landscape scales. Sound professional judgment incorporates field experience, knowledge of refuge resources and the refuge's role within an ecosystem, applicable laws, and best available science, including consultation with others both inside and outside the Service.

NATIONAL AND INTERNATIONAL CONSERVATION PLANS AND INITIATIVES

Multiple partnerships have been developed among government and private entities to address the environmental problems affecting regions. There is a large amount of conservation and protection information that defines the role of the refuge at the local, national, international, and ecosystem levels. Conservation initiatives include broad-scale planning and cooperation between affected parties to address declining trends of natural, physical, social, and economic environments. The conservation guidance described below, along with issues, problems, and trends, was reviewed and integrated where appropriate into this CCP.

This CCP supports, among others, the Partners-in-Flight Plan, the North American Waterfowl Management Plan, the Western Hemisphere Shorebird Reserve Network, and the National Wetlands Priority Conservation Plan.

North American Bird Conservation Initiative. Started in 1999, the North American Bird Conservation Initiative is a coalition of government agencies, private organizations, academic institutions, and private industry leaders in the United States, Canada, and Mexico working to ensure the long-term health of North America's native bird populations by fostering an integrated approach to bird conservation to benefit all birds in all habitats. The four international and national bird initiatives include the North American Waterfowl Management Plan, Partners-in-Flight, Waterbird Conservation for the Americas, and the U.S. Shorebird Conservation Plan.

North American Waterfowl Management Plan. The North American Waterfowl Management Plan is an international action plan to conserve migratory birds throughout the continent. The plan's goal is to return waterfowl populations to their 1970s levels by conserving wetland and upland habitat. Canada and the United States signed the plan in 1986 in reaction to critically low numbers of waterfowl. Mexico joined in 1994, making it a truly continental effort. The plan is a partnership of federal, provincial/state and municipal governments, non-governmental organizations, private companies, and many individuals, all working towards achieving better wetland habitat for the benefit of migratory birds, other wetland-associated species, and people. Plan projects are international in scope, but implemented at regional levels. These projects contribute to the protection of habitat and wildlife species across the North American landscape.

Partners-in-Flight Bird Conservation Plan. Managed as part of the Partners-in-Flight Plan, the Cabo Rojo’s salt marsh physiographic area represents a scientifically based land bird conservation planning effort that ensures long-term maintenance of healthy populations of native land birds, primarily non-game land birds. Non-game land birds have been vastly under-represented in conservation efforts, and many are exhibiting significant declines. This plan is voluntary and non-regulatory, and focuses on relatively common species in areas where conservation actions can be most effective, rather than the frequent local emphasis on rare and peripheral populations.

U.S. Shorebird Conservation Plan. The U.S. Shorebird Conservation Plan is a partnership effort throughout the United States to ensure that stable and self-sustaining populations of shorebird species are restored and protected. The plan was developed by a wide range of agencies, organizations, and shorebird experts for separate regions of the country, and identifies conservation goals, critical habitat conservation needs, key research needs, and proposed education and outreach programs to increase awareness of shorebirds and the threats they face.

North American Waterbird Conservation Plan. This plan provides a framework for the conservation and management of 210 species of waterbirds in 29 nations. Threats to waterbird populations include destruction of inland and coastal wetlands, introduced predators and invasive species, pollutants, mortality from fisheries and industries, disturbance, and conflicts arising from abundant species. Particularly important habitats of the Southeast Region include pelagic areas, marshes, forested wetlands, and barrier and sea island complexes. Fifteen species of waterbirds are federally listed, including breeding populations of wood storks, Mississippi sandhill cranes, whooping cranes, interior least terns, and Gulf Coast populations of brown pelicans. A key objective of this plan is the standardization of data collection efforts to better recommend effective conservation measures.

RELATIONSHIP TO STATE WILDLIFE AGENCY

A provision of the Improvement Act, and subsequent agency policy, is that the Service shall ensure timely and effective cooperation and collaboration with other state fish and game agencies and tribal governments during the course of acquiring and managing refuges. State wildlife management areas and national wildlife refuges provide the foundation for the protection of species, and contribute to the overall health and sustainment of fish and wildlife species in the Commonwealth of Puerto Rico.

The Puerto Rico Department of Environment and Natural Resources (DNER) provides management and protection for the commonwealth's fish and wildlife resources. The DNER's mission is:

> 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.

II. Refuge Overview

INTRODUCTION

Cabo Rojo NWR was established in 1974 when 587 acres of upland habitat were obtained from the Central Intelligence Agency (CIA). Actual protection and restoration of the area began in 1978, with the hiring of the first manager. In 1999, 1,269 acres of salt flats, mangrove fringes, and uplands were purchased from the Carrera family, bringing the total to 1,856 acres.

REFUGE HISTORY AND PURPOSE

Cabo Rojo NWR was established for its "…particular value in carrying out the national migratory bird management program" [16 U.S.C. 667b (An act authorizing the transfer of certain real property for wildlife or other purposes)]. The salt flats were acquired in 1999, to protect important shorebird habitat.

Cabo Rojo NWR, on the southwestern side of Puerto Rico, was established in 1974, when 587 acres of land were obtained from the CIA as an upland buffer for the Cabo Rojo Salt Flats (a potential Western Hemisphere Shorebird reserve) and as potential habitat for migratory birds. The 1,249-acre Cabo Rojo Salt Flats, previously under private ownership, were purchased and added to the refuge in1999 for a total of 1,836 acres. The salt flats are now managed under a special use permit with a private operator, who continues to manage water levels as part of a commercial salt-harvesting operation and in accordance with the needs of shorebirds.

The current objectives of the refuge include:

- To restore and enhance native wildlife and plants, particularly the endangered yellow-shouldered blackbird and the endangered grass, *Aristida chaseae;*
- To increase the level of environmental awareness among residents and visitors; and
- To protect one of the most important shorebird habitats in the Caribbean.

Cabo Rojo NWR was established in 1974 when 587 acres of land were obtained from the CIA, although the Service did not have a presence on the refuge until 1978, when the first manager was hired. The land occupied by the refuge was used for cattle ranching and agriculture for about five centuries prior to Service ownership. Because of that practice, much of the native vegetation had been replaced by plants from other regions, which has left much of the land barren, except for a limited number of trees in drainages and near homesteads. With the elimination of cattle grazing, the habitat has changed considerably, becoming overgrown with exotic forage grass species in the understory and exotic trees, especially mesquite, in the overstory.

The refuge lies along a coastal plain and has a few gently rolling hills overlooking the southwestern tip of Puerto Rico. The establishment of the refuge was justified for the potential value that the habitat held for migratory birds and also for its value in providing habitat for resident birds, particularly doves and pigeons. The area is one of the few blocks of land in southwestern Puerto Rico west of the Guánica Commonwealth Forest remaining in public ownership. The native vegetation is classified as subtropical dry forest under the Holdridge classification of world life zones. At least 245 plant species and 145 bird species have been identified on the refuge.

The refuge is an important stop-over point for birds that migrate between North and South America. These birds use the refuge during the cooler months, while resident species are present year-round. The refuge provides highly valued habitat for doves and pigeons. Some of the bird species on the refuge are Prairie Warbler, Northern Parula, Cape May Warbler; resident species include Puerto Rican Tody, Adelaide's Warbler, Caribbean Elaenia, Turpial, and the endangered Yellow-shouldered Blackbird and Piping Plover. Although bats are the only living land mammals in Puerto Rico, introduced mammals that can be found on the refuge include the small Indian mongoose and the African Patas Monkey.

The gently rolling hills of the refuge lie within the subtropical dry forest belt. At present, the refuge is approximately 65 percent forest/scrub and 35 percent grassland.

SPECIAL DESIGNATIONS

Designated Critical Habitat for the Yellow-shouldered Blackbird.

The Yellow-shouldered Blackbird was listed as an endangered species and critical habitat was designated in 1976, pursuant to the Endangered Species Act of 1973, as amended (P.L. 93-205). The entire refuge is part of the more extensive designated critical habitat for this species. Under the law, critical habitat is defined as “an area essential to the conservation of a listed species, though the area need not actually be occupied by the species at the time it is designated.” This designation is the most strict conservation measure the Service can provide to the habitat of any federally listed wildlife species.

Important Bird Area (IBA), BirdLife International, October 2007.

The entire refuge is part of the IBA named “Surosete de PR.” BirdLife International (2009) Important Bird Area fact sheet: Suroeste, Puerto Rico (to USA). The IBA Programme of BirdLife International aims to identify, monitor, and protect a global network of IBAs for the conservation of the world's birds and other biodiversity. IBAs are key sites for conservation – small enough to be conserved in their entirety and often already part of a protected-area network. They do one (or more) of three things: (1) Hold significant numbers of one or more globally threatened species; (2) are one of a set of sites that together hold a suite of restricted-range species or biome-restricted species; and (3) have exceptionally large numbers of migratory or congregatory species.

Puerto Rico Critical Wildlife Areas, DNER, 2005.

A significant portion of the refuge, the Cabo Rojo Salt Flats (CRSF), is recognized as an Important Critical Wildlife Area. The recognition of Critical Wildlife Areas fulfills one of the most fundamental responsibilities of the Puerto Rico DNER: to provide comprehensive information on important wildlife and habitat resources in Puerto Rico and associated islands. The Puerto Rico DNER imparts important wildlife and habitat information to local governments, state and federal agencies, private landowners, and consultants for land-use planning purposes. Critical wildlife habitats are recognized by Puerto Rico DNER areas to be protected and preserved from degradation due to incompatible land use in situ or adjacent to the areas. The Service officially designated the CRSF as Resource Category 1, which is the highest possible ranking that can be given to a wetland area. The designation implies that it is considered unique and irreplaceable on a national or eco-regional basis.

Figure 1. Location of Cabo Rojo NWR

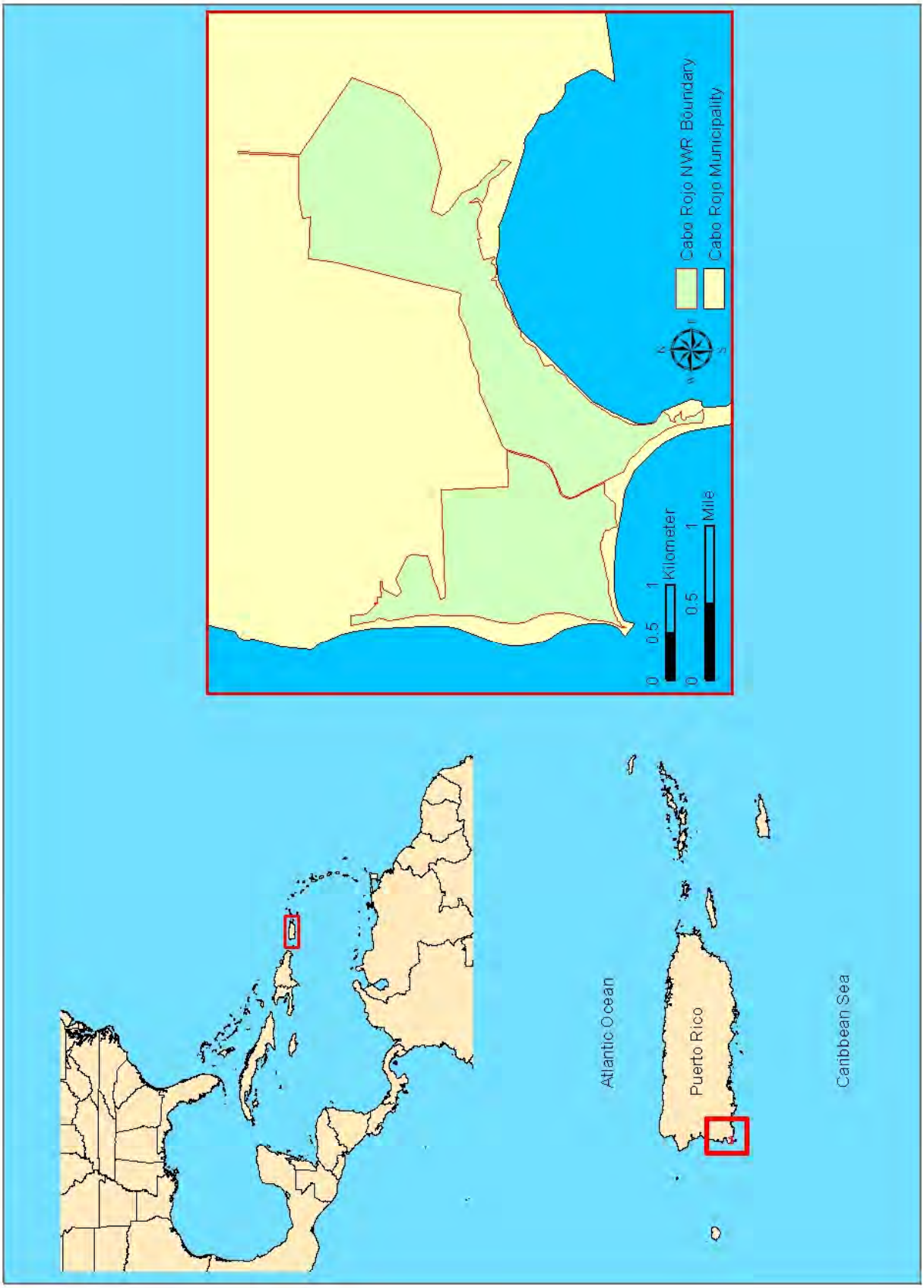


Figure 2. Approved boundary of Cabo Rojo NWR

The CRSF was recognized as a prime wildlife area by Raffaele and Duffield (1979) and by Cardona and Rivera (1988). In 2004, BirdLife International and Sociedad Ornitológica Puertorriqueña, Inc., (SOPI) recognized the CRSF as an Important Bird Area.

The CRSF is the most important site for migratory shorebirds. Actually, more than 40,000 birds depend on the CRSF to complete their migratory cycle (Puerto Rico DNER 1998). The salt flats support the only known breeding population of the Snowy Plover (*Charadrius alexandrinus*) on the Island. There is also presence of the migratory Piping Plover (*C.melodus*), endemic Yellow-shouldered Blackbird (*Agelaius xanthomus*), and Least Tern (*Sterna antillarum*) (Cardona and Rivera 1988). The CRSF is also an important nesting habitat for Wilson's Plover (*Charadrius wilsonia*), Killdeer (*C. vociferous*), and Black-necked Stilt (*Himantopus mexicanus*). There are also historical records of the presence of Greater Flamingo (*Phoenicopterus rubber*) in the mud flats close to Boquerón and Mourning Dove (*Zenaida macroura*) in the cactus covered area in the vicinity of Faro de Cabo Rojo (Ventura Barnés 1947); White-cheeked Pintail (*Anas bahamensis*), Roseate Tern (*Sterna dougallii*), Royal Tern (*S. maxima*), and Common Tern (*S. hirundo*) (USFWS 1993).

Western Hemisphere Shorebird Reserve, February 2010.

The Western Hemisphere Shorebird Reserve Network (WHSRN) is a conservation strategy launched in 1986. The WHSRN aligns with the simple strategy that we must protect key habitats throughout the Americas in order to sustain healthy populations of shorebirds. During the last 25 years, 29 million acres of shorebird habitat have been brought under the auspices of WHSRN. WHSRN works to: (1) Build a strong system of international sites used by shorebirds throughout their migratory ranges; (2) develop science and management tools that expand the scope and pace of habitat conservation at each site within the WHSRN; (3) establish local, regional, and international recognition for sites, raising new public awareness and generating conservation funding opportunities; and (4) serve as an international resource, convener, and strategist for issues related to shorebird and habitat conservation.

There are some national wildlife refuges in the system with such designation, but the Cabo Rojo NWR is the first WHSRN designated in the Caribbean.

ECOSYSTEM CONTEXT

The Caribbean Islands National Wildlife Refuge Complex (Complex) is located on the Cabo Rojo NWR and supports and protects wildlife and ecosystems found nowhere else in the United States. Many of these species are endemic to the Commonwealth of Puerto Rico, the U.S. Virgin Islands, and Navassa. Presently encompassing nine existing national wildlife refuges, the Complex collectively supports significant recovery opportunities for a large number of federally listed threatened and endangered species. Particularly notable, the Complex presently has the potential to recover more threatened and endangered species than any other national wildlife refuge in the Southeast Region.

Many migratory birds depend on habitat found within the Complex, including a large number of Fish and Wildlife Service Birds of Conservation Concern. Particularly notable are: (1) Endemic species; (2) species spending part of the year in the neotropics (i.e., neotropical migratory birds); and (3) species that have unique breeding site requirements, making them extremely vulnerable to decline (e.g., colonially nesting seabirds, waterfowl, marshbirds, shorebirds).

REGIONAL CONSERVATION PLANS AND INITIATIVES

The Puerto Rico DNER provides management and protection for the commonwealth's fish and wildlife resources. Puerto Rico DNER's efforts are guided by the Puerto Rico Comprehensive Wildlife Conservation Strategy (CWCS), which was completed in 2005. CWCS lists the following as major threats to Puerto Rico's biodiversity: habitat loss, poaching and over-exploitation, and invasive exotic species. The main goals of Puerto Rico's CWCS are:

- To identify and address the greatest conservation needs of Puerto Rico's fish and wildlife;
- To prioritize efforts on species with the greatest conservation needs;
- To allow Puerto Rico 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;
- To improve Puerto Rico DNER's ability to address present and future challenges and opportunities to conserve fish and wildlife species and their habitats; and
- To integrate monitoring and managing of hunted and non-hunted species.

The commonwealth's participation and contribution throughout this planning process has provided for ongoing opportunities and open dialogue to improve the sustainable management of fish and wildlife, and their dependent habitats, in the Commonwealth of Puerto Rico. An essential part of comprehensive conservation planning is integrating common mission objectives where appropriate.

ECOLOGICAL THREATS AND PROBLEMS

The principal threats to the refuge come from invasive exotic plants and animals. The refuge was seriously degraded of native habitat, and especially upland trees, through its history of being used as farmland. In the time since the land has been managed by the Service (1974), an effort has been made to reduce invasive plant species and restore native habitat, particularly through reforestation efforts to rehabilitate upland subtropical forest. While these efforts have been on-going, they have been conducted on a limited basis (as per volunteer and budget availability) and will require additional years of effort to be fully successful.

The refuge suffers from the presence of numerous fauna that threaten the populations of several key bird species through nest predation. Species that are a particular problem include the African Patas Monkey, mongooses, iguanas, cats, and dogs. The threats on bird populations are not precisely known, as detailed monitoring surveys have yet to be undertaken.

PHYSICAL RESOURCES

CLIMATE

The climate is mild year-round, with an average high temperature of 89°F and an average low temperature of 71°F. Summers and winters are both dry, while consistent and occasional heavy rains occur during the wet season from September through November. This is also the period when hurricanes occur. Puerto Rico has been struck by nine hurricanes since 1893. Additional and sometimes torrential rains generally occur in April or May. Rains of more than 10 inches in 24 hours

occurred during the month of May in both 2001 and 2003. The 17-year average rainfall at the refuge is 36 inches, with a low in 1997 of 15 inches, and a high of 58 inches corresponding to the passage of Hurricane Georges in 1998.

Trade winds vary between the northeast and southeast; during January through April, wind velocities exceed 15 knots for extended daily periods. Winter storms cause winds to change to a northerly direction. For much of the year, winds are calm in the morning, increasing to a high of 10-20 knots during the day, and becoming calm again in the evening.

HURRICANES

Portions of this section were taken directly from Weaver, Peter L.; Schwagerl, Joseph J. 2009. U.S. Fish and Wildlife Service Refuges and Other nearby Reserves in Southwestern Puerto Rico, General Technical Report IITF-40. San Juan, PR: U.S. Department of Agriculture Forest Service, International Institute of Tropical Forestry, 110p.

Since 1700, Puerto Rico has experienced hurricane force winds at least 33 times. Twenty hurricanes had trajectories over much of the island (type A hurricane) and thirteen had trajectories over a portion of the island, or immediately offshore (type B hurricane) (Neumann et. al 1988, Quinones 1992, Salvia 1972). Local effects from more distant storms or hurricanes (type C storms) were also experienced more than 50 times. Since hurricane size, duration, and wind speed vary considerably, estimating trajectories and classifying storm types before the 20th century is a matter of conjecture.

Four hurricanes have damaged southwest Puerto Rico since the end of the 19th century. San Ciriaco of 1899 and San Felipe II of 1928 passed to the northeast, and Georges of 1998 to the north. San Ciriaco, with sustained winds around 180 km/hr, and San Felipe with winds at 250 km/hr, were major storms, the latter perhaps being the most powerful on record for Puerto Rico. Hortense in 1996, a category 1 hurricane on the Saffir-Simpson Scale, passed directly over the refuge (Monzon 1996). With sustained winds of 135 km/hr and rainfall averaging between 75 and 125 mm in the southwest, Hortense caused flooding, uprooted trees, and damaged buildings and electrical lines. Its short time over Puerto Rico, poorly defined center, and generally low winds, prevented more damage. Georges in 1998, a category 3 hurricane with sustained winds of 180 km/hr, flooded the Lajas Valley and damaged the refuge.

On September 22, 2008, the Cabo Rojo NWR received 16.92 inches of rain in just 24 hours as a result of tropical storm Hanna. Almost 4 inches of rain fell from 3 a.m. to 7 a.m. on that day. As a result, the refuge experienced major flooding and severe damage to facilities such as roads, dikes, trails, and maintenance and storage buildings. This extraordinary rainfall event is considered a 200-year-plus frequency rain event in the weather history of southwest Puerto Rico (pers. comm. between refuge manager and Mr. Rafael Mojica, U.S. Weather Station in San Juan, PR).

GEOLOGY AND TOPOGRAPHY

The geology and topography section of this document was taken directly from Weaver, Peter L.; Schwagerl, Joseph J. 2009. U.S. Fish and Wildlife Service Refuges and Other nearby Reserves in Southwestern Puerto Rico, General Technical Report IITF-40. San Juan, PR: U.S. Department of Agriculture Forest Service, International Institute of Tropical Forestry, 110p.

The southwestern part of Puerto Rico is characterized by long ridges, such as the Sierra Bermeja, separated by parallel valleys like Lajas that extend eastward for many kilometers from the Mona Passage (Meyeroff 1933). The ridges contain rocks of marine Cretaceous sediments such as ashy

shales, massive limestone, and agglomerates. The valleys, in contrast, are partly covered with alluvial deposits of recent origin underlain by consolidated carbonate and clastic strata (sedimentary rock) of Cretaceous and Tertiary age (Bonnet and Tirado Sulsona 1950, Graves 1991). These, in turn, are underlain by igneous rocks at depths of 165 to 265 m.

The 1,500-ha Sierra Bermeja is the oldest and among the most interesting mountain ranges on the Caribbean plate. The Bermeja Complex is composed of basalt (volcanic origin), amphibolites and serpentinites (metamorphic rocks), and chert (formed by organisms in deep marine waters). The complex contains radiolarian (amoeboid protozoan) fossils in chert that date to 195 million years ago (Montgomery et. al 1994, Pindell and Barrett 1990). The Lower Jurassic radiolarian signature is older than the Caribbean Sea and establishes the Pacific origin of the Caribbean plate.

The Yauco- Boquerón anticlinal valley (Lajas Valley) is about 30 km long by 5 km at its widest point (Graves 1991). During the Tertiary period, the Lajas Valley was eroded by a large stream, with its source in the mountains near the town of Yauco. Subsequently, the Rio Guanajibo extended its headwaters and pirated streams flowing into the Lajas Valley (Michtell 1922).

Nearly three-quarters of Cabo Rojo NWR consist of beach deposits and quartz sand deposits; also, Ponce limestone and alluvium cover nearly one-quarter of the tract (Bawiec 2001, Vockmann 1984). The remaining refuge lands, in descending areal coverage, are occupied by pyroxene olivine basalt, Mariquita chert, mangrove swamp, and Parguera limestone.

SOILS

The most recent soil series digital map of the study area, the San Germán Soil Survey (USDA 2007), was clipped using the Cabo Rojo NWR boundary. A matrix of soil chemical and physical characteristics of the soil series within the refuge was assembled and analyzed with the multivariate statistical package PCORD (McCune and Mefford 1999). The process first included the determination of the very unusual soil characteristics and soil series. Unusual soil series compositions were those with extremely different values (here defined as those with average differences two or more standard deviations greater than the overall mean difference when all are compared to each other). Soil series with unusual soil characteristics were considered sufficiently unique to deserve classifying them within a soils group of its own. When no more unusual soil characteristics or soil series were detected, a cluster analysis was used to find groups among the remaining soil series.

Twenty soil mapping units of the San Germán Soil Survey occur within the refuge. Among these, the following units have no direct relevance to the terrestrial vegetation of the refuge: water, salt flats, and salt pits. The other units formed the following soil groups (Figure 5):

Group I: Beach soils were not described in detail in the soil survey, nor were their physical and chemical properties listed. However, since these soils hold plant communities, they were included as a soil group.

Group II: The Bahia Salinas series are very different from other soil units in having a high salinity and very low available water capacity. This is a sandy soil derived from volcanic material.

Group III: MDA series are soils that developed under mangrove forest in the past; they are distinguished by having high cation exchange capacity, high pH, low bulk density, high salinity, and high organic matter content.

Figure 3. Geology of Cabo Rojo NWR

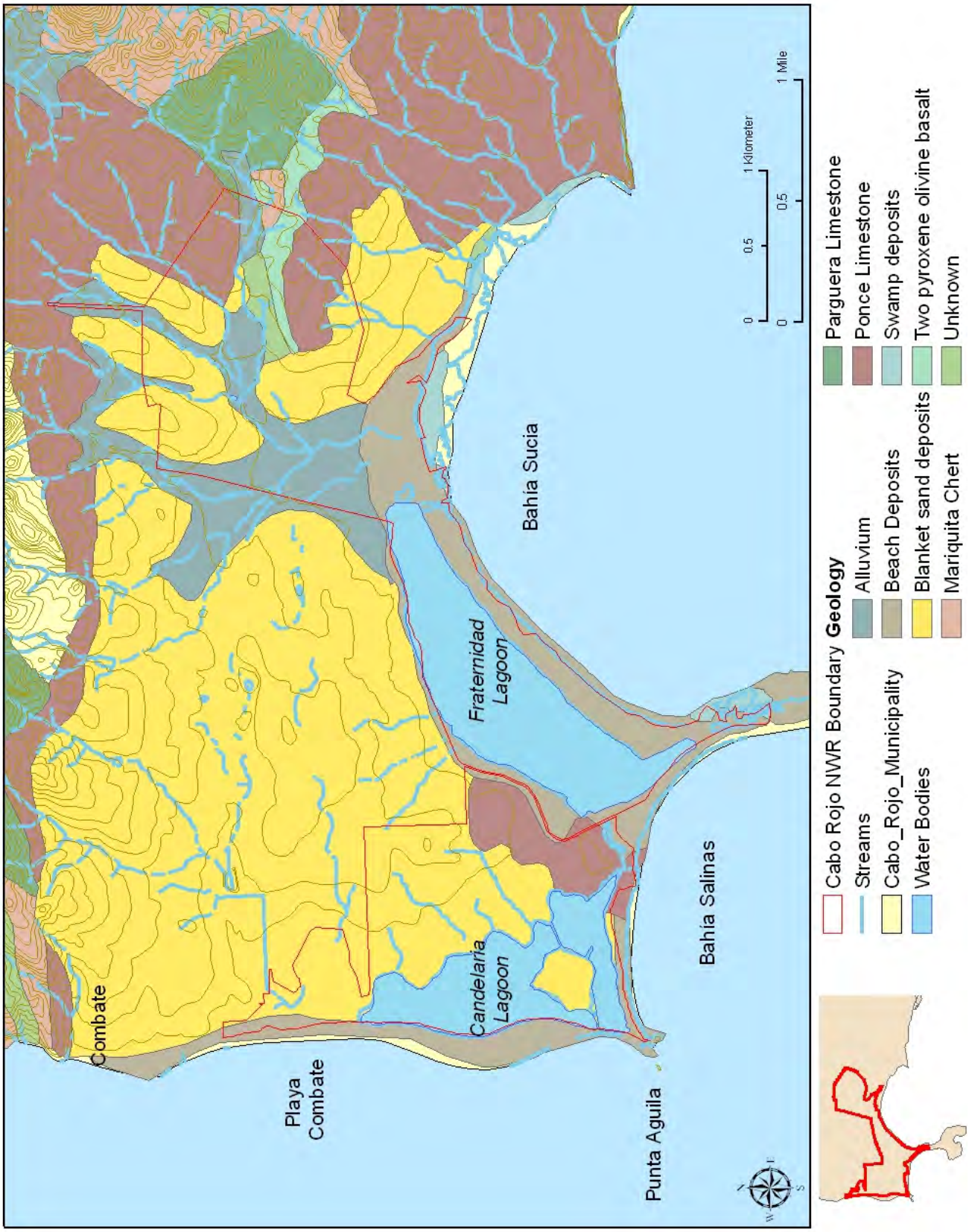
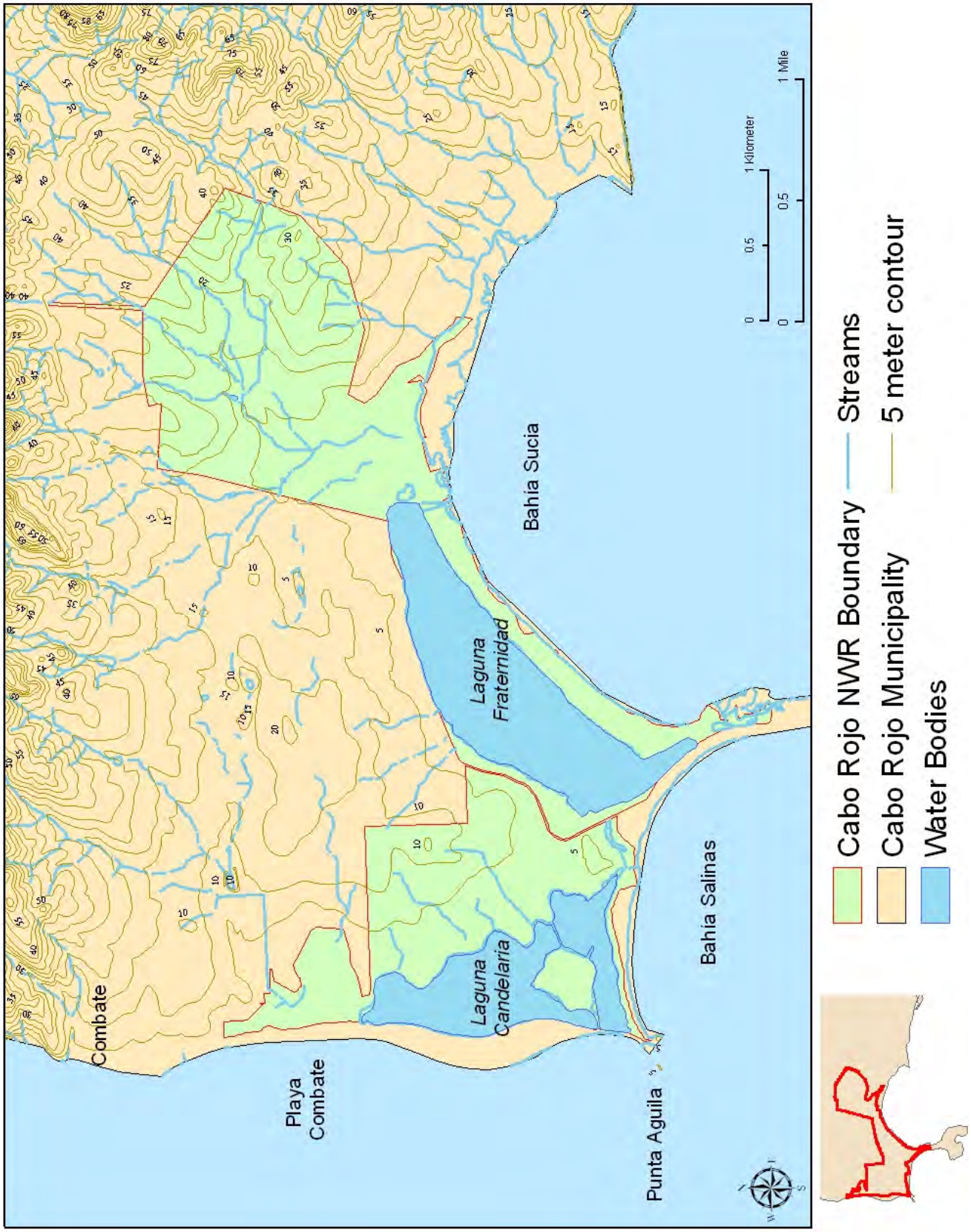


Figure 4. Topography of Cabo Rojo NWR



The following groups were determined by a clustering procedure:

Group IV: The group composed of soil series Bahia, Guayabo, and Sosa soils is distinguished by having acid to slightly acid soil reaction, low cation exchange capacity, low clay content, high bulk density, and low organic matter.

Group V: The group composed of soil series Altamira and Pitahaya complex is distinguished by high calcium content. These soils are derived from limestone.

Group VI: The group composed of soil series Llanos Costa is distinguished by having the lowest salinity. This soil is derived from gravely material of basaltic or chert origin.

Group VII: The group composed of soil series Guayacán, Melones, and Vayas soils had conditions intermediate to other groups. These soils are mostly clayey or silty clayey derived from material of mixed origins.

Determination of Dominance Classes

The species by sample site data matrix was classified with a multivariate technique (Flexible beta algorithm) to determine compositional affinities among sample units. Then the first levels of the dendrogram that retained at least half of the information were analyzed for significant indicator species (McCune and Mefford 1999). The appropriate level to trim the dendrogram was determined as the highest level at which indicator species were still detected for all clusters. This was accomplished at the second level of the dendrogram, producing three clusters. Although one of these clusters was clearly interpreted by site conditions (i.e., highly saline soils), the other two clusters could not be interpreted based on structural classes or soil groups, which suggested that other unexplored conditions may be influencing this vegetation (probably due to a history of land use or past disturbances, or a combination of several factors). Therefore, the dominance classes were based on a combination of dominant species and, in some cases, species that tended to result as significant indicator species.

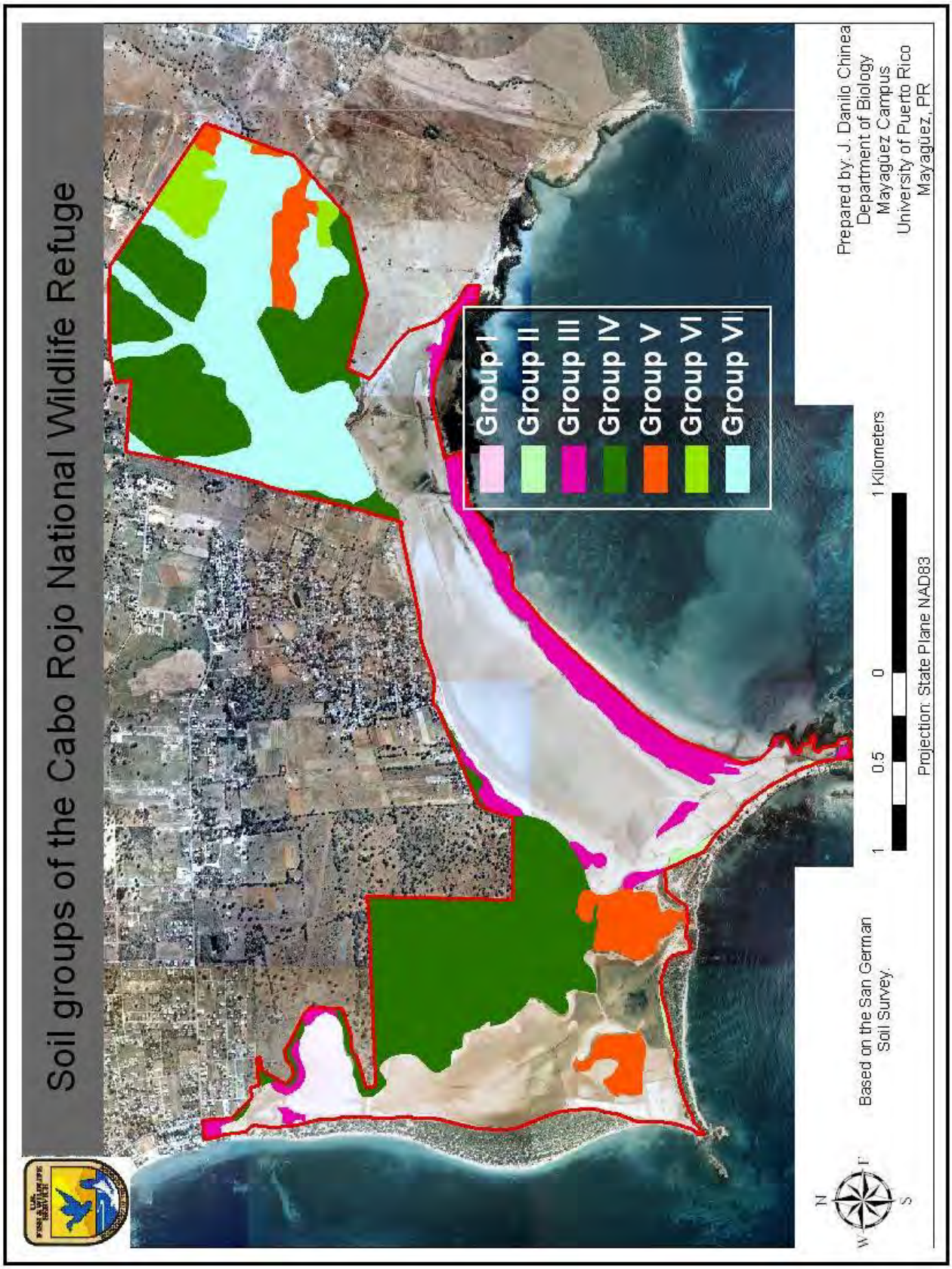
Mapping of Vegetation Types

Once the structural classes and the dominance classes were determined, these were combined into vegetation types and named by the combination of the dominance class names and the structural class names.

Results - Structural Classes

Lagoon water occupied most of the area of this refuge (Table 2 and Figure 6). Scrub was almost equally abundant on both units. Savanna occurred exclusively on the Eastern Unit. Forest was almost equally abundant on both units; on the Eastern Unit this structural class occurred mostly near drainage ways, while at the Salinas Unit it was more prevalent at a site where a 1936 photo showed scrub vegetation. Man-made areas occurred mostly at the Salinas Unit, consisting mainly of the salt extraction structures. The desert structural class was exclusively found at the Salinas Unit, mostly along the edges of the lagoons. Woodland and prairie occurred exclusively on the Eastern Unit.

Figure 5. Soil groups of the Cabo Rojo NWR; lagoon areas are not colored



Vegetative Structure

Dansereau's formation-type definitions (Table 1) were used as guides for mapping vegetation structural classes. These were photo-interpreted from a set of Ikonos true color images obtained in 2004 at a spatial resolution of 1 m. A minimum mapping unit of 0.2-hectare (half an acre) was used. Canopy heights were inferred from crown diameters.

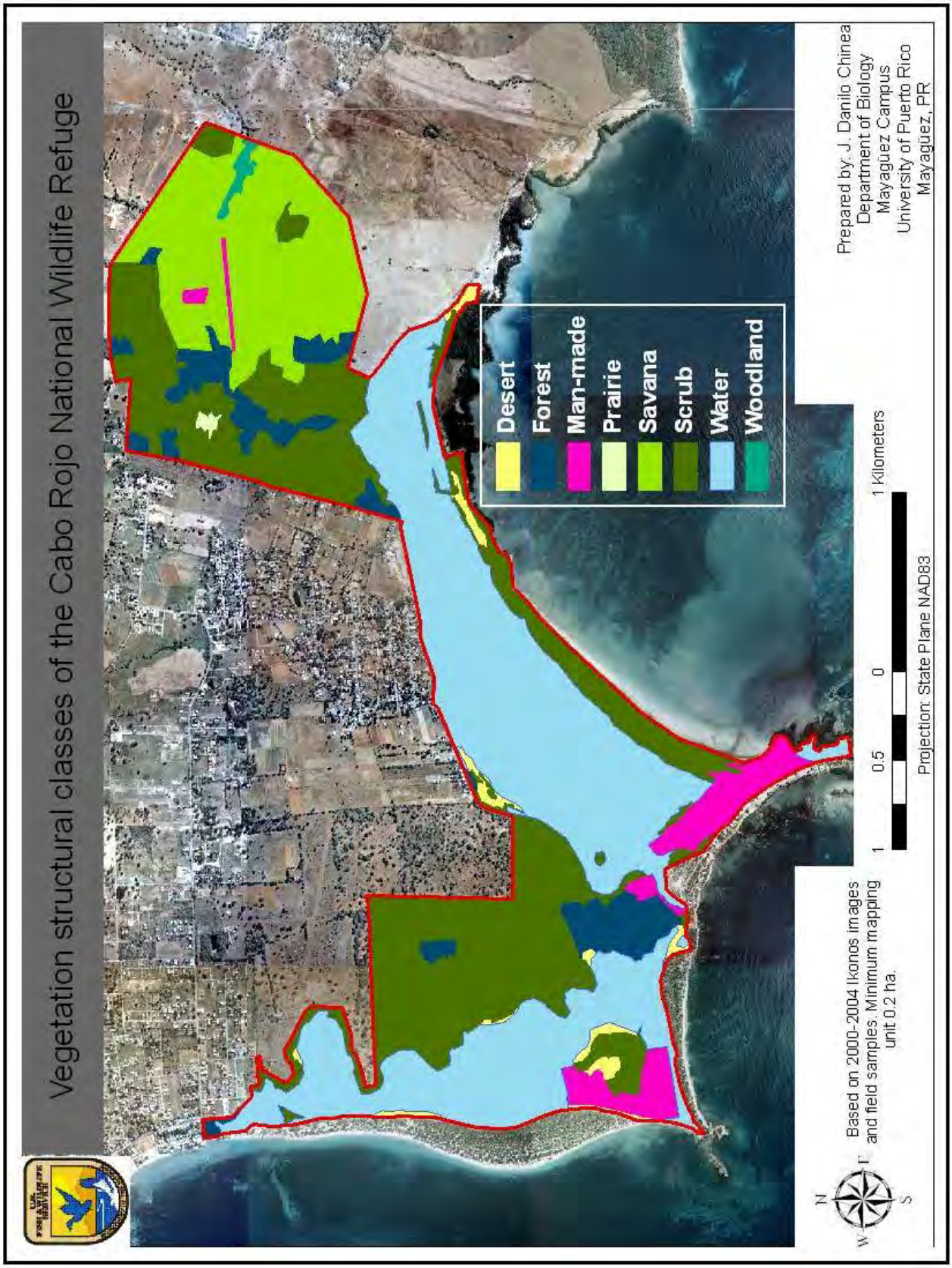
Table 1. Dansereau's formation-type definitions used for mapping vegetation structural classes (Dansereau 1966)

	Woody plants		**Herbaceous plants**	
Formation-type	***Height (m)***	***Cover (%)***	***Height (m)***	***Cover (%)***
Forest	>8	>60	Variable	Variable
Woodland	>8	25 – 60	Variable	Variable
Savanna	2 – 10	10 – 25	0 – 2	25 – 100
Scrub	0.1 – 8	25 – 100	Variable	Variable
Prairie	-	-	0.5 – 2	50 – 100
Desert	0.0 – 10	0 – 10	0.0 – 0.5	0 – 10

Table 2. Summary of area by structural classes of the Cabo Rojo NWR

Structural class	Area (ha)
Water	287
Scrub	246
Savanna	112
Forest	48
Man-made	36
Desert	12
Woodland	3
Prairie	1
Total	**746**

Figure 6. Vegetation structural classes of the Cabo Rojo NWR



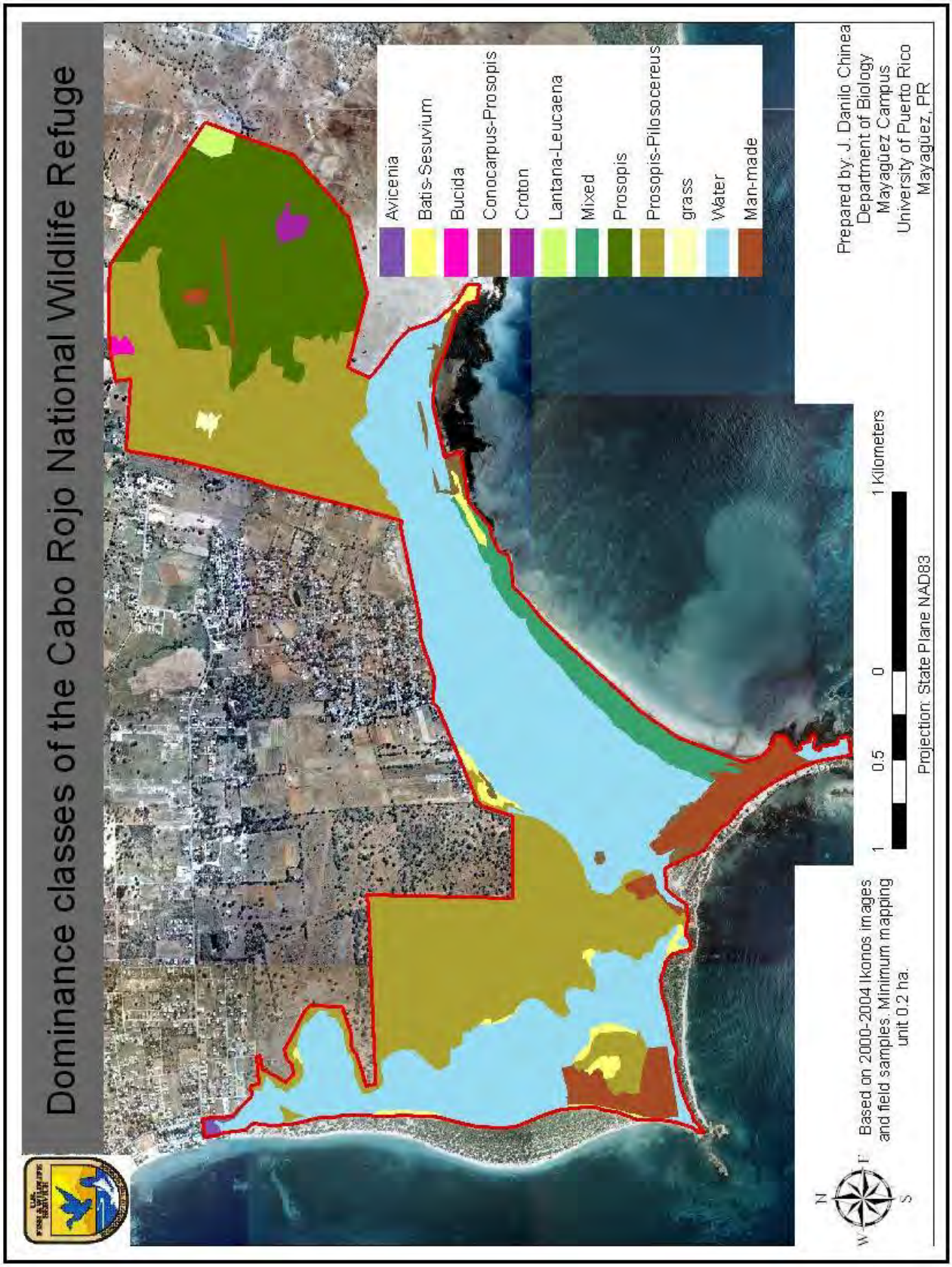
Dominance Classes

The most abundant dominance class was the Prosopis-Pilosocereus class, almost equally abundant on both units of this refuge (Table 3 and Figure 7). The Prosopis class was the second most abundant class, occurring almost exclusively within the savanna of the Eastern Unit. The "Mixed" dominance class occurs exclusively along the beach south of the Fraternidad Lagoon and is a mixture of patches of beach, mangrove, salt flat, mudflat, and coastal low dune vegetation types, too variable and patchy to be able to map accurately. The Batis-Sesuvium class occurred exclusively on the Salinas Unit as the only dominance class within the desert structural class. The Conocarpus-Prosopis class occurred exclusively on the Salinas Unit, along the edges of the Fraternidad Lagoon. The Lantana-Leucaena class and the Croton class occurred exclusively on the Eastern Unit, at the tops of the highest hills of the refuge where the Ponce Limestone formation is exposed (Bawiec 2001). The Bucida class was found exclusively along a drainage way at a northern edge of the Eastern Unit. The Avicennia class was found at the northwestern tip of the Salinas Unit; this patch is not present in a 1936 aerial photo. Grass is the dominance class found at the only prairie patch in the Eastern Unit.

Table 3. Summary of area by dominance classes of the Cabo Rojo NWR

Dominance class	Area (ha)
Water	287
Prosopis-Pilosocereus	252
Prosopis	116
Man-made	36
Mixed	26
Batis-Sesuvium	12
Conocarpus-Prosopis	8
Lantana-Leucaena	3
Croton	2
Bucida	1
Avicenia	1
Grass	1
Total	**746**

Figure 7. Dominance classes of the Cabo Rojo NWR



Vegetation Types

Twelve vegetation types were determined (Table 4 and Figure 8). Brief vegetation type descriptions follow:

Avicenia forest – This is a relatively young stand of nearly pure *Avicennia germinans* with several other species along the edges on higher ground (e.g., *Thespesia populnea, Prosopis pallida, Batis maritima*). The soils of this area belong to group III. The aerial photo of 1977 shows only a few scattered bushes in this site; therefore, the conditions appropriate for mangrove growth in this site occurred on or after 1977.

Conocarpus-Prosopis Scrub – This vegetation type occurs in the vicinity of or in isolated patches within the Fraternidad Lagoon, on ground that is higher than for the Batis-Sessuvium Desert Type. *Conocarpus erecta and Prosopis pallida* are the dominant species. These patches occur over soils of groups II and III. Aerial photos of all dates also show these patches consistently with very similar vegetation structure.

Batis-Sesuvium Desert – This is a very distinct vegetation type, characterized by the dominance of two salt-tolerance species: *Sesuvium portulacastrum and Batis maritima. Avicennia germinans* and less frequently *Laguncularia racemosa, Conocarpus erectus, and Rhizophora mangle* occur usually as scattered and stunted trees. This vegetation type was sampled at sites bordering the two lagoons, on soils of groups II, III and V. Aerial photos of all dates consistently show no vegetation or very open and short vegetation.

Mixed Scrub – This vegetation type occurs along the south side of Fraternidad Lagoon, over a system of low sand dunes with soils of soil group III. It consists of a mosaic of patches that seem mostly associated with a small range of elevations. On lower ground the patches are dominated by *Batis maritima and Conocarpus erecta*. On higher ground there is a more diverse set of species, including several sedges, *Croton discolor, Krameria ixine, Melocactus intortus, Jacquinia arborea, Lantana sp., Gossypium hirsutum*, and others. Aerial photos of all dates show vegetation of very similar structure to that of today.

Prairie – This is a single one-hectare patch of nearly pure grassland dominated by *Urochloa maxima*. A 2000 Ikonos image shows a contiguous set of linear features within most of this area, consistent with the pattern left by mowing with a large machine.

Prosopis Savanna – Most of the eastern half of the Eastern Unit is occupied by this vegetation type. It consists of very open savanna-like vegetation with the woody component dominated by *Prosopis pallida* (with few very scattered individuals of *Parkinsonia aculeata* and *Pilosocereus royenii*) and the herbaceous component dominated by the grasses *Urochloa maxima* and *Botriochloa pertusa*. Soils of group IV occupy most of this area, followed by soil groups VI and V (in decreasing order of areal extent). Aerial photos of this area show very few trees, mostly along the intermittent streams and drainage ways, suggesting active management for grazing; a clear increase in tree numbers and tree sizes is evident in the 1977 photo.

Prosopis-Pilosocereus Scrub – This vegetation type has a more closed canopy dominated by *Prosopis pallida*, with many large individuals of the columnar cactus *Pilosocereus royenii* mostly in the understory. *Urochloa maxima* is the main species in the herbaceous layer. Minor species include *Gossypium hirsutum, Lantana sp., Opuntia repens*, and several vines (most notably *Jasminum fluminense*). Soils of groups IV and VII occupy most of this area. The sequence of aerial photos shows a consistent increase in tree density and canopy closure since 1936 in these areas.

Prosopis Woodland – This vegetation type was mapped along an intermittent stream on the eastern side of the Eastern Unit. Large individuals of *Prosopis pallida* form a canopy of scattered trees on a dense understory of grasses, mostly *Urochloa maxima*. Soils mostly belong to group VII. The sequence of aerial photos shows a very similar development to the Prosopis Savanna.

Prosopis-Pilosocereus Forest – This vegetation type occurs mostly along drainage ways over soils of groups IV and VII on the Eastern Unit and over soils of group V on the Salinas Unit. *Prosopis pallida and Pilosocereus royenii* are the most conspicuous members of the type, with an understory usually dominated by *Urochloa maxima*; minor species include *Gossypium hirsutum, Lantana sp.,* and *Tournefortia microphylla*. The southernmost third of the largest patch of this type on the Salinas Unit shows fairly dense low scrub vegetation through the sequence of aerial photos since 1936, suggesting that at least this area may have been utilized at low intensity. No such patches are evident in the 1936 aerial photos of the Eastern Unit, but most of the patches of this type in that unit of the refuge included the densest woody vegetation in the 1977 photos.

Bucida Forest – This type was mapped as a single small patch on the northernmost portion of the Eastern Unit; it occurs on the basin of an intermittent stream with soils of group VII. It is named after the dominant tree species: *Bucida buceras*. The understory is dominated by *Urochloa maxima*. Minor species include *Melicocus bijugatus, Leucaena leucocephala,* and *Jasminum fluminense*. Aerial photos of 1936 show savanna-like vegetation (probably a low intensity pasture). In the 1963 photos, the area was subdivided into several fields, but most of the trees of this patch were left alive. By 1977 the patch had a much more closed canopy due to ingrowth of many stems.

Lantana-Leucaena Scrub – This vegetation type was observed only on the Eastern Unit, on soils of group VII. Its canopy is dominated by *Lantana sp*. and *Leucaena leucocephala* and the herbaceous component is dominated by *Pennisetum ciliare*. Minor species are *Prosopis pallida, Jasminum fluminense, and Stigmaphyllon emarginatum*. The sequence of aerial photos shows dominance of fairly uniform low vegetation (most likely pasture) from 1936 until after 1977.

Croton Scrub – This vegetation type was observed only on the Eastern Unit, on soils of group V (derived from limestone). The canopy is dominated by *Croton discolor* and the herbaceous layer is dominated by *Pennisetum ciliare*. Minor species include *Leucaena leucocephala, Lantana sp.,* and *Bourreria succulenta*. Low scrubby vegetation shows in the 1936 photos in the middle half of the patch, with further encroachment through the sequence of photos.

Table 4. Summary of area by vegetation types of the Cabo Rojo NWR

Vegetation type	Area (ha)
Water	287
Prosopis-Pilosocereus Scrub	206
Prosopis Savanna	112
Prosopis-Pilosocereus Forest	46
Man-made	36

Vegetation type	Area (ha)
Mixed Scrub	26
Batis-Sesuvium Desert	12
Conocarpus-Prosopis Scrub	8
Lantana-Leucaena Scrub	3
Prosopis Woodland	3
Croton Scrub	2
Bucida Forest	1
Avicenia Forest	1
Prairie	1
Total	**746**

Notes on Soil and Vegetative Structural Mapping

This study area is composed of two management units: the Eastern Unit holding the main offices and the western Salinas Unit where salt extraction is still practiced. The Salinas Unit includes two large lagoons: Candelaria Lagoon to the west and the Fraternidad Lagoon to the south.

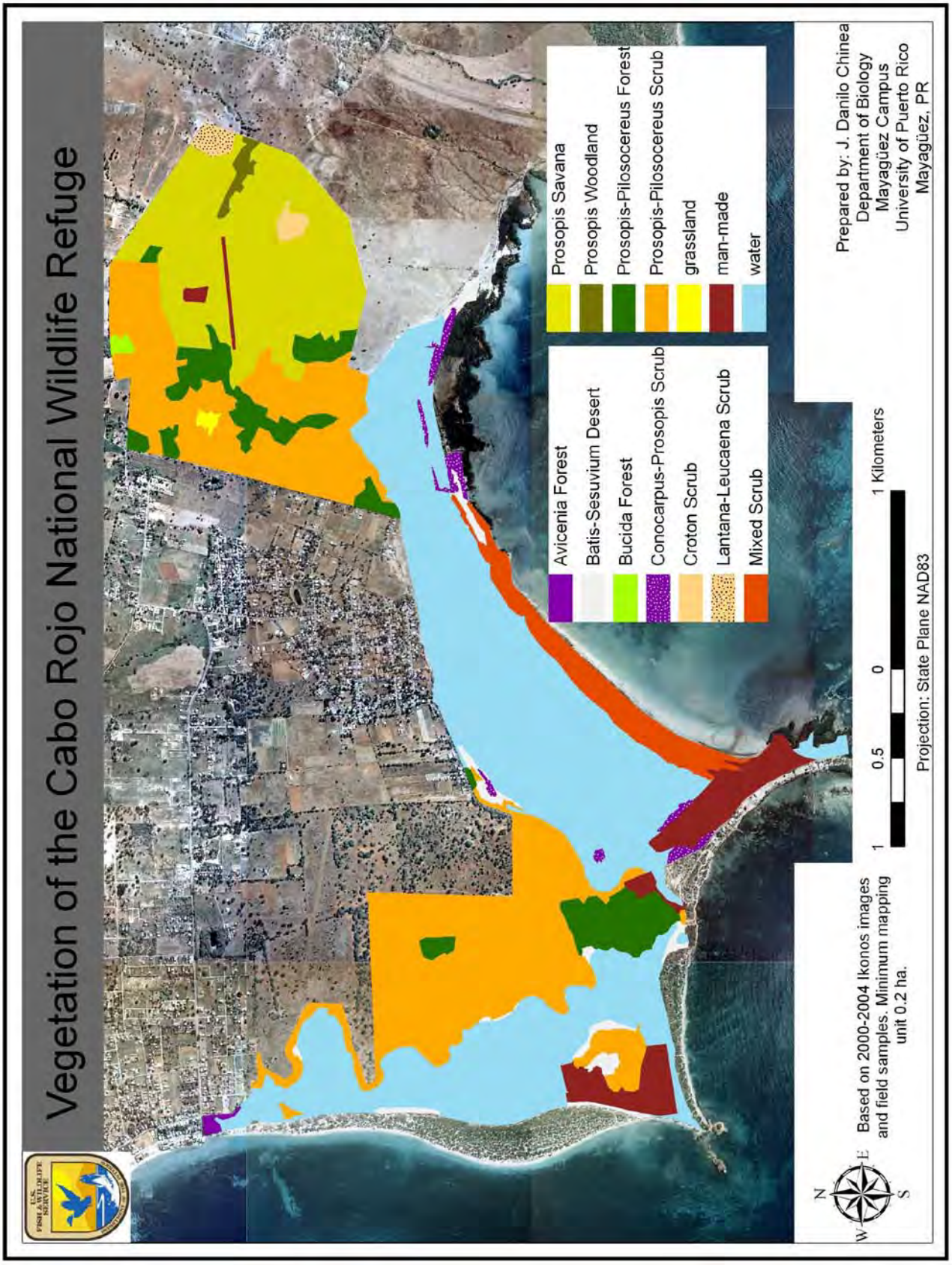
Methods

The general strategy for mapping vegetation units within this refuge was to: (1) Conduct an initial brief recognizance of the vegetation; (2) map the vegetation structural classes; (3) determine soil groups based on similar chemical and physical characteristics of the soil series within the refuge; (4) generate a map of combinations of vegetation structural classes and the soil groups; (5) select sites within the structure/soil combinations for sampling the species composition of the vegetation; (6) use multivariate statistical techniques for determining dominance classes; and (7) map the vegetation units.

HYDROLOGY

The hydrology section of this document was taken directly from Weaver, Peter L.; Schwagerl, Joseph J. 2009. U.S. Fish and Wildlife Service Refuges and Other nearby Reserves in Southwestern Puerto Rico, General Technical Report IITF-40. San Juan, PR: U.S. Department of Agriculture Forest Service, International Institute of Tropical Forestry, 110p.

Figure 8. Vegetation types of the Cabo Rojo NWR



The western part of the Lajas Valley rises from sea level at Bahia Boquerón to about 13 m in elevation at Puerto Rico Route 303. The highway runs along the drainage divide that separates the eastern and western parts of the valley (Graves 1991). The principal aquifer of the Lajas Valley consists of alluvial deposits. Consolidated sedimentary rocks with different hydraulic characteristics underlie the deposits and could be considered as a distinct aquifer (Graves 1991). The principal aquifer is recharged by rainfall and stream flow, most of which occurs through coarse grain alluvial fans along the valley's edges. Seasonal changes of 0.6-m are apparent in the altitude of the potentiometric surface, which averages about 15 m at the northern and southern boundaries of the valley, and 4 m in the middle. Discharge of ground water occurs through pumping, evapotranspiration, and subsurface seepage.

The headquarters tract, characterized by gentle slopes, ranges from <5 m in the southwest corner to about 35 m in elevation in the northwest corner. The entire Salinas tract is virtually at sea level. The large shallow Laguna Candelaria and Laguna Fraternidad saltwater lagoons, which fluctuate in size according to rainfall, runoff from upland areas and tidal levels, are the most striking features of the tract (Tripp and Collazo 2003). Evaporation from the lagoons is high, and salinity tends to increase with distance from the water control structures. Water movement in the lagoons is influenced by wind and flow is generally from east to west, particularly in Laguna Fraternidad.

BIOLOGICAL RESOURCES

HABITAT

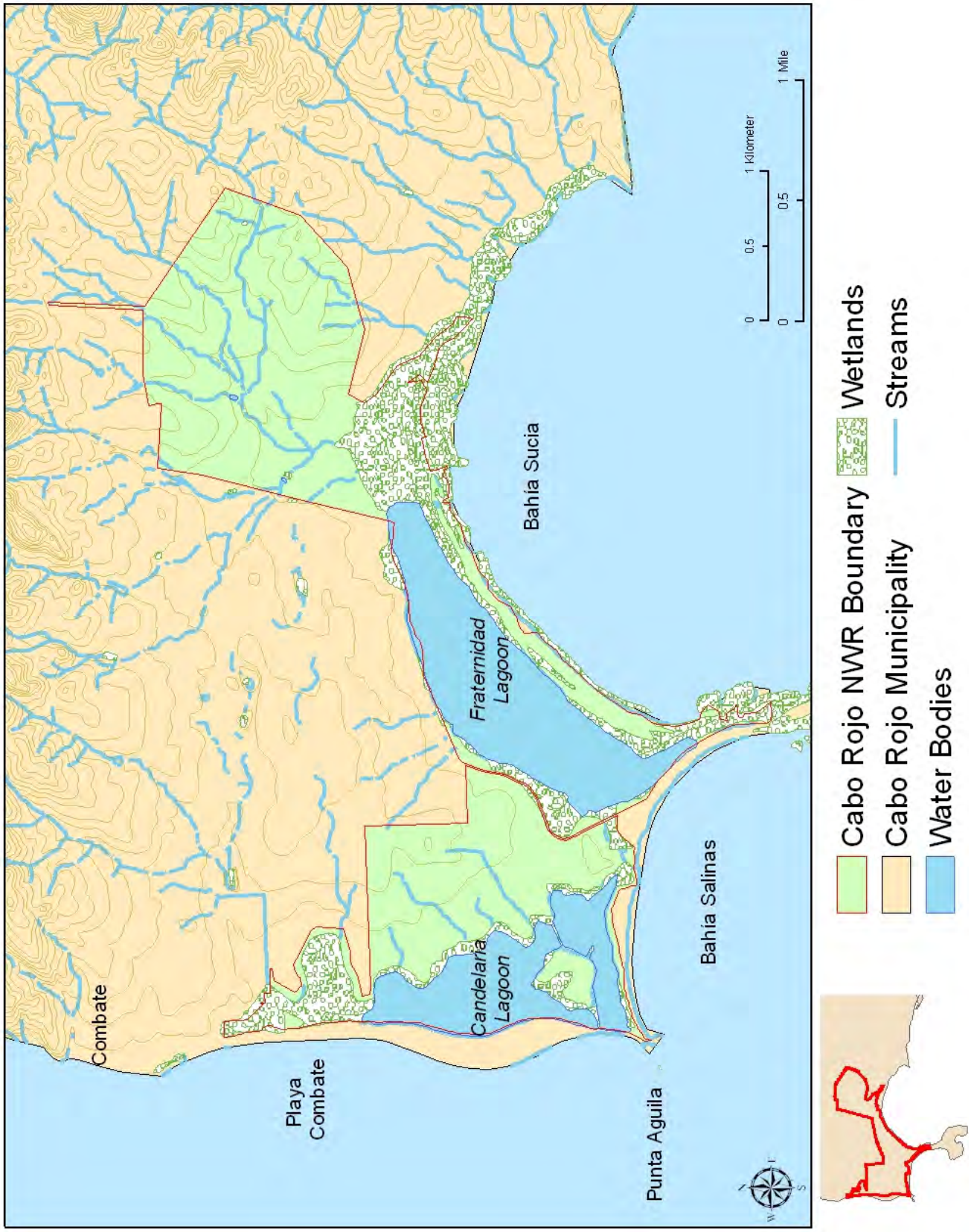
The habitat section of this document was taken directly from Weaver, Peter L.; Schwagerl, Joseph J. 2009. U.S. Fish and Wildlife Service Refuges and Other nearby Reserves in Southwestern Puerto Rico, General Technical Report IITF-40. San Juan, PR: U.S. Department of Agriculture Forest Service, International Institute of Tropical Forestry, 110p.

"Puerto Rico was originally mantled by forests from the level of the sea to the summit of its mountains" (Hill 1899) and the dominant vegetation in southwestern Puerto Rico at the time of Columbus' arrival was forest (Murphy 1916). Mangroves probably covered about 12,000 ha of Puerto Rico's shorelines, declining to nearly one-half by 1938 (Carrera and Lugo 1978). The dry, rocky slopes along the south coast were covered by woodland and cactus (Wadsworth 1950, 1962). Prominent tree species included Amyris elemifera, Bucida buceras, Bursera simaruba, Ceiba pentandra, Colubrina arborescens, Exostema caribaeum, Guaiacum officinale, Pictetia'aculeata, and Tabebuia hetrophylla.

The flora of Puerto Rico, ranging from coastal areas through the mountainous interior, was studied in detail during the 1920s (Britton and Wilson 1923-1930; Gleason and Cook 1927; Cook and Gleason 1928). Britton, the founder and first director of the New York Botanical Garden, helped carry out the first systematic inventory of natural history in the Caribbean (Sastre and Santiago-Valentin 1996). Many of his expeditions included sites in southwestern Puerto Rico. Major environmental concerns at that time included the island's loss of forest cover, and the need for forest policy and reforestation.

Puerto Rico’s original forest cover included approximately 300,000 acres of subtropical dry forest or about 14 percent of the island. Long since converted to agriculture and much subsequently replaced by housing, pasture, and Prosopis/Acacia woodland, the cause of the severe dry forest habitat loss is well known. Dry forest is easily cleared with fire and woody regeneration in fields and pastures easily suppressed with fire. The two most severe ecological threats to the refuge’s subtropical dry forest are wildfires and cattle grazing. The vegetation on the island evolved in the absence of large herbivores and is also very susceptible to grazing.

Figure 9. Surface hydrology of Cabo Rojo NWR



Many dry forest species are relatively robust due to their evolutionary history of exposure to seasonal droughts. Thus even tiny population fragments and severely altered populations can be ecologically reworked into viable interacting populations and complex habitats. Recolonization will occur if the seed source is present; however, in many areas human-assisted introductions will be necessary. Mangroves grew along the coast. *Bucida buceras,* often draped with the epiphyte *Tillandsia recurvata,* and its associates, were common in the stream deltas and alluvial valleys of the original forest (Gleason and Cook 1927). *Capparis cyanophallophora, Citharexylum fruiticosum, Coccoloba diversifolia, Guaiacum officinale, Guapirafragrans, Pisonia albida,* and *Tabebuia hetreophylla* were common along the coastal strip (Gleason and Cook 1927). Subsequently, during colonization and settlement, trees were cut for construction, fuel, and agriculture. At the beginning of the 20th century, the deciduous forests, ranging from Patillas in southeastern Puerto Rico along the south coast to Hormigueros near Mayaguez, were recurrently burned and grazed (Murphy 1916).

In the early 1900s, aside from locally grown fruit trees, the most conspicuous trees of the southwestern coastal areas were the natives *Cassine xylocarpa, Ceiba pentandra, Hippomane mancinella, Hymenaea courbaril, Manilkara bidentata,* and the exotics *Delonix regia* and *Tamarindus indica* (Hill 1899). Other native trees observed during the early 1900s were *Acacia famesiana, Andira inermis, Bucida buceras, Guazuma ulmifolia, Inga laurina, Inga vera, Pictetia aculeata, Randia aculeata, Stahlia monosperma,* and the exotic *Haematoxylum campechianum* (Gleason and Cook 1927, Murphy 1916). Pasture land, if unattended, would soon revert to a thorn thicket characterized by *Capparis flexuosa, Parkinsonia aculeata, Pilosocereus royenii,* and *Pithecellobium unguis-cati,* among other species (Gleason and Cook 1927).

The Great Depression and World War II forced most islanders to utilize available land for pasture and crops. During the late 1940s, all but 6 percent of Puerto Rico was in natural forest. After the mid-1980s, however, much of the agricultural land had been abandoned and secondary forests occupied about one-third of the island, including much of the southwest (Birdsey and Weaver 1982, Franco et. al 1997).

All of Puerto Rico's native tree species and many introduced exotics have been described and illustrated in local publications (Francis and Liogier 1991, Francis and Lowe 2000, Little and Wadsworth 1964, Little et. al 1974). Moreover, taxonomic descriptions of the flora (e.g., grasses, trees, and vines) are available for Puerto Rico and other islands in the Caribbean (Acevedo-Rodríguez and Woodbury 1985; Hitchcock 1936; Howard 1979, 1988-1989; Liogier 1985-1997; Liogier and Martorell 1982, 2000). Eight common species of grasses have also been illustrated in a field guide (Mas and García 1990). Plant nomenclature in this report has followed Liogier.

Southwestern Puerto Rico, including all of the refuge properties, is situated in the subtropical dry forest according to the ecological life zone system (Ewel and Whitmore 1973, Holdridge 1967). Within the life zones, associations are referred to as zonal (that is, with a typical climate and a typical soil type), or azonal if strongly influenced by edaphic, atmospheric, or hydric conditions. Another classification system used throughout the Caribbean also recognizes environmental effects on vegetation (Beard 1949, 1955).

The major types of vegetation cover in the southwest are: mangroves; salt flats; littoral woodland (beach thickets); mesquite and semi-evergreen woodland; coastal shrub or thorn woodland; deciduous woodland; agricultural lands, including pastures; and residential areas and roadside trees (McKenzie and Nobel 1990). Mangroves and salt flats are the vegetation types that most closely approach the original cover. Moreover, the littoral woodland still contains numerous tree species that were part of the original vegetation. In contrast, pastures, agricultural lands, and residential areas are the most modified landscapes. The remaining vegetation types contain exotic and native species in compositions that differ from the original vegetation.

Currently, the refuge sites are highly disturbed by human activity and occupied by secondary vegetation, including numerous exotics. The following vegetation descriptions, mainly overstory trees, are derived from previous work on forest cover in southwestern Puerto Rico (McKenzie and Nobel 1990).

Mangrove Forest

Mangroves are dominated by four tree species: *Avicennia germinans, Conocarpus erecta, Laguncularia racemosa,* and *Rhizophora mangle. Rhizophora mangle* frequently forms a fringe along the coast, and occasionally isolated islands of vegetation in shallow water. *Avicennia germinans* and *Laguncularia racemosa* are common in estuaries and around salt flats. *Conocarpus erecta* is commonly found at the landward edge of tidal mangrove swamps.

Cabo Rojo Salt Flats

The Cabo Rojo Salt Flats and crystallization ponds are extremely important for nesting, migrating, and wintering shorebirds. Thousands of shorebirds can be observed here during migration, and species such as the snowy plover use the salt flats for nesting and foraging. The source of water and salt at the salt flats and crystallization ponds is through water control structures directly from the Caribbean Sea, directed by a network of channels and ditches. The addition of this area to the refuge has been extremely important for migratory bird conservation. It must now be determined whether upgrading components of this entire system will provide further benefit to migratory birds by enhancing the refuge's water management capabilities and providing additional quality habitat.

The Cabo Rojo Salt Flats are recent unconsolidated littoral, alluvial, and eolian deposits. The Fraternidad and Candelaria lagoons are the most noticeable feature of the area. The maximum depth of the lagoons is approximately 18 inches. Ocean water is allowed to flow into the lagoons at high tide through narrow channels used to maintain the desired water levels for migratory and resident birds and salt production. Areas of both Fraternidad and Candelaria lagoons are flooded seasonally, caused by tidal influence as well as heavy rains. During the winter and spring, some areas of the shallow intermittent lagoons often dry completely.

The salt flats are mostly unvegetated, with some areas harboring scrub habitat such as mangrove forest or thorn scrub. Vegetation within the salt flats consists of salt-tolerant plants such as saltwort (*Batis maritima*) and sea purslane (*Sesuvium portulacastrum*). The slightly higher elevations of the flats are vegetated by species such as sea grape (*Coccoloba uvifera*), cotton (*Gossypium hirsutum*), and Sebucán (*Pilosocerus royenii*).

Often adjacent to mangrove swamps, the salt flats contain a ground cover with *Batis maritima, Heliotropium curassavicum, Sesuvium portulacastrum,* and other salt-tolerant plants. Trees are usually limited to scattered patches of *Avicennia germinans* and *Laguncularia racemosa.*
The most recent scientific interest on the Cabo Rojo Salts Flats is the extraordinary opportunity to study an important ecosystem lying just beneath the bottom of these seasonally flooded hypersaline lagoons (called the microbial mats). Scientists believe that under the extreme conditions of high salinity, solar radiation, and temperatures very ancient life forms (from the domain Archea) evolved into more complex organisms. The microbial mats located in the Cabo Rojo Salt Flats are approximately 50-70 mm in depth, with three distinct layers (green, pink and black). Each layer is composed of different and unique very ancient microscopic life forms, many of them representing new species discoveries.

Vegetative Cover
Cabo Rojo NWR is divided into two tracts - Headquarters and Salinas. Intensive farming and grazing were the main uses of the Headquarters tract. In 1978, livestock were removed when the first refuge manager arrived. In 1980, the planting of *Bucida buceras* trees began in several areas. The planting continued irregularly through 1995 and annually thereafter when several new tree species were introduced (Weaver and Schwagerl 2004).

The existing forest cover in the wooded portion of the Headquarters tract contains *Prosopis juliflora* along with a few other exotic tree species such as *Albizia lebbeck, Leucaena leucocephala, Melicoccus bujugatus, Parkinsonia aculeata, Pithecellobium dulce,* and *Tamarindus indica* (Stacier 1992; Zuill 1985). Maturing *Bucida buceras* trees also grow along with occasional *Hymenaea courbaril* and other native species scattered in secondary patches. Regeneration of native tree species is apparent under existing tree cover.

In general, drainages contain the greatest concentration of large trees. In the grass-dominated areas, *Panicum maximum* and *Cenchrus ciliaris* grow along with widely scattered trees of *Prosopis juliflora* or clumps of cactus. The grasses cause serious problems. They are aggressive competitors for light and water and retard the regeneration of native tree species. Moreover, the grasses facilitate the spread of wildfires that sometimes enter from surrounding farm lands.

The Salinas tract contains three principal vegetation types: scattered patches of mangrove; stretches of littoral woodland; and the salt flats with salt-tolerant plants. The mangroves and the littoral woodland have been affected by the harvest of fenceposts and fuelwood in the past. The tract also contains shallow lagoons, not exceeding 0.5-m in depth, and occupying about 225 ha (Negron Gonzalez 1986). Human manipulation of the salt ponds for nearly three millennia has allowed salt extraction with little apparent impact on the shorebirds.

Littoral Woodland (Beach Thickets)
The littoral woodland, stretching in a fringe along the coast behind beaches, contains several native canopy species like *Canella winterana, Clerodendron aculeatum, Coccoloba diversifolia, Coccoloba uvifera, Colubrina arborescens, Erithalis fruticosa, Erythroxylum aerolatum, Jacquinia arborea, Krugiodendron ferreum, Piscidia carthagenesis, Pisonia albida, Randia aculeata,* and *Rochefortia acanthophora.* The exotic *Thespesia populnea* reproduces abundantly in some areas.

Mesquite and Semi-evergreen Woodland
Land clearing for pasture and agriculture in the lowlands between the salt flats and nearby mountains has modified the original forest dominated by *Bucida buceras* (Cook and Gleason 1928) into an association with grass and scattered *Prosopis juliflora,* resembling a savanna (García-Molinari 1952). Other common trees include the natives *Bucida buceras, Guaicum officinale,* and *Pisonia albida,* along with numerous understory species. Common exotics are *Leucaena leucocephala, Pithcellobium dulce,* and *Tamarindus indica.* Trees common to arroyos in the mesquite and semi-evergreen woodland include natives such as *Acaciafamesiana, Crecentia cujete, Piscidia carthagenesis,* and *Tabebuia heterophylla* and exotics like *Albizia lebbeck, Bauhinia monandra,* and *Swietenia mahagoni.*

Coastal Shrub or Thorn Woodland
Some areas are dominated by a coastal scrub previously called cactus scrub or thorn woodland (Beard 1949). The dominant canopy trees in this vegetation type are almacigo *Bursera simaruba, Guaicum offincinale, Pisonia albida, Plume ria alba, Prosopis juliflora,* and scattered *Bucida buceras.* Near Bahia Sucia, the composition varies somewhat in small areas of limestone. *Bucida buceras, Crescentia cujete, Guapira discolor, Pisonia albida, Prosopis juliflora,* and *Tabebuia heterophylla* are the principal canopy species.

Deciduous Woodland
The major tree species in the deciduous woodland are *Bourreria succulenta, Bucida buceras, Bursera simaruba, Clusia rosea, Coccolobia diversifolia, Colubrina arborescens, Colubrina elliptica, Erothroxylum aerolatum, Guazuma ulmifolia, Pisonia albida, Rauvolfia nitida, Thouinia striata* var. *portoricensis, Zanthoxylum martincense, Zanthoxylum monophyllum,* and *Ziziphus reticulata.* Occasionally *Guaicum offincinale* is found.

Other vegetation types are solely the result of human activities and are maintained in a highly modified state by regular tending, at least for a period of time.

Agricultural Lands and Pastures
Agricultural lands often contain *Carica papaya, Persea americana,* and ground crops such as melons, peppers, pineapples, pumpkin, and yucca. Pastures are occupied by about 15 species of native and introduced grasses. Secondary regeneration of native tree species and planted *Prosopis juliflora* and *Swietenia mahagoni* are seen in the vicinity of the refuge.

Residential and Roadside Trees
Selected for shade, ornament, and fruit, or regenerated naturally, several species of trees survive around private homes, along fencelines, and scattered in fields. The most common trees planted for shade or as ornamental are *Delonix regia, Swietenia mahagoni, Tabebuia heterophylla, Tecoma stans,* and *Tectona grandis.* Among the most common fruit tree is *Tamarindus indica.*

Forest Tree Plantings (Plantations)
Forest trees are planted for a variety of purposes, usually timber production. In Puerto Rico's dry southwest, however, timber production was not previously a priority (Birdsey and Weaver 1982), although experimental work with timber species was attempted more than 60 years ago (Marrero 1950; Wadsworth 1943, 1990). During the past 25 years, at least 80 tree species have been planted on the refuge lands to stimulate native forest regeneration and to restore wildlife habitat.

Frequent fires, heavy grazing, and continuous cropping, mainly in sugar cane, characterized the past use of the refuge. Soil erosion and sedimentation were rampant. During this period, native plants were severely reduced in numbers and several exotics increased in area. Today, the refuge is covered with pasture interspersed with native and exotic trees, patches of secondary forest, and tree plantings of various species.

Vegetative surveys have been carried out at both Cabo Rojo NWR (McKenzie 1986) and the Laguna Cartagena NWR (Proctor 1996). The identified plants include: 7 ferns, 1 gymnosperm, 47 monocotyledons, and 308 dicotyledons.

Among the monocots are 1 aroid, 2 bromeliads, 1 spiderwort, 4 sedges, 36 grasses, 2 orchids, and 1 climbing shrub. The dicots include 64 families. Eleven families had nearly 60 percent of the species: 18 Boraginaceae, 8 Cactaceae, 16 Compositae, 11 Convolvulaceae, 21 Euphorbiaceae, 49 Leguminosae, 8 Malphighiaceae, 18 Malvaceae, 8 Myrtaceae, 13 Rubiaceae, and 12 Verbenaceae.

Coastal and Marine Resources

Refuge lands also include estuarine, brackish, and hypersaline lagoons. These areas support a wide variety of fish and crustaceans, and some may serve as nursery areas. Red mangrove roots are well known for diverse communities of invertebrates and algae that in turn support a variety of fish and crustaceans. The hypersaline salt pond invertebrate communities are the key to maintaining

shorebird and wading bird populations in these areas. While this is a very low diversity invertebrate community, the abundance fluctuations are particularly important, and are probably correlated with salinity fluctuations and water movement in the lagoons.

Mangroves and associated mud flats provide a variety of wetland and wildlife functions. They serve as sedimentation and nutrient filters; provide foraging, resting, and nesting areas for a variety of wading birds, shorebirds, and other migratory and resident bird species; and provide habitat and forage for a number of estuarine and marine fish and shellfish species. Mangroves are included as Essential Fish Habitat under the Fishery Management Plan for the Caribbean Fisheries Management Council under the Magnuson-Stevens Fishery Conservation and Management Act. On Cabo Rojo NWR, these estuarine/marine wetlands include mangrove areas, mudflats, and salt ponds. Refuge units with these habitats include the Cabo Rojo Salt Flats.

Refuge lands lie adjacent to or near shoreline areas that contain special aquatic sites including mangroves, seagrass beds, and coral reefs. The Cabo Rojo Salt Flats include shorelines of shallow bays with extensive seagrass meadows used by a wide variety of fish and shellfish as nursery and feeding areas. Like mangroves and coral reefs, seagrass beds are considered to be Essential Fish Habitat. Seagrass meadows adjacent to the Cabo Rojo Salt Flats are also used as grazing and resting areas by Antillean manatees. Management of erosion, runoff, and water access points is particularly important for these habitats.

An Overview of Plant Species

A complete Biota List is presented as Appendix I – Refuge Biota.

Animals	Federal(1)	State(2)
Birds		
West Indian Whistling Duck-*Dendrocygna arborea*		CR
Yellow-shouldered Blackbird-*Agelaius xanthomus xanthomus*	E	EN
Snowy Plover-*Charadrius alexandrinus tenuirostris*)		CR
Least Grebe-*Trachybactus dominicus*		DD
Duck Masked -*Nomonix dominica*		EN
Caribbean Coot -*Fulica caribaea*		VU
Ruddy Duck- *Oxyura jamaicensis*		VU
White-cheeked Pintail-*Anas bahamensis*		VU
Puerto Rican Oriole-*Icterus dominicensis*		DD
Least Tern-*Sterna antillarum*		DD
Piping Plover - *Charadrius melodus*	E	CR
Peregrine Falcon-*Falco pergrinus tundrius*	E	CR
Grasshopper Sparrow-*Ammodramus savannarum*		DD

Animals	Federal(1)	State(2)
Reptiles and Amphibians		
Green Sea Turtle-*Chelonia mydas*	T	EN
Hawksbill Turtle- *Eretmochelys imbricata*	E	EN
Puerto Rican Slider-*Trachemys stejnegeri*		DD
Cook Lizard-*Anolis cooki*		EN
Crustaceans		**DD**
Fiddler crab-*Uca vocator*		LR
Goniopsis cruentata		DD
Aratus pisonii		DD
Macrbrachium acanthurus		DD
Land crab-*Cardisoma guanhumi*		LR
Mammals		
West Indian Manatee-*Trichechus manatus manatus*	E	EN
Brazilian free-tailed bat *Tadarida brasiliensis*		LR
Plants		
Aristida chaseae	E	EN
Cóbana Negra-*Stahlia monosperma*	E	VU
Eugenia woodburyana -Historic and planted	E	CR
Goetzea elegans -planted	E	E
Crescentia portorricensis –planted	E	CR
Higo Chumbo – *Harrisia portorricensis* -planted	E	VU

1/ Federal: Listed species under the US Endangered Species Act (ESA), 1973 as amended. E=Endangered; T=Threatened

2/ State: Listed species under the Puerto Rico Commonwealth Department of Natural and Environmental Resources (DNER). Regulation 6766, Feb 11, 2004. CR=Critically Endangered; EN= Endangered species designated by the Secretary of DNER; EF= Designated endangered by the federal government; DD=Deficient data; EX=Extinct; ESS= Extinct on the wild; LR=Less Risk ; VF= Designated vulnerable by the federal government; VU= Vulnerable.
Endemic species on boldface

Non-native Plant Species Present

- Tamarind tree (*Tamarindus indica* L.)
- African Guinea grass (*Panicum maximum*)
- Mesquite tree (*Prosopis pallida*)
- Aroma tree (*Acacia farnesiana*)
- *Leucaena leucocephala*
- *Prosopis juliflora*
- *Acacia retusa*
- *Albizzia lebbeck*
- Saline buffel grass (*Cenchrus ciliaris*)
- Kleberg bluestem (*Dichanthium annulatum*)
- *Pithecellobium dulce*

An Overview of Bird Species

A total of 145 bird species have been identified on the refuge. The refuge falls within designated critical habitat for the endangered yellow-shouldered blackbird (*Agelaius xanthomus xanthomus*) (U.S. Fish and Wildlife Service 1976). The species has not been known to nest on the refuge in recent years, nor were any individuals recorded during 1991-96 surveys on the refuge. It has been observed foraging sporadically on the original 587 acres of the refuge and in coastal areas (to the south and west of Candelaria and Fraternidad lagoons). The closest known nesting areas to the proposed site are Bahía Sucia and the town of Corozo, each approximately one kilometer from the refuge.

Data collected by the Puerto Rico Department of Natural and Environmental Resources, the U.S. Fish and Wildlife Service and the Sociedad Ornitológica Puertorriqueña Inc., or Puerto Rico Ornithological Society (SOPI) indicate that the Cabo Rojo Salt Flats provide some of the best habitat for migrating shorebirds in the eastern Caribbean. A total of 25 species have been recorded from the salt flats and historical accounts report up to 10,000 birds in a single day. The salt flats provide nesting habitat for killdeer (*Charadrius vociferous*), black-necked stilt (*Himantopus mexicanus*), Wilson's plover (*Charadrius wilsonia*), snowy plover (*Charadrius alexandrinus tenuirostris*), and willet (*Catoptrophorus semipalmatus*). These species nest on the open, sparsely vegetated areas immediately adjacent to the salt ponds. Other species known to occur in the salt flat area include the least tern (*Sternula antillarum*) and the white-cheeked pintail (*Anas bahamensis*). Least terns are known to nest in the open sparsely vegetated areas adjacent to the salt flats, as well as on dredge piles in the salt flats, between May and August. Nesting habitat for these species are approximately one kilometer or more from the refuge. The federally listed piping plover (*Charadrius melodus*) has been observed resting and feeding on the Cabo Rojo NWR (Raffaele 1989).

Cabo Rojo NWR supports habitats that presently (or in the near future could) contribute to recovery of three federally listed threatened and endangered birds: (1) Yellow-shouldered blackbird, (2) Puerto Rican nightjar, and (3) Caribbean populations of roseate tern.

Yellow-shouldered Blackbird

The yellow-shouldered blackbird (YSBB) is one of the nine species of blackbird genus *Agelaius.* There are two recognized subspecies: *Agelaius xanthomus xanthomus*, known only from Puerto Rico, and formerly from Vieques Island, and *Agelaius xanthomus monensis*, which occur only on Mona and Monito Islands. The YSBB is a medium- sized bird, which is glossy black with yellow humeral patches. The YSBB was determined to be an endangered species and critical habitat was designated in 1976. Critical

habitat includes all of Mona Island; a portion of southwestern Puerto Rico (from Boquerón to Guánica south to Road 101, Road 305 and Road 116; a circular area with a 1-mile radius in the town of San Germán; and Roosevelt Roads Naval Station in Ceiba).

In the past, this endemic species was considered abundant and widespread in Puerto Rico. In the mid-1970s, the species declined drastically mostly because of destruction of the species' nesting and foraging habitat and brood parasitism by the shiny cowbird (*Molothrus bonariensis*). At present, the species is restricted to a few localities in southwestern, southern, and eastern Puerto Rico, and to Mona and Monito Islands.

High priority recovery activities identified in the YSBB Recovery Plan include preventing further habitat loss and degradation by the protection and the management of the YSBB habitat and populations and continued monitoring of population levels and nesting activities.

The Cabo Rojo NWR and the Laguna Cartagena NWR are located within the range of the species. Cabo Rojo NWR and nearby Laguna Cartagena-La Tinaja NWR support feeding habitat for the species and habitat enhancement measures can be conducted for providing nesting habitat to the southwestern population (Post 1981).

Other Bird Species of Concern
This section includes other non-federally listed bird species for which the Service has a special management interest. These species may be drawn from state wildlife management plans and/or scientific research conducted on the refuge.

Landbirds
Among resident breeding species, priorities are focused on the endemic Puerto Rican oriole *(Icterus dominicensis portoricensis*), and the endemic subspecies of grasshopper sparrow (*Ammodramus savannarum borinquensis*) and short-eared owl (*Asio flammeus portoricensis*).

The Puerto Rican oriole is now a rare species in southwest Puerto Rico and is heavily parasitized by shiny cowbirds. Occasionally this species may be found on Cabo Rojo NWR and Laguna Cartagena NWR, and efforts should be undertaken to determine occurrence and persistence of nesting pairs on refuge lands. This species favors palms for nesting similar to the YSBB, which should figure into reforestation efforts on both Cabo Rojo and Laguna Cartagena NWRs. When possible, endemic royal palm should be used for these efforts.

Habitat restoration focused on these three species should also benefit other priority species including Key West and bridled quail-doves (*Geotrygon chrysia and Geotrygon mystacea*), lesser Antillean pewee (*Contopus latirostris*), Puerto Rican flycatcher (*Myiarchus antillarum*), yellow warbler (*Dendroica petechia*), black-throated blue warbler (*Dendroica caerulescens)*, Adelaide's warbler (*Dendroica adelaidae*), prairie warbler *(Dendroica discolor)*, and the northern waterthrush (*Seiurus noveboracensis*). In fact, as dry forest and mangrove restoration moves forward, it is important to track response by other priority bird species, including establishing baseline and determining trends over time. Two high-priority species are common enough to track habitat changes and can serve as sentinel species. Adelaide's warbler is present in dry subtropical forest habitats at Cabo Rojo, Laguna Cartagena, and Vieques NWRs. Similarly, the yellow warbler is a good species to indicate changes in mangrove systems at Cabo Rojo, Culebra, Vieques, and Sandy Point NWRs. Standardized surveys should yield important information as habitats are restored or otherwise changed over time.

The two endemic subspecies, Puerto Rican short-eared owl and Puerto Rican grasshopper sparrow, are grassland associates. Both of these birds are known from Cabo Rojo NWR, and adjacent private lands; reforestation efforts are expected to result in reduction of habitat for these species. Forest restoration at Cabo Rojo NWR should be the priority action, but there should also be some effort to better understand the status of these two priority species, both on refuge and adjacent private lands. The presumption is that there is substantial habitat for both of these species on private lands, so there should be minimal impact from ongoing restoration efforts to restore dry subtropical forests. However, since private lands are not necessarily managed for wildlife benefits, and their future as grasslands is uncertain, the refuge may become an important area where both species can exist if extirpated from surrounding farms. A better understanding of the habitat requirements for these two species is necessary in order that refuge land can be managed for its habitat needs (in case existing private lands are converted to other uses that no longer provide suitable habitat).

Shorebirds

Shorebirds are narrowly associated with mud flats and sand flats associated with wetland habitats that are themselves locally occurring in the Caribbean-West Indies region. Two major issues emerge for shorebird conservation for the Caribbean Islands Complex: (1) Protect nesting habitat; and (2) provide ample foraging habitat for transient and overwintering populations. The addition of the Cabo Rojo Salt Flats to the Complex helps ensure addressing both major issues. Shorebird species breeding in Puerto Rico and the Virgin Islands that are of particular conservation interest include: snowy plover, willet, Wilson's plover, and American oystercatcher. The only known breeding site for the snowy plover is now part of the Cabo Rojo NWR, where this species clearly favors open flats with crystalline salt in abundance. With the recent acquisition of the salt flats came what is thought to be at least 20 pairs of nesting snowy plovers. Snowy plovers once also nested on St. Croix, but are no longer known from there. Wilson's plovers are more widespread as they favor more-or-less open flats but with more vegetation, such as hard pan flats mixed with mangrove habitats. The American oystercatcher is also more widespread than the snowy plover, but is decidedly very local by favoring rocky shorelines above high tide lines for breeding and by maintaining large territories. The Cabo Rojo Salt Flats is one of only two nesting sites in Puerto Rico for the willet.

Both of these plovers and the oystercatcher must be protected from human disturbance as they are all subject to abandoning nesting efforts where humans are present. Wilson's plovers are now considered endangered by the Puerto Rico DNER. Oystercatchers are probably most susceptible to abandoning nest sites, so known nesting areas should be patrolled to assess the level of human disturbance present (most nest sites are likely only accessible by boat).

American oystercatchers are a very long-lived bird, but under at least fair conditions they on average only produce one fledged chick per pair every 4 years, so areas constantly disturbed could lead eventually to a population collapse. Snowy plovers at the Cabo Rojo Salt Flats likely are exposed to most frequent human disturbance and this disturbance needs to be controlled and eliminated to the extent possible.

With respect to foraging habitat, two major issues involving Cabo Rojo NWR require further review. Without salt harvesting, it is possible that the importance of this area for shorebirds would diminish greatly; having the salt harvesting operation has not led to any obvious detrimental problems. Nevertheless, if the operator's lease is either not renewed in the future or the operation otherwise closes, there is still a need for developing alternative management strategies. Hopefully, the refuge staff can make use of the existing operation to learn about how to best manage the salt flats in the future with or without the salt harvesting operation, with particular focus needed on producing superior shorebird food availability.

The second issue involves competing priorities of mangrove restoration and maintaining large open areas for shorebirds. Both are important and should be pursued by the refuge staff, but these priorities may come into direct conflict in what is called Unit A. This area is presently heavily used by transient shorebirds, but by expanding existing mangrove stands, this use would likely diminish as shorebirds are subject to higher predation pressure particularly from merlins and peregrine falcons. Since the purpose for Cabo Rojo NWR is migratory bird conservation and the salt flats were acquired for shorebirds specifically, shorebird habitat would have priority over mangrove restoration where there is conflict. If the conflict can be resolved with shorebirds benefiting overall, then additional acreage in mangrove would constitute a win-win situation.

Among non-breeding shorebirds, the Cabo Rojo Salt Flats appear to be particularly important for the stilt sandpiper, among the higher priority shorebird species requiring conservation attention migrating through the Caribbean (and sometimes overwintering). Also, large numbers of semipalmated sandpipers and other “peeps” make use of the area. In addition, 1-2 piping plovers, a federally threatened species, are found almost annually at the Cabo Rojo Salt Flats, among the very few found anywhere in Puerto Rico and the Virgin Islands. The red knot and the American golden plover, both presently targeted internationally because of their declining populations, are also present in the salt flats. Overall, the Cabo Rojo Salt Flats serve as one of the most important shorebird habitats not only in Puerto Rico, but in the wider Caribbean-West Indies faunal region (Collazo 1995).

Least Tern
The least tern also is considered in need of immediate management attention, but this species depends on beaches and salt flats for nest sites and comes into frequent conflict with human disturbance and problems with a number of exotic mammalian predators that are harder to control on larger islands. About 500 pairs are thought to occur within Puerto Rico and the U.S. Virgin Islands, but this colonially nesting species is more scattered and therefore harder to delineate sites in need of protection and estimate population status and trends when compared with other tern species. If this estimate is correct, up to a quarter of all West Indies-Caribbean least terns occur in Puerto Rico and the U.S. Virgin Islands. The Cabo Rojo NWR is an important nesting site for least terns as is the Sandy Point NWR in St. Croix.

Non-native Species Present: Birds

- Shiny Cowbird (*Molothrus bonariensis*)

An Overview of Mammals, Reptiles and Amphibian Species

Sea Turtles
Of the six species of sea turtles that are found in U.S. waters or that nest on U.S. beaches, three species nest on beaches found on refuges within the Caribbean: leatherback sea turtle (*Dermochelys coriacea*), hawksbill sea turtle (*Eretmochelys imbricata*), and green sea turtle (*Chelonia mydas*). The hawksbill and leatherback turtles are known to nest on the beaches of the Cabo Rojo NWR.

Bats
Very little is known about the abundance and distribution of bats in the Caribbean basin. Fruit-eating bats are known to be present on lands near Cabo Rojo NWR (Joe Schwagerl, personal communication).

Non-native Species Present: Mammals

- Mongoose (*Herpestes auropunctatus*)
- Rhesus Macaque (*Mucaca mulatta*)
- Patas Monkey (*Erythrocebus patas*)
- Black Rat (*Rattus rattus*)

Non-native Species Present: Reptiles and Amphibians

- Cane Toad (*Bufo marinus*)
- Bull Frog (*Rana aatesbeiana*)
- Green Iguana (*Iguana iguana*)

CULTURAL RESOURCES

It is the refuge's intent to fully comply with Section 106 of the National Historic Preservation Act or any other pertinent historic preservation mandates prior to the initiation of any refuge undertaking or habitat management action. The refuge is currently protecting the ruins of a historic building, but there has not been a cultural or historical inventory conducted on the refuge. The refuge hopes to conduct such an assessment and, once completed, will then outline the steps required to protect important resources, depending on the findings of the assessment. With the exception of the historic building that is currently being protected, the refuge staff is not aware of other cultural resources located on the refuge.

SOCIOECONOMIC ENVIRONMENT

The municipality of Cabo Rojo is located in the southwestern corner of Puerto Rico bordering the Caribbean Sea. It is located west of San Germán and Lajas and south of Hormigueros and Mayagüez. The population of Cabo Rojo by 2000 was 46,911. Estimated per capita income is $8,070, and there are approximately 42.7 percent of the families living under the poverty level standard. The unemployment rate was 8.0 percent, with high school graduates around 19.5 percent of the total population. Most of the employed civilian population works in three main industries: educational, health, and social services (18.3 percent), manufacturing (17.4 percent), and retail trade (14.8 percent) (Bureau of Census 2000).

The Service pays refuge revenue sharing to the commonwealth government to replace lost taxes on fee title lands. Once Cabo Rojo NWR is fully restored, it should provide increased recreation opportunities and attract tourism dollars to the area.

REFUGE ADMINISTRATION AND MANAGEMENT

LAND PROTECTION AND CONSERVATION

The refuge consists of 1,836 acres, with 65 percent in forest scrub and 35 percent in grassland. The refuge lies along the coastal plain of southwestern Puerto Rico. This land had been in agricultural use for at least two centuries prior to Service ownership. Management tools include reforestations, restorations, law enforcement, environmental education, and vegetation monitoring.

VISITOR SERVICES

The Improvement Act and Executive Order 12996 emphasize the importance of providing compatible wildlife-dependent educational and recreational opportunities on national wildlife refuges. A variety of public use opportunities is available at Cabo Rojo NWR. Access to both upland and salt flats land tracts is allowed throughout the year during daylight hours when the refuge is open to the public. Refuge lands have been opened to the public since they were acquired.

Hunting was not permitted on the refuge before it was established and it is not currently allowed due to low numbers of hunt species and safety issues. The refuge does not have jurisdiction over the coastal waters to allow fishing. However, the refuge does provide access to public beaches where sport fishing is allowed. Fishing is governed by state regulations.

The refuge staff provides environmental education activities to school groups and teachers from all over the island, working closely with the Department of Education's western region office. Both on- and off-site activities are offered year-round to students from all levels. The refuge staff also participates in the main environmental fairs on the island. The refuge has two visitor centers: one at the refuge headquarters and one at the refuge Friends Group facility at the salt flats (The Caborrojeños Pro Salud y Ambiente). They are equipped with a wide variety of dioramas, exhibits, and interpretive panels to interpret the refuge's ecosystems and wildlife. Interpretive signs and a 6-panel kiosk are found on the interpretive trail system. The refuge also hosts lecture programs throughout the year, highlighting its natural resources. Guided tours and talks are offered at both visitor centers as part of the interpretive program. The emphasis in the programs is to increase environmental awareness, inform visitors about management activities, and educate the public regarding wildlife needs and habitat requirements.

The refuge has two observation towers at the salt flats and one observation deck near the refuge headquarters, providing excellent views of both the salt flats and sub-tropical forest. Along with this is a network of more than 15 miles of trails (e.g., interpretive, hiking, and bicycling), providing for wildlife observation, wildlife photography, and environmental education and interpretation during visiting hours. There are two photo blinds and one wooden deck in the trails network that allow visitors to photograph wildlife in areas not restricted to access during visiting hours. Photo contests have been conducted by the Friends Group in the past.

The Service headquarters was technically closed to the public while a new administration building was under construction. The new administration building has improved visitor services' facilities including a larger audiovisual theater, educational exhibits, and receiption area. Visitation to the refuge is expected to increase significantly with the grand opening of the new facilities and the completion of ongoing projects to improve roads, trails, and other infrastructure.

PERSONNEL, OPERATIONS, AND MAINTENANCE

Cabo Rojo NWR is part of the Caribbean Islands NWR Complex that administers nine wildlife refuges. The refuge headquarters is located in Boquerón, Puerto Rico. There are 25 full-time employees, of which 6 are assigned duties on Cabo Rojo NWR. The staff is responsible for maintaining assets including buildings, roads, parking lots, a fleet of heavy equipment, passenger vehicles, fishing platforms, and small equipment. The Complex budget supports all activities and staff on Cabo Rojo NWR, Laguna Cartagena NWR, Desecheo NWR, Vieques NWR, Culebra NWR, Sandy Point NWR, Green Key NWR, Buck Island NWR, and Navassa NWR. In Fiscal Year 2009, the budget for the Complex totaled $2,700,000.

III. Plan Development

PUBLIC INVOLVEMENT AND THE PLANNING PROCESS

In accordance with Service guidelines and NEPA recommendations, public involvement has been a crucial factor throughout the development of the CCP for Cabo Rojo NWR. This CCP has been written with input and assistance from interested citizens, conservation organizations, and employees of local and state agencies. The participation of these stakeholders and their ideas has been of great value in setting the management direction for the refuge. The Service, as a whole, and the refuge staff, in particular, are very grateful to each one who has contributed time, expertise, and ideas to the planning process. The staff remains impressed by the passion and commitment of so many individuals for the lands and waters administered by the refuge.

Development of the Cabo Rojo CCP was initiated in November 2007. The planning team responsible for the development of the CCP was established at that time with activities such as gathering data, meeting with refuge staff and intergovernmental partners, visioning, and preparing for the public scoping phase. As a group, the core planning team prioritized the most critical issues to be addressed by the refuge over the 15-year life of the CCP. The core planning team involved staff from Cabo Rojo NWR and the Caribbean Islands NWR Complex. This team was the primary decision-making team tasked with the development of the CCP. Key tasks of the team involved defining and refining the vision; identifying, reviewing, and filtering issues; defining the goals; outlining the alternatives; and preparing the final CCP.

In identifying key issues to be addressed during the planning process, the planning team considered recommendations from the biological reviews and visitor services review reports; comments received through the public scoping and review meetings and intergovernmental scoping letters; and input from open planning team meetings, comment packets, and personal contacts of planning team members. In addition, the team considered opportunities for coordination with other relevant conservation plans; applicable legal mandates; the purposes of all national wildlife refuges, as well as the mission, goals, and policies of the Refuge System; and evaluations and documentation required by Service procedures for refuge planning.

The Service expanded the planning team's identified issues and concerns to include those generated by the agencies, organizations, businesses, and citizens from the local community. These issues and concerns formed the basis for the development and comparison of the different alternatives described in the environmental assessment, which was Section B of the Draft CCP. The Service made the Draft CCP/EA available for public review May 2, 2011 through June 2, 2011. A summary of the public scoping comments and the Draft CCP/EA, as well as the Service's response, are provided in Appendix D.

SUMMARY OF ISSUES, CONCERNS, AND OPPORTUNITIES

The planning team identified a number of issues, concerns, and opportunities related to fish and wildlife protection, habitat restoration, recreation, and management of threatened and endangered species. Additionally, the planning team considered federal and state mandates, as well as applicable local ordinances, regulations, and plans. The team also directed the process of obtaining public input through public scoping meetings, open planning team meetings, comment packets, and personal contacts. All public and advisory team comments were considered; however, some issues important to the public were outside the scope of the decision to be made within this planning process. The team considered all

issues that were raised throughout the planning process, and developed this CCP which attempts to balance the competing opinions regarding important issues. The team identified those issues that, in the team's best professional judgment, are most significant to the refuge.

This chapter summarizes the most significant issues related to refuge management that emerged as a result of refuge meetings, scoping meetings, and other consultations. It also lists the meetings that have been held with the various agencies, organizations, and individuals who were consulted in the preparation of this CCP.

SUMMARY OF MEETINGS AND CONTACTS

The process to develop this CCP has involved a series of meetings with staff and key constituencies, including holding a public scoping meeting with neighboring communities, non-governmental organizations, local business leaders, community and political leaders, and other interested parties. The key events in this process have included:

- Notice of intent to prepare a CCP and environmental documents was published in the Federal Register (72 FR 11047), with a request for comments on March 12, 2007.

- List of key issues identified in a preplanning meeting with refuge staff in November 2007.

- A public scoping meeting held for Cabo Rojo NWR-Corozo Community on March 26, 2008.

- A meeting to review public scoping comments and identify goals, alternative management options, and objectives and strategies was held in June 2008.

- The refuge manager held a number of one-on-one meetings with key stakeholders over the planning period. This included a meeting with the Municipal Legislature on March 25, 2008.

- Members of the Service's core planning team met periodically to review public comments, data, and information collected to write the CCP. Professional reviews of the refuge were conducted to determine the status, trends, and conditions of refuge resources and facilities. The information garnered from this review helped the planning team analyze and develop recommendations.

- Notice of availablitity of the Draft CCP/EA was published in the Federal Register (76 FR 24511) on May 2, 2011, announcing the public review period from May 2, 2011 to June 2, 2011.

- A public meeting was held on May 18, 2011, at the Cabo Rojo community building. The core planning team reviewed and addressed comments and prepared the final CCP.

SUMMARY OF ISSUES AND CONCERNS

The significant issues are divided into three categories: species and habitat; public use; and refuge outreach and management. The following list is a summary of key issues that emerged from internal refuge meetings and public scoping meetings.

Wildlife and Habitat Conservation

- The need to manage water levels and quality (salinity), primarily for shorebirds that use the salt flats. Part of the current management program is executed through a special use permit for commercial salt production.

- Identify alternative management options for managing the salt flats other than the current special use permit with a commercial salt harvesting operator.

- There is a need to evaluate and manage water levels in areas outside of those currently managed under the special use permit to expand available shorebird habitat. Part of this process should include establishing a water management plan for the Fraternidad and Candelaria Lagoons that is focused on the needs of migratory birds.

- Continue reforestation of native vegetation and consider the feasibility of building a new nursery to expand reforestation effort (in cooperation with Ecological Services). Focus on the use of native species for reforestation, especially "Guayacán" to reestablish the dry forest habitat.

- Consider management of the haying program that is currently conducted under a special use permit and covers about 80 acres. The ecological goals and commercial options should both be revisited in light of refuge objectives to manage habitat for a diverse set of species.

- Restore and enhance freshwater ponds to increase habitat value.

- Establish a plan for removal of exotic species of animals in the refuge area and the adjacent areas. This will involve a program to inventory, control, and eradicate the following invasive species: green iguana, mongoose, rats, monkeys, cow birds, mesquite, and guinea grass.

- Conduct a monthly shorebird monitoring survey.

- Provide maintanace of the exisiting population of endangered *Aristida chaseae*.

- Restore and enhance yellow-shouldered blackbird habitat within the refuge.

Public Use

- Strengthen the relationship with the Caborrojeños (as per Cooperative Agreement). The Caborrojeños is a local environmental group that also serves as the refuge's Friends Group and staffs the refuge's visitor center.

- Expand and maintain trails (hiking and biking), including extending the trail from the new refuge headquarters' building.

- Establish better signs and information kiosks that include: refuge boundary, compatible uses of the refuge, hours of operation, refuge property, rules and regulations, and regulations pertaining to the protection of endangered species.

- Improve signage for the new building location and for road entrances.

- Add information kiosks at trailheads and at the new visitor's center.
- Expand the interpretive programs as a strategy for increasing refuge visitation.
- Develop a curriculum-based environmental education program for use with the local school system.
- Improve refuge promotion and use with the local school system.
- Clarify beach access issues: the refuge is adjacent to a tourist town (Combate) whose economy is heavily dependent on tourism. Many visitors use a beach that can only be accessed via the refuge; however, there is insufficient parking, no through access by vehicle, and a host of environmental issues related to vacation crowds.

Refuge Outreach and Management

- Improve and clarify the relationship with Puerto Rico's DNER.
- Continue the cooperative relationship with the Commonwealth Fire Department.
- Continue (and formalize) the cooperative relationship with local law enforcement agencies.
- There is a need to develop research agendas for continued cooperation with the University of Puerto Rico (and others).
- Reduce fuel loads and clear fire lanes.
- Provide training to local cooperators (state, local fire department, individuals) to improve the skills they need to be effective refuge partners.
- Expand the volunteer program and increase the availability of adequate volunteer support infrastructure, especially housing.
- Establish better communication with public and private school teachers in the community to provide outreach and education in the conservation of natural resources.
- Establish a cooperative effort between the Cabo Rojo Municipality and the Cabo Rojo NWR to: control surface water runoff of the Corozo community to the refuge area, use municipality public broadcast systems to promote refuge activities and mission and manage the parking area of the Combate Beach to make it accessible to the public.

Wilderness Review

Refuge planning policy requires a wilderness review as part of the comprehensive conservation planning process. While there is no land within the Cabo Rojo NWR that qualifies as wilderness, the results of the wilderness review are nevertheless included in Appendix H.

IV. Management Direction

INTRODUCTION

The Service manages fish and wildlife habitats considering the needs of all resources in decision-making. But first and foremost, fish and wildlife conservation assumes priority in refuge management. A requirement of the Improvement Act is for the Service to maintain the ecological health, diversity, and integrity of refuges. Public uses are allowed if they are appropriate and compatible with wildlife and habitat conservation. The Service has identified five priority wildlife-dependent public uses that are emphasized in this CCP. These uses are: fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Described below is the CCP for managing the Cabo Rojo NWR over the next 15 years. This management direction contains the goals, objectives, and strategies that will be used to achieve the refuge's vision.

Three alternatives for managing the refuge were considered in the Draft CCP/EA: (A) Current management/no action alternative; (B) Resource emphasis; and (C) Habitat and public use emphasis. Each of the alternatives was described in the Alternatives section of the EA. The Service chose Alternative C as the preferred management direction.

Alternative C is considered to be the most effective management action for meeting the purposes of the refuge and the mission of the Refuge System. Implementing the preferred alternative will result in an emphasis on improving refuge resources for habitat and wildlife, while increasing visitor services programs. Management efforts will focus on achieving the refuge's goals to restore and enhance native wildlife and plants, particularly the endangered yellow-shouldered blackbird; to increase the level of environmental awareness among residents and visitors; and to protect one of the most important shorebird habitats in the Caribbean. Management will also provide greater support for visitor services programs, including an emphasis on the following programs and activities: (1) Curriculum-based environmental education program; (2) role of the Friends Group to include providing staffing and interpretation services at the refuge's new visitor services center; (3) opening of the new headquarters building in 2012; (4) review and update of the refuge's brochures and website, including offering a Spanish version of the website; (5) update of current kiosks and add new kiosks along the trail system; (6) expand the volunteer program to also provide assistance with public use activities; (7) seek and develop new partnerships, particularly with regard to trail maintenance; and (8) add additional signage to clarify refuge uses.

VISION

The Cabo Rojo NWR is managed in partnership with the community and other resource management agencies to: (1) Protect and restore subtropical dry forest; (2) protect and restore resident and migratory shorebirds and their habitats; and (3) provide wildlife-dependent recreational opportunities.

GOALS, OBJECTIVES, AND STRATEGIES

The goals, objectives, and strategies presented are the Service's response to the issues, concerns, and needs expressed by the planning team, the refuge staff and partners, and the public and are presented in hierarchical format. Chapter V identifies the projects associated with the various strategies.

These goals, objectives, and strategies reflect the Service's commitment to achieve the mandates of the Improvement Act, the mission of the Refuge System, and the purposes and vision of the Cabo Rojo NWR. The Service intends to accomplish these goals, objectives, and strategies within the next 15 years.

Goals

1. Monitor, protect, and recover species of management interest.
2. Conserve, enhance, and restore native plant communities and wetland habitat.
3. Protect natural, historical, and cultural resources to maintain ecological integrity.
4. Provide opportunities for appropriate and compatible public use.
5. Provide sufficient staff, volunteers, facilities, and equipment, and foster partnerships in order to implement a comprehensive refuge management program.
6. Understand the impacts of climate change on refuge resources to plan for and adapt management as necessary to protect the wildlife and habitat of Cabo Rojo NWR.

FISH AND WILDLIFE POPULATION MANAGEMENT

Goal 1: Monitor, protect, and recover species of management interest.

Objective 1.1: Develop an Inventorying and Monitoring Plan by 2015.

Discussion: This is a required step-down plan that will be developed to guide the development, use of, and protocols for collecting biological information on species of interest.

Strategy:

- Produce inventorying and monitoring plan.

Objective 1.2: Over the life of this CCP, monitor and protect federal and state listed species and enhance their essential habitats within the refuge.

Discussion: The Cabo Rojo NWR contains (or supports) a number of species of special management interest, including snowy plovers and yellow-shouldered blackbirds (a federally listed endangered species). Of the six species of sea turtles that are found in U.S. waters or that nest on U.S. beaches, three species nest on refuge beaches within the Caribbean. These species are the leatherback sea turtle (*Dermochelys coriacea*), hawksbill sea turtle (*Eretmochelys imbricata*), and green sea turtle (*Chelonia mydas*). The hawksbill and leatherback sea turtles are known to nest on the beaches adjacent to and within the Cabo Rojo NWR. The refuge's boundary does not include shoreline, as all coastal areas adjacent to the refuge are managed by the Puerto Rico DNER. Access to these beach areas is controlled by the refuge and close collaboration will be required with Puerto Rico DNER to monitor and improve the conservation of the area's sea turtles.

Strategies:

- Expand planting of endangered flora within the historic range of the species including *Eugenia woodburyanna*, *Stahlia momosperma*, *Vernonia proctorii*, *Harrissa portoricensis*, *Catesbaea melanocarpa*, *Aristida chaseae*, and *Trichilia triacantha*.

- Identify and map suitable feeding, roosting, and nesting habitat of yellow-shouldered blackbirds on the refuge in coordination with Puerto Rico DNER and the Service's Ecological Services personnel.

- Work with private landowners adjacent to Cabo Rojo NWR to enhance yellow-shouldered blackbirds' habitat.

- Partner with Puerto Rico DNER/other partners to conduct nesting surveys on hawksbill, green, and leatherback sea turtles. (Morning surveys will be undertaken to indicate nesting activity.)

- Partner with Puerto Rico DNER/other partners to protect hawksbill, green, and leatherback sea turtle nests, and reduce impacts from invasive species and human disturbance

- Actively manage endangered plant population of *Aristida chaseae,* including removal of exotic grasses (e.g., Guinea grass).

- Partner with Puerto Rico DNER to manage species of greater conservation needs like the dry forest lizard (*Anolis cooki*) and the Puerto Rican nightjar (*Caprimulgus noctiterus*) on areas adjacent to the refuge where the species is known to occur or suitable habitat exists.

Objective 1.3: Over the life of this CCP, continue to protect and monitor seabird and shorebird populations.

Discussion: The salt flats at Cabo Rojo NWR are among the best sites for attracting birds migrating from North and South America through the eastern Caribbean. The fall bird migration may be divided into three events with some overlap: shorebirds dominate from July to mid-September, warblers from September to mid-October, and waterfowl in late October and November. Data recorded at the salt flats have confirmed that:

- More than 25 species of shorebirds use the refuge;

- As many as 40,000 shorebirds migrate through the salt flats during the fall months;

- Daily counts in the fall sometimes exceed 7,000 birds, with historic daily counts as high as 10,000 birds; and

- A small breeding population of snowy plovers (*Charadrius alexandrines)* is present, which is not found elsewhere in Puerto Rico.

Three shorebird species breeding in Puerto Rico and the Virgin Islands are of particular conservation interest: snowy plover, Wilson's plover, and American oystercatcher. The only known breeding site for the snowy plover is now part of the Cabo Rojo NWR, where this species clearly favors open flats with crystalline salt in abundance. Both of these plovers and the oystercatcher must be protected from human disturbance as they are all subject to abandoning nesting efforts where humans are present.

The least tern also is considered in need of immediate management attention, but this species depends on beaches and salt flats for nest sites and comes into frequent conflict with human disturbance and problems with a number of exotic mammalian predators that are harder to control on larger islands. About 500 pairs are thought to occur within Puerto Rico and the U.S. Virgin Islands, but this colonially nesting species is more scattered and therefore harder to delineate sites in need of protection and estimate population status and trends when compared with other tern species. If this estimate is correct, up to a quarter of all West Indies-Caribbean least terns occur in Puerto Rico and the U.S. Virgin Islands. Particularly important for nesting least terns in Puerto Rico is Cabo Rojo NWR.

Strategies:

- Conduct nesting season surveys of least terns and snowy plovers to assess nesting success.
- Develop artificial "islands" in eastern lagoons for shorebird nesting.
- Continue to conduct monthly surveys to establish and monitor long-term population trends and relative abundance of species (in relation to habitat/habitat management).
- Coordinate with Puerto Rican Ornithological Society to monitor shorebirds with its Shorebird Monitoring Network.
- Construct and maintain fencing along road bordering salt flats.
- Develop outreach and education efforts; employ law enforcement if absolutely necessary.
- Maintain water level at lagoon(s) and create spoil island(s) in center of lagoon(s) to attract breeding birds.
- Use decoys and vocalizations to attract to safer areas for breeding.

Objective 1.4: Over the life of this CCP, initiate a program to control invasive and exotic vegetation and replace with native subtropical dry forest.

Discussion: The land occupied by the refuge was used for cattle ranching and agriculture for more than five centuries prior to Service ownership. Frequent fires, heavy grazing, and continuous cropping characterized the past use of the refuge. Soil erosion and sedimentation were rampant. Because of past land use practices, much of the native vegetation had been replaced by plants from other regions. This has left much of the land barren, except for a limited number of trees in drainages and near homesteads. With the elimination of cattle grazing, the habitat has changed considerably, becoming overgrown with exotic forage grass species in the understory and exotic trees, especially mesquite, in the overstory. During this period, native plants were severely reduced in numbers and several exotics increased in area. Today, the refuge is covered with pasture interspersed with native and exotic trees, patches of secondary forest, and tree plantings of various species.

The refuge has planted native species of trees and grasses over the past 10 years, but this effort has been on a limited basis as permitted by resource and time constraints. It has had some positive impact on increasing native plant populations. The refuge would like to step-up its efforts to further reduce invasive vegetation and increase the coverage of native vegetation, particularly in upland subtropical forest areas and on grasslands. To date, the management of invasive species has relied

principally on manual and mechanical removal of invasive plants. The refuge plans to explore the use of a wider variety of strategies to address this issue, including the use of herbicides and prescribed burning to promote grassland growth.

Strategies:

- Within 2 years of the date of this CCP, develop a plan to detect and control/eradicate invasive exotic plants, including mesquite and guinea grass.
- Survey the entire refuge annually to detect new exotic species.
- On an annual basis, 5 acres of exotic/invasive vegetation will be treated and native trees planted.

Objective 1.5: Within 2 years of the date of this CCP, initiate a program of invasive and exotic animal control.

Discussion: There are a number of exotic animals on the refuge that are a threat to the bird populations as a result of predation. The most damaging species are thought to be dogs, cats, iguanas, mongooses, and monkeys. The refuge currently undertakes periodic opportunistic efforts to reduce exotic animal populations, but would like to increase the effort and systematically target those predators that are most prevalent and are causing the most damage.

Strategies:

- Develop a nuisance/exotic animal control plan (high priorities are dogs, cats, iguanas, and mongooses).
- Develop a public information strategy targeted toward neighboring communities to decrease incidence of dogs and cats on refuge.
- Partner with municipal animal control to help address the dog and cat problem.
- Continue working with Puerto Rico DNER Primate Control Program to control feral monkeys (*Erytrocebus patas*) within the refuge.
- Collaborate with Puerto Rico DNER and initiate a control program for the shiny cowbird (*Molothrus bonariensis*) within refuge boundaries

Objective 1.6: Over the life of this CCP, monitor and survey mangrove-associated species of concern.

Strategies:

- Within 5 years of the date of this CCP, establish point counts or transects surveys to establish baseline population status for mangrove-associated species, with focus on the yellow “golden” warbler in order to track responses to any mangrove restoration or other habitat changes occurring over the next 15 years.
- Over the life of this CCP, search for any nesting white-crowned pigeons and protect colonies from human-based disturbance.

Objective 1.7: Within 1 year of the date of this CCP, initiate a project to survey for bats on the refuge.

Discussion: Bats are the only living terrestrial mammals in Puerto Rico. Since they evolved with the native plant and animal communities of the island, they are an important and essential component as fruit dispersal and pollinator agents of many of the island's native flora. Information about the bats occurring on the Cabo Rojo NWR and their importance to its ecosystems is rare. There is a need to better understand the importance that these animals play on the ongoing reforestation efforts of the subtropical dry forest.
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Strategies:

- Within 1 year of the date of this CCP, establish permanent survey sites to capture, identify, and monitor bat species.
- Within 3 years of the date of this CCP, develop a long-term program to survey bat population trends.
- Develop a partnership with any entity interested in working with bats on the refuge.

Objective 1.8: Within 1 year of the date of this CCP, initiate a project to survey reptiles and amphibians on the refuge.

Discussion: Most of the information about native reptiles and amphibians occurring on the refuge has been extrapolated from studies conducted on nearby areas and/or based on historical records. Very little has been done recently to document the presence and/or absence of the different species reported in existence on the refuge. Due to the uncontrolled residential and tourist developments nearby, the refuge might already be the last piece of suitable habitat for many of these species. It is imperative to update our knowledge of these animals and to properly protect and manage their populations.

Strategies:

- Within 1 year of the date of this CCP, establish permanent survey sites to capture, identify, and monitor reptile and amphibian species.
- Within 3 years of the date of this CCP, develop a long-term program to survey their population trends.
- Maintain annually the freshwater ponds on the refuge.
- Improve the water structures (i.e., piletas) near the new offices that have native species of frogs and lizards. These could serve as excellent sites for environmental education.

HABITAT MANAGEMENT

Goal 2: Conserve, enhance, and restore native plant communities and wetland habitat.

Objective 2.1: Develop a habitat management plan by the year 2014.

Discussion: This is a required step-down plan that will be developed to guide management practices in the refuge's upland and wetland areas.

Strategy:

- Produce a habitat management plan.

Objective 2.2: Within 2 years of the date of this CCP, develop a long-term water management plan for the salt flat lagoons that addresses the issues of salinity and water levels and flow.

Discussion: The Cabo Rojo Salt Flats are extremely important for nesting, migrating, and wintering shorebirds. Thousands of shorebirds can be observed here during migration, and species such as the snowy plover use the salt flats for nesting and foraging. The source of water and salt at the salt flats and crystallization ponds is through water control structures directly from the Caribbean Sea, directed by a network of channels and ditches.

The salt flats are a managed system that is used for commercial salt harvesting. It is uncertain how the value of the salt flats for shorebirds would fare in the absence of commercial salt harvesting, although the prevailing view is that the salt harvesting is helpful to shorebirds as it keeps salt from building up in the lagoon beds. The commercial salt harvesting operation has been in existence for several hundred years, and an earlier compatibility determination concluded that the continued salt harvesting operation is critical to maintaining the habitat's value for shore birds. The salt harvest operation is currently managed under a special use permit with a for-profit business. However, there is no guarantee that this business will continue indefinitely. As such, the refuge needs to review various management options to consider what would be most beneficial and feasible in the future, including options such as having the refuge directly manage the salt flats, continuing with the current arrangement, or possibly having the salt flats and water levels managed under an alternative arrangement, such as by a contractor.

Strategies:

- Conduct a literature review of similar tidal salt flat areas to identify best practices for the management of salt lagoons in a manner that benefits wildlife (include Mexico and San Francisco Bay areas as part of review; review compatibility study completed for Cabo Rojo Salt Flat operations).

- Develop an experimental design/adaptive management process for western lagoons that are not currently managed for salt production. The study will compare water quality and wildlife use between managed and natural lagoons.

- Examine the feasibility of improving the hydrology between the sea and the most eastern lagoon.

- Develop monitoring stations to document/study salinity and water levels (in relation to shorebird use).

Objective 2.3: Within 2 years of the date of this CCP, develop a water management plan to reclaim salt lagoons not currently managed to improve bird habitat (Fraternidad and Candelaria Lagoons).

Discussion: There are several small lagoons on the refuge (particularly the Fraternidad and Candelaria Lagoons) that are not currently managed, either for salt production or to optimize habitat value. The refuge proposes to experiment by adding water to these areas to increase their habitat value and to monitor the results to ensure that outcomes are desirable for wildlife.

Strategies:

- Study water run-off patterns from refuge uplands to determine how to optimally direct stormwater flow so as to increase water in select lagoons.

- Improve stormwater management in the eastern portions of the refuge (near the fishermen's association facility) to benefit refuge habitat/wildlife.

Objective 2.4: Over the life of this CCP, increase reforestation in upland areas.

Discussion: There are few large tracts of dry forest remaining in Puerto Rico. If this habitat is to be maintained into the future, it has to be protected and expanded. The refuge has been engaged in limited planting of native vegetation (subject to resource and volunteer constraints) to expand the upland forest area and would like to continue and expand this effort. This effort is implemented in conjunction with Objective 1.3.

Strategies:

- On an annual basis, plant 3-5 acres of native trees.

- Establish a cost-sharing project to establish a larger on-refuge nursery (potential funding sources could include the Refuge System, Fish and Wildlife Partners and Coastal Program, or others).

- Begin reforesting drainage areas since these already have some trees including native species.

- Consider historical plant associations used by federal and state listed wildlife species on reforestation efforts to promote the recovery of these species.

- When appropriate, use native plants and species identified as critical elements by Puerto Rico DNER Natural Heritage Division for reforestation programs.

Objective 2.5: Over the life of this CCP, monitor and assess the impact of the reforestation program.

Discussion: The reforestation program will be monitored to better assess its affect on wildlife, particularly on bird populations.

Strategies:

- Monitor the response of the dry forest vegetation community under reforestation program.

- Establish and implement wildlife monitoring protocol to assess wildlife response to reforested areas.

Objective 2.6: Within 3 years of the date of this CCP, restore freshwater ponds to improve water bird habitat (three artificial ponds on refuge).

Discussion: There are currently three freshwater ponds on the refuge that are overgrown with exotic vegetation. The refuge will assess the feasibility and potential benefit of rehabilitating these ponds and, if feasible, will develop a management plan to address the issue. The management plan will

provide details as to the optimal methodology and timing for clearing invasive species, and also review options for improved water quality management.

Strategies:

- Assess issues with each pond to determine appropriate actions and restoration potential (e.g., water source and sedimentation).
- Establish and implement a maintenance plan for pond management.
- Remove exotic vegetation from ponds by mechanical means.

Objective 2.7: Over the life of this CCP, convert grassland areas to species more favorable to wildlife (as opposed to current predominance of guinea grass).

Discussion: The refuge will continue and review efforts to reduce the area of land that is covered with exotic grass species while at the same time increasing the coverage of native grasses, particularly *Aristida chaseae.* These grasslands support populations of Greater Antillean short-eared owl and Puerto Rican grasshopper sparrow.

Strategies:

- Manage grassland areas to increase the diversity of grasses available, including increasing coverage of guinea grass to buffel grass, including exploring the targeted use of herbicide.
- Actively manage endangered plant population of *Aristida chaseae*, including removal of exotic grasses (Guinea grass) and establish experimental plots to review removal techniques.

Objective 2.8: Over the life of this CCP, restore mangrove habitats where appropriate.
Discussion: Mangroves on Cabo Rojo NWR should be restored in areas where they are not in conflict with other high-priority objectives. These mangroves are used by species such as yellow "golden" warblers and white-crowned pigeons.

Strategy:

- The refuge will either allow natural expansion or planting on sites that formerly supported mangrove stands. Public use conflicts, such as beach parking lots, will be removed.

RESOURCE PROTECTION

Goal 3: Protect natural, historical, and cultural resources to maintain ecological integrity.

Objective 3.1: Over the life of this CCP, manage a fire program to prevent and suppress wildfires on and adjacent to the refuge.

Discussion: There are generally several fires a year that occur on the refuge and most of these fires appear to be deliberately set. The refuge has one full-time fire staff and has an active program of cooperation and training with the local fire department, which will be continued. The refuge will also explore the possibility of conducting controlled burns to reduce fuel loads and support the development of diverse grassland areas. Currently, prescribed burns are not conducted. Additional

outreach concerning the purpose of the refuge and the negative effects of fire may help to reduce the incidence of intentionally set and accidental fires.

Strategies:

- Continue on-going mechanical fuel reduction practices.
- Finalize interagency memorandum of understanding with the local municipal fire department.
- Acquire necessary staff, heavy equipment, and supplies to fully implement the fire management plan.
- Explore the potential use of prescribed fire and herbicides for maintenance of fire breaks.
- Provide outreach to neighboring communities on the impacts of fire and the need for fire prevention.
- Continue and expand the on-going fire training and certification program.
- Maintain firebreaks around the reforested areas.

Objective 3.2: Over the life of this CCP, manage the law enforcement program to provide for resource protection, visitor safety, and facilities security.

Discussion: The refuge currently has one full-time law enforcement officer. The officer patrols the refuge, provides outreach services, and assists Puerto Rico DNER officials in off-refuge hunts during hunting season peak times. The law enforcement officer has an active program of cooperation with Puerto Rico DNER and municipal and commonwealth police; however, these arrangements have never been formalized under a memorandum of understanding or common operational procedures.

Strategies:

- Provide on-the-job training for law enforcement staff to provide outreach services to visitors and to build an understanding of critical resource protection issues.
- Ensure that law enforcement staff is fully equipped to provide adequate security for resources, visitors, and staff.
- Employ an additional full-time law enforcement officer (split between Cabo Rojo and Laguna Cartagena NWRs) to work cooperatively with other local law enforcement agencies, Puerto Rico DNER, and local police.
- Within 2 years of the date of this CCP, develop and formalize interagency memorandums of understanding with other law enforcement agencies, Puerto Rico DNER, and municipal and commonwealth police.
- Continue to seasonally support Puerto Rico DNER in monitoring hunting programs on private and state lands and cooperate in sea turtle protection.

Objective 3.3: Within 5 years of the date of this CCP, inventory, protect, and interpret cultural and historical resources.

Discussion: The refuge is currently protecting the ruins of a historic building, but there has not been a cultural or historical inventory conducted on the refuge. The refuge hopes to conduct such an assessment and, once completed, will then outline the steps required to protect important resources, depending on the findings of the assessment.

Strategies:

- Complete a Request for Cultural Resource Review Form, which will then be submitted to the Regional Archaeologist. The Regional Archaeologist will determine, in consultation with the refuge, the appropriate steps necessary for compliance.
- In consultation with the Regional Archaeologist, integrate cultural resources management and protection strategies into refuge management plans such as fire and road maintenance.
- Continue to collect location information on historic properties from refuge employees and members of the local community, including university anthropologists.
- Inventory and assess the condition of cultural and historical resources and develop a cultural resources plan.
- Where necessary, stabilize and/or restore cultural resources and provide interpretive information.
- Seek partnerships to support the protection and support of cultural and historical resources.

Objective 3.4: Enhance Birds of Conservation Concern and Potential Candidate's habitat on private lands adjacent to the Cabo Rojo and Laguna Cartagena NWRs.

Strategies:

- Identify and map appropriate areas for habitat enhancement activities on private lands.
- Identify landowners and inform them about the different habitat restoration programs and incentives available from the Service and other federal and commonwealth agencies to implement voluntary habitat restoration projects on their lands.

VISITOR SERVICES

Goal 4: Provide opportunities for appropriate and compatible public use.

Objective 4.1: Within 2 years of the date of this CCP, update the visitor services plan.

Strategies:

- Establish an annual monitoring system to review the visitor services program.
- Hire one park ranger (environmental education) to implement the visitor services plan.
- Hire a STEP/volunteer to provide a welcoming presence at Cabo Rojo NWR.

Objective 4.2: Over the life of this CCP, develop a program to increase awareness and understanding of the refuge's natural and cultural resources.

Discussion: The refuge has two full-time visitor services staff who work closely with the local community and the local Friends Group. The Friends Group operates an active environmental interpretation program and provides presentations for visiting groups, especially school groups. In addition, the Friends Group staffs a visitor center adjacent to the refuge and provides access services for one of the refuge's observation towers. The observation tower is locked at night to control access and prevent inappropriate use.

Activities on the refuge currently include hiking and bird watching trails, biking trails, the availability of four observation platforms, and the provision of trail maps. The visitor services specialist also maintains an active program of providing presentations to local schools and community organizations. At this point, although there is an active program of visitor services, the program is mainly structured as a demand-driven program, with activities being scheduled in response to requests.

With the completion of the refuge headquarters building and visitors center, management will need to re-visit its overall visitor services program, including expanding the role of the Friends Group to help staff the center. The service will explore ways to keep the center open on weekends and develop a set of interpretive themes and support materials. In addition, the refuge will explore the possibility of establishing a curriculum-based environmental education program in partnership with local schools.

Strategies:

- Develop a public use management plan that will include identification of interpretive themes for the refuge.
- Develop seasonal staff-led and self-guided tours of the refuge.
- Include interpretive exhibits and displays as an integral component of the visitor center.
- Partner with the Department of Education to develop and implement a curriculum-based environmental education program.
- Continue and enhance partnership with Friends Group to provide visitor services.
- Assist the Friends Group to identify additional and new sources of funding.

Objective 4.3: Within 5 years of the date of this CCP, develop and implement an outreach/public relations plan to inform the community, the general public, and media outlets of the refuge's mission, programs, and activities.

Discussion: With the availability of the new headquarters and visitor center, and the recent addition of a second visitor services staff person, the refuge will be in a position to accommodate additional visitors and host periodic events. The new facilities will provide an opportunity to expand public outreach efforts to increase community knowledge of the refuge, its mission and resources, and to promote increased public involvement and use. Initiatives may include expanded use of publications and hosting an annual refuge promotion event.

Strategies:

- Produce and distribute information through a variety of communication methods, such as newspapers, websites, and television and radio programs.
- Conduct an annual refuge festival/public event to attract visitors and raise the refuge's profile in the community.
- Obtain additional resources to manage and expand the Youth Conservation Corps Program (e.g., add a supervisor, vehicle support, and other equipment/supplies).
- Review and update refuge brochures.
- Update endangered species fact sheets for species that exist on the refuge.
- Create a Spanish version of the refuge's website.

Objective 4.4: Over the life of this CCP, improve and maintain visitor services infrastructure.

Discussion: The Cabo Rojo NWR receives upwards of 5,500 visitors per year. Activities on the refuge currently include use of hiking and bird watching trails, biking trails, and the use of four observation platforms. There are a number of improvements and maintenance issues that need to be addressed to improve the quality and availability of visitor services. These issues include trail maintenance, rehabilitation of viewing platforms, adding sign boards and interpretive displays, and placing spotting scopes at viewing platforms.

Strategies:

- Develop and promote the trail system for special interest groups (e.g., biker's clubs, hikers groups), and provide map displays at the beginning of trails. As part of this effort, assess the impact of the trail system on bird nesting and breeding (particularly for plovers and terns).
- Maintain trails, including identifying "sponsors" to adopt and maintain all trails, and link existing trails to the new headquarters' building.
- Provide spotting scopes at observation towers.
- Explore options for expanded hours of operation for the visitor center and for the observation tower at the Cabo Rojo Salt Flats.
- Develop interpretive panels.
- Replace two photo blinds which have become dilapidated.

- Update current kiosks plus create two new kiosks near refuge headquarters.

- Develop a plan to keep the visitor center staffed and opened on weekends; maintain exhibits and information displays.

- Improve visitor parking at various public use areas.

- Install pedestrian counter at access gates.

Objective 4.5: Over the life of this CCP, continue to provide pedestrian access to beach and coordinate with local authorities to improve parking in the Combate Beach area outside the refuge boundary.

Discussion: The issue of beach access is a sensitive issue in the Combate community, which is a community adjacent to the refuge that relies on beach tourism as a significant component of its economy. The Puerto Rico DNER, and not the refuge, is responsible for management and control of the beach, as well as the parking area located adjacent to the Combate Beach. The main access to this beach area is via an unpaved road that is part of the refuge, and which is closed to vehicular traffic; however, the area is open and visitors can access the beach by walking or bicycling.

The reason the refuge has closed the road to vehicles is because there is insufficient parking within the refuge to accommodate the large crowds that seasonally access the beaches and the refuge deed includes restrictions on infrastructure development (which prevents additional on-refuge parking from being added); because there are not sufficient resources to manage the crowds and the trash that is left behind; and because of the environmental threats caused by the crowds, including cutting firewood and bringing pet dogs onto the refuge, which can harass or harm wildlife.

The main issue that has been raised by the community, including in public scoping meetings, is the need for additional parking and beach access to accommodate tourists. Providing additional parking, however, is not within the ability of the refuge and must be solved by the local municipality. In order to try and contribute to a solution, and to build improved relations with the Combate community, the refuge will coordinate with the local government to see if solutions can be identified, and to explore if there is anything further the refuge can do to help improve the situation (without compromising the integrity of the refuge).

Strategy:

- Work with the municipality and others to identify alternative parking areas.

REFUGE ADMINISTRATION

Goal 5: Provide sufficient staff, volunteers, facilities, and equipment, and foster partnerships in order to implement a comprehensive refuge management program.

Objective 5.1: Add refuge staff to fully implement the CCP.

Strategy:

- Hire the following additional staff: one biologist; one bio-technician; two engineering equipment operators; one park ranger (environmental education); one volunteer coordinator; one GIS specialist (to be shared with the Complex) ; and one law enforcement officer.

Objective 5.2: Over the life of this CCP, continue to support and expand existing partnerships.

Discussion: The refuge engages in a wide array of partners in the management of the refuge. The refuge has partnerships in the areas of reforestation, visitor services, fire suppression, law enforcement, and research.

Strategies:

- Expand the role of the Friends Group, in particular its involvement in programs at the visitor center (and in other programs).
- Continue Rural Fire Assistance Program.
- Assist Friends Group in acquiring additional funding.
- Other current partnerships to target for expansion or strengthening may include local schools, communities, and universities.

Objective 5.3: Over the life of this CCP, seek opportunities to develop new partnerships.

*Discussion***:** The refuge will strive to strengthen existing partnerships and look to add new partners for future cooperation. In particular, the refuge will look to formalize its relationship with Puerto Rico DNER concerning the cooperative management of the Boquerón forest and the Combate beach area.

Strategies:

- Partner with local and commonwealth agencies to improve stormwater management (particularly in Corozo and Combate).
- Develop and formalize an agreement with Puerto Rico DNER to cooperatively manage the Boquerón forest in coordination with the management of the Cabo Rojo NWR.
- The Service will offer its participation to the state, federal, and municipal governments in the development of any regional or local planning effort that includes the refuge within its scope of such effort.

Objective 5.4: Within 2 years of the date of this CCP, redefine and enhance volunteer program.

Discussion: The refuge currently uses volunteers on an ad hoc basis to support tree planting and visitor service activities. The refuge's Caribbean location, with easy access to beaches, provides an attractive location for development of an expanded volunteer program. The refuge would like to increase the use of volunteers, but is currently constrained from doing so due to a lack of support infrastructure (especially housing) and personnel. Ideally, the refuge would like to hire a volunteer coordinator and develop adequate support facilities to enable an expansion of the program. This would include building new housing facilities for use by volunteers.

Strategies:

- Fund the volunteer program and hire a volunteer coordinator for the Complex.
- Advertise/promote refuge volunteer opportunities.
- Construct volunteer housing.

Objective 5.5: Within 2 years of the date of this CCP, develop and formalize agreements with universities and research institutions to focus on refuge needs and priorities.

Discussion: The Refuge System has hosted and supported several research studies over the past several years, including a current study on salt flat microbial beds. Most of these studies, however, have been proposed and conducted by research partners. In order to ensure that future research studies will address the priority needs of the refuge, the staff plans to develop research priorities, produce terms of reference/guidance for these studies, and then solicit partners to undertake the studies. Future studies are expected to focus on both biological and social issues.

Strategies:

- Continue to support on-going research activities (e.g., salt flat microbial beds study).
- Develop/document research priority concept papers (to share with universities and other research institutes). Priorities will include topics focused on biological issues and social science issues in regard to relationships with neighboring communities.

Objective 5.6: Over the life of this CCP, seek the possibility to participate and cooperate with the Puerto Rico Tourism Company, the municipality of Cabo Rojo, and other government agencies in the development and implementation of Gateway Community Economic Model for the nearby communities of Boquerón, Ploe Ojea/Corozo, and El Combate.

Discussion: The southwestern tip of Puerto Rico has become an important tourism and vocational area due to the presence of unique and valuable natural and historical attributes. In fact, it has one of the four National Natural Areas in Puerto Rico designated by National Park Service: the Cabo Rojo National Natural Area. This scenic area is an excellent example of a tombolo (tied island) with two sand spits. The landform resembles a large letter Y with a bar across the top enclosing a salt water lagoon. The site includes mangroves, beaches, reddish cliffs, xeric vegetation, and seabird nesting habitat. It has also the only designated site under the Western Hemisphere Shorebird Reserve Network in the Caribbean and the oldest salt production industry in the new world, both located within the Cabo Rojo NWR. However, the rural communities nearby these attractions have not been economically benefited to their full potential. The Service should seek for a full participation with federal and state agencies in the creation of an economic development plan for this area.

Strategies:

- Continue participating with the municipality of Cabo Rojo on its Land Use Management Plan.
- Keep Puerto Rico Tourism Company, municipality of Cabo Rojo, and other state agencies involved in the development of step-down management plans.

CLIMATE CHANGE

Goal 6: Understand the impacts of climate change on refuge resources to plan for and adapt management as necessary to protect the wildlife and habitat of Cabo Rojo NWR.

Objective 6.1: Over the life of this CCP, coordinate with researchers and partners to identify climate change research needs, investigating the impacts of climate change on fish and wildlife, listed species, vegetative communities, water quality and quantity, and other resources.

Discussion: The staff will need to determine how climate change will likely affect the refuge's ecological functioning and consider what management actions, if any, should be undertaken as a consequence of climate change.

Strategy:

- Coordinate with new information and initiatives and follow Refuge System guidance.

V. Plan Implementation

INTRODUCTION

Refuge lands are managed as defined under the Improvement Act. Congress has distinguished a clear legislative mission of wildlife conservation for all national wildlife refuges. National wildlife refuges, unlike other public lands, are dedicated to the conservation of the nation's fish and wildlife resources and wildlife-dependent recreational uses. Priority projects emphasize the protection and enhancement of fish and wildlife species first and foremost, but considerable emphasis is placed on balancing the needs and demands for wildlife-dependent recreation and environmental education.

This chapter identifies the projects, funding, personnel, volunteers, partnership opportunities, and step-down management plans needed to accomplish the purpose, vision, goals, and objectives contained in this CCPfor Cabo Rojo NWR.

PROPOSED PROJECTS

Listed below are the proposed project summaries and their associated costs for fish and wildlife population management, habitat management, resource protection, visitor services, and refuge administration over the next 15 years. This proposed project list reflects the priority needs identified by the public, planning team, and refuge staff based upon available information. These projects were generated for the purpose of achieving the refuge's objectives and strategies. The primary linkages of these projects to those planning elements are identified in each summary.

Project 1. Science-based inventorying and monitoring program

Science-based inventorying and monitoring of plant and animal populations are critical to ensuring the biological integrity of the refuge. Information collected will serve as the basis for developing habitat management plans and will influence all refuge management activities. Standardized census and survey techniques will be employed and all data compiled into databases including GIS for spatial analysis. All data will be shared with appropriate state, federal, and local partners in an effort to further strategic habitat management.

Wildlife Objectives: 1.1-8
Habitat Objectives: 2.1-8
Visitor Services Objectives: 4.2-3
Refuge Administration Objectives: 5.1-5
Climate Change Objectives: 6.1

Project 2. GIS

The use of GIS has become widespread as a valuable tool in developing and implementing habitat management plans. To better organize, understand, and make inferences regarding habitat management, a comprehensive GIS database is needed. Once established, the geographic layers will incorporate all refuge programs. This will help ensure compatibility and productivity. This project will develop a data management, storage, and retrieval system; obtain spatial information from appropriate sources; develop geographical layers for refuge management programs; and facilitate spatial analysis and creation of maps.

Wildlife Objectives: 1.1-8
Habitat Objectives: 2.1-8
Resource Protection Objectives: 3.1, 3.3-4
Visitor Services Objectives: 4.1-3
Refuge Administration Objectives: 5.1-6
Climate Change Objectives: 6.1

Project 3. Invasive Plant Species

Past land use practices such as cattle ranching and agriculture have resulted in much of the native vegetation being replaced by plants from other regions. Many areas are overgrown with exotic grass species in the understory and exotic trees, especially mesquite, in the overstory. This project will include initiating annual surveys to detect new exotic species, annually treating 5 acres, increasing the effort to further reduce invasive vegetation and increasing the coverage of native vegetation, particularly in upland subtropical forest areas and grasslands. Aggressive treatments through mechanical and manual removal, prescribed fire, and herbicides will be used and results monitored.

Wildlife Objectives: 1.1-8
Habitat Objectives: 2.1-8
Resource Protection Objectives: 3.1-2
Visitor Services Objectives: 4.2-3
Refuge Administration Objectives: 5.1-6
Climate Change Objectives: 6.1

Project 4. Water salinity, levels, and flow on the salt flat lagoons

The Cabo Rojo Salt Flats are extremely important for nesting, migrating, and wintering shorebirds. Thousands of shorebirds can be observed here during migration, and species such as the snowy plover use the salt flats for nesting and foraging. The source of water and salt at the salt flats and crystallization ponds is through water control structures directly from the Caribbean Sea, directed by a network of channels and ditches. This project will include researching and identifying best management practices of salt lagoons that benefit wildlife, developing a study for western lagoons that are not managed for salt production to compare wildlife use to those that are used for salt production, improving hydrology between the sea and the eastern most part of the lagoon, and installing monitoring stations to document salinity and water levels. This project will also include improving stormwater management.

Wildlife Objectives: 1.1-3, 1.5, 1.8
Habitat Objectives: 2.1-3
Resource Protection Objectives: 3.4
Visitor Services Objectives: 4.2-3
Refuge Administration Objectives: 5.1-5
Climate Change Objectives: 6.1

Project 5. Reforestation of uplands

There are few large tracts of dry forest still remaining in Puerto Rico. If this habitat is to be maintained into the future, it has to be protected and expanded. Reforestation will benefit neotropical migratory birds and endangered species such as the yellow-shouldered blackbird. This project will

include planting 3-5 acres of native trees annually, establishing a larger nursery on refuge, establishing wildlife monitoring protocol to assess wildlife response to reforestation, and monitoring response of the dry forest vegetation.

Wildlife Objectives: 1.1-2, 1.4-5
Habitat Objectives: 2.1, 2.4-5
Resource Protection Objectives: 3.4
Visitor Services Objectives: 4.2-3
Refuge Administration Objectives: 5.1-5
Climate Change Objectives: 6.1

Project 6. Maintain Grasslands

There are several patches of grassland areas on the refuge. One of these areas supports the endangered *Aristida chaseae.* Many areas have been dominated by nonnative guinea grass. These grasslands support populations of the Greater Antillean short-eared owl and the Puerto Rican grasshopper sparrow. This project will include replacing nonnative guinea grass with native grasses such as *Aristida chaseae*, increasing diversity of grasses to benefit wildlife species, and exploring the use of herbicides. This project will also include actively managing, monitoring, and mapping *Aristida chaseae*.

Wildlife Objectives: 1.1-2, 1.4-5
Habitat Objectives: 2.1, 2.7
Resource Protection Objectives: 3.4
Visitor Services Objectives: 4.2-3
Refuge Administration Objectives: 5.1-5
Climate Change Objectives: 6.1

Project 7. Restoration of freshwater ponds

The refuge currently supports three freshwater ponds. Overgrowth in exotic vegetation has been an ongoing problem. Restoration of these ponds is needed to improve habitat for waterbirds such as least grebe, pied-billed grebe, and Bahamas pintail. This project will include determinations for appropriate management actions for each pond, development of a water maintenance plan, and removal of exotic species by mechanical means.

Wildlife Objectives: 1.1-5, 1.8
Habitat Objectives: 2.1, 2.6
Resource Protection Objectives: 3.4
Visitor Services Objectives: 4.2-3
Refuge Administration Objectives: 5.1-5
Climate Change Objectives: 6.1

Project 8. Fire Management

Control burns are not currently conducted on the refuge. There are several fires that occur annually on the refuge that appear to be deliberately or accidently set. This project will include acquiring heavy equipment to fully implement the fire management plan, exploring introduction of prescribed fire to reduce fuel loads, controlling or removing exotic species, expanding fire training, and promoting grassland areas. This project will also include initiating additional outreach to local communities concerning the positive and negative effects fire can have on the refuge which may result in reduced intentional or accidental fires.

Wildlife Objectives: 1.1-2, 1.4-5
Habitat Objectives: 2.1
Resource Protection Objectives: 3.1
Visitor Services Objectives: 4.2-3
Refuge Administration Objectives: 5.1-6
Climate Change Objectives: 6.1

Project 9. Law Enforcement

The refuge currently has one full-time law enforcement officer who is responsible for providing resource protection, visitor safety, facilities security, and partnering with Puerto Rico DNER. This project will include hiring an additional law enforcement officer to be shared with Laguna Cartagena NWR to provide outreach and cultural resource training for law enforcement staff, increasing presence at new visitor center, ensuring staff is fully equipped, developing a memorandum of understanding with other law enforcement agencies, and continuing to support Puerto Rico DNER in monitoring hunt programs on private and state lands and with sea turtle protection.

Resource Protection Objectives: 3.1-4
Visitor Services Objectives: 4.2-5
Refuge Administration Objectives: 5.1-6
Climate Change Objectives: 6.1

Project 10. Historic and Cultural Resources Protection

The refuge is protecting the ruins of one historic building. There is not a lot known about the cultural and historical resources on the refuge. This project would include the completion of a cultural resources survey, whose results would be incorporated into the refuge's GIS database. An integrated cultural resources plan and a cultural resources overview for the refuge would be developed as a part of this project with guidance and assistance from the Regional Archaeologist.

Resource Protection Objectives: 3.1-3
Visitor Services Objectives: 4.2-3
Refuge Administration Objectives: 5.1-6
Climate Change Objectives: 6.1

Project 11. Improve Visitor Services opportunities

Cabo Rojo NWR hosts around 5,500 visitors per year. Wildlife-dependent recreation opportunities are offered at the refuge. Balancing visitor use with our mission to protect wildlife and habitat should be central to all decisions regarding expanding recreation opportunities. This project includes developing and promoting a trail system for special interest groups, maintaining trails, providing spotting scopes at observation towers, developing interpretive panels, replacing two photo blinds, updating current kiosks, installing two kiosks near the new refuge headquarters, increasing staffing of visitor center, improving visitor parking, and installing pedestrian counter at access gates. This project will also include updating the visitor services plan; developing self-guided tours, including interpretive exhibits; developing partnerships with Department of Education; and continuing partnerships with Friends Group. The Service will also participate and cooperate with the Puerto Rico Tourism Company in the implementation of Gateway Communtiy Economic Model for communities adjacent to and/or nearby the refuge.

Wildlife Objectives: 1.1
Habitat Objectives: 2.1
Resource Protection Objectives: 3.2
Visitor Services Objectives: 4.1-5
Refuge Administration Objectives: 5.1-6
Climate Change Objectives: 6.1

Project 12. Climate Change

Global climate change poses risks to human health and to terrestrial and aquatic ecosystems. This project will provide funding to work with the research partners to assess the changes to refuge resources associated with climate change, and evaluate the potential changes in habitat or species diversity that may be irreversible; potential refuge management activities that could mitigate or minimize the impact to refuge purposes; and strategies that may be implemented to assist key species in adapting to climate changes.

Wildlife Objectives: 1.1-8
Habitat Objectives: 2.1-8
Resource Protection Objectives: 3.1, 3.4
Visitor Services Objectives: 4.2-3
Refuge Administration Objectives: 5.1-6
Climate Change Objectives: 6.1

Project 13. Refuge Administration

The Complex has 25 full-time employees of which 6 employees are assigned duties between Cabo Rojo NWR and Laguna Cartagena NWR. This project will provide for additional staff to accomplish the goals and objectives of this CCP. Personnel priorities will include employing a biologist, a biological technician, two engineering equipment operators, a park ranger (environmental education), volunteer coordinator, a GIS specialist, forestry technician, and law enforcement officer (to be shared with Laguna Cartagena NWR). This increase in budget and staff will better enable Cabo Rojo NWR to meet the obligations of wildlife stewardship, habitat management, public use, resource protection, and refuge administration.

Wildlife Objectives: 1.1-8
Habitat Objectives: 2.1-8
Resource Protection Objectives: 3.1-4
Visitor Services Objectives: 4.1-5
Refuge Administration Objectives: 5.1-6
Climate Change Objectives: 6.1

FUNDING AND PERSONNEL

Implementation of this CCP will require increased funding and personnel support that will come from a variety of internal and external sources. New projects and maintenance needs for existing facilities and projects are identified through the Service Asset Maintenance Management System (SAMMS). Figure 6 identifies the proposed Cabo Rojo NWR organization chart and staffing required to help achieve the goals, objectives, and strategies outlined in this CCP. Table 5 lists the proposed projects described above, their costs, and associated staffing. This CCP does not constitute a commitment (from Congress) for staffing increases, operational and maintenance increases, or funding for future land acquisition, but represents wildlife resource needs based on sound biological science and input from the public.

Figure 10. Proposed organizational chart for Cabo Rojo NWR

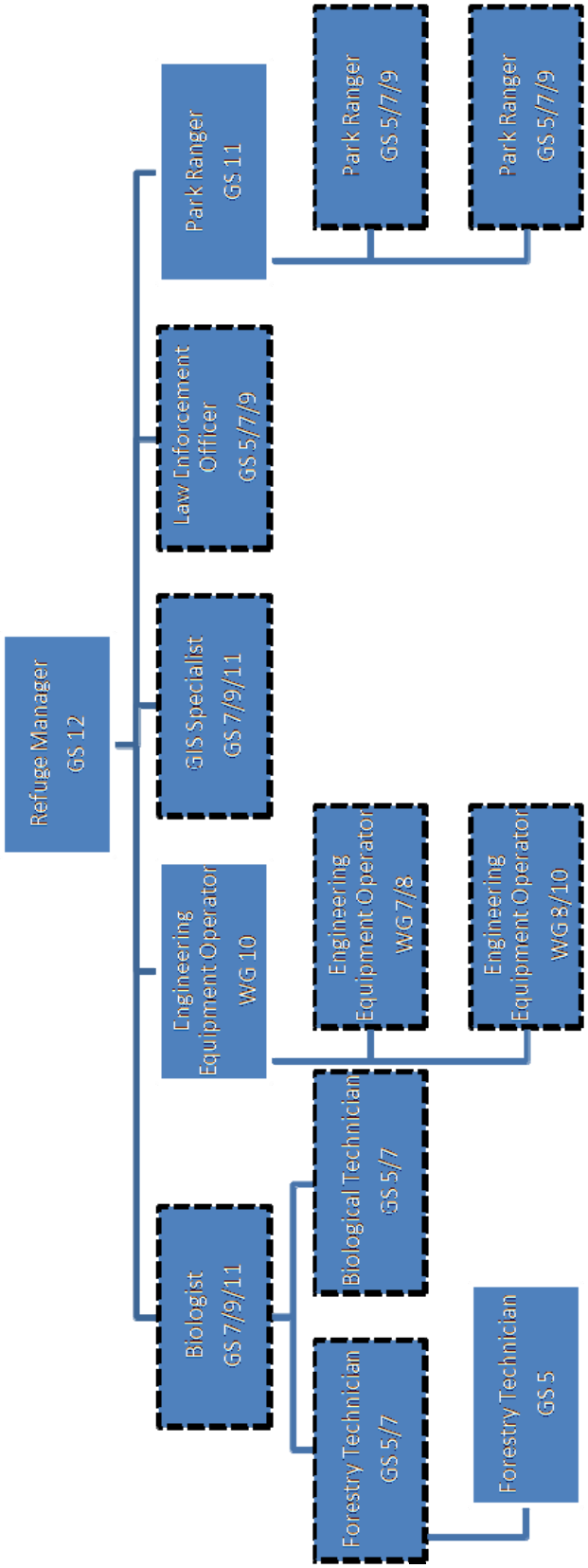


Table 5. Summary of projects

PROJECT NUMBER	PROJECT TITLE	FIRST YEAR COST	RECURRING ANNUAL COST	STAFF (FTE'S)
1	Science-based inventorying and monitoring program	45,000	32,000	1
2	GIS	20,000	15,000	.2
3	Invasive Species	30,000	30,000	.5
4	Salt Flat Lagoons water quality, quantity, and flow	25,000	Contract	Contract
5	Reforestation of uplands	82,000	82,000	1.5
6	Maintain grasslands	40,000	10,000	1
7	Restoration of freshwater ponds	40,000	8,000	Contract
8	Fire management	74,000	24,000	.5
9	Law enforcement	47,000	25,000	.5
10	Historic and cultural resources protection	25,000	Contract	Contract
11	Improve visitor services	230,000	150,000	2
12	Climate change	60,000	30,000	.5
13	Refuge administration	400,000	350,000	7.7

PARTNERSHIP/VOLUNTEER OPPORTUNITIES

A key element of this CCP is to establish partnerships with local volunteers, landowners, private organizations, and state and federal natural resource agencies. In the immediate vicinity of the refuge, opportunities exist to establish partnerships with local conservation organizations, such as Sociedad Ornitológica Puertorriqueña, Inc. (SOPI), the Friends Group, various birding groups, and recreational groups such as the local bike club. At regional and state levels, partnerships may be established or enhanced with organizations such as the Puerto Rico Tourism Company, local community leaders, and municipal fire and police departments.

STEP-DOWN MANAGEMENT PLANS

A comprehensive conservation plan is a strategic plan that guides the direction of the refuge. A step-down management plan provides specific guidance on activities, such as habitat, fire, and visitor services. These plans (Table 6) are also developed in accordance with NEPA, which requires the identification and evaluation of alternatives and public review and involvement prior to their implementation.

Table 6. Step-down management plans related to the goals and objectives of the CCP

Step-down Plan	Completion Date
Inventorying and Monitoring Plan	2015
Habitat Management Plan	2014
Law Enforcement Plan	2015
Visitor Services Plan	2014
Cultural Resources Management Plan	2020
Fire Management Plan	2015

MONITORING AND ADAPTIVE MANAGEMENT

Adaptive management is a flexible approach to long-term management of biotic resources that is directed over time by the results of ongoing monitoring activities and other information. More specifically, adaptive management is a process by which projects are implemented within a framework of scientifically driven experiments to test the predictions and assumptions outlined within a plan.

To apply adaptive management, specific surveying, inventorying, and monitoring protocols will be adopted for the refuge. The habitat management strategies will be systematically evaluated to determine management effects on wildlife populations. This information will be used to refine approaches and determine how effectively the objectives are being accomplished. Evaluations will include ecosystem team and other appropriate partner participation. If monitoring and evaluating indicate undesirable effects for target and non-target species and/or communities, then alterations to the management projects will be made. Subsequently, the CCP will be revised. Specific monitoring and evaluating activities will be described in the step-down management plans.

PLAN REVIEW AND REVISION

The final CCP will be reviewed annually as the refuge's annual work plans and budgets are developed. It will also be reviewed to determine the need for revision. A revision will occur if and when conditions change or significant information becomes available, such as a change in ecological conditions or a major refuge expansion. The final CCP will be augmented by detailed step-down management plans to address the completion of specific strategies in support of the refuge's goals and objectives. Revisions to the CCP and the step-down management plans will be subject to public review and NEPA compliance.

Appendix A. Glossary

Adaptive Management: Refers to a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in a management plan. Analysis of results helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

Alluvial: Sediment transported and deposited in a delta or riverbed by flowing water.

Alternative: 1. A reasonable way to fix the identified problem or satisfy the stated need (40 CFR 1500.2). 2. Alternatives are different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues (Service Manual 602 FW 1.6B).

Anadromous: Migratory fishes that spend most of their lives in the sea and migrate to fresh water to breed.

Biological Diversity: The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (Service Manual 052 FW 1. 12B). The System's focus is on indigenous species, biotic communities, and ecological processes. Also referred to as biodiversity.

Carrying Capacity: The maximum population of a species able to be supported by a habitat or area.

Categorical Exclusion: A category of actions that does not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a federal agency pursuant to the National Environmental Policy Act (40 CFR 1508.4).

CFR: Code of Federal Regulations.

Compatible Use: A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose(s) of the national wildlife refuge [50 CFR 25.12 (a)]. A compatibility determination supports the selection of compatible uses and identifies stipulations or limits necessary to ensure compatibility.

Comprehensive Conservation Plan: A document that describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purposes of the refuge; helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates (Service Manual 602 FW 1.6 E).

Concern: See Issue

Cover Type: The present vegetation of an area.

Cultural Resource Inventory: A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4 (Service Manual 614 FW 1.7).

Cultural Resource Overview: A comprehensive document prepared for a field office that discusses, among other things, its prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement on how program objectives should be met and conflicts resolved. An overview should reference or incorporate information from a field office's background or literature search described in Section VIII of the Cultural Resource Management Handbook (Service Manual 614 FW 1.7).

Cultural Resources: The remains of sites, structures, or objects used by people in the past.

Designated Wilderness Area: An area designated by the U.S. Congress to be managed as part of the National Wilderness Preservation System (Draft Service Manual 610 FW 1.5).

Disturbance: Significant alteration of habitat structure or composition. May be natural (e.g., fire) or human-caused events (e.g., aircraft overflight).

Ecosystem: A dynamic and interrelating complex of plant and animal communities and their associated non-living environment.

Ecosystem Management:	Management of natural resources using system-wide concepts to ensure that all plants and animals in ecosystems are maintained at viable levels in native habitats and basic ecosystem processes are perpetuated indefinitely.
Endangered Species (Federal):	A plant or animal species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.
Endangered Species (State):	A plant or animal species in danger of becoming extinct or extirpated in the state within the near future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a significant degree.
Environmental Assessment (EA):	A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).
Environmental Impact Statement (EIS):	A detailed written statement required by section 102(2)(C) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).
Estuary:	The wide lower course of a river into which the tides flow. The area where the tide meets a river current.
Finding of No Significant Impact (FONSI):	A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared (40 CFR 1508.13).
Goal:	Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Service Manual 620 FW 1.6J).
Habitat:	Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.
Habitat Restoration:	Management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy ecosystems.
Habitat Type:	See Vegetation Type.

Improvement Act:	The National Wildlife Refuge System Improvement Act of 1997.
Informed Consent:	The grudging willingness of opponents to “go along” with a course of action that they actually oppose (Bleiker).
Issue:	Any unsettled matter that requires a management decision [e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or other presence of an undesirable resource condition (Service Manual 602 FW 1.6K)].
Management Alternative:	See Alternative
Management Concern:	See Issue
Management Opportunity:	See Issue
Migration:	The seasonal movement from one area to another and back.
Mission Statement:	Succinct statement of the unit’s purpose and reason for being.
Monitoring:	The process of collecting information to track changes of selected parameters over time.
National Environmental Policy Act of 1969 (NEPA):	Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision-making (40 CFR 1500).
National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57):	Under the Refuge Improvement Act, the Fish and Wildlife Service is required to develop 15-year comprehensive conservation plans for all national wildlife refuges outside Alaska. The Act also describes the six public uses given priority status within the Refuge System (i.e., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation).
National Wildlife Refuge System Mission:	The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

National Wildlife Refuge System: Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction; all lands, waters, and interests therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; game ranges; wildlife management areas; or waterfowl production areas.

National Wildlife Refuge: A designated area of land, water, or an interest in land or water within the Refuge System.

Native Species: Species that normally live and thrive in a particular ecosystem.

Noxious Weed: A plant species designated by federal or state law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or non-native, new, or not common to the United States. According to the Federal Noxious Weed Act (P.L. 93-639), a noxious weed is one that causes disease or had adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

Objective: A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Making objectives attainable, time-specific, and measurable (Service Manual 602 FW 1.6N).

Plant Association: A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community.

Plant Community: An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community.

Preferred Alternative: This is the alternative determined (by the decision-maker) to best achieve the refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management.

Prescribed Fire: The application of fire to wildland fuels to achieve identified land use objectives (Service Manual 621 FW 1.7). May occur from natural ignition or intentional ignition.

Priority Species: Fish and wildlife species that require protective measures and/or management guidelines to ensure their perpetuation. Priority species include the following: (1) State-listed and candidate species; (2) species or groups of animals susceptible to significant population declines within a specific area or statewide by virtue of their inclination to aggregate (e.g., seabird colonies); and (3) species of recreation, commercial, and/or tribal importance.

Public Involvement Plan: Broad long-term guidance for involving the public in the comprehensive conservation planning process.

Public Involvement: A process that offers impacted and interested individuals and organizations an opportunity to become informed about, and to express their opinions on Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.

Public: Individuals, organizations, and groups; officials of federal, state, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in service issues and those who do or do not realize that Service decisions may affect them.

Purposes of the Refuge: "The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge sub-unit." For refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge (Service Manual 602 FW 106 S).

Recommended Wilderness: Areas studied and found suitable for wilderness designation by both the Director of the Fish and Wildlife Service and the Secretary of the Department of the Interior, and recommended for designation by the President to Congress. These areas await only legislative action by Congress in order to become part of the Wilderness System. Such areas are also referred to as "pending in Congress" (Draft Service Manual 610 FW 1.5).

Record of Decision (ROD): A concise public record of decision prepared by the federal agency, pursuant to NEPA, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).

Refuge Goal: See Goal

Refuge Purposes:	See Purposes of the Refuge
Songbirds: (Also Passerines)	A category of birds that is medium to small, perching landbirds. Most are territorial singers and migratory.
Step-down Management Plan:	A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, and safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives (Service Manual 602 FW 1.6 U).
Strategy:	A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives (Service Manual 602 FW 1.6 U).
Study Area:	The area reviewed in detail for wildlife, habitat, and public use potential. For purposes of this CCP, the study area includes the lands within the currently approved refuge boundary and potential refuge expansion areas.
Threatened Species (Federal):	Species listed under the Endangered Species Act that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
Threatened Species (State):	A plant or animal species likely to become endangered in the state within the near future if factors contributing to population decline or habitat degradation or loss continue.
Tiering:	The coverage of general matters in broader environmental impact statements with subsequent narrower statements of environmental analysis, incorporating by reference, the general discussions and concentrating on specific issues (40 CFR 1508.28).
U.S. Fish and Wildlife Service Mission:	The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.
Unit Objective:	See Objective
Vegetation Type, Habitat Type, Forest Cover Type:	A land classification system based upon the concept of distinct plant associations.
Vision Statement:	A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System mission and specific refuge purposes, and other mandates. We will tie the vision statement for the refuge to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates (Service Manual 602 FW 1.6 Z).

Wilderness Study Areas: Lands and waters identified through inventory as meeting the definition of wilderness and undergoing evaluation for recommendation for inclusion in the Wilderness System. A study area must meet the following criteria:

- Generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;
- Has outstanding opportunities for solitude or a primitive and unconfined type of recreation; and
- Has at least 5,000 contiguous roadless acres or is sufficient in size as to make practicable its preservation and use in an unimpaired condition (Draft Service Manual 610 FW 1.5).

Wilderness: See Designated Wilderness

Wildfire: A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

Wildland Fire: Every wildland fire is either a wildfire or a prescribed fire (Service Manual 621 FW 1.3

ACRONYMS AND ABBREVIATIONS

APHIS	Animal Plant and Health Inspection Services
BCC	Birds of Conservation Concern
BRT	Biological Review Team
CCP	Comprehensive Conservation Plan
CFR	Code of Federal Regulations
CFS	Cubic feet per Second
CINWR	Caribbean Islands National Wildlife Refuge Complex (the Complex)
CRSF	Cabo Rojo Salt Flats
CWCS	Comprehensive Wildlife Conservation Strategy
DNER	Department of Natural and Environmental Resources
DOI	Department of the Interior
DU	Ducks Unlimited
EA	Environmental Assessment
EE	Environmental Education
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
FR	Federal Register
FTE	Full-time equivalent
FY	Fiscal Year
FWS	U.S. Fish and Wildlife Service (also Service)
GIS	Geographic Information System
LE	Law Enforcement
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NGO	Non-government Organization
NOAA	National Oceanic Atmospheric Administration
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
PFT	Permanent Full Time

PREPA	Puerto Rico Energy Power Administration
PUNA	Public Use Natural Area
RM	Refuge Manual
RNA	Research Natural Area
ROD	Record of Decision
RONS	Refuge Operating Needs System
RRP	Refuge Roads Program
SOPI	Sociedad Ornitológica Puertorriqueña Inc. or Ornithological Society of Puerto Rico
SUP	Special Use Permit
TFT	Temporary Full Time
USC	United States Code
USGS	United States Geological Survey
USFWS	United States Fish and Wildlife Service
WHSRN	Western Hemisphere Shorebird Reserve Network
YCC	Youth Conservation Corps
YSBB	Yellow-shouldered Blackbird

Appendix B. References and Literature Citations

Acevedo-Rodríguez, Pedro; Woodbury, Roy O. 1985. Los bejucos de Puerto Rico. Gen. Tech. Rep. SO–58. Río Piedras, PR: U.S. Department of Agriculture Forest Service, International Institute of Tropical Forestry. 331 p. In Spanish.

Bawiec, W.J. 2001. Geology, geochemistry, geophysics, mineral occurrences, and mineral resource assessment for the Commonwealth of Puerto Rico. US Geological Survey Open-File Report 98-38.

Beard, J.S. 1949. The natural vegetation of the Windward and Leeward Islands. Oxford, UK: Clarendon Press. 192 p.

Beard, J.S. 1955. The Classification of Tropical American Vegetation Types. Ecology.

Birdlife International. 2009. Edited by David C Wege and Veronica Anadon-Irizarry. Important Bird Areas of the Caribbean: key sites for conservation. 348 p.

Birdsey, Richard A.; Weaver, Peter L. 1982. The forest resources of Puerto Rico. Resour. Bull. SO–85. New Orleans: U.S. Department of Agriculture Forest Service, Southern Forest Experiment Station. 59 p.

Bonnet, J.A., Tirado, Sulsona, 1950. Soil Studies in the Lajas Valley. Bulletin No. 86. University of Puerto Rico Experimental Station. Rio Piedras, Puerto Rico.

Britton, N.L.; Wilson, Percy. 1923–30. Botany of Porto Rico and the Virgin Islands: Spermatophyta and Ptridophyta. In: Scientific survey of Porto Rico and the Virgin Islands. New York: New York Academy of Sciences: 5(1–4): 1–626; 6(1–4): 1–663.

Cantrell, Sharon A.; et. al. 2006. Characterization of fungi from hypersaline environments of solar salterns using morphological and molecular techniques. Mycological Research 110: 962-970.

Cantrell, Sharon A.; et. al. 2007. *Periconia variicolor* sp. nov.; a new species from Puerto Rico.. Mycology, 93 (3) 482-487.

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, Carlos J. and Lugo, Ariel E. 1978. The System of Mangroves in Puerto Rico. Department of Natural Resources. San Juan, Puerto Rico.

Carver, Erin and James Caudill. 2007. Banking on Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation. Division of Economics, U.S. Fish and Wildlife Service. Washington, DC.

Casillas-Martínez, Lillian, et. al. 2005. Community structure, geochemical characteristics and mineralogy of hypersaline microbial mat, Cabo Rojo, PR. Geomicrobiology Journal, 22:269-281.

Collazo, Jaime A. et. al. 1995. Abundance and distribution of shorebirds at the Cabo Rojo Salt Flats, Puerto Rico. Journal of Field Ornithology 66:424-438.

Colón-Ortiz, Lourdes. 2008. Species Richness of Cyanobacteria, Diatoms, and Ciliates in Microbial Mats of the Cabo Rojo Salterns, Puerto Rico. Master Thesis, University of Puerto Rico, Mayagüez, PR. 178. pages

Cook, Melville T.; Gleason, Henry A. 1928. Ecological survey of the flora of Puerto Rico. Journal of the Department of Agriculture of Porto Rico. 12(1–2): 3–139 + photos and maps.

Dansereau, P. 1966. Studies on the vegetation of Puerto Rico. Special Publication No. 1. University of Puerto Rico, Faculty of Arts and Sciences, Institute of Caribbean Science, Mayaguez, PR.

Departamento de Recursos Naturales y Ambientales (DNER). 1998. Plan de manejo para el área de planificación especial de suroeste, sector Boquerón. Gobierno de Puerto Rico. Preparado por G. I. Fuentes y M. Rivera. Borrador. 75 pp.

Department of Natural and Environmental Resources (DNER). 2005. Comprehensive Wildlife Conservation Strategy. San Juan, PR.

Department of Natural and Environmental Resources (DNER), 2006. Puerto Rico Critical Wildlife Areas, Puerto Rico.

Endangered Species Act of 1973 as amended (P.L. 93-205).

Ewel, John J., Whitmore, Jacob L. 1973. The Ecological Life Zones of Puerto Rico and the U.S. Virgin Islands. Puerto Rico Institute of Tropical Forestry.

Francis, John K.; Liogier, Henri A. 1991. Naturalized and exotic tree species of Puerto Rico. Gen. Tech. Rep. SO–62. New Orleans: U.S. Department of Agriculture Forest Service, Southern Forest Experiment Station. 12 p.

Francis, John K.; Lowe, Carol A. 2000. Bioecología de árboles nativos y exóticos de Puerto Rico y las Indias Occidentales. Reporte Técnico General IITF–15. Río Piedras, PR: Departamento de Agricultura de los Estados Unidos, Servicio Forestal, Instituto Internacional de Dasonomia Tropical. 582 p. In Spanish.

Franco, Peter A., Weaver, Peter L. and Eggen-McIntosh, Susan. 1997. Forest Resources of Puerto Rico. US Department of Agriculture, Forest Service. Asheville, NC.

García-Molinari Ovidio. 1952. Grasslands and Grasses of Puerto Rico. University of Puerto Rico Agricultural Experimental Station. Rio Piedras, Puerto Rico.

Gleason, H.A. and Cook, Mel T. 1927. Scientific Survey of Puerto Rico and the Virgin Islands: Plant Ecology of Puerto Rico. New York Academy of Sciences. New York.

Graves, Robert P. 1991. Groundwater Resources in the Lajas Valley, Puerto Rico. Water Resources Investigation Report. US Geological Survey.

Grear, Jason S. 1992. Habitat use by migratory shorebirds at the Cabo Rojo Salt Flats, Puerto Rico. Technical Report No. 46. Cooperative Fish and Wildlife Research Unit, School of Forest Resources and Conservation, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL. 91 pages.

Grear J.S. and Collazo J.A. 1999. Habitat use by migrant shorebirds Weber L.M. and Haig S.M. 1997. Shorebird-prey interactions in a tropical salt flat system.Vida Silvestre Tropical (J. Neotropi- South Carolina coastal soft sediments. Can. J. Zool. 75: 245–cal Wildlife) 7: 15–22.

Hill, Robert T. 1899. The forest conditions of Porto Rico. Bull. 25. Washington, DC: Government Printing Office, U.S. Department of Forestry, Division of Forestry. 48 p.

Hitchcock, A.S. 1936. Manual of the grasses of the West Indies. Misc. Publ. 243. Washington, DC: U.S. Department of Agriculture. 439 p

Holdridge, L.R., 1967. Life Zone Ecology. Tropical Science Center. San Jose, Costa Rica.

Howard, Richard A. 1979. Flora of the Lesser Antilles, Leeward and Windward Islands. Monocotyledonaceae. Jamaica Plain, MA: Harvard University, Arnold Arboretum. 586 p. Vol. 3.

Howard, Richard A. 1988–1989. Flora of the Lesser Antilles, Leeward and Windward Islands. Dicotyledonaceae. Pts. 1, 2, and 3. Jamaica Plain, MA: Harvard University, Arnold Arboretum. 673 p. Vol. 4; 1,262 p. Vol. 5.

Küepper, Clemens and Alcides Morales. 2009. Breeding ecology of Snowy Plovers (*Charadrius alexandrinus tenuirostris*) at Cabo Rojo, Puerto Rico. Fieldwork Report, April 18-May 10, 2009. 14 pages.

Liogier, Henri Alain. 1985–1997. Descriptive flora of Puerto Rico and adjacent islands—Spermatophyta. San Juan, PR: Editorial de la Universidad de Puerto Rico. 352 p. Vol. 1; 481 p. Vol. 2; 461 p. Vol. 3; 617 p. Vol 4; 436 p. Vol 5.

Liogier, Henri Alain; Martorell, Luis F. 1982. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Río Piedras, PR: Editorial de la Universidad de Puerto Rico. 343 p.

Liogier, Henri Alain; Martorell, Luis F. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. 2d ed., rev. San Juan, PR: Editorial de la Universidad de Puerto Rico. 382 p.

Little, Elbert L., Jr.; Wadsworth, Frank. H. 1964. Common trees of Puerto Rico and the Virgin Islands. Agric. Handb. 249. Washington, DC: U.S. Department of Agriculture. 548 p.

Little, Elbert L., Jr.; Woodbury, Roy O.; Wadsworth, Frank H. 1974. Trees of Puerto Rico and the Virgin Islands. Agric. Handb. 449. Washington, DC: U.S. Department of Agriculture. 1,024 p.

Lonzarich, D.J. 1989. Temporal and spatial variations in salt pond environments and implications for fish and invertebrates. M.A. Thesis. State University, San Jose, CA.

Mas, Edwin G. and García, Molinari O. 1990. Illustrated Guide of Puerto Rico Herbal Communities. University of Puerto Rico, Mayagüez.

Marrero, J. 1950. Resultados de la repoblación forestal en los bosques insulares de Puerto Rico. Caribbean Forester. 11(3): 151–195. In Spanish.

McCune, B. and M.J. Mefford. 1999. Multivariate Analysis of Ecological Data Version 4.25. MjM Software, Gleneden Beach, Oregon U.S.A.

McKenzie, Paul M. 1986. Critical plants found on the Cabo Rojo National Wildlife Refuge. Boquerón, PR: U.S. Fish and Wildlife Service. 8 p. Unpublished report. On file with: U.S. Fish and Wildlife Service, Carretera 301, Km 5.1, P.O. Box 491, Boquerón, PR 00622.

McKenzie, PM and Noble, RE. 1991. Habitat Use, Movements and Behavior of Shiny Cowbirds in Southwestern Puerto Rico. US Fish and Wildlife Service. Boquerón, Puerto Rico.

Mercado-Alvarez, W. 2003. Efecto de la salinidad en las poblaciones de *Artemia salina* y *Gomphosphaeria aponina*, y los nutrientes en las lagunas Fraternidad y Candelaria de las salinas de Cabo Rojo. Tesis de Maestría en Ciencias Ambientales. Universidad Interamericana Recinto de San Germán, Puerto Rico.

Meyerhoff, Howard. 1933. Geology of Puerto Rico. Monographs of the University of Puerto Rico. University of Puerto Rico.

Mitchell, G.J. 1922. Geology of the Ponce District. Scientific Survey of Puerto Rico and the Virgin Islands. New York Academy of Sciences. New York.

Montalvo-Rodríguez, Rafael; et. al. 1997. New isolates of extremely Halophilic Archaebacteria (Halobacteria) from Puerto Rico and the Caribbean. Caribbean Journal of Science, Vol.33, No. 1-2, 98-104.

Montalvo-Rodríguez, Rafael; et. al. 1998. *Halogeometricum borinquense* gen. nov. sp. nov,; a novel halophilic archaeon from Puerto Rico. International Journal of Systematic Bacteriology, 48: 1305-1312.

Montalvo-Rodríguez, Rafael; et. al. 2000. *Haloterrigena thermotolerans* sp. nov.;a halophilic archaeon from Puerto Rico. International Journal of Systematic Bacteriology, 50: 1065-1071.

Montgomery, Homer; Pessago, Emile A., Jr.; Lewis, John F.; Schellekens, Johannes. 1994. Paleogeography of jurassic fragments in the Caribbean. Tectonics. 13(2): 725–732.

Monzón, Ada R. 1996. Preliminary report: Hurricane Hortense, Monday, September 9–Tuesday, September 10, 1996 [Bulletin]. San Juan, PR: Federal Emergency Management Administration. 5 p.

Murphy, Louis S. 1916. Forests of Porto Rico: past, present, and future, and their physical and economic environment. Bull. 354. Washington, DC: U.S. Department of Agriculture. 99 p.

Negrón González, Luis. 1986. Las lagunas de Puerto Rico. In: Vivaldi, José Luis; Paniagua Valverde, Carlos, eds. Compendio Enciclopédico de los Recursos Naturales de Puerto Rico. San Juan, PR: Departamento de Recursos Naturales, Programa de Manejo de Zona Costera de Puerto Rico. 248 p. Vol. IX. In Spanish.

New Employee Handbook. U.S. Fish and Wildlife Service.

Pindell, James L. and Barrett, Stephen F. 1990. Geological Evolution Off the Caribbean region: a Plate Tectonic Perspective. Geological Society of America. Boulder, Colorado.

Post, William. 1981. Biology of the Yellow-shouldered Blackbird (*Agelaius xanthomus*) on a Tropical Island. Bulletin of Florida State Museum Biological Sciences.

Proctor, George R. 1994. Vieques mangrove forest manual. San Juan, PR: Departamento de Recursos Nturales y Ambientales. 72 p. English section.

Raffaele, H. and J. M. Duffield. 1979. Critical wildlife areas of Puerto Rico. Division of Fishand Wildlife Planning, Dept. of Natural Resources, Puerto Rico. 165 pp.

Raffaele, Herbert A., 1989. A Guide to the Birds of Puerto Rico and the Virgin Islands. Princeton University Press. Princeton, NJ.

Sastre-D.J., Ines; Santiago-Valentín, E. 1996. Botanical explorations of Puerto Rico by N.L. Britton and E.G. Britton: their significance in plant conservation, horticulture, and education. Brittonia. 48(3): 322–336.

Staicer, Cynthia A. 1992. Social behavior of the Northern Parula, Cape May warbler, and Prairie warbler wintering in second-growth forest in southwestern Puerto Rico. In: Hagan, John M., III; Johnston, David W., eds. Ecology and conservation of neotropical migrant landbirds. Washington, DC: Smithsonian Institution Press: 308–320.

Tripp, Kimberly J.; Collazo, Jaime A. 2003. Density and distribution of water boatmen and brine shrimp at a major shorebird wintering area in Puerto Rico. Wetlands Ecology and Management. 11: 331–341.

USDA 2007. Soil Survey Geographic (SSURGO) database for San Germán Area, Puerto Rico Southwestern Part. U.S. Department of Agriculture, Natural Resources Conservation Service, p 787.

U.S. Department of Commerce, Bureau of the Census. 2000 Census. (http://censtats.census.gov/data/PR/05072023.pdf)

USFWS. 1976. Determination of the yellowshouldered blackbird as an endangered species and designation of critical habitat. Federal Register. 41: 510,119–510,122.

USFWS. 1993. Proposed Expansion of Cabo Rojo National Wildlife Refuge, Boquerón, Puerto Rico. Final Environmental Assessment. United States Department of the Interior. Fish and Wildlife Service, Southeast Region. 17pp.

USFWS. 2002. Caribbean Islands Wildlife Refuge Complex, Biological Review, January 2002. Note: Text in the section on flora is drawn directly from this document.

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

Volckmann, Richard P. 1984b. Geologic map of the San Germán quadrangle, southwest Puerto Rico. Misc. Invest. Ser., Map I–1556. San Juan, PR: Department of the Interior, U.S. Geological Survey;Commonwealth of Puerto Rico, Department of Natural Resources.

Wadsworth, Frank H. 1943. The Las Cobanitas campeche plantation. Caribbean Forester. 4(3): 140–143.

Wadsworth, Frank H. 1950. Notes on the climax forests of Puerto Rico and their destruction and conservation prior to 1950. Caribbean Forester. 11: 38–47.

Wadsworth, Frank, H. 1962. The Forests of Puerto Rico. Revista de Agricultura de Puerto Rico.

Wadsworth, Frank, H. 1990. Plantation Forests in the State Forest of Guánica. Acta Científica.

Weaver, Peter L. and Schwagerl, Joe. 2004. Tree Planting in the National Wildlife Refuges of Southwestern Puerto Rico. Proceedings of the 7th Annual Caribbean Urban Forestry Conference, Caribbean Foresters Meeting. St. Croix, US Virgin Islands Cooperative Extension Service.

Weaver, Peter L.; Schwagerl, Joseph J. 2009. U.S. Fish and Wildlife Service Refuges and Other nearby Reserves in Southwestern Puerto Rico, General Technical Report IITF-40. San Juan, PR: U.S. Department of Agriculture Forest Service, International Institute of Tropical Forestry, 110p.

Zuill, Henry. 1985. The trees of a selected area of the national wildlife refuge, Cabo Rojo, Puerto Rico: structure and composition. Boquerón, PR: U.S. Fish and Wildlife Service. 21 p. Unpublished report. On file with: U.S. Fish and Wildlife Service, Carretera 301, Km 5.1, P.O. Box 491, Boquerón, PR 00622.

Appendix C. Relevant Legal Mandates and Executive Orders

STATUTE	DESCRIPTION
Administrative Procedures Act (1946)	Outlines administrative procedures to be followed by federal agencies with respect to identification of information to be made public; publication of material in the Federal Register; maintenance of records; attendance and notification requirements for specific meetings and hearings; issuance of licenses; and review of agency actions.
American Antiquities Act of 1906	Provides penalties for unauthorized collection, excavation, or destruction of historic or prehistoric ruins, monuments, or objects of antiquity on lands owned or controlled by the United States. The Act authorizes the President to designate as national monuments objects or areas of historic or scientific interest on lands owned or controlled by the Unites States.
American Indian Religious Freedom Act of 1978	Protects the inherent right of Native Americans to believe, express, and exercise their traditional religions, including access to important sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites.
Americans With Disabilities Act of 1990	Intended to prevent discrimination of and make American society more accessible to people with disabilities. The Act requires reasonable accommodations to be made in employment, public services, public accommodations, and telecommunications for persons with disabilities.
Anadromous Fish Conservation Act of 1965, as amended	Authorizes the Secretaries of Interior and Commerce to enter into cooperative agreements with states and other non-federal interests for conservation, development, and enhancement of anadromous fish and contribute up to 50 percent as the federal share of the cost of carrying out such agreements. Reclamation construction programs for water resource projects needed solely for such fish are also authorized.
Archaeological Resources Protection Act of 1979, as amended.	This Act strengthens and expands the protective provisions of the Antiquities Act of 1906 regarding archaeological resources. It also revised the permitting process for archaeological research.
Architectural Barriers Act of 1968	Requires that buildings and facilities designed, constructed, or altered with federal funds, or leased by a federal agency, must comply with standards for physical accessibility.

STATUTE	DESCRIPTION
Bald and Golden Eagle Protection Act of 1940, as amended	Prohibits the possession, sale or transport of any bald or golden eagle, alive or dead, or part, nest, or egg except as permitted by the Secretary of the Interior for scientific or exhibition purposes, or for the religious purposes of Indians.
Bankhead-Jones Farm Tenant Act of 1937	Directs the Secretary of Agriculture to develop a program of land conservation and utilization in order to correct maladjustments in land use and thus assist in such things as control of soil erosion, reforestation, conservation of natural resources and protection of fish and wildlife. Some early refuges and hatcheries were established under authority of this Act.
Cave Resources Protection Act of 1988	Established requirements for the management and protection of caves and their resources on federal lands, including allowing the land managing agencies to withhold the location of caves from the public, and requiring permits for any removal or collecting activities in caves on federal lands.
Clean Air Act of 1970	Regulates air emissions from area, stationary, and mobile sources. This Act and its amendments charge federal land managers with direct responsibility to protect the “air quality and related values” of land under their control. These values include fish, wildlife, and their habitats.
Clean Water Act of 1974, as amended	This Act and its amendments have as its objective the restoration and maintenance of the chemical, physical, and biological integrity of the Nation’s waters. Section 401 of the Act requires that federally permitted activities comply with the Clean Water Act standards, state water quality laws, and any other appropriate state laws. Section 404 charges the U.S. Army Corps of Engineers with regulating discharge of dredge or fill materials into waters of the United States, including wetlands.
Coastal Barrier Resources Act of 1982 (CBRA)	Identifies undeveloped coastal barriers along the Atlantic and Gulf Coasts and included them in the John H. Chafee Coastal Barrier Resources System (CBRS). The objectives of the act are to minimize loss of human life, reduce wasteful federal expenditures, and minimize the damage to natural resources by restricting most federal expenditures that encourage development within the CBRS.

STATUTE	DESCRIPTION
Coastal Barrier Improvement Act of 1990	Reauthorized the Coastal Barrier Resources Act (CBRA), expanded the CBRS to include undeveloped coastal barriers along the Great Lakes and in the Caribbean, and established "Otherwise Protected Areas (OPAs)." The Service is responsible for maintaining official maps, consulting with federal agencies that propose spending federal funds within the CBRS and OPAs, and making recommendations to Congress about proposed boundary revisions.
Coastal Wetlands Planning, Protection, and Restoration (1990)	Authorizes the Director of the Fish and Wildlife Service to participate in the development of a Louisiana coastal wetlands restoration program, participate in the development and oversight of a coastal wetlands conservation program, and lead in the implementation and administration of a national coastal wetlands grant program.
Coastal Zone Management Act of 1972, as amended	Established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans and requires that "any federal activity within or outside of the coastal zone that affects any land or water use or natural resource of the coastal zone" shall be "consistent to the maximum extent practicable with the enforceable policies" of a state's coastal zone management plan. The law includes an Enhancement Grants Program for protecting, restoring, or enhancing existing coastal wetlands or creating new coastal wetlands. It also established the National Estuarine Research Reserve System, guidelines for estuarine research, and financial assistance for land acquisition.
Emergency Wetlands Resources Act of 1986	This Act authorized the purchase of wetlands from Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. The Act requires the Secretary to establish a National Wetlands Priority Conservation Plan, required the states to include wetlands in their Comprehensive Outdoor Recreation Plans, and transfers to the Migratory Bird Conservation Fund amounts equal to import duties on arms and ammunition. It also established entrance fees at national wildlife refuges.
Endangered Species Act of 1973, as amended	Provides for the conservation of threatened and endangered species of fish, wildlife, and plants by federal action and by encouraging the establishment of state programs. It provides for the determination and listing of threatened and endangered species and the designation of critical habitats. Section 7 requires refuge managers to perform internal consultation before initiating projects that affect or may affect endangered species.

STATUTE	DESCRIPTION
Environmental Education Act of 1990	This Act established the Office of Environmental Education within the U.S. Environmental Protection Agency to develop and administer a federal environmental education program in consultation with other federal natural resource management agencies, including the Fish and Wildlife Service.
Estuary Protection Act of 1968	Authorized the Secretary of the Interior, in cooperation with other federal agencies and the states, to study and inventory estuaries of the United States, including land and water of the Great Lakes, and to determine whether such areas should be acquired for protection. The Secretary is also required to encourage state and local governments to consider the importance of estuaries in their planning activities relative to federal natural resource grants. In approving any state grants for acquisition of estuaries, the Secretary was required to establish conditions to ensure the permanent protection of estuaries.
Estuaries and Clean Waters Act of 2000	This law creates a federal interagency council that includes the Director of the Fish and Wildlife Service, the Secretary of the Army for Civil Works, the Secretary of Agriculture, the Administrator of the Environmental Protection Agency and the Administrator for the National Oceanic and Atmospheric Administration. The council is charged with developing a national estuary habitat restoration strategy and providing grants to entities to restore and protect estuary habitat to promote the strategy.
Food Security Act of 1985, as amended (Farm Bill)	The Act contains several provisions that contribute to wetland conservation. The Swampbuster provisions state that farmers who convert wetlands for the purpose of planting after enactment of the law are ineligible for most farmer program subsidies. It also established the Wetland Reserve Program to restore and protect wetlands through easements and restoration of the functions and values of wetlands on such easement areas.
Farmland Protection Policy Act of 1981, as amended	The purpose of this law is to minimize the extent to which federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses. Federal programs include construction projects and the management of federal lands.
Federal Advisory Committee Act (1972), as amended	Governs the establishment of and procedures for committees that provide advice to the federal government. Advisory committees may be established only if they will serve a necessary, nonduplicative function. Committees must be strictly advisory unless otherwise specified and meetings must be open to the public.

STATUTE	DESCRIPTION
Federal Coal Leasing Amendment Act of 1976	Provided that nothing in the Mining Act, the Mineral Leasing Act, or the Mineral Leasing Act for Acquired Lands authorized mining coal on refuges.
Federal-Aid Highways Act of 1968	Established requirements for approval of federal highways through national wildlife refuges and other designated areas to preserve the natural beauty of such areas. The Secretary of Transportation is directed to consult with the Secretary of the Interior and other federal agencies before approving any program or project requiring the use of land under their jurisdiction.
Federal Noxious Weed Act of 1990, as amended	The Secretary of Agriculture was given the authority to designate plants as noxious weeds and to cooperate with other federal, State and local agencies, farmers' associations, and private individuals in measures to control, eradicate, prevent, or retard the spread of such weeds. The Act requires each Federal land-managing agency, including the Fish and Wildlife Service, to designate an office or person to coordinate a program to control such plants on the agency's land and implement cooperative agreements with the states, including integrated management systems to control undesirable plants.
Fish and Wildlife Act of 1956	Establishes a comprehensive national fish, shellfish, and wildlife resources policy with emphasis on the commercial fishing industry but also includes the inherent right of every citizen and resident to fish for pleasure, enjoyment, and betterment and to maintain and increase public opportunities for recreational use of fish and wildlife resources. Among other things, it authorizes the Secretary of the Interior to take such steps as may be required for the development, advancement, management, conservation, and protection of fish and wildlife resources including, but not limited to, research, development of existing facilities, and acquisition by purchase or exchange of land and water or interests therein.
Fish and Wildlife Conservation Act of 1980, as amended	Requires the Service to monitor non-gamebird species, identify species of management concern, and implement conservation measures to preclude the need for listing under the Endangered Species Act.
Fish and Wildlife Coordination Act of 1958	Promotes equal consideration and coordination of wildlife conservation with other water resource development programs by requiring consultation with the Fish and Wildlife Service and the state fish and wildlife agencies where the "waters of a stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted…or otherwise controlled or modified" by any agency under federal permit or license.

STATUTE	DESCRIPTION
Improvement Act of 1978	This act was passed to improve the administration of fish and wildlife programs and amends several earlier laws, including the Refuge Recreation Act, the National Wildlife Refuge System Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out volunteer programs.
Fishery (Magnuson) Conservation and Management Act of 1976	Established Regional Fishery Management Councils comprised of federal and state officials, including the Fish and Wildlife Service. It provides for regulation of foreign fishing and vessel fishing permits.
Freedom of Information Act, 1966	Requires all federal agencies to make available to the public for inspection and copying administrative staff manuals and staff instructions; official, published and unpublished policy statements; final orders deciding case adjudication; and other documents. Special exemptions have been reserved for nine categories of privileged material. The Act requires the party seeking the information to pay reasonable search and duplication costs.
Geothermal Steam Act of 1970, as amended	Authorizes and governs the lease of geothermal steam and related resources on public lands. Section 15 c of the Act prohibits issuing geothermal leases on virtually all Service-administrative lands.
Lacey Act of 1900, as amended	Originally designed to help states protect their native game animals and to safeguard U.S. crop production from harmful foreign species, this Act prohibits interstate and international transport and commerce of fish, wildlife or plants taken in violation of domestic or foreign laws. It regulates the introduction to America of foreign species.
Land and Water Conservation Fund Act of 1948	This Act provides funding through receipts from the sale of surplus federal land, appropriations from oil and gas receipts from the outer continental shelf, and other sources for land acquisition under several authorities. Appropriations from the fund may be used for matching grants to states for outdoor recreation projects and for land acquisition by various federal agencies, including the Fish and Wildlife Service.

STATUTE	DESCRIPTION
Marine Mammal Protection Act of 1972, as amended	The 1972 Marine Mammal Protection Act established a federal responsibility to conserve marine mammals with management vested in the Department of the Interior for sea otter, walrus, polar bear, dugong, and manatee. The Department of Commerce is responsible for cetaceans and pinnipeds, other than the walrus. With certain specified exceptions, the Act establishes a moratorium on the taking and importation of marine mammals, as well as products taken from them.
Migratory Bird Conservation Act of 1929	Established a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. The role of the commission was expanded by the North American Wetland Conservation Act to include approving wetlands acquisition, restoration, and enhancement proposals recommended by the North American Wetlands Conservation Council.
Migratory Bird Hunting and Conservation Stamp Act of 1934	Also commonly referred to as the “Duck Stamp Act,” requires waterfowl hunters 16 years of age or older to possess a valid federal hunting stamp. Receipts from the sale of the stamp are deposited into the Migratory Bird Conservation Fund for the acquisition of migratory bird refuges.
Migratory Bird Treaty Act of 1918, as amended	This Act implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Except as allowed by special regulations, this Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, barter, export or import any migratory bird, part, nest, egg, or product.
Mineral Leasing Act for Acquired Lands (1947), as amended	Authorizes and governs mineral leasing on acquired public lands.
Minerals Leasing Act of 1920, as amended	Authorizes and governs leasing of public lands for development of deposits of coal, oil, gas, and other hydrocarbons; sulphur; phosphate; potassium; and sodium. Section 185 of this title contains provisions relating to granting rights-of-way over federal lands for pipelines.
Mining Act of 1872, as amended	Authorizes and governs prospecting and mining for the so-called “hardrock” minerals (i.e., gold and silver) on public lands.

STATUTE	DESCRIPTION
National and Community Service Act of 1990	Authorizes several programs to engage citizens of the U.S. in full-and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Among other things, this law establishes the American Conservation and Youth Service Corps to engage young adults in approved human and natural resource projects, which will benefit the public or are carried out on federal or Indian lands.
National Environmental Policy Act of 1969	Requires analysis, public comment, and reporting for environmental impacts of federal actions. It stipulates the factors to be considered in environmental impact statements, and requires that federal agencies employ an interdisciplinary approach in related decision-making and develop means to ensure that unqualified environmental values are given appropriate consideration, along with economic and technical considerations.
National Historic Preservation Act of 1966, as amended	It establishes a National Register of Historic Places and a program of matching grants for preservation of significant historical features. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register.
National Trails System Act (1968), as amended	Established the National Trails System to protect the recreational, scenic, and historic values of some important trails. National recreation trails may be established by the Secretaries of Interior or Agriculture on land wholly or partly within their jurisdiction, with the consent of the involved state(s), and other land managing agencies, if any. National scenic and national historic trails may only be designated by Congress. Several national trails cross units of the National Wildlife Refuge System.
National Wildlife Refuge System Administration Act of 1966	Prior to 1966, there was no single federal law that governed the administration of the various national wildlife refuges that had been established. This Act defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of a refuge provided such use is compatible with the major purposes(s) for which the refuge was established.

STATUTE	DESCRIPTION
National Wildlife Refuge System Improvement Act of 1997	This Act amends the National Wildlife Refuge System Administration Act of 1966. This Act defines the mission of the National Wildlife Refuge System, establishes the legitimacy and appropriateness of six priority wildlife-dependent public uses, establishes a formal process for determining compatible uses of Refuge System lands, identifies the Secretary of the Interior as responsible for managing and protecting the Refuge System, and requires the development of a comprehensive conservation plan for all refuges outside of Alaska.
Native American Graves Protection and Repatriation Act of 1990	Requires federal agencies and museums to inventory, determine ownership of, and repatriate certain cultural items and human remains under their control or possession. The Act also addresses the repatriation of cultural items inadvertently discovered by construction activities on lands managed by the agency.
Neotropical Migratory Bird Conservation Act of 2000	Establishes a matching grant program to fund projects that promote the conservation of neotropical migratory birds in the united States, Latin America, and the Caribbean.
North American Wetlands Conservation Act of 1989	Provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, the United States, and Mexico. The North American Wetlands Conservation Council was created to recommend projects to be funded under the Act to the Migratory Bird Conservation Commission. Available funds may be expended for up to 50 percent of the United States' share cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on federal lands).
Refuge Recreation Act of 1962, as amended	This Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife-oriented recreational development or protection of natural resources. It also authorizes the charging of fees for public uses.
Partnerships for Wildlife Act of 1992	Establishes a Wildlife Conservation and Appreciation Fund to receive appropriated funds and donations from the National Fish and Wildlife Foundation and other private sources to assist the state fish and game agencies in carrying out their responsibilities for conservation of non-game species. The funding formula is no more that 1/3 federal funds, at least 1/3 foundation funds, and at least 1/3 state funds.

STATUTE	DESCRIPTION
Refuge Revenue Sharing Act of 1935, as amended	Provided for payments to counties in lieu of taxes from areas administered by the Fish and Wildlife Service. Counties are required to pass payments along to other units of local government within the county, which suffer losses in tax revenues due to the establishment of Service areas.
Rehabilitation Act of 1973	Requires nondiscrimination in the employment practices of federal agencies of the executive branch and contractors. It also requires all federally assisted programs, services, and activities to be available to people with disabilities.
Rivers and Harbors Appropriations Act of 1899, as amended	Requires the authorization by the U.S. Army Corps of Engineers prior to any work in, on, over, or under a navigable water of the United States. The Fish and Wildlife Coordination Act provides authority for the Service to review and comment on the effects on fish and wildlife activities proposed to be undertaken or permitted by the Corps of Engineers. Service concerns include contaminated sediments associated with dredge or fill projects in navigable waters.
Sikes Act (1960), as amended	Provides for the cooperation by the Departments of Interior and Defense with state agencies in planning, development, and maintenance of fish and wildlife resources and outdoor recreation facilities on military reservations throughout the United States. It requires the Secretary of each military department to use trained professionals to manage the wildlife and fishery resource under his jurisdiction, and requires that federal and state fish and wildlife agencies be given priority in management of fish and wildlife activities on military reservations.
Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948	This Act provides that upon determination by the Administrator of the General Services Administration, real property no longer needed by a federal agency can be transferred, without reimbursement, to the Secretary of the Interior if the land has particular value for migratory birds, or to a state agency for other wildlife conservation purposes.
Transportation Equity Act for the 21st Century (1998)	Established the Refuge Roads Program, requires transportation planning that includes public involvement, and provides funding for approved public use roads and trails and associated parking lots, comfort stations, and bicycle/pedestrian facilities.
Uniform Relocation and Assistance and Real Property Acquisition Policies Act (1970), as amended	Provides for uniform and equitable treatment of persons who sell their homes, businesses, or farms to the Service. The Act requires that any purchase offer be no less than the fair market value of the property.

STATUTE	DESCRIPTION
Water Resources Planning Act of 1965	Established Water Resources Council to be composed of Cabinet representatives including the Secretary of the Interior. The Council reviews river basin plans with respect to agricultural, urban, energy, industrial, recreational and fish and wildlife needs. The act also established a grant program to assist States in participating in the development of related comprehensive water and land use plans.
Wild and Scenic Rivers Act of 1968, as amended	This Act selects certain rivers of the nation possessing remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values; preserves them in a free-flowing condition; and protects their local environments.
Wilderness Act of 1964, as amended	This Act directs the Secretary of the Interior to review every roadless area of 5,000 acres or more and every roadless island regardless of size within the National Wildlife Refuge System and to recommend suitability of each such area. The Act permits certain activities within designated wilderness areas that do not alter natural processes. Wilderness values are preserved through a “minimum tool” management approach, which requires refuge managers to use the least intrusive methods, equipment, and facilities necessary for administering the areas.
Youth Conservation Corps Act of 1970	Established a permanent Youth Conservation Corps (YCC) program within the Departments of Interior and Agriculture. Within the Service, YCC participants perform many tasks on refuges, fish hatcheries, and research stations.

EXECUTIVE ORDERS	DESCRIPTIONS
EO 11593, Protection and Enhancement of the Cultural Environment (1971)	States that if the Service proposes any development activities that may affect the archaeological or historic sites, the Service will consult with Federal and State Historic Preservation Officers to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.
EO 11644, Use of Off-road Vehicles on Public Land (1972)	Established policies and procedures to ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands.
EO 11988, Floodplain Management (1977)	The purpose of this Executive Order is to prevent federal agencies from contributing to the "adverse impacts associated with occupancy and modification of floodplains" and the "direct or indirect support of floodplain development." In the course of fulfilling their respective authorities, federal agencies "shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains."
EO 11989 (1977), Amends Section 2 of EO 11644	Directs agencies to close areas negatively impacted by off-road vehicles.
EO 11990, Protection of Wetlands (1977)	Federal agencies are directed to provide leadership and take action to minimize the destruction, loss of degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.
EO 12372, Intergovernmental Review of Federal Programs (1982)	Seeks to foster intergovernmental partnerships by requiring federal agencies to use the state process to determine and address concerns of state and local elected officials with proposed federal assistance and development programs.
EO 12898, Environmental Justice (1994)	Requires federal agencies to identify and address disproportionately high and adverse effects of its programs, policies, and activities on minority and low-income populations.

EXECUTIVE ORDERS	DESCRIPTIONS
EO 12906, Coordinating Geographical Data Acquisition and Access (1994), Amended by EO 13286 (2003). Amendment of EOs and other actions in connection with transfer of certain functions to Secretary of DHS.	Recommended that the executive branch develop, in cooperation with state, local, and tribal governments, and the private sector, a coordinated National Spatial Data Infrastructure to support public and private sector applications of geospatial data. Of particular importance to comprehensive conservation planning is the National Vegetation Classification System (NVCS), which is the adopted standard for vegetation mapping. Using NVCS facilitates the compilation of regional and national summaries, which in turn, can provide an ecosystem context for individual refuges.
EO 12962, Recreational Fisheries (1995)	Federal agencies are directed to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities in cooperation with states and tribes.
EO 13007, Native American Religious Practices (1996)	Provides for access to, and ceremonial use of, Indian sacred sites on federal lands used by Indian religious practitioners and direction to avoid adversely affecting the physical integrity of such sites.
EO 13061, Federal Support of Community Efforts Along American Heritage Rivers (1997)	Established the American Heritage Rivers initiative for the purpose of natural resource and environmental protection, economic revitalization, and historic and cultural preservation. The Act directs Federal agencies to preserve, protect, and restore rivers and their associated resources important to our history, culture, and natural heritage.
EO 13084, Consultation and Coordination With Indian Tribal Governments (2000)	Provides a mechanism for establishing regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications.
EO 13112, Invasive Species (1999)	Federal agencies are directed to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species in a cost effective and environmentally sound manner, accurately monitor invasive species, provide for restoration of native species and habitat conditions, conduct research to prevent introductions and to control invasive species, and promote public education on invasive species and the means to address them. This EO replaces and rescinds EO 11987, Exotic Organisms (1977).

EXECUTIVE ORDERS	DESCRIPTIONS
EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. (2001)	Instructs federal agencies to conserve migratory birds by several means, including the incorporation of strategies and recommendations found in Partners in Flight Bird Conservation plans, the North American Waterfowl Plan, the North American Waterbird Conservation Plan, and the United States Shorebird Conservation Plan, into agency management plans and guidance documents.

Appendix D. Public Involvement

SUMMARY OF PUBLIC SCOPING

Public Listening Session. March 26, 2008. 5 - 9 p.m. - Corozo Community Center
Cabo Rojo, Puerto Rico

Components of the CCP

These are the public comments on the Draft CCP/EA for Cabo Rojo NWR CCP based on the recording at the public listening session. These comments were obtained in Spanish and translated in English. The comments are organized based on the number of people that addressed the same issue within the topic selected, arranged from the item most commented on to topics which received the fewest comments. The number of times a topic was mentioned is indicated in parentheses.

Topics:

Wildlife and Habitat

- Provide a more complete reforestation strategy and itinerary; focus on the use of native species for the reforestation. Focus on propagation of native tree species, especially "Guayacán" in the refuge to reestablish the dry forest habitat. (4 comments)

- Emphasize that hunting is not compatible with the refuge mission of conservation of habitat for endangered bird species. (2 comments)

- Establish a plan for removal of exotic species of animals (i.e., green lizard) in the refuge area and the adjacent areas. (2 comments)

- Use markers to identify the high tension electric cables that are between Candelaria and Fraternidad Lagoons to protect migratory birds. (1 comment)

- Establish a water level management plan of the Fraternidad and Candelaria Lagoons for migratory birds. (1 comment)

Public Use, Recreation, and Outreach

- Provide better means of promotion of the activities of the refuge in the schools of the community. (5 comments)

- Reestablish vehicle access, partial or complete, to the Combate Beach area. (5 comments)

- Reopen the parking area of the Combate Beach, especially on the weekends and during summer season. (5 comments)

- Establish better signs and information kiosks that include: refuge boundary, compatible uses of the refuge, and hours of operation, refuge property, rules and regulations, and law enforcement of endangered species. (3 comments)

- Establish a camping area in the refuge for the boy and girl scouts and the community organizations to enjoy the refuge wildlife. (3 comments)

- Document information on the historic areas of the refuge, including the salt flats area.

- Promote compatible uses of the refuge (i.e., hiking, biking) to the community. (3 comments)

Partnerships and Friends Group

- Establish a cooperative effort between the municipality of Cabo Rojo and the Cabo Rojo NWR to: control surface water runoff of the Corozo community to the refuge area, use municipality public broadcast systems to promote refuge activities and mission, and manage the parking area of the Combate Beach to make it accessible to the public. (7 comments)

- Establish better communication between the Cabo Rojo NWR and Puerto Rico DNR. These issues include: waste management in the beach area, parking access, reforestation, and boundary management. (7 comments)

- Promote the Combate Beach parking to be managed by volunteers or Friends Group. (3 comments)

- Establish better communication with public and private school teachers in the community to provide outreach and education in the conservation of the natural resources. (3 comments)

- Provide better agency support for the community in the development of projects that affect areas near the refuge. (3 comments)

- Promote more scientific research on the Cabo Rojo NWR. (1 comment)

Law Enforcement

- Provide better coordination (listening methods) between law enforcement officers and community. (3 comments)

- Provide better security in the refuge area in conjunction with state and local police, Puerto Rico DNR rangers, and Service law enforcement. (2 comments)

Volunteers

- Include volunteers in the reforestation plan, especially children from the Corozo community. (3 comments)

Fire Management

Others

- Use more effective promotion methods (i.e., flyers, handouts, public speakers) to keep public informed.

DRAFT CCP/EA COMMENTS AND SERVICE RESPONSES
CABO ROJO

This appendix summarizes all comments that were received on the Draft CCP/EA for Cabo Rojo NWR. Public comments on this document were accepted from May 2 to June 2, 2011.

Four people submitted comments either in writing or at public forums held on May 18, 2011. More than one individual represented some agencies or organizations.

PUBLIC FORUMS

The notice of availability for a 30-day public review of the Cabo Rojo NWR Draft CCP/EA was published in the *Federal Register* on May 2, 2011. All individuals on the CCP mailing list were notified by postal mail or e-mail of the upcoming public review period. The Draft CCP/EA was also available for review on the Southeast Region's Internet planning site. A news release was sent to 85 news media sources, including newspapers, television, radio, and web media sites. Periodico Estrella and Periodico Vision printed the news release on Monday May 26, 2011. Also, online newspaper Primera Hora and Online web news Revisita Atabey posted the news release. Refuge manager Oscar Díaz announced the meeting during a radio interview on May 16, 2011, on Radio Paraiso (FM 92.7). Additionally, the refuge distributed 300 flyers to the nearby community and posted others at businesses and public places.

The refuge and planning staffs hosted a public forum on May 18, 2011, at the Cabo Rojo community building (the town in which the refuge headquarters is located). The forum began at 5:30 p.m. and concluded at 7:30 p.m., with 16 people in attendance. The forum started as an open house with the refuge staff available to discuss the Draft CCP/EA and refuge operations. A 30-minute formal presentation was then given, followed by a facilitated discussion to solicit open-floor comments.

AFFILIATIONS OF RESPONDENTS

The table below identifies the names and affiliations of respondents who commented on the Draft CCP/EA, either in writing or at the public forum.

Name of Respondent	Affiliation
Gabriel Lugo	TROPICBIRDS, Birding in Puerto Rico
José Juan Terrasa-Soler	Puerto Rico Tourism Company
Daniel J. Galan-Kercado	Puerto Rico Department of Natural and Environmental Resources
Ruben Flores Marzan	Puerto Planning Board

The number of affiliations represented in the above table can be summarized as follows: one comment from a non-governmental organization, one letter from the Puerto Rico Tourism Company and two letters from a Puerto Rican government agency.

COMMENT MEDIA

The types of media used to deliver the comments received by the refuge and planning staffs are categorized as follows: one e-mail and one letter.

GEOGRAPHIC ORIGIN OF RESPONDENTS

The geographic origin of the individual respondents who submitted comments is Puerto Rico.

SUMMARY OF CONCERNS AND THE SERVICE'S RESPONSES

The public comments received addressed the concerns indicated below. The Service's response to each concern is also summarized below.

Comment:
(Translated into English)

First and most important, I think that for more than 30 years bird censuses have been carried out at the Cabo Rojo Salt Flats. I can't understand how the bird list on the biota table is so deficient. Birds, as common as the great egret, are not included as well as the clapper rail, among others. You should look at the Puerto Rico Ornithological Society data and check with various volunteers that have done censuses at the Cabo Rojo Salt Flats.

My greatest worry is that there is no public control to nesting areas used by snowy plovers, least terns and Antillean nighthawks. The last is not listed on the entire document as a nesting species on the Salt Flats. Although I understand this problem will be addressed, the agency must be strict when providing access to people not informed about the reproductive behavior of these birds. I hope that the creation of islands on the lagoons to provide nesting habitat, as has been mentioned, gets done. There is a need to reactivate the shiny cowbird control program, to help the yellow-shouldered blackbird to continue to have sustainable populations, as well as the yellow warbler populations to get out of the difficult situation it is going through. Stray dogs on the Salt Flats need to be controlled and refuge patrols need to increase.

Service Response: Comment noted. Refer to Appendix I for a complete and updated Biota list. Objective 1.2 and 1.3 in the document address the protection of threatened and endangered Species and snowy plovers.

Comment:
The Puerto Rico Tourism Company is a public corporation created by the Government of Puerto Rico to foster, enhance, and regulate the tourism industry in our islands, as per Law Numbers 10 and 24, June 1970, as amended.

The Cabo Rojo NWR is administered by the Service and among the ecosystems of importance within it there are 1,249 acres of Cabo Rojo Salt Flats. The ecological importance of the Cabo Rojo NWR includes serving as important wintering habitat for migratory birds.

Law Number 254 of November 30, 2006, established as the public policy of the Government of Puerto Rico the development of sustainable tourism, including fostering eco-tourism and nature tourism offerings in the islands. The Puerto Rico Tourism Company sees eco-tourism as an instrument of economic development for local communities and as a way of protecting precious landscape values and scenic and natural resources.

The Puerto Rico Tourism Company believes that the scenic beauty and natural resources of the Cabo Rojo NWR, along with other protected lands in the southwestern municipalities of Puerto Rico, make this area of prime importance for the development of eco-tourism and nature tourism.

The Puerto Rico Tourism Company agrees with the vision of the Draft CCP/EA for Cabo Rojo NWR in that it should be "managed in partnership with community and other resource management agencies to: (1) Protect and restore subtropical dry forests; (2) protect and restore resident and migratory shorebirds and their habitats; and (3) provide wildlife-dependent recreational opportunities."

We are pleased that the Draft CCP/EA takes into consideration the importance of recreational use within the Cabo Rojo NWR. The objectives delineated in pages 57-59 of the Draft CCP/EA will increase the enjoyment of visitors while promoting economic benefits to the area. If requested, we are willing to help the Service on strategies to optimize the visitation experience at Cabo Rojo NWR.

Besides protecting ecosystems and providing economic benefits, eco-tourism has a strong component of community involvement. The Draft CCP/EA goes along with this definition of eco-tourism by relying on volunteers to provide part of the visitation services. However, these volunteers are not necessarily from communities nearby the refuge.

Currently, we are spearheading, along with the municipality of Rio Grande, the USDA Forest Service, and other government agencies, the Economic Development Plan for the Township of Palmer. This plan seeks to turn Palmer into a "Gateway Community" for the El Yunque National Forest. The Gateway Community will benefit from the flow of tourists that visit El Yunque by providing services to visitors (restaurants, souvenir shops, etc.). The Gateway Community model has been successful in other U.S. jurisdictions, such as Bar Harbor, Maine (Acadia National Park), Seward, Alaska (Kenai Fjords National Park and Kenai NWR), and Jackson Hole, Wyoming (Grand Teton National Park). We view the Gateway Community as a model that can be implemented in other areas of Puerto Rico where there are communities near protected lands.

We recognize that the visitation rate to El Yunque is vastly superior to that of the Cabo Rojo NWR; however, we believe that the feasibility of implementing a Gateway Community in the El Corozon/Pole Ojea community should be studied. Even though the Service would not be the agency in charge of implementing a Gateway Community economic model at El Corozo/Pole Ojea, as the steward of the Cabo Rojo NWR, its participation and cooperation would be needed.

We believe that the Draft CCP/EA should not be limited to saying that the implementation of the Finaol CCP will not have any negative impacts on the nearby communities; they should also address and discuss how the Cabo Rojo NWR will economically benefit the nearby community of El Corozo/Pole Ojea.

Even though it is not on the road to the Cabo Rojo NWR, the community of El Combate is on its northern edge. The Draft CCP/ EA should also discuss how it will benefit this community. Regarding the issue of crowds of vacationers that spill over from Combate to the beaches along

the coasts of the Cabo Rojo NWR (page 45), we believe that the Department of Natural and Environmental Resources (DNER), the Puerto Rico Tourism Company, and the Service should collaborate to establish a framework of usage for those beaches. The framework should strive to conserve the integrity of the refuge's ecosystems while respecting societal expectations in Puerto Rico that establish that beaches are for public use.

Service Response: Comment noted. Objective 5.6 was added to the document to address this comment as well as the addition to Chapter V, Project 11.

Comment: Projects and management plans proposed for the refuge to address, among other things, are habitat and natural resource management, as well as public order and improving service opportunities for visitors. For that reason, we are willing to work with the Service in implementing the objectives and strategies aimed to monitor and protect threatened and endangered species, including but not limited to, sea turtles nesting at the beaches of the Cabo Rojo NWR. Likewise, we are willing to work with the Service in formalizing cooperative management agreements which may be necessary to maintain the ecological integrity of the natural, historical, and cultural resources of the site, and to provide for the protection and safety of visitors and the refuge facilities.

Service Response: Comment noted.

Comment: We recommend adding a buffer zone as part of the refuge delimitation area to include habitats identified and proposed for designation by the Puerto Rico DNER as Critical Habitat for the endangered species *Agelaius xanthomus* (yellow-shouldered blackbird) and *Anolis cooki* (dry forest Lizard). This is an important step to protect threatened habitats and species with greatest conservation needs from human actions such as disturbance, residential developments, agricultural practices, invasive species introductions and establishment, among other actions nearby the refuge.

Service Response: Comment noted. The refuge manager is aware of the efforts made by the DNER to delineate buffer areas around critical areas (some federally designated under the Endangered Species Act) of several wildlife species (some federally listed, but other state listed only). On the specific case of the federally listed yellow-shouldered blackbird, a buffer zone needs to be included along a certain portion of its perimeter. On other cases, Puerto Rico DNER has designated critical habitat for species they considered to be endangered, although this critical habitat designation by the state does not get enforced effectively.

Comment: We recommend considering the following species with greatest conservation needs and ecological characteristics as part of the conservation strategies mentioned in Section IV of the Draft CCP/EA: (1) *Anolis cooki* (dry forest lizard) - State and federal protection, listed this lizard as an endangered species. It is found in the evergreen coastal dry forests of southern Puerto Rico. At present, the species is distributed in fragmented areas from the southwest coast of Cabo Rojo, coastal areas of Guanica State Dry Forest through Guayanilla Bay. Cabo Rojo is one of the municipalities with the highest population size of the species. This species was identified as a critical element by the Puerto Rico DNER Natural Heritage Division. (2) *Caprimulgus noctiterus* (Puerto Rican nightjar) - State protection, listed this bird as an endangered species. It is found in coastal dry forest with continuous canopy in southwest Puerto Rico. The species is distributed from Cabo Rojo (Sierra Bermeja) through Penuelas. It has been identified as a critical element by the Puerto Rico DNER Natural Heritage Division.

Service Response: Anolis cooki is not listed as a federal endangered species, nor does it have Critical Habitat Designation under the Endangered Species Act. A strategy was added to Objective 1.2 that states: Partner with Puerto Rico DNER to manage species of greater conservations needs like the dry rorest lizard (Anolis cooki) and the Puerto Rican nightjar (Caprimulgus noctiterus) on areas adjacent to the refuge where the species is known to occur or suitable habitat exists.

Comment: A list of plant species considered for habitat restoration should be submitted to the Puerto Rico DNER for evaluation and recommendations. This is critical to promote the benefit of target species in terms of the nesting, forage behavior, and other important ecological resources needed.

Service Response: Comment noted.

Comment: As part of the reforestation program, we suggest to consider historical habitat associations used by species identified as species of greatest conservation needs and as critical elements by the Puerto Rico DNER Natural Heritage Division (i.e., *A. xanthomus, A. cooki, C. noctiterus*). For instance, the planting of native palms (*Cocos nucifera, Roystonea borincana, Sabal causiarum*) and *Coccoloba uvifera* will create an ecological corridor providing a nesting and feeding habitat for *A.* xanthomus, as well as for other wildlife species with conservation priority.

Service Response: Comment noted. Strategies were added to Objective 2.4. (1) Consider historical plant associations used by federal and state listed wildlife species on reforestation efforts to promote the recovery of these species. (2) When appropriate, use native plants and species identified as critical elements by the Puerto Rico DNER Natural Heritage Division for reforestation programs.

Comment: We recommend considering rhesus *(Macaca mulatta)* and patas *(Erythrocebus patas)* primates species *as* species to be controlled within the refuge. This action should be conducted in collaboration with the Puerto Rico DNER Primate Control Program.

Service Response: Comment noted. Rhesus monkeys (*Maccaca Mulatta*) are not known to occur on Cabo Rojo NWR. A strategy was added to Objective 1.5 to continue working with the Puerto Rico DNER Primate Control Program to control feral monkeys (*Erytrocebus patas*) within the refuge.

Comment: Conduct a population control of the shiny cowbird *(Molothvus bonariensis)* within the refuge. This species has been identified as a major threat to the yellow-shouldered blackbird and other species of wildlife.

Service Response: Comment noted. A strategy was added to Objective 1.5 to collaborate with Puerto Rico DNER and initiate a control program for shiny cowbird (*Molothrus bonariensis*) within refuge boundaries.

Comment: According to Figure 2 of the boundary of the municipality of Cabo Rojo NWR, part of the lagoon is out of the refuge boundary and this has not been explained in the document.

Service Response: Comment noted. Both Candelaria and Fraternidad Lagoons are part of the refuge and they are within the boundaries of the refuge.

Comment: The Puerto Rico DNER is working on a Special Planning Area (SPA). The document does not mention this SPA and the partnering between the agencies.

Service Response: Comment noted. An additional strategy was added to Objective 5.3 that states: The Service will offer its participation to the state, federal, or municipal government in the development of any regional or local planning efforts that include the refuge within its scope of such effort.

Comment: Please specify if the Service has the intention to acquire additional land on this area in the future.

Service Response: The Service is always willing to acquire lands with great wildlife value that become available in the future from willing sellers only.

Comment: Please specify if the Service reviewed the Cabo Rojo Municipal Land Use Plan.

Service Response: Although the refuge did not receive a copy of the Cabo Rojo Municipal Land Use Plan, we provided information to the municipality of Cabo Rojo when it was developing the plan, and presented a presentation to the Municipal Legislature about the planning process the Service would follow in developing the Cabo Rojo CCP.

Appendix E. Appropriate Use Determinations

Cabo Rojo NWR Appropriate Use Determinations

An appropriate use determination is the initial decision process a refuge manager follows when first considering whether or not to allow a proposed use on a refuge. The refuge manager must find that a use is appropriate before undertaking a compatibility review of the use. This process clarifies and expands on the compatibility determination process by describing when refuge managers should deny a proposed use without determining compatibility. If a proposed use is not appropriate, it will not be allowed and a compatibility determination will not be undertaken.

Except for the uses noted below, the refuge manager must decide if a new or existing use is an appropriate refuge use. If an existing use is not appropriate, the refuge manager will eliminate or modify the use as expeditiously as practicable. If a new use is not appropriate, the refuge manager will deny the use without determining compatibility. Uses that have been administratively determined to be appropriate are:

- Six wildlife-dependent recreational uses - As defined by the National Wildlife Refuge System Improvement Act of 1997, the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) are determined to be appropriate. However, the refuge manager must still determine if these uses are compatible.

- Take of fish and wildlife under state regulations - States have regulations concerning take of wildlife that includes hunting, fishing, and trapping. The Service considers take of wildlife under such regulations appropriate. However, the refuge manager must determine if the activity is compatible before allowing it on a refuge.

Statutory Authorities for this policy:

National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd-668ee. This law provides the authority for establishing policies and regulations governing refuge uses, including the authority to prohibit certain harmful activities. The Act does not authorize any particular use, but rather authorizes the Secretary of the Interior to allow uses only when they are compatible and "under such regulations as he may prescribe." This law specifically identifies certain public uses that, when compatible, are legitimate and appropriate uses within the Refuge System. The law states ". . . it is the policy of the United States that . . .compatible wildlife-dependent recreation is a legitimate and appropriate general public use of the System . . .compatible wildlife-dependent recreational uses are the priority general public uses of the System and shall receive priority consideration in refuge planning and management; and . . . when the Secretary determines that a proposed wildlife-dependent recreational use is a compatible use within a refuge, that activity should be facilitated . . . the Secretary shall . . . ensure that priority general public uses of the System receive enhanced consideration over other general public uses in planning and management within the System . . . ." The law also states "in administering the System, the Secretary is authorized to take the following actions: . . . issue regulations to carry out this Act." This policy implements the standards set in the Act by providing enhanced consideration of priority general public uses and ensuring other public uses do not interfere with our ability to provide quality, wildlife-dependent recreational uses.

Refuge Recreation Act of 1962, 16 U.S.C. 460k. The Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife oriented recreational development or protection of natural resources. It also authorizes the charging of fees for public uses.

Other Statutes that Establish Refuges, including the Alaska National Interest Lands Conservation Act of 1980 (ANILCA) (16 U.S.C. 410hh - 410hh-5, 460 mm - 460mm-4, 539-539e, and 3101 - 3233; 43 U.S.C. 1631 et seq.).

Executive Orders. The Service must comply with Executive Order 11644 when allowing use of off-highway vehicles on refuges. This order requires the Service to designate areas as open or closed to off-highway vehicles in order to protect refuge resources, promote safety, and minimize conflict among the various refuge users; monitor the effects of these uses once they are allowed; and amend or rescind any area designation as necessary based on the information gathered. Furthermore, Executive Order 11989 requires the Service to close areas to off-highway vehicles when it is determined that the use causes or will cause considerable adverse effects on the soil, vegetation, wildlife, habitat, or cultural or historic resources. Statutes, such as ANILCA, take precedence over executive orders.

Definitions:

Appropriate Use
A proposed or existing use on a refuge that meets at least one of the following four conditions.

1) The use is a wildlife-dependent recreational use as identified in the Improvement Act.
2) The use contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act was signed into law.
3) The use involves the take of fish and wildlife under state regulations.
4) The use has been found to be appropriate as specified in section 1.11.

*Native American***.** American Indians in the conterminous United States and Alaska Natives (including Aleuts, Eskimos, and Indians) who are members of federally recognized tribes.

Priority General Public Use. A compatible wildlife-dependent recreational use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Quality. The criteria used to determine a quality recreational experience include:

- Promotes safety of participants, other visitors, and facilities.
- Promotes compliance with applicable laws and regulations and responsible behavior.
- Minimizes or eliminates conflicts with fish and wildlife population or habitat goals or objectives in a plan approved after 1997.
- Minimizes or eliminates conflicts with other compatible wildlife-dependent recreation.

- Minimizes conflicts with neighboring landowners.
- Promotes accessibility and availability to a broad spectrum of the American people.
- Promotes resource stewardship and conservation.
- Promotes public understanding and increases public appreciation of America's natural resources and the Service's role in managing and protecting these resources.
- Provides reliable/reasonable opportunities to experience wildlife.
- Uses facilities that are accessible and blend into the natural setting.
- Uses visitor satisfaction to help define and evaluate programs.

Wildlife-Dependent Recreational Use**.** As defined by the Improvement Act, a use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cabo Rojo National Wildlife Refuge

Use: All-terrain Vehicles

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described
in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?		X
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		X
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?		X
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		X

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with Territorial fish and wildlife agency. **Yes** _X_ **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.
Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate X **Appropriate** ____

Refuge Manager: Signed _____ Date: Aug 31/2011

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: for Signed _____ Date: 9/5/11

A compatibility determination is required before the use may be allowed.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cabo Rojo National Wildlife Refuge

Use: Camping (associated with EE, Interpretation, and Conservation Projects)

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described
in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. **Yes _X_ No __**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate __X__**

Refuge Manager: Signed _____ Date: Aug. 31/2011

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: For Signed _____ Date: 9/3/11

A compatibility determination is required before the use may be allowed.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cabo Rojo National Wildlife Refuge

Use: Geocaching

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described
in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		X
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?		X
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		X

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with Territorial fish and wildlife agency. **Yes** _X_ **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_ X_ **Appropriate** ____

Refuge Manager: Signed _____ Date: Aug 31/2011

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: for Signed _____ Date: 9/5/11

A compatibility determination is required before the use may be allowed.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cabo Rojo National Wildlife Refuge

Use: Bicycling, Hiking, Walking, and Jogging

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described
in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with Territorial fish and wildlife agency. **Yes** X **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** __X_

Refuge Manager: Signed _____ Date: Aug. 31/2011

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: for Signed _____ Date: 9/5/11

A compatibility determination is required before the use may be allowed.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cabo Rojo National Wildlife Refuge

Use: Research, Investigation, Surveys, and Monitoring

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described
in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	x	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	x	
(c) Is the use consistent with applicable executive orders and Department and Service policies?	x	
(d) Is the use consistent with public safety?	x	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	x	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	x	
(g) Is the use manageable within available budget and staff?	x	
(h) Will this be manageable in the future within existing resources?	x	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	x	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	x	

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with Territorial fish and wildlife agency. **Yes** X **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** __X__

Refuge Manager: Signed _____ Date: Aug. 31/2011

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: for Signed _____ Date: 9/5/11

A compatibility determination is required before the use may be allowed.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cabo Rojo National Wildlife Refuge

Use: Commercial Harvesting of Sea Salt

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described
in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with Territorial fish and wildlife agency. **Yes** _X_ **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** _X___

Refuge Manager Signed _____ Date: Aug. 31/2011

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: Signed _____ Date: 9/5/11

A compatibility determination is required before the use may be allowed.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cabo Rojo National Wildlife Refuge

Use: Horseback Riding

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described
in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		X
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?		X
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		X

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with Territorial fish and wildlife agency. **Yes** X **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate X **Appropriate** ___

Refuge Manager: Signed _____ Date: Aug. 31/2011

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: for Signed _____ Date: 9/5/11

A compatibility determination is required before the use may be allowed.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cabo Rojo National Wildlife Refuge

Use: Access to Fishing and to the Fishermen Village

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described
in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. **Yes _X_ No __**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** __X__

Refuge Manager: Signed _____ Date: Aug. 31/2011

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: For Signed _____ Date: 9/5/11

A compatibility determination is required before the use may be allowed.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cabo Rojo National Wildlife Refuge

Use: Having

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described
in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be use be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with Territorial fish and wildlife agency. **Yes** _X_ **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate **Appropriate** __X__

Refuge Manager: Signed _____ Date: Aug 31/2011

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: for Signed _____ Date: 9/5/11

A compatibility determination is required before the use may be allowed.

Appendix F. Compatibility Determinations

Cabo Rojo National Wildlife Refuge Compatibility Determination

Uses: The following uses were found to be appropriate and evaluated to determine their compatibility with the mission of the Refuge System and the purposes of the refuge.

1. Access to Seashore Fishing and Fishermen Facility
2. Research, Investigations, Surveying, and Monitoring
3. Camping (associated with Environmental Education, Interpretation, and Conservation Projects)
4. Commercial Harvesting of Sea Salt
5. Wildlife Observation, Wildlife Photography, and Environmental Education and Interpretation
6. Bicycling, Hiking, Walking, and Jogging
7. Haying

Refuge Name: Cabo Rojo National Wildlife Refuge.

Date Established: 1974.

Establishing and Acquisition Authority: The Cabo Rojo NWR was established in 1974 when 587 acres of upland habitat were obtained from the Central Intelligence Agency. Actual protection and restoration of the area began in 1978, with the hiring of the first manager. In 1999, 1,269 acres of salt flats, mangrove fringe, and uplands were purchased from the Carrera family, bringing the total to 1,856 acres.

Refuge Purpose: The purpose of the Cabo Rojo NWR is: (1) To operate a management program to conserve and enhance its particular value in carrying out the national migratory bird management program; and (2) conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans (16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act).

National Wildlife Refuge System Mission:

The mission of the Refuge System, as defined by the National Wildlife Refuge System Improvement Act of 1997, is:

> *... to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.*

Other Applicable Laws, Regulations, and Policies:

Antiquities Act of 1906 (34 Stat. 225)
Migratory Bird Treaty Act of 1918 (15 U.S.C. 703-711; 40 Stat. 755)
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715r; 45 Stat. 1222)
Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-178h; 48 Stat. 451)
Criminal Code Provisions of 1940 (18 U.S.C. 41)
Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d; 54 Stat. 250)
Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686)
Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat.1119)
Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)
Wilderness Act (16 U.S.C. 1131; 78 Stat. 890)
Land and Water Conservation Fund Act of 1965
National Historic Preservation Act of 1966, as amended (16 U.S.C. 470, et seq.; 80 Stat. 915)
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd, 668ee; 80 Stat. 927)
National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq; 83 Stat. 852)
Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended
by Executive Order 10989)
Endangered Species Act of 1973 (16 U.S.C. 1531 et seq; 87 Stat. 884)
Refuge Revenue Sharing Act of 1935, as amended in 1978 (16 U.S.C. 715s; 92 Stat. 1319)
National Wildlife Refuge Regulations for the Most Recent Fiscal Year
(50 CFR Subchapter C; 43 CFR 3101.3-3)
Emergency Wetlands Resources Act of 1986 (S.B. 740)
North American Wetlands Conservation Act of 1990
Food Security Act (Farm Bill) of 1990 as amended (HR 2100)
The Property Clause of the U.S. Constitution Article IV 3, Clause 2
The Commerce Clause of the U.S. Constitution Article 1, Section 8
The National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, USC668dd)
Executive Order 12996, Management and General Public Use of the
National Wildlife Refuge System. March 25, 1996
Title 50, Code of Federal Regulations, Parts 25-33
Archaeological Resources Protection Act of 1979
Native American Graves Protection and Repatriation Act of 1990

Compatibility determinations for each description listed were considered separately. Although for brevity, the preceding sections from “Uses” through “Other Applicable Laws, Regulations and Policies” and the succeeding sections, “Literature Cited,” “Public Review,” and the “Approval of Compatibility Determinations” are only written once within the CCP, they are part of each descriptive use and become part of that compatibility determination if considered outside of the CCP.

Use: Access to Seashore Fishing and Fishermen Facility

The Boquerón State Forest surrounds the refuge lands facing the Caribbean Sea on the salt flats. On that strip of land, from refuge boundary to the beach, the Service is mandated by commonwealth law to provide public access to people who use the beach for recreation and/or fishing. Fishing has been a traditional activity of the local communities near the refuge. In fact, one of the communities has its fishermen facilities located adjacent to the refuge boundary south of Laguna Fraternidad. A Service road provides access for those fishermen and the general public to their fishing facilities and their boats.

Another visited fishing site is located along the southeast end of Combate Beach to a point called Punta Aguila (Eagle's Point). People access this point walking along the Combate Beach and hiking along the bike trail south of Candelaria Lagoon. Fishing from the shore in Puerto Rico is mostly done during the night, so these accesses are open to the public year-round by foot only.

Availability of Resources: Access to the shoreline has been allowed to the public since these lands were acquired. Roads, access trails, parking lots, signs, and other infrastructure, as well as staff to enforce regulations and maintain these facilities, have been provided by the Service. Improvement projects to the main road and bridge to access the fishermen facilities, as well as to the bicycling trail, are expected to be completed in the near future. The continuation of this use will not require a significant increase in additional maintenance or enforcement staff expenditures.

Anticipated Impacts of the Use: Littering along trails and roads is an expected negative impact, but is unlikely to increase in the future. Maintenance of these accesses is a common activity of refuge staff. With the projected and already funded improvement projects for the roads and trails, it is reasonable to expect more visitation but users might have an additional stimulus to keep these clean and enjoyable for others.

Public Review and Comments: The notice of availability for a 30-day public review of the Cabo Rojo NWR Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) was published in the *Federal Register* on May 2, 2011. All individuals on the CCP mailing list were notified by postal mail or e-mail of the upcoming public review period. The Draft CCP/EA was also available for review from the Service's Internet site. A news release was sent to 85 news media sources, including newspapers, television, radio, and web media sites. Periodico Estrella and Periodico Vision printed the news release on Monday, May 26, 2011. Online newspaper Primera Hora and Online web news Revisita Atabey posted the news release. Refuge Manager, Oscar Díaz, announced the meeting during a radio interview on May 16, 2011, on Radio Paraiso (FM 92.7). Appendix D summarizes the public comments.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: The Service will monitor the potential increase on negative impacts caused by users entering fishing sites and will correct immediately any problems that may arise. Law enforcement patrol will continue to provide for public safety and resource conservation. Fishermen must comply with all applicable state and refuge fishing regulations. Access to fishing sites along the Combate Beach is by foot only.

Justification: The National Wildlife Refuge System Improvement Act of 1997 identified fishing, among other wildlife-dependent uses, as an activity that the Service should provide and expand on refuges. It is through permitted, compatible public uses, such as these, that the public becomes aware of and provides support for national wildlife refuges. Allowing public access through refuge lands to fishing sites along the sea shoreline will provide for improved support of the Service's mission to protect natural resources.

NEPA Compliance for Refuge Use Description: *Place an X in appropriate space.*

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-year Re-evaluation Date: 9/22/2022

Description of Use: Research, Investigations, Surveying, and Monitoring

Research studies, wildlife surveying, monitoring, and scientific collections are conducted by local, state, or federal agencies; local schools, technical colleges, and universities; nonprofit organizations; and private, for profit research companies on the refuge when the refuge acts solely in an administrative role. The access and assistance provided by the refuge may range from minimal to substantial depending on the benefits to the Service. This includes data gathering for hypothesis testing, modeling, monitoring, and surveying. This use also includes permitting the collection of animals, fish, plants, soils, and water for monitoring and research purposes. The research and collection activities will vary in scope and duration to satisfy the requirements of the research project or survey. Projects may involve everything from a limited one-time sampling or survey to long-term study projects.

Scientific research studies will be accommodated for the purpose of properly administering the refuge, supporting the refuge's establishing purpose, advancing the mission of the Refuge System, and protecting the health, biological integrity, diversity of ecosystems, and the health and safety of the public. The objective of authorizing this use is to gain better knowledge of our natural resources and improve methods to manage, monitor, and protect refuge resources and the public.

All animals will be captured, handled, released, and collected following the best scientific practices and standards established by respected scientific societies, as well as the Service's policies and guidelines for scientific collecting and research.

All research studies will be evaluated and if deemed beneficial, a special use permit will be issued as an agreement between the researcher and the refuge. The permit will outline the guidelines that the researcher must follow while conducting research on the refuge. In addition to the general conditions and requirements of the special use permits, specific conditions may be added as appropriate.

Availability of Resources: Refuge lands have been opened to the public since they were acquired. Thus, roads, access trails, parking lots, signs, and other infrastructure, as well as staff to enforce regulations and maintain these facilities, have been provided by the Service. Since the Service's Ecological Services field office and the NOAA-National Marine Fisheries office are co-located with the Service headquarters on the refuge, scientists and investigators can benefit from the scientific staff located in these offices. These uses do not require a significant increase in additional maintenance and law enforcement staff expenditures.

Anticipated Impacts of the Use: Short-term impacts: There should be no significant adverse impacts from scientific research, because each proposal will be reviewed when received, before the researcher is issued a special use permit. Factors such as project purpose, data collection methods, number of researchers, transportation, project duration, and location of access points will determine the extent of effects on the refuge. For long-term research projects, appropriateness and consistency with the Service's policies and regulations will be conducted annually. The knowledge gained from the research activities will provide information towards improving management techniques for trust resource species. Impacts such as trampling vegetation, removal of small numbers of plants and/or animals, and temporary disturbance to wildlife could occur, but should not be significant.

Long-term impacts: Long-term benefits associated with species' population trends and improved management techniques will outweigh any negative impacts that occur.

Public Review and Comments: The notice of availability for a 30-day public review of the Cabo Rojo NWR Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) was published in the *Federal Register* on May 2, 2011. All individuals on the CCP mailing list were notified by postal mail or e-mail of the upcoming public review period. The Draft CCP/EA was also available for review from the Service's Internet site. A news release was sent to 85 news media sources, including newspapers, television, radio, and web media sites. Periodico Estrella and Periodico Vision printed the news release on Monday, May 26, 2011. Online newspaper Primera Hora and Online web news Revisita Atabey posted the news release. Refuge Manager, Oscar Díaz, announced the meeting during a radio interview on May 16, 2011, on Radio Paraiso (FM 92.7). Appendix D summarizes the public comments.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Each request for any of these uses on the refuge will be examined on its individual merits. A Service official will determine if the requested proposal contributes to the refuge purposes and could be best conducted on the refuge without significantly affecting the resources. If so, the researcher will be issued a special use permit that will clearly define allowable activities under general and/or special conditions. Progress will be monitored through annual reports. The success and usefulness of the data will be evaluated through final reports, and through chronicles in publications derived from the research.

The following stipulations apply to special use permits issued for scientific research. Monitoring authorized research activities will ensure compliance with the permit's general and special conditions.

The permittee is responsible for ensuring that all employees, party members, and any other persons working for the permittee and conducting activities allowed by the permit are familiar with and adhere to the conditions of the permit.

The permit may be cancelled or revised at any time by the refuge manager in case of emergency, unsatisfactory compliance, or determination of incompatibility with the purpose of the refuge.

In accordance with the Archaeological Resources Protection Act (16 U.S.C. 470aa), the removal or disturbance of archaeological or historic artifacts is prohibited. The excavation, disturbance, collection, or purchase of historical, ethnological, or archaeological specimens or artifacts are prohibited.

All waste materials and markers must be removed from the refuge upon the permittee's departure.

Construction of temporary structures is prohibited unless prior approval is obtained.
All animals and fish shall be captured, handled, released, and collected following the best scientific practices and standards established by respected scientific societies, as well as the Service's policies and guidelines for scientific collecting and research.

Justification: The benefits derived from scientific research provide a better understanding of resources on the refuge and surrounding area. This knowledge becomes valuable in managing natural systems, establishing thresholds, identifying threats, and better understanding the species and the environmental communities present on the refuge. Research projects will be designed to minimize impacts and disturbance.

NEPA Compliance for Refuge Use Description: *Place an X in appropriate space.*

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-year Re-evaluation Date: 9/22/2022

Description of Use: Camping (associated with Environmental Education, Interpretation, and Conservation Projects)

Camping has been allowed historically on the refuge when it is associated with conservation projects or environmental education and interpretation activities. These can be Boy or Girl Scouts (15-25 participants) traveling from far away who are working toward the fulfillment of advance ranks (Eagle Scouts projects and merit badges) or are doing volunteer work to help on conservation projects (e.g., planting trees, maintaining trails, and painting and reconditioning structures) on the refuge. Most of this use occurs during long weekends or during off-school seasons (December; mid-May to mid-August). Requests for this use are evaluated and conducted and if the use is determined to be beneficial, a special use permit is issued.

Availability of Resources: Refuge lands have been opened to the public since they were acquired. Thus, roads, access trails, parking lots, signs, and other infrastructure, as well as staff to enforce regulations and maintain these facilities, have been provided by the Service. Camping is only allowed on a small area distant from the general visiting public. This use does not require a significant increase in additional maintenance and law enforcement staff expenditures. Existing staff can administer permits and monitor use as part of routine refuge management duties.

Anticipated Impacts of the Use: Impacts that could occur may involve some violation of refuge regulations such as deliberate disturbance of wildlife or plants, littering, or vandalism, but they are very unlikely to occur since these groups are environmentally aware of the importance and value of the resources on the refuge. Short-term impacts to facilities such as roads and structures should be minimal.

No long-term or cumulative negative impacts are anticipated, however, programs may be modified in the future to mitigate unforeseen negative impacts.

Public Review and Comments: The notice of availability for a 30-day public review of the Cabo Rojo NWR Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) was published in the *Federal Register* on May 2, 2011. All individuals on the CCP mailing list were notified by postal mail or e-mail of the upcoming public review period. The Draft CCP/EA was also available for review from the Service's Internet site. A news release was sent to 85 news media sources, including newspapers, television, radio, and web media sites. Periodico Estrella and Periodico Vision printed the news release on Monday, May 26, 2011. Online newspaper Primera Hora and Online web news Revisita Atabey posted the news release. Refuge Manager, Oscar Díaz, announced the meeting during a radio interview on May 16, 2011, on Radio Paraiso (FM 92.7). Appendix D summarizes the public comments.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Camping will be allowed only with a special use permit and will be restricted to a specific and clearly delineated small area behind the cactus garden. Visitors will be greeted by a Service official who will discuss with them the general and specific conditions of the special use permit In order to be issued a special use permit, these groups will have to perform a designated service project, such as planting trees, cleaning/clearing hiking trails, posting boundaries, fence repairs, and any other conservation project on the refuge. The project will be determined by the refuge staff in conjunction with group leader.

Justification: Camping has been determined to be an appropriate use on the refuge, when it is associated with a conservation project that requires an extended period of time on the refuge. Volunteers, Boy Scouts, and other conservation groups assist refuge staff on facilities maintenance, habitat management, species monitoring, and inventorying projects. Some of these projects are conducted during weekends (when people can volunteer) and most of the work is done in early morning or late afternoon when the heat is not so extreme. It's often more efficient and convenient that people stay overnight on the refuge to finish a project, instead of coordinating staff and volunteers for another visit, especially when the group is coming from far away. People coming from the metropolitan area of San Juan (where half of the population on the island lives) are about two and a half hours drive from the refuge.

Camping will be only permitted when this use is associated with a particular conservation project and will be approved on a case-by-case basis by the refuge manager.

NEPA Compliance for Refuge Use Description: *Place an X in appropriate space.*

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-year Re-evaluation Date: 9/22/2022

Description of Use: Commercial Harvesting of Sea Salt

Commercial harvesting of sea salt has occurred on the Cabo Rojo Salt Flats for centuries. In fact, what are presently the Cabo Rojo Salts Flats have been exploited without interruption since 1511, constituting the oldest economic activity in the history of Puerto Rico (Ramirez 2002). The salt flats were purchased as part of a significant addition to the refuge acreage in March 1999, due to their extraordinary value for migratory and resident shorebirds. When the Service acquired these lands, a local harvest enterprise was operating and the Service decided to allow the salt harvest operation through a 3-year lease that expired in March 2002. Since then, the Service has allowed the harvest operation through a special use permit, charging a fee and requiring the private operator to comply with certain conditions for the benefit of wildlife and their habitats. This use occurs on two shallow and tidally influenced lagoons, Fraternidad and Candelaria, which comprise a total of approximately 710 acres.

Salt production entails controlling ocean water flow into these lagoons through a system of canals and gates. During high tide, seawater is allowed to enter and it is held in these lagoons in which dissolved salt concentration increases due to solar evaporation. When the salinity concentration in the water reaches certain levels, the water is then mechanically pumped to precipitation pools (crystallizers) where the salt starts to precipitate. Eventually all remaining water on the crystallizers evaporates and the precipitated salt is removed by the use of heavy equipment and transported to a temporary storage area nearby. The salt is then transported out of the refuge for its processing, packing, storage, and sale.

Most of the salt extraction occurs during the dry season when there is little rainfall and significant solar radiation to assist in the evaporation process. Other activities related to this salt harvest operation include dredging of canals to maintain proper water flow from the water control structures to the lagoon and from the lagoon to the crystallizers, maintenance of the roads, dikes and crystallizers, and the maintenance of the water control structures. Mechanized equipment used includes electric pumps, front-end loaders, and trucks. Vehicular and heavy equipment traffic related to this operation is restricted to designated areas only.

The hydrology, chemistry, and ecology of the Cabo Rojo Salt Flats are not fully known. We know that high salinity levels are directly proportional to low abundance of algae, brine shrimp, and dissolved oxygen (Lonzarich 1989 and Mercado-Alvarez 2003). However, lower salt concentrations below 35 ppt are important for the development of brine shrimp eggs and the full development and survival of adults are optimal at salinities on the range of 6-70 ppt. (Meyer pers. comm.). Many shorebird species feed on different prey depending on their availability and abundance, which is related to salinity levels and water depth (Grear and Collazo 1999).

The most obvious natural value of the salt flats is its value to shorebirds. At least 27 species of migratory and resident shorebirds have been recorded and this area has the highest peak use by these birds of 23 sites in the Caribbean (Collazo et. al 1995). The Cabo Rojo Salt Flats are considered a very important breeding ground for a behaviorally and genetically different subspecies of snowy plovers that exhibit exceptionally high reproductive success (Küpper 2009). In Puerto Rico, the snowy plover nests only at the Cabo Rojo Salt Flats. Recent studies have shown that centuries of salt harvesting operations have created an extraordinary and exceptionally valuable thick microbial mat that provides the conditions for a complex and unique life web that support higher forms of life. Scientific research concerning this microbial mat continues to be conducted by a number of entities (Montalvo-Rodríguez, et. al 1998, 1999 and 2000; Cantrell 2007; Casillas-Martinez et. al. 2005). In his observations, Grear (1992) observed that the distribution of birds on the salt flats depends mostly on the microbial mats as well as on salinity and water levels. It's of vital importance that salinity and water levels continue to be managed on these highly valuable wildlife areas. Significant differences in cyanobacterial biovolume between dry and rainy seasons may occur when the water levels are depleted. Extremely dry periods may change the composition of the mat, from one dominated by filamentous cyanobacteria to one dominated by coccoid forms (Colon-Ortiz 2008). A shift in the abundant type of cyanobacteria in the microbial mat may represent a change in the whole trophic chain. For instance, shifts in the community of grazers, such as copepods, ciliates, and other metazoans (that prefer to eat filamentous cyanobacteria than coccoid ones) may imply shifts in other feeders like insects or crustaceans such as Artemia, which function as food for migratory and resident shorebirds as well (Colon-Ortiz 2008). This might well explain why abandoned salt flats elsewhere in Puerto Rico, where sea salt was extracted but water levels are no longer manipulated, are significantly poor in shorebird abundance and species richness. The sea salt harvesting operation on the Cabo Rojo Salt Flats is the last remnant of this industry in Puerto Rico.

Availability of Resources: Commercial salt harvesting operations have been allowed on both lagoons: Laguna Fraternidad and Laguna Candelaria. However, the area in use on Laguna Candelaria has been reduced to about 50 percent since 2002. Part of the area not in use was converted to deeper brackish water ponds; the rest gets flooded during rain events and little salt water is entering. Some emergency repairs of the dikes and canals were done in 2009 on areas damaged by extraordinary rains. Improvements to water control structures are planned to be done in 2010.

The use has been allowed since the acquisition of the property through a special use permit, which incorporates necessary stipulations to assure its compatibility with resource protection and conservation. The permittee employs about 18 local people yearly and pays a determined monthly fee to the Service.

Anticipated Impacts of the Use: Currently, the area occupied by the salt crystallizers is about 5 percent of the lagoons. This portion has little value for wildlife since biological productivity of this area is very limited due to extreme salt concentrations. However, this relative small area is insignificant with respect to the benefits to wildlife resulting from the manipulation of water levels and salinity concentrations associated with the harvesting of salt. Negative impacts on Service roads used by salt extraction operators should be minimal and maintenance costs can be shared with the Service. The use can be compatible under an effective implementation of specific conditions through a special use permit

Public Review and Comments: The notice of availability for a 30-day public review of the Cabo Rojo NWR Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) was published in the *Federal Register* on May 2, 2011. All individuals on the CCP mailing list were notified by postal mail or e-mail of the upcoming public review period. The Draft CCP/EA was also available for review from the Service's Internet site. A news release was sent to 85 news media sources, including newspapers, television, radio, and web media sites. Periodico Estrella and Periodico Vision printed the news release on Monday, May 26, 2011. Online newspaper Primera Hora and Online web news Revisita Atabey posted the news release. Refuge Manager, Oscar Díaz, announced the meeting during a radio interview on May 16, 2011, on Radio Paraiso (FM 92.7). Appendix D summarizes the public comments.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: (1) All harvested salt stored on the refuge must be in the vicinity of office buildings and/or in the area behind the ruins; (2) all canals must be cleaned manually except in immediate area of intake at the two main water control structures; all material removed from canals must be deposited on existing dikes or roads; (3) material used for road repair, when needed, must be approved by the Service on a case-by-case basis; (4) Candelaria and Fraternidad Lagoons will be filled up to their maximum water capacity beginning on August 1, and their water levels will be maintained according to the following inundation regime: Candelaria - water level will be maintained at a level of 1 to 3 inches at the new flap at the north end of lagoon; Fraternidad - water level will be maintained at a level of 1 to 3 inches in line with Mr. Harry Padilla's residence; (5) all salt operation traffic must be confined to designated roads; (6) all refuge access gates must be closed at all times; (7) refuge boundary fence adjacent to the salt extraction operation and along Road 301 must be maintained and repairs made promptly when needed; (8) all illegal trespass, hunting, crabbing, dumping, strayed dogs, etc., must be reported to refuge headquarters immediately; (9) permit compliance meetings will be held quarterly with the refuge manager to discuss special use permit conditions and any problems or concerns; (10) permittee will give special protection to a population of the very rare plant, Glasswort (*Salicornia bigelovii*), located at the southern most dike in Fraternidad (along the road in front of the hotels); (11) any trash, garbage and discarded materials, belonging to the salt operation activity found on refuge premises will be properly disposed of; and (12) the conditions of this permit are subject to revision at any time, and permittee will be informed immediately.

Justification: This use has been determined compatible because it is beneficial to the wildlife with the compliance of necessary stipulations. The process used to harvest sea salt on the area has created and maintained the necessary conditions on the microbial mats to sustain an intricate and delicate life web that provides the basis for the rich diversity and abundance of shorebirds on the lagoons. Currently, the Service does not have the needed resources (monetary and personnel) to operate year-round the critical water levels and salinity concentrations necessary to perpetuate these conditions. If for any reason the actual contractor decides to discontinue this use, the Service will need to come up with an emergency plan to save the wildlife value of this area.

NEPA Compliance for Refuge Use Description: *Place an X in appropriate space.*

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-year Re-evaluation Date: 9/22/2022

Description of Use: Wildlife Observation, Wildlife Photography, and Environmental Education and Interpretation

The proposed uses will allow the general public to use the Cabo Rojo NWR for non-consumptive activities, such as wildlife observation, wildlife photography, and environmental education and interpretation. These activities are priority public uses on national wildlife refuges as identified in the Improvement Act. Access to both the upland and the salt flats land tracts of the refuge is allowed throughout the year during daylight hours when the refuge is open to the public, or after dark on a case-by-case basis, as authorized by the refuge manager. Refuge lands have been opened to the public since they were acquired.

Currently, the refuge has two main facilities that people visit; the Salt Flats Interpretive Center (Center) and the Service headquarters for Puerto Rico and the Caribbean. The Center located at the salt flats land tract is operated under a cooperative agreement with our Friends Group (The Caborrojeños Pro Salud y Ambiente). This facility provides environmental education programs and guided interpretive tours to hundreds of students and other groups of visitors. The Center is visited by thousands of visitors annually. The new administration building has improved visitor services' facilities including a larger audiovisual theater, educational exhibits, and reception area. Visitation to the refuge is expected to increase significantly with the grand opening of the new facilities and the completion of ongoing projects to improve roads, trails, and other infrastructure.

Construction of any new foot trails and photography blinds and the upgrading refuge roads may alter small portions of the natural environment. Proper planning prior to construction and sediment retention and grade stabilization features will reduce negative impacts to wetlands, threatened and endangered species, and species of special concern. Impacts such as trampling vegetation and wildlife disturbance do occur, but are presently not significant. Visitors could cause other potential negative impacts such as violating refuge regulations, littering, or illegally taking plants or wildlife. These potential violations will be addressed through a combination of education, outreach, and law enforcement activities. Use of refuge roads, trails, and facilities by the public does incur added maintenance costs.

Availability of Resources: Refuge lands have been opened to the public since they were acquired. Thus, roads, access trails, parking lots, signs, and other infrastructure, as well as staff to enforce regulations and maintain these facilities, have been provided by the Service. The refuge is also working to develop and manage a volunteer program to successfully integrate the community and complement the implementation of environmental education, visitor use, and interpretation programs. These uses do not require a significant increase in additional maintenance and law enforcement staff expenditures.

Anticipated Impacts of the Use: The use of the refuge for non-commercial and non-consumptive activities, such as wildlife observation, nature photography, and environmental education and interpretation, poses minimal impacts to wildlife and plant species. Access for these types of activities is typically by individuals or small groups. Depending on the mode of access and its potentially adverse impact on the natural resources, the refuge will post and restrict the type of use within the designated trails and areas. Within the designated routes of travel and in established parking lot areas, there are barriers to prevent vehicles from driving onto the foot trails, mangroves, beaches, or environmentally sensitive areas. Based on biological data, conservation management plans, unreasonable harassment of wildlife, or destruction of the habitat, the refuge manager may restrict the use or close some areas to public use.

Wildlife Observation and Photography: These activities could result in some disturbance to wildlife, especially if visitors venture too close to tern nests, colonial nesting bird rookeries, or resting waterfowl and/or shorebirds during migration. The refuge will prohibit visitors from traveling in areas around nests, rookeries, and managed wetlands. The staff will monitor the foot trails and wildlife observation areas opened to pedestrian use to minimize disturbance that could occur in these sensitive areas. If the staff identifies unacceptable levels of disturbance at any time, the sites will be closed to public entry. Some minimal trampling of vegetation also may occur.

Environmental Education and Interpretation: The refuge has facilities, such as kiosks, observations posts/towers, blinds, and interpretive trails with appropriate signage. The Salt Flats Interpretive Center, managed in cooperation with the Caborrojeños Pro Salud y Ambiente, provides environmental education and interpretation services to school groups with previous arrangements. Proper planning and placement of facilities ensure the protection of important resource and ensure that they do not negatively impact wetlands, threatened or endangered species, or species of special concern, while at the same time provide excellent environmental education and interpretation opportunities.

The refuge staff will obtain proper permits through the commonwealth and federal regulatory agencies, prior to construction, to ensure resource protection. The use of on-site, hands-on, action-oriented activities to accomplish environmental education and interpretive tours may impose a low-level impact on the sites used for these activities. These low-level impacts may include trampling of vegetation and temporary disturbance to wildlife species in the immediate area. Educational activities held off-refuge will not create any biological impacts on the resource.

Public Review and Comments: The notice of availability for a 30-day public review of the Cabo Rojo NWR Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) was published in the *Federal Register* on May 2, 2011. All individuals on the CCP mailing list were notified by postal mail or e-mail of the upcoming public review period. The Draft CCP/EA was also available for review from the Service's Internet site. A news release was sent to 85 news media sources, including newspapers, television, radio, and web media sites. Periodico Estrella and Periodico Vision printed the news release on Monday, May 26, 2011. Online newspaper Primera Hora and Online web news Revisita Atabey posted the news release. Refuge Manager, Oscar Díaz, announced the meeting during a radio interview on May 16, 2011, on Radio Paraiso (FM 92.7). Appendix D summarizes the public comments.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: (1) Harassment of wildlife and damage to vegetation are prohibited; (2) access by motorized vehicles is only authorized on designated roads and parking lots; (3) any overnight use requires a special use permit issued by the refuge; (4) providing outfitting or commercial services on the refuge requires a special use permit issued by the refuge manager; (5) all Puerto Rico and federal traffic laws must be obeyed; (6) zoning of visitor activities by time and space, clustering public use facilities, proper monitoring, educating visitors, and enforcement will ensure compatibility with the purposes of the refuge and mission of the Refuge System; (7) prior to construction, the refuge staff will obtain permits from local, state, and federal regulatory agencies to reduce the possibility of negatively impacting wetlands, cultural resources, or protected species; and (8) public use will be monitored to document any negative impacts, and if any become noticeable, the staff will take corrective action to reduce or eliminate the effects on wildlife.

Justification: The Improvement Act identified wildlife observation, wildlife photography, and environmental education and interpretation as activities that the Service should provide and expand on refuges. It is through permitted, compatible public uses, such as these, that the public becomes aware of and provides support for national wildlife refuges. Educating and informing the public through structured environmental education courses, interpretive materials, and guided tours about migratory birds, endangered species, wildlife management, and ecosystems will lead to improved support of the Service's mission to protect natural resources.

NEPA Compliance for Refuge Use Description: *Place an X in appropriate space.*

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
___X___ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 15-year Re-evaluation Date: 9/22/2027

Description of Use: Bicycling, Hiking, Walking, and Jogging

These uses will allow the general public access onto the refuge by hiking, walking/jogging, and bicycling for wildlife observation, wildlife photography, and recreation. Access to the refuge will be allowed anytime of the year during daylight hours when the refuge is open to the public, or after dark, on a case-by-case basis, as authorized by the refuge manager. Activities on foot and bicycling will be allowed on specified and designated roads, footpaths, and trails. Some of these designated travel routes will be accessible for all these uses while others will be posted as being specific to a certain activity (e.g., a hiking trail). Access through or entry on all or portions of individual areas may be temporarily suspended, by posting, upon occasions of unusual or

critical conditions affecting land, water, vegetation, wildlife and plant populations, or public safety. Access for the general public onto the potentially sensitive environmental areas is only allowed by foot travel.

Access to the refuge through designated travel routes provides the general public the opportunity to enjoy scenic views, diverse wildlife, and an array of plants and various habitats. This, in turn, allows for wildlife observation, wildlife photography, and environmental education and interpretation opportunities not usually available on adjacent state and private lands.

Availability of Resources: Refuge lands have been opened to the public since they were acquired. Roads, trails access, parking lots, signs, and other infrastructure, as well as staff to enforce regulations and maintain these facilities, have been provided by the Service. Designated travel routes, trails, other facilities, and educational/interpretive signs in these areas have been addressed in the comprehensive conservation plan. No significant increase of law enforcement and maintenance staff is needed to continue providing these uses.

Anticipated Impacts of the Use: Access and use of the refuge for non-commercial use of activities like jogging, hiking, and bicycling on designated roads and trails pose minimal impacts to plant and wildlife species on the refuge. Access for these types of activities is typically by individuals or small groups. The designated routes of travel end in established parking lot areas, which, in turn, have strategically placed barriers that prevent vehicles from being driven onto the foot trails and mangrove or beach areas. Although these prohibitions are currently posted at various points inside the refuge, the refuge will increase and improve the signage in certain environmentally sensitive areas to ensure compliance. Based on biological data, conservation management plans, unreasonable harassment of wildlife, or destruction of the habitat, the refuge manager may restrict the use or close some beaches and other areas to public use if it is determined that the use could have negative impacts on the resources or bird and/or sea turtle nesting activities.

Bicycling: Damage to the habitat by individuals riding through designated, interpretive, and posted bike trails is minimal and temporary. Some erosion and widening might be expected on either side of the trails as part of the bike traffic. Regular preventive and corrective maintenance should be able to address this problem. There is some temporary disturbance to wildlife due to human activity on the land. The Service will invest in placing some bike security lock racks in certain designated areas, such as parking lots or sections of the track where the biking trails end and the hiking trails or board walks begin. These security lock racks will assist in providing the visitors with added security from theft and it will keep the bicycles from being locked to other Service structures or to trees and from being dragged across possible bird/sea turtle nesting beaches.

Most recreational bicycling use is from personally owned bikes. Bike rental operations do not exist on the refuge or near the refuge. The riders are mostly locals or from nearby municipalities that have been enjoying the beautiful landscape not available anywhere around the refuge. With the improvement of current facilities and the grand opening of the Service headquarters, it is expected that there will be an increase during tourism season (November through March) and during long weekends year-round.

Hiking, walking and jogging: Damage to habitat by individuals hiking, walking, or jogging through designated, interpretive, and posted hiking trails is minimal and temporary. Some erosion and widening might be expected on either side of the trails as part of foot traffic increase in the area. Regular preventive and corrective maintenance should be able to address this problem. There is some temporary disturbance to wildlife due to human activity on the land.

Once interpretive signs, hiking trails, and additional rest areas have been established on the refuge to facilitate wildlife/plant observations, photography, environmental education, recreation and exercise, it is expected that there will be an increase in their use by local community visitors, as well as visitors from other areas during tourism season (November through March) and during long weekends year-round.

Public Review and Comments: The notice of availability for a 30-day public review of the Cabo Rojo NWR Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) was published in the *Federal Register* on May 2, 2011. All individuals on the CCP mailing list were notified by postal mail or e-mail of the upcoming public review period. The Draft CCP/EA was also available for review from the Service's Internet site. A news release was sent to 85 news media sources, including newspapers, television, radio, and web media sites. Periodico Estrella and Periodico Vision printed the news release on Monday, May 26, 2011. Online newspaper Primera Hora and Online web news Revisita Atabey posted the news release. Refuge Manager, Oscar Díaz, announced the meeting during a radio interview on May 16, 2011, on Radio Paraiso (FM 92.7). Appendix D summarizes the public comments.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: (1) Harassment of wildlife or excessive damage to vegetation is prohibited; (2) access by motorized vehicles is only authorized on public roads and parking lots; and (3) no bicycles or motorized vehicles may be left overnight on the refuge.

Outfitting or commercial services on the refuge requires a special use permit to be issued by the refuge manager, as does any activity that requires visitors to remain on the refuge overnight.

Justification: These uses have been determined compatible because they are considered compatible and acceptable alternate modes of transportation. They provide the means for the general public to access and travel on designated routes of the refuge for wildlife/plant observation, photography, environmental education, fishing, exercise, and recreation. It is believed that if properly managed, these activities will not interfere with the Service's work to protect and conserve natural resources. The level of use for these activities on the refuge is moderate to high, depending on the season. The associated disturbance to wildlife is temporary and minor. Although recreational hiking, jogging, and/or bicycling are not priority uses on the refuge, under the conditions described above they are not detrimental activities. For a number of visitors, access to partake in fishing, wildlife observation, wildlife photography, and environmental education and interpretation, which are priority public uses, is only possible if they use one of the above-listed modes of transportation. Designated trails, observation platforms, or other sites set aside for these uses also provide the Service with specific areas and the opportunity to place educational/interpretive signs highlighting natural resources and their conservation needs. These uses also help fulfill the mission of the Refuge System.

NEPA Compliance for Refuge Use Description: *Place an X in appropriate space.*

_____ Categorical Exclusion without Environmental Action Statement
_____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
_____ Environmental Impact Statement and Record of Decision

Mandatory 10-year Re-evaluation Date: 9/22/2027

Description of Use: Haying

Haying, as a method of cutting and removal of grasses, is an effective habitat management tool at Cabo Rojo NWR. It serves to reduce the excessive amount of the nonnative and invasive grasses, mostly Guinea grass (*Urochloa maxima*) and hurricane grass (*Botriochloa pertusa*), as an effective method for site preparation for reforestation of the area with native trees. Haying is also used effectively to reduce the fuel loads avoiding major damages to reforested areas in case of accidental fires. It can also be used along trails, roads, and boundary lines to reduce vegetation loads and keep these routes open. Under special use permits, local farmers can benefit from this use and reduce the significant amount of time and work the refuge staff dedicates to the maintenance of these areas.

Haying can be used to manage the grassland component of the refuge to sustain viable populations of the rare short-eared owl (*Asio flammeus portoricensis*) and the grasshopper sparrow (*Ammodramus savannarum borinquensis*). Although the habitat nearby the refuge for these two species is abundant, its conservation is jeopardized due to the tremendous pressure for urban and tourist developments in the southwest part of the island
.

Availability of Resources: The staff to enforce regulations and maintain facilities such as roads, trails, parking lots, signs, and other infrastructure is provided by the Service. Under special use permits, local farmers can benefit from haying and reduce the significant amount of time and work the refuge staff dedicates to the maintenance of these areas. No additional fiscal resources are needed to conduct this use. The additional time needed to coordinate this use with interested persons is relatively minor and can be done within the existing resources.

Anticipated Impacts of the Use: Mechanical cutting of grasses can result in short-term disturbance to people observing and photographing birds. It can also cause minor disturbance to wildlife, but most birds easily become accustomed to the noise of tractors. No anticipated significant negative impacts are expected if this use is permitted under a well-planned program and coordinated with refuge maintenance and fire staff.

Public Review and Comments: The notice of availability for a 30-day public review of the Cabo Rojo NWR Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) was published in the *Federal Register* on May 2, 2011. All individuals on the CCP mailing list were notified by postal mail or e-mail of the upcoming public review period. The Draft CCP/EA was also available for review from the Service's Internet site. A news release was sent to 85 news media sources, including newspapers, television, radio, and web media sites. Periodico Estrella and Periodico Vision printed the news release on Monday,

May 26, 2011. Online newspaper Primera Hora and Online web news Revisita Atabey posted the news release. Refuge Manager, Oscar Díaz, announced the meeting during a radio interview on May 16, 2011, on Radio Paraiso (FM 92.7). Appendix D summarizes the public comments.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: The Service will conduct this use under a special use permit. Haying will be done only on designated and well-marked areas. All trees and facilities will be protected. Law enforcement patrol will continue to provide for public safety and resources conservation.

Justification: This use can be easily managed by refuge staff and is determined to be beneficial for wildlife and refuge operation needs.

Mandatory 10-year Re-evaluation Date: 9/22/2022

Approval of Compatibility Determinations

The signature of approval is for all compatibility determinations considered within the Comprehensive Conservation Plan for Cabo Rojo National Wildlife Refuge. If one of the descriptive uses is considered for compatibility outside of the comprehensive conservation plan, the approval signature becomes part of that determination.

Refuge Manager: Signed 6/17/2011
(Signature/Date)

Regional Compatibility Coordinator: Signed 9/5/11
(Signature/Date)

For **Refuge Supervisor:** Signed 9/20/2011
(Signature/Date)

Regional Chief, National Wildlife Refuge System, Southeast Region: Signed 9-20-11
(Signature/Date)

Appendix G. Intra-Service Section 7 Biological Evaluation

Originating Person: Oscar Díaz
Telephone Number: 787/851-7258, ext. 312
E-Mail: oscar-Díaz@fws.gov
Date: June 17, 2011
Project Name: Cabo Rojo National Wildlife Refuge Comprehensive Conservation Plan
Service Program:

___ **Ecological Services**
___ **Federal Aid**
___ **Clean Vessel Act**
___ **Coastal Wetlands**
___ **Endangered Species Section 6**
___ **Partners for Fish and Wildlife**
___ **Sport Fish Restoration**
___ **Wildlife Restoration**
___ **Fisheries**
_X_ **Refuges/Wildlife**

State/Agency: Puerto Rico/Fish and Wildlife Service

Station Name: Cabo Rojo National Wildlife Refuge

Description of Proposed Action (attach additional pages as needed):

Implementation of the Comprehensive Conservation Plan for the Cabo Rojo National Wildlife Refuge by adopting the preferred alternative that will provide guidance, management direction, and operation plans for the next 15 years.

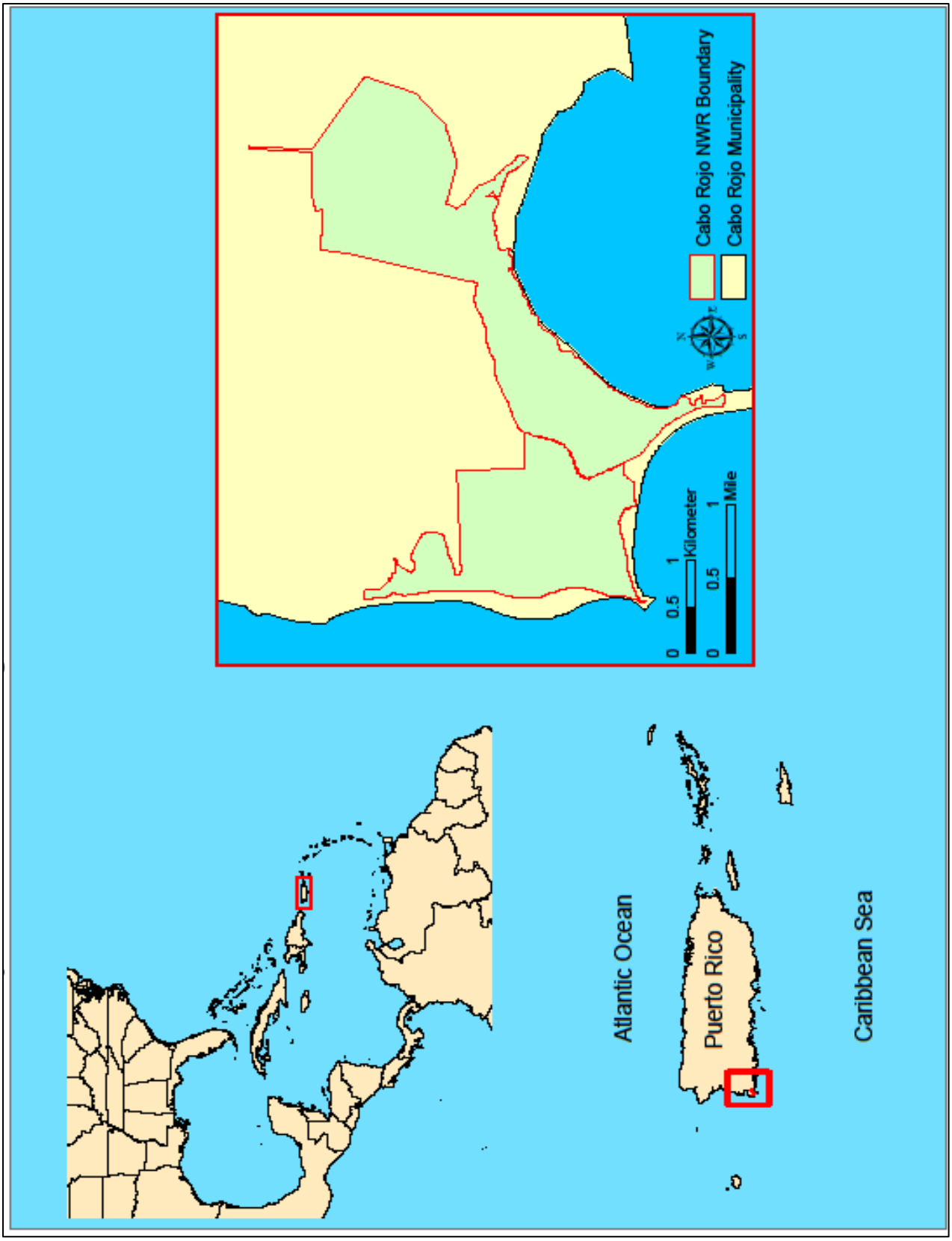
Pertinent Species and Habitat:

Include species/habitat occurrence map:

SPECIES/CRITICAL HABITAT	STATUS[1]
Yellow-Shouldered Blackbird	Endangered
Aristida chaseae	Endangered
Eugenia woodburyana	Endangered
Goetzea elegans	Endangered
Stahlia monosperma	Threatened

[1]*STATUS: E=endangered, T=threatened, PE=proposed endangered, PT=proposed threatened, CH=critical habitat, PCH=proposed critical habitat, C=candidate species*

Location of Cabo Rojo NWR



Ecoregion Number and Name: Caribbean

A. County and State: Cabo Rojo, Puerto Rico

B. Section, township, and range (or latitude and longitude):
Latitude N17 58 34 and Longitude W67 10 07

C. Distance (miles) and direction to nearest town: 12 Km (8 miles) SW of Boquerón, PR

D. Species/habitat occurrence: Details of species occurrence and habitat are provided in text of the comprehensive conservation plan. The following is a summary of occurrence:

Yellow-shouldered blackbird - The species is commonly seen along the mangrove fringe and coastal shrubs nearby the Salt Flats. It has been observed most recently foraging on the refuge uplands. The entire refuge is part of its designated critical habitat, although no nests have been found. The main population of this species breeds on the nearby Boquerón State Forest, but it's very likely that the refuge uplands serve as important foraging habitat.

Aristida chaseae - Only two populations are known of this grass; one on the Cabo Rojo National Wildlife Refuge and the other one in Sierra Bermeja. The population on Cabo Rojo National Wildlife Refuge is protected and conservation efforts are on the way to improve the habitat where it occurs.

Eugenia woodburyana - Species known to occur naturally on the refuge. Several trees have been planted on recent years as part of habitat restoration efforts

Goetzea elegans - Some were planted in recent years as part of habitat restoration efforts, although the refuge is not part of the known geographical range of the species. No more trees of this species should be planted in the future.

Stahlia monosperma - Several mature trees are known to exist on the refuge and others have been planted as part of the reforestation efforts to restore the subtropical dry forest. The species is within its geographical range.

Determination of Effects:

Explanation of effects of the action on species and critical habitats in item V. B (attach additional pages as needed).

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Yellow-shouldered Blackbird	No adverse effects anticipated. Beneficial effects include providing additional nesting habitat as reforestation efforts on refuge continue and as objectives and strategies described under Goal 1 get implemented. Other beneficial effects include monitoring programs, feral animal control, and education/outreach activities.

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Aristida chaseae	No adverse effects anticipated. Beneficial effects include coordinating with partners to conduct research of this species, mapping and protecting existing trees, and the propagation and establishment or enhancement of populations. Conservation of the species can be highlighted during on-site refuge environmental education programs.
Eugenia woodburyana	No adverse effects anticipated. Beneficial effects include coordination with partners to conduct research of this species, mapping and protecting existing trees, and the propagation and establishment or enhancement of populations. Conservation of the species can be highlighted during on-site refuge environmental education programs.
Goetzea elegans	No adverse effects anticipated. Trails, roads, and structures will be located so as to avoid impacts to the species. Beneficial effects include mapping and protecting existing trees and the propagation and establishment or enhancement of populations elsewhere outside the refuge within the geographical distribution of the species. Conservation of the species can be highlighted during on-site refuge environmental education programs.
Stahlia monosperma	No adverse effects anticipated. Trails, roads, and structures will be located so as to avoid impacts to the species. Beneficial effects include inventories to locate additional populations and the propagation and the establishment or enhancement of populations. Conservation of the species can be highlighted during on-site refuge environmental education programs

VIII. Effect Determination and Response Requested:

SPECIES/ CRITICAL HABITAT	DETERMINATION[1]			RESPONSE[1]
	NE	NA	AA	
Yellow-shouldered Blackbird		X		
Aristida chaseae		X		
Eugenia woodburyana		X		
Goetzea elegans		X		
Stahlia monosperma		X		

[1]DETERMINATION/RESPONSE REQUESTED:
NE = no effect. This determination is appropriate when the proposed action will not impact directly, indirectly, or cumulatively, either positively or negatively, any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested is optional but a Concurrence is recommended for a complete Administrative Record.
NA = not likely to adversely affect. This determination is appropriate when the proposed action is not likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat or there may be beneficial effects to these resources. Response Requested is a Concurrence.
AA = likely to adversely affect. This determination is appropriate when the proposed action is likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested for listed species is Formal Consultation. Response Requested for proposed or candidate species is Conference.

Signed

Signature (originating station)

6/17/2011
Date

Refuge Manager Cabo Rojo NWR
Title

Reviewing Ecological Services Office Evaluation:

A. **Concurrence** ___✓___ **Non concurrence** _____

B. **Formal consultation required** _____

C. **Conference required** _____

D. **Informal conference required** _____

E. **Remarks (attach additional pages as needed):** _____

_____

_____

Signed

Signature 6/17/2011 **Date**

Deputy field Supervisor Caribbean ES field Office

Title **Office**

Appendix H. Wilderness Review

The Wilderness Act of 1964 defines a wilderness area as an area of federal land that retains its primeval character and influence, without permanent improvements or human inhabitation, and is managed so as to preserve its natural conditions and which:

1. generally appears to have been influenced primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;

2. has outstanding opportunities for solitude or primitive and unconfined types of recreation;

3. has at least 5,000 contiguous roadless acres or is of sufficient size to make practicable its preservation and use in an unimpeded condition; or is a roadless island, regardless of size;

4. does not substantially exhibit the effects of logging, farming, grazing, or other extensive development or alteration of the landscape, or its wilderness character could be restored through appropriate management at the time of review; and

5. may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

The lands within Cabo Rojo NWR were reviewed for their suitability in meeting the criteria for wilderness, as defined by the Wilderness Act of 1964. No lands in the refuge were found to meet these criteria. Therefore, the suitability of refuge lands for wilderness designation is not further analyzed in this CCP.

Appendix I. Refuge Biota

BIRDS

GREBES	SP	S	W	F
Least Grebe* Tigua	c	c	c	c
Pied-billed Grebe* Zaramago	c	c	c	c

PELECANIDAE	SP	S	F	W
Brown Pelican Pelícano	c	c	c	c

FRIGATEBIRDS	SP	S	F	W
Magnificent Frigatebird Tijereta	o	o	o	o

HERONS AND BITTERNS	SP	S	F	W
Great Blue Heron* Garzón Cenizo	c	c	c	c
Redish Egret Garza rojiza	o	o	o	o
Green Heron* Martinete	u	u	u	u
Little Blue Heron Garza azul	o	o	o	o
Cattle Egret* Garza ganadera	c	c	c	c
Great Egret Garza real	c	c	c	c
Snowy Egret Garza blanca	o	o	o	o
Black-crowned Night Heron Yaboa real	r	r	r	r
Yellow-crowned Night Heron* Yaboa común	o	o	o	o

IBISES, SPOONBILLS, FLAMINGOS AND LIMPKINS	SP	S	F	W
Greater Flamingo* Flamingo	r	-	-	r
Glossy Ibis Coco prieto	r	-	-	r

DUCKS, GEESE AND SWAMS	SP	S	F	W
White-cheeked Pintail Pato quijada colorada	c	c	c	c

West-indian Whistling Duck Chiriría, Yaguaza	r	r	r	r
Blue-winged Teal Pato quijada colorada	-	-	c	c
American Wigeon Pato cabeciblanco	-	-	-	r
Brant Ganso carinegro	-	-	-	x

AMERICAN VULTURES	SP	S	F	W
Turkey Vulture* Aura tiñosa	a	a	a	a

HAWKS AND HARRIER	SP	S	F	W
Red-tailed Hawk* Guaraguao	u	u	u	u
Osprey Aguila pescadora	r	-	u	-

FALCONS	SP	S	F	W
Merlin Falcón migratorio	o	-	o	o
American Kestrel* Falcón común	c	c	c	c
Peregrine Falcon# Falcón peregrino	u	-	o	u

JUNGLEFOWL AND QUAIL	SP	S	F	W
Red Junglefowl+ Gallina y gallo	-	z	-	-

GUINEAFOWL	SP	S	F	W
Helmeted Guineafowl (Domestic)+ Guinea	o	o	o	o

RAILS, GALLINULES AND COOTS	SP	S	F	W
Common Moorhen* Gallareta común	c	c	c	c
Clapper Rail* Pollo de mangle	c	c	c	c

PLOVERS For a complete list, please use; 1995. Collazo, J.A. et. al. Abundance and distribution of shorebirds at the Cabo Rojo Salt Flats, Puerto Rico. J. of Field Ornithology. 66(3): 424-438.

	SP	S	F	W
Killdeer* Playero sabanero	c	c	c	u

Semipalmated Plover Chorlito acollarado	-	-	u	u
Semipalmated Plover Chorlito acollarado	-	-	u	u
Wilson’s Plover* Chorlito marítimo	c	c	c	c
Snowy Plover* Chorlito blanco	c	c	c	c
Black-bellied Plover Chorlito cabezón	-	-	o	o
American Golden Plover Chorlito dorado	-	-	r	r
Piping Plover Chorlito melodic	-	-	r	r

STILTS AND AVOCETS	SP	S	F	W
Black-necked Stilt* Viuda	c	c	c	c
American Avocet Avoceta americana	-	-	-	x

TURNSTONES, SNIPES AND SANDPIPERS	SP	S	F	W
Common Snipe Becasina	u	-	u	u
Spotted Sandpiper Playero coleador	c	-	a	c
Lesser Yellowlegs Playero guineilla menor	c	u	c	c
Greater Yellowlegs Playero guineilla mayor	c	u	c	c
Upland Sandpiper Playero Pradero	-	-	-	x
Solitary Sandpiper Playero solitario	o	-	u	u
Stilt Sandpiper Playero patilargo	c	-	c	c
Least Sandpiper Playero menudillo	c	u	c	c
White-rumped Sandpiper Playero de rabadilla blanca	u	c	u	-
Pectoral Sandpiper Playero pectoral	u	-	c	u
Semipalmated Sandpiper Playero gracioso	c	u	c	c
Western Sandpiper Playero occidental	c	u	c	c
Short-billed Dowitcher Agujeta piquicorta	o	-	u	o
Long-billed Dowitcher Agujeta piquilarga	-	-	u	o
Ruddy Turnstone Playero turco	c	-	c	c
Red Knot	-	-	-	r

Playero gordo Sanderling	-	-	o	o
Playero arenero Willet*	r	r	c	c
Playero aliblanco Whimbrel	-	-	u	u
Playero picocorvo Hudsonian Godwit	-	-	-	x
Barga aliblanca Red-necked Phalarope	-	-	-	x
Falaropo picofino Wilson’s Phalarope	x	-	-	x
Falaropo tricolor Buff-breasted Sandpiper	-	-	-	x
Playero Canelo Eskimo Curlew	-	-	-	x
Playero artico				

GULLS, TERNS AND ALLIES	SP	S	F	W
Laughing Gull	-	o	-	-
Gaviota gallega Least Tern	c	c	c	c
Gaviota chica Royal Tern	o	o	c	c
Gaviota común Least Tern*	c	c	c	c
Gaviota chica Sandwich tern	o	o	o	o
Charran piquiagudo Black tern	r	-	-	r
Fumarel común Roseate tern	o	o	o	o
Palometa Herring Gull	r	-	-	r
Gaviota argentea Gull-billed Tern	x	-	-	x
Gaviota piquigorda Caspian Tern	x	-	-	x
Gaviota de Caspia				

PIGEONS AND DOVES	SP	S	F	W
Rock Dove	c	c	c	c
Paloma casera African-collared Dove	c	c	c	c
Tórtola collarina Mourning Dove*	u	u	u	u
Tórtola rabiche Zenaida Dove*	c	c	z	z
Tórtola cardosantera White-winged Dove*	u	u	u	u
Tórtola aliblanca Ringed Turtle Dove*	c	c	c	c
Paloma collarina				

Common Ground-Dove*	a	a	a	a
Rolita				
CUCKOOS AND ANIS	SP	S	F	W
Mangrove Cuckoo*	c	c	c	c
Pájaro bobo menor				
Yellow-billed Cuckoo*	u	u	u	u
Pájaro bobo picoamarillo				
Smooth-billed Ani*	c	c	c	c
Judío				
TYPICAL OWLS	SP	S	F	W
Short-eared Owl*	c	c	c	c
Múcaro real				
GOATSUCKERS	SP	S	F	W
Chuck-will's-widow	u	-	u	u
Guabairo mayor				
Antillean Nighthawk*	c	c	u	z
Querequequé				
Common Nighthawk	-	-	z	-
Querequequé migratorio				
HUMMINGBIRDS	SP	S	F	W
Puerto Rican Emerald*^		o	o	r o
Zumbadorcito de Puerto Rico				
Antillean Mango*	c	c	c	o
Zumbador dorado				
TODIES	SP	S	F	W
Puerto Rican Tody*^	u	u	u	u
San Pedrito				
KINGFISHERS	SP	S	F	W
Belted Kingfisher	-	-	r	-
Martín pescador				
TYRANT FLYCATCHERS	SP	S	F	W
Gray Kingbird*	a	a	a	a
Pitirre				
Puerto Rican Loggerhead Kingbird*^	u	u	u	o
Clérigo de Puerto Rico				
Puerto Rican Flycatcher*^	c	c	c	c
Juí de Puerto Rico				
Lesser Antillean Pewee*	c	c	u	u
Bobito antillano menor				
Caribbean Elaenia*	c	c	c	c
Juí blanco				

SWALLOWS AND MARTINS	SP	S	F	W
Caribbean Martin*	z	-	r	-
Golondrina de iglesias				
Bank Swallow*	-	-	c	a
Golondrina parda				
Barn Swallow	z	-	c	a
Golondrina de horquilla				
Cave Swallow*	a	a	a	a
Golondrina de cuevas				
Violet-green swallow	x	-	-	x
Golondrina verde violeta.				

THRUSHES	SP	S	F	W
Red-legged Thrush	r	r	-	-
Zorzal de patas coloradas				

MOCKINGBIRDS AND THRASHERS	SP	S	F	W
Northern Mockingbird*	a	a	a	c
Ruiseñor				
Bahama mockingbird	r	-	-	r
Sinsonte de Bahamas				
Pearly-eyed Thrasher	r	r	-	r
Zorzal pardo				

VIREOS	SP	S	F	W
Puerto Rican Vireo*^	c	c	c	c
Bien-te-veo				
White-eyed Vireo	-	-	r	r
Julián chiví ojiblanco				
Black-whiskered Vireo*	c	c	c	r
Julián chiví				

EMBERIZIDS	SP	S	F	W
Black-and-white Warbler	u	-	u	o
Reinita trepadora				
Prothonotary Warbler	o	-	o	o
Reinita anaranjada				
Golden-winged Warbler	-	-	r	-
Reinita alidorada				
Northern Parula	c	z	c	a
Reinita pechidorada				
Yellow Warbler	c	c	c	c
Canario de mangle				
Magnolia Warbler	r	-	r	o
Reinita manchada				
Cape May Warbler	c	r	c	c
Reinita tigre				

Black-throated Blue Warbler Reinita azul	x	-	-	-
Yellow-rumped Warbler Reinita coronada	o	-	o	o
Black-throated Green Warbler Reinita verdosa	x	-	-	-
Yellow-throated Warbler Reinita gargantiamarilla	-	-	u	u
Adelaide's Warbler*^ Reinita mariposera	a	a	a	c
Chestnut-sided Warbler Reinita costadicastaña	-	-	x	-
Blackpoll Warbler Reinita rayada	o	r	c	o
Prairie Warbler Reinita galana	c	r	c	a
Palm Warbler Reinita palmera	u	-	u	u
Ovenbird Pizpita dorada	u	r	r	u
Northern Waterthrush Pizpita de mangle	u	z	c	u
Louisiana Waterthrush Pizpita de río	o	-	u	o
Kentucky Warbler Reinita de Kentucky	-	-	z	-
Connecticut Warbler Reinita de Connecticut	-	-	z	-
Common Yelowthroat Reinita pica tierra	c	-	u	c
Hooded Warbler Reinita de capucha	o	-	o	o
American Redstart Candelita	u	-	u	u
Bananaquit* Reinita común	a	a	a	a
Antillean Euphonia* Jilguero	c	c	c	c
Puerto Rican Spindalis* Reina Mora de Puerto Rico	u	u	u	u
Rose-breasted Grosbeak Piquigrueso rosado	r	-	r	r
Blue Grosbeak Azulejo	r	-	-	r
Indigo Bunting Gorrión azul	o	-	-	o
Puerto Rican Bullfinch Come ñame de Puerto Rico	z	z	z	z
Yellow-faced Grassquit Gorrión barba amarilla	a	a	a	a
Black-faced Grassquit Gorrión negro	a	a	a	a
Grasshopper Sparrow Gorrión chicharra	u	u	u	u
Shiny Cowbird Tordo lustroso	c	c	c	c
Greater Antillean Grackle	c	c	c	c

Mozambique, Chango				
Troupial*	c	c	c	c
Turpial				
Yellow-shouldered Blackbird*^#	c	c	c	c
Mariquita				
WEAVER FINCHES	SP	S	F	W
Pin-tailed Whydah+*	u	u	u	u
Viuda colicinta				
WAXBILLS AND ALLIES	SP	S	F	W
Red Avadavat (Strawberry Finch)+	z	z	r	z
Chamorro fresa				
Warbling Silverbill*+	a	a	a	a
Gorrión picoplata				
Bronze Mannikin+	c	c	c	c
Diablito				
Nutmeg Mannikin+	z	c	c	z
Gorrión canela				
Chestnut Mannikin+	-	z	z	-
Monja tricolor				
Orange Bishop+*	c	c	c	c
Obispo anaranjado				

Symbols on the preceding checklist represent the following:

Seasonal appearance/*Estaciones*:
Sp - Spring/*Primavera* (March - May)
S - Summer/*Verano* (June - August)
F - Fall/*Otoño* (September- November)
W - Winter/*Invierno* (December- February)

Seasonal abundance/*Abundancia Por Estaciones*:
a - abundant/*seguro de observarse* — a common species which is very numerous
c - common/*sequro de observarse en habitat apropiado* — certain to be seen in suitable habitat
u - uncommon/*presente, pero posiblemente no se observe* — present but not certain to be seen
o - occasional/*observado algunas veces durante la estación* — seen only a few times during a season
r - rare/*observado solo cada 2 a 5 anos* — seen at intervals of 2 to 5 years
x - accidental/*observado solo una o dos veces* — seen only once or twice
z - abundance unknown/*abundancia no conocida*

Status:
^ - Endemic +-Exotic
# - Endangered *-Nesting

MAMMALS

Native - Bats

Artibeus jamaicensis	Jamaican fruit-eating bat
Brachyhylla cavernarum	Antillian fruit-eating bat
Erophylla sezekoini	Brown flower bat
Molossus molossus fortis	Velvety free-tailed bat
Monophyllus redmani	Greater Antillian long-tailed

Mormoops blainvilli	Antillian ghost-faced bat
Noctilio leporinus	Greater bulldog bat
Nyctinomus murinus [e]	Brazilian free-tailed bat
Introduced - Various	
Erythrocebus patas	Patas monkey
Macaca mulatta	Rhesus monkey
Herpestes auropunctatus	Mongoose
Mus musculus	House mouse
Rattus norvegicus	House rat
R. rattus	Roof rat

REPTILES

Lizards	
Ameiva exsul	Puerto Rican ground lizard
A. wetmorei	Blue tailed ground lizard
Anolis cooki	Dry land anole
A. cristatellus	Puerto Rican crested anole
A. ponsensis	Ponce's garden lizard
A. pulchellus	Grass anole
A. stratulus	Spotted lizard
Iguana iguana (introduced)	Green Iguana
Geckos	
Phyllodactylus wirshingi	NA [f]
Sphaerodactylus macrolepsis	Common gecko
S. roosevelti	Roosevelt's dwarf gecko
S. nicholsi nicholsi	Nichols' dwarf gecko
Turtles	
Dermochelys coriacea	Leatherback turtle
Eretmochelys imbricata	Hawksbill turtle
Trachemys stejnegeri	West Indian slider
Snakes	
Typhlops richardi	Blind snake

AMPHIBIANS

Bufo marinus	Marine toad
Eleutherodactylus antiliensis	Puerto Rican red-eyed frog
E. coqui	Coqui
Leptodactylus albilabris	White-lipped frog
Rana catesbiana	Bull frog

FISH

Anguilla rostraca	Eel
Awaous taiasica	Striated river goby
Bathygobius soporator	Frillfin goby
Caranx latus	Horse eye jack
Centropomidae	Snook family
Centropomus parallelus	Fat snook
Centropomus undecimales	Common snook
Dormitator maculatus	Fat sleeper
Eleotris pisonis	Spiny cheek sleeper
Gerres cinereus	Yellow fin mojarra
Gobiomorus dormirtor	Bigmouth sleeper
Hypostomus plecostamus	Plecostomus
Ictalurus nebulosus	Brown bullhead
Lepomis gibbosus	Pumpkin seed
L. macrochirus	Bluegill
Liposarcus multiradiatus [g]	Armored sailfin catfish
Megalops atlanticus	Tarpon
Mugilidae	Mullet family
Mugil curema	Mullet
Poecilia reticulata	Guppy
P. vivipara	Top minnow
Tilapia aurea	Tilapia
T. mossambica	Tilapia

a - Sources: Danforth (1926), Díaz-Soltero (1990), Joglar (1998), Negrón González (1986), Rivero (1978). Domestic animals are omitted.

b - Sources (fish names): Erdman (1972), Erdman and others (1985).

c - Cabo Rojo Refuge, with tracts; H = Cabo Rojo Headquarters; S = Salinas
d - Other reserves and information sources: A = Boqueron Wildlife Refuge (Chabert and others 1982, Negrón González, 1986). Fifteen species of fish were mentioned for the lagoon but only six were identified to species. B = Los Morrillos de Cabo Rojo (Municipio Autónomo de Cabo Rojo, 1998); C = Punta Guaniquilla Natural Reserve (Fuentes Santiago and Quevedo Bonilla, 2002); D = Guánica Forest (Canals Mora 1990, Conde Costas y González 1990, Genet 2002, Rivero 1978); E = Parguera Natural Reserve (Departamento de Recursos Naturales, 1981); Departamento de Recursos Naturales y Ambientales, 2000a; Ventosa-Febles and others, 2005).

e - Now called Tadarida brasiliensis.

PLANTS

MONOCOTYLEDONAE

Alismataceae

*Echinodorus berteroi (*Spreng.) Fassett

Saggittaria lancifolia L.

Arecaceae

Acrocomia media O.F. Cook

Cocos nucifera L.

Roystonea borinquena O.F. Cook

Sabel morrissi H. Wendl.

Cyperaceae

Bulbostylis capillaris (L.) Kunth ssp. *Antillana* (Britton) T. Koyama

Cyperus ochraceus Vahl

C. rotundus L.

C. surinamensis Rottb.

Graminae (or Poaceae)

Paspalum conjugatum Berg.

P. distichum L.

P. laxum Lam.

P. notatum Flugge

P. sateceum Michx. Var. *ciliatifolium* (Michx.) Vasey

Pharus glaber HBK

Rottboellia cochinchinensis (Lour.) Clayton

Saccharum officinarum L.

Setaria barbata (Lam.) Kunth

S. rariflora Mikan

S. setosa (Sw.) Scribn. Var. *leiophylla* (Nees) Arechavaleta

*Sporobolus indicus (*L.) R. Br.

S. jacquemontii Kunth.

S. pyramidatus (Lam.) Hitchc.

*S. virginicus (*L.) Kunth

Tragus berteronianus Schult.

Tricholaena repens (Willd.) Hitchc.

Urochloa maxima (Jacq.) R.D. Webster

Tarigidia axelrodii **

Liliaceae

Aloe vera (L.) Burn. F.

Sansevieria trifasciata Prain

Yucca aloifolia L.

Orchidaceae

Oecceoclades maculata (Lindl.) Lindl.

DICOTYLEDONAE

Acanthaceae

Ruellia tuberosa L.

Siphanoglossa sessilis (Jacq.) Gibson

Aizoaceae

Mollugo verticillata L.

Sesuvium portulacastrum L.

Amaranthaceae

Achyanthes aspera L.

Amaranthus crassipes Schlecht

A. dubius Mart.

Gomphrena serrata L.

Salicornia bigelovii

Amaryllidaceae

Hymenocallis caribaea (L.) Herb.

Anacardiaceae

Comocladia dodonaea (L.) Urban

Mangifera indica L.

Metopium toxiferum (L.) Krug & Urban

Spondias mombin L.

Annonceae

Annona muricata L.

A. squamosa L.

Apocynaceae

Catharansus roseus (L.) G. Don

Pentalinon luteum (L.) Hansen & Wunderlin

Plumaria alba L.

P. obtusa

Rauvolfia nitida Jacq.

R. viridis Willd. Ex. Roem. & Schult.

Asclepidaceae

Calotropis procera (Ait.) Ait. F.

Matelea maritima (Jacq.) Woodson

Metasteima fallax Schltr.

Basellaceae

Anredera leptostachys (Moq.) v. Stennis

Bataceae

Batis maritima L.

Bignoniaceae

Crescentia cujete L.

C. linearifolia Miers.

C. portoricensis Britton

Disticus lactifolia (Vahl) DC.

Macfadyena unguis-cati (L.) A. Gentry

Tabebuia donnell-smithii Rose

T. heterophylla (DC.) Britton

Tecoma stans (L.) Kunth in HBK

Bombacaceae

Ceiba pentandra (L.) Gaertner

Boraginaceae

Bourreia succulenta Jacq. Var. succulenta

Cordia collococca L.

C. globosa (Jacq.) Kunth var. humilis (Jacq.) I.M. Johnst.

C. laevigata Lam.

C. ricksekeri Millsp.

C. stenophylla Alain

C. sulcata DC.

Heliotropium angiospermum Murray

H. curvassavicum L.

H. fruticosum L.

H. indicum L.

H. procumbens Mill.

Rochefortia acanthophora (DC.) Griseb.)

Tourmefortia volubilis L.

Brassicaceae

Brassica sp.

Cakile lanceolata (Wild.) O.E. Schultz

Bromeliaceae

Bromelia pinguin L.

Tillandsia recurvata (L.) L.

Burseraceae

Bursera simaruba (L.) Sarg.

Cactaceae

Harrissia portoricensis Britton

Leptocereus quadricostatus (Bello) Britton & Rosa

Melocactus intortus (Mill.) Urban

Opuntia boriquensis Britton & Rose

O. dillenii (Ker.-Gawl.) Haw.

O. repens Bello

O. tricantha (Willd.) Sweet

Pilosocereus royenii (L.) Byles & Rowley

Canellaceae

Canella winterana (L.) Gaertner

Capparaceae

Capparis baducca L.

C. flexuosa (L.) L.

C. hastada Jacq.

C. indica (L.) Fawc. & Rendle

Cleome spinosa Jacq.

C. viscosa L.

Celastraceae

Crosopetalum rhacoma Crantz

Eleodendrum xylocarpum (Vent.) DC.

Chrysobalanaceae

Chrysobalanus icaco L.

Clusiaceae

Clusia rosea Jacq.

Combretaceae

Bucida buceras L.

Conocarpus erectus L.

Laguncularia racemosa (L.) Gaertn.

Quisqualis indica L.

Terminalia catappa L.

Commelinaceae

Commelina elegans Kunth in HBK.

Compositae

Acanthuspermum hispidum DC.

Borrichia arborescens (L.) DC.

Eclipta prostrada (L.) L.

Emilia fosbergii Nicolson

Eupatorium odoratum L.

Gnaphalium indicum L.

Lagasoea mollis Cav.

Mikania micrantha HBK.

Partherium hysterophorus L.

Pectis ciralis L.

P. Carthusianorum Less.

P. linifolia L.

Pluschea carolinensis (Jacq.) G. Don

Tridax procumbens L.

Verbesina encelioides (Cav.) Benth. & Hook

Vermonia cinerea (L.) Less.

Wedelia lanceolata DC.

Convolvulaceae

Convolvulus nodifforus Desr.

Cuscuta idecora Choisey

Evovulus alsinoides (L.) L. var. grisebachianus Meissn.

Ipomoea indica (Burm.f.)

I. nil (L.) Roth

I. ochracea (Lindf.) G. Don.

I. steudelii Millsp.

I. triloba L.

Jacquemontia tamnifolia (L.) Griseb.

Merremia aegyptia (L.) Urban

M. dissecta (Jacq.) Hall.f.

M. quinquefolia (L.) Hall.f.

M. umbellata (L.) Hall.f.

Crassulaceae

Bryophyllum pinnatum (Lam.) Oken

Cucurbitaceae

Cucumis anguria L.

Melothria pendula L.

Momordica charantia L.

Erythroxlaceae

Erythroxylum areolatum L.

Euphorbiaceae

Acalypha bisetosa Bert.

A. portoricensis Muell. Arg.

Argythamnia candicans Sw.

Chamaesyce glomerifera Millsp.

C. hirta (L.) Millsp.

C. hypericifolia (L.) Millsp.

C. prostata (Ait.) Small

Cnidoscolus aconitifolius (Mill.) I.M. Johnston

C. betulinus Vahl

C. discolor Willd.

C. glandulosus L.

C. humilis L.

C. lobatus L.

Dalechampia scandens L.

Euphorbia herterophylla L.

E. lactea Haw.

Hura crepitans L.

Jatropha gossypifolia L.

J. hernandifolia Vent.

Phyllanthus amarus Schumach.

Ricinus communis L.

Securinega acidoton (L.) Rawcett & Rendle

Tragia volubilis L.

Goodeniaceae

Scaevola plumieri (L.) Vahi

Guttiferae

Calophyllum calaba L.

Krameriaceae

Krameria ixina L.

Labiatae

Hyptis sueveolens (L.) Poit.

Leonotis nepetifolia L.

Ocium sanctum L.

Lemnaceae

Lomna polyrhiza (L.) Schleiden

Leguminosae - Caesalpinioidae

Caesalpinia bonduc (L.) Roxb.
Cassia chamaecrista L.
C. obtusifolia L.

Hymenaea courbaril L.
Parkinsonia aculeataisonia aculeata L.
Senna obtusifolia (L.) Irwin & Barneby
S. polyphylia (Jacq.) Irwin & Barneby
Stahlia monosperma (Tul.) Urban
Tamarindus indica L.
Tamarindus indica L.
Abrus precatorius L.

Leguminosae - Faboidae

Alysicarpus vaginalis (L.) DC.
Andira inermis (W. Wright) Kunth
Centrosema virginianum (L.) Benth.
Clitoria ternatea L.
Cracca caribaea (Jacq.) Benth
Crotalaria retusa L.
Desmodium glabram (Mill.) DC.
D. procumbens (Mill.) Hitch.
D. tortuosum (Sw.) DC.
Galactia striata (Jacq.) Urban
Indigofora tinctoria L.
Macroptilium lathyroides (L.) Urban
Pictetia aculeata (Vahl) Urban
Piscidia carthagenensis Jacq.
Poitea paucifolia (DC.) Lavin
Rhynchosia minima (L.) DC.
Sesbania sericea (Willd.) Link
Stylosanthes hamata (L.) Taub.
Tephrosia cinerea (L.) Pers.
T. senna HBK.
Teramnus labialis (L.f.) Spreng.
Zornia reticulata J.E. Smith
Acacia farnesiana (L.) Willd.

Leguminosae - Mimosaideae

Albizia lebbeck (L.) Benth.
Dasmanthus virgatus (L.) Willd.
Inga vera Willd.
Leucaena leucocephala (Lam.) de Wit

Minosa pudica L.

Pithecellobium dulce (Roxb.) Benth.

P. ungis-cati (L.) Mart.

Prosopis juliflora (Sw.) DC.

Samanea saman (Willd.) Merr.

Malphigiaceae

Bunchosia glandulosa (Cav.) L.C. Rich

Byrsomina lucida (Mill.) L.C. Rich

B. spicata (Cav.) HBK.

Heteropteris purpurea (L.) Kunth

H. laurifolia (L.) A. Juss.
Stigmaphyllon emarginatum (Cav.) A. Juss.

Malvaceae

Abutilon umbellatum (L.) Sweet

Bastardia viscosa (L.) HBK.

Hibiscus phoeniceus Jacq.
Gossypium barbadense L. var. barbadense

Malachra alcelfolia Jacquin

Malvastrum americanum (L.) Torrey

M. coromandelianum (L.) Garke

Sida abutilifolia Mill.

S. acuta Burm. F.

S. alba L.

S. cordifolia L.

S. glabra Mill.

S. glomerata Cav.

S. jamaicensis L.

S. rhombifolia L.

S. salviifolia Presl.

S. urens L.

Sidastrum multiflorum (Jacq.) Fryxell
Thespesia populnea (L.) Solander ex Correa

Wissadula amplissima (L.) R.E. Fries

Meliaceae

Cedrela odorata L.

Melia azedarach L.

Swietenia mahagoni (L.) Jacq.

Trichilia hirta L.

Molluginaceae

Mullugo verticulata L.

Moraceae

Ficus benjamina L.

F. citrifolia Mill.

Myrtaceae

Eugenia foetida Pers.

E. sessiliflora Vahl

E. woodburyana Alain

Pimenta recemosa (Miller) J.W.Moore var. racemosa

Nyctaginaceae

Boerhavia diffusa L.

Commicarpus scandens (L.) Standl.

Pisonia albida (Heimerl) Britton ex Standl.

P. subcordata Sw.

Oleaceae

Jasminum fluminense Velloso

Onagraceae

Ludwigia erecta (L.) H. Hara

Passifloraceae

Passifloria suberosa L.

Phytolaccaceae

Rivina humilis L.

Polygalaceae

Polygala cowellii (Britton) S.F. Blake

Polygonaceae

Antigonon leptupus Hook. & Am.

Coccoloba diversifolia Jacq.

C. microstachya Willd.

C. swartzii Meissn.

C. uvifera (L.) L.

Portulacaceae

Portulaca halimoides L.

P. oleracea L.

P. pilosa L.

P. quadrifida L.

Talinum fruticosum (L.) A.L. Juss.

T. triangulare (Jacq.) Willd.

Rhamnaceae

Colubrina arborescens (Mill.) Sarg.

Krugiodendron ferreum (Vahl) Urban

Reynosia uncinata Urban

Ziziphus reticulata (Vahl) DC.

Rhizophoraceae

Rizophora mangle L.

Rubiaceae

Diodia apiculata (Willd.) K. Schum.

D. rigida Cham. & Schldl.

Erithalis fruticosa L.

Exostema caribaeum (Jacq.) Roem. & Schult.

Guettarda elliptica Sw.

Randia aculeata L.

Spermacoce assurgens Ruiz & Pavon

S. confusa Rendle & Gillis

S. prostrata Aubl.

S. repens (DC.) Fosberg & Powell

S. verticillata (L.) Meyer

Rutaceae

Citrus aurantifolia (Christm.) Swingle

C. limon (L.) Burm.f.

Zanthoxylum flavum Vahl

Z. martinicense (Lam.) DC.

Z. monophyllum (Lam.) P. Wilson

Sapindaceae

Cardiospermum corundum L.

Dodonaea americana L.

Melicoccus bijugatus Jacq.

Thouinia striata Radik. Var. portoricensis (Radik.) Votava & Alain

Triphasia trifolia (Burm.f) P. Wilson

Sapotaceae

Bumelia obovata (Lam.) A. DC.

Sideroxylon foetidissimum Jacq.

S. obovatum Lam.

Scrophulariaceae

Capraria biflora L.

Scoparia dulcis L.

Solanaceae

Datura inoxia Mill.
Goetza elegans Wydler
Physalis angulata L.
Solanum persicifolium Dunal

Sterculiaceae

Ayenia insulicola Cristobal
Guazuma ulmifolia Lam.
Helicteres jamaicensis Jacq.
Melochia pyramidata L.
M. tomentosa L.
Sterculia apelata (Jacq.) Karst
Waltheria indica L.

Theophrastaceae

Jacquinia arborea Vahl

Tiliaceae

Corchorus aestuana L.
C. hirsutus L.
C. orinocensis Kunth in HBK.
C. siliquosus L.

Turneraceae

Piriqueta ovata (Bello) Urban
Turnera diffusa Willd.
T. ulmifolia L.

Verbenaceae

Bouchea prismatica (L.) Ktze
Citharexylum fruitcosum L.
Clerodendrum aculeatum (L.) Schlecht
Lantata camara L.
L. involucrata L.
Lippia nodiflora (L.) Michx.
Stachytarpheta jamaicensis (L.) Vahl
Tamonea spinosa Sw.

Viscaceae

Phoradendron anceps (Spenng.) Krug & Urb.
P. quarangulare (Kunth) Griseb.

Vitaceae

Cissus trifoliata (L.) L.

Zygophyllaceae

Gualacum officinale L.

Kallstroemia maxima (L.) Hook & Arn.

Tribulus cistoides L.

f - NA = not known.

*** new species described in 2010.* *Systematic Botany* (2010), 35(1): pp. 96–101

Appendix J. Budget Requests

The refuge's budget requests are contained in the Refuge Operating Needs System (RONS) and Service Asset and Maintenance Management System (SAMMS) databases that include a wide variety of new and maintenance refuge projects. The RONS and SAMMS lists are constantly updated and include priority projects. Contact the refuge for the most current RONS and SAMMS lists. Please refer to Chapter V, Plan Implementation, for the key budget requests associated with the proposed projects and staffing. Chapter V includes the proposed projects, which are linked to the applicable objectives, and Table 5, which identifies staff, first-year costs, and recurring costs for the outlined projects.

Appendix K. List of Preparers

Susan Silander, Project Leader, *Caribbean Islands NWR Complex*

Joesph Schwagerl, Deputy Project Leader, *Caribbean Islands NWR Complex*

Oscar Díaz, Refuge Manager, *Cabo Rojo and Laguna Cartagena NWRs*

William Hernández, GIS Specialist, *Caribbean Islands NWR Complex*

David Bocanegra, Outreach Specialist, *Caribbean Islands NWR Complex*

Beverly Yoshioka, Biologist, *USFWS Boquerón Ecological Service*

David Callihan, Consultant, *Management Systems International*

Laura Housh, Regional Planner, *USFWS Southeast Regional Office*

Monica Harris, Planner, *USFWS Southeast Regional Office*

Evelyn Nelson, Editor, *USFWS Southeast Regional Office*

Randy Musgraves, Graphics, *USFWS Southeast Regional Office*

Rose Hopp, Planning Chief, *USFWS Southeast Regional Office*

Appendix L. Consultation and Coordination

OVERVIEW

This appendix summarizes the consultation and coordination that occurred in the process of identifying the issues, alternatives, and proposed alternative, which were presented in the Draft CCP/EA during the period of time while the Draft CCP/EA was being prepared and distributed, and during the period of public review and comment on the Draft CCP/EA.

The following meetings, contacts, and presentations were undertaken by the Service during the preparation of the CCP:

VISITOR SERVICES REVIEW
A Visitor Services Review was conducted for the Complex in June 2003. Participants included Complex staff as well as the following:

Garry Tucker, FWS, Regional Office
Ray Paterra, White River NWR
Gisella Burgos, Okefenokee NWR

BIOLOGICAL REVIEW
A Biological Review was conducted for the Complex on January 14-25, 2002. The review team included:

Cal Garnett, Assistant Refuge Supervisor, FWS Regional Office (Former)
Chuck Hunter, Non-game Migratory Bird Coordinator, FWS Regional Office (Former)
Margaret Miller, Coral Reef Scientist, National Oceanic and Atmospheric Administration
Keith Watson, Non-game Migratory Bird Biologist, FWS, Migratory Bird Office
Craig Watson, Assistant Atlantic Coast Joint Venture Coordinator, South Atlantic Working Group

Staff of Caribbean Ecological Services Field Office:

Felix López, Contaminants Specialist
Leopoldo Miranda, Private Lands Biologist
Marelisa Rivera, Endangered Species Biologist
Ana Román, Habitat Conservation Biologist
Jorge Saliva, PhD, Endangered Species Biologist
Beverly Yoshioka, Habitat Conservation Biologist

Staff of Caribbean Islands NWR Complex:

Oscar Díaz, Refuge Manager, Vieques
Stephen D. Earsom, Refuge Biologist/Pilot
Mike Evans, Refuge Manager, St. Croix
Claudia Lombard, Biologist
Amy Mackay, Biologist
Joseph Schwagerl, Deputy Project Leader
Susan Silander, Project Leader
Teresa Tallevast, Refuge Manager, Culebra

CORE PLANNING TEAM MEMBERS
The core planning team involved staff from Cabo Rojo NWR, Puerto Rico, and a staff from the Caribbean Islands NWR Complex. This team was the primary decision-making team for the development of the CCP. Key tasks of the team involved defining and refining the vision; identifying, reviewing, and filtering issues; defining the goals; and outlining the alternatives. The team members included:

Name	Organization
Susan Silander	Project Leader, Caribbean Islands NWR Complex, FWS
Joseph Schwagerl	Deputy Project Leader, Caribbean Islands NWR Complex, FWS
Oscar Díaz	Planning Team Leader: Refuge Manager, Cabo Rojo and Laguna Cartagena NWRs, FWS
William Hernández	GIS Specialist, Caribbean Islands NWR Complex, FWS
David Bocanegra	Outreach Specialist, Caribbean Islands NWR Complex, FWS
Beverly Yoshioka	FWS Ecological Services Office – Boquerón, P.R.
David Callihan	MSI- Management Systems international
Laura Housh	Regional Planner, FWS Southeastern Regional Office

Summary of Meetings and Contacts
The process to develop the refuge's management plan has involved a series of meetings with staff and key constituencies, including holding a public scoping meeting with neighboring communities and interested non-governmental organizations, local business leaders, community and political leaders, and other interested parties. The key events in this process included:

- Notice of intent published: Notice of intent to prepare a Draft CCP/EA published in the Federal Register, with a request for comments (May 16, 2007).
- Preplanning meeting: List of key issues identified in a preplanning meeting with refuge staff (November 2007).
- Public scoping meeting held for Cabo Rojo NWR - Corozo Community (March 26, 2008).
- Refuge manager Oscar Díaz held a number of one-on-one meetings with key stakeholders over the planning period. This included a meeting with the Mayor of Cabo Rojo on March 25, 2008.
- Meeting to review public scoping comments and Identify goals, alternative mManagement options, and objectives and strategies (une 2008).
- Notice of availability was published in the Federal Register announcing a 30-day public review of the Draft CCP/EA (May 2, 2011).
- A public meeting was held at the Cabo Rojo community building (May 18, 2011).
- Preparation of final document (uly 2011).

Appendix M. Finding of No Significant Impact

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) will protect and manage certain fish and wildlife resources in the Cabo Rojo National Wildlife Refuge (NWR). An environmental assessment was prepared to inform the public of the possible environmental consequences of implementing the Comprehensive Conservation Plan (CCP) for Cabo Rojo NWR. A description of the alternatives, the rationale for selecting the preferred alternative, the environmental effects of the preferred alternative, the potential adverse effects of the action, and a declaration concerning the factors determining the significance of effects, in compliance with the National Environmental Policy Act of 1969, are outlined below. The supporting information can be found in the Environmental Assessment, which was Section B of the Draft Comprehensive Conservation Plan.

ALTERNATIVES

In developing the CCP for Cabo Rojo NWR, the Service evaluated three alternatives - A, B, and C.

The Service adopted Alternative C (Habitat and Public Use Emphasis) as the “preferred alternative” for guiding the direction of the refuge for the next 15 years. The overriding concern reflected in this CCP is that wildlife conservation assumes first priority in refuge management; wildlife-dependent recreational uses are allowed if they are compatible with wildlife conservation. Wildlife-dependent recreation uses (e.g., fishing, wildlife observation, wildlife photography, and environmental education and interpretation) will be emphasized and encouraged.

Alternative A. No Action Alternative
Under Alternative A, existing refuge management practices and uses would continue. All refuge management actions would be directed towards achieving the refuge’s goals, which include: (1) Restore and enhance native wildlife and plants, particularly the endangered yellow-shouldered blackbird; (2) increase the level of environmental awareness among residents and visitors; and (3) protect one of the most important shorebird habitats in the Caribbean.

Alternative B. Resource Management Emphasis
Under Alternative B, emphasis would be on improving refuge resources for wildlife. As with Alternative A, management efforts would focus on achieving the refuge’s primary purposes. Under Alternative B, management would provide greater enhancement and management of habitats and associated plant communities for the greater benefit of wildlife.

Alternative C. Improving Resource Management for Habitat and Expanding Visitor Services

Alternative C, the preferred alternative, is considered to be the most effective management action for meeting the purposes of the refuge and the mission of the Refuge System. Under Alternative C, the emphasis will be on improving refuge resources for habitat and wildlife, while support for visitor services programs will be increased. As with Alternatives A and B, management efforts will focus on achieving the refuge’s primary purposes.

Under Alternative C, management will provide greater support for visitor services programs, including an emphasis on the following: (1) Developing a curriculum-based environmental education program; (2) expanding the role of the Friends Group to include providing staffing and interpretation services at

the refuge's new visitor services center; (3) opening the new headquarters building in 2012; (4) reviewing and updating the refuge's brochures and website, including offering a Spanish version of the website; (5) updating current kiosks and building new kiosks along the trail system; (6) expanding the volunteer program to also provide assistance with public use activities; (7) seeking and developing new partnerships, particularly with regard to trail maintenance; and (8) adding more signage to clarify refuge uses.

Selection Rationale

Alternative C is selected for implementation because it directs the development of programs to best achieve the refuge purpose and goals, emphasizes improving refuge resources and wildlife and habitat, collects habitat and wildlife data, and ensures long-term achievement of refuge and Service objectives. At the same time, management actions will also emphasize expanded and balanced levels of compatible public use opportunities consistent with existing laws, Service policies, and sound biological principles. It provides the best mix of program elements to achieve desired long-term conditions.

Under this alternative, all lands under the management and direction of the refuge will be protected, maintained, and enhanced to best achieve national, ecosystem, and refuge-specific goals and objectives within anticipated funding and staffing levels. In addition, the action positively addresses significant issues and concerns expressed by the public.

This alternative was developed based on public input and the best professional judgment of the planning team. The objectives and strategies presented in this CCP were developed as a direct result of the selection of Alternative C.

Environmental Effects

Implementation of the Service's management action is expected to result in environmental, social, and economic effects as outlined in this CCP. Habitat management, population management, land conservation, and visitor service management activities on Cabo Rojo NWR will result in: an increased effort to monitor and protect federal and state listed species and enhance their essential habitats within the refuge; continued protection and monitoring of shorebird populations; initiation of a program to control invasive and exotic vegetation and replace with native subtropical dry forest; development of a long-term water management plan for the salt flat lagoons that addresses the issues of salinity and water levels and flow; development of a water management plan to reclaim salt lagoons not currently managed to expand and improve bird habitat (Fraternidad and Candelaria Lagoons); and increased reforestation in upland areas.

These effects are detailed as follows:

1. Increased monitoring and protection of federal and state listed species to enhance and expand their essential habitats within the refuge. The Cabo Rojo NWR contains (or supports) a number of species of special management interest, including snowy plovers and yellow-shouldered blackbirds (a federally listed endangered species). Of the six species of sea turtles found in U.S. waters or that nest on U.S. beaches, three of these nest on beaches found on refuges within the Caribbean--the leatherback sea turtle (*Dermochelys coriacea*), hawksbill sea turtle (*Eretmochelys imbricata*), and green sea turtle (*Chelonia mydas*). The hawksbill and the leatherback are known to nest on the beaches adjacent to Cabo Rojo NWR.

Refuge actions under this CCP designed to monitor, protect, and support population growth for species of concern will include: expand nesting and forage habitat of yellow-shouldred blackbirds; conduct nesting surveys of hawksbill, green and leatherback sea turtles to increase nest protection and hatchling success; and actively manage the endangered plant population of *Aristida chaseae.*

2. Continued protection and monitoring of shorebird populations. The salt flats at Cabo Rojo are among the best sites for attracting birds migrating from North and South America through the eastern Caribbean; as many as 40,000 shorebirds migrate through the salt flats during the fall months, and daily counts can exceed 7,000 birds.

   Actions to be undertaken to protect and support an increase in shorebird populations will include: conducting monthly shorebird surveys; conducting nesting season surveys of least terns and snowy plovers to assess nesting success; and developing artificial "islands" in eastern lagoons for shorebird nesting.

3. Initiation of a program to control invasive and exotic vegetation and replace with native subtropical dry forest, and initiate a program to reduce exotic pests, including green iguanas. The land occupied by the refuge was used for cattle ranching and agriculture for more than five centuries prior to Service ownership. During this period, native plants were severely reduced in number and several exotics increased in area. Today, the refuge is covered with pasture interspersed with native and exotic trees, patches of secondary forest, and tree plantings of various species.

   Under this CCP, invasive species will be reduced as the refuge will treat 5 acres per year of exotic/invasive vegetation and plant native trees in these areas. In addition, the entire refuge will be surveyed annually to detect new exotic species. The refuge will also develop a nuisance/exotic animal control plan to reduce the number of high-priority pests on the refuge, including iguanas, cats, and dogs (which negatively impact bird populations).

4. Improve and expand the management of the refuge's salt ponds and lagoons. Improved salt pond and lagoon management will be based on the development of a long-term water management plan for the salt flat lagoons that addresses salinity and water levels and flow. The Cabo Rojo Salt Flats are extremely important for nesting, migrating, and wintering shorebirds. Thousands of shorebirds can be observed here during migration, and species such as the snowy plover use the salt flats for nesting and foraging. The source of water and salt at the salt flats and crystallization ponds is through water control structures directly from the Caribbean Sea, directed by a network of channels and ditches.

   The refuge plans to undertake a number of actions that will lead to the development of a sustainable long-term management plan for the salt lagoons. Initial actions will include conducting a literature review of similar tidal salt flat areas to identify best practices for the management of salt lagoons in a manner that benefits wildlife. This, together with a review of existing data and previous Cabo Rojo Salt Flat studies, will help the refuge to develop a long-term management plan. In addition, the refuge will develop an adaptive management process for western lagoons that are not currently managed for salt production. The study will compare water quality and wildlife use between managed and natural lagoons in an effort to improve management to meet the habitat needs of the refuge's shorebirds.

   In addition, there are several small lagoons on the refuge that are not currently managed (particularly adjacent to the Fraternidad and Candelaria Lagoons), either for salt production or to optimize habitat

value. The refuge proposes to experiment with adding water to these areas to increase their habitat value and will monitor the results to ensure the outcomes are desirable for wildlife.

5. Increase reforestation in upland areas. There are virtually no large tracts of dry forest still standing anywhere on the planet. If this habitat is to be maintained into the future, it has to be protected and expanded. Restoration ecology and habitat management are the only solutions.

   The refuge has been engaged in limited planting of native vegetation to expand the upland forest area and would like to continue and expand this effort. Under this CCP period, the refuge plans to annually plant 5 acres of native trees. This effort will be implemented in conjunction with Objective 1.3 -- Initiate a program to control invasive and exotic vegetation and replace with native subtropical dry forest.

Potential Adverse Effects and Mitigation Measures

Wildlife Disturbance

Disturbance to wildlife at some level is an unavoidable consequence of any public use program, regardless of the activity involved. Obviously, some activities innately have the potential to be more disturbing than others. The management actions to be implemented have been carefully planned to avoid unacceptable levels of impact.

As currently proposed, the known and anticipated levels of disturbance of the management action are considered minimal and well within the tolerance level of known wildlife species and populations present in the area. Implementation of the public use program will take place through carefully controlled time and space zoning, establishment of protection zones around key sites, closures of all-terrain vehicle trails, and routing of roads and trails to avoid direct contact with sensitive areas, such as nesting bird habitat. Monitoring activities through wildlife inventories and assessments of public use levels and activities will be utilized, and public use programs will be adjusted as needed to limit disturbance.

User Group Conflicts

As public use levels expand across time, some conflicts between user groups may occur. Programs will be adjusted, as needed, to eliminate or minimize these problems and provide quality wildlife-dependent recreational opportunities. Experience has proven that time and space zonings, such as establishment of separate use areas, use periods, and restricting numbers of users, are effective tools in eliminating conflicts between user groups.

Effects on Adjacent Landowners

Implementation of the management action will not impact adjacent landowners. Future land acquisition will occur on a willing-seller basis only, at fair market values within the approved acquisition boundary. Lands are acquired through a combination of fee title purchases and/or donations and less-than-fee title interests (e.g., conservation easements, cooperative agreements) from willing sellers. Funds for the acquisition of lands within the approved acquisition boundary will likely come from the Land and Water Conservation Fund or the Migratory Bird Conservation Act. The management action contains neither provisions nor proposals to pursue off-refuge stream bank riparian zone protection measures (e.g., fencing) other than on a volunteer/partnership basis.

Land Ownership and Site Development

Proposed acquisition efforts by the Service will result in changes in land and recreational use patterns, since all uses on national wildlife refuges must meet compatibility standards. Land ownership by the Service also precludes any future economic development by the private sector.

Potential development of access roads, dikes, control structures, and visitor parking areas could lead to minor short-term negative impacts on plants, soil, and some wildlife species. When site development activities are proposed, each activity will be given the appropriate National Environmental Policy Act consideration during pre-construction planning. At that time, any required mitigation activities will be incorporated into the specific project to reduce the level of impacts to the human environment and to protect fish and wildlife and their habitats.

As indicated earlier, one of the direct effects of site development is increased public use; this increased use may lead to littering, noise, and vehicle traffic. While funding and personnel resources will be allocated to minimize these effects, such allocations make these resources unavailable for other programs.

The management action is not expected to have significant adverse effects on wetlands and floodplains, pursuant to Executive Orders 11990 and 11988.

Coordination

The management action has been thoroughly coordinated with all interested and/or affected parties. Parties contacted include:

All affected landowners
Commonweath of Puerto Rico District Representatives
Governor of Puerto Rico
Mayor of Cabo Rojo Municipality
Puerto Rico Department of Natural and Environmental Resources
Local community officials
Interested citizens
Conservation organizations

Findings

It is my determination that the management action does not constitute a major federal action significantly affecting the quality of the human environment under the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969 (as amended). As such, an environmental impact statement is not required. This determination is based on the following factors (40 C.F.R. 1508.27), as addressed in the Environmental Assessment for the Cabo Rojo National Wildlife Refuge:

1. Both beneficial and adverse effects have been considered and this action will not have a significant effect on the human environment. (Environmental Assessment, page 89)

2. The actions will not have a significant effect on public health and safety. (Environmental Assessment, page 89)

3. The project will not significantly affect any unique characteristics of the geographic area such as proximity to historical or cultural resources, wild and scenic rivers, or ecologically critical areas. (Environmental Assessment, page 90)

4. The effects on the quality of the human environment are not likely to be highly controversial. (Environmental Assessment, page 90)

5. The actions do not involve highly uncertain, unique, or unknown environmental risks to the human environment. (Environmental Assessment, page 90)

6. The actions will not establish a precedent for future actions with significant effects nor do they represent a decision in principle about a future consideration. (Environmental Assessment, page 108)

7. There will be no cumulatively significant impacts on the environment. Cumulative impacts have been analyzed with consideration of other similar activities on adjacent lands, in past action, and in foreseeable future actions. (Environmental Assessment, page 109)

8. The actions will not significantly affect any site listed in, or eligible for listing in, the National Register of Historic Places, nor will they cause loss or destruction of significant scientific, cultural, or historic resources. (Environmental Assessment, page 108)

9. The actions are not likely to adversely affect threatened or endangered species, or their habitats. (Environmental Assessment, page 109)

10. The actions will not lead to a violation of federal, state, or local laws imposed for the protection of the environment. (Environmental Assessment, page 109)

Supporting References

Fish and Wildlife Service. 2011. Draft Comprehensive Conservation Plan and Environmental Assessment for Cabo Rojo National Wildlife Refuge, Puerto Rico. U.S. Department of the Interior, Fish and Wildlife Service, Southeast Region.

Document Availability

The Environmental Assessment was Section B of the Draft Comprehensive Conservation Plan for Cabo Rojo National Wildlife Refuge and was made available in May 2011. Additional copies are available by writing: Cabo Rojo National Wildlife Refuge, P.O. Box 510, Boquerón, Puerto Rico 00622.

Signed

Cynthia Dohner
Regional Director

9/22/11
Date