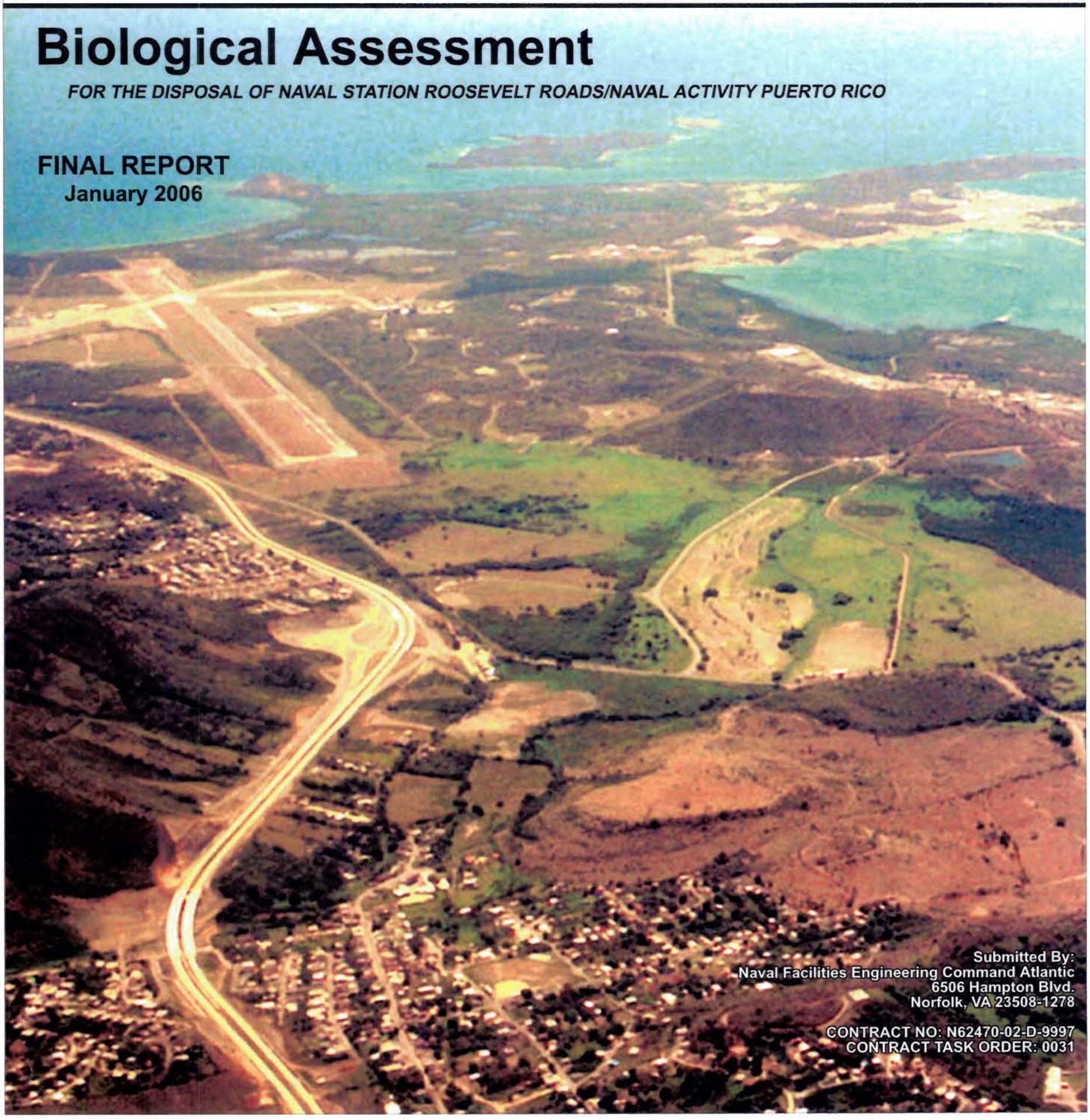
NAVFAC
Naval Facilities Engineering Command

Biological Assessment

FOR THE DISPOSAL OF NAVAL STATION ROOSEVELT ROADS/NAVAL ACTIVITY PUERTO RICO

FINAL REPORT
January 2006



Submitted By:
Naval Facilities Engineering Command Atlantic
6506 Hampton Blvd.
Norfolk, VA 23508-1278

CONTRACT NO: N62470-02-D-9997
CONTRACT TASK ORDER: 0031

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LIST OF ACRONYMS AND ABBREVIATIONS

ac	acre(s)
ADNFEC	Atlantic Division Naval Facilities and Engineering Command
BA	Biological Assessment
BRAC	Base Realignment and Closure
CBC	Christmas Bird Counts
CFR	Code of Federal Regulations
CNS	Caribbean Stranding Network
DNER	Department of Natural and Environmental Resources
DOD	Department of Defense
DODAA	Department of Defense Appropriations Act
DON	Department of the Navy
DPS	distinct population segment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
ft	feet
FY	Fiscal Year
GMI	Geo-Marine, Inc.
ha	hectare(s)
km	kilometer(s)
LRA	Local Redevelopment Authority
m	meter(s)
mi	mile(s)
NAPR	Naval Activity Puerto Rico
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOS	National Ocean Service
NRC	National Research Council
NSRR	Naval Station Roosevelt Roads
OPNAVINST	Naval Operations Instructions
P.L.	Public Law
PRPA	Puerto Rico Ports Authority
U.S.	United States
U.S.C.	U.S. Code
USACE	U.S. Army Corp of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

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1.0 INTRODUCTION

This section of the Biological Assessment (BA) discusses the purpose and need of the proposed action and provides synopses of legislation relevant to the proposed action. Historical information concerning the action area being considered is also provided in this section.

1.1 PURPOSE AND NEED

Pursuant to the United States Department of Defense Appropriations Act (DODAA) of Fiscal Year (FY) 2004 (Public Law [P.L.] 108-87), the United States (U.S.) Department of the Navy (DON) has closed Naval Station Roosevelt Roads (NSRR) in Puerto Rico. Section 8132 (a) of P.L. 108-87 states, "Notwithstanding . . . any other provision of law, the Secretary of the Navy shall close Naval Station Roosevelt Roads, Puerto Rico, no later than 6 months after enactment of this Act." Accordingly, on March 31, 2004, NSRR ceased operations as a Naval Station. The base was re-designated as Naval Activity Puerto Rico (NAPR) to maintain a Navy presence and associated security during the disposal process. P.L. 108-87, Section 8132(b) further states, "The closure provided for in subsection (a), and subsequent disposal, shall be carried out in accordance with the procedures and authorities contained in the Defense Base Closure and Realignment Act of 1990 (title XXIX of P.L. 101-510; 10 U.S. Code [U.S.C.] 2687 note)."

A BA is generally prepared if federally protected species or critical habitats may be present in the proposed action area in order to ensure compliance with the Endangered Species Act (ESA) (50 Code of Federal Regulations [CFR] 402.12). Based on prior surveys on and around NSRR, 12 federally protected species are known or have the potential to occur in the action area (Rathbun et al. 1985; DON 1998, 2001, 2003a; CB Richard Ellis et al. 2004; Tolson 2004). Critical habitat is present at NAPR for one listed species: the yellow-shouldered blackbird (*Agelaius xanthomus*) (DON 1998).

The purpose of this BA is to evaluate the potential effects of the proposed action on listed and proposed species and designated and proposed critical habitats that are present within NAPR to determine whether any such species or habitats are likely to be adversely affected by the proposed action, and to determine whether formal consultation or a conference is necessary. This BA, which is being prepared in accordance with the requirements stipulated in 50 CFR Part 402.12 as well as the ESA, National Environmental Policy Act (NEPA), and Naval Operations Instructions (OPNAVINST) 5090.1B (*Environmental and Natural Resources Program Manual*), is necessary for the proposed disposal of land at NAPR.

1.2 RELEVANT LEGISLATION

The following are brief summaries of the federal laws that the Navy must consider as it transfers NAPR to future landowners. These statutes include the ESA, the Defense Base Closure and Realignment Act, and several U.S. Codes that deal with the transfer of military lands.

1.2.1 Endangered Species Act

The ESA of 1973 provides for the designation and protection of species that are in danger of becoming extinct and conserves the ecosystems on which such species depend. An "endangered" species is a species that is in danger of extinction throughout all or a significant portion of its range. "A threatened" species is one that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Critical habitats as defined by the ESA are specific geographic areas with physical and/or biological features that are essential for the conservation of threatened or endangered species and that may require special management considerations or protection. The U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) jointly administer the ESA and are responsible for the listing (i.e., labeling) of "candidate" species as threatened or endangered. A candidate species is one that is the subject of either a petition to list or status review, and for which the USFWS or NMFS has determined that listing may be or is warranted (NMFS 2004). The NMFS is further charged with the listing of all "species of concern" that fall under its jurisdiction. A species of concern is

one about which the NMFS has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA (NMFS 2004). In accordance with the regulations implementing Section 7 of the ESA, federal agencies must consult with the USFWS or NMFS when their actions may either affect a listed species, candidate species, or species of concern or result in destruction or adverse modification of critical habitat.

1.2.2 Defense Base Closure and Realignment Act

Base realignment and closure (BRAC) is the process the Department of Defense (DOD) uses to reorganize its installation infrastructure to more efficiently and effectively support its forces, increase operational readiness, and facilitate new ways of doing business (DOD 2004). The DODAA for FY 2004 states that "the closure and subsequent disposal (of NSRR) be carried out in accordance with the procedures and authorities contained in the Defense Base Closure and Realignment Act of 1990 (Title XXIX of P.L. 101-510; 10 U.S.C. 2687 note)." This law states that the Secretary of Defense must follow all regulations regarding disposal of property in the Federal Property and Administrative Services Act of 1949 (40 U.S.C. 483; Section 202) and the Surplus Property Act of 1944 (50 U.S.C. App. 1622 (g)).

Prior to disposal of any real property, the DOD shall, consistent with the NEPA and section 2905 of the Defense Base Closure and Realignment Act, as amended (10 U.S.C. 2687), complete an environmental impact analysis of all reasonable disposal alternatives. The DOD shall consult with the redevelopment authority throughout the environmental impact analysis process to ensure that the redevelopment authority is provided the most current environmental information available concerning the installation and that the DOD receives the most current information available concerning the authority's redevelopment plans for the installation (24 CFR 586.45(b)).

1.3 HISTORY OF NAVAL STATION ROOSEVELT ROADS

Interest in establishing a naval base in the Virgin Islands and/or eastern Puerto Rico began in 1919 when Admiral Robert L. Pettigrew surveyed the Caribbean for potential base sites. In 1940, when the Navy's involvement in World War II appeared to be imminent, Captain R. Spruce, Commandant of the Tenth Naval District, recommended the Vieques Sound area in Puerto Rico as an ideal location for an operational facility. The Greensdale Board, a task force composed of Army, Navy, and Marine Corps officers appointed by President Roosevelt to assess current naval facilities and determine how the Navy should proceed in the establishment of new installations, concluded in 1940 that a large naval base was necessary in the Caribbean to protect the eastern approach to the Panama Canal because of expected wartime activities. The Board selected Puerto Rico as one of the locations for a major operating base (Atlantic Division Naval Facilities Engineering Command [ADNFEC] 1998).

The Vieques Sound location was selected as the site for an operating base in 1941. The Navy purchased 6,680 acres (ac) of land surrounding Ensenada Honda in the municipality of Ceiba, Puerto Rico. The Navy built a temporary camp, a pier, began dredging operations, and established a new operating base at the Vieques Sound site in 1941. Facilities on the base were constructed in the following years and completed in 1943. The base was officially commissioned as a U.S. Naval Operations Base in 1943. Although not officially designated as "Roosevelt Roads" until 1943 the base was commonly referred to as Roosevelt Roads as early as 1941 (DON 1949). The installation was placed in caretaker status and re-designated as "United States NSRR" in 1944 and served as a training facility and base for Navy ships and aircraft in World War II (ADNFEC 1998).

After World War II, the operating status and mission of NSRR changed frequently. Until 1955, the primary mission of NSRR was to serve as a training installation and fuel depot for the Atlantic Fleet. In 1955 NSRR became the center for Fleet Guided Missile Training Operations in the Atlantic, now known as the Atlantic Fleet Weapons Training Facility, and began a period of expansion to meet its new mission requirements. The Army's Fort Bundy property was then acquired and, in 1957, its buildings were converted to house the station's Administration, Personnel, and Security departments; a variety of new buildings were also constructed on the acquired property at that time. In 1959, Ofstie Field was established to support this mission. NSRR continued to function as a missile-training complex in the

1960s and 1970s. The primary mission of NSRR was to increase and perfect the Navy's skills in missile warfare (ADNFEC 1998). NSRR also supported training in the Puerto Rico Operations Area (e.g., Vieques Naval Reservation) to maintain combat readiness through 2003.

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2.0 PROPOSED ACTION AND GEOGRAPHIC LOCATION

The following section describes the proposed action and action area within the Commonwealth of Puerto Rico, with primary emphasis on the recommended land uses for the base following land transfer.

2.1 DESCRIPTION OF THE PROPOSED ACTION

The proposed action evaluated in the BA is the disposal of Navy property located at NAPR. Disposal and subsequent reuse evaluated in this BA is pursuant to the conceptual reuse scenario identified in the Reuse Plan (CB Richard Ellis et. al 2004). It should be noted that the Reuse Plan is conceptual and focuses on proposed land uses and not on specific developments. The Reuse Plan is divided into four phases covering 34 years of development. Accordingly, the first two phases—property transferal and the initial development—cover 10 years and primarily utilizes existing assets and infrastructure capacity. The last two phases are more speculative and would be contingent upon undetermined economic factors. Specific project sponsors would be responsible for the preparation of detailed engineering and design studies and obtaining necessary permits and approvals from the respective regulatory agencies before implementation of development activities.

Parcels of land within NAPR will either be conveyed to other federal agencies, the Commonwealth of Puerto Rico, or disposed to private investors/parties. The Reuse Plan for NSRR (NAPR) identifies all land parcels that the consulting team proposes to be transferred or sold, but does not identify the intended recipients. It is currently anticipated that all conveyances, transfers, and sales of land would be completed soon as practicable. Species specific conservation measures are identified for each parcel. Compliance with the conservation measures is the responsibility of the new landowner and/or developer.

2.2 AREA OF THE PROPOSED ACTION

The island of Puerto Rico is situated in the Antillean arc, a lengthy chain of islands that separates the Caribbean Sea from the Atlantic Ocean and Gulf of Mexico. The Antillean arc is an island chain of volcanic origin that is approximately 1,300 miles (mi) (2,093 kilometers [km]) long. Puerto Rico is located approximately 1,650 mi (2,657 km) southeast of New York City and 500 mi (805 km) north of Venezuela. The island is about 100 mi (161 km) long and 36 mi (58 km) wide. NAPR is located on the east coast of Puerto Rico, at the physical center of the eastern Caribbean region (**Figure 2-1**).

NAPR encompasses approximately 8,660 ac (3,513 hectares [ha]) of land area, of which 3,868 ac (1,569 ha) are available for reuse. The remainder of the area is listed as conservation zone or as having a slope greater that 15% and considered undevelopable. Ninety percent (90%) of NAPR is located with the municipality of Ceiba while the remaining 10% is within the Naguabo municipality. The nearest major town is Fajardo, located approximately 10 mi (16 km) north of the station. San Juan, the capital of Puerto Rico, is located approximately 40 mi (64 km) to the northwest. The islands of Culebra and Vieques, sites of prior naval training activities associated with NSRR, are located to the east of NAPR across the Vieques Passage.

As mentioned in Section 2.1, the Reuse Plan divides NAPR into nine distinct redevelopment zones (**Figure 2-2**). Within these zones, a total of 3,868 ac (1,569 ha) of land are identified as available for reuse. Below are brief summaries of the existing conditions and proposed land uses for each redevelopment zone. The Reuse Plan proposes that the redevelopment of NAPR be completed in phases, with full buildout scheduled for completion by 2037. **Figure 2-3** depicts how NAPR will look at buildout if all goes according to the Reuse Plan.

2.2.1 Zone 1—Airport

Zone 1 includes the airport and potential development areas outside of the airport fence line. The airport currently houses a 2.1-mi (3.4-km) long runway as well as a secondary runway, helipad, U.S. customs office, and buildings that can be reused as terminals, hangars, or storage facilities. Proposed land uses of

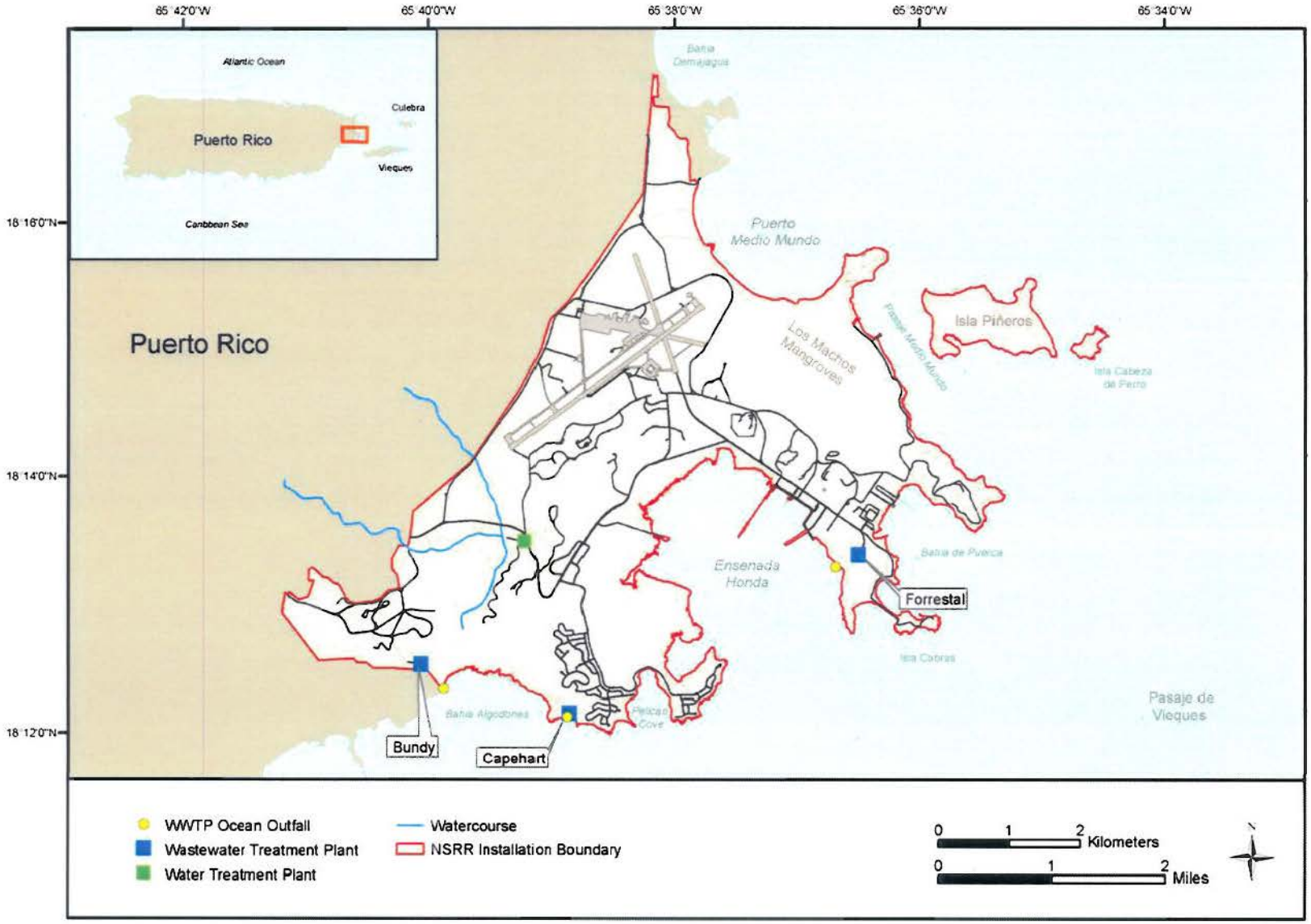

Figure 2-1. Overview of Naval Activity Puerto Rico (NAPR).

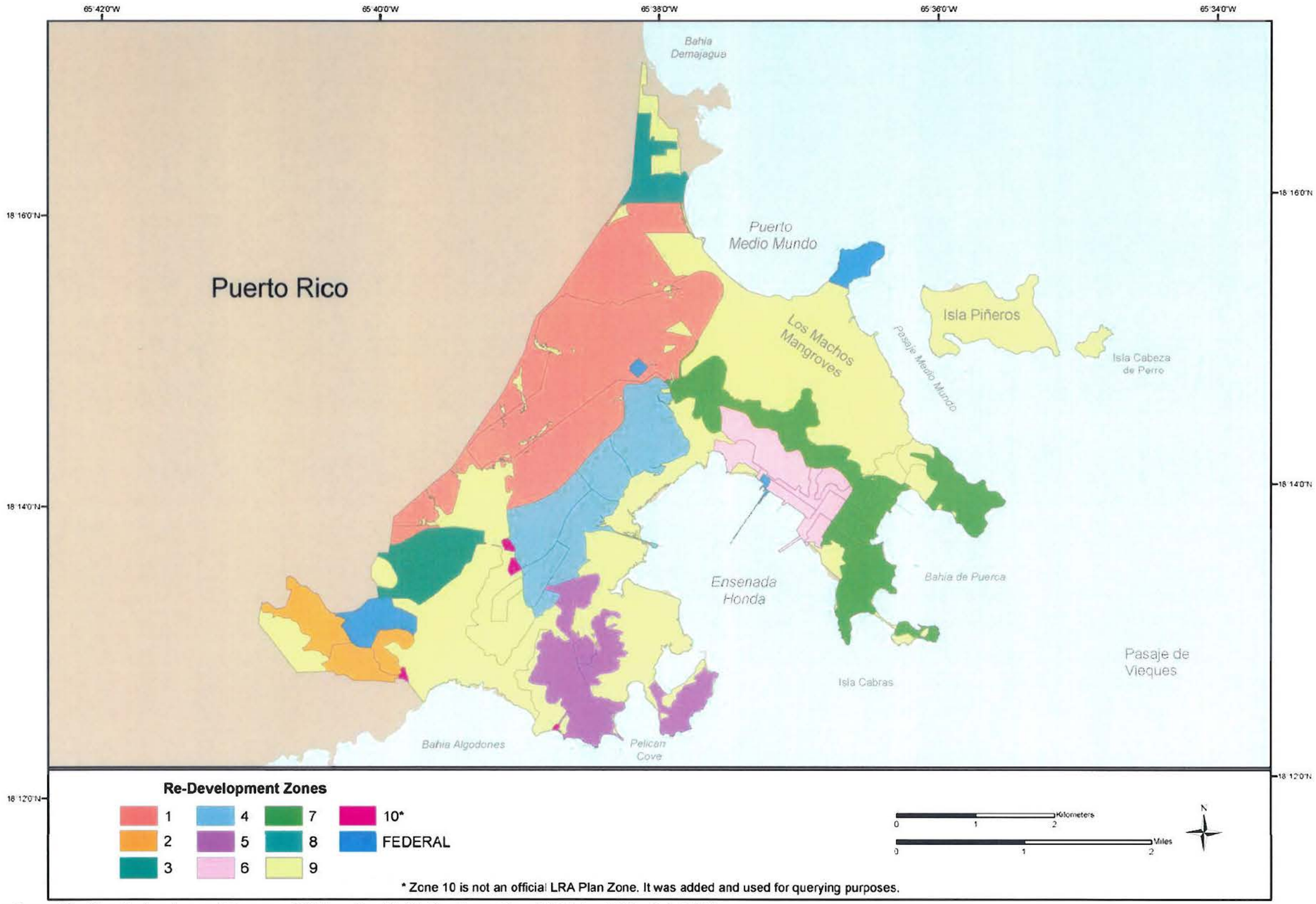

Figure 2-2. Locations of the Nine Redevelopment Zones on NAPR as Identified in the Reuse Plan (CB Richard Ellis et al. 2004).

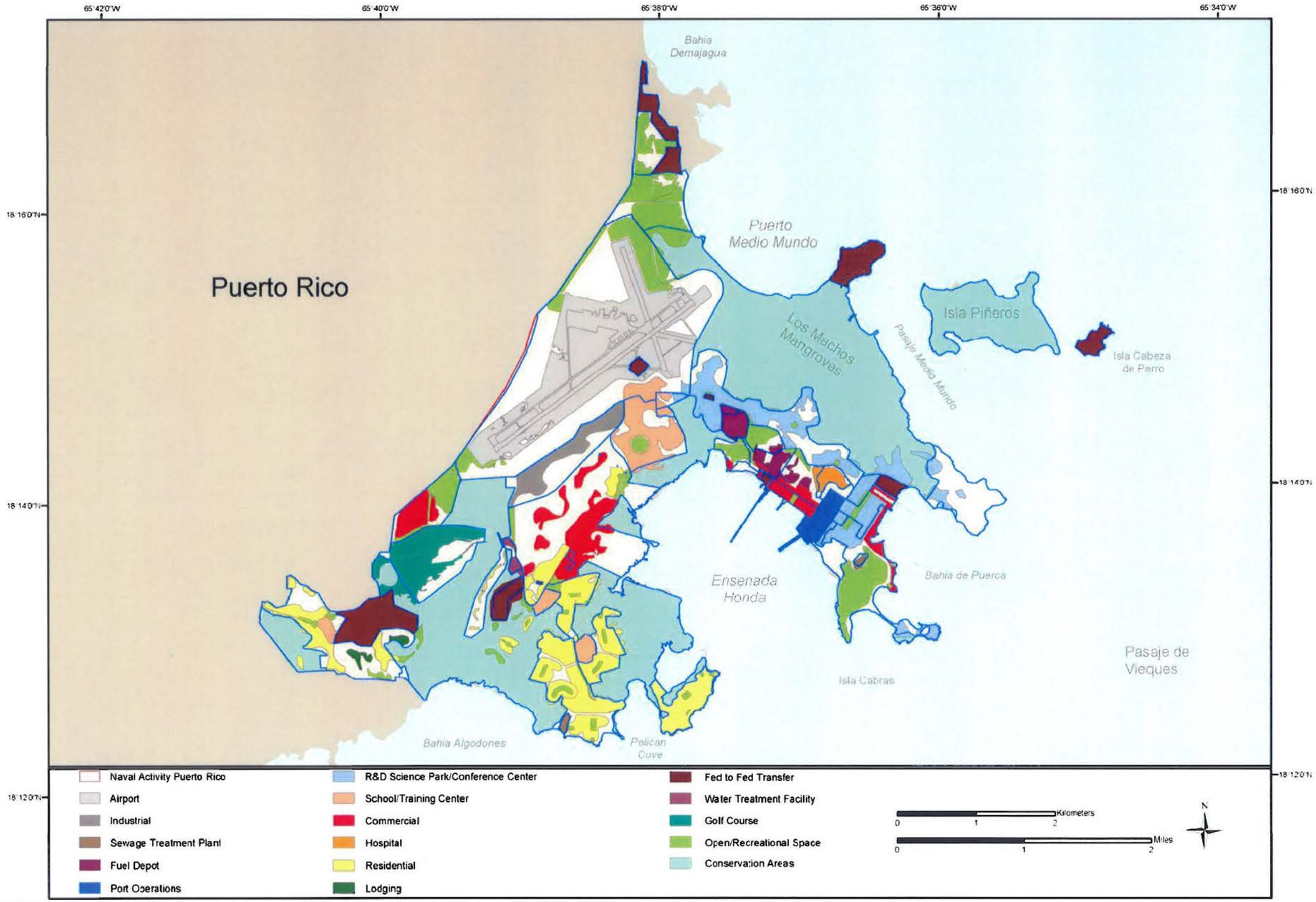

Figure 2-3. NAPR Land Use Composite at Buildout According to the Reuse Plan (CB Richard Ellis et al. 2004).

this zone include: (1) establishment of an operating airport serving both passenger and cargo needs, with direct access from the regional road network, (2) industrial use along the airport perimeter, (3) creation of open space reserves to the northeast and southwest of the airport, and (4) highway-oriented commercial development adjacent to the Southern Gate. Zone 1 consists of approximately 1,750 ac (710 ha). Ownership responsibility of approximately 10-ac (4-ha) will be transferred from the Navy to the Department of Homeland Security. The 900 ac (365.1 ha) airport will be transferred to the Puerto Rico Ports Authority (PRPA) from the Navy. The remaining developable land in this zone is available for reuse.

The small open space reserves are areas, because of their location relative to other uses or because of their natural attributes, are identified in the Reuse Plan as areas where no development is planned. Open space reserves are passive recreational areas with very limited development and construction. Future development would be limited to low impact facilities such as park benches, gazebos, picnic tables, pathways, and public restrooms to facilitate passive recreational activities. These areas are good candidates for planting new trees and/or replanting existing ones to create a more aesthetic natural environment. This can be done in a way that will have a positive impact on all species. Any additional work done within conservation areas must have environmental documentation submitted by the proponents and all permits must be obtained.

2.2.2 Zone 2—Bundy

Zone 2, approximately 370 ac (150.1 ha), is the "Bundy area," which currently contains lodging facilities, a residential campus, small storage and office structures, a fitness center with an outdoor pool, and a sewage treatment plant. Proposed land uses in this zone include: (1) construction of learning, government training, and lodging facilities, (2) low and moderate density residential development adjacent to the existing community and at higher elevations, (3) creation of small, open space reserves, and (4) continued use of the Bundy sewage treatment plant. An estimated 120-ac (48.7-ha) area of land in the northeast corner of the Bundy area will be transferred from the Navy to the U.S. Army Reserve. An estimated 250 ac (101.4 ha) of land are available for reuse in Zone 2.

2.2.3 Zone 3—Golf Course

Zone 3 contains a 78.9-ac (32-ha) 9-hole golf course located near the base's southern entrance. Proposed land use for this zone includes expansion and reconfiguration of the existing golf course to 18 holes and the addition of a driving range adjacent to the course. The expanded golf course facility, which will then be open to the general public, will ultimately encompass approximately 200 ac (81.1 ha) of land area.

2.2.4 Zone 4—Downtown

Zone 4, about 930 ac (377.3 ha), is recognized as the "Downtown" area of NAPR. This area, which is accessible from both existing entrances, consists of topographically level development areas that are suitable for reuse. There are several proposed land uses for this zone, including: (1) expansion of the loosely-organized campus into a university, which will house classroom, office, residential, support, and recreational facilities, (2) modification of recently constructed apartment quarters for residential use, (3) mixed-use commercial, moderate lodging, service retail, and civic development along Langley Drive, (4) mixed-use commercial development at the top of the Delicias Hills, (5) continued use of the base's water filtration plant and public school facility, and (6) establishment of multiple open space reserves throughout the area. In the southern portion of Zone 4, a 30-ac (12.2-ha) parcel of land will be transferred from the Navy to the Department of Homeland Security. The remaining developable land in Zone 4 would be available for reuse.

2.2.5 Zone 5—Residential

Zone 5 consists of almost 500 ac (202.9 ha) located along the southern peninsula of NAPR. Most of this land is currently devoted to single and multi-family housing, although storage and maintenance facilities can also be found in the area. Also known as "Cabo del Sur" or the "Capehart area" (due to its proximity

to the Capehart housing area), this area has the potential to support a broad range of residential development initiatives, from the renovation of existing units to the construction of new single and multi-family homes. Additional proposed land uses in Zone 5 are the reuse of the existing high school as a private bilingual school and the creation of several open space reserves amongst the proposed housing units.

2.2.6 Zone 6—Port

Zone 6, approximately 365 ac (148 ha), encompasses a significant portion of the most accessible coastline at NAPR. It is organized as a series of waterfront sites located along the northeastern edge of Ensenada Honda. These sites include fuel storage tanks, a small-boat marina, athletic facilities, a hospital, the Base headquarters, a public works building, refrigerated storage structures, and a harbor terminal with several piers at the water's edge. The proposed conceptual land uses for Zone 6 include: (1) continued use of the fuel storage areas to support airport and maritime activities; (2) water-oriented commercial use of the existing marina (while the Reuse Plan indicates potential for expansion of the existing marina, any substantial expansion or change in use would require re-initiation of Section 10 and Section 401/404 permitting through the Corps of Engineers); (3) creation of an accessible, aesthetically enjoyable recreational open space that includes trees and attractive landscaping (this open space reserve is located contiguous to the fuel farm, and, due to the contaminated soil condition that underlay the site, any habitable construction is not practicable; this would be a passive recreation area with no significant development or construction); (4) establishment of marine-oriented retail operations, boat repair shops, charter and yacht brokerages, and small cruise ship capabilities along the waterfront; (5) development of a passenger and cargo ferry service between eastern Puerto Rico and Culebra/Vieques supported by cargo storage facilities, public parking, and intermodal transportation; and (6) reuse of the 30 ac (12.2 ha) hospital for regional and community needs. The Navy would transfer ownership responsibility to other federal agencies including approximately 5-ac (2-ha) to the Department of the Army and 1.5 ac (0.6 ha) to the Department of Homeland Security. The 130 ac (52.7 ha) waterfront port and tanks would be transferred to the Puerto Rico Ports Authority (PRPA) from the Navy. Within Zone 6, approximately 360 ac (146 ha) of land are available for reuse. The existing waterfront is industrial/military in nature. While redevelopment plans have not been designed beyond concept, these plans would be oriented more toward public use and commercial transportations facilities (e.g., the Vieques Ferry Terminal).

2.2.7 Zone 7—Science Park

Zone 7, estimated at 800 ac (324.6 ha), is located at the easternmost end of NAPR and is divided into a northern and southern component. The northern component is largely undeveloped, housing only a fire station and a former officers club that was operated as a restaurant. The southern component, also known as "Cabo del Norte," is a horseshoe-shaped area that encircles Bahía de Puerca. It contains Camp Moscrip, the Forrestal sewage treatment plant, the U.S. Army Reserve headquarters (which will be relocated), a never-occupied Navy SEALs office building, a residential campus, multiple storage structures, and a Navy operated landfill. Aside from steeply sloped areas on Punta Puerca, most of the land in this zone is available for reuse. The conceptual proposed land use in Zone 7 is the creation of a science park and conference center that will be linked via a new road network to the proposed university in Zone 4. A "science park" may be described as a cluster of buildings designed around a park-like setting as opposed to a developed downtown area, while the intended uses are to be consistent with research and development activities. Proposed sites for the conference center, which would contain lodging and meeting facilities, include three hilltop locations set back from the waterfront that overlook the base in all directions. Additional conceptual development initiatives in support of the science park and conference center have also been proposed. While the existing restaurant may be used as a conference center, no specific plans for this facility's reuse have been put forth at this point in time. These include aesthetic, low impact facilities such as benches fountains, public bathrooms, and parking areas and commercial enhancement of the existing waterfront; establishment of open spaces, a park, or golf course; linkage of the area to the proposed ferry terminal in Zone 6; and provide beach water access on Isla de Cabras to complement other area uses... (Improvements to the beach area would only entail minor construction of beach amenities such as cabanas, picnic tables, and public restrooms, and would not include any new beach construction).

2.2.8 Zone 8—North Gate

Zone 8 consists of 250 ac (101.4 ha) of land located beyond NAPR's Northern Gate. Situated adjacent to a large conservation area previously transferred to the Puerto Rico Department of Natural and Environmental Resources (DNER), these lands are Ceiba's only access to the waterfront at present. Ceiba Beach, a fishing pier, a fish market, and a small boat anchorage are all located at the water's edge, at the end of an access road that bisects the zone. Since Zone 8 is home to extensive wetlands and lies in proximity to conservation areas, the proposed land use is as an open space reserve with low-impact facilities that can enhance the accessibility of the waterfront and provide the general public with recreational opportunities. Improvement of the access road has been identified as a necessary redevelopment activity in this zone.

2.2.9 Zone 9—Conservation

Zone 9 is a patchwork of distinct areas on the NAPR mainland and three small islands off the east coast of Punta Medio Mundo (Isla Pineros, Isla Pinerita, and Cabeza de Perro). The conservation zone encompasses 3,333 ac (1,345 ha) of land consisting of mangrove forests, wetlands, adjacent upland forest areas, and recently added prime upland habitat that provide natural habitat to a number of threatened and endangered species (**Figure 2-4**). Unlike the other eight zones, the proposed land use in Zone 9 will be solely for conservation purposes. It is the belief of the consulting team that conservation of these properties will no doubt contribute to the on-going regional conservation initiative in eastern Puerto Rico and also lead to increased ecological education, regional ecotourism, and environmental protection. The conservation zones are proposed for transfer to the Commonwealth of Puerto Rico DNER to be managed through DNER and the Puerto Rico Conservation Trust.

2.3 AGENCY REGULATION/ZONING REQUIREMENTS

The U.S. Navy, in accordance with federal law, preserved the ecological areas that protected the sensitive and critical species and habitats on NSRR/NAPR. The majority of these areas will be transferred and managed by Commonwealth of Puerto Rico regulatory agencies.

Upon the Navy's disposal of NAPR, the future landowner and/or developer would be responsible for complying with all current Commonwealth of Puerto Rico environmental laws, zoning requirements, building permits, and any other approvals and/or authorizations prior to commencement of construction or implementation of their respective development projects. The Department of Economic Development through the local reuse authority has requested that a Special Zoning Plan be adopted by the Puerto Rico Planning Board. The Special Zoning Plan is based on the NAPR Reuse Plan and includes conservation measures for protected species and habitats. The engineering, design, and studies needed to obtain the various approvals from the respective regulatory agencies have not been accomplished.

Because of the conceptual nature of the Reuse Plan, this BA does not preclude the potential need for future landowners and/or developers to comply with federal and Commonwealth laws. All Puerto Rican entities must comply with relevant federal laws (e.g., Clean Water Act, Clean Air Act, and ESA) and Commonwealth's planning, zoning, and environmental laws.

2.4 CONSERVATION MEASURES

The proposed Special Zoning Plan for the former NAPR would incorporate the conservation measures that are currently under discussion between the Navy and the FWS (**Appendix A**). All owners of property within the former NAPR will be on notice as to those conservation measures and the possible violations of the ESA if the measures are not followed. Conservations measures are identified in Chapter 6 for 68 land parcels based on the status of the listed species and, if applicable, critical habitat(s) within each parcel.

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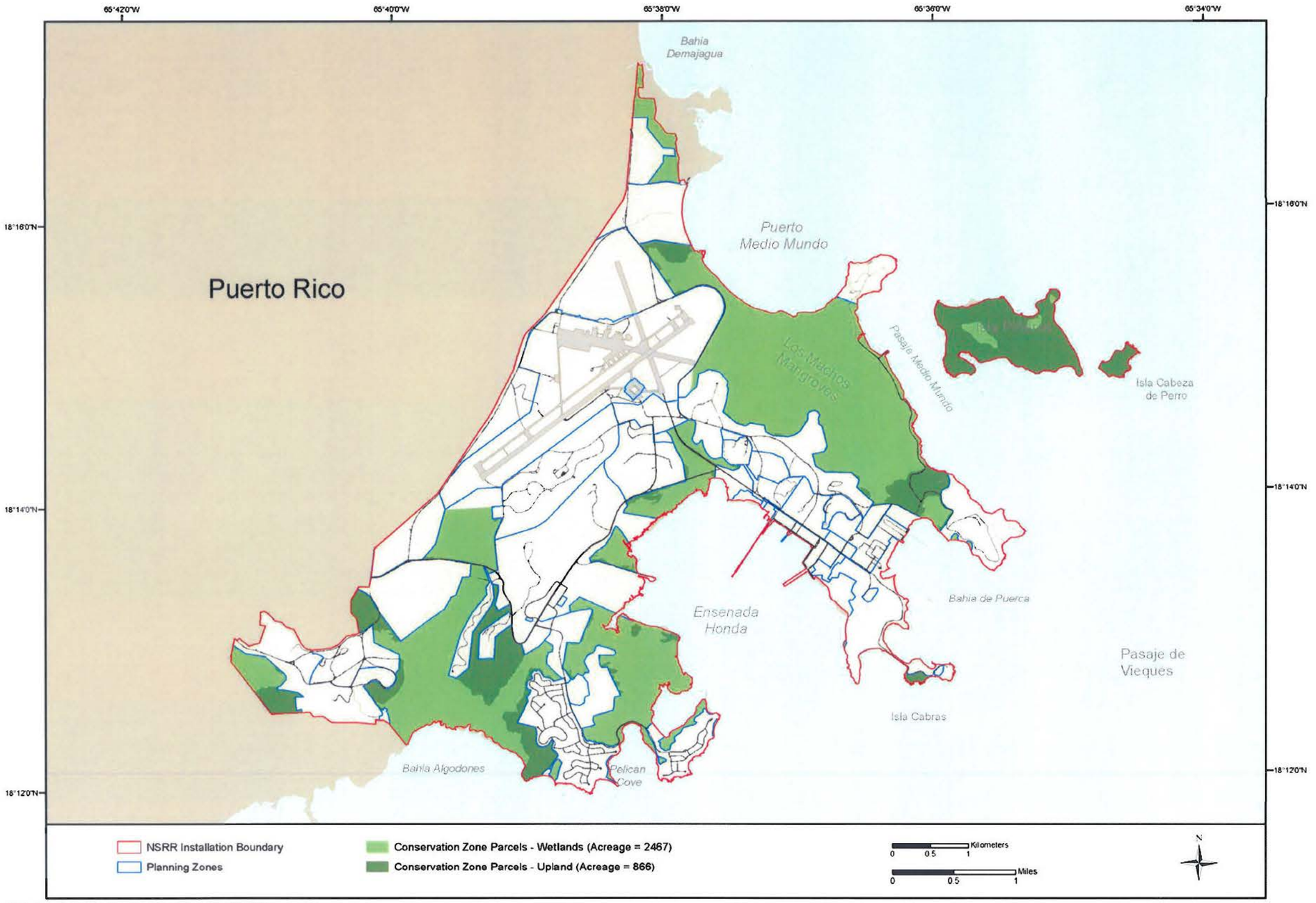

Figure 2-4. Added Uplands to Conservation Zone 9, NAPR.

3.0 STATUS OF LISTED SPECIES AND CRITICAL HABITAT

This section provides baseline information on threatened and endangered species that are known, or have the potential, to occur on or around NAPR (**Table 3-1**). Brief discussions of the classification status and, if available, descriptions of critical habitats located in proximity to the action area are provided for each species. Also included are reviews of the population status and distribution patterns for each of the listed species.

Table 3-1
Federal and Commonwealth Listed Plants and Animals of NAPR

COMMON NAME (*SCIENTIFIC NAME*)	FEDERAL STATUS	COMMONWEALTH STATUS	GENERAL HABITAT PREFERENCES
PLANTS			
Cobana negra (*Stahlia monosperma*)	Threatened	Threatened	Brackish, seasonally flooded wetlands in association with mangroves; limited to the drier, slightly elevated soil not occupied by mangroves
SEA TURTLES			
Green sea turtle (*Chelonia mydas*)	Threatened	Threatened	Temperate seas and oceans where it typically inhabits fairly shallow water; nests on sloped open beaches with minimal disturbance
Hawksbill sea turtle (*Eretmochelys mbricate*)	Endangered	Endangered	Rocky areas, reefs, lagoons, and narrow creeks; seldom found in water deeper than 65 feet (ft) (20 meters [m]); nests on beaches with vegetated areas
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	Endangered	Most often found in the open ocean; nests on beaches backed with vegetation, sloped sufficiently, and close to deep and generally rough seas
Loggerhead sea turtle (*Caretta caretta*)	Threatened	Threatened	Coral reefs, hard bottom habitats, and shipwrecks often used as feeding areas; nests on open beaches or along narrow bays
SNAKES			
Puerto Rican boa (*Epicrates inornatus*)	Endangered	Endangered	Forested limestone hills and subtropical forests; hunts in nearby trees at night; uses ground level retreats for resting during the day
Virgin Islands tree boa (*Epicrates monensis granti*)	Endangered	Endangered	Subtropical forests and mangroves; forages from eye level to as high as 16 ft (5 m) in secondary scrub or coastal forest; may use ground level refugia during the day
BIRDS			
Brown pelican (*Pelecanus occidentalis*)	Endangered	Endangered	Sand pits and offshore sandbars; shallow estuarine waters no more than 20 mi (32 km) out to sea
Piping plover (*Charadrius melodus*)	Threatened	Threatened	Sandbars within riverbeds, and sandy wetland pastures; all of which must be sparsely vegetated
Roseate tern (*Sterna dougallii*)	Threatened	Endangered	Coastal waters, bays, and estuaries; nests on sandy beaches, open bare ground, and grassy areas and under tumbled boulders primarily on islands
Yellow-shouldered blackbird (*Agelaius xanthomus*)	Endangered	Endangered	Historically utilized most habitat types found in Puerto Rico; most commonly associated with coastal zones
MAMMALS			
West Indian manatee (*Trichechus manatus*)	Endangered	Endangered	Shallow coastal areas, sheltered from oceanic wave action; availability of vegetation and freshwater are important elements of manatee habitat

Source: DON 1998, 2001, 2003a; GMI 2002, 2004; USFWS 2000a

3.1 PLANTS

Puerto Rico is home to 49 threatened and endangered plant species. With the exception of two, all are endemic to the Caribbean region. The moist karst/limestone region of the north and the dry limestone forests of the southwest are home to the majority of Puerto Rico's threatened and endangered plant life. The only federal or Commonwealth listed plant species that is known to occur on NAPR is the Cobana negra (*Stahlia monosperma*) (USFWS 2004a).

3.1.1 Cobana Negra

3.1.1.1 Classification Status and Critical Habitat

The Cobana negra was listed as a threatened species by the USFWS in 1990 (55 Federal Register [FR] 12790-12792). Critical habitat has not been designated for this species in Puerto Rico. The recovery plan for Cobana negra indicates that if recovery criteria are met, delisting of the species should be initiated in 2015 (USFWS 1995).

3.1.1.2 Population Status and Distribution

- Overview

The Cobana negra has declined in response to the severe degradation of Puerto Rico's wetlands over the last three centuries. Scattered populations of Cobana negra survive in Puerto Rico, on the island of Vieques, and in the eastern portion of the Dominican Republic. Optimal habitats for the Cobana negra include brackish, seasonally flooded wetlands where it is often associated with black and buttonwood mangrove communities. The largest population is located on the southwestern coast of Puerto Rico near Boqueron. Other mature trees are found on Puerto Rico's northeast coast (near Rio Grande), while 30 to 40 individuals occur on Vieques (USFWS 1995).

3.1.1.3 Potential Habitat

Habitat requirements for cobana negra were identified during a literature search. A GIS-based habitat occurrence model was developed based on the species habitat requirements. Forest and wetland polygons with the highest potential for locating the species were selected for survey. These polygons, which identify potential habitat for the species, are illustrated in **Appendix B**.

- NSRR/NAPR

Previous environmental assessments have indicated that the Cobana negra can be found in undeveloped areas of NAPR (USFWS 1995; CB Richard Ellis et al. 2004). In 1989, during a post-Hurricane Hugo habitat and population assessment, a Cobana negra tree was identified from a mangrove stand near the Coast Guard (old ammunition) pier in Ensenada Honda (Vicente et al. 1989). Only one individual of this rare species was encountered at NAPR during recent baseline surveys conducted by Geo-Marine, Inc. (GMI) in August 2004 (**Appendix B**). This individual was found in redevelopment Zone 5, in a humid, forested area just west of American Circle (**Figure 3-1**). The single individual is an old stump that has given rise to a number of sprout trunks after being cut. Judging from the size of the sprouts and the rate of growth of the species, it is presumed that the original tree was logged more than half a century ago. These records represent two of what may be only a few ever-detailed encounters of this species at NAPR.

3.2 SEA TURTLES

Four species of sea turtles are commonly found in the ocean waters off Puerto Rico. These include the green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricate*), leatherback (*Dermochelys coriacea*), and loggerhead (*Caretta caretta*) sea turtles. All four species are listed as either threatened or endangered under the ESA. Puerto Rico provides important nesting, foraging, and developmental habitat for the green, hawksbill, and leatherback sea turtles (Hillis-Starr et al. 1998). The loggerhead sea turtle has also been documented to occur in the waters surrounding Puerto Rico but on infrequent occasions. Loggerhead nesting has not been documented in Puerto Rico and would be considered highly atypical (Rainey 1979). The waters around Puerto Rico are attractive to sea turtles because they are warm year round, they provide diverse mosaic of feeding habitats (from shallow coral reefs and seagrass beds to deep water trenches), and easy access to suitable nesting beaches.

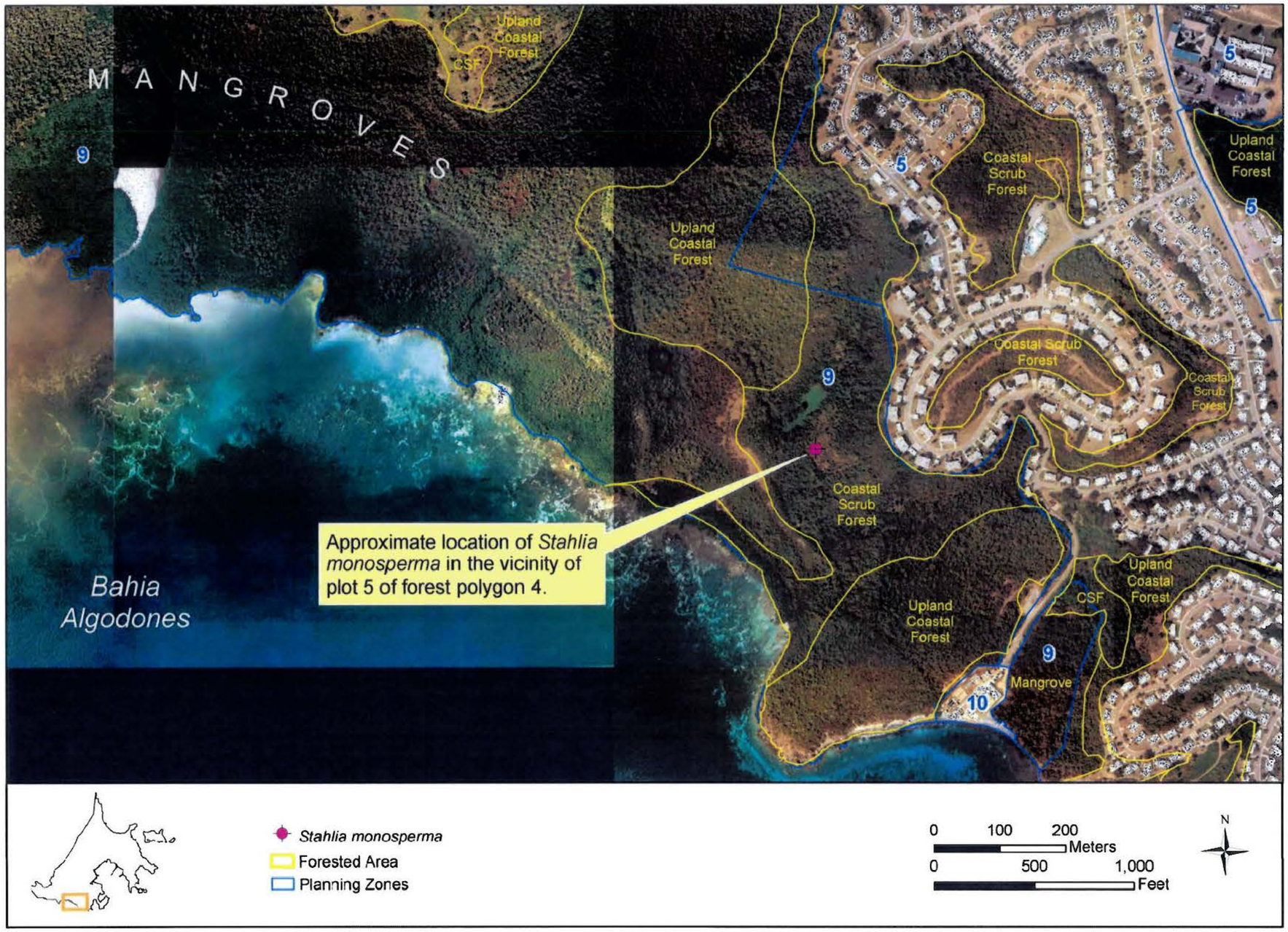

Figure 3-1. Location of the Cobana Negra (*Stahlia monosperma*) Observation on NAPR in 2004.

Two other sea turtle species, the olive ridley (*Lepidochelys olivacea*) and the Kemp's ridley (*Lepidochelys kempii*) could potentially occur in Puerto Rican waters, but the likelihood is extremely low. The olive ridley sea turtle is only known from two individual sightings off Puerto Rico (Caldwell and Erdman 1969; Horta et al. 2000), while the Kemp's ridley sea turtle (federally listed as occurring in Puerto Rico) has one confirmed occurrence within the entire Caribbean region, an incidental capture near Miskito Cay, Nicaragua (Manzella 1991). Due to their extreme rarity in and around the action area, these two species are not considered in this assessment.

Although sea turtles spend the vast majority of their life at sea, the most crucial environmental element of their survival (i.e., egg laying) takes place on shore. The onshore areas where sea turtles typically lay their eggs are commonly referred to as "sea turtle nesting beaches." Adult female sea turtles utilize these nesting beaches for very brief periods of time. Females will come ashore just long enough to hollow out a nest in the sand, lay their eggs, and cover the eggs for incubation. Sea turtle hatchlings, which utilize the beach as an incubator, will immediately make their way out to sea upon hatching. The environmental characteristics of sea turtle nesting beaches vary somewhat according to species-specific adaptations and requirements; however, all sea turtle species prefer beaches with minimal disturbance.

The Navy contracted GMI to conduct sea turtle nesting surveys in 2002 and 2004 on NSRR. The objective of the sea turtle nesting surveys was to answer the question, "What species of sea turtles are nesting on NSRR and in what numbers?" In addition, the purpose of the 2004 sea turtle nesting surveys was to complete a full survey regime over all four seasons. The 2002 and 2004 surveys recorded:

- Nest/track locations and species
- Day/time nests were found
- Nest flagged and tape dated
- Hatching data and nesting success
- Nest depredation
- Sea turtle deaths and/or strandings

In 2002, GMI conducted 66 pedestrian and boat surveys for nesting sea turtles two days per week between April and December to determine the nesting activities on 32 NSRR beaches (**Figure 3-2**). Thirty-seven pedestrian surveys were conducted one day each week at 25 beaches north and east of Playa Blanco. Twenty-nine boat surveys were conducted one day each week at the 25 beaches, plus the seven beaches at Pineros Island (**Figure 3-2**). In the event foul weather prevented a boat survey from being conducted, a pedestrian survey was performed at the 25 beaches north and east of Playa Blanco.

During the pedestrian and boat surveys, hawksbill, leatherback, and green sea turtles were recorded nesting on NSRR. In 2002, surveys documented 73 sea turtle nests (46 hawksbill, 24 unidentified, 2 leatherback, 1 green), 17 sea turtle tracks (4 hawksbill, 23 unidentified, 1 leatherback), 35 depredated nests (21 hawksbill, 14 unidentified), and 6 live sea turtles (5 unidentified, 1 green; **Figure 3-2**). On 8 November 2002, the first known green sea turtle nest was recorded on Beach 18.

The 73 recorded sea turtle nests in 2002 occurred on Beaches 2, 3, 7, 9, 10, 12, 15, 17, 18, 19, 25, and B, with the maximum nesting activity occurring on Beach 18 (**Table 3-2**). Sea turtle nest depredation occurred on Beaches 9, 12, 15, 17, and 18 (**Table 3-3**); Beach 18 had 26 depredated nests.

In 2004, to ensure that all four seasons were surveyed, GMI conducted 44 pedestrian and boat surveys along 32 NSRR beaches for three days per week between January and April to augment previous years surveys conducted in 2002 (**Figure 3-2**). Thirty-three pedestrian surveys were conducted two days each week at 25 beaches north and east of Playa Blanco. Eleven boat surveys were conducted one day each week at the 25 beaches, plus the seven beaches at Pineros Island (**Figure 3-2**). In the event foul weather prevented a boat survey from being conducted, a pedestrian survey was performed at the 25 beaches north and east of Playa Blanco.

Table 3-2
Number of Nests by Beach—2002

Beach No.	Number of Nests
2	5
3	1
7	3
9	5
10	1
12	6
15	9
17	5
18	30
19	1
25	2
B	5

Source: GMI 2002

Table 3-3
Number of Depredated Nests by Beach and Species—2002

Beach No.	Number of Nests	Sea Turtle Species
9	5	4 hawksbill, 1 unidentified
12	2	2 unidentified
15	1	1 hawksbill
17	1	1 hawksbill
18	26	15 hawksbill, 11 unidentified

Source: GMI 2002

During the pedestrian and boat surveys, hawksbill and unidentified sea turtles were recorded nesting on NSRR. In 2004, surveys documented 16 sea turtle nests (6 hawksbill, 10 unidentified), 5 sea turtle tracks (1 hawksbill, 4 unidentified), 4 depredated nests (unidentified), 2 live sea turtles (unidentified), and 3 dead sea turtles (hawksbills—1 juvenile and 2 adults; see following page). On April 30, 2004, a nesting hawksbill was trapped between the trees on Beach 18. She became frightened when the observers walked onto the beach; she turned the other direction and was freed from the trees. In 2002, nest depredation was due to the mongoose. In 2004, with the closure of NSRR, nest depredation resulted from mongoose, rats, iguanas, dogs, cats, and human. Two of the three sea turtle deaths, in 2004, were attributed to natural causes, with the third sea turtle death identified as a human-induced.

The 16 recorded sea turtle nests in 2004 occurred on Beaches 10, 14, 15, 16, 18, 22, and A, with the maximum nesting activity occurring on Beach 14 (**Table 3-4**). Sea turtle nest depredation occurred on Beaches 14 and 15 (**Table 3-5**).

Table 3-4
Number of Nests by Beach—2004

Beach No.	Number of Nests
10	1
14	6
15	1
16	1
18	4
22	2
A	1

Source: GMI 2004

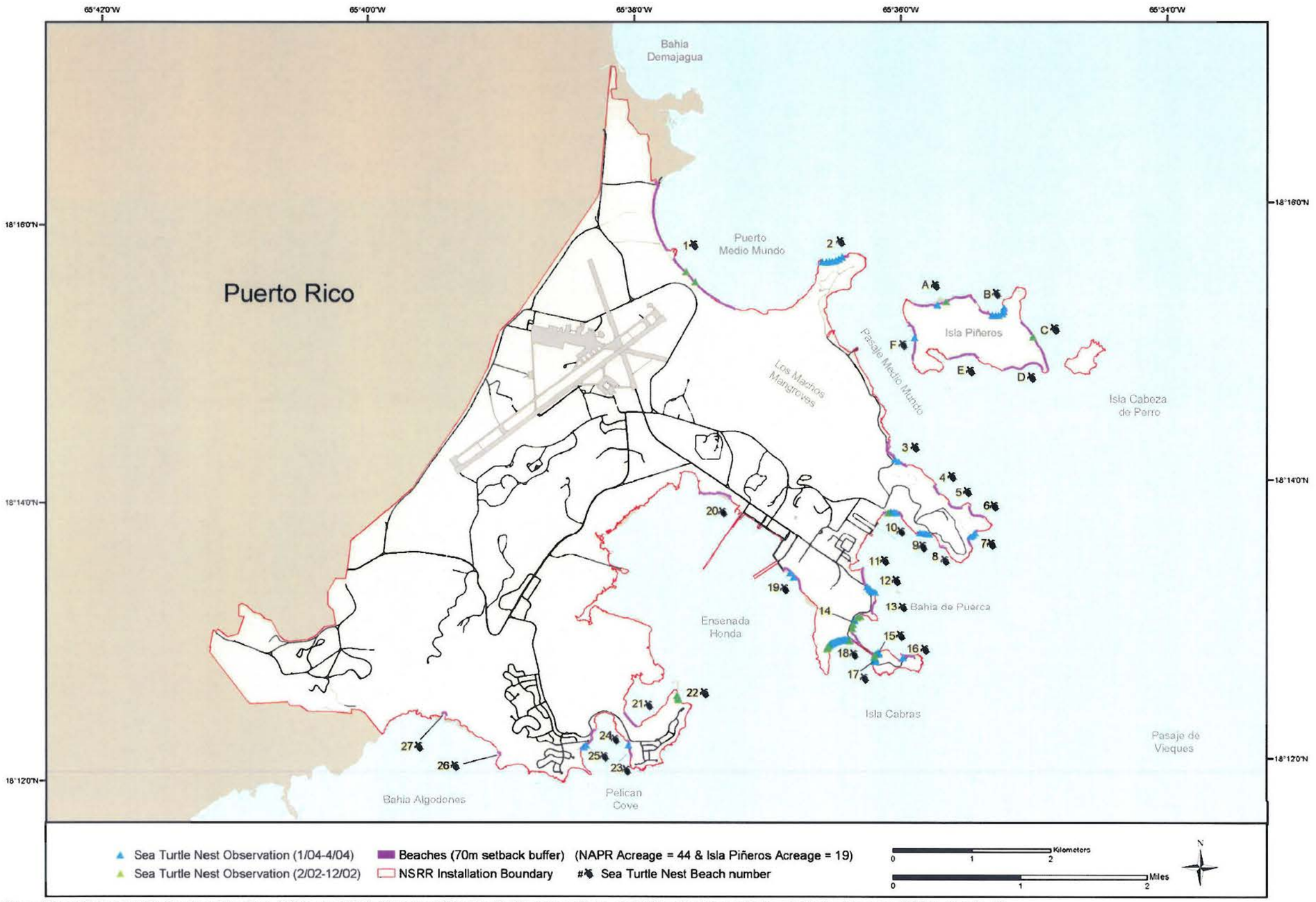

Figure 3-2. Locations of the 33 Sea Turtle Nesting Beaches, 2002 and 2004 Observed Sea Turtle Nest Locations, and 70 meter Beach Setback Buffer Zone on NAPR, Puerto Rico.

Table 3-5
Number of Depredated Nests by Beach and Species—2004

Beach No.	Number of Nests	Sea Turtle Species
14	3	3 unidentified
15	1	1 unidentified

Source: GMI 2004


26 January 2004: Beach 18. Adult Hawksbill Sea Turtle Carcass (GMI 2004).


6 February 2004: Beach 1. Dead Juvenile Hawksbill Sea Turtle (GMI 2004).


29 March 2004: Beach 18. Dead Adult Hawksbill Sea Turtle (GMI 2004).

The primary nesting beaches in 2002 (12, 15, 18) and 2004 (14, 18, 22) are considered highly sensitive because disturbance must be kept to a minimum to ensure successful nesting and hatching.

Based on the 2002 and 2004 sea turtle nesting surveys, potential sea turtle nesting and coastal habitat (70 m inland from the high water mark) comprises 67.29 ac on NAPR and 32.87 ac on Isla Pineros (**Figure 3-2**). **Table 3-6** illustrates the presence and/or absence of species habitat, based on sea turtle requirements, by parcel number.

Table 3-6
Presence and/or Absence of Sea Turtle Habitat by Parcel Number

Parcel Number	Sea Turtle Habitat	Parcel Number	Sea Turtle Habitat	Parcel Number	Sea Turtle Habitat	Parcel Number	Sea Turtle Habitat
1		18		35	✓	52	
2		19		36		53	
3		20		37		54	
4		21		38	✓	55	
5	✓	22		39	✓	56	✓
6	✓	23		40		57	
7	✓	24		41		58	✓
8	✓	25	✓	42	✓	59	✓
9	✓	26	✓	43		60	✓
10	✓	27		44	✓	61	✓
11	✓	28	✓	45	✓	62	✓
12	✓	29		46	✓	63	✓
13	✓	30		47	✓	64	✓
14		31		48		65	✓
15		32		49	✓	66	✓
16		33		50		67	✓
17		34		51		68	✓

Legend:
✓ = Suitable habitat present
Sea Turtles = Green, Hawksbill, Leatherback, and Loggerhead

3.2.1 Green Sea Turtle

3.2.1.1 Classification Status and Critical Habitat

The green sea turtle is currently listed as threatened under the ESA, although the Florida and Mexican Pacific nesting populations are listed as endangered (NMFS and USFWS 1991a). In Puerto Rico, designated critical habitat for the green sea turtle includes the waters surrounding Culebra from the mean high water line out to 3.5 mi (5.6 km) from shore (NMFS 1998).

3.2.1.2 Population Status and Distribution

- Overview

Green sea turtles are distributed in tropical and subtropical waters throughout the world. In the western North Atlantic Ocean, green sea turtles are found along the continental U.S. from Massachusetts to Texas and throughout the Caribbean Sea (NMFS and USFWS 1991a). The green sea turtle is the most common sea turtle species occurring in the coastal waters of Puerto Rico (Rainey 1979; Rathbun et al. 1985). The optimal habitats for this species are warm waters that are quiet and shallow, possess an abundance of submerged vegetation (seagrasses and/or algae), and are located in proximity to nearshore reefs or rocky areas that are used for resting (Ernst et al. 1994). Green sea turtles found in the Caribbean are almost entirely herbivorous, feeding primarily on seagrasses such as *Thalassia spp*. Adult green turtles are known to undertake long oceanic migrations between nesting and foraging habitats and can traverse an entire ocean basin during their life cycles (Lagueux 2001). Genetic analyses on foraging populations of juvenile green sea turtles have revealed juvenile feeding habitats likely contain green turtles from multiple nesting populations. Green sea turtles captured at foraging grounds in the Caribbean Sea include representatives from several nesting stocks located throughout the Atlantic Ocean (e.g.,

Costa Rica, Mexico, southeastern U.S., Aves Island, Suriname, Ascension Island, and west Africa) (Lahanas et al. 1998).

Although large populations of green sea turtles forage throughout the coastal areas surrounding Puerto Rico, green turtles infrequently nest on the island's mainland beaches. In the Caribbean, green sea turtle nesting activity peaks between June and August, although in Puerto Rico it is known to occur as early as March (Hall 1994). This species commonly nests on sloped, open beaches with minimal disturbance adjacent to rough seas.

- NSRR/NAPR

Green sea turtles accounted for 76% of all sea turtles sighted during aerial surveys along the coast of NSRR from March 1984 through March 1985 (Rathbun et al. 1985). The extensive seagrass beds located around NAPR (especially those within Pelican Cove and Ensenada Honda) provide highly suitable foraging habitat for this species. Anecdotal evidence suggests that green sea turtles can be seen in the marina area of Ensenada Honda on occasion; however consistent visitation to the marina area has not been documented (DON 1995). The first ever-recorded nesting of a green sea turtle at NSRR was documented on 8 November 2002 at Beach 18, which is located in redevelopment Zone 7 (**Appendix C**).

Immediately to the east of NAPR, the waters around Culebra are known to harbor a large population of juvenile and subadult green sea turtles, which use the area as a developmental feeding habitat (Collazo et al. 1992). Due to their proximity to each other, it is highly possible that there is some exchange of green sea turtles between Culebra and the waters surrounding NAPR.

3.2.2 Hawksbill Sea Turtle

3.2.2.1 Classification Status and Critical Habitat

The hawksbill sea turtle is currently listed as endangered throughout its entire range (NMFS and USFWS 1993). In Puerto Rico, designated critical habitat for the hawksbill sea turtle includes the waters surrounding Mona Island from the mean high water line out to 3.5 mi (5.6 km) from shore (NMFS 1998).

3.2.2.2 Population Status and Distribution

- Overview

The hawksbill sea turtle, distributed worldwide, is found in tropical and subtropical waters. Within the U.S., hawksbills are most common in coastal areas surrounding Puerto Rico and the U.S. Virgin Islands (NMFS and USFWS 1993; Hillis-Starr et al. 1998). This species is often found in shallow, nearshore areas that are associated with coral reefs, mangroves, or other hard bottom habitats, where they forage almost exclusively on sponges (Meylan 1988). Hawksbills are seldom found in waters deeper than 66 feet (ft) (20 meters [m]), unless they are in transit between distant foraging and nesting grounds.

In Puerto Rico, hawksbill sea turtles nest on Mona Island, Vieques, Culebra, and at scattered locations on the mainland (Hillis-Starr et al. 1998). Humacao, located 17 mi (27 km) south of Ceiba, is one of the most important nesting sites on the mainland (Fleming 2001). The nesting season of hawksbills is the longest of all sea turtles and may occur year-round. In the western North Atlantic Ocean, nesting occurs primarily between spring and late fall, with a peak in nesting activity between July and October (Witzell 1983). Although hawksbills exhibit a wide tolerance for nesting substrate type, nesting usually occurs on undisturbed, deep-sand beaches with sufficient vegetative cover (NMFS and USFWS 1993).

- NSRR/NAPR

The hawksbill sea turtle is the second most common sea turtle species found in the waters around NSRR (Rathbun et al. 1985). Foraging hawksbills are probably not as abundant around NAPR as foraging green sea turtles due to the lack of coral reef and hard bottom habitat. The hawksbill sea turtle is, however, the

most frequent species encountered on NAPR beaches. In 2002, 46 hawksbill nests were identified during the boat and pedestrian surveys. In 2004, six hawksbill nests were documented during similar surveys. Twenty-one (21) of the hawksbill nests observed in 2002 were depredated, all presumably by mongoose. Beach 18, located in redevelopment Zone 7, was host to the highest number of total nests as well as depredated nests (**Appendix C**).

A hawksbill has also been recorded crossing the Forrestal Causeway, located between Beaches 17 and 18. It is not known whether this turtle, which was identified from photographs by sea turtle expert Dr. Jeanette Wyneken, was attempting to nest at NAPR. In Hawaii, female hawksbills have been observed crossing coastal highways to nest (Mangel at al. 2000).

Genetic studies have revealed that hawksbill sea turtles nesting in Puerto Rico contribute offspring to foraging populations found around Cuba and Mona Island. This species may also contribute to foraging populations in the U.S. Virgin Islands, Lesser Antilles, and Central America (Bass et al. 1996).

3.2.3 Leatherback Sea Turtle

3.2.3.1 Classification Status and Critical Habitat

The leatherback sea turtle is currently listed under the ESA as endangered throughout its entire range (NMFS and USFWS 1992). Designated critical habitat for the leatherback sea turtle includes the waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands from the mean high tide line out to 600 ft (183 m) in depth. Critical habitat also includes a strip of land 0.2 mi (0.3 km) wide (from the mean high tide inland) at Sandy Point Beach (50 CFR 226.207).

Hawksbill Sea Turtle Crossing the Forrestal Causeway between Beaches 17 and 18.

3.2.3.2 Population Status and Distribution

- Overview

The leatherback sea turtle is distributed circumglobally in tropical and warm-temperate waters throughout the year and into cooler temperate waters during warmer months (Ernst et al. 1994). Leatherbacks in the North Atlantic Ocean are broadly distributed from the Caribbean region to as far north as Nova Scotia, Newfoundland, Labrador, Iceland, the British Isles, and Norway (NMFS and USFWS 1992). This species migrates further and moves into cold waters more than any other sea turtle species (Bleakney 1965; Lazell 1980; Shoop and Kenney 1992). This species is also the most oceanic and most wide-ranging of sea turtles, undertaking extensive migrations following depth contours for hundreds, even thousands, of kilometers (Morreale et al. 1996; Hughes et al. 1998). This species is also known for its unique deep-diving ability and its specialized jellyfish diet (Brongersma 1972; Eckert et al. 1986).

Leatherback sea turtles are found in Puerto Rico only during the nesting season (February through July), when they come to nest on the beaches of the main island, Culebra, and Vieques. Leatherbacks prefer to nest on open sand beaches that are backed with vegetation, sufficiently inclined, and in proximity to deep water (DON 2002). On the main island of Puerto Rico, nesting occurs on several beaches along the north shore, but not in large numbers (NMFS and USFWS 1992; Hillis-Starr et al. 1998). Tagging studies have shown that females are highly mobile during the nesting season, often moving between beaches in Puerto Rico, the Virgin Islands, and Anguilla during inter-nesting intervals (Hillis-Starr et al. 1998). Once the nesting season is over, most leatherbacks in the Caribbean leave the tropics for feeding grounds further north.

- NSRR/NAPR

Leatherback sea turtles accounted for only 1% of all sea turtle sightings around NSRR during aerial surveys conducted between March 1984 and March 1985 (Rathbun et al. 1985). Leatherback sea turtle nesting on the beaches of NAPR is also infrequent. Only two leatherback nests were identified on NSRR during the 2002 and 2004 boat and pedestrian surveys (**Appendix C**). Although NSRR provides suitable nesting habitat for this species, leatherbacks most often prefer nesting beaches that are in proximity to deep water (e.g., Sandy Point, St. Croix) (DON 2002). Situated in the middle of the Puerto Rican Platform, NAPR is located a good distance from the deeper waters found beyond the continental shelf.

Leatherbacks that nest at NAPR may also nest on Vieques, Culebra, elsewhere on the Puerto Rico mainland, or in the U.S. Virgin Islands. Nesting females of this species do not seem to exhibit the same degree of site fidelity as do green and hawksbill sea turtles, and as such, may only nest at NSRR on a single occasion during their lifetimes (Keinath and Musick 1993).

3.2.4 Loggerhead Sea Turtle

3.2.4.1 Classification Status and Critical Habitat

The loggerhead sea turtle is currently listed as threatened under the ESA (NMFS and USFWS 1991b). Critical habitat has not been designated for this species. In 2002, environmental groups petitioned the NMFS and USFWS to reclassify two U.S. nesting subpopulations as distinct population segments (DPSs) with endangered status and to designate critical habitat. The NMFS, however, ruled against this petition citing that the two nesting subpopulations did not meet the criteria for classification as DPSs and that the species is already afforded protection under the ESA (USFWS and NMFS 2003).

3.2.4.2 Population Status and Distribution

- Overview

Loggerhead sea turtles are found in subtropical and temperate waters throughout the world (NMFS and USFWS 1991b). The loggerhead is the most abundant sea turtle occurring in U.S. waters, numbering in

the thousands throughout inner continental shelf waters from Massachusetts to southern Florida. However, around Puerto Rico and the U.S. Virgin Islands loggerheads are much less abundant than greens, hawksbills, and leatherbacks (Hillis-Starr et al. 1998). From 1985 to 1996, loggerheads accounted for only 1% of all sea turtle strandings documented in these areas (Ortiz Rivera 2000). Bays, estuaries, lagoons, river mouths, and other continental shelf environments are primary feeding habitats for this species. Juvenile and subadult loggerhead sea turtles are omnivorous, foraging on pelagic crabs, mollusks, jellyfish, and vegetation captured at or near the surface, while adult loggerheads are generalized carnivores that forage on nearshore benthic invertebrates (Dodd 1988). Loggerhead encounters in the waters surrounding Puerto Rico are infrequent and almost always involve individuals that are in transit to more temperate foraging or nesting areas (Hillis-Starr et al. 1998).

Although this species is known to nest in the Caribbean region, loggerhead nesting on Puerto Rican beaches are not expected (Rainey 1979). If nesting does occur, it will likely take place between April and September on open beaches or along narrow bays (NMFS and USFWS 1991b).

- NSRR/NAPR

Two percent (2%) of all aerial survey-based sea turtle sightings in the vicinity of NSRR from March 1984 to March 1985 were of loggerhead sea turtles (Rathbun et al. 1985). No loggerhead nests were recorded on NSRR beaches in 2002 or 2004 (**Appendix C**).

3.3 SNAKES

Two federal and Commonwealth listed snake species are either known to occur or have the potential to occur at NAPR. These species include the Puerto Rican boa (*Epicrates inornatus*) and the Virgin Islands tree boa (*Epicrates monensis granti*), both of which are endangered.

3.3.1 Puerto Rican Boa

3.3.1.1 Classification Status and Critical Habitat

The Puerto Rican boa was designated as an endangered species throughout its entire range in 1970. Since the species is endemic to Puerto Rico, the island encompasses its entire range. Critical habitat has not been designated for this species (USFWS 1986).

3.3.1.2 Population Status and Distribution

- Overview

Historic records documented the occurrence of the Puerto Rican boa as far back as the 1700s. The species was termed common during the first few centuries of colonization by the Spanish. However, no boas were found when the U.S. National Museum conducted a survey for the species in 1900. At that time the amount of native forest, the preferred habitat of the species, had declined dramatically because of clearing for agriculture. Another reason for its decline was that the oil produced from the snake's fat was valued locally for medicinal purposes and as an export (USFWS 1986). From 1972 to 1977, Perez-Rivera and Velez (1978) reported finding 75 boas at 18 different locations. Numerous boa observations were reported in the Caribbean National Forest during the 1980s. The overall increase in the number of boas may be the result of an increase in secondary forest on the island during the latter part of the 20th century because of the abandonment of agriculture (Tolson 2004).

Using the convex polygon method, Tolson (1997) estimated that 44 boas/ha were present in the limestone hills at Naval Security Group Activity Sabana Seca in northern Puerto Rico, which is likely a preferred habitat of the species. Although the Puerto Rican boa population appears to some degree to be increasing, the recovery is not sufficient to remove protective measures on the species (USFWS 2004b).

- NSRR/NAPR

Prior to 1999, four occurrence records for the Puerto Rican boa were documented at NSRR. In 1971, one boa was found dead on Tarawa Road east of the airfield (**Figure 3-3**; No. 1). Another was reported as killed by a worker in an equipment building in 1981 (specific location unknown). In 1989, one was found inside a wooden box in the NSRR Flying Center (**Figure 3-3**; No. 2). Also, one Puerto Rican boa was found in the surroundings of the airfield in either 1994 or 1995 (specific location unknown).

Four Puerto Rican boas were also reported at NSRR from 2001 to 2003. In 2001, one boa was found behind the Bachelor Enlisted Quarters (BEQ) (on the hill immediately west of the 1999 spill area in the mangroves; **Figure 3-3**; No. 3) and another was sighted at the former horse stables near Gate 3 (**Figure 3-3**; No. 4). One was found near the manatee tower prior to 2003 (**Figure 3-3**; No. 5) and one was encountered at the Capehart sewage treatment plant in 2003 (**Figure 3-3**; No. 6). All four recent sightings occurred in areas that are located within or in proximity to proposed zones of redevelopment (No. 3 – within Zone 4, No. 4 – within Zone 1, Nos. 5 and 6 – near Zone 5). In 2003, two Puerto Rican boas were also found in nearby Ceiba (Wiley 2003).

A habitat assessment was conducted in 2004 to identify habitats at NSRR that were most likely to provide suitable habitat for the Puerto Rican boa. Limited nighttime surveys for the species were subsequently conducted in suitable habitat on NSRR. No Puerto Rican boas were found during the 211 man-hours of surveys completed at NSRR from 4-9 February 2004. However, a shed skin of a Puerto Rican boa was found in an abandoned building at the NSRR Flying Center, an area where two other sightings of the Puerto Rican boa have been reported. Puerto Rican boas apparently occur in low densities at NSRR (Tolson 2004; **Appendix D**).

3.3.2 Virgin Islands Tree Boa

3.3.2.1 Classification Status and Critical Habitat

The Virgin Islands tree boa is classified as an endangered species throughout its entire range (which includes Puerto Rico and the British Virgin Islands) (USFWS 1979). Critical habitat has not been designated for the species (**Figure 3-3**).

3.3.2.2 Population Status and Distribution

- Overview

Very little historic data are available on the species and a population estimate is not available due to a lack of data (USFWS 2004c). In the 1970s, Dr. James Peters of the U.S. National Museum reported that the species was known to occur only in Puerto Rico and the British Virgin Islands and that only a single recent record could be found for the species on Tortola, British Virgin Islands (USFWS 1979). The reason for the decline of the species, deforestation/loss of habitat, is similar to that reported for the Puerto Rican boa. Populations of the Virgin Islands tree boa are known from Rio Grande, Playa Naguabo, and Humacao (Tolson 2004). A current population estimate for Puerto Rico is not available (USFWS 2004c).

- NSRR/NAPR

Wiley (2003) and Tolson (2004) did not know of any historical or recent occurrences of Virgin Islands tree boas at NSRR. A habitat assessment was conducted in 2004 to identify habitats at NSRR that were most likely to provide suitable habitat for the Virgin Islands tree boa. Limited nighttime surveys were subsequently conducted in suitable habitat on NSRR. No Virgin Islands tree boas were found during the 211 man-hours of surveys conducted at NSRR from 4-9 February 2004. Although not confirmed as existing at NSRR, the Virgin Islands tree boa may still occur on the base given the proximity of nearby populations in Rio Grande, Playa Naguabo, and Humacao (Tolson 2004; **Appendix D**).

3.3.2.3 Potential Habitat

Physical and biological habitat requirements of the species were identified. Two habitat requirements were selected for Puerto Rican boa: 1) upland forests and 2) slopes greater than 15 percent. Three habitat requirements were selected for the Virgin Islands boa: (1) low elevation islands and cays with simple vegetation, (2) areas with sea grape habitat, and 3) steep, coastal rocky cliffs. **Figure 3-3** illustrates potential boa habitat and comprises 1,279 ac (519 ha) on NAPR. The potential presence/absence of the boa by land parcel, based on species habitat requirements, is provided in **Table 3-7**

Table 3-7
Presence and/or Absence of Boa Suitable Habitat by Parcel Number

Parcel Number	Boa Habitat	Parcel Number	Boa Habitat	Parcel Number	Boa Habitat	Parcel Number	Boa Habitat
1	✓	18	✓	35		52	
2	✓	19	✓	36		53	
3	✓	20	✓	37		54	
4	✓	21		38	✓	55	
5	✓	22	✓	39	✓	56	✓
6	✓	23		40	✓	57	
7	✓	24		41		58	✓
8	✓	25		42		59	✓
9	✓	26		43	✓	60	
10	✓	27	✓	44	✓	61	✓
11	✓	28	✓	45		62	✓
12	✓	29	✓	46		63	✓
13	✓	30	✓	47		64	✓
14	✓	31	✓	48	✓	65	✓
15		32		49		66	✓
16		33		50		67	✓
17		34		51		68	✓

Legend:

✓ = Possible suitable habitat present
BOA = Virgin Island or Puerto Rican Boa

3.4 BIRDS

Four listed bird species are known to occur or have the potential to occur at NAPR or in coastal aquatic habitats adjacent to NAPR (e.g., beaches, cays, nearshore waters). These species include the brown pelican (*Pelecanus occidentalis*), piping plover (*Charadrius melodius*), roseate tern (*Sterna dougallii*), and yellow-shouldered blackbird (*Agelaius xanthomus*).

3.4.1 Brown Pelican

3.4.1.1 Classification Status and Critical Habitat

The brown pelican was listed as an endangered species on 13 October 1970, except along the U.S. Atlantic, west Florida, and Alabama coasts (35 FR 16047-16048). No critical habitat is designated for the species at NAPR, on adjacent cays, or in nearby coastal waters. Two subspecies of brown pelican occur in the West Indies. *Pelecanus occidentalis occidentalis* (Caribbean subspecies) occurs south of the central Bahama Islands, while *Pelecanus occidentalis carolinensis* (Eastern subspecies) generally occurs north of the central Bahamas, primarily on or around the U.S. mainland (Van Halewyn and Norton 1984).

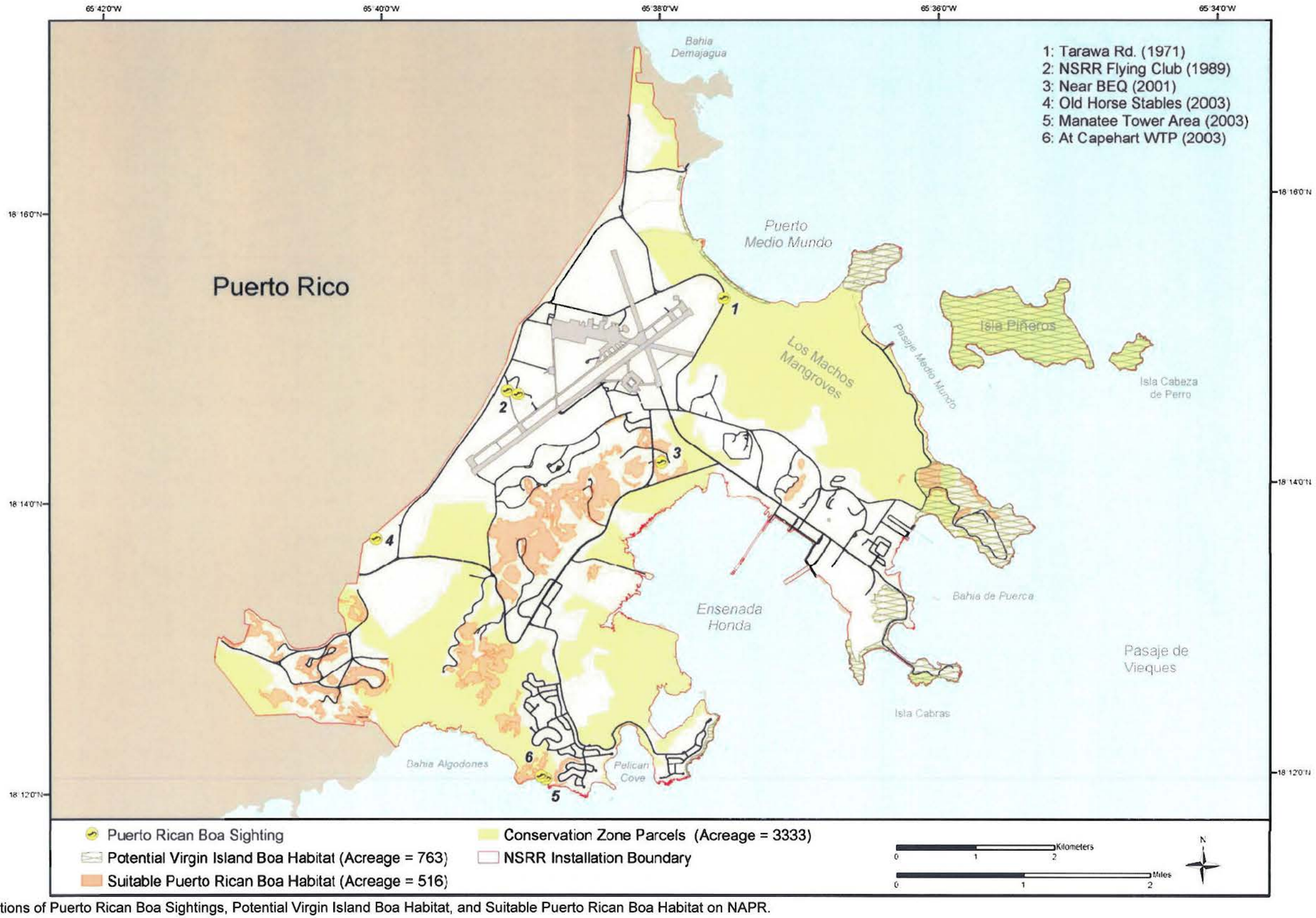

Figure 3-3. Locations of Puerto Rican Boa Sightings, Potential Virgin Island Boa Habitat, and Suitable Puerto Rican Boa Habitat on NAPR.

3.4.1.2 Population Status and Distribution

- Overview

Historically, brown pelican populations in the West Indies were not well studied. In general, however, brown pelicans are thought to be less numerous today than they were in the past. Outside of Puerto Rico and the Virgin Islands, the status of the brown pelican is difficult to ascertain because of scant historical survey data and a lack of recent survey data. In the early 1980s, scientists estimated the brown pelican population in the West Indies to be 6,200 pairs (Van Halewyn and Norton 1984). The degradation and/or loss of roosting and nesting habitat (e.g., cutting/clearing of mangroves and other vegetation) and frequent human disturbance (e.g., tourism, boating, recreation, and poaching of eggs) were thought to be the main factors that were adversely affecting West Indian brown pelican populations (Van Halewyn and Norton 1984; Collazo et al. 2000). Coastal degradation, whose effects on feeding habitats are currently unknown, may potentially be an existing or future factor in the decline of the species (Collazo et al. 2000).

Brown pelicans were considered common in the coastal regions of Puerto Rico in the early 1900s (Wetmore 1916), although investigation of seabird populations around Puerto Rico and the Virgin Islands did not begin until the early 1920s. Van Halewyn and Norton (1984) noted that several brown pelican colonies (three to four) in Puerto Rico disappeared after the 1930s. From 1980 to 1983, the average annual number of brown pelicans in the waters off Puerto Rico was 1,996 (Collazo 1985). Winter populations in Puerto Rico were 25% to 30% higher than summer populations because of the movement of young and adult brown pelicans from the Virgin Islands to Puerto Rico at that time (Collazo 1985). More recent winter surveys conducted in Puerto Rico revealed that the population from 1992 to 1995 (mean = 593) was 74% lower than from 1980 to 1982 (mean = 2,289) (Collazo et al. 2000).

In 2000, the population of brown pelicans in the West Indies was estimated at 3,000 individuals (1,500 pairs) (Collazo et al. 2000). Winter populations ranged from 2 to 89 during the San Juan Bay Christmas Bird Counts (CBC) (northern Puerto Rico); from 38 to 67 during the Cabo Rojo CBC (southwest Puerto Rico); and from 43 to 128 during the Fajardo CBC (eastern Puerto Rico). All three sites have stable to increasing winter population trends from 1999 to 2003 (National Audubon Society 2004). Based on the most recent data, the population of brown pelicans around Puerto Rico is less than 600 individuals (Collazo et al. 2000).

- NSRR/NAPR

Based on Wetmore's (1916) account, brown pelicans were probably common around NSRR in the early 1900s. In the seabird status review conducted by Van Halewyn and Norton (1984), no nesting brown pelican colonies were observed at or in the immediate vicinity of NSRR. The nearest breeding sites were located at or around Cordillera, Culebra, and Vieques (Van Halewyn and Norton 1984).

At present, the brown pelican appears to be a common seasonal (May-July, October, January-March) resident in coastal waters adjacent to NAPR. Small numbers of brown pelicans, mostly juveniles, were observed during weekly boat and pedestrian surveys of sea turtle nesting beaches at NSRR in 2002 and 2004 (**Table 3-8**). These individuals were observed day roosting, feeding, and resting irregularly in both onshore habitats and nearshore waters off NSRR. During the 2004 surveys, two brown pelicans were found dead due to unknown causes. No brown pelican nesting colonies were found on NSRR or on the small cays nearby.

3.4.1.3 Potential Habitat

Brown pelican nesting habitat, cays similar to Conejo off Vieques, is not present within coastal areas adjacent to NAPR. Foraging habitat is present in near shore coastal and offshore coastal waters off of NAPR. Day roosting habitat is present on beaches and onshore structures (i.e., docks, pylons).

Table 3-8
Incidental Observations of Brown Pelicans during
Weekly Boat/Beach Turtle Surveys at NSRR during 2002 and 2004

Date	No.	Location	Observers[1]
05-31-02	1	Flying east over Beach 13	MFP, MLR
06-25-02	2	In the water off of Beach 17	MFP, MLR
06-25-02	2	In the water off of Beaches 23, 24, and 25	MFP, MLR
07-16-02	1	In flight north of Beach 5	MFP, MLR
07-23-02	2	Flying/landing on the south side of Beach 23	MFP, MLR
10-11-02	5	Sitting on rocks on the north side of Beach 11	MFP, MLR
10-22-02	7	Perched or fishing between Beaches 11 and 12	MFP, MLR
10-22-02	2	Sitting on metal debris in the water off Beach 19	MFP, MLR
01-21-04	4	Floating off of Beach 19	CL, MLR
01-30-04	1	Found dead in the middle of Beach 1	CL, MLR
02-16-04	1	Observed off Beach 1	CL, MLR
03-03-04	2	Found dead at the water/shoreline interface along Beach 1	CL, MLR

[1]Observers: CL = Carlos Laboy; MFP = Manuel Figueroa Pagan; MLR = Melissa Lopez Rodriguez

3.4.2 Piping Plover

3.4.2.1 Classification Status and Critical Habitat

The piping plover was listed as endangered in the Great Lakes watershed and as threatened in the remainder of its range on 11 December 1985 (50 FR 50726-50734). Critical habitat for wintering piping plovers was designated in July 2001 for all southeast U.S. coastal states from North Carolina through Texas (USWFS 2001). However, critical habitat has not been designated in Puerto Rico. All piping plovers are still considered threatened when on their wintering grounds.

3.4.2.2 Population Status and Distribution

- Overview

Piping plovers nest in North America from the Carolinas north (Atlantic Coast, Great Lakes, Northern Great Plains populations) and winter primarily from North Carolina south along the Atlantic and Gulf of Mexico coasts as well as in the northern Bahamas. Habitat loss, disturbance due to human recreation (i.e., four wheelers, beachgoers, etc.), and increases in predator populations have affected both nesting and wintering piping plovers. Historic wintering areas in the Caribbean have not been thoroughly documented. An international census for wintering piping plovers conducted in 1991 and 1996 located only 63% and 42% of the estimated numbers of breeding piping plovers (USFWS 2001). In the Caribbean, some piping plovers winter in the southern Bahamas, the Greater Antilles (including the Virgin Islands), and the Lesser Antilles south to Barbados (Raffaele et al. 1998).

The piping plover is classified as a rare species in the southern Bahamas and Greater Antilles and as a vagrant in the Lesser Antilles. A rare species is defined as a species for which there are fewer than two records per year with at least one occurrence every five years; a vagrant species occurs less frequently than once every 10 years (Raffaele et al. 1998).

Data on the occurrence and abundance of wintering piping plovers in Puerto Rico is known only from incidental observations and a few CBCs. A search of National Audubon Society CBC records from 1985 through 1998 revealed only two piping plover observations, which occurred during the 1997 Fajardo CBC. Two more piping plovers were reported during the Fajardo CBC between 1999 and 2000. In 2000 and 2001, five piping plovers were recorded during the San Juan Bay Estuary CBC and one individual was sighted during the Cabo Rojo CBC. Two piping plovers were also observed during the Cabo Rojo CBC in 2002 and 2003. The increase in the number of sightings in current years as compared to historic surveys

may or may not be related to the experience level of bird watchers and/or the number of observers conducting the counts (National Audubon Society 2004).

- NSRR/NAPR

The piping plover was documented by Ecology and Environment (1987) as a species known to occur at NSRR. However, observation dates, numbers of individuals, and sighting locations were not documented. No piping plover observations were reported at NSRR during the 1990s. Piping plovers were also not observed during boat and pedestrian surveys of sea turtle nesting beaches at NSRR in 2002 and 2004. The current wintering status of piping plovers at NAPR is not well known because of a lack of long-term winter beach surveys. The vagrant occurrence classification status of piping plover presented by Raffaele et al. (1998) for the Greater Antilles is probably predictive of its occurrence status at NSRR.

3.4.2.3 Potential Habitat

Piping plovers prefer open beach and mudflat estuarine habitat. Suitable wintering and migratory habitat for piping plover on NAPR is primarily sandy, coastal beaches and is similar to those illustrated for sea turtles (**Figure 3-2**).

3.4.3 Roseate Tern

3.4.3.1 Classification Status and Critical Habitat

In 1987, the roseate tern was listed as endangered along the U.S. Atlantic coast from Maine to North Carolina and as threatened in the Western Hemisphere and adjacent oceans (including Florida, Puerto Rico, and the Virgin Islands) where not already listed as endangered. Critical habitat has not been designated for this species, as the USFWS believed that there would be no demonstrable overall benefit to the roseate tern if critical habitat was designated (USFWS 1987).

3.4.3.2 Population Status and Distribution

- Overview

The historic status of roseate tern populations in the Caribbean is poorly known. Early researchers misidentified Caribbean roseate terns as common terns (*Sterna hirundo*) because of their similar bill coloration patterns. As a result, historical data on the Caribbean roseate tern is speculative (Saliva 2000). Van Halewyn and Norton (1984) were among the first to begin separating roseate terns from common terns and estimated that the roseate tern population in Puerto Rico and the Virgin Islands was approximately 2,500 pairs. However, they cautioned that many areas, some of which were highly inaccessible (e.g., uninhabited islands), had not been surveyed. Surveys and studies throughout the 1990s were reviewed by Saliva (2000) to obtain a more recent estimate of the Caribbean roseate tern population, which ranged between 4,000 and 6,000 pairs.

In the 1980s, the primary threats to roseate tern survival were egg collecting, human disturbance (e.g., tourists), rat predation, and the netting of birds while they were on their wintering grounds off Guyana (Van Halewyn and Norton 1984). These threats, along with predation by gulls, pollution, and depletion of their prey species, persist today as well.

- NSRR/NAPR

No historic evidence is available to indicate whether or not the roseate tern has ever nested at NSRR/NAPR. Based on a review of NSRR/NAPR internal reports, roseate terns have not been observed in or over coastal waters adjacent to NAPR in recent times. No roseate terns were spotted during the 2002 and 2004 boat and pedestrian surveys of sea turtle nesting beaches at NSRR. The nearest active roseate tern colony likely occurs on the eastern end of Vieques (more than 20 mi [32 km] east of NSRR) (DON 2003b). Although the occurrence of the roseate tern at NAPR has never been documented the

species should be considered accidental at NAPR because the potential exists that the species could be pushed into nearby coastal waters or inshore during a hurricane.

3.4.3.3 Potential Habitat

Cays, one of the preferred nesting habitats for roseate tern, are not present on NAPR. Some suitable habitat, rocky points with adjacent beach habitat, may occur near rocky points on Isla Cabeza de Perro. Foraging habitat includes all marine waters with suitable forage (fish) populations. However, the roseate tern has not been detected in the vicinity of Isla Cabeza de Perro or over marine waters adjacent to NAPR.

3.4.4 Yellow-shouldered Blackbird

3.4.4.1 Classification Status and Critical Habitat

The yellow-shouldered blackbird was classified as an endangered species in 1976 (USFWS 1976). Critical habitat for the yellow-shouldered blackbird was designated the following year and included all of NSRR (USFWS 1977). The Navy initiated consultation regarding yellow-shouldered blackbird critical habitat on NSRR with the USFWS under the ESA. In 1980, the Navy signed an agreement that designated consultation areas within NSRR for the yellow-shouldered blackbird (**Figure 3-4**). Any proposed activities (e.g., construction, training) within consultation areas required the DON to consult the USFWS under Section 7 of the ESA.

3.4.4.2 Population Status and Distribution

- Overview

The yellow-shouldered blackbird was formally abundant and widespread throughout most habitats on Puerto Rico (USFWS 1976). Wetmore (1916) indicated that the species was found mainly below an altitude of 800 ft, and was most abundant in the coastal region and inland along open valleys. Post and Wiley (1976) indicated that the yellow-shouldered blackbird remained widespread and very common until 1940, when the population began to decline. Several factors contributing to the decline were disease, loss of feeding and nesting habitats, nest predation by the pearly-eyed thrasher (*Margarops fuscatus*), and introduced mammals (e.g., black rat [*Rattus rattus*] and Norway rat [*R. norvegicus*]) (Post and Wiley 1976, 1977a, 1977b; Post 1981). However, the main cause of the decline in yellow-shouldered blackbird populations was thought to be due to the extensive parasitism of nests by the shiny cowbird (*Molothrus bonariensis*) (Post and Wiley 1977a, 1977b; Wiley 1985).

In 1976, Post and Wiley estimated the yellow-shouldered blackbird population at 2,400 individuals. Based on roost counts and on surveys of nesting areas they concluded that the population was concentrated in three areas: 1) Mona Island (200 individuals), 2) coastal southwestern Puerto Rico (2,000 individuals), and 3) coastal southeastern Puerto Rico (200 individuals). The species was detected in the towns of Barranquitas, Adjuntas, Cidra, Caguas, and Cayey as late as 1978 and on Vieques in April 1974 and March 1978 (Pérez-Rivera 1978; USFWS 1976). Between 1982 and 1986 the total island-wide population of yellow-shouldered blackbirds was approximately 771 to 1,212 individuals (Wiley et al. 1991).

In 1998, the total estimated yellow-shouldered blackbird population was estimated to be 1,250 individuals and the overall population trend was rated as increasing (BirdLife International 2004). No other recent population data for all of Puerto Rico are available.

In eastern Puerto Rico, Nuñez-García (1988) observed a minimum of 28 yellow-shouldered blackbirds during the 1985 nesting season with 30 and 26 observations during 1986 and 1987, respectively. After Hurricane Hugo, in September of 1989, this population was thought to be extirpated (USFWS 1989, 1991). The only recent survey data found for southeastern Puerto Rico are from survey and monitoring activities at NSRR. The status of the yellow-shouldered blackbird population outside of the NAPR is unknown.

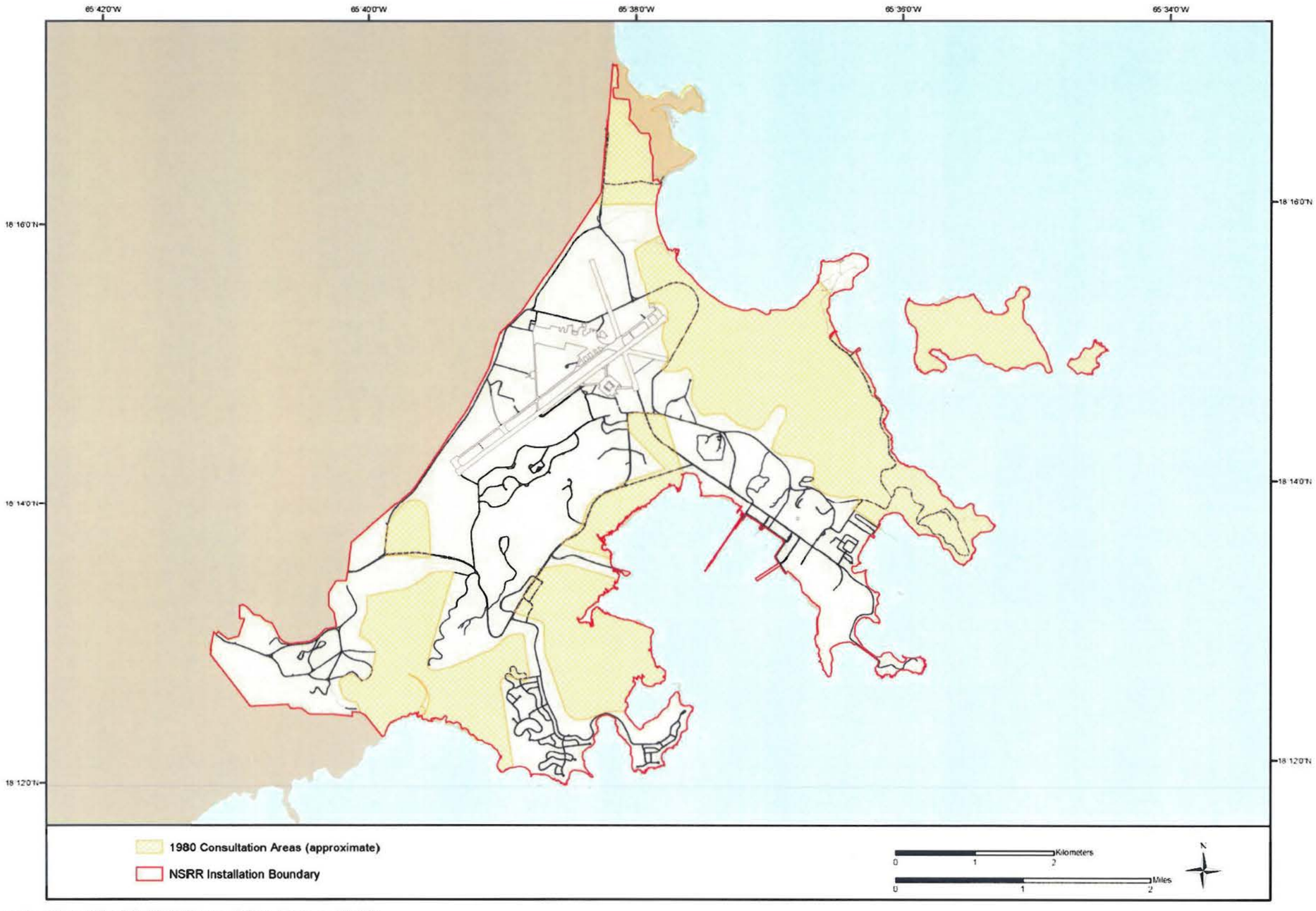

Figure 3-4. Yellow-shouldered Blackbird 1980 Consultation Areas on NSRR.

- NSRR/NAPR

The yellow-shouldered blackbird population on NSRR was the second largest population in Puerto Rico in 1976. However, from 1976 to 1982, the yellow-shouldered blackbird population at NSRR declined by 97% (Wiley et al. 1991). After the passing of Hurricane Hugo in 1989, no yellow-shouldered blackbirds were observed during the habitat and population assessment surveys at NSRR that immediately followed the hurricane's passing. As a result, the species was believed to be absent at NSRR. After Hurricane Hugo, one hurricane, Georges, significantly impacted the area in 1998. No studies were done to determine the effects of this hurricane on the yellow-shouldered blackbird population on NSRR.

However, several general surveys for the yellow-shouldered blackbirds were conducted from 1993 to 1999 and a number of incidental observations of yellow-shouldered blackbirds were made. One individual was observed at NSRR in May 1993 and another two were reported during the December 1994 CBC (DON 2001). In 1995, the Puerto Rico DNER reported 15 yellow-shouldered blackbirds near the main gate of NSRR and one dead yellow-shouldered blackbird was found at an electrical substation near NSRR (DNER 1995). In 1999, four yellow-shouldered blackbirds were found at the NSRR airport in spring and four yellow-shouldered blackbird nests were discovered during the summer of 1999 (DON 2001). As a result of these encounters, the U.S. Navy agreed to conduct extensive surveys for yellow-shouldered blackbirds at NSRR and nearby in Ceiba during 2000, 2002, and 2004.

During pre-breeding surveys at NSRR in 2000 between 24 and 26 yellow-shouldered blackbirds were counted. Six yellow-shouldered blackbird pairs were confirmed nesting in the NSRR/Ceiba study area during 2000. Five of the six nests were found on NSRR. Nesting success was low as only two of the six nests fledged young. During post-breeding counts, only one yellow-shouldered blackbird was observed on NSRR (DON 2001).

Ten yellow-shouldered blackbirds were found during the pre-breeding survey count in 2002. During nesting season surveys at NSRR and in downtown Ceiba in 2002, 27 to 28 yellow-shouldered blackbirds were observed. Eleven yellow-shouldered blackbirds were located in or adjacent to the NSRR airport. Three pairs of yellow-shouldered blackbirds were confirmed nesting on NSRR and Ceiba. The three nesting pairs made a total of 8 nesting attempts. Eggs hatched successfully in three of the eight nests and six chicks fledged. Ten yellow-shouldered blackbirds did not breed (DON 2003a).

In addition, several incidental observations of yellow-shouldered blackbirds were made during boat and pedestrian surveys of beaches and roadsides at NSRR (**Table 3-9**). All incidental observations of perched birds occurred adjacent to or in mangrove habitat and most of the flying birds were headed toward mangrove habitat. Most of the observations occurred along Beach 1 or Tarawa Road. The area between these locations is primarily mangrove habitat. The general location of yellow-shouldered blackbird observations on NSRR from 1995 to 2004 is illustrated in **Figure 3-5**.

During pre-breeding surveys at NSRR and Ceiba in 2004, two yellow-shouldered blackbirds were observed. Three pairs of yellow-shouldered blackbirds were found during breeding/nesting surveys conducted between 23 March and 29 April 2004. One pair had constructed a nest on NSRR but had not laid eggs by the end of the early season surveys. No adult or juvenile yellow-shouldered blackbirds were found during surveys conducted in August. The nesting status of the other two pairs remains unknown (**Appendix E**).

Based on the available data, the total number of yellow-shouldered blackbirds observed in the NSRR/Ceiba study area appeared to increase from 1995 (15) through 2000 (27-28) (DON 2001, 2003a) and then appeared to decline from 2000 to 2004 (6). The number of nesting pairs declined from five to zero (one possible nesting pair in 2004, but unconfirmed) and nesting success remained low from 1995 to 2004. Based on post-breeding counts in 2000 and 2002, it was thought that yellow-shouldered blackbirds were not likely to be present on NSRR after the breeding season. However, incidental observations by experienced biologists indicate that some yellow-shouldered blackbirds are present at NSRR during the winter. Two individuals were recently observed at NSRR during the 2004 Fajardo CBC, the first time this

Table 3-9
Incidental Observations of Yellow-shouldered Blackbirds during Weekly Boat/Beach Surveys at NSRR in 2002 and 2004

Date	No.	Location	Observers[1]
05-19-02	1	Observed while walking along Beach 1	MFP, MLR
05-31-02	2	Observed while walking along Beach 1; Flew SE	MFP, MLR
06-11-02	2	Observed flying over the mangroves north of Beach 1	MFP, MLR
07-12-02	1	Observed flying north toward mangroves from Beach 21	MFP, MLR
01-30-04	1	Heard; Tarawa Rd. mangroves (between Tarawa Rd.-Beach 1)	CL, MLR
02-27-04	2	Observed; palm tree along Tarawa Rd	CL, MLR

[1]Observers: CL = Carlos Laboy; MFP = Manuel Figueroa Pagan; MLR = Melissa Lopez Rodriguez

species had been seen by CBC observers since the early years of the count (Wunderle 2004). Pre-breeding, nesting, and post-breeding data from surveys conducted in 2000, 2002, and 2004 are summarized below in **Table 3-10**. The eastern Puerto Rico yellow-shouldered blackbird population may currently be declining on NSRR/NAPR. Based on surveys conducted in 2000, 2002, and 2004, the cause of the decline may be the result of an increase in the population of the shiny cowbird, an obligate nest parasite (**Appendix E**).

Table 3-10
Summary of Recent Survey and Monitoring Data for Yellow-shouldered Blackbirds at NSRR

Parameter	2000	2002	2004[1]
Pre-breeding Count	24-26	10	2
Nesting			
Nesting Pairs	5	3	1[2]
Nesting Attempts	11	8	UNK
Known Number – Eggs	25	11	UNK
Number Hatched	7	6	UNK
Number Fledged	6	6	UNK
Non-breeders	16	10	UNK
Post-breeding Count	1	0	NA

[1] UNK – unknown, NA – not available
[2] One probable nesting pair; two pair of unknown nesting status but possible nesting pairs

3.4.4.3 Potential Habitat

Yellow-shouldered blackbird habitat was delineated on NSRR in the mid-1990's. Nesting, foraging, and roosting habitat requirements of the species were determined by conducting a literature search. Yellow-shouldered blackbirds have been observed utilizing a wide variety of different habitats for nesting including: (1) coastal mangroves, (2) coastal upland dry forest, (3) black mangrove (*Avicennia germinans*) forest, (4) offshore red mangrove (*Rhizophora mangle*) cays, (5) lowland pasture (adjacent to mangrove forest), (6) coconut palm (*Cocos nucifera*) plantations, (7) cactus scrub, (8) coastal cliffs and caves (crevices and ledges), (9) suburban and urban areas, (10) ucar (Bucida buceras), and (11) artificial structures (buildings and lamps) (Post and Wiley 1976; Raffaele 1989; PRDNER 1991, 1992; USFWS 1996; U.S. Navy 2001). In NSRR, the species has been observed roosting in mangrove cays (Raffaele 1989; Wiley et al, 1991) and in Piñeros Island (USFWS 1988; Ventosa-Febles (PRDNER) 1996). Recent aerial photography was delineated to identify areas with suitable nesting, foraging, and roosting habitat. Ground-truth field surveys were conducted on NAPR to identify and/or correct aerial photography delineations. These maps were combined to produce a potential habitat map for the yellow-shouldered blackbird on NAPR (**Figure 3-5**). Potential yellow-shouldered blackbird habitat encompassed 5,955 ac 2,410 ha) on NAPR in the mid-1990's. Major large-scale land use changes have not occurred on NSRR/NAPR since the time of the original delineation. Presence/absence of the yellow-shouldered

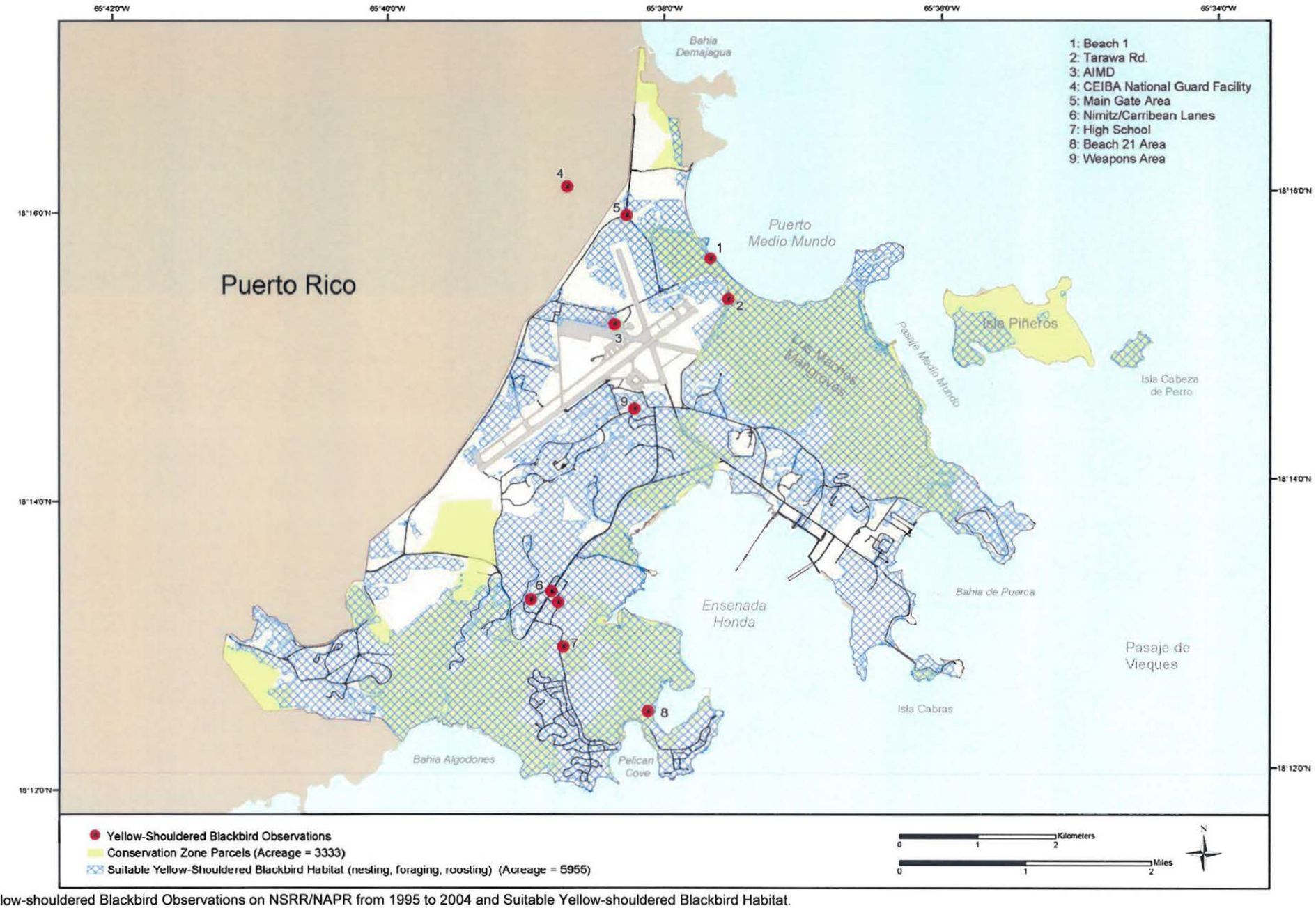

Figure 3-5. Yellow-shouldered Blackbird Observations on NSRR/NAPR from 1995 to 2004 and Suitable Yellow-shouldered Blackbird Habitat.

habitat is listed in **Table 3-11** by land parcel. Parcels proposed for sale, with the potential for development, are designated in the table.

Table 3-11
Presence and/or Absence of Yellow-shouldered Blackbird Habitat by Parcel Number

Parcel Number	YSBB Habitat	Parcel Number	YSBB Habitat	Parcel Number	YSBB Habitat	Parcel Number	YSBB Habitat
1	✓	18	✓*	35	✓	52	✓
2	✓*	19	✓*	36	✓	53	✓
3	✓	20	✓	37	✓	54	✓
4	✓	21	✓	38	✓	55	✓
5	✓	22	✓*	39	✓	56	✓
6	✓	23	✓	40	✓	57	✓
7	✓	24	✓	41	✓	58	✓
8	✓*	25	✓*	42	✓	59	✓*
9	✓	26	✓	43	✓	60	✓
10	✓*	27	✓*	44	✓	61	✓
11	✓	28		45	✓*	62	✓
12	✓	29	✓	46	✓	63	✓
13	✓	30	✓*	47	✓*	64	✓
14	✓*	31	✓*	48	✓*	65	✓
15	✓*	32	✓	49	✓	66	✓
16	✓*	33	✓	50	✓	67	✓
17	✓*	34	✓*	51	✓	68	✓

Legend:

✓ = Suitable habitat / designated critical habitat
✓* = Sale Parcel
YSBB = Yellow-shouldered Blackbird

3.5 MAMMALS

The West Indian manatee (*Trichechus manatus*) is the only federal and Commonwealth listed mammal species known to occur at NAPR. Other listed mammals, such as the endangered humpback, fin, sei, and sperm whales, are known to occur in ocean waters off Puerto Rico, but not in proximity to NAPR.

3.5.1 West Indian Manatee

3.5.1.1 Classification Status and Critical Habitat

The West Indian manatee is listed as endangered throughout its entire range (Rathbun and Possardt 1986). Critical habitat has not been designated for this species in Puerto Rican waters.

3.5.1.2 Population Status and Distribution

- Overview

Since 1984, the USFWS Caribbean Field Office has conducted aerial surveys for manatees throughout Puerto Rico's nearshore waters. The goals of these surveys have been to determine population size and monitor trends in abundance (USFWS 2000b). The exact number of manatees in Puerto Rican waters is unknown, although the number of manatees counted during aerial surveys has ranged from 43 to 101 individuals. Lefebvre et al. (2001) noted that since 1978, the number of manatees in Puerto Rico probably has not declined, and may have increased.

Puerto Rican manatees are found in coastal waters well inside the continental shelf and rarely, if at all, near the shelf edge. Manatees occur throughout the Commonwealth, although they are most abundant

along the south and east coasts, particularly in the area of Fajardo and Ceiba (near NAPR) and in the Jobos Bay area between Guayama and Salinas. In general, manatees are not abundant on the north coast and are infrequently seen in areas immediately to the west of San Juan. Manatees are also rarely seen around Culebra (Powell et al. 1981; Rathbun et al. 1985; Mignucci-Giannoni 1989; USFWS 2000b; Lefebvre et al. 2001; DON 2002).

Manatee distribution in Puerto Rico is often influenced by the availability of seagrass, their preferred food (Mignucci-Giannoni 1989; Mignucci-Giannoni and Beck 1998). Seagrass beds are extensive on the eastern and southern coasts of Puerto Rico and throughout the coastal waters of Vieques (NOS 2001). Tagging studies have revealed a heavy reliance on the seagrass beds and nearshore waters adjacent to NSRR and the northwest coast of Vieques (Lefebvre et al. 2000). The higher incidence of manatees (in particular, cow/calf pairs) in these two areas is directly related to seagrass abundance (Rathbun et al. 1985; Reid and Kruer 1998; Lefebvre et al. 2000). It should be noted, however, that although seagrass beds extend several miles offshore and are found in waters with bottom depths greater than 66 ft (20 m), most observations of feeding manatees at NSRR and Vieques are close to shore and in shallow water (bottom depths of 3 to 16 ft [1 to 5 m]) (Lefebvre et al. 2000). It is possible that manatees are most often seen in nearshore waters because they are easier to see at shallower depths.

Manatee distribution in Puerto Rico, as well as in other locales where this species is found, is also likely influenced by the availability of freshwater (Hartman 1979; Powell et al. 1981; Olivera-Gomez and Mellink 2005). Powell et al. (1981) ascertained that most manatees in Puerto Rico, over 85% during their surveys, would be found within 3 mi (5 km) of a natural (e.g., a river) or artificial (e.g., a sewage treatment plant outfall) freshwater source.

Manatees have been observed drinking from the mouths of the Río Blanco and Río Humacao in southeastern Puerto Rico and the Río Guanajibo in western Puerto Rico (Belitsky et al. 1979; Lefebvre et al. 2001). Interviews with coastal residents have indicated that manatees also visit the mouths of the Río Grande de Loíza and Río Fajardo in northeastern Puerto Rico, and may ascend those rivers for short distances after heavy rains (Powell et al. 1981). Manatees likely utilize these river mouths as freshwater sources because they are all located in proximity (within one mile) to extensive seagrass beds.

Although Puerto Rican manatees may occasionally enter freshwater environments to drink, the remainder of the time they are much more common in marine environments (Lefebvre et al. 2001). It is believed that this is due primarily to Puerto Rico's lack of broad sluggish rivers, which are the preferred habitats for manatees in most other regions of the world (Lefebvre et al. 2001). Powell et al. (1981) concluded that most Puerto Rican rivers (especially quebradas, or intermittent streams, on Vieques) are generally too shallow for manatees to ascend, especially during the dry season (December to July). Others believe that the reduced numbers of manatees seen in freshwater habitats is attributable to the silting up of river mouths, which prevents manatees from grazing on shoreline grasses found at river mouths and also presumably limits their access to freshwater for drinking (Barrett 1935).

For the past 25 years, manatees in eastern Puerto Rico have been observed drinking from the Capehart sewage treatment plant effluent at NSRR/NAPR, as it has been a dependable, year-round source of freshwater. During this same period, large aggregations of manatees have been seen drinking from this artificial freshwater source (Belitsky et al. 1979; Worthy 1999). On rare occasions, manatees in Puerto Rico have also been known to acquire freshwater from garden hoses. Manatees have been observed drinking from freshwater hoses at boat marinas along the east coast of Puerto Rico since 1990 (Mignucci-Giannoni personal communication 2004). In 1994, 'Moises' the manatee was regularly offered freshwater from a garden hose around NSRR during rehabilitation efforts, as there were no rivers that flowed into the cove where he was enclosed (CSN 1994).

- NSRR/NAPR

The marine habitat surrounding NAPR is an area where manatees tend to concentrate, as it provides foraging and breeding habitat for these animals. Slightly over one-third of all manatee sightings in Puerto Rico are around NSRR, on the eastern end of the island near Fajardo and Ceiba, and along the

northwestern shore of Vieques (Powell et al. 1981; Rathbun et al. 1985; **Figure 3-6**). Located a short distance to the east of NAPR, the nearshore waters off the northwest coast of Vieques are a well-known manatee feeding and resting area (Magor 1979; Rathbun et al. 1985; Reid and Kruer 1998).

At NSRR/NAPR, manatee sightings are often concentrated in the station's shallow coves and bays, where both manatees and their primary food source (seagrasses) receive protection from wave action and strong currents. Pelican Cove and Ensenada Honda are two seagrass-laden areas where feeding manatees are most often spotted (Rathbun et al. 1985; Freeman and Quintero 1990; Lefebvre et al. 2000). Manatees also frequently utilize seagrass habitats in Bahía Algodones and nearby waters located along the southern perimeter of NSRR (Reid 1994). Sightings are also very common off northwestern Vieques, where seagrass biomass appears to be even higher than at NSRR. However, the habitats off Vieques are likely not as attractive to manatees since freshwater sources there are much more difficult to locate (Diaz et al. 1992; **Figure 3-6**).

Manatees inhabiting the waters around NSRR/NAPR and Vieques have been observed drinking freshwater from both the Capehart sewage treatment plant effluent and the Río Daguao (Powell et al. 1981; Rathbun et al. 1985). From 1984 to 1985, the average number of manatees sighted per hour in the effluent zone of the Capehart treatment plant was 20.6 ± 12.6 individuals. Manatees were attracted to the freshwater effluents at the Capehart treatment plant during all times of the day with no preference for high or low tide. Manatees principally used the outer effluent during the first five months of observations (May through September 1984) and then switched to the effluent closest to shore during the last five months of surveys (October 1984 through February 1985). Over 80% of the sightings in the Capehart area occurred within a 33-ft (10-m) radius of each outfall and along a 66-ft (20-m) corridor between the two effluents. When manatees approached the effluent, they swam directly to the pipe opening and stuck their heads in for 0.5 to 3.5 minutes (Rathbun et al. 1985; **Appendix F**).

From 1992 through 1996, the U.S. Geological Survey (USGS) Sirenia Project, in cooperation with the Navy, tagged seven manatees at NSRR (Reid 1997). This tracking study revealed that manatees make regional movement patterns, including directed movements between eastern Puerto Rico and Vieques (Reid and Bonde 1993). Most individuals remained near, or frequently returned to, NSRR; however, one manatee swam 31 mi (50 km) south to Puerto Patillas and another swam 25 mi (40 km) north to Luquillo (Lefebvre et al. 2001). Four of the seven radio-tagged manatees repeatedly traveled 6 mi (10 km) to Vieques (Reid and Kruer 1998).

Although the manatee population around NAPR may be increasing, the threat of mortality from boat collisions and net entanglement remains high in the waters around Ceiba and Fajardo. Presently, there are no estimates of the size of the manatee population that resides in the waters around NAPR.

3.5.1.3 Potential Habitat

Marine coastal habitats adjacent to NAPR provide habitat for the West Indian manatee (manatees). Shallow coves and bays in areas with abundant forage (i.e., sea grasses), are preferred locations for the manatees. The manatees also occur near the Capehart sewage plant where they come to drink freshwater. Potential habitat includes all waters adjacent to NAPR since the manatees are known travel to Vieques to feed.

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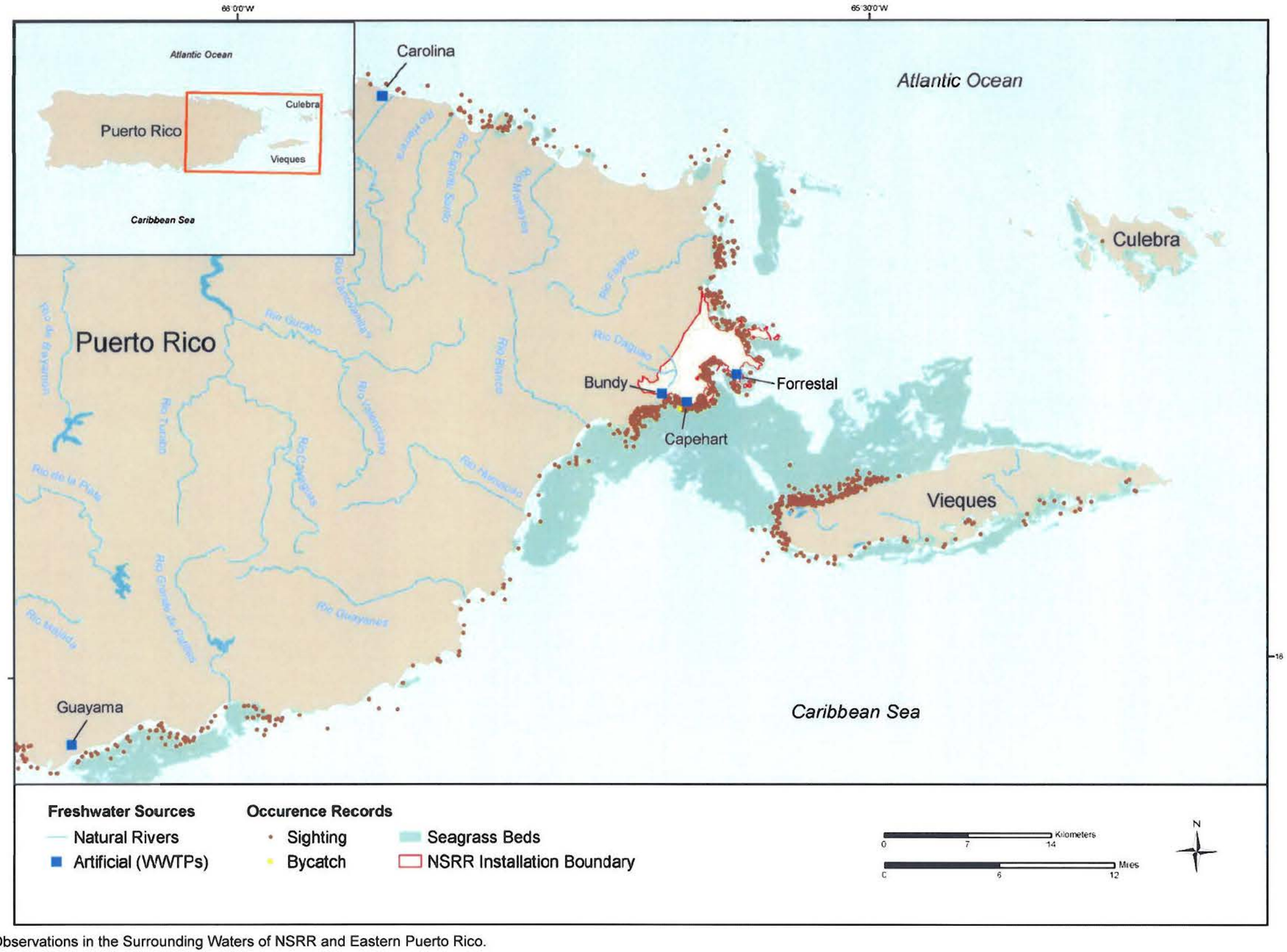

Figure 3-6. Manatee Observations in the Surrounding Waters of NSRR and Eastern Puerto Rico.

4.0 DETERMINATION OF IMPACTS TO LISTED SPECIES AND CRITICAL HABITAT

This section of the BA describes the potential impacts of the proposed action on federal and Commonwealth listed species known to occur or possibly occurring at NAPR.

4.1 TRANSFER OF LANDS TO OTHER FEDERAL AGENCIES

The Navy has divided the NAPR into 68 distinct parcels. Six parcels will be transferred to other federal agencies. Any future federal activity that would result in possible adverse effects to threatened and endangered species will require a section 7 consultation (see Section 1.2) between the federal agency and the USFWS. The new federal agency landowner would have to protect threatened and endangered species known to occur or that may potentially occur on the land transferred to their ownership. No new impacts to listed species and critical habitat would occur with the transfer of land from one federal agency (e.g., DOD-Navy) to another.

4.2 TRANSFER OF LANDS TO NON-FEDERAL OWNERSHIP

Implementation of the proposed action, the disposal of NAPR property to future property owners, would not in and of itself constitute an adverse affect to any listed species known to occur. Upon completion of the proposed action future land-use changes by subsequent owners could constitute an adverse affect to listed species.

Future developments will have to be evaluated to reach a final determination on any adverse effects to listed species. Subsequent landowners are subject to the regulatory protection afforded to the species under federal and Commonwealth law. Any Federal-nexus project (funding, licensing, permits, or activities) that would result in possible adverse effects to threatened and endangered species will require a section 7 consultation (see Section 1.2) between the federal agency and the USFWS. The new landowners will be required to comply with T/E species protection laws and to implement the conservation measures incorporated into the proposed special zoning requirements for specific parcels within the former NAPR property (**Appendix A**). All Puerto Rican entities must comply with relevant federal laws (e.g., Clean Water Act, Clean Air Act, ESA, and Coastal Zone Management Act) and the Commonwealth's planning, zoning, and environmental laws. The Commonwealth of Puerto Rico Department of Environmental and Natural Resources (DNER) has interagency agreements with other state and federal regulatory agencies, including FWS. The DNER list of threatened and endangered species is in fact identical to the federal list. Any new developments will have to be evaluated under the existing environmental laws and regulations at the time the proposal is made. Discussion of potential reuse impacts at this time is unquantifiable. Future landowners/developers will be responsible for the preparation of necessary engineering and design studies and obtaining necessary permits and approvals from the respective regulatory agencies before implementation of development activities.

The primary impact to federally listed plants, sea turtles, snakes, birds, and mammals that occur at or in the adjacent coastal waters of NAPR would be the loss of protection afforded to those species by the Navy's presence at NAPR. The management of the Navy Activity was guided by an Integrated Natural Resources Management Plan and any activity that may affect federally-listed species or designated critical habitat required a section 7 consultation with the USFWS. Future activities with federal nexus would require a section 7 consultation with the USFWS. However, section 7 consultation will not apply for future non-federal nexus projects or activities. Private property owners that are unable to adhere to the conservation measures that have been established for the transfer activity would be required to seek an Incidental Take Permit under section 10 (a)(1)(B) of the ESA.

Specific impacts to listed species are discussed below.

4.2.1 Plants

Coastal development and resulting losses in wetland habitat have been identified as the biggest threats to remnant populations of Cobana negra in Puerto Rico (USFWS 1995). Although residential development is

proposed for an area in proximity to where the lone Cobana negra was encountered in 2004 (Parcel 5), the specific forested area where the individual was found has been deemed undevelopable land (CB Richard Ellis et al. 2004). Cobana negra is only found within an area not proposed for development. Therefore, no adverse impacts to this threatened plant species are anticipated.

4.2.2 Sea Turtles

Upon completion of the proposed action future land-use changes by subsequent owners could constitute an adverse affect to listed species. Potential adverse impacts to sea turtles resulting from the transfer could result from the development of coastal projects without sea turtle conservation measures. Potentially affected beaches include Beach numbers 12, 14, 15, 16, 17, and 18. Potentially affected sea turtle habitat is illustrated in **Figure 4-1 & Appendix G—Sea Turtle Nesting Habitat Map.** The total potentially affected sea turtle nesting habitat is 9.07 ac (3.67 ha).

The Reuse Plan proposes that development occur at beachfront areas along Bahía de Puerca (Zone 7), Ensenada Honda (Zones 6 and 7), and in the Capehart area (Zone 5). These three zones house some of the highest density nesting beaches for sea turtles at NAPR (including Beach 18). Construction activities and concurrent increases in vehicle traffic on or along beachfront areas are known to disturb sea turtles and their nesting beaches which could potentially occur during future construction proposed in these areas (Raymond 1984). Physical obstacles, such as tire tracks and sand piles, may slow the rate of sea-approach for hatchling sea turtles and increase their susceptibility to stress and predation (Witham 1995).

The development of coastal lands at NAPR could lead to an increase in the amount of artificial light directed upon sea turtle nesting beaches at night. However, proposed local zoning requirements will require new landowners to establish appropriate set backs and develop comprehensive lighting plans in compliance with the sea turtle conservation measures developed in the Special Zoning Plan established for NAPR. Beachfront development without comprehensive sea turtle conservation measures may result in habitat degradation and destruction, resulting in adverse impacts to sea turtles and their nesting habitat. Some of the activities that may affect these species and their habitat are: destruction of native coastal vegetation, installation of permanent barriers or structures at their habitat, installation of artificial lights that can be seen from the beach, vehicular traffic or parking within the beach, increased predation by pest species (rats, mongooses, dogs, horses, and ants), and root intrusion from landscapes or exotic vegetation. Artificial lighting may deter females from coming onto the beach to nest and may cause disorientation or misorientation of both adult female nesting turtles and emerging hatchlings, often resulting in their death.

Artificial lighting from streetlights and oceanfront properties has been known to cause disorientation and misorientation of both hatchlings and adults and may also cause sea turtles to abandon nesting attempts (Witherington and Martin 1996). Upon emerging from their nest, hatchling sea turtles have a strong tendency to crawl in the direction of the brightest light, which, on naturally lighted beaches, is towards the ocean/sky horizon (Ernst et al. 1994). However, on artificially lighted beaches, light intensity is often much greater than the ocean/sky horizon. Light pollution from areas inland of the nesting beach would potentially orient hatchling sea turtles away from the ocean, which would increase their vulnerability to terrestrial predators and other sources of injury or mortality (e.g., automobiles, intense sunlight). As for nesting sea turtles, they tend to avoid areas where beachfront lighting is most intense and more often abort nesting attempts in lighted areas as opposed to unlit areas.

Additional threats to sea turtles while they are in the water may involve ingestion of or entanglement in debris that is produced as a result of residential, commercial, educational, and tourism development projects (Laist 1997; Lutcavage et al. 1997; Laist et al. 1999). Because of their buoyancy and persistence, plastic items contribute disproportionately to the overall impacts of marine debris. Most of the debris that either entangles sea turtles or is found in their stomachs is made of plastic (Laist 1997). Leatherback sea turtles, which often mistake plastics for jellyfish, may be more vulnerable to marine debris than other sea turtle species.

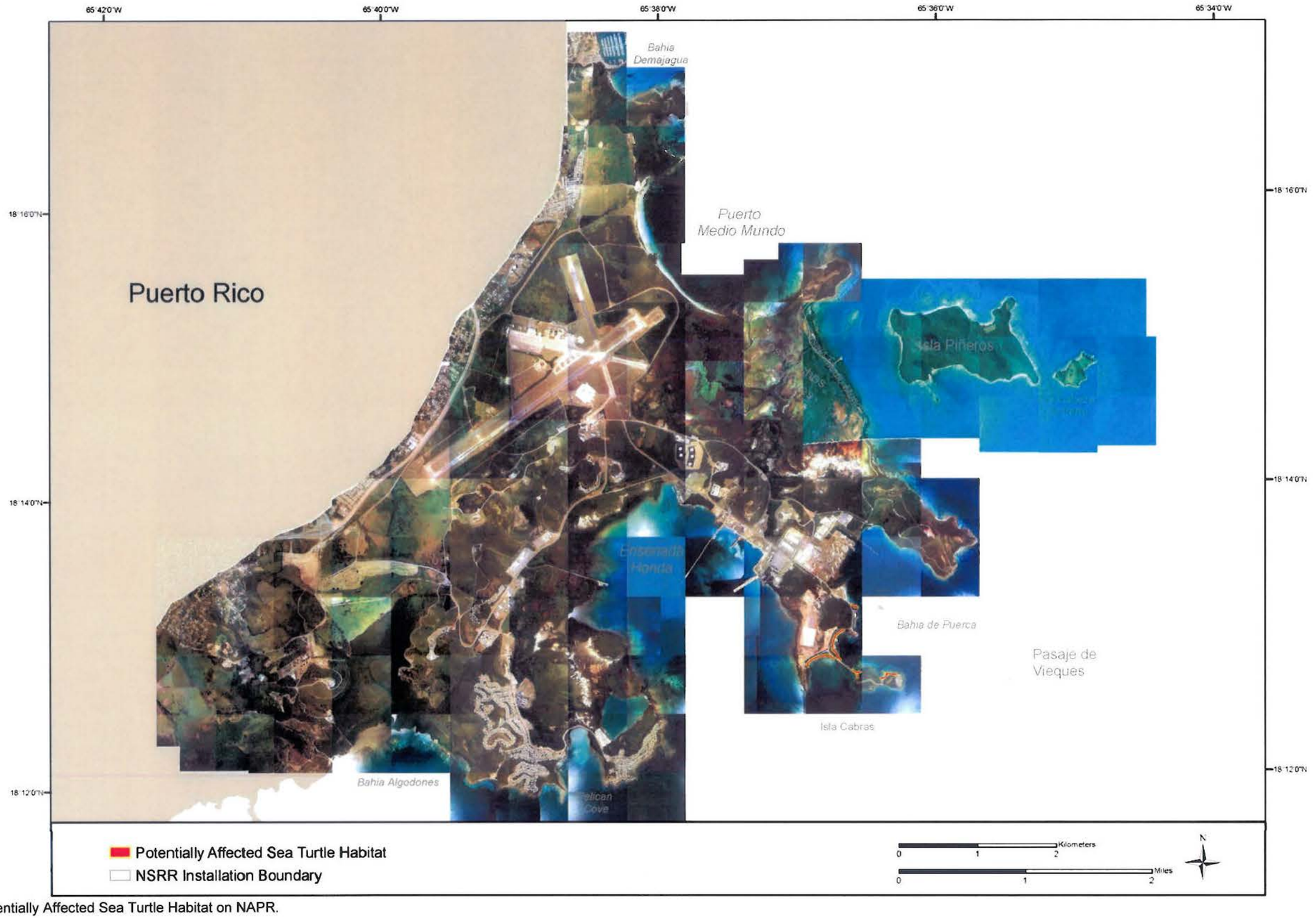

Figure 4-1. Potentially Affected Sea Turtle Habitat on NAPR.

Sea turtles may also be more frequently exposed to direct interactions with humans following the land transfer. In the Caribbean region, particularly near Puerto Rico, illegal take of nesting sea turtles and poaching of their eggs have been identified as significant problems (NMFS and USFWS 1991a). In 1991, through a cooperative agreement with the Puerto Rico DNER, the Navy began making concentrated efforts to protect sea turtle nesting activity at NSRR and Vieques (Belardo et al. 2001). Prior to the Navy leaving, there were no recorded incidents of human consumption of either nesting sea turtles or their eggs at NSRR. Upon transfer of lands to civilian ownership, the protection of sea turtles and their eggs from human harvesting at and around NAPR would likely diminish significantly.

Nest depredation by predators such as mongoose, feral dogs and cats, rats, and iguanas is also a great concern throughout the Caribbean (Boulon 1999). Feral animals are known to increase in numbers during development and construction activities. Increases in human population density at NAPR may cause the displacement of these scavenging animals into important habitat areas that are proposed for conservation. An increase in human activities around sea turtle nesting beaches, even in the form of organized turtle walks, may cause sea turtles to spend less time camouflaging or protecting their nests, which would leave sea turtle eggs more vulnerable to predation (Johnson et al. 1996).

Incidental catch in fisheries is widely recognized as a major mortality factor for sea turtles and is of great concern in Puerto Rican waters (NRC 1990). In the water, sea turtles are prone to entanglement in both active and discarded fishing gear. Discarded lines and nets also have the potential to harm sea turtles while they are attempting to nest on land. Discarded fishing gear, washed up along the beaches, can be found along NSRR/NAPR. An abundance of fishing gear on a nesting beach can be a large deterrent to sea turtle nesting activity and hatchling emergence. With the Navy no longer in control of the ocean waters around NAPR, increases in both artisanal and recreational fishing activities offshore of NAPR are likely to occur. Increases in fishing activities may lead to increases in potentially fatal turtle/fishing gear interactions both in the water and on land. On the other hand, redevelopment of the NAPR coastline may induce property owners to remove discarded nets and other debris from their beaches, thereby lessening potential impacts to nesting sea turtles.

The redevelopment of NAPR may also lead to increases in recreational and commercial boat traffic around the base. Collisions with boats or their propellers can injure and/or kill sea turtles. An animal with a wound has an increased probability of predation. Depending on the severity of the wound, a sea turtle's buoyancy and its ability to swim and dive can be compromised.

4.2.3 Snakes

Despite their endangerment, West Indian boas are moderately tolerant of human disturbance. Puerto Rican boas, which have been known to occur on NSRR, are often observed in areas with frequent human activity (e.g., in buildings, along roadsides, at managed tree plantations). In the vicinity of the Caribbean National Forest, boas have been reported from residents' garages and patios as well as from U.S. Forest Service buildings (Reagan 1984). According to Tolson, 2004, limited construction and clearing on NAPR would not result in adverse effects on the two boa species.

Potential adverse impacts to Puerto Rican and Virgin Islands tree boas resulting from the transfer of NAPR from federal to non-federal ownership include increased mortality and habitat loss. Boas may experience higher rates of mortality during both construction and demolition activities and may become increasingly susceptible to mortality if there are significant rises in vehicular traffic on the base. Loss of suitable habitat may occur if vegetative cover is to be cleared during residential, industrial, educational, or recreational development activities. Potential indirect impacts to boas include a decrease in prey abundance that may result from habitat destruction and/or modification of existing facilities. However, based upon recent surveys, the boa prey base at NSRR appears to be healthy and relatively immune to disturbance. Tolson (2004) noted that there were an abundance of frogs, lizards, and rats present in most habitats at NSRR that were suitable for boas. Although development may lead to declines in the abundance of certain prey species, the introduction of exotic mammals (rats and mice), which may also occur during the development process, may actually help to enhance the boa food supply (Reagan 1984).

Potentially affected Puerto Rican boa habitat lies within land covered by slopes greater than 15% is illustrated in **Figure 4-2 & Appendix G—Puerto Rico Boa and Virgin Island Boa Habitat Map**. Boa habitat is not likely to be adversely affected since development in these areas is strictly limited and is not recommended in the Reuse Plan nor supported by the Special Zoning Plan. However, any boa traveling between suitable habitats may be directly impacted by development related activities (trucks, tractors, etc.) and subsequent increases in traffic as they move between areas of suitable habitat.

Potentially affected Virgin Island boa habitat includes low profile offshore islands and cays with simple vegetation, areas with steep coastal rocky cliffs, and areas with sea grape vegetation habitat. Virgin Island boa habitat is shown in **Figure 4-2 & Appendix G—Puerto Rico Boa and Virgin Island Boa Habitat Map**. The Virgin Island boa habitat is not likely to be adversely affected because of the minimal acreage impacted.

4.2.4 Birds

4.2.4.1 Brown Pelican

Potential adverse impacts to brown pelicans resulting from the transfer of NAPR lands to non-federal ownership could include increased harassment, injury, and mortality as well as the loss of nearshore and onshore roosting habitats. Increases in recreational activities (e.g., swimming, fishing, boating) and vehicular traffic (e.g., four wheelers, dirt bikes, trucks) on or near beach areas during redevelopment have the potential to cause both direct (e.g., harassment, injury, mortality) and indirect (e.g., habitat loss) impacts to the species. Additional impacts to the species may involve ingestion of plastics or other waste items that are produced as a result of redevelopment initiatives. However, nesting habitat within the NAPR has not been identified. All suitable roosting habitats for the species are located either within designated areas for conservation (mangrove forests and Piñeros Island) or coastal beaches. In Puerto Rico, beach activities are regulated by the Puerto Rico Department of Natural and Environmental Resources and water-related project are regulated by Clean Water Act and may require federal permits from U.S. Army Corps of Engineers (USACE) and Environmental Protection Agency (EPA). Any federal permit or activity that would result in possible adverse effects to threatened and endangered species will require a section 7 consultation between the federal agency and the USFWS.

4.2.4.2 Piping Plover

The piping plover is considered a vagrant occurrence species in NAPR. However, suitable habitat could be potentially impacted by the redevelopment of NAPR through loss of feeding, nesting, and roosting habitat. These impacts may occur as a result of increases in recreational activities (e.g., swimming, fishing, boating) and vehicular traffic (four wheelers, dirt bikes, trucks) on or near beach areas. Potential adverse impacts may also include increased susceptibility to predation from feral animals, whose numbers tend to increase during development and construction activities. Suitable habitats for the species are located either within designated areas for conservation or coastal beaches. In Puerto Rico, beach activities are regulated by the Puerto Rico Department of Natural and Environmental Resources and water-related project are regulated by Clean Water Act and may require federal permits from USACE and EPA. Any federal permit or activity that would result in possible adverse effects to threatened and endangered species will require a section 7 consultation between the federal agency and the USFWS.

4.2.4.3 Roseate Tern

Although incidental occurrences of roseate terns are possible during intense storms, adverse impacts to this species stemming from the proposed action are not expected due to its vagrant status at NAPR. Potential impacts would be restricted to lands and waters near NAPR and would not extend into other areas, such as Vieques, where roseate tern colonies are known to occur. In Puerto Rico, beach activities are regulated by the Puerto Rico Department of Natural and Environmental Resources and water-related project are regulated by Clean Water Act and may require federal permits from USACE and EPA. Any federal permit or activity that would result in possible adverse effects to threatened and endangered species will require a section 7 consultation between the federal agency and the USFWS.

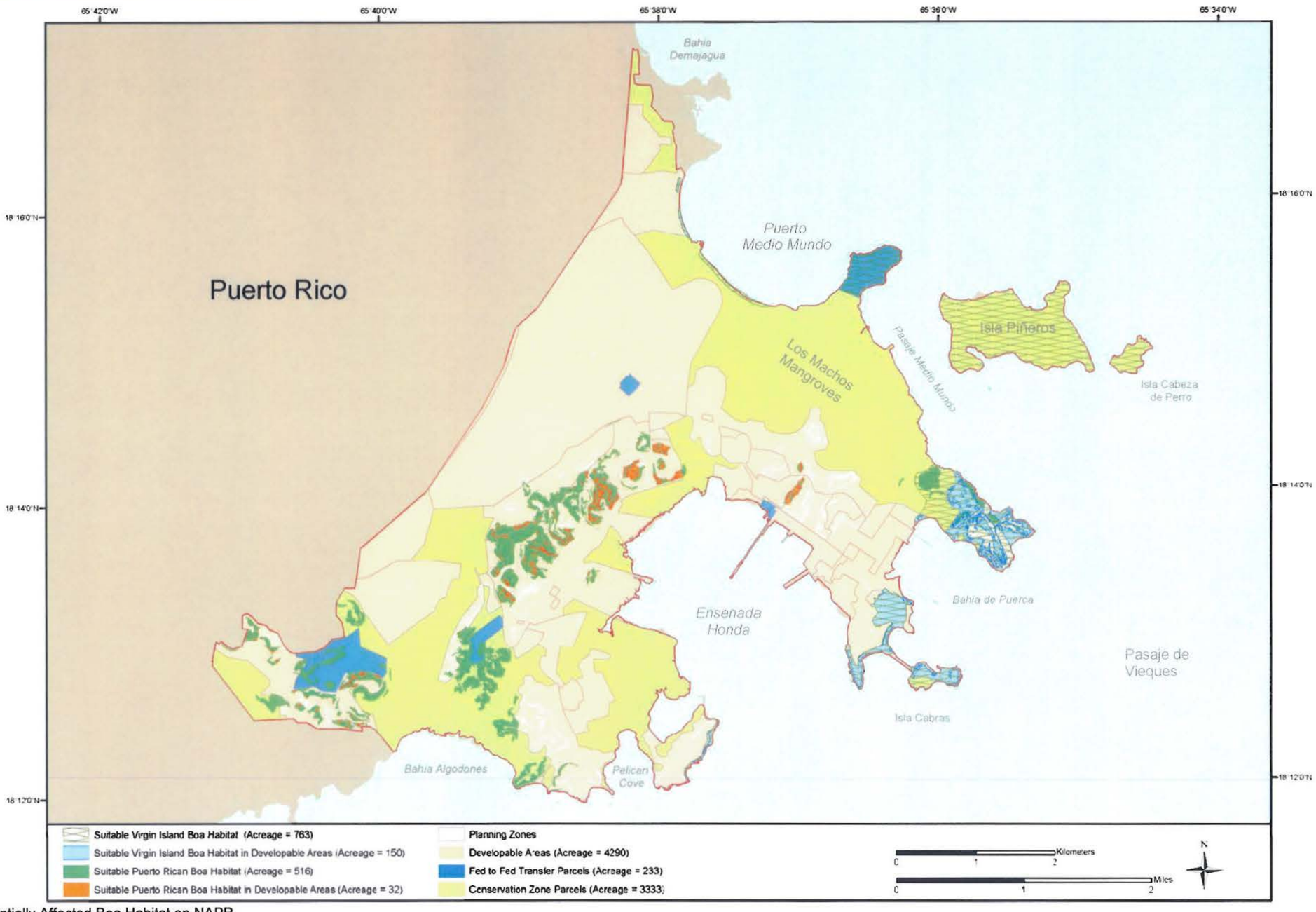

Figure 4-2. Potentially Affected Boa Habitat on NAPR.

4.2.4.4 Yellow-shouldered Blackbird

Potential adverse impacts to yellow-shouldered blackbirds resulting from the transfer of federal land to non-federal ownership could include increased mortality of individual yellow-shouldered blackbirds and loss of their habitat. The loss of yellow-shouldered blackbird eggs and nestlings could also have the potential to occur during construction and demolition activities in areas on NAPR. Other potentially adverse impacts could include increased nest parasitism by shiny cowbirds and increased predation by native, introduced, and feral animals (e.g., mongoose, cats, dogs, rats). Designated yellow-shouldered blackbird critical habitat may be affected in areas proposed for development.

Areas subject to development, federal to federal land transfer parcels, designated conservation parcels, and suitable yellow-shouldered blackbird habitat in sale parcels, non-federal to federal transfers, with slopes of less than 15%, are illustrated in **Figure 4-3**. Acreages for each of the above categories are enumerated in the figure legend.

APR has been divided into 68 parcels of which 18 parcels have been designated for conservation. These parcels support habitat for the species. Furthermore, special zoning will be adopted that limits development on slopes of greater than or equal to 15% (**Figure 4-3**). Additional conservation measures have been developed to protect the species and its habitat within the parcels identified for re-use or for sale. Designated critical habitat will continue to provide protection to the species in parcels transferred to other federal agencies, and in federal nexus projects. Potentially affected yellow-shouldered blackbird habitat is illustrated in **Figure 4-4 & Appendix G—Yellow-Shouldered Blackbird Pre-Development and Post Development Habitat Map**.

4.2.5 Mammals

Coastal development activities such as dredge and fill projects, and marina and boat ramp construction have the potential to harm manatees and their habitat. The construction and/or demolition of piers, boat slips, or other structures may cause noise harassment to manatees present in Ensenada Honda and Bahía de Puerca, but it is also probable that increased noise levels and turbidity during construction/demolition activities would cause manatees to avoid these areas outright (DON 1995). Although foraging habitat does exist in both Ensenada Honda and Bahía de Puerca, there are other, more extensive seagrass beds located in proximity that manatees are also known to utilize (e.g., those found along the southern perimeter of NSRR or off the northwestern coast of Vieques) (Reid 1994).

Increases in recreational boating, jet skiing, and commercial ship/ferry traffic that could potentially result from the proposed port and marina expansions in Zones 6 could also lead to adverse impacts. Manatees are routinely injured and can at times be killed by collisions with recreational watercraft, barges, and commercial ships. From 1990 to 1995, watercraft collisions accounted for the largest number of manatee mortalities in Puerto Rico (Mignucci-Giannoni et al. 2000). Although manatees have good hearing abilities at high frequencies, they have relatively poor hearing sensitivity in the low frequency ranges associated with boat noise (Gerstein 2002). An increase in vessel traffic around NAPR could adversely affect manatees by: (1) increasing injury and/or mortality through boat strike, (2) alienating manatees from areas of suitable habitat due to boat strikes, underwater noise, or unintentional harassment, and (3) limiting manatees' access to nearshore seagrass beds that may be safely accessed only at high tide (Preen 1999). As with sea turtles, incidental takes of manatees resulting from entanglement in fishing gear may also rise during the redevelopment of NAPR. Artisanal and recreational fishing activities in the area will likely expand as the number of available boat slips and the accessibility of the NAPR waterfront increase. In the recovery plan for the Puerto Rico population of the West Indian manatee, Rathbun and Possardt (1986) identified entanglement in turtle and gill nets as the principal source of human-related manatee mortality in Puerto Rico. Although other factors such as boat collisions and hunting may be causing higher numbers of manatee deaths at present, accidental net entanglement is still a major concern, as fishing activities in Puerto Rico take place year round and occur throughout the Commonwealth's coastal zone. The most recent stock assessment has indicated that fisheries interactions significantly affect the status of the manatee in Puerto Rico (USFWS 2000b).

These activities have the potential to occur during the redevelopment of the NAPR waterfront along Ensenada Honda and Bahía de Puerca (Zones 6 and 7). These potential construction activities, however, will be evaluated as separate federal actions under USACE Section 10 and Section 401/404 permitting procedures and subsequent section 7 consultation for any permit authorizations. Impacts from these activities could adversely affect the manatee.

4.3 SUMMARY

The primary impacts to terrestrial species would result from the sale of land parcels and subsequent development and daily activities resulting from development. Cobana negra is protected since it is in a conservation parcel. Piping plover is a rarely occurring species. Yellow-shouldered blackbird habitat is present in more than 50% of all the land parcels on NAPR (**Table 4-1**). Boa and sea turtle nesting habitat occurs in less than 50% of the land parcels. Impacts could occur to these more commonly occurring species. Marine species like the brown pelican and manatee could be impacted.

Table 4-1
Summary of All Listed Species Habitat by Parcel

Parcel Number	Listed Group or Species				
	BOA	ST	YSBB	M	P
1	✓		✓		
2	✓		✓		
3	✓		✓		
4	✓		✓		
5	✓	✓	✓	✓	✓
6	✓	✓	✓	✓	✓
7	✓	✓	✓	✓	✓
8	✓	✓	✓		
9	✓	✓	✓		✓
10	✓	✓	✓		
11	✓	✓	✓	✓	✓
12	✓	✓	✓		
13	✓	✓	✓	✓	✓
14	✓		✓		
15			✓		
16			✓		
17			✓		
18	✓		✓		
19	✓		✓		
20	✓		✓		
21			✓		
22	✓		✓		
23			✓		
24			✓		
25		✓	✓	✓	✓
26		✓	✓	✓	✓
27	✓		✓		
28	✓	✓			✓
29	✓		✓		
30	✓		✓		
31	✓		✓		
32			✓		
33			✓		
34			✓		
35		✓	✓	✓	✓
36			✓		✓
37			✓		
38	✓	✓	✓	✓	✓
39	✓	✓	✓	✓	✓
40	✓		✓		
41			✓		
42		✓	✓	✓	✓
43	✓		✓		
44	✓	✓	✓		✓
45		✓	✓	✓	✓
46		✓	✓	✓	✓
47		✓	✓	✓	✓
48	✓		✓		
49		✓	✓	✓	✓
50			✓		
51			✓		
52			✓	✓	✓
53			✓		
54			✓		
55			✓		
56	✓	✓	✓	✓	✓
57			✓	✓	✓
58	✓	✓	✓	✓	✓
59	✓	✓	✓	✓	✓
60		✓	✓	✓	✓
61	✓	✓	✓	✓	✓
62	✓	✓	✓	✓	
63	✓	✓	✓	✓	✓
64	✓	✓	✓	✓	✓
65	✓	✓	✓	✓	✓
66	✓	✓	✓	✓	✓
67	✓	✓	✓	✓	✓
68	✓	✓	✓	✓	✓

Legend:

✓ = Habitat present.
BOA = Puerto Rican boa and/or Virgin Islands tree boa (coastal habitats)
M = Manatee **P** = Pelican **ST** = Sea turtles (green, hawksbill, leatherback, and loggerhead)
YSBB = Yellow-shouldered blackbird

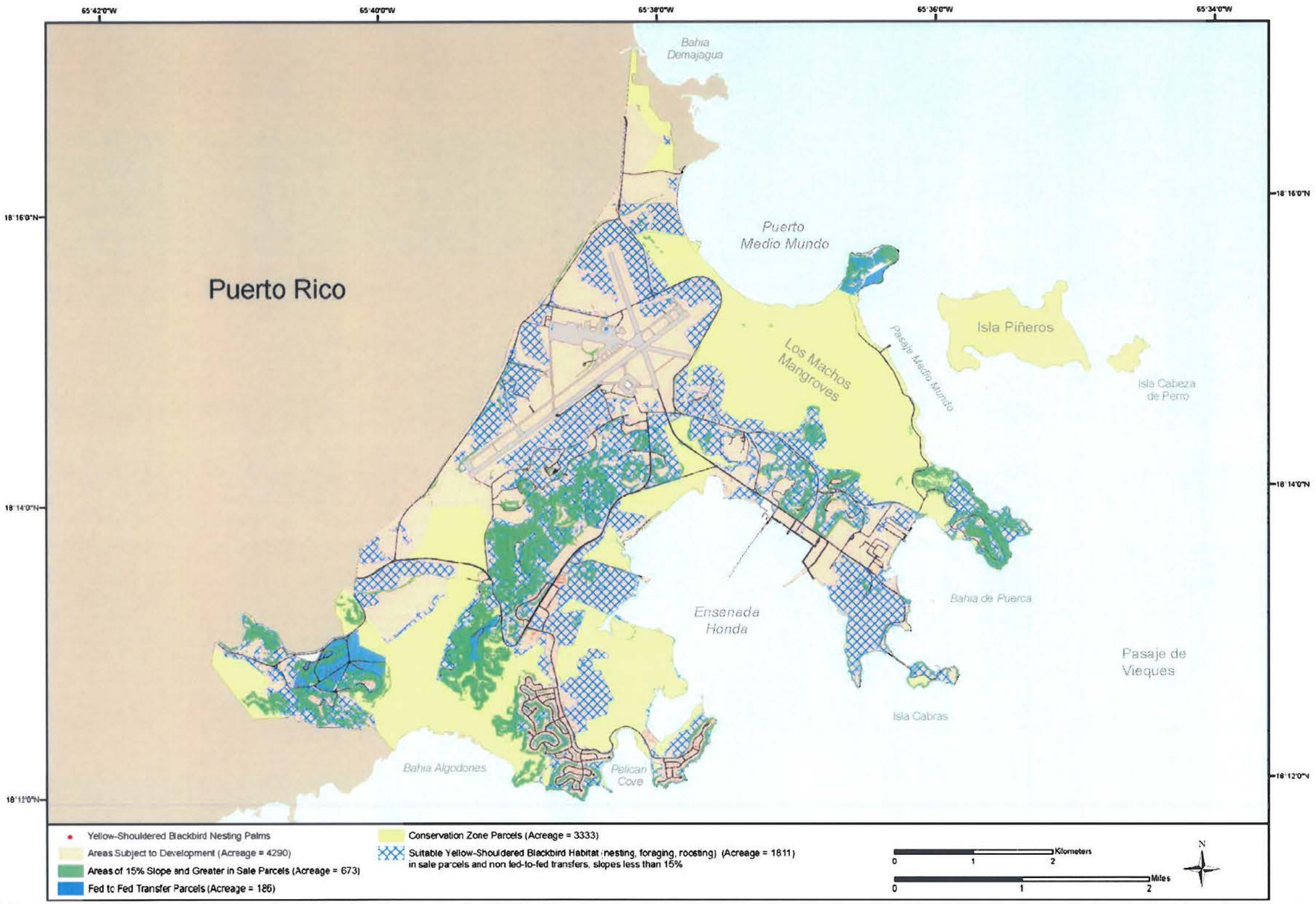

Figure 4-3. Areas Subject to Development, Federal to Federal Land Transfer Parcels, Designated Conservation Parcels, and suitable yellow-shouldered blackbird habitat in sale parcels, Non-Federal to Federal Transfers, with Slopes of Less than 15%.

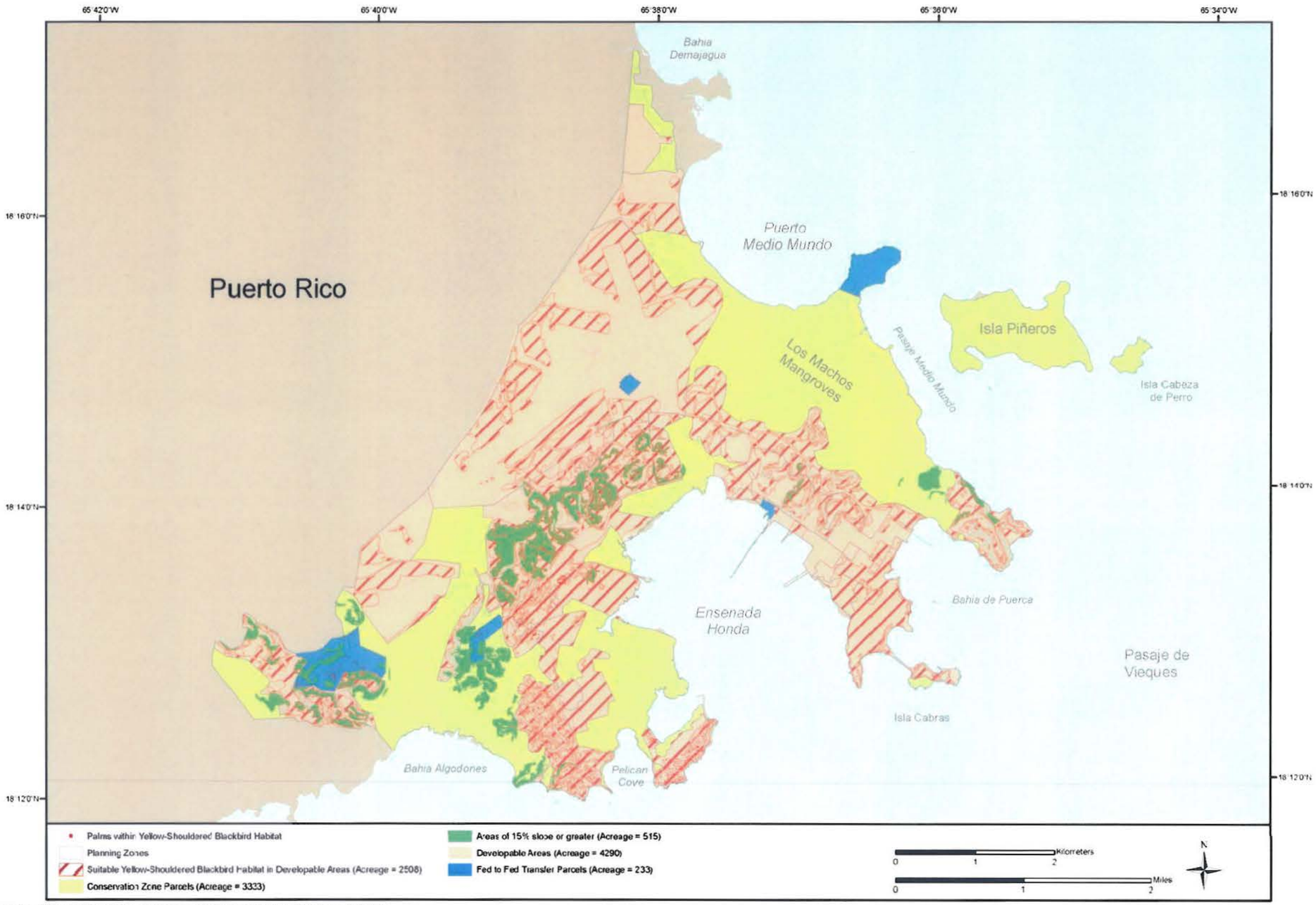

Figure 4-4. Potentially Affected Yellow-shouldered Blackbird Habitat on NAPR.

5.0 CUMULATIVE IMPACTS

Cumulative impacts are those resulting from the incremental effects of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency or person undertakes them. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over time. The types of actions proposed under the Reuse Plan were addressed in the impacts section of this BA (Section 4.0). This section summarizes the level (intensity) of all cumulative impacts likely to occur in the action area.

5.1 PLANTS

Cumulative effects on the Cobana negra resulting from past, present, and future actions at and around NAPR are not expected. There is no evidence that indicates that the Cobana negra was ever an abundant plant species at NSRR. Potential reintroductions of this species at NAPR would only help increase its numbers. The most suitable habitats for Cobana negra individuals that may exist on the property are those that are inherently unsuitable for development. Future actions that would entail clearing of vegetation for tourism or residential development would not likely impact native or reintroduced Cobana negra individuals since those activities will likely be concentrated in areas where the species would not or does not exist.

5.2 SEA TURTLES

The proposed action would not have any adverse impacts on sea turtles if conservation measures are followed. However, it is recognized that beyond the scope of the proposed action and action area, a wide variety of human activities and natural events have the potential to adversely impact sea turtles. Chronic sublethal effects (e.g., stress) resulting in persistent physiological or behavioral changes and/or avoidance of impacted areas could cause declines in survival or productivity, resulting in either acute or gradual population declines (Milton and Lutz 2003). Several of the activities mentioned above are already addressed in Section 4.2.2 and are not repeated here. For those activities/events that are not described in the impacts section of this BA, a discussion of their effects on sea turtles is included below.

Sea turtles frequent coastal areas, such as algae and seagrass beds, to seek food and shelter (Carr and Caldwell 1956). Submerged vegetated areas may be lost or damaged by activities that alter salinity, increase turbidity, or disturb natural tidal and sediment exchange (Gibson and Smith 1999). Natural catastrophes, including storms, floods, droughts, and hurricanes, can also substantially damage sea turtle habitats and nesting beaches (Agardy 1990). In addition, the hurricane season for the Caribbean and western North Atlantic (June to November) overlaps closely with the sea turtle nesting season (March through November) (NRC 1990). Hurricanes cause mortality to turtle nests in two ways: immediate drowning from ocean surges and after hatching as a result of radically altered beach topography. Species that have limited nesting ranges would be highly impacted if a hurricane hits a nesting area (Milton et al. 1994). Indirect effects (contamination of food or poisoning of reef-building communities) on the marine and coastal habitats of sea turtles include pollution of coastal waters from storm-associated runoff.

Sea turtles face harm from a number of human activities throughout their migratory ranges, both in their foraging habitats and on their nesting beaches. Sea turtles are particularly vulnerable because of their wide-ranging movements in coastal waters (NRC 1990). Demographic analyses suggest that a reduction of human-induced mortality in juvenile, subadult, or adult life stages will have a significantly greater effect on population growth than reduction of human-induced mortality of eggs and hatchlings (NRC 1990).

5.3 SNAKES

The proposed action would not have any adverse impacts on boas if conservation measures are followed. In eastern Puerto Rico, boas are found in both virgin forests (e.g., Caribbean National Forest) and areas with varying degrees of human disturbance (e.g., Ceiba and NSRR) (USFWS 1986). Forested areas outside of NAPR are likely to remain relatively pristine, as several of them are located within the National Park System. Boas found in these areas are likely to experience few to no adverse impacts from humans,

although some portions of the Caribbean National Forest are subject to minor levels of disturbance resulting from recreational use, road construction and maintenance, and timber management practices (Reagan 1984). In areas where development is more prevalent (e.g., areas near busy roadways), boas are likely to experience more frequent interactions with humans. However, because these snakes have relatively broad habitat and food requirements, they are moderately tolerant of environmental changes brought on by development (Tolson 2004).

5.4 BIRDS

The proposed action would not have adverse impacts on the brown pelican or YSBB if conservation measures are followed. However, as redevelopment proceeds, the levels of impacts discussed for brown pelicans and yellow-shouldered blackbirds would increase until the redevelopment process has been completed. The number of humans utilizing new/reused facilities and the number involved in recreational activities would increase. Unintentional harassment of brown pelicans at their roost sites and nesting of yellow-shouldered blackbirds in unnatural areas (e.g., buildings) may occur in the action area. Brown pelicans may be forced to find new roost sites as recreational activities increase, although they are somewhat tolerant of human activities away from their nesting colonies and may habituate to certain non-invasive human activities.

Impacts would be restricted primarily to the future development after implementation of the proposed action. However, cumulative impacts would not affect brown pelican nesting success because no nesting areas occur on NAPR. Since brown pelicans and yellow-shouldered blackbirds occur in low to very low numbers in coastal and developed areas on NAPR, cumulative impacts would not likely affect either species or contribute to its extinction.

Cumulative effects on piping plovers and roseate terns are not expected. Piping plovers occur on average of only once every two to five years and roseate terns have not been recorded on or over nearshore waters adjacent to NSRR (Raffaele et al. 1998).

5.5 MAMMALS

Like sea turtles, manatees also face harm from human activities throughout their ranges. Due to their wide-ranging movements in Puerto Rico's coastal waters, manatees are vulnerable to impacts from recreational boating, jet skiing, fishing, and coastal development activities outside the study area. Over 100 manatee deaths have been confirmed in Puerto Rico since the inception of the manatee salvage program in 1974 (USFWS 2000b). Between 1990 and 1995, the highest incidence of manatee mortality occurred in Fajardo/Ceiba area near NSRR (Mignucci-Giannoni et al. 2000). Human interactions, such as illegal hunting, collisions with personal watercraft (power boats and jet skis), incidental net entanglement, and habitat degradation are known to be the major causes of manatee mortality in the near vicinity of the action area (Mignucci-Giannoni et al. 2000). Incidents of mortality attributable to natural causes or ingestion of debris are less frequent. Other activities, including dredging, marina construction, and commercial shipping, also have the potential to cause manatee mortality, although these activities likely cause less significant impacts such as incidental harassment and changes in behavior. Chronic sublethal effects (e.g., stress) resulting in persistent physiological or behavioral changes and/or avoidance of impacted areas could cause declines in survival or productivity, resulting in acute or gradual population declines (Fair and Becker 2000). Potential impacts from human-related activities are described in more detail in Section 4.2.5. Water related projects will be evaluated as separate federal actions under USACE Section 10 and Section 401/404 permitting procedures and subsequent section 7 consultation for any permit authorizations.

5.6 SUMMARY OF TERRESTRIAL AND MARINE ENVIRONMENTS AND THREATENED AND ENDANGERED SPECIES

Implementation of the proposed action, when combined with past, present, and future actions, would not have a significant impact on the terrestrial environment and those threatened and endangered species that occur at NAPR. The potential impacts associated with development through Phase II of the Reuse

Plan are considered as indirect impacts of the proposed disposal action. Potential impacts from development through Phase IV of the Reuse Plan are discussed below.

It is anticipated the Puerto Rico Planning Board (PRPB) will adopt a Special Zoning Plan based on the proposed the Reuse Plan for the development of NAPR. Included in the zoning plan will be specific conservation measures, presented in **Table 6-4**, to be undertaken by future landowners/developers to assure protection of threatened and endangered species and their habitat. As part of the zoning conditions will be a statement, which directs property owners/developers to consult with USFWS if they have questions on, or cannot comply with the conservation measures. It further states that failure to comply could violate section 9.0 of ESA and USFWS has the authority to prosecute violations under ESA. As these conservation recommendations would become part of the Special Zoning Plan for the development of NAPR, they would constitute conditions that all future landowners/developers will be advised of when undergoing the site/development review process required to obtain a building permit. In addition, any changes in operational tempo for USACE permitted facilities (e.g., marina, boat ramps, and cargo pier) would require a new permit from the USACE no matter where in the phase development these changes occur.

During implementation of Phase I of the Reuse Plan, which is the disposal action, the Navy would include notification of the recommended conservation measures in all bid packages as it relates to the respective parcel. The successful bidder's transfer documents would also include a copy of the applicable recommended conservation measures and notification to USFWS the name of the successful bidder. During the subsequent Phases II through IV, developers would be made aware of the conservation measures as part of the zoning/building permit process.

Implementation of the proposed action could have the potential for an adverse cumulative impact on the marine environment, sea grasses, sea turtles, and the West Indian manatee if proper conservation measures are not undertaken.

It is likely that restrictions on use of near-shore waters by private vessels and protective restrictions in the Enseñada Honda marina area have contributed to the conservation of these resources. In addition, use of the waters adjacent to NAPR by the Navy decreased dramatically and ultimately ceased with the closure of training facilities and operations at Vieques and NSRR. However, over time, a greater use of the waters for civilian purposes (e.g., recreation, fishing, education, and research) would occur.

In addition to the conservation measures specific to zoning, there are a number of mitigation measures that Commonwealth and/or Federal resource agencies could/may impose on these non-federal owners/developers prior to them being issues development specific approvals or permits. Implementation of these mitigation requirements would be the responsibility of the new owner/developer and the respective issuing agency would be responsible for assuring mitigation measures are instituted.

Following is a list of potential mitigation measures that could be implemented to minimize any potential impacts to threatened and endangered species or their habitat as a result of future development:

- Prevent nutrient run-off through the use of sedimentation barriers during ground clearing and other construction activities;
- Create a clearly marked and buoyed (mandatory channel) for the approach to the ferry terminal(s) and other marine activities;
- Create specific locations where boats may/may not be anchored;
- Establish maintenance and usage restrictions for mooring areas;
- Enforce vessel speed limits through established 'make no wake' zones and other such restrictions;
- For construction activities within the coastal zone, establishing appropriate set backs and enforcing lighting restrictions as they relate to sea turtles and nesting beaches;
- Assist future property owners in pursuing establishing conservation easement to facilitate their receiving tax deductions and/or property tax exemptions; and

- Local municipalities or Commonwealth agencies establish animal pest management programs to help manage feral cats and dogs as well as the introduced mongoose.

Provided that future owners/developers develop and follow mitigation measures for reuse activities that have the potential for adverse impacts on marine resources, sea grasses, sea turtles, the proposed reuse through Phase IV—if it occurs as proposed—would not be expected to result in significant adverse cumulative impacts.

6.0 MITIGATION

The transfer of NAPR property to federal agencies and disposal to other future property owners would not in and of itself result in impacts to threatened or endangered species or their habitat. Therefore, no Navy instituted mitigation measures are proposed. However, it is important to note that 3,333 ac (1,349 ha) of ecologically sensitive areas of the former NAPR are being transferred to the Puerto Rico DNER for conservation lands management. The conservation areas include 2,467ac (998 ha) of mangroves and 866 ac (351 ha) of adjacent upland forest. Future protection of these areas will benefit all listed species present within the former NAPR. These conservation areas constitute 18 parcels and will be managed by the Puerto Rico DNER and the Puerto Rico Conservation Trust. Additionally, a Special Zoning Plan has been proposed by the LRA to regulate land-use of additional areas of concern. Land covered by slopes greater than 15% has limited development opportunity and is listed as undevelopable in the NAPR Reuse Plan. Special conservation measures have been developed for federally-listed species and will be incorporated into the special zoning to ensure their compliance by future land-owners. For those properties being retained as federal property with only caretaker status being transferred to other federal agencies, any future land use changes would be coordinated with USFWS as required under section 7 of the ESA. Any future federal permit, fund, or activity that would result in possible adverse effects to threatened and endangered species will require a section 7 consultation with the USFWS. Implementation of conservation measures would be the responsibility of the new owner/developer and the respective reviewing agency would be responsible for assuring mitigation measures are instituted. The Navy would no longer retain any ownership or control of these properties.

Tables 6-1 through **6-3** provide species-specific conservation measures for the perspective parcels. **Table 6-4** provides a consolidated overview of the conservation measures by parcel for the listed species.

- In a letter dated December 2, 2005, the Department of Economic Development and Commerce (DEDC) indicated that the Department, through the LRA is working on a Special Zoning Plan for Porto del Futuro (the NAPR property), which the LRA will present to the to the PRPB for approval (this will also require approval of the Strategic Environmental Impact Statement by the Puerto Rico EQB). It is anticipated that the PRPB would adopt the Special Zoning Plan. Upon its adoption, this plan would serve as the local zoning for the property. Any future development projects proposed on former NAPR property would be reviewed by the PRPB to ensure that such development is consistent with the Special Zoning Plan. This Special Zoning Plan the Authority will incorporate the conservation measures that are currently under discussion between the Navy and the FWS (**Appendix A**). All owners of property within the former Roosevelt Roads will be on notice as to those conservation measures and the possible violations of the Endangered Species Act if the measures are not followed.

Table 6-1
Sea Turtle Conservation Measures by Parcel #:

GENERAL REQUIREMENTS

- Consult with U.S. Fish and Wildlife Service (USFWS) and Puerto Rico Department of Environmental Resources (DNER) on all beach use plans and permit requirements
- Notify DNER if you observe an injured or dead turtle anywhere on the property (787-724-5700–Centro de Mando–24 hours).
- Pesticide and herbicide applications must follow Commonwealth of Puerto Rico regulations.
- **Obtain all Commonwealth of Puerto Rico required permits (development, use, etc.) and implement permit requirements**
- Implement all USFWS and Puerto Rico DNER lighting standards/requirements
- No commercial or residential development is allowed in Zone 9 (Conservation)

During planning and development phases; vegetation removal, land clearing activities, new construction; demolition or remodeling of existing structures; ground maintenance; building maintenance; and general operations the following conservation measures should be implemented to minimize possible effects to the sea turtle species and their habitats.

Sea Turtles Conservation Measures by Parcel:

1. Avoid the removal of vegetation, fence installation, construction activities, and light installation within 50 meters from the high tide.
2. Designate a buffer zone of additional 20 meters from the 50-meter setback to minimize indirect impacts from the project and plant sea grapes and native trees within the zone.
3. Prepare and implement a comprehensive lighting plan to avoid detrimental impacts of artificial lighting on sea turtles. The goal of the plan should be that lights not be seen directly, indirectly or cumulatively from the beach. Light management strategies such as shielding, lowering of the lights, locating the lights away from sight view of the beach, using an alternate light source such as Low Pressure Sodium Vapor, and planting of vegetation barriers are some of the available alternatives to reach the plan goal. In already constructed projects, all lights visible from the beach should be eliminated or relocated so as not to be visible. Those remaining lights shall be modified in order to avoid or minimize the possibility of disorientation. The plan goal and the light management strategies should be specified, described and located in the lighting plan. The plan should be submitted to the Service for review.
4. Once the plan is fully implemented, a lighting inspection should be conducted to identify and correct any remaining problematic lights.
5. Enhance coastal vegetation with planting of native species (e.g., sea grapes) within the maritime zone. Protect coastal vegetation and nesting habitat from vehicular traffic in the area.
6. Proposed local zoning requirements will require new landowners to develop a lighting plan compliant with lighting plan specifications of the USFWS and DNER. Beachfront development without comprehensive sea turtle conservation measures may result in habitat degradation and destruction, resulting in adverse impacts to sea turtles and their nesting habitat. Some of the activities that may affect these species and their habitat are: destruction of native coastal vegetation, installation of permanent barriers or structures at their habitat, installation of artificial lights that can be seen from the beach, vehicular traffic or parking within the beach, increased predation by pest species (rats, mongooses, dogs, horses, and ants), and root intrusion from landscapes or exotic vegetation. Artificial lighting may deter females from coming onto the beach to nest and may cause disorientation or misorientation of both adult female nesting turtles and emerging hatchlings, often resulting in their death.

Note: The above conservation measures are applicable to parcels as noted in **Figure 4-1**.

Parcels: 5, 6, 7, 8, 9, 10, 11, 12, 13, 25, 26, 28, 35, 38, 39, 42, 44, 45, 46, 47, 49, 56, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, and 68.

Notice: If you are willing to comply with the general requirements and conservation measures listed above during the development and subsequent use of this parcel, you may proceed with the project. If you have any questions on the conservation measures, please consult with USFWS, Caribbean Field Office in Boquerón, Puerto Rico. Property owners that cannot adhere to the conservation measures must consult with USFWS to seek an Incidental Take Permit (ITP) under section 10(a)(1)(B). Be aware that the preparation of a Habitat Conservation Plan is required to apply for an ITP. Failure to comply with the identified general requirements and conservation measures may result in the violation of section 9 of the ESA. The USFWS has the authority to prosecute violations under ESA.

Table 6-2
Boas Conservation Measures by Parcel #:

During development and planning; new construction or clearing; demolition or remodeling; grounds maintenance; building maintenance; and general operations the following conservation measures are necessary to minimize possible adverse effects to Puerto Rico boa and VI tree boa or their habitats:

- No commercial or residential development is allowed in Zone 9 (Conservation)

- When planning new developments in areas that contain possible Puerto Rican boa and VI tree boa habitat protect as many existing forested habitat as possible.
- If suitable Puerto Rico boa or VI tree boa habitats are present and proposed for clearing, consult with USFWS and PRDNER. Note: A minimum of one year maybe required to complete consultation. As part of the consultation process, USFWS may require a survey conducted by experienced and qualified personnel prior to clearing to determine the presence/absence of boas.
- If Puerto Rico boas are present, USFWS and PRDNER should be contacted. These agencies may require the implementation of the Search and Protection Protocol established by the PRDNER for the protection of boas in Puerto Rico. An Endangered Species permit from DNER may be required.
- Notify USFWS and DNER if a Puerto Rico boa or VI tree boa is found during maintenance activities, inside a building/structure or on the grounds.

Note: The above conservation measures are applicable to parcels as noted in **Figure 4-2**.

Parcels: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 18, 19, 20, 22, 27, 28, 29, 30, 31, 38, 39, 40, 43, 44, 48, 56, 58, 59, 61, 62, 63, 64, 65, 66, 67, 68

Notice: If you are willing to comply with the general requirements and conservation measures listed above during the development and subsequent use of this parcel, you may proceed with the project. If you have any questions on the conservation measures, please consult with USFWS, Caribbean Field Office in Boquerón, Puerto Rico. Property owners that cannot adhere to the conservation measures must consult with USFWS to seek an Incidental Take Permit (ITP) under section 10(a)(1)(B) of the ESA. Be aware that the preparation of a Habitat Conservation Plan is required to apply for an ITP. Failure to comply with the identified general requirements and conservation measures may result in the violation of section 9 of the ESA. The USFWS has the authority to prosecute violations under ESA.

Table 6-3
Yellow-shouldered Blackbird Conservation Measures by Parcel #:

GENERAL REQUIREMENTS

- No commercial or residential development is allowed in Zone 9 (Conservation)
- All development related activities (new construction, ground clearing, demolition/remodeling) in zones adjacent to Zone 9 should occur between September 1 and March 15 (non-breeding season) or be restricted to an area 50 m from the Zone 9 boundary from March 15-August 30 (breeding season).
- Notify USFWS and DNER if a yellow-shouldered blackbird nest is found anywhere on the property
- Pesticide and herbicide applications should conform with Commonwealth of Puerto Rico regulations.

Yellow-Shouldered Blackbird Conservation Measures by Parcel:

During development and planning; new construction or clearing; demolition or remodeling; grounds maintenance; building maintenance; and general operations the following conservation measures are necessary to avoid impact to Yellow-shouldered Blackbirds or their habitat:

1. Protect as many existing on site palms and trees as possible in new development plans.
2. If forested suitable habitat is proposed for clearing or alteration, consultation with USFWS should be initiated. Note: A minimum of one year may be required to complete consultation.
3. Schedule activity from September 1 through March 14 or conduct outdoor survey of building(s) (ledges, etc.) and nearby trees (within 50 m of the building) for yellow-shouldered blackbird nests prior to start date if the development activity is scheduled to occur between March 15 and August 30. Surveys should be conducted by qualified and experienced personnel. Consult with USFWS if a yellow-shouldered blackbird nest is found.
4. Consult with PRDNER to identify the need for an endangered species permit to conduct such surveys.
5. No trimming or cutting of palms and trees between March 15 and August 30 except in an emergency (i.e., downed trees and palms from storms).
6. Survey for yellow-shouldered blackbird nests prior to any outdoor building maintenance activities between March 15 and August 30. Determine identity of any bird nest found. If a yellow-shouldered blackbird nest is found do not disturb, notify and consult with USFWS.
7. Before moving parked outdoor equipment (e.g., carts, vehicles) check for yellow-shouldered blackbird nests (March 15 to August 30). If a yellow-shouldered blackbird nest is located do not disturb, notify USFWS.

Note: The above conservation measures are applicable to all the parcels as noted in **Figure 4-3**.

Parcels: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68

Notice: If you are willing to comply with the general requirements and conservation measures listed above during the development and subsequent use of this parcel, you may proceed with the project. If you have any questions on the conservation measures, please consult with USFWS, Caribbean Field Office in Boquerón, Puerto Rico. Property owners that cannot adhere to the conservation measures must consult with USFWS to seek an Incidental Take Permit (ITP) under section 10(a)(1)(B) of the ESA. Be aware that the preparation of a Habitat Conservation Plan is required to apply for an ITP. Failure to comply with the identified general requirements and conservation measures may result in the violation of section 9 of the ESA. The USFWS has the authority to prosecute violations under ESA.

Table 6-4
Conservation Measures by Parcel for Listed Species on NAPR

Activity	Conservation Measure	Parcel Number																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Development Planning	Protect as many existing on site palms and trees, or forested habitat as possible in new development plans.	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA		YSBB BOA	YSBB	YSBB BOA		YSBB BOA				YSBB BOA	YSBB	YSBB	YSBB
New Construction/Clearing	If forested suitable boa and/or yellow-shouldered blackbird habitat is proposed for clearing or alteration consult with USFWS a minimum of one year prior to planned project initiation. USFWS may require a survey conducted by qualified and experienced personnel prior to clearing to determine presence/absence of boas. A protocol to search and protect boas may be required by DNER and USFWS.	BOA	YSBB BOA	YSBB BOA	BOA	YSBB BOA	YSBB BOA	YSBB BOA	BOA	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA	BOA		YSBB	
Demolition/Remodeling	Schedule activity from September 1 through March 14 or conduct outdoor survey of building(s) (ledges, etc.) and nearby trees (within 50 m of the building) for yellow-shouldered blackbird nests prior to start date if the development activity is scheduled to occur between March 15 and August 30. Surveys should be conducted by qualified and experienced personnel. Consult with USFWS if a yellow-shouldered blackbird nest is found. Identify the need for an endangered species permit from DNER.		YSBB	YSBB			YSBB		YSBB		YSBB				YSBB BOA	YSBB	YSBB	YSBB
Grounds Maintenance	No trimming or cutting of palms and trees between March 15 and August 30 except in an emergency (i.e., downed trees and palms from storms). Notify USFWS and DNER if a boa is found.	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA	YSBB	YSBB BOA		YSBB	YSBB		YSBB	YSBB BOA	YSBB	YSBB	YSBB
Building Maintenance	Survey for yellow-shouldered blackbird nests prior to any outdoor building maintenance activities between March 15 and August 30. Determine identity of any bird nest found. Notify and consult with USFWS if a yellow-shouldered blackbird nest is found. Notify USFWS and DNER if a boa is found during maintenance activities.	BOA	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA		YSBB BOA		YSBB BOA				YSBB BOA	YSBB	YSBB	YSBB
General Operations	Before moving parked outdoor equipment (e.g., carts, vehicles) check for yellow-shouldered blackbird nests (March 15 to August 30). Notify USFWS and DNER if a yellow-shouldered blackbird nest is located.		YSBB	YSBB			YSBB		YSBB		YSBB				YSBB	YSBB	YSBB	YSBB
Property Sale/Lease	Notify buyer/lessee of all mitigation requirements (see above) and include mitigation with all legal documents.	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA ST	YSBB BOA ST	YSBB BOA ST	YSBB BOA ST	YSBB BOA ST	YSBB BOA ST	YSBB BOA ST	YSBB BOA ST	YSBB BOA ST	YSBB BOA	YSBB	YSBB	YSBB
Beach Development/Use	Implement all USFWS and Puerto Rico DNER lighting standards/requirements (includes parcels bordering the nesting area.					ST	ST	ST	ST	ST	ST	ST	ST	ST				
	Implement USFWS/ Puerto Rico DNER precautionary measures for sea turtles before, during, and after development activities.					ST	ST	ST	ST	ST	ST	ST	ST	ST				
	Establish a 50 m set back plus a 20 m buffer zone between any developed or undeveloped site and the land edge of the sea turtle nesting beach.					ST	ST	ST	ST	ST	ST	ST	ST	ST				
Conservation Zone	No development is lowed in Zone 9																	

Table 6-4 (Continued)
Conservation Measures by Parcel for Listed Species on NAPR

Activity	Conservation Measure	Parcel Number																
		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Development Planning	Protect as many existing on site palms and trees, or forested habitat as possible in new development plans.	YSBB BOA	YSBB BOA	YSBB BOA	YSBB	YSBB BOA	YSBB	YSBB	YSBB BOA		YSBB BOA	BOA	YSBB BOA	YSBB BOA	YSBB BOA		YSBB	YSBB
New Construction/Clearing	If forested suitable boa and/or yellow-shouldered blackbird habitat is proposed for clearing or alteration consult with USFWS a minimum of one year prior to planned project initiation. USFWS may require a survey conducted by qualified and experienced personnel prior to clearing to determine presence/absence of boas. A protocol to search and protect boas may be required by DNER and USFWS.	YSBB	YSBB	YSBB BOA		BOA				YSBB			YSBB		YSBB			
Demolition/Remodeling	Schedule activity from September 1 through March 14 or conduct outdoor survey of building(s) (ledges, etc.) and nearby trees (within 50 m of the building) for yellow-shouldered blackbird nests prior to start date if the development activity is scheduled to occur between March 15 and August 30. Surveys should be conducted by qualified and experienced personnel. Consult with USFWS if a yellow-shouldered blackbird nest is found. Identify the need for an endangered species permit from DNER.	YSBB		YSBB			YSBB	YSBB	YSBB		YSBB		YSBB		YSBB	YSBB	YSBB	
Grounds Maintenance	No trimming or cutting of palms and trees between March 15 and August 30 except in an emergency (i.e., downed trees and palms from storms). Notify USFWS and DNER if a boa is found.	YSBB BOA	BOA	YSBB BOA	YSBB	YSBB BOA	YSBB	YSBB	YSBB BOA		YSBB BOA	BOA	YSBB BOA	YSBB BOA	YSBB BOA		YSBB	YSBB
Building Maintenance	Survey for yellow-shouldered blackbird nests prior to any outdoor building maintenance activities between March 15 and August 30. Determine identity of any bird nest found. Notify and consult with USFWS if a yellow-shouldered blackbird nest is found. Notify USFWS and DNER if a boa is found during maintenance activities.	YSBB BOA	BOA	YSBB BOA		BOA	YSBB	YSBB	YSBB BOA		YSBB BOA	BOA	YSBB BOA	YSBB BOA	YSBB BOA	YSBB	YSBB	
General Operations	Before moving parked outdoor equipment (e.g., carts, vehicles) check for yellow-shouldered blackbird nests (March 15 to August 30). Notify USFWS and DNER if a yellow-shouldered blackbird nest is located.	YSBB		YSBB	YSBB	YSBB	YSBB	YSBB	YSBB		YSBB		YSBB		YSBB	YSBB	YSBB	
Property Sale/Lease	Notify buyer/lessee of all mitigation requirements (see above) and include mitigation with all legal documents.	YSBB BOA	YSBB BOA	YSBB BOA	YSBB	YSBB BOA	YSBB	YSBB	YSBB BOA ST	YSBB ST	YSBB	YSBB ST	YSBB	YSBB	YSBB	YSBB	YSBB	YSBB
Beach Development/Use	Implement all USFWS and Puerto Rico DNER lighting standards/requirements (includes parcels bordering the nesting area.								ST	ST		ST						
	Implement USFWS/ Puerto Rico DNER precautionary measures for sea turtles before, during, and after development activities.								ST	ST		ST						
	Establish a 50 m set back plus a 20 m buffer zone between any developed or undeveloped site and the land edge of the sea turtle nesting beach.								ST	ST		ST						
Conservation Zone	No development is lowed in Zone 9																	

Table 6-4 (Continued)
Conservation Measures by Parcel for Listed Species on NAPR

Activity	Conservation Measure	Parcel Number																
		35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Development Planning	Protect as many existing on site palms and trees, or forested habitat as possible in new development plans.	YSBB	YSBB	YSBB	YSBB BOA	YSBB BOA	YSBB BOA	YSBB	YSBB	YSBB BOA	YSBB BOA	YSBB	YSBB	YSBB	YSBB BOA	YSBB	YSBB	YSBB
New Construction/Clearing	If forested suitable boa and/or yellow-shouldered blackbird habitat is proposed for clearing or alteration consult with USFWS a minimum of one year prior to planned project initiation. USFWS may require a survey conducted by qualified and experienced personnel prior to clearing to determine presence/absence of boas. A protocol to search and protect boas may be required by DNER and USFWS.	YSBB	YSBB	YSBB	YSBB BOA	YSBB	YSBB	YSBB	YSBB	YSBB BOA	YSBB BOA	YSBB	YSBB		YSBB BOA			YSBB
Demolition/Remodeling	Schedule activity from September 1 through March 14 or conduct outdoor survey of building(s) (ledges, etc.) and nearby trees (within 50 m of the building) for yellow-shouldered blackbird nests prior to start date if the development activity is scheduled to occur between March 15 and August 30. Surveys should be conducted by qualified and experienced personnel. Consult with USFWS if a yellow-shouldered blackbird nest is found. Identify the need for an endangered species permit from DNER.	YSBB			YSBB		YSBB	YSBB	YSBB	YSBB				YSBB		YSBB	YSBB	YSBB
Grounds Maintenance	No trimming or cutting of palms and trees between March 15 and August 30 except in an emergency (i.e., downed trees and palms from storms). Notify USFWS and DNER if a boa is found.	YSBB			YSBB BOA	YSBB BOA	YSBB BOA	YSBB	YSBB	YSBB BOA	YSBB BOA	YSBB		YSBB	YSBB BOA	YSBB	YSBB	YSBB
Building Maintenance	Survey for yellow-shouldered blackbird nests prior to any outdoor building maintenance activities between March 15 and August 30. Determine identity of any bird nest found. Notify and consult with USFWS if a yellow-shouldered blackbird nest is found. Notify USFWS and DNER if a boa is found during maintenance activities.	YSBB			YSBB BOA	BOA	YSBB BOA	YSBB	YSBB	YSBB BOA	BOA			YSBB	BOA	YSBB	YSBB	YSBB
General Operations	Before moving parked outdoor equipment (e.g., carts, vehicles) check for yellow-shouldered blackbird nests (March 15 to August 30). Notify USFWS and DNER if a yellow-shouldered blackbird nest is located.				YSBB		YSBB	YSBB	YSBB	YSBB				YSBB	YSBB	YSBB	YSBB	YSBB
Property Sale/Lease	Notify buyer/lessee of all mitigation requirements (see above) and include mitigation with all legal documents.	YSBB ST	YSBB		YSBB BOA ST	YSBB BOA ST	YSBB BOA	YSBB	YSBB ST	YSBB BOA	YSBB BOA	YSBB ST	YSBB BOA ST	YSBB BOA ST	YSBB BOA	YSBB ST	YSBB	YSBB
Beach Development/Use	Implement all USFWS and Puerto Rico DNER lighting standards/requirements (includes parcels bordering the nesting area.	ST			ST	ST			ST			ST	ST	ST		ST		
	Implement USFWS/ Puerto Rico DNER precautionary measures for sea turtles before, during, and after development activities.	ST			ST	ST			ST			ST	ST	ST		ST		
	Establish a 50 m set back plus a 20 m buffer zone between any developed or undeveloped site and the land edge of the sea turtle nesting beach.	ST			ST	ST			ST			ST	ST	ST		ST		
Conservation Zone	No development is lowed in Zone 9																	

Table 6-4 (Continued)
Conservation Measures by Parcel for Listed Species on NAPR

Activity	Conservation Measure	Parcel Number																
		52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
Development Planning	Protect as many existing on site palms and trees, or forested habitat as possible in new development plans.	YSBB	YSBB	YSBB	YSBB	YSBB BOA	YSBB		YSBB BOA			YSBB BOA	YSBB BOA	YSBB BOA				
New Construction/Clearing	If forested suitable boa and/or yellow-shouldered blackbird habitat is proposed for clearing or alteration consult with USFWS a minimum of one year prior to planned project initiation. USFWS may require a survey conducted by qualified and experienced personnel prior to clearing to determine presence/absence of boas. A protocol to search and protect boas may be required by DNER and USFWS.		YSBB	YSBB	YSBB	YSBB BOA	YSBB	YSBB BOA	YSBB BOA	YSBB	YSBB	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA
Demolition/Remodeling	Schedule activity from September 1 through March 14 or conduct outdoor survey of building(s) (ledges, etc.) and nearby trees (within 50 m of the building) for yellow-shouldered blackbird nests prior to start date if the development activity is scheduled to occur between March 15 and August 30. Surveys should be conducted by qualified and experienced personnel. Consult with USFWS if a yellow-shouldered blackbird nest is found. Identify the need for an endangered species permit from DNER.	YSBB	YSBB	YSBB	YSBB		YSBB		YSBB				YSBB	YSBB				
Grounds Maintenance	No trimming or cutting of palms and trees between March 15 and August 30 except in an emergency (i.e., downed trees and palms from storms). Notify USFWS and DNER if a boa is found.	YSBB							YSBB		YSBB			BOA				
Building Maintenance	Survey for yellow-shouldered blackbird nests prior to any outdoor building maintenance activities between March 15 and August 30. Determine identity of any bird nest found. Notify and consult with USFWS if a yellow-shouldered blackbird nest is found. Notify USFWS and DNER if a boa is found during maintenance activities.	YSBB	YSBB	YSBB		YSBB			YSBB BOA		YSBB		YSBB BOA	BOA	YSBB BOA			
General Operations	Before moving parked outdoor equipment (e.g., carts, vehicles) check for yellow-shouldered blackbird nests (March 15 to August 30). Notify USFWS and DNER if a yellow-shouldered blackbird nest is located.	YSBB	YSBB	YSBB	YSBB		YSBB		YSBB				YSBB		YSBB			
Property Sale/Lease	Notify buyer/lessee of all mitigation requirements (see above) and include mitigation with all legal documents.	YSBB	YSBB	YSBB	YSBB	YSBB BOA ST	YSBB ST	YSBB BOA	YSBB BOA ST		YSBB BOA	YSBB BOA	YSBB BOA	YSBB BOA	YSBB ST	YSBB BOA ST	YSBB BOA ST	YSBB BOA ST
Beach Development/Use	Implement all USFWS and Puerto Rico DNER lighting standards/requirements (includes parcels bordering the nesting area.					ST	ST		ST	ST	ST	ST	ST	ST	ST	ST	ST	ST
	Implement USFWS/ Puerto Rico DNER precautionary measures for sea turtles before, during, and after development activities.					ST	ST		ST	ST	ST	ST	ST	ST	ST	ST	ST	ST
	Establish a 50 m set back plus a 20 m buffer zone between any developed or undeveloped site and the land edge of the sea turtle nesting beach.					ST	ST		ST	ST	ST	ST	ST	ST	ST	ST	ST	ST
Conservation Zone	No development is lowed in Zone 9																	

Legend:

BOA = Puerto Rican or Virgin Islands Boa
ST = Sea Turtles (Green, Hawksbill, Leatherback, and Loggerhead)
YSBB = Yellow-shouldered Blackbird

7.0 DETERMINATION OF EFFECTS

Effect determination for listed species on NAPR is discussed in this section. Two sub-actions occur under the proposed action, the disposal of land to other federal agencies and disposal of land to non-federal entities.

7.1 FEDERAL DISPOSAL

Implementation of the proposed action, the disposal of NAPR property to other federal property owners, would not in and/or by itself adversely affect any listed species. Any future federal activity that would result in possible adverse effects to threatened and endangered species will require a section 7 consultation under the ESA.

7.2 NON-FEDERAL DISPOSAL

Initially, the disposal of NAPR property to non-federal entities would not in or by itself adversely affect any listed species. After completion of the proposed action (i.e., land disposal), future land use changes made by non-federal owners could affect listed species. To minimize possible effects of future activities on all federally-listed species, 18 parcels were designated for conservation and will be transferred to the PRDNER and be managed in conjunction with the PR Conservation Trust. Additionally, as the Special Zoning Plan would be based on the NAPR Reuse Plan, its adoption would limit development on slopes of greater than or equal to 15%, as this is listed as undevelopable in the Reuse Plan. Additional conservation measures have been developed to protect the species and its habitat within the parcels identified for re-use or for sale. Designated critical habitat will continue to provide protection to the species in parcels transferred to other federal agencies, and in federal nexus projects. The new landowners will be required to comply with T/E species protection laws and to implement the conservation measures incorporated into the proposed special zoning requirements for specific parcels within the former NAPR property (**Appendix A**). Any federal-nexus project (funding, licensing, permits, or activities) that would result in possible adverse effects to threatened and endangered species will require a section 7 consultation (see Section 1.2) between the federal agency and the USFWS.

Based on the land uses developed for NAPR by the Land Redevelopment Authority (LRA), potential species-specific effect determinations of the proposed future land use changes are provided below.

7.2.1 Plants

The only listed federally listed plant species known to occur on NAPR is *Cobana negra*. One individual *Cobana negra* was found in Parcel 5. The implementation of the proposed action would have no effect on *Cobana negra* since it is within a parcel that is designated for conservation under the proposed action.

7.2.2 Snakes

7.2.2.1 Puerto Rican Boa

Puerto Rican boas appear to be present in low densities on NAPR (Tolson 2004). Based on the designation of conservation parcels proposed by the Special Zoning Plan, which would limit development in areas on slopes of greater than or equal to 15%, and the conservation measures (Section 6.0) that would be adopted for the species as special zoning restrictions by the Puerto Rico Planning Board, the implementation of the proposed action is not likely to adversely affect the Puerto Rican boa.

7.2.2.2 Virgin Island Boa

Although the Virgin Island boa has not been confirmed on NAPR, the species may occur based on the known presence of nearby populations in Rio Grande, Playa Naguabo, and Humacao (Tolson 2004). Based on the designation of conservation parcels proposed by the Special Zoning Plan, which would limit development in areas on slopes of greater than or equal to 15%, and the conservation measures (Section

6.0) that would be adopted for the species as special zoning restrictions by the Puerto Rico Planning Board, the implementation of the proposed action is not likely to adversely affect the VI tree boa.

7.2.3 Sea Turtles

7.2.3.1 Green Sea Turtle

The green sea turtle is the second most common sea turtle found nesting on NAPR and the most common sea turtle in coastal waters off NAPR. Based on the establishment of 70-meter setback coastal conservation zones and the full implementation of the sea turtle conservation measures (Section 6.0) that would be adopted for the species as special zoning restrictions by the Puerto Rico Planning Board, the implementation of the proposed action is not likely to adversely affect the green sea turtle.

7.2.3.2 Hawksbill Sea Turtle

The hawksbill sea turtle is most common sea turtle found nesting on NAPR and the second most common sea turtle in coastal waters off NAPR. Based on the establishment of 70-meter setback coastal conservation zones and the full implementation of the sea turtle conservation measures (Section 6.0) that would be adopted for the species as special zoning restrictions by the Puerto Rico Planning Board, the implementation of the proposed action is not likely to adversely affect the hawksbill turtle.

7.2.3.3 Leatherback Sea Turtle

Low numbers of leatherback sea turtles were observed during aerial surveys over NAPR coastal waters and NAPR beach nesting surveys. Based on the establishment of 70-meter setback coastal conservation zones and the full implementation of the sea turtle conservation measures (Section 6.0) that would be adopted for the species as special zoning restrictions by the Puerto Rico Planning Board, the implementation of the proposed action is not likely to adversely affect the leatherback sea turtle.

7.2.3.4 Loggerhead Sea Turtle

Low numbers of loggerhead sea turtles were observed during aerial surveys over NAPR coastal waters. Nesting of loggerheads have not been documented in Puerto Rico. The Navy has determined that the proposed action would have no effect on the loggerhead sea turtle.

7.2.4 Birds

7.2.4.1 Brown Pelican

Nesting sites for the brown pelican are not present on NAPR. Small numbers of primarily immature brown pelicans rest onshore on NAPR or use offshore coastal areas adjacent to NAPR. All suitable roosting habitats for the species are located either within designated areas for conservation (mangrove forests and Piñeros Island) or coastal beaches. In Puerto Rico, beach activities are regulated by the Puerto Rico Department of Natural and Environmental Resources and water-related project are regulated by Clean Water Act and may require federal permits from USACE and EPA. Any federal permit or activity that would result in possible adverse effects to threatened and endangered species will require a section 7 consultation between the federal agency and the USFWS. For all these reasons, the Navy has determined that the implementation of the proposed action is not likely to adversely affect the brown pelican.

7.2.4.2 Piping Plover

The piping plover is known to occur rarely on beach habitat at NAPR. The species has not been recorded as wintering on NAPR. Since the species is not known to occur regularly on NAPR and suitable habitat is located within conservation zones, the piping plover is not likely to be adversely affected by the Implementation of the proposed action.

7.2.4.3 Roseate Tern

The occurrence of the roseate tern has not been documented at NAPR. Any occurrence of roseate tern would be unexpected and would probably be related to an unusual weather event (a tropical storm or hurricane). Implementation of the proposed action would have no effect on the roseate tern.

7.2.4.4 Yellow-shouldered Blackbird

The number of yellow-shouldered blackbirds observed yearly varied from 1 to 28 from 1993 to 2004. Based on the designation of 18 parcels for conservation, adoption of the Special Zoning Plan which limits development on slopes of greater than or equal to 15%, and the implementation of the additional conservation measures to protect the species and its habitat within the parcels identified for re-use or for sale, the Navy has determined that the implementation of the proposed action is not likely to adversely affect the yellow-shouldered blackbird. Designated critical habitat will continue to provide protection to the species in parcels transferred to other federal agencies, and in federal nexus projects. Any Federal-nexus project (funding, licensing, permits, or activities) that would result in possible adverse effects to threatened and endangered species will require a section 7 consultation (see Section 1.2) between the federal agency and the USFWS.). The Navy has also determined that the implementation of the proposed action would not result in adverse modification to designated critical habitat.

7.2.5 Mammals

The West Indian manatee occurs in coastal waters adjacent to NAPR. The proposed future use of this area (e.g., marina expansion) has the potential to adversely impact the West Indian manatee. If there a significant operational changes at the marina, or if other marine activities are proposed, potential impacts and manatee conditions will be evaluated by the proponent and will require a Section10/404 permit issued from the USACE and a subsequent section 7 consultation with the USFWS.

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APPENDIX A

Commonwealth of Puerto Rico
DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE

PO Box 362350, San Juan, PR 00936-2350
Phone **787.765.2900**, Fax **787.753.6874**

December 2, 2005

Mr. Edwin Muñiz
U.S.Fish and Wildlife Service
Caribbean Field Office
P.O. Box 491
Boquerón, PR 00622

Dear Mr. Muñiz:

The Department of Economic Development and Commerce (DEDC) is the Local Redevelopment Authority (LRA) for Naval Station Roosevelt Roads. The Portal del Futuro Authority (the Authority), created under Law 508 of September 29, 2004, will soon replace the DEDC as the LRA for Roosevelt Roads. I am the President of the Board of Directors of the Authority.

Since the DEDC began its work on the Reuse Plan for Roosevelt Roads, the protection of the natural resources and threatened and endangered species in this area has always been one of the guiding principles of our work. Accordingly, the DEDC is ready to provide the necessary assurances so that appropriate steps are taken to implement the necessary conservation measures to ensure that there will be no adverse effects to these species and their habitats by virtue of the Navy transferring this property to new public and private owners. The DEDC is working on a Special Zoning Plan for Portal del Futuro, which the Authority will present to the Puerto Rico Planning Board for approval (this will also require approval of a Strategic Environmental Impact Statement by the Puerto Rico Environmental Quality Board). This Special Zoning Plan will incorporate the conservation measures resulting from the ongoing consultation between the Navy and the Service pursuant Section 7 of the Endangered Species Act (Act) . All owners of property within the former Roosevelt Roads will be informed of the conservation measures applicable to their properties and proposed activities, legal consequences of the violation of Section 9 of the Act, and additional permit requirements under Section 10 of the Act, if measures are not followed.

I hope this commitment will facilitate finalizing the Environmental Assessment and Biological Assessment required under the NEPA.

Very truly yours,

Jorge E. Silva Puras
Secretary

APPENDIX B

SURVEY FOR THREATENED AND ENDANGERED PLANTS

ON NAVAL ACTIVITY PUERTO RICO (NAPR), AUGUST 2004

Alberto E. Areces-Mallea, M.Phil., Ph.D.

INTRODUCTION

Early in Puerto Rico's 400-year history of colonization, the forests were cut and up to 90% of the plains and mountains were tilled, largely for sugarcane, coffee, tobacco and, to a lesser extent, for bay trees (*Pimenta racemosa*). Even steep and relatively inaccessible mountain areas not suited for agriculture were selectively deprived of their valuable timber trees. The rapid destruction of the original tropical broadleaf forests was so intense that the island was no longer self-sufficient in wood and timber products as early as 1830 (U.S. Dep. Commerce, *Economic Study of Puerto Rico*, Washington, DC, Gov. Print. Office, 1979).

Even half a century ago Puerto Rico had still an agricultural economy based primarily on sugarcane, coffee, tobacco and cattle. Heavy hillside soil erosion severely hindered tobacco cultivation and contributed to reduction in already economically stressed sugar operations. The sediment laden runoff silted mangrove swamps in coastal areas, and many water supply facilities. When the profit margin decreased, hillside tobacco and sugar land was abandoned (sugarcane cultivation still continued on flat coastal lands for a number of years). Harvested land declined continuously over the years (e.g., from 724,000 acres to 283,000 acres between 1959 and 1978) and most of the former farming areas returned to scrub brush and mixed tree cover having little economic value.

During World War II Puerto Rico became important militarily, with naval bases established there (Roosevelt Roads) and on the nearby island of Culebra. As an botanist specialized on West Indian plant communities, my experience in other Caribbean naval facilities, i.e., Guantánamo naval base (Cuba), and Campamento Santiago (Puerto Rico) indicates that none of these military bases were originally established on "intact," pristine land, but on places with significant amounts of degraded and abandoned land, that were covered with secondary vegetation. However, it is necessary to survey thoroughly the vegetation on a given area before arriving to this or any other conclusions.

In August 2004 I conducted a plant survey on Naval Activity Puerto Rico (NAPR) formerly known as Naval Station Roosevelt Roads, to determine the conservation status of its vegetated areas. Although the emphasis was made on rare plant communities and threatened or endangered plant species, the survey was also meant to spot any potential "intact" habitat within NAPR. For the altered vegetation, a very general evaluation of the "degree of alteration" was also made based on species composition of selected plots. The amount of information obtained may be useful if the next goal is to compare species diversity between habitats, which is determined by changes in species assemblages along environmental gradients such as salt content of soil, altitude, and topography.

Because of its implications, it is perhaps necessary to define what I consider an intact or nearly intact habitat is, as opposed to an altered one. Although it would have been preferable to classify vegetated areas into several categories reflecting different levels of habitat alteration and degradation, constraints imposed by data availability, lack of category definitions, and time and resource limitation necessitated using only two broad classes: *intact*, and *altered*. I propose that intact or remaining habitat represents relatively undisturbed areas that are characterized by communities (1) with most of their original suite of native species, and (2) without alien species of vascular plants. Although no attempt was made to evaluate any of the ecological processes running in these *intact* areas (e.g., biomass production and decomposition, nutrient circulation, population dynamics), I presume that they maintain the most original ecological processes to be found in any island habitat within the Caribbean region.

MATERIALS AND METHODS

Baseline surveys for threatened and endangered plant species were conducted in NAPR between August 4, 2004 and August 18, 2004, based on predictive models for rare plant communities and potential threatened and endangered plant habitat provided by Geo-Marine, Inc. (GMI). The models were developed listed historical data elements review and analysis on NAPR from a GIS theme depicting the least disturbed sites by excluding prior disturbed areas. Polygons with the highest probability for rare, threatened and endangered plant occurrence (based on the predictive model ranking) were selected for the baseline survey. GMI selected the twenty (23) highest probability polygons to conduct surveys that range in size from ten (10) to twenty (20) hectares (ha) each. Of the eight (8) random five (5)-meter (m) radius plots within each polygon pre-selected by GMI , five were thoroughly analyzed. In forest polygon #11 not five (5) but six (6) suitable plots were analyzed.

A total number of eighty-one (81) plots within sixteen (16) forest polygons (**PG**) were analyzed. These are listed as follows:

PG 1	PG 2	PG 3	PG 4	PG 5	PG 6	PG 7	PG 8
Plot 1	Plot 1	Plot 1	Plot 2	Plot 2	Plot 1	Plot 2	Plot 1
Plot 3	Plot 3	Plot 3	Plot 3	Plot 3	Plot 2	Plot 3	Plot 2
Plot 5	Plot 4	Plot 4	Plot 5	Plot 4	Plot 5	Plot 4	Plot 3
Plot 6	Plot 6	Plot 5	Plot 6	Plot 5	Plot 6	Plot 6	Plot 4
Plot 7	Plot 8	Plot 8	Plot 7	Plot 8	Plot 7	Plot 8	Plot 6

PG 9	PG 10	PG 11	PG 12	PG 13	PG 14	PG 15	PG 16
Plot 1	Plot 2	Plot 1	Plot 1	Plot 3	Plot 1	Plot 1	Plot 1
Plot 3	Plot 4	Plot 2	Plot 3	Plot 4	Plot 2	Plot 3	Plot 2
Plot 5	Plot 5	Plot 3	Plot 4	Plot 5	Plot 4	Plot 4	Plot 3
Plot 7	Plot 6	Plot 4	Plot 6	Plot 6	Plot 5	Plot 5	Plot 5
Plot 8	Plot 8	Plot 7	Plot 8	Plot 8	Plot 7	Plot 6	Plot 8
		Plot 8					

In addition, twenty (20) more plots corresponding to seven (7) wetland buffer polygons (W) were also analyzed. These are listed as follows:

W 1	W 2A	W 2B	W 2C	W 2D	W 3	W 4
Plot 1	Plot 2	Plot 6	Plot 1	Plot 4	Plot 1	Plot 1
Plot 2	Plot 3				Plot 5	Plot 3
Plot 3					Plot 6	Plot 5
Plot 6					Plot 7	Plot 6
Plot 7					Plot 8	Plot 7

In each of the one-hundred-one (101) plots analyzed, and usually in their near vicinity as well, every vascular plant species was determined, including herbs, epiphytes, vines and vascular cryptogams (i.e., ferns). The number of individuals of each species was carefully recorded within the plots. An exception was made in certain grass-dominated areas with more than one-hundred (100), usually cespitose individuals of the same species in each plot. In these cases (five plots in total, corresponding to the grasses *Panicum maximum* and *Ichnanthus pallens* in forest polygons 2, 3, 5, 8, and 10) the number of the herbaceous individuals was recorded as indeterminate (*indet*). No tree or shrub seedlings one foot tall or smaller was recorded within the 5-meter radius plots, but individuals with branches or climbing stems trespassing the aerial limits of the plots were recorded, and counted. Also, The phenological status of each plant species was recorded within the plot limits and their near vicinity, i.e., the occurrence of flowers and fruits in any individual (see plot tables in APPENDIX). In addition, random opportunistic vegetation observations were conducted while traveling to and from the plots. Vegetation types of the plots was also recorded. The individual plants pertaining to threatened and/or endangered species were marked with colored flagging tape and pinpointed in the maps provided by GMI.

RESULTS

All GMI designated forest polygons represent secondary communities derived from lowland tropical moist broadleaf (mesophytic) semi-deciduous forests. According to Areces et al. (*A Guide to Caribbean Vegetation Types*, The Nature Conservancy, Washington DC, 1999), they all belong to the *Coccoloba diversifolia* Forest Alliance, probably including 2-3 different associations. Although this forest alliance is one of the most widespread in the Caribbean region, nearly everywhere has been heavily impacted. The narrow wetland buffer polygons that fringe mangrove and marshes represent transitional communities between mangrove forests, mangrove woodlands, and marshes, and the lowland semi-deciduous forests of sub-coastal occurrence.

In the forest polygons, a total number of 269 species of vascular plants was reported, 106 of which (39.4%) correspond to tree (arboreal) species (see APPENDIX). In the polygons, a 28% of the total number of species correspond to herbaceous plants, while 63 species of vines (23.4%) were found. This high number of climbers, abnormal for a lowland semi-deciduous community, is a clear sign of disturbance. In general, there is a

relative lack of species diversity in these forests (another indication of disturbance), with respect to what should be expected in a similar, undisturbed habitat. There are 5 species (2% of total number of species in the forest polygons) that occur in every polygon, while 106 species (39.4%) were reported in just one polygon. For a complete list of vascular plants recorded in the forest and wetland buffer polygons, see APPENDIX).

No plant species designated by Federal and Commonwealth legislation as endangered was found in NAPR, other than *Stahlia monosperma*. However, only one individual of this rare species was found, in the vicinity of Plot 5 of forest Polygon 4, approximately 120 meters in straight line from houses 7-B and 9-B, in a rather humid area (see map in APPENDIX). This single *Stahlia monosperma* individual, marked with colored flagging tape, actually consisted of an old stump that gave a number of sprout trunks after being cut. Judging from the size of the sprouts and the rate of growth of *Stahlia*, I presumed that the original tree was logged more than half a century ago.

In the 20 plots of wetland buffer polygons analyzed, 139 vascular plant species were recorded, 23 of which were only found in the wetland fringe belts and not in the forest polygons. Of the 139 plant records, there are 69 species (50%) that occurred in only one polygon. By contrast, only one opportunistic species (*Leucaena leucocephala*) was seen in all wetland buffer polygons. It is remarkable that 37 species (26.61% of the 139 records) correspond to vines (see APPENDIX).

DISCUSSION

As predicted, the vegetation of NAPR's forested polygons cannot be considered intact. The physiognomy and species composition of typical mesophytic secondary forests in Caribbean coastal/sub-coastal areas is present in all analyzed plots. Canopy and understory disturbance through human activities such as timber extraction, induced fires, and probably grazing and agriculture as well, is evident and has a wide extension in the area, certainly more than 10% of the whole. Thus, by our standards, these communities should be considered "disturbed" forests. The overrepresentation and strong synecological role of climbers, the dominance of opportunistic species, and the absence of many sensitive species that should be present in these communities (they should be much richer in species diversity than they actually are) indicate a degraded habitat.

According to the diameter of sprout-trunks developed on stumps of hardwood species that were logged in the past, and the size of fast-growing trees such as *Bursera simaruba*, *Ficus citrifolia*, *Guapira fragrans* and *G. obtusata*, the main disturbing activities ceased about half a century ago (between 50 and 70 years ago, to be precise). Presumably, this was the time when most of the area that was previously cleared, was left abandoned. Because of the reduced gene pool of the starting (pioneer) communities, these secondary forests and woodlands are deficient in diversity, even after half a century of presumably continuous growth. Unfortunately, they will never again exhibit the same species-composition and appearance as the original forests, even if they are permitted to mature (a rather slow process, perhaps to be measured in centuries). This is a good example to learn –the hard way– that merely setting aside habitat for conservation will often led to

unsatisfactory results at best, and to irreversible simplifications at worst. If these forests were to be preserved, which is very desirable, mangers and planners should include in their plans not just their "conservation" but their restoration. A fairly good restoration project for these plant communities will imply:

1. Removal of all foreign species from habitat, particularly the Guinea grass (*Panicum maximum*) and the Asian lime-berry (Triphasia trifolia). A feasible, cost-effective plan for removal of foreign invasive species should be developed, and implemented.

2. Reduction (in number of individuals) of overrepresented, opportunistic species that are native, such as *Guapira fragrans*, *Leucaena leucocephala*, *Randia aculeata*, *Erythroxylum brevipes* and *Bromelia penguin*, according to carefully designed plan. This will leave room for rare, underrepresented, or missing species.

3. Introduction of missing species in habitat, such as *Guaiacum sanctum*, *Colubrina elliptica*, *Maclura tinctoria*, *Hypelate trifoliata*, *Sideroxylon salicifolium*, *Manilkara bidentata* and *Zanthoxylum flavum* (just to mention some of them).

4. Increase presence of underrepresented species in forested areas, such as Amyris elemifera, Argythamnia fasciculata, Canella winteriana, Savia sessiliflora, Celtis iguanaea, Gymnanthes lucida, Hymenaea courbaril, Krugiodendron ferreum, Chrysophyllum pauciflorum, Pictetia aculeata, Sideroxylon obovatum, and many others.

5. Increase presence of *Stahlia monosperma*, the only plant species found in site that has been designated by Federal and Commonwealth as endangered. Areas for reintroduction of this species should be carefully chosen.

6. Control of native, dominating vines, specially *Tricostigma octandrum*, *Cissus verticillata*, *Serjania polyphylla*, *Acacia retusa* and *Mimosa ceratonia*.

Wetland buffer polygons resulted in much less species diversity than forest polygons. Twenty-three plant species not occurring in forest polygons were reported in these areas. They are often dominated by a small number of species (e.g., *Leucaena leucocephala*, *Trichostigma octandrum*, *Guapira fragrans*), and the remainder of the vascular plant community is most often comprised of a larger number of incidental species represented by only a few individuals. In these buffer zones there are many alien invasive species such as *Syngonium podophyllum*, *Panicum maximum*, *Achyranthes aspera*, *Terminalia catappa*, *Sansevieria hyacinthoides*, *Melicoccus bijugatus*, *Pithecellobium dulce*, *Calophyllum inophyllum*, and *Cryptostegia grandiflora*, sometimes forming dense patches (*Sansevieria hyacinthoides*). No rare, threatened or endangered plant species was found in the buffer polygons. Unfortunately, in most of these sites there is (or has been in the past) deposition of

trash. Measures should be implemented to stop deposition of garbage and eliminate trash in these sensitive areas.

APPENDIX

LIST OF ALL VASCULAR PLANTS RECORDED IN THE 5-METER RADIUS PLOTS SELECTED WITHIN THE 7 WETLAND BUFFER POLYGONS

LIST OF ALL VASCULAR PLANTS RECORDED IN THE 5-METER RADIUS PLOTS SELECTED WITHIN THE 7 WETLAND BUFFER POLYGONS

(INCLUDES OTHER PLANT SPECIES FOUND IN VICINITY OF PLOTS)

Habit: HE = *herbaceous*; LS = *low shrub* (*sufrutex*); SH = *shrub*; TR = *tree*; VI = *vine*; EP = *epiphyte*; SU = *succulent*.

Species in **bold** (23 in total) were not recorded in forest polygons

#	SPECIES	HE	LS	SH	TR	VI	EP	SU
1	*Abrus precatorius* L.					X		
2	*Acacia muricata* (L.) Willd. ex L.				X			
3	*Acacia retusa* (Jacq.) Howard					X		
4	*Acacia tortuosa* (L.) Willd.			X				
5	***Achyranthes aspera* L.**	X						
6	***Acrostichum aureum* L.**	X						
7	*Amphilophium paniculatum* (L.) HBK.					X		
8	*Anoda acerifolia* DC.	X						
9	*Antigonon leptopus* Hook & Arn.					X		
10	*Argythamnia candicans* Sw.		X	X				
11	*Aristolochia trilobata* L.					X		
12	*Avicennia germinans* (L.) L.			X	X			
13	***Bacopa monnieri* (L.) Penn.**	X						
14	*Batis maritima* L.		X					
15	***Bidens pilosa* L.**	X						
16	*Bourreria succulenta* Jacq.			X	X			
17	*Bucida buceras* L				X			
18	*Bursera simaruba* (L.) Sarg.				X			
19	*Calophyllum calaba* L.				X			
20	***Calophyllum inophyllum* L.**				X			
21	*Capparis cynophallophora* L.			X	X			
22	*Capparis flexuosa* (L.) L.			X	X			
23	*Capparis hastata* Jacq.			X	X			
24	*Capraria biflora* L.	X	X					
25	*Caraxeron vermiculare* (L.) Raf.	X						
26	*Casearia decandra* Jacq.			X	X			
27	*Casearia guianensis* (Aubl.) Urban			X	X			
28	*Casearia sylvestris* Sw.			X	X			
29	*Ceiba pentandra* (L.) Gaertn.				X			
30	*Cenchrus incertus* M. A. Curtis	X						
31	*Centrosema pubescens* Benth.					X		
32	*Centrosema virginianum* (L.) Benth.					X		

33	***Chamaesyce hyssopifolia* (L.) Small**	X	X					
34	***Chamaesyce messembrianthemifolia* (Jacq.) Dugand**		X					
35	*Chiococca alba* (L.) Hitchc.			X	X			
36	*Chloris ciliata* Sw.	X						
37	*Cissampelos pareira* L.					X		
38	*Cissus verticillata* (L.) Nicolson & Jarvis					X		X
39	*Citharexylum fruticosum* L.			X	X			
40	*Coccoloba microstachya* Willd.			X	X			
41	*Cocos nucifera* L.				X			
42	*Colubrina arborescens* (Mill.) Sarg.			X	X			
43	*Commelina diffusa* Burm. f.	X						
44	*Conocarpus erecta* L.			X	X			
45	*Cordia collococca* L.				X			
46	*Croton lobatus* L.	X						
47	***Cryptostegia grandiflora* R. Brown**					X		
48	***Cyperus elegans* L.**	X						
49	***Distichlis spicata* (L.) Greene**	X						
50	*Distictis lactiflora* (Vahl) DC.					X		
51	*Echinochloa colona* (L.) Link	X						
52	***Eleocharis interstincta* (Vahl) R. & S.**	X						
53	*Erithalis fruticosa* L.			X	X			
54	*Erythroxylum brevipes* DC.			X	X			
55	*Eugenia biflora* (L.) DC.				X			
56	*Eugenia ligustrina* (Sw.) Willd.			X	X			
57	*Eugenia monticola* (Sw.) DC.			X	X			
58	*Eustachys petraea* (Sw.) Desv.	X						
59	*Fimbristylis cymosa* R. Br. ssp. spathacea (Roth) Koy.	X						
60	***Fimbristylis ferruginea* (L.) Vahl**	X						
61	***Fimbristylis miliacea* (L.) Vahl**	X						
62	*Fimbristylis spadicea* (L.) Vahl	X						
63	*Galactia dubia* DC.					X		
64	*Galactia striata* (Jacq.) Urban					X		
65	*Guapira fragrans* (Dum.-Cours.) Little			X	X			
66	*Guettarda odorata* (Jacq.) Lam.			X	X			
67	*Guettarda scabra* (L.) Vent.			X	X			
68	*Heliotropium curassavicum* L.	X						
69	*Ichnanthus pallens* (Sw.) Munro	X						
70	*Ipomoea alba* L.					X		
71	*Ipomoea indica* (Burman) Merr.					X		
72	*Ipomoea tiliacea* (Willd.) Choisy in DC.					X		
73	*Ipomoea violacea* L.					X		
74	*Iresine angustifolia* Euphrasén			X		X		
75	*Jacquinia armillaris* Jacq.			X	X			
76	***Kyllinga* sp.**	X						
77	*Laguncularia racemosa* (L.) Gaertn.			X	X			

78	*Lantana involucrata* L.			X				
79	*Lasiacis divaricata* (L.) Hitchc.	X						
80	*Leucaena leucocephala* (Lam.) De Wit			X	X			
81	***Lippia nodiflora* (L.) Michx.**	X						
82	*Macfadyena unguis-cati* (L.) A. Gentry					X		
83	***Macroptilium lathyroides* (L.) Urban**	X						
84	*Mariscus planifolius* (L. C. Rich.) Urban	X						
85	*Melicoccus bijugatus* Jacq.				X			
86	*Melochia nodiflora* Sw.		X	X				
87	*Merremia quinquefolia* (L) Hall. f.					X		
88	*Metastelma parviflorum* R. Br. ex J. A. Schultes					X		
89	***Momordica charantia* L.**					X		
90	*Ocotea leucoxylon* (Sw.) Mez				X			
91	*Panicum maximum* Jacq.	X						
92	*Paspalum distichum* L.	X						
93	*Paspalum vaginatum* Sw.	X						
94	*Passiflora suberosa* L.					X		
95	*Paullinia pinnata* L.					X		
96	*Pavonia paludicola* Nicolson in R. Howard			X				
97	*Pictetia aculeata* (Vahl) Urban			X	X			
98	*Pilosocereus royenii* (L.) Byles & Rowley			X	X			X
99	*Pithecellobium dulce* (Roxb.) Benth. in Hook.			X	X			
100	*Pithecellobium unguis-cati* (L.) Mart.			X	X			
101	***Pluchea odorata* (L.) Cass.**			X				
102	*Psychotria brownei* Spreng.			X	X			
103	*Psychotria microdon* (DC.) Urban			X				
104	*Randia aculeata* L.			X	X			
105	*Rauvolfia nitida* Jacq.			X	X			
106	***Rhizophora mangle* L.**				X			
107	*Rhynchosia minima* (L.) DC.					X		
108	*Rhynchosia reticulata* (Sw.) DC.					X		
109	*Rhynchospora fascicularis* (Michx.) Vahl.	X						
110	*Rivina humilis* L.	X	X					
111	*Roystonea borinquena* O. F. Cook				X			
112	*Sabinea florida* (Vahl.) DC.			X	X			
113	*Samyda dodecandra* Jacq.			X	X			
114	*Sansevieria hyacinthoides* (L.) Druce	X						
115	*Scleria lithosperma* (L.) Sw.	X						
116	***Scoparia dulcis* L.**	X	X					
117	*Senna bicapsularis* (L.) Roxb.			X		X		
118	*Serjania polyphylla* (L.) Radlk.					X		
119	*Sesbania sericea* (Willd.) Link			X				
120	*Sesuvium portulacastrum* (L.) L.	X						
121	*Spartina patens* (Ait.) Muhl.	X						
122	*Sporobolus virginicus* (L.) Kunth	X						

123	*Stachytarpheta jamaicensis* (L.) Vahl	X						
124	*Stictocardia tiliifolia* (Desr.) Hallier f.					X		
125	*Stigmaphyllon emarginatum* (Cav.) A. Juss.					X		
126	*Stylosanthes hamata* (L.) Taubert in Verh.		X					
127	***Syngonium podophyllum* Schott**					X		X
128	***Tephrosia senna* HBK.**	X						
129	*Terminalia catappa* L.				X			
130	*Thespesia populnea* (L.) Soland ex Correa				X			
131	*Tournefortia volubilis* L.					X		
132	*Tragia volubilis* L.					X		
133	*Trichilia hirta* L.				X			
134	*Trichostigma octandrum* (L.) H. Walt.					X		
135	*Triphasia trifolia* (Burm. f.) P. Wilson			X				
136	*Turbina corymbosa* (L.) Raf.					X		
137	*Vigna adenantha* (G.F.W. Meyer) Maréchal & al.					X		
138	***Vigna* sp.**					X		
139	*Zanthoxylum monophyllum* (Lam.) P. Wilson			X	X			

LIST OF ALL VASCULAR PLANTS RECORDED IN THE 5-METER RADIUS PLOTS SELECTED WITHIN THE 16 FOREST POLYGONS

LIST OF ALL VASCULAR PLANTS RECORDED IN THE 5-METER RADIUS PLOTS SELECTED WITHIN THE 16 FOREST POLYGONS

(INCLUDES OTHER PLANT SPECIES FOUND IN VICINITY OF PLOTS)

Habit: HE = *herbaceous*; LS = *low shrub* (*sufrutex*); SH = *shrub*; TR = *tree*; VI = *vine*; EP = *epiphyte*; SU = *succulent*.

#	SPECIES	HE	LS	SH	TR	VI	EP	SU
1	*Abrus precatorius* L.					X		
2	*Abutilon umbellatum* (L.) Sweet		X					
3	*Acacia farnesiana* (L.) Willd.			X	X			
4	*Acacia muricata* (L.) Willd. ex L.				X			
5	*Acacia retusa* (Jacq.) Howard					X		
6	*Acacia tortuosa* (L.) Willd.			X				
7	*Adelia ricinella* L.			X	X			
8	*Amphilophium paniculatum* (L.) HBK.					X		
9	*Amyris elemifera* L.			X	X			
10	*Andira inermis* (W. Wr.) DC.				X			
11	*Anoda acerifolia* DC.	X						
12	*Antigonon leptopus* Hook & Arn.					X		
13	*Argythamnia candicans* Sw.		X	X				
14	*Argythamnia fasciculata* (Vahl) Muell. Arg.			X				
15	*Aristolochia trilobata* L.					X		
16	*Avicennia germinans* (L.) L.			X	X			
17	*Batis maritima* L.		X					
18	*Bidens alba* (L.) DC. var. *radiata* (C.H. Schulz) Melc.	X						
19	*Blechum pyramidatum* (Lam.) Urb.	X						
20	*Boerhavia coccinea* Mill.	X						
21	*Bourreria succulenta* Jacq.			X	X			
22	*Bouteloua repens* (HBK.) Scribn. & Merr.	X						
23	*Bromelia pinguin* L.	X						
24	*Bryophyllum pinnatum* (Lam.) Oken	X						
25	*Bucida buceras* L				X			
26	*Bursera simaruba* (L.) Sarg.				X			
27	*Calophyllum calaba* L.				X			
28	*Calopogonium coeruleum* (Benth.) Sauv.					X		
29	*Canella winteriana* (L.) Gaertn.			X	X			
30	*Canavalia rosea* (Sw.) DC.					X		
31	*Capparis cynophallophora* L.			X	X			
32	*Capparis flexuosa* (L.) L.			X	X			
33	*Capparis hastata* Jacq.			X	X			
34	*Capraria biflora* L.	X	X					
35	*Caraxeron vermiculare* (L.) Raf.	X						
36	*Casearia decandra* Jacq.			X	X			

37	*Casearia guianensis* (Aubl.) Urban			X	X			
38	*Casearia sylvestris* Sw.			X	X			
39	*Cassytha filiformis* L.					X		
40	*Cayaponia racemosa* (Mill.) Cogn. in DC.					X		
41	*Cecropia schreberiana* Miq.				X			
42	*Ceiba pentandra* (L.) Gaertn.				X			
43	*Celtis iguanaea* (Jacq.) Sarg.			X	X			
44	*Cenchrus incertus* M. A. Curtis	X						
45	*Centrosema pubescens* Benth.					X		
46	*Centrosema virginianum* (L.) Benth.					X		
47	*Cestrum cf. laurifolium* L'Hér.			X				
48	*Chamaecrista diphylla* (L.) Greene	X	X					
49	*Chamaecrista nictitans* (L.) Moench		X					
50	*Chamaesyce hirta* (L.) Millsp.		X					
51	*Chamissoa altissima* (Jacq.) HBK.			X		X		
52	*Chiococca alba* (L.) Hitchc.			X	X			
53	*Chloris ciliata* Sw.	X						
54	*Chrysophyllum pauciflorum* Lam.				X			
55	*Cissampelos pareira* L.					X		
56	*Cissus verticillata* (L.) Nicolson & Jarvis					X		X
57	*Citharexylum fruticosum* L.			X	X			
58	*Citrus aurantiifolia* (Christm.) Swingle			X	X			
59	*Cleome spinosa* Jacq.	X						
60	*Coccoloba diversifolia* Jacq.			X	X			
61	*Coccoloba microstachya* Willd.			X	X			
62	*Coccoloba uvifera* (L.) L.				X			
63	*Coccoloba venosa* L.				X			
64	*Coccothrinax alta* (O. F. Cook) Becc.			X				
65	*Cocos nucifera* L.				X			
66	*Colubrina arborescens* (Mill.) Sarg.			X	X			
67	*Commelina diffusa* Burm. f.	X						
68	*Comocladia dodonaea* (L.) Urban							
69	*Conocarpus erecta* L.			X	X			
70	*Convolvulus nodiflorus* Desr.					X		
71	*Cordia alliodora* (R. & P.) Oken				X			
72	*Cordia collococca* L.				X			
73	*Cordia laevigata* Lam.			X	X			
74	*Cordia polycephala* (Lam.) I. M. Johnst.			X				
75	*Cordia rickseckeri* Millsp.			X	X			
76	*Crescentia cujete* L.				X			
77	*Crotalaria lotifolia* L.			X				
78	*Crotalaria retusa* L.	X						
79	*Croton betulinus* Vahl		X					
80	*Croton lobatus* L.	X						
81	*Cupania americana* L.				X			

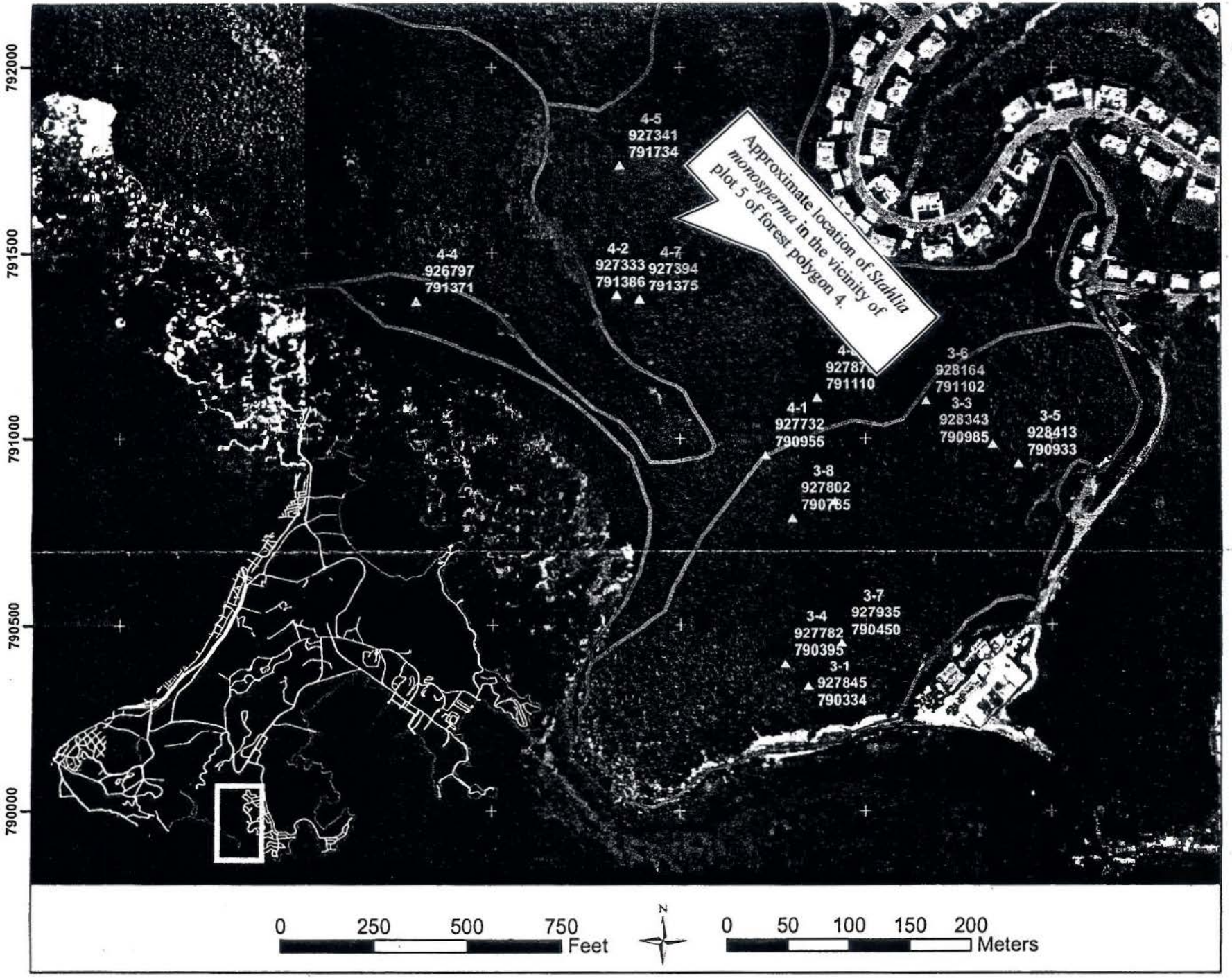
82	*Cydista aequinoctialis* (L.) Miers					X		
83	*Dactyloctenium aegyptium* (L.) Beauv.	X						
84	*Dalechampia scandens* L.					X		
85	*Dalbergia ecastaphyllum* (L.) Taub.			X	X			
86	*Delonix regia* (Bojer in Hook.) Raf.				X			
87	*Dendropanax arboreus* (L.) Decne. & Planch.				X			
88	*Distictis lactiflora* (Vahl) DC.					X		
89	*Echinochloa colona* (L.) Link	X						
90	*Elaeodendrum xylocarpum* (Vent.) DC.				X			
91	*Erithalis fruticosa* L.			X	X			
92	*Erythroxylum areolatum* L.			X	X			
93	*Erythroxylum brevipes* DC.			X	X			
94	*Eugenia biflora* (L.) DC.				X			
95	*Eugenia confusa* DC.			X	X			
96	*Eugenia cordata* (Sw.) DC.			X	X			
97	*Eugenia ligustrina* (Sw.) Willd.			X	X			
98	*Eugenia monticola* (Sw.) DC.			X	X			
99	*Eugenia* sp.			X				
100	*Eupatorium macrophyllum* L.	X		X				
101	*Euphorbia heterophylla* L.	X	X					
102	*Eustachys petraea* (Sw.) Desv.	X						
103	*Ficus citrifolia* P. Miller				X			
104	*Fimbristylis cymosa* R. Br. ssp. spathacea (Roth) Koy.	X						
105	*Fimbristylis spadicea* (L.) Vahl	X						
106	*Furcraea tuberosa* (Miller) Ait. f.							X
107	*Galactia dubia* DC.					X		
108	*Galactia striata* (Jacq.) Urban					X		
109	*Genipa americana* L.				X			
110	*Gonzalagunia hirsuta* (Jacq.) K. Schum.			X	X			
111	*Gossypium hirsutum* L.			X	X			
112	*Gouania polygama* (Jacq.) Urban					X		
113	*Guapira fragrans* (Dum.-Cours.) Little			X	X			
114	*Guapira obtusata* (Jacq.) Little			X	X			
115	*Guettarda elliptica* Sw.			X	X			
116	*Guettarda odorata* (Jacq.) Lam.			X	X			
117	*Guettarda scabra* (L.) Vent.			X	X			
118	*Guettarda* sp. aff. *G. ovalifolia* Urban			X	X			
119	*Gymnanthes lucida* Sw.			X	X			
120	*Helicteres jamaicensis* Jacq.			X	X			
121	*Heliotropium curassavicum* L.	X						
122	*Heteropteris laurifolia* (L.) A. Juss.					X		
123	*Heteropteris purpurea* (L.) Kunth					X		
124	*Hippocratea volubilis* L.					X		
125	*Hylocereus trigonus* (Haw.) Safford					X		X
126	*Hymenaea courbaril* L.				X			

127	*Hymenocallis caribaea* (L. emend Gawl.) Herb.	X						
128	*Ichnanthus pallens* (Sw.) Munro	X						
129	*Ipomoea alba* L.					X		
130	*Ipomoea indica* (Burman) Merr.					X		
131	*Ipomoea tiliacea* (Willd.) Choisy in DC.					X		
132	*Ipomoea triloba* L.					X		
133	*Ipomoea violacea* L.					X		
134	*Iresine angustifolia* Euphrasén			X		X		
135	*Jacquemontia pentanthos* (Jacq.) G. Don					X		
136	*Jacquinia armillaris* Jacq.			X	X			
137	*Jaquinia berteroi* Spreng.			X	X			
138	*Jatropha gossypiifolia* L.	X	X	X				
139	*Kallstroemia maxima* (L.) Hook & Arn.	X						
140	*Krugiodendron ferreum* (Vahl) Urban				X			
141	*Laguncularia racemosa* (L.) Gaertn.			X	X			
142	*Lantana camara* L.			X				
143	*Lantana involucrata* L.			X				
144	*Lasiacis divaricata* (L.) Hitchc.	X						
145	*Leucaena leucocephala* (Lam.) De Wit			X	X			
146	*Macfadyena unguis-cati* (L.) A. Gentry					X		
147	*Malvastrum corchorifolium* (Desr.) Britton in Small			X				
148	*Mangifera indica* L.				X			
149	*Mariscus planifolius* (L. C. Rich.) Urban	X						
150	*Melicoccus bijugatus* Jacq.				X			
151	*Melocactus intortus* (Mill.) Urb.							X
152	*Melochia nodiflora* Sw.		X	X				
153	*Melochia pyramidata* L.	X	X					
154	*Melochia villosa* (Mill.) Fawc. & Rendle	X	X					
155	*Merremia dissecta* (Jacq.) Hall. f.					X		
156	*Merremia quinquefolia* (L) Hall. f.					X		
157	*Metastelma* cf. *lineare* Bello					X		
158	*Metastelma parviflorum* R. Br. ex J. A. Schultes					X		
159	*Miconia laevigata* (L.) DC.			X	X			
160	*Mikania cordifolia* (L. f.) Willd.					X		
161	*Mimosa ceratonia* L.			X		X		
162	*Mimosa pudica* L.	X	X					
163	*Morinda citrifolia* L.			X	X			
164	*Mucuna urens* (L.) Medik.					X		
165	*Musa paradisiaca* L.	X						
166	*Neea buxifolia* (Hook.f.) Heimerl			X				
167	*Neurolaena lobata* (L.) R. Br.	X	X	X				
168	*Ocotea leucoxylon* (Sw.) Mez				X			
169	*Oeceoclades maculata* (Lindley) Lindley	X						
170	*Oplonia spinosa* (Jacq.) Raf.		X	X				
171	*Oxalis barrelieri* L.	X	X					

172	*Panicum maximum* Jacq.	X						
173	*Paspalum conjugatum* Berg.	X						
174	*Paspalum distichum* L.	X						
175	*Paspalum vaginatum* Sw.	X						
176	*Passiflora suberosa* L.					X		
177	*Paullinia pinnata* L.					X		
178	*Pavonia paludicola* Nicolson in R. Howard			X				
179	*Pedilanthus tithimaloides* (L.) Poiteau			X				X
180	*Peltophorum pterocarpum* (DC.) Back. ex K. Heyne				X			
181	*Pharus glaber* HBK.	X						
182	*Phyllanthus niruri* L.	X						
183	*Pictetia aculeata* (Vahl) Urban			X	X			
184	*Pilea inaequalis* (Juss. ex Poir) Wedd.	X						
185	*Pilosocereus royenii* (L.) Byles & Rowley			X	X			X
186	*Pithecellobium dulce* (Roxb.) Benth. in Hook.			X	X			
187	*Pithecellobium unguis-cati* (L.) Mart.			X	X			
188	*Plumeria alba* L.			X	X			
189	*Psidium guajava* L.			X	X			
190	*Psychotria brownei* Spreng.			X	X			
191	*Psychotria microdon* (DC.) Urban			X				
192	*Pueraria phaseoloides* (Roxb.) Benth.					X		
193	*Rajania cordata* L.					X		
194	*Randia aculeata* L.			X	X			
195	*Rauvolfia nitida* Jacq.			X	X			
196	*Rauvolfia viridis* Willd. ex Roem. & Schultes			X	X			
197	*Rhynchosia minima* (L.) DC.					X		
198	*Rhynchosia reticulata* (Sw.) DC.					X		
199	*Rhynchospora fascicularis* (Michx.) Vahl.	X						
200	*Rivina humilis* L.	X	X					
201	*Rondeletia pilosa* Sw.			X	X			
202	*Roystonea borinquena* O. F. Cook				X			
203	*Sabicea villosa* Willd. ex R. & S.					X		
204	*Sabinea florida* (Vahl.) DC.			X	X			
205	*Samyda dodecandra* Jacq.			X	X			
206	*Sansevieria hyacinthoides* (L.) Druce	X						
207	*Savia sessiliflora* (Sw.) Willd.			X	X			
208	*Scaevola plumieri* (L.) Vahl.			X				X
209	*Schaefferia frutescens* Jacq.			X	X			
210	*Schefflera morototoni* (Aubl.) Maguire				X			
211	*Scleria canescens* Boeck.	X						
212	*Scleria lithosperma* (L.) Sw.	X						
213	*Scleria microcarpa* Nees ex Kunth	X						
214	*Scleria pterota* Presl	X						
215	*Securidaca virgata* Sw.					X		
216	*Senna bicapsularis* (L.) Roxb.			X		X		

217	*Senna nitida* (L. C. Rich.) Irwin & Barneby			X		X		
218	*Senna obtusifolia* (L.) Irwin & Barneby	X						
219	*Senna polyphylla* (Jacq.) Irwin & Barneby			X	X			
220	*Senna sophera* (L.) Roxb.			X				
221	*Senna spectabilis* (DC.) Irwin & Barneby				X			
222	*Serjania polyphylla* (L.) Radlk.					X		
223	*Sesbania sericea* (Willd.) Link			X				
224	*Sesuvium portulacastrum* (L.) L.	X						
225	*Sida cordifolia* L.		X					
226	*Sida stipularis* Cav.	X	X					
227	*Sideroxylon obovatum* Lam.				X			
228	*Smilax domingensis* Willd.					X		
229	*Spartina patens* (Ait.) Muhl.	X						
230	*Spathodea campanulata* Beauv.				X			
231	*Spermacoce verticillata* L.		X					
232	*Sporobolus virginicus* (L.) Kunth	X						
233	*Stachytarpheta jamaicensis* (L.) Vahl	X						
234	*Stahlia monosperma* (Tul.) Urban				X			
235	*Stenandrium tuberosum* (L.) Urban	X						
236	*Sterculia apetala* (Jacq.) Karst.				X			
237	*Stictocardia tiliifolia* (Desr.) Hallier f.					X		
238	*Stigmaphyllon bannisterioides* (L.) C. Anderson					X		
239	*Stigmaphyllon emarginatum* (Cav.) A. Juss.					X		
240	*Stizolobium pruriens* (L.) Medic.					X		
241	*Stylosanthes hamata* (L.) Taubert in Verh.		X					
242	*Suriana maritime* L.			X				
243	*Swietenia macrophylla* G. King				X			
244	*Tabebuia aurea* (Manso) Benth. & Hook.				X			
245	*Tabebuia heterophylla* (DC.) Britton				X			
246	*Tamarindus indica* L.				X			
247	*Terminalia catappa* L.				X			
248	*Thespesia populnea* (L.) Soland ex Correa				X			
249	*Tillandsia fasciculata* Sw.						X	
250	*Tillandsia recurvata* (L.) L.						X	
251	*Tournefortia hirsutissima* L.			X		X		
252	*Tournefortia volubilis* L.					X		
253	*Tragia volubilis* L.					X		
254	*Trema micrantha* (L.) Blume.			X	X			
255	*Trianthema portulacastrum* L.	X						X
256	*Trichilia hirta* L.				X			
257	*Trichostigma octandrum* (L.) H. Walt.					X		
258	*Triphasia trifolia* (Burm. f.) P. Wilson			X				
259	*Turbina corymbosa* (L.) Raf.					X		
260	*Urena lobata* L.	X	X	X				
261	*Vigna adenantha* (G.F.W. Meyer) Maréchal & al.					X		

262	*Vigna luteola* (Jacq.) Benth.	X				X		
263	*Wedelia lanceolata* DC.			X				
264	*Wedelia trilobata* (L.) Hitch.	X						
265	*Waltheria indica* L.		X	X				
266	*Xiphidium caeruleum* Aubl.	X						
267	*Zanthoxylum martinicense* (Lam.) DC.				X			
268	*Zanthoxylum monophyllum* (Lam.) P. Wilson			X	X			
269	*Zebrina pendula* Schnizl.	X						



Forest Polygons 3, 4, and 5

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF WETLAND BUFFER POLYGON 1 AND ITS NEAR VICINITY

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF WETLAND BUFFER POLYGON 1 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Avicennia germinans* (L.) L.		X	X	2
No	*Bourreria succulenta* Jacq.	X			NA
Yes	*Capparis flexuosa* (L.) L.	X			6
Yes	*Coccoloba microstachya* Willd.	X			3
Yes	*Colubrina arborescens* (Mill.) Sarg.	X			2
Yes	*Conocarpus erecta* L.		X	X	1
Yes	*Erithalis fruticosa* L.				12
Yes	*Erythroxylum brevipes* DC.	X			3
No	*Eugenia biflora* (L.) DC.	X			NA
Yes	*Eugenia monticola* (Sw.) DC.	X			5
No	*Guettarda odorata* (Jacq.) Lam.	X			NA
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	4
No	*Macfadyena unguis-cati* (L.) A. Gentry	X			NA
Yes	*Pictetia aculeata* (Vahl) Urban	X			2
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			1
Yes	*Randia aculeata* L.	X			3
No	*Tournefortia volubilis* L.		X		NA
Yes	*Tragia volubilis* L.		X		7

TOTAL NUMBER OF SPECIES IN PLOT	13
TOTAL NUMBER OF INDIVIDUALS IN PLOT	51

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 2 OF WETLAND BUFFER POLYGON 1 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Acacia tortuosa* (L.) Willd.	X			**NA**
No	*Avicennia germinans* (L.) L.		X	X	**NA**
No	*Bourreria succulenta* Jacq.	X			**NA**
No	*Bursera simaruba* (L.) Sarg.	X			**NA**
No	*Casearia guianensis* (Aubl.) Urban	X			**NA**
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			5
No	*Citharexylum fruticosum* L.			X	**NA**
No	*Cocos nucifera* L.		X	X	**NA**
No	*Erithalis fruticosa* L.		X	X	**NA**
Yes	*Eugenia biflora* (L.) DC.	X			4
Yes	*Eugenia ligustrina* (Sw.) Willd.	X			3
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			14
Yes	*Ipomoea tiliacea* (Willd.) Choisy in DC.		X	X	3
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	12
Yes	*Passiflora suberosa* L.	X			1
Yes	*Paullinia pinnata* L.	X			10
Yes	*Randia aculeata* L.		X	X	24
Yes	*Syngonium podophyllum* Schott	X			2
Yes	*Turbina corymbosa* (L.) Raf.	X			1
Yes	*Zanthoxylum monophyllum* (Lam.) P. Wilson	X			1

TOTAL NUMBER OF SPECIES IN PLOT	12
TOTAL NUMBER OF INDIVIDUALS IN PLOT	80

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF WETLAND BUFFER POLYGON 1 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Avicennia germinans* (L.) L.		X	X	**NA**
Yes	*Batis maritima* L.			X	3
Yes	*Bursera simaruba* (L.) Sarg.			X	1
Yes	*Capparis flexuosa* (L.) L.		X		11
Yes	*Casearia decandra* Jacq.	X			1
Yes	*Citharexylum fruticosum* L.			X	2
Yes	*Erythroxylum brevipes* DC.	X			2
Yes	*Guapira fragrans* (Dum.-Cours.) Little		X		4
No	*Heliotropium curassavicum* L.		X	X	**NA**
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	39
Yes	*Randia aculeata* L.		X	X	14
Yes	*Rauvolfia nitida* Jacq.	X			6
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			3
No	*Trichostigma octandrum* (L.) H. Walt.		X		**NA**

TOTAL NUMBER OF SPECIES IN PLOT	11
TOTAL NUMBER OF INDIVIDUALS IN PLOT	86

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF WETLAND BUFFER POLYGON 1 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Bursera simaruba* (L.) Sarg.	X			**NA**
Yes	*Capparis flexuosa* (L.) L.	X			1
No	*Capparis hastata* Jacq.	X			**NA**
No	*Centrosema pubescens* Benth.		X		**NA**
No	*Chiococca alba* (L.) Hitchc.			X	**NA**
Yes	*Cordia collococca* L.	X			3
No	*Erythroxylum brevipes* DC.	X			**NA**
No	*Eugenia biflora* (L.) DC.	X			**NA**
No	*Galactia dubia* DC.	X			**NA**
No	*Galactia striata* (Jacq.) Urban	X			**NA**
No	*Guapira fragrans* (Dum.-Cours.) Little	X			**NA**
No	*Ipomoea tiliacea* (Willd.) Choisy in DC.		X	X	**NA**
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	23
No	*Metastelma parviflorum* R. Br. ex J. A. Schultes	X			**NA**
No	*Panicum maximum* Jacq.		X	X	**NA**
No	*Passiflora suberosa* L.	X			**NA**
Yes	*Randia aculeata* L.		X	X	41
No	*Rhynchosia reticulata* (Sw.) DC.			X	**NA**
No	*Stictocardia tiliifolia* (Desr.) Hallier f.	X			**NA**
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			4
No	*Trichostigma octandrum* (L.) H. Walt.		X		**NA**

TOTAL NUMBER OF SPECIES IN PLOT	5
TOTAL NUMBER OF INDIVIDUALS IN PLOT	72

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 7 OF WETLAND BUFFER POLYGON 1 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Cenchrus incertus* M. A. Curtis			X	1
Yes	*Chamaesyce messembrianthemifolia* (Jacq.) Dugand		X	X	1
No	*Chloris ciliata* Sw.		X	X	**NA**
No	*Croton lobatus* L.		X	X	**NA**
No	*Cyperus elegans* L.			X	**NA**
Yes	*Distichlis spicata* (L.) Greene		X	X	12
Yes	*Echinochloa colona* (L.) Link		X	X	5
No	*Eleocharis interstincta* (Vahl) R. & S.		X	X	**NA**
Yes	*Eustachys petraea* (Sw.) Desv.			X	2
Yes	*Fimbristylis ferruginea* (L.) Vahl.	X			2
Yes	*Fimbristylis miliacea* (L.) Vahl			X	7
Yes	*Heliotropium curassavicum* L.		X		4
No	*Lippia nodiflora* (L.) Michx.		X		**NA**
No	*Mariscus planifolius* (L. C. Rich.) Urban			X	**NA**
No	*Paspalum distichum* L.		X	X	**NA**
No	*Paspalum vaginatum* Sw.			X	**NA**
Yes	*Rhynchospora fascicularis* (Michx.) Vahl.		X	X	3
Yes	*Sesuvium portulacastrum* (L.) L.		X	X	9
No	*Spartina patens* (Ait.) Muhl.		X	X	**NA**
Yes	*Sporobolus virginicus* (L.) Kunth		X	X	Indet.
Yes	*Stachytarpheta jamaicensis* (L.) Vahl		X	X	3
No	*Stylosanthes hamata* (L.) Taubert in Verh.		X		**NA**

TOTAL NUMBER OF SPECIES IN PLOT	12
TOTAL NUMBER OF INDIVIDUALS IN PLOT	Indet.

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 2 OF WETLAND BUFFER POLYGON 2-A AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Acacia muricata* (L.) Willd. ex L.		X	X	3
No	*Amphilophium paniculatum* (L.) HBK.	X			**NA**
Yes	*Avicennia germinans* (L.) L.	X			3
Yes	*Batis maritima* L.	X			2
Yes	*Bourreria succulenta* Jacq.	X			2
Yes	*Capparis cynophallophora* L.		X		4
Yes	*Capparis flexuosa* (L.) L.	X			7
Yes	*Capparis hastata* Jacq.	X			3
Yes	*Citharexylum fruticosum* L.			X	1
Yes	*Cordia collococca* L.	X			1
Yes	*Distictis lactiflora* (Vahl.) DC.	X			1
Yes	*Erythroxylum brevipes* DC.	X			3
Yes	*Eugenia biflora* (L.) DC.	X			2
Yes	*Eugenia monticola* (Sw.) DC.	X			4
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			7
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	5
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			11
Yes	*Randia aculeata* L.	X			6
Yes	*Sabinea florida* (Vahl.) DC.	X			1
Yes	*Tragia volubilis* L.	X			4
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			5
Yes	*Triphasia trifolia* (Burm. f.) P. Wilson			X	1

TOTAL NUMBER OF SPECIES IN PLOT	21
TOTAL NUMBER OF INDIVIDUALS IN PLOT	76

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF WETLAND BUFFER POLYGON 2-A AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Achyranthes aspera* L.		X	X	**NA**
No	*Acrostichum aureum* L.		spores		**NA**
No	*Anoda acerifolia* DC.	X			**NA**
No	*Avicennia germinans* (L.) L.	X			**NA**
No	*Calophyllum inophyllum* L.	X			**NA**
Yes	*Capparis flexuosa* (L.) L.	X			2
Yes	*Centrosema pubescens* Benth.	X			1
No	*Cryptostegia grandiflora* R.		X		**NA**
Yes	*Erithalis fruticosa* L.		X	X	1
No	*Fimbristylis cymosa* R. Br. ssp. spathacea (Roth) Koy.		X	X	**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			4
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	8
Yes	*Pihechellobium dulce* (Roxb.) Benth. in Hook	X			3
No	*Pluchea odorata* (L.) Cass.	X			**NA**
Yes	*Randia aculeata* L.		X	X	5
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			1
No	*Terminalia catappa* L.			X	**NA**
No	*Thespesia populnea* (L.) Soland ex Correa			X	**NA**
Yes	*Trichostigma octandrum* (L.) H. Walt.		X		26

TOTAL NUMBER OF SPECIES IN PLOT	9
TOTAL NUMBER OF INDIVIDUALS IN PLOT	51

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF WETLAND BUFFER POLYGON 2-B AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Avicennia germinans* (L.) L.		X	X	4
Yes	*Batis maritima* L.	X			1
Yes	*Capparis flexuosa* (L.) L.	X			5
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			1
No	*Citharexylum fruticosum* L.	X			**NA**
No	*Conocarpus erecta* L.		X	X	**NA**
No	*Fimbristylis spadicea* (L.) Vahl			X	**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			3
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	2
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			1
No	*Randia aculeata* L.			X	**NA**
Yes	*Thespesia populnea* (L.) Soland ex Correa		X	X	3
No	*Trichilia hirta* L.	X			**NA**
Yes	*Trichostigma octandrum* (L.) H. Walt.		X		6

TOTAL NUMBER OF SPECIES IN PLOT	9
TOTAL NUMBER OF INDIVIDUALS IN PLOT	26

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF WETLAND BUFFER POLYGON 2-C AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Avicennia germinans* (L.) L.		X	X	**NA**
No	*Bursera simaruba* (L.) Sarg.	X			**NA**
No	*Chloris ciliata* Sw.		X	X	**NA**
No	*Conocarpus erecta* L.		X	X	**NA**
Yes	*Laguncularia racemosa* (L.) Gaertn.		X		1
No	*Leucaena leucocephala* (Lam.) De Wit		X	X	**NA**
No	*Panicum maximum* Jacq.		X	X	**NA**
No	*Pithecellobium unguis-cati* (L.) Mart.	X			**NA**
Yes	*Rhizophora mangle* L.			X	9
No	*Terminalia catappa* L.			X	**NA**
No	*Thespesia populnea* (L.) Soland ex Correa		X	X	**NA**

TOTAL NUMBER OF SPECIES IN PLOT	2
TOTAL NUMBER OF INDIVIDUALS IN PLOT	10

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 4 OF WETLAND BUFFER POLYGON 2-D AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Acrostichum aureum* L.		spores		NA
Yes	*Argythamnia candicans* Sw.		X	X	2
Yes	*Bourreria succulenta* Jacq.	X			1
No	*Bucida buceras* L			X	NA
Yes	*Bursera simaruba* (L.) Sarg.			X	3
Yes	*Capparis flexuosa* (L.) L.			X	6
Yes	*Casearia decandra* Jacq.	X			2
Yes	*Casearia guianensis* (Aubl.) Urban	X			2
No	*Casearia sylvestris* Sw.	X			NA
No	*Ceiba pentandra* (L.) Gaertn.	X			NA
No	*Centrosema virginianum* (L.) Benth.	X			NA
Yes	*Citharexylum fruticosum* L.		X	X	3
Yes	*Cordia collococca* L.	X			3
Yes	*Erythroxylum brevipes* DC.	X			8
Yes	*Eugenia biflora* (L.) DC.	X			1
Yes	*Eugenia monticola* (Sw.) DC.	X			5
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			6
Yes	*Guettarda scabra* (L.) Vent.	X			3
Yes	*Lantana involucrata* L.		X	X	2
Yes	*Lasiacis divaricata* (L.) Hitchc.	X			1
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	5
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			1
Yes	*Psychotria brownei* Spreng.			X	2
Yes	*Psychotria microdon* (DC.) Urban	X			1
Yes	*Randia aculeata* L.		X		18
Yes	*Rauvolfia nitida* Jacq.	X			1
No	*Roystonea borinquena* O. F. Cook		X		NA
No	*Samyda dodecandra* Jacq.	X			NA
Yes	*Scleria lithosperma* (L.) Sw.		X	X	3
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			1
No	*Trichilia hirta* L.		X		NA

TOTAL NUMBER OF SPECIES IN PLOT	23
TOTAL NUMBER OF INDIVIDUALS IN PLOT	80

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF WETLAND BUFFER POLYGON 3 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Acacia retusa* (Jacq.) Howard	X			1
No	*Avicennia germinans* (L.) L.		X	X	**NA**
No	*Bourreria succulenta* Jacq.			X	**NA**
No	*Centrosema virginianum* (L.) Benth.		X		**NA**
Yes	*Citharexylum fruticosum* L.	X			3
Yes	*Ipomoea alba* L.			X	2
Yes	*Ipomoea tiliacea* (Willd.) Choisy in DC.		X	X	1
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	5
Yes	*Panicum maximum* Jacq.		X	X	Indet.
No	*Randia aculeata* L.	X			**NA**
Yes	*Rhynchosia minima* (L.) DC.	X			1
Yes	*Stictocardia tiliifolia* (Desr.) Hallier f.	X			4
No	*Trichilia hirta* L.		X		**NA**
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			3

TOTAL NUMBER OF SPECIES IN PLOT	9
TOTAL NUMBER OF INDIVIDUALS IN PLOT	Indet.

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 5 OF WETLAND BUFFER POLYGON 3 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Avicennia germinans* (L.) L.		X	X	**NA**
Yes	*Capparis flexuosa* (L.) L.	X			10
No	*Centrosema virginianum* (L.) Benth.	X			**NA**
Yes	*Chloris ciliata* Sw.			X	4
No	*Citharexylum fruticosum* L.	X			**NA**
Yes	*Eugenia biflora* (L.) DC.	X			2
No	*Fimbristylis cymosa* R. Br. ssp. spathacea (Roth) Koy.		X	X	**NA**
Yes	*Fimbristylis ferruginea* (L.) Vahl.		X	X	7
Yes	*Guapira fragrans* (Dum.-Cours.) Little		X		27
Yes	*Ipomoea tiliacea* (Willd.) Choisy in DC.		X		2
Yes	*Ipomoea violacea* L.		X		1
No	*Laguncularia racemosa* (L.) Gaertn.		X		**NA**
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	6
Yes	*Mariscus planifolius* (L. C. Rich.) Urban			X	5
Yes	*Melochia nodiflora* Sw.	X			8
No	*Merremia quinquefolia* (L) Hall. f.	X			**NA**
Yes	*Panicum maximum* Jacq.		X	X	15
No	*Paspalum vaginatum* Sw.		X	X	**NA**
No	*Pithecellobium unguis-cati* (L.) Mart.	X			**NA**
Yes	*Randia aculeata* L.	X			9
Yes	*Rhynchosia reticulata* (Sw.) DC.	X			1
Yes	*Senna bicapsularis* (L.) Roxb.	X			3
Yes	*Stictocardia tiliifolia* (Desr.) Hallier f.	X			3
No	*Trichilia hirta* L.	X			**NA**
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			7

TOTAL NUMBER OF SPECIES IN PLOT	16
TOTAL NUMBER OF INDIVIDUALS IN PLOT	110

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF WETLAND BUFFER POLYGON 3 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Capparis flexuosa* (L.) L.	X			3
Yes	*Centrosema virginianum* (L.) Benth.	X			1
Yes	*Cissampelos pareira* L.	X			1
No	*Citharexylum fruticosum* L.		X	X	**NA**
Yes	*Erythroxylum brevipes* DC.	X			2
Yes	*Galactia striata* (Jacq.) Urban	X			2
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			3
Yes	*Ipomoea alba* L.		X		2
No	*Ipomoea indica* (Burman) Merr.	X			**NA**
Yes	*Ipomoea tiliacea* (Willd.) Choisy in DC.		X	X	3
No	*Laguncularia racemosa* (L.) Gaertn.		X	X	**NA**
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	42
Yes	*Merremia quinquefolia* (L) Hall. f.	X			1
Yes	*Panicum maximum* Jacq.		X	X	17
Yes	*Randia aculeata* L.		X	X	5
No	*Rhynchosia reticulata* (Sw.) DC.			X	**NA**
Yes	*Sesbania sericea* (Willd.) Link	X			1
Yes	*Stictocardia tiliifolia* (Desr.) Hallier f.	X			2
No	*Trichilia hirta* L.		X		**NA**
Yes	*Trichostigma octandrum* (L.) H. Walt.		X		9
No	*Turbina corymbosa* (L.) Raf.	X			**NA**
No	*Vigna adenantha* (G. F. W. Meyer) Maréchal & al.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	15
TOTAL NUMBER OF INDIVIDUALS IN PLOT	94

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 7 OF WETLAND BUFFER POLYGON 3 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.			X	11
No	*Avicennia germinans* (L.) L.		X	X	**NA**
No	*Bursera simaruba* (L.) Sarg.	X			**NA**
Yes	*Capparis flexuosa* (L.) L.	X			8
Yes	*Casearia decandra* Jacq.	X			2
No	*Cissampelos pareira* L.		X		**NA**
No	*Cissus verticillata* (L.) Nicolson & Jarvis	X			**NA**
Yes	*Citharexylum fruticosum* L.	X			3
Yes	*Commelina diffusa* Burm. f.		X	X	12
Yes	*Eugenia biflora* (L.) DC.	X			9
Yes	*Eugenia monticola* (Sw.) DC.	X			4
Yes	*Guapira fragrans* (Dum.-Cours.) Little		X		29
No	*Ichnanthus pallens* (Sw.) Munro		X	X	**NA**
No	*Ipomoea indica* (Burman) Merr.	X			**NA**
No	*Iresine angustifolia* Euphrasén		X		**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	19
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	5
No	*Melochia nodiflora* Sw.	X			**NA**
Yes	*Ocotea leucoxylon* (Sw.) Mez	X			2
Yes	*Panicum maximum* Jacq.		X	X	17
Yes	*Passiflora suberosa* L.	X			3
Yes	*Psychotria microdon* (DC.) Urban	X			6
Yes	*Randia aculeata* L.			X	7
No	*Sansevieria hyacinthoides* (L.) Druce		X		**NA**
Yes	*Serjania polyphylla* (L.) Radlk.	X			4
No	*Stictocardia tiliifolia* (Desr.) Hallier f.	X			**NA**
Yes	*Trichilia hirta* L.	X			2
Yes	*Trichostigma octandrum* (L.) H. Walt.			X	4

TOTAL NUMBER OF SPECIES IN PLOT	18
TOTAL NUMBER OF INDIVIDUALS IN PLOT	147

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 8 OF WETLAND BUFFER POLYGON 3 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Avicennia germinans* (L.) L.		X	X	**NA**
No	*Centrosema virginianum* (L.) Benth.	X			**NA**
Yes	*Citharexylum fruticosum* L.	X			2
Yes	*Ipomoea alba* L.		X		1
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	8
Yes	*Merremia quinquefolia* (L) Hall. f.			X	3
No	*Momordica charantia* L.			X	**NA**
Yes	*Panicum maximum* Jacq.		X	X	Indet.
No	*Pluchea odorata* (L.) Cass.		X		**NA**
No	*Stictocardia tiliifolia* (Desr.) Hallier f.	X			**NA**
Yes	*Trichilia hirta* L.		X		6
Yes	*Turbina corymbosa* (L.) Raf.	X			1

TOTAL NUMBER OF SPECIES IN PLOT	7
TOTAL NUMBER OF INDIVIDUALS IN PLOT	Indet.

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF WETLAND BUFFER POLYGON 4 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Avicennia germinans* (L.) L.			X	12
Yes	*Capparis flexuosa* (L.) L.	X			2
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			5
Yes	*Crypostegia grandiflora* R. Brown	X			4
No	*Cyperus elegans* L.		X	X	NA
Yes	*Fimbristylis cymosa* R. Br. ssp. spathacea (Roth) Koy.		X	X	2
No	*Fimbristylis ferruginea* (L.) Vahl.			X	NA
No	*Fimbristylis spadicea* (L.) Vahl		X	X	NA
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			2
Yes	*Jacquinia armillaris* Jacq.			X	1
No	*Laguncularia racemosa* (L.) Gaertn.	X			NA
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	7
No	*Melicoccus bijugatus* Jacq.	X			NA
No	*Pithecellobium dulce* (Roxb.) Benth. in Hook.			X	NA
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			1
No	*Sansevieria hyacinthoides* (L.) Druce		X		NA
No	*Sesuvium portulacastrum* (L.) L.		X	X	NA
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			1
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			10
Yes	*Triphasia trifolia* (Burm. f.) P. Wilson	X			1

TOTAL NUMBER OF SPECIES IN PLOT	12
TOTAL NUMBER OF INDIVIDUALS IN PLOT	48

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF WETLAND BUFFER POLYGON 4 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Avicennia germinans* (L.) L.		X	X	7
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			9
Yes	*Conocarpus erecta* L.		X	X	3
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			1
Yes	*Laguncularia racemosa* (L.) Gaertn.			X	1
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	8
No	*Pavonia paludicola* Nicolson in R. Howard	X			**NA**
No	*Terminalia catappa* L.			X	**NA**
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			17

TOTAL NUMBER OF SPECIES IN PLOT	7
TOTAL NUMBER OF INDIVIDUALS IN PLOT	46

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 5 OF WETLAND BUFFER POLYGON 4 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Argythamnia candicans* Sw.		X	X	3
Yes	*Bursera simaruba* (L.) Sarg.	X			3
No	*Calophyllum calaba* L.	X			**NA**
Yes	*Capparis flexuosa* (L.) L.	X			11
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			7
No	*Cocos nucifera* L.		X	X	**NA**
Yes	*Colubrina arborescens* (Mill.) Sarg.	X			1
Yes	*Erithalis fruticosa* L.		X	X	23
Yes	*Jacquinia armillaris* Jacq.			X	14
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			2
Yes	*Rivina humilis* L.		X	X	4
No	*Terminalia catappa* L.			X	**NA**
Yes	*Thespesia populnea* (L.) Soland ex Correa		X	X	2
Yes	*Tournefortia volubilis* L.	X			1
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			3
Yes	*Triphasia trifolia* (Burm. f.) P. Wilson		X	X	5

TOTAL NUMBER OF SPECIES IN PLOT	13
TOTAL NUMBER OF INDIVIDUALS IN PLOT	79

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF WETLAND BUFFER POLYGON 4 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Aristolochia trilobata* L.	X			**NA**
No	*Avicennia germinans* (L.) L.	X			**NA**
No	*Batis maritima* L.		X	X	**NA**
Yes	*Capparis flexuosa* (L.) L.	X			4
No	*Caraxeron vermiculare* (L.) Raf.	X			**NA**
No	*Chloris ciliata* Sw.			X	**NA**
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			1
Yes	*Colubrina arborescens* (Mill.) Sarg.	X			2
No	*Conocarpus erecta* L.			X	**NA**
No	*Erithalis fruticosa* L.			X	**NA**
Yes	*Erythroxylum brevipes* DC.	X			2
No	*Fimbristylis ferruginea* (L.) Vahl.		X	X	**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			6
No	*Kyllinga* sp.			X	**NA**
No	*Laguncularia racemosa* (L.) Gaertn.			X	**NA**
No	*Lantana involucrata* L.	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.	X			7
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	2
Yes	*Panicum maximum* Jacq.	X			2
No	*Paspalum vaginatum* Sw.		X	X	**NA**
Yes	*Pilosocereus royenii* (L.) Byles & Rowley	X			2
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			1
Yes	*Randia aculeata* L.		X	X	9
No	*Rhizophora mangle* L.	X			**NA**
No	*Sesuvium portulacastrum* (L.) L.		X	X	**NA**
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			**NA**
No	*Thespesia populnea* (L.) Soland ex Correa		X	X	**NA**
Yes	*Tragia volubilis* L.	X			10
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			3
Yes	*Triphasia trifolia* (Burm. f.) P. Wilson	X			13
Yes	*Vigna* sp.	X			1

TOTAL NUMBER OF SPECIES IN PLOT	16

TOTAL NUMBER OF INDIVIDUALS IN PLOT	65

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 7 OF WETLAND BUFFER POLYGON 4 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Antigonon leptopus* Hook & Arn.	X			NA
Yes	*Avicennia germinans* (L.) L.	X			1
No	*Bacopa monnieri* (L.) Penn.	X			NA
No	*Bidens pilosa* L.		X		NA
Yes	*Bursera simaruba* (L.) Sarg.			X	1
Yes	*Capparis flexuosa* (L.) L.	X			2
No	*Capraria biflora* L.		X	X	NA
Yes	*Cenchrus incertus* M. A. Curtis			X	1
No	*Chamaesyce hyssopifolia* (L.) Small		X	X	NA
No	*Chamaesyce messembrianthemifolia* (Jacq.) Dugand		X	X	NA
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			1
No	*Cocos nucifera* L.		X	X	NA
Yes	*Erithalis fruticosa* L.	X			2
Yes	*Erythroxylum brevipes* DC.	X			2
No	*Eustachys petraea* (Sw.) Desv.			X	NA
Yes	*Fimbristylis cymosa* R. Br. ssp. spathacea (Roth) Koy.			X	5
Yes	*Ipomoea violacea* L.		X		2
Yes	*Laguncularia racemosa* (L.) Gaertn.	X			3
No	*Lantana involucrata* L.	X			NA
Yes	*Leucaena leucocephala* (Lam.) De Wit		X		3
No	*Macroptilium lathyroides* (L.) Urban		X	X	NA
Yes	*Paspalum distichum* L.			X	3
No	*Paspalum vaginatum* Sw.			X	NA
Yes	*Passiflora suberosa* L.	X			4
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			3
Yes	*Randia aculeata* L.	X			6
No	*Rhynchospora fascicularis* (Michx.) Vahl.			X	NA
Yes	*Rhizophora mangle* L.	X			1
No	*Scoparia dulcis* L.	X			NA
No	*Spartina patens* (Ait.) Muhl.			X	NA
Yes	*Sporobolus virginicus* (L.) Kunth	X			97
Yes	*Stachytarpheta jamaicensis* (L.) Vahl		X		6
No	*Stylosanthes hamata* (L.) Taubert in Verh.		X	X	NA

No	*Tephrosia senna* HBK.	X			**NA**
Yes	*Terminalia catappa* L.	X			5
Yes	*Thespesia populnea* (L.) Soland ex Correa	X			4
Yes	*Triphasia trifolia* (Burm. f.) P. Wilson	X			3

TOTAL NUMBER OF SPECIES IN PLOT	21
TOTAL NUMBER OF INDIVIDUALS IN PLOT	155

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF FOREST POLYGON 1 AND ITS NEAR VICINITY

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF FOREST POLYGON 1 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Argythamnia candicans* Sw.		X	X	**NA**
No	*Capparis cynophallophora* L.			X	**NA**
Yes	*Capparis flexuosa* (L.) L.	X			5
No	*Colubrina arborescens* (Mill.) Sarg.	X			**NA**
Yes	*Erithalis fruticosa* L.		X		8
No	*Guapira fragrans* (Dum.-Cours.) Little	X			**NA**
Yes	*Jacquinia armillaris* Jacq.			X	2
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	11
Yes	*Metastelma parviflorum* R. Br. ex J. A. Schultes	X			1
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			1
Yes	*Rivina humilis* L.		X		3
Yes	*Tabebuia heterophylla* (DC.) Britton	X			1
No	*Terminalia catappa* L.			X	**NA**
Yes	*Trichostigma octandrum* (L.) H. Walt.		X		4
Yes	*Triphasia trifolia* (Burm. f.) P. Wilson		X	X	32

TOTAL NUMBER OF SPECIES IN PLOT	10
TOTAL NUMBER OF INDIVIDUALS IN PLOT	68

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF FOREST POLYGON 1 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Capparis flexuosa* (L.) L.	X			5
Yes	*Casearia guianensis* (Aubl.) Urban	X			1
No	*Cocos nucifera* L.		X	X	**NA**
Yes	*Commelina diffusa* Burm. f.	X			2
No	*Erythroxylum brevipes* DC.	X			**NA**
No	*Galactia striata* (Jacq.) Urban	X			**NA**
No	*Guapira fragrans* (Dum.-Cours.) Little	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.	X			2
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	8
Yes	*Melicoccus bijugatus* Jacq.	X			1
Yes	*Oeceoclades maculata* (Lindley) Lindley	X			13
Yes	*Peltophorum pterocarpum* (DC.) Back. ex K. Heyne		X	X	2
No	*Pithecellobium unguis-cati* (L.) Mart.	X			**NA**
Yes	*Sansevieria hyacinthoides* (L.) Druce		X		42
Yes	*Serjania polyphylla* (L.) Radlk.	X			4
No	*Spathodea campanulata* Beauv.	X			**NA**
No	*Swietenia macrophylla* G. King	X			**NA**
No	*Terminalia catappa* L.			X	**NA**
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			17
Yes	*Triphasia trifolia* (Burm. f.) P. Wilson		X	X	21

TOTAL NUMBER OF SPECIES IN PLOT	12
TOTAL NUMBER OF INDIVIDUALS IN PLOT	118

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 5 OF FOREST POLYGON 1 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Bryophyllum pinnatum* (Lam.) Oken	X			**NA**
Yes	*Capparis flexuosa* (L.) L.	X			2
No	*Centrosema pubescens* Benth.	X			**NA**
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			13
No	*Cocos nucifera* L.		X	X	**NA**
Yes	*Cordia collococca* L.	X			5
Yes	*Erythroxylum brevipes* DC.	X			2
No	*Hymenocallis caribaea* (L. emend Gawl.) Herb.	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	6
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	9
Yes	*Melochia nodiflora* Sw.	X			4
Yes	*Oeceoclades maculata* (Lindley) Lindley	X			4
Yes	*Passiflora suberosa* L.	X			1
No	*Pedilanthus tithimaloides* (L.) Poiteau	X			**NA**
No	*Peltophorum pterocarpum* (DC.) Back. ex K. Heyne		X	X	**NA**
No	*Pithecellobium dulce* (Roxb.) Benth. in Hook.	X			**NA**
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			3
Yes	*Rivina humilis* L.		X		7
Yes	*Sansevieria hyacinthoides* (L.) Druce		X		3
No	*Serjania polyphylla* (L.) Radlk.	X			**NA**
No	*Spathodea campanulata* Beauv.	X			**NA**
Yes	*Trichostigma octandrum* (L.) H. Walt.		X		6
Yes	*Triphasia trifolia* (Burm. f.) P. Wilson		X	X	20
No	*Xiphidium caeruleum* Aubl.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	14
TOTAL NUMBER OF INDIVIDUALS IN PLOT	85

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF FOREST POLYGON 1 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Amphilophium paniculatum* (L.) HBK.	X			1
No	*Antigonon leptopus* Hook & Arn.		X		**NA**
Yes	*Blechum pyramidatum* (Lam.) Urb.		X		2
No	*Bursera simaruba* (L.) Sarg.	X			**NA**
Yes	*Capparis hastata* Jacq.	X			5
Yes	*Casearia decandra* Jacq.	X			2
No	*Citharexylum fruticosum* L.		X	X	**NA**
Yes	*Cordia collococca* L.	X			6
Yes	*Distictis lactiflora* (Vahl.) DC.	X			1
No	*Gouania polygama* (Jacq.) Urban	X			**NA**
No	*Ichnanthus pallens* (Sw.) Munro		X	X	**NA**
No	*Ipomoea violacea* L.	X			**NA**
Yes	*Leucaena leucocephala* (Lam.) De Wit			X	8
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			10
Yes	*Serjania polyphylla* (L.) Radlk.	X			14
Yes	*Trichostigma octandrum* (L.) H. Walt.		X		15
Yes	*Triphasia trifolia* (Burm. f.) P. Wilson		X	X	17

TOTAL NUMBER OF SPECIES IN PLOT	11
TOTAL NUMBER OF INDIVIDUALS IN PLOT	81

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 7 OF FOREST POLYGON 1 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abutilon umbellatum* (L.) Sweet	X			2
No	*Avicennia germinans* (L.) L.		X	X	**NA**
No	*Calophyllum calaba* L.	X			**NA**
No	*Capparis flexuosa* (L.) L.	X			**NA**
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			8
No	*Coccoloba uvifera* (L.) L.	X			**NA**
No	*Jacquinia armillaris* Jacq.			X	**NA**
No	*Laguncularia racemosa* (L.) Gaertn.			X	**NA**
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	19
No	*Musa paradisiaca* L.	X			**NA**
No	*Panicum maximum* Jacq.		X	X	**NA**
Yes	*Terminalia catappa* L.			X	1
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			13
No	*Triphasia trifolia* (Burm. f.) P. Wilson		X	X	**NA**

TOTAL NUMBER OF SPECIES IN PLOT	5
TOTAL NUMBER OF INDIVIDUALS IN PLOT	43

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF FOREST POLYGON 2 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Boerhavia coccinea* Mill.		X	X	**NA**
No	*Citrus aurantiifolia* (Christm.) Swingle				**NA**
No	*Coccoloba uvifera* (L.) L.	X			**NA**
No	*Cocos nucifera* L.		X	X	**NA**
No	*Colubrina arborescens* (Mill.) Sarg.	X			**NA**
No	*Comocladia dodonaea* (L.) Urban	X			**NA**
Yes	*Ficus citrifolia* P. Miller		X	X	1
No	*Guapira fragrans* (Dum.-Cours.) Little	X			**NA**
Yes	*Guapira obtusata* (Jacq.) Little	X			2
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	6
Yes	*Panicum maximum* Jacq.		X	X	Indet.
Yes	*Pilosocereus royenii* (L.) Byles & Rowley			X	4
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			1
Yes	*Plumeria alba* L.	X			1
No	*Sansevieria hyacinthoides* (L.) Druce			X	**NA**
Yes	*Serjania polyphylla* (L.) Radlk.	X			3
No	*Terminalia catappa* L.			X	**NA**
No	*Thespesia populnea* (L.) Soland ex Correa		X	X	**NA**
Yes	*Vigna luteola* (Jacq.) Benth.			X	1

TOTAL NUMBER OF SPECIES IN PLOT	Indet.
TOTAL NUMBER OF INDIVIDUALS IN PLOT	9

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF FOREST POLYGON 2 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Boerhavia coccinea* Mill.		X	X	11
No	*Bourreria succulenta* Jacq.			X	**NA**
Yes	*Capparis flexuosa* (L.) L.		X		6
No	*Cocos nucifera* L.			X	**NA**
No	*Echinochloa colona* (L.) Link			X	**NA**
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	17
Yes	*Panicum maximum* Jacq.		X	X	13
Yes	*Trianthema portulacastrum* L.	X			2
Yes	*Trichostigma octandrum* (L.) H. Walt.		X		15

TOTAL NUMBER OF SPECIES IN PLOT	6
TOTAL NUMBER OF INDIVIDUALS IN PLOT	64

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 4 OF FOREST POLYGON 2 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Abrus precatorius* L.			X	**NA**
Yes	*Bourreria succulenta* Jacq.		X	X	3
No	*Capparis cynophallophora* L.	X			**NA**
Yes	*Capparis flexuosa* (L.) L.	X			4
Yes	*Capparis hastata* Jacq.	X			2
Yes	*Cordia alliodora* (R. & P.) Oken			X	1
Yes	*Cordia collococca* L.	X			2
Yes	*Erythroxylum brevipes* DC.	X			17
Yes	*Eugenia monticola* (Sw.) DC.	X			5
Yes	*Galactia dubia* DC.	X			4
Yes	*Guapira fragrans* (Dum.-Cours.) Little		X		9
Yes	*Lasiacis divaricata* (L.) Hitchc.	X			6
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	2
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			6
Yes	*Melicoccus bijugatus* Jacq.	X			1
Yes	*Passiflora suberosa* L.	X			1
Yes	*Randia aculeata* L.			X	3
Yes	*Rauvolfia nitida* Jacq.	X			1
No	*Schaefferia frutescens* Jacq.	X			**NA**
No	*Tabebuia heterophylla* (DC.) Britton	X			**NA**
Yes	*Trichilia hirta* L.	X			3

TOTAL NUMBER OF SPECIES IN PLOT	17
TOTAL NUMBER OF INDIVIDUALS IN PLOT	70

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF FOREST POLYGON 2 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Bourreria succulenta* Jacq.			X	5
Yes	*Bursera simaruba* (L.) Sarg.	X			2
Yes	*Capparis flexuosa* (L.) L.	X			14
No	*Centrosema virginianum* (L.) Benth.	X			**NA**
No	*Cocos nucifera* L.			X	**NA**
Yes	*Commelina diffusa* Burm. f.		X		24
No	*Convolvulus nodiflorus* Desr.		X		**NA**
Yes	*Erythroxylum brevipes* DC.	X			2
Yes	*Galactia dubia* DC.		X		3
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			1
No	*Ipomoea violacea* L.	X			**NA**
No	*Kallstroemia maxima* (L.) Hook & Arn.		X	X	**NA**
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	12
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			4
No	*Merremia quinquefolia* (L) Hall. f.	X			**NA**
No	*Oxalis barrelieri* L.		X		**NA**
Yes	*Panicum maximum* Jacq.		X	X	5
Yes	*Randia aculeata* L.	X			1
No	*Rauvolfia viridis* Willd. ex Roem. & Schultes	X			**NA**
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			3

TOTAL NUMBER OF SPECIES IN PLOT	12
TOTAL NUMBER OF INDIVIDUALS IN PLOT	76

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 8 OF FOREST POLYGON 2 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Casearia guianensis* (Aubl.) Urban	X			1
Yes	*Centrosema virginianum* (L.) Benth.			X	1
Yes	*Cocos nucifera* L.		X	X	2
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	14
Yes	*Melochia nodiflora* Sw.	X			1
No	*Mikania cordifolia* (L. f.) Willd.	X			**NA**
Yes	*Panicum maximum* Jacq.		X	X	23
No	*Peltophorum pterocarpum* (DC.) Back. ex K. Heyne			X	**NA**
No	*Pithecellobium dulce* (Roxb.) Benth. in Hook.	X			**NA**
No	*Terminalia catappa* L.			X	**NA**
Yes	*Trichostigma octandrum* (L.) H. Walt.		X		7

TOTAL NUMBER OF SPECIES IN PLOT	7
TOTAL NUMBER OF INDIVIDUALS IN PLOT	49

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF FOREST POLYGON 3 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Acacia retusa* (Jacq.) Howard	X			**NA**
Yes	*Argythamnia candicans* Sw.		X	X	11
Yes	*Bourreria succulenta* Jacq.		X	X	7
Yes	*Bursera simaruba* (L.) Sarg.	X			1
Yes	*Capparis cynophallophora* L.	X			2
Yes	*Capparis flexuosa* (L.) L.	X			9
Yes	*Capparis hastata* Jacq.	X			12
Yes	*Erythroxylum brevipes* DC.	X			14
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			25
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	14
Yes	*Leucaena leucocephala* (Lam.) De Wit	X			3
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			5
Yes	*Panicum maximum* Jacq.		X	X	19
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			1
Yes	*Randia aculeata* L.		X	X	12
No	*Schaefferia frutescens* Jacq.	X			**NA**
Yes	*Scleria pterota* Presl			X	3
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			6
No	*Terminalia catappa* L.			X	**NA**
No	*Thespesia populnea* (L.) Soland ex Correa		X	X	**NA**
Yes	*Tragia volubilis* L.		X	X	10
Yes	*Trichilia hirta* L.	X			4
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			2

TOTAL NUMBER OF SPECIES IN PLOT	19
TOTAL NUMBER OF INDIVIDUALS IN PLOT	160

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF FOREST POLYGON 3 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Acacia retusa* (Jacq.) Howard	X			6
Yes	*Argythamnia candicans* Sw.		X	X	12
Yes	*Bursera simaruba* (L.) Sarg.	X			1
Yes	*Capparis flexuosa* (L.) L.	X			2
Yes	*Capparis hastata* Jacq.	X			4
No	*Chiococca alba* (L.) Hitchc.		X	X	**NA**
Yes	*Coccothrinax alta* (O. F. Cook) Becc.	X			1
No	*Crotalaria lotifolia* L.	X			**NA**
No	*Croton betulinus* Vahl		X	X	**NA**
Yes	*Erythroxylum brevipes* DC.	X			19
Yes	*Eugenia monticola* (Sw.) DC.	X			1
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			9
No	*Guapira obtusata* (Jacq.) Little	X			**NA**
Yes	*Ichnanthus pallens* (Sw.) Munro		X	X	Indet.
No	*Leucaena leucocephala* (Lam.) De Wit		X	X	**NA**
No	*Macfadyena unguis-cati* (L.) A. Gentry	X			**NA**
Yes	*Panicum maximum* Jacq.			X	15
Yes	*Passiflora suberosa* L.	X			2
Yes	*Scleria lithosperma* (L.) Sw.		X	X	11
Yes	*Serjania polyphylla* (L.) Radlk.	X			3
Yes	*Trichilia hirta* L.	X			6
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			5
Yes	*Zanthoxylum monophyllum* (Lam.) P. Wilson	X			2

TOTAL NUMBER OF SPECIES IN PLOT	17
TOTAL NUMBER OF INDIVIDUALS IN PLOT	Indet.

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 4 OF FOREST POLYGON 3 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.	X			2
Yes	*Abutilon umbellatum* (L.) Sweet	X			7
Yes	*Acacia retusa* (Jacq.) Howard	X			2
Yes	*Argythamnia candicans* Sw.		X	X	8
No	*Bourreria succulenta* Jacq.	X			**NA**
No	*Capparis cynophallophora* L.	X			**NA**
Yes	*Capparis flexuosa* (L.) L.	X			3
Yes	*Capparis hastata* Jacq.	X			9
Yes	*Coccoloba microstachya* Willd.	X			9
Yes	*Erythroxylum brevipes* DC.	X			2
Yes	*Eugenia biflora* (L.) DC.	X			1
Yes	*Eugenia monticola* (Sw.) DC.	X			6
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			15
Yes	*Heteropteris purpurea* (L.) Kunth	X			1
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	27
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	13
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			4
No	*Panicum maximum* Jacq.	X			**NA**
Yes	*Randia aculeata* L.			X	7
No	*Samyda dodecandra* Jacq.	X			**NA**
Yes	*Scleria lithosperma* (L.) Sw.		X	X	10
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			3
Yes	*Tragia volubilis* L.		X	X	12
No	*Trichilia hirta* L.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	19
TOTAL NUMBER OF INDIVIDUALS IN PLOT	141

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 5 OF FOREST POLYGON 3 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Argythamnia candicans* Sw.		X	X	1
Yes	*Bourreria succulenta* Jacq.	X			4
No	*Bromelia pinguin* L.	X			**NA**
No	*Bursera simaruba* (L.) Sarg.			X	**NA**
Yes	*Capparis flexuosa* (L.) L.	X			4
Yes	*Capparis hastata* Jacq.	X			5
Yes	*Chiococca alba* (L.) Hitchc.		X	X	6
Yes	*Commelina diffusa* Burm. f.		X	X	10
No	*Distictis lactiflora* (Vahl.) DC.	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			16
Yes	*Eugenia biflora* (L.) DC.	X			3
Yes	*Eugenia monticola* (Sw.) DC.	X			7
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			22
Yes	*Guapira obtusata* (Jacq.) Little	X			1
Yes	*Heteropteris purpurea* (L.) Kunth	X			1
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	29
Yes	*Leucaena leucocephala* (Lam.) De Wit	X			2
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			2
No	*Melochia nodiflora* Sw.	X			**NA**
Yes	*Panicum maximum* Jacq.		X	X	12
Yes	*Passiflora suberosa* L.	X			1
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			2
Yes	*Samyda dodecandra* Jacq.	X			6
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			1
No	*Tragia volubilis* L.			X	**NA**

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	135

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 8 OF FOREST POLYGON 3 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Abrus precatorius* L.			X	**NA**
Yes	*Acacia retusa* (Jacq.) Howard	X			1
No	*Argythamnia candicans* Sw.		X	X	**NA**
Yes	*Bourreria succulenta* Jacq.			X	5
Yes	*Capparis flexuosa* (L.) L.	X			8
Yes	*Capparis hastata* Jacq.	X			5
Yes	*Casearia decandra* Jacq.	X			3
No	*Coccothrinax alta* (O. F. Cook) Becc.	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			14
Yes	*Eugenia biflora* (L.) DC.	X			2
Yes	*Eugenia monticola* (Sw.) DC.	X			7
Yes	*Galactia dubia* DC.	X			4
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			13
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	4
Yes	*Leucaena leucocephala* (Lam.) De Wit			X	3
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			6
Yes	*Neea buxifolia* (Hook.f.) Heimerl	X			1
Yes	*Panicum maximum* Jacq.	X			8
Yes	*Passiflora suberosa* L.	X			1
Yes	*Randia aculeata* L.	X			2
Yes	*Rivina humilis* L.		X	X	3
No	*Schefflera morototoni* (Aubl.) Maguire	X			**NA**
Yes	*Serjania polyphylla* (L.) Radlk.	X			4
No	*Stenandrium tuberosum* (L.) Urban	X			**NA**
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			2
Yes	*Tournefortia volubilis* L.	X			2
No	*Trichilia hirta* L.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	21
TOTAL NUMBER OF INDIVIDUALS IN PLOT	98

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 2 OF FOREST POLYGON 4 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Abrus precatorius* L.	X			**NA**
Yes	*Argythamnia candicans* Sw.		X	X	8
Yes	*Bourreria succulenta* Jacq.	X			2
Yes	*Bursera simaruba* (L.) Sarg.	X			3
Yes	*Capparis flexuosa* (L.) L.	X			2
Yes	*Capparis hastata* Jacq.	X			1
No	*Casearia decandra* Jacq.	X			**NA**
Yes	*Casearia guianensis* (Aubl.) Urban	X			1
Yes	*Erythroxylum brevipes* DC.	X			9
Yes	*Eugenia biflora* (L.) DC.	X			4
Yes	*Eugenia monticola* (Sw.) DC.	X			7
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			7
Yes	*Guapira obtusata* (Jacq.) Little	X			2
No	*Krugiodendron ferreum* (Vahl) Urban	X			**NA**
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			5
No	*Passiflora suberosa* L.	X			**NA**
No	*Pithecellobium unguis-cati* (L.) Mart.	X			**NA**
Yes	*Randia aculeata* L.		X	X	10
Yes	*Rondeletia pilosa* Sw.	X			11
No	*Samyda dodecandra* Jacq.	X			**NA**
Yes	*Scleria lithosperma* (L.) Sw.		X	X	4
No	*Serjania polyphylla* (L.) Radlk.	X			**NA**
Yes	*Stenandrium tuberosum* (L.) Urban	X			34
Yes	*Tragia volubilis* L.		X	X	6

TOTAL NUMBER OF SPECIES IN PLOT	17
TOTAL NUMBER OF INDIVIDUALS IN PLOT	116

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF FOREST POLYGON 4 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Abrus precatorius* L.			X	NA
Yes	*Bourreria succulenta* Jacq.		X	X	1
No	*Bucida buceras* L			X	NA
Yes	*Capparis flexuosa* (L.) L.	X			3
Yes	*Casearia guianensis* (Aubl.) Urban	X			5
No	*Cissampelos pareira* L.	X			NA
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis			X	12
No	*Cocos nucifera* L.		X	X	NA
No	*Conocarpus erecta* L.		X	X	NA
Yes	*Cordia laevigata* Lam.	X			2
Yes	*Erythroxylum brevipes* DC.	X			7
Yes	*Eugenia biflora* (L.) DC.	X			2
Yes	*Eugenia monticola* (Sw.) DC.	X			8
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			11
No	*Ipomoea tiliacea* (Willd.) Choisy in DC.	X			NA
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	5
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	3
No	*Merremia quinquefolia* (L) Hall. f.			X	NA
No	*Panicum maximum* Jacq.		X	X	NA
Yes	*Passiflora suberosa* L.	X			4
No	*Pavonia paludicola* Nicolson in R. Howard	X			NA
Yes	*Randia aculeata* L.			X	3
No	*Rhynchosia reticulata* (Sw.) DC.	X			NA
No	*Spathodea campanulata* Beauv.	X			NA
No	*Stictocardia tiliifolia* (Desr.) Hallier f.	X			NA
Yes	*Trichilia hirta* L.	X			1
Yes	*Trichostigma octandrum* (L.) H. Walt.		X		14

TOTAL NUMBER OF SPECIES IN PLOT	15
TOTAL NUMBER OF INDIVIDUALS IN PLOT	81

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 5 OF FOREST POLYGON 4 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Acacia muricata* (L.) Willd. ex L.			X	13
Yes	*Argythamnia candicans* Sw.			X	3
Yes	*Bourreria succulenta* Jacq.	X			1
Yes	*Bromelia pinguin* L.	X			5
Yes	*Capparis flexuosa* (L.) L.	X			8
Yes	*Chiococca alba* (L.) Hitchc.		X	X	9
No	*Chrysophyllum pauciflorum* Lam.	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			12
Yes	*Eugenia biflora* (L.) DC.	X			7
Yes	*Eugenia monticola* (Sw.) DC.	X			5
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			14
No	*Guapira obtusata* (Jacq.) Little	X			**NA**
Yes	*Ichnanthus pallens* (Sw.) Munro		X	X	16
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	10
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			2
Yes	*Neea buxifolia* (Hook.f.) Heimerl	X			6
Yes	*Psychotria microdon* (DC.) Urban	X			10
Yes	*Rauvolfia nitida* Jacq.	X			4
Yes	*Rondeletia pilosa* Sw.	X			3
No	*Stahlia monosperma* (Tul.) Urban	X			**NA**
Yes	*Stenandrium tuberosum* (L.) Urban	X			49

TOTAL NUMBER OF SPECIES IN PLOT	18
TOTAL NUMBER OF INDIVIDUALS IN PLOT	177

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF FOREST POLYGON 4 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.			X	3
Yes	*Bourreria succulenta* Jacq.		X	X	4
Yes	*Bursera simaruba* (L.) Sarg.			X	3
No	*Capparis flexuosa* (L.) L.	X			**NA**
Yes	*Capparis hastata* Jacq.	X			9
Yes	*Erythroxylum brevipes* DC.	X			10
Yes	*Eugenia monticola* (Sw.) DC.	X			6
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			31
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			5
Yes	*Lasiacis divaricata* (L.) Hitchc.	X			7
Yes	*Leucaena leucocephala* (Lam.) De Wit				1
No	*Ocotea leucoxylon* (Sw.) Mez	X			**NA**
Yes	*Passiflora suberosa* L.	X			2
No	*Pharus glaber* HBK.		X	X	**NA**
Yes	*Psychotria microdon* (DC.) Urban	X			9
No	*Randia aculeata* L.	X			**NA**
Yes	*Samyda dodecandra* Jacq.			X	2
Yes	*Senna bicapsularis* (L.) Roxb.	X			1
Yes	*Serjania polyphylla* (L.) Radlk.	X			7
Yes	*Tragia volubilis* L.		X	X	5
Yes	*Trichostigma octandrum* (L.) H. Walt.		X		12
No	*Zanthoxylum monophyllum* (Lam.) P. Wilson			X	**NA**

TOTAL NUMBER OF SPECIES IN PLOT	17
TOTAL NUMBER OF INDIVIDUALS IN PLOT	117

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 7 OF FOREST POLYGON 4 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.			X	3
Yes	*Argythamnia candicans* Sw.		X	X	21
Yes	*Bucida buceras* L	X			3
Yes	*Capparis flexuosa* (L.) L.	X			8
Yes	*Capparis hastata* Jacq.	X			4
Yes	*Casearia guianensis* (Aubl.) Urban	X			3
No	*Celtis iguanaea* (Jacq.) Sarg.	X			NA
Yes	*Erythroxylum brevipes* DC.	X			6
Yes	*Eugenia monticola* (Sw.) DC.	X			9
Yes	*Guapira fragrans* (Dum.-Cours.) Little		X		15
Yes	*Guapira obtusata* (Jacq.) Little	X			3
No	*Krugiodendron ferreum* (Vahl) Urban	X			NA
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	5
No	*Macfadyena unguis-cati* (L.) A. Gentry	X			NA
No	*Neea buxifolia* (Hook.f.) Heimerl	X			NA
Yes	*Passiflora suberosa* L.	X			7
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			4
Yes	*Psychotria microdon* (DC.) Urban	X			8
No	*Randia aculeata* L.		X	X	NA
Yes	*Rondeletia pilosa* Sw.	X			17
Yes	*Samyda dodecandra* Jacq.	X			2
Yes	*Schaefferia frutescens* Jacq.	X			2
Yes	*Securidaca virgata* Sw.	X			1
Yes	*Serjania polyphylla* (L.) Radlk.	X			1
Yes	*Tragia volubilis* L.		X	X	5

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	127

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 2 OF FOREST POLYGON 5 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.	X			2
Yes	*Bourreria succulenta* Jacq.	X			3
Yes	*Bromelia pinguin* L.	X			15
Yes	*Bursera simaruba* (L.) Sarg.	X			2
Yes	*Casearia decandra* Jacq.	X			4
Yes	*Cestrum cf. laurifolium* L'Hér.	X			15
No	*Coccoloba venosa* L.			X	**NA**
Yes	*Commelina diffusa* Burm. f.		X	X	12
Yes	*Erythroxylum brevipes* DC.	X			14
Yes	*Galactia striata* (Jacq.) Urban	X			4
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			13
No	*Guapira obtusata* (Jacq.) Little	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	23
No	*Mangifera indica* L.	X			**NA**
Yes	*Neea buxifolia* (Hook.f.) Heimerl	X			5
Yes	*Ocotea leucoxylon* (Sw.) Mez	X			1
Yes	*Oxalis barrelieri* L.		X	X	6
Yes	*Panicum maximum* Jacq.		X	X	7
No	*Pilea inaequalis* (Juss. ex Poir) Wedd.		X		**NA**
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			1
Yes	*Psychotria microdon* (DC.) Urban	X			19
Yes	*Scleria lithosperma* (L.) Sw.		X	X	25
No	*Securidaca virgata* Sw.	X			**NA**
Yes	*Serjania polyphylla* (L.) Radlk.	X			11
Yes	*Smilax domingensis* Willd.	X			1
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			3
Yes	*Tillandsia fasciculata* Sw.	X			3
No	*Trichilia hirta* L.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	22
TOTAL NUMBER OF INDIVIDUALS IN PLOT	189

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF FOREST POLYGON 5 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.			X	10
Yes	*Bourreria succulenta* Jacq.	X			3
Yes	*Bursera simaruba* (L.) Sarg.	X			1
No	*Capparis cynophallophora* L.	X			**NA**
Yes	*Capparis hastata* Jacq.	X			2
Yes	*Casearia decandra* Jacq.	X			4
Yes	*Centrosema virginianum* (L.) Benth.	X			4
Yes	*Cestrum cf. laurifolium* L'Hér.	X			3
No	*Citharexylum fruticosum* L.		X	X	**NA**
Yes	*Coccoloba venosa* L.			X	4
Yes	*Cordia collococca* L.	X			1
No	*Delonix regia* (Bojer in Hook.) Raf.	X			**NA**
Yes	*Dendropanax arboreus* (L.) Decne. & Planch.	X			2
Yes	*Erythroxylum brevipes* DC.	X			9
Yes	*Eugenia biflora* (L.) DC.	X			9
Yes	*Eugenia monticola* (Sw.) DC.	X			6
No	*Genipa americana* L.	X			**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			16
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			2
Yes	*Ichnanthus pallens* (Sw.) Munro		X	X	Indet.
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	8
Yes	*Magnifera indica* L.	X			1
Yes	*Neea buxifolia* (Hook.f.) Heimerl	X			7
Yes	*Ocotea leucoxylon* (Sw.) Mez	X			5
No	*Passiflora suberosa* L.	X			**NA**
Yes	*Psychotria microdon* (DC.) Urban	X			16
No	*Pueraria phaseoloides* (Roxb.) Benth.	X			**NA**
Yes	*Rivina humilis* L.		X	X	7
Yes	*Securidaca virgata* Sw.	X			2
Yes	*Serjania polyphylla* (L.) Radlk.	X			1
No	*Tabebuia heterophylla* (DC.) Britton	X			**NA**
Yes	*Trichilia hirta* L.	X			5
No	*Zanthoxylum monophyllum* (Lam.) P. Wilson	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	25
TOTAL NUMBER OF INDIVIDUALS IN PLOT	Indet.

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 4 OF FOREST POLYGON 5 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Abrus precatorius* L.	X			**NA**
Yes	*Argythamnia candicans* Sw.		X	X	12
Yes	*Bourreria succulenta* Jacq.		X	X	4
Yes	*Bursera simaruba* (L.) Sarg.	X			4
Yes	*Capparis flexuosa* (L.) L.	X			8
Yes	*Capparis hastata* Jacq.	X			10
Yes	*Commelina diffusa* Burm. f.		X	X	10
Yes	*Dalechampia scandens* L.	X			1
Yes	*Erythroxylum brevipes* DC.	X			9
Yes	*Eugenia biflora* (L.) DC.	X			6
Yes	*Eugenia monticola* (Sw.) DC.	X			17
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			16
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			5
Yes	*Ichnanthus pallens* (Sw.) Munro		X	X	9
Yes	*Lasiacis divaricata* (L.) Hitchc.	X			5
No	*Leucaena leucocephala* (Lam.) De Wit		X	X	**NA**
Yes	*Ocotea leucoxylon* (Sw.) Mez	X			5
Yes	*Oeceoclades maculata* (Lindley) Lindley	X			7
No	*Oxalis barrelieri* L.		X	X	**NA**
No	*Passiflora suberosa* L.	X			**NA**
Yes	*Psychotria microdon* (DC.) Urban	X			11
No	*Rondeletia pilosa* Sw.	X			**NA**
No	*Scleria lithosperma* (L.) Sw.		X	X	**NA**
No	*Scleria pterota* Presl			X	**NA**
Yes	*Tragia volubilis* L.		X	X	13
No	*Trichostigma octandrum* (L.) H. Walt.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	18
TOTAL NUMBER OF INDIVIDUALS IN PLOT	152

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 5 OF FOREST POLYGON 5 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.			X	9
Yes	*Bourreria succulenta* Jacq.	X			1
Yes	*Bromelia pinguin* L.	X			27
Yes	*Bursera simaruba* (L.) Sarg.	X			2
Yes	*Capparis flexuosa* (L.) L.	X			1
No	*Capparis hastata* Jacq.	X			**NA**
Yes	*Cestrum cf. laurifolium* L'Hér.	X			8
Yes	*Citharexylum fruticosum* L.	X			1
Yes	*Coccoloba venosa* L.			X	3
No	*Croton betulinus* Vahl		X	X	**NA**
Yes	*Eugenia biflora* (L.) DC.	X			4
Yes	*Ficus citrifolia* P. Miller	X			1
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			15
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban			X	4
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	7
No	*Melochia nodiflora* Sw.	X			**NA**
Yes	*Mikania cordifolia* (L. f.) Willd.	X			5
Yes	*Ocotea leucoxylon* (Sw.) Mez	X			7
Yes	*Panicum maximum* Jacq.		X	X	19
Yes	*Psychotria microdon* (DC.) Urban	X			13
Yes	*Randia aculeata* L.	X			3
No	*Rhynchosia reticulata* (Sw.) DC.	X			**NA**
No	*Serjania polyphylla* (L.) Radlk.	X			**NA**
No	*Tillandsia recurvata* (L.) L.			X	**NA**

TOTAL NUMBER OF SPECIES IN PLOT	18
TOTAL NUMBER OF INDIVIDUALS IN PLOT	130

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 8 OF FOREST POLYGON 5 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.	X			2
Yes	*Bromelia pinguin* L.	X			1
Yes	*Bursera simaruba* (L.) Sarg.	X			1
Yes	*Capparis hastata* Jacq.				4
Yes	*Casearia decandra* Jacq.				3
Yes	*Casearia guianensis* (Aubl.) Urban				2
Yes	*Centrosema virginianum* (L.) Benth.		X	X	5
Yes	*Cestrum cf. laurifolium* L'Hér.	X			5
No	*Citharexylum fruticosum* L.	X			NA
Yes	*Erythroxylum brevipes* DC.	X			16
Yes	*Eugenia biflora* (L.) DC.	X			5
Yes	*Eugenia monticola* (Sw.) DC.	X			7
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			19
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			2
Yes	*Ichnanthus pallens* (Sw.) Munro		X	X	49
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	17
Yes	*Mikania cordifolia* (L. f.) Willd.	X			3
Yes	*Neea buxifolia* (Hook.f.) Heimerl	X			9
Yes	*Ocotea leucoxylon* (Sw.) Mez	X			2
Yes	*Oxalis barrelieri* L.		X	X	5
Yes	*Passiflora suberosa* L.	X			4
Yes	*Psychotria microdon* (DC.) Urban	X			14
Yes	*Rauvolfia nitida* Jacq.	X			3
Yes	*Rhynchosia reticulata* (Sw.) DC.	X			3
Yes	*Samyda dodecandra* Jacq.			X	6
Yes	*Scleria lithosperma* (L.) Sw.		X	X	23
Yes	*Serjania polyphylla* (L.) Radlk.	X			2
Yes	*Tillandsia fasciculata* Sw.	X			3
No	*Tillandsia recurvata* (L.) L.	X			NA

TOTAL NUMBER OF SPECIES IN PLOT	27
TOTAL NUMBER OF INDIVIDUALS IN PLOT	215

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF FOREST POLYGON 6 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Acacia muricata* (L.) Willd. ex L.		X	X	**NA**
Yes	*Bourreria succulenta* Jacq.	X			1
Yes	*Bursera simaruba* (L.) Sarg.	X			1
Yes	*Casearia decandra* Jacq.	X			2
Yes	*Casearia guianensis* (Aubl.) Urban	X			3
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			4
No	*Cocos nucifera* L.		X	X	**NA**
Yes	*Distictis lactiflora* (Vahl.) DC.	X			1
Yes	*Erythroxylum brevipes* DC.	X			5
Yes	*Eugenia biflora* (L.) DC.	X			3
Yes	*Eugenia monticola* (Sw.) DC.			X	11
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			10
No	*Jacquinia armillaris* Jacq.	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	5
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			5
No	*Mangifera indica* L.			X	**NA**
Yes	*Melochia nodiflora* Sw.	X			4
No	*Oeceoclades maculata* (Lindley) Lindley	X			**NA**
Yes	*Peltophorum pterocarpum* (DC.) Back. ex K. Heyne		X	X	3
Yes	*Psychotria brownei* Spreng.			X	9
Yes	*Psychotria microdon* (DC.) Urban	X			5
Yes	*Randia aculeata* L.			X	3
Yes	*Serjania polyphylla* (L.) Radlk.	X			4
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			3
Yes	*Triphasia trifolia* (Burm. f.) P. Wilson			X	2
Yes	*Vigna adenantha* (G.F.W. Meyer) Maréchal & al.			X	1

TOTAL NUMBER OF SPECIES IN PLOT	21
TOTAL NUMBER OF INDIVIDUALS IN PLOT	85

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 2 OF FOREST POLYGON 6 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.	X			7
Yes	*Bourreria succulenta* Jacq.	X			3
No	*Bursera simaruba* (L.) Sarg.	X			**NA**
No	*Capparis hastata* Jacq.	X			**NA**
No	*Casearia decandra* Jacq.	X			**NA**
Yes	*Casearia guianensis* (Aubl.) Urban	X			1
No	*Centrosema pubescens* Benth.	X			**NA**
No	*Citharexylum fruticosum* L.	X			**NA**
Yes	*Cordia collococca* L.	X			1
Yes	*Erythroxylum brevipes* DC.	X			2
Yes	*Eugenia biflora* (L.) DC.	X			3
Yes	*Eugenia monticola* (Sw.) DC.	X			9
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			19
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	14
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	4
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			2
No	*Melochia nodiflora* Sw.	X			**NA**
Yes	*Oeceoclades maculata* (Lindley) Lindley	X			6
Yes	*Psychotria brownei* Spreng.			X	5
Yes	*Psychotria microdon* (DC.) Urban	X			2
Yes	*Randia aculeata* L.			X	3
Yes	*Rhynchosia minima* (L.) DC.	X			3
Yes	*Securidaca virgata* Sw.	X			1
Yes	*Serjania polyphylla* (L.) Radlk.	X			5
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			2
Yes	*Tragia volubilis* L.		X	X	2

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	94

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 5 OF FOREST POLYGON 6 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.	X			3
Yes	*Bourreria succulenta* Jacq.			X	2
No	*Capparis hastata* Jacq.	X			**NA**
No	*Casearia decandra* Jacq.	X			**NA**
Yes	*Casearia guianensis* (Aubl.) Urban	X			2
Yes	*Centrosema pubescens* Benth.		X	X	3
Yes	*Cissampelos pareira* L.	X			1
Yes	*Crotalaria retusa* L.		X		2
Yes	*Erythroxylum brevipes* DC.	X			2
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			6
Yes	*Ipomoea tiliacea* (Willd.) Choisy in DC.	X			4
Yes	*Melochia nodiflora* Sw.	X			1
Yes	*Melochia villosa* (Mill.) Fawc. & Rendle	X			5
Yes	*Panicum maximum* Jacq.		X	X	58
Yes	*Psychotria brownei* Spreng.			X	5
Yes	*Psychotria microdon* (DC.) Urban	X			4
Yes	*Randia aculeata* L.	X			5
Yes	*Scleria pterota* Presl			X	5
Yes	*Securidaca virgata* Sw.	X			1
Yes	*Smilax domingensis* Willd.	X			4
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			3
No	*Tragia volubilis* L.		X	X	**NA**
Yes	*Urena lobata* L.	X			3
No	*Zanthoxylum monophyllum* (Lam.) P. Wilson	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	119

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF FOREST POLYGON 6 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.	X			4
No	*Aristolochia trilobata* L.	X			**NA**
Yes	*Bourreria succulenta* Jacq.	X			1
Yes	*Bursera simaruba* (L.) Sarg.	X			2
Yes	*Capparis flexuosa* (L.) L.	X			3
Yes	*Capparis hastata* Jacq.	X			2
Yes	*Casearia decandra* Jacq.	X			4
Yes	*Citharexylum fruticosum* L.		X	X	3
No	*Cordia collococca* L.	X			**NA**
No	*Delonix regia* (Bojer in Hook.) Raf.	X			**NA**
No	*Distictis lactiflora* (Vahl.) DC.	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			5
Yes	*Eugenia biflora* (L.) DC.	X			5
Yes	*Eugenia monticola* (Sw.) DC.	X			3
Yes	*Eugenia* sp.	X			1
Yes	*Guapira fragrans* (Dum.-Cours.) Little		X		21
No	*Guettarda scabra* (L.) Vent.	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	13
No	*Leucaena leucocephala* (Lam.) De Wit		X	X	**NA**
No	*Macfadyena unguis-cati* (L.) A. Gentry	X			**NA**
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			1
Yes	*Psychotria microdon* (DC.) Urban	X			3
Yes	*Randia aculeata* L.	X			2
No	*Rhynchosia reticulata* (Sw.) DC.		X		**NA**
Yes	*Serjania polyphylla* (L.) Radlk.	X			6
No	*Sterculia apetala* (Jacq.) Karst.	X			**NA**
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			3
No	*Tabebuia aurea* (Manso) Benth. & Hook.	X			**NA**
Yes	*Trichilia hirta* L.	X			2

TOTAL NUMBER OF SPECIES IN PLOT	19
TOTAL NUMBER OF INDIVIDUALS IN PLOT	84

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 7 OF FOREST POLYGON 6 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Bursera simaruba* (L.) Sarg.	X			2
Yes	*Capparis hastata* Jacq.	X			3
Yes	*Casearia decandra* Jacq.	X			3
Yes	*Casearia guianensis* (Aubl.) Urban	X			2
No	*Chiococca alba* (L.) Hitchc.		X	X	**NA**
Yes	*Citharexylum fruticosum* L.			X	1
Yes	*Erythroxylum brevipes* DC.	X			4
Yes	*Eugenia biflora* (L.) DC.	X			2
Yes	*Eugenia monticola* (Sw.) DC.	X			15
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			17
Yes	*Guettarda scabra* (L.) Vent.	X			4
No	*Jacquinia armillaris* Jacq.	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	36
No	*Leucaena leucocephala* (Lam.) De Wit		X	X	**NA**
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			1
No	*Neea buxifolia* (Hook.f.) Heimerl	X			**NA**
Yes	*Panicum maximum* Jacq.	X			6
Yes	*Psychotria brownei* Spreng.	X			7
Yes	*Psychotria microdon* (DC.) Urban	X			5
Yes	*Randia aculeata* L.	X			2
No	*Roystonea borinquena* O. F. Cook		X		**NA**
No	*Scleria lithosperma* (L.) Sw.		X	X	**NA**
Yes	*Securidaca virgata* Sw.	X			1
Yes	*Serjania polyphylla* (L.) Radlk.	X			1
No	*Zanthoxylum monophyllum* (Lam.) P. Wilson			X	**NA**

TOTAL NUMBER OF SPECIES IN PLOT	18
TOTAL NUMBER OF INDIVIDUALS IN PLOT	112

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 2 OF FOREST POLYGON 7 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Bursera simaruba* (L.) Sarg.	X			1
No	*Calopogonium coeruleum* (Benth.) Sauv.			X	**NA**
Yes	*Casearia decandra* Jacq.	X			4
Yes	*Casearia guianensis* (Aubl.) Urban	X			2
No	*Cordia polycephala* (Lam.) I. M. Johnst.		X	X	**NA**
Yes	*Erythroxylum brevipes* DC.	X			5
Yes	*Eugenia biflora* (L.) DC.	X			6
Yes	*Eugenia monticola* (Sw.) DC.	X			20
No	*Galactia dubia* DC.	X			**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			13
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	15
Yes	*Leucaena leucocephala* (Lam.) De Wit			X	3
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			18
Yes	*Melochia nodiflora* Sw.	X			9
Yes	*Panicum maximum* Jacq.			X	16
Yes	*Passiflora suberosa* L.	X			10
Yes	*Randia aculeata* L.		X	X	17
Yes	*Securidaca virgata* Sw.	X			11
Yes	*Serjania polyphylla* (L.) Radlk.	X			11
Yes	*Stizolobium pruriens* (L.) Medic.			X	1
No	*Tournefortia hirsutissima* L.		X	X	**NA**
Yes	*Tragia volubilis* L.		X	X	15
Yes	*Trichilia hirta* L.		X		2
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			3

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	182

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF FOREST POLYGON 7 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Aristolochia trilobata* L.	X			2
Yes	*Bourreria succulenta* Jacq.			X	2
Yes	*Bursera simaruba* (L.) Sarg.	X			1
No	*Capparis cynophallophora* L.	X			NA
Yes	*Capparis flexuosa* (L.) L.	X			5
Yes	*Capparis hastata* Jacq.	X			3
No	*Chamissoa altissima* (Jacq.) HBK.		X		NA
Yes	*Chiococca alba* (L.) Hitchc.		X	X	3
No	*Citharexylum fruticosum* L.	X			NA
Yes	*Erythroxylum brevipes* DC.	X			13
Yes	*Eugenia biflora* (L.) DC.	X			4
Yes	*Eugenia monticola* (Sw.) DC.	X			20
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			22
Yes	*Guettarda odorata* (Jacq.) Lam.			X	2
No	*Guettarda scabra* (L.) Vent.	X			NA
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	11
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			7
Yes	*Ocotea leucoxylon* (Sw.) Mez	X			1
Yes	*Passiflora suberosa* L.	X			6
No	*Psychotria brownei* Spreng.			X	NA
Yes	*Psychotria microdon* (DC.) Urban	X			2
No	*Randia aculeata* L.			X	NA
Yes	*Samyda dodecandra* Jacq.	X			2
Yes	*Scleria lithosperma* (L.) Sw.		X	X	28
Yes	*Serjania polyphylla* (L.) Radlk.	X			5
Yes	*Tragia volubilis* L.		X	X	19

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	158

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 4 OF FOREST POLYGON 7 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Andira inermis* (W. Wr.) DC.			X	**NA**
Yes	*Argythamnia candicans* Sw.		X	X	24
Yes	*Bourreria succulenta* Jacq.	X			1
Yes	*Bursera simaruba* (L.) Sarg.	X			2
Yes	*Capparis flexuosa* (L.) L.	X			6
Yes	*Capparis hastata* Jacq.	X			12
Yes	*Casearia decandra* Jacq.	X			2
No	*Chiococca alba* (L.) Hitchc.		X	X	**NA**
Yes	*Citharexylum fruticosum* L.			X	3
Yes	*Commelina diffusa* Burm. f.		X	X	26
Yes	*Erythroxylum brevipes* DC.	X			16
No	*Eugenia biflora* (L.) DC.	X			**NA**
Yes	*Eugenia monticola* (Sw.) DC.	X			3
Yes	*Guapira fragrans* (Dum.-Cours.) Little		X		21
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	13
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			9
Yes	*Passiflora suberosa* L.	X			2
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			5
No	*Psychotria microdon* (DC.) Urban	X			**NA**
Yes	*Randia aculeata* L.		X	X	5
Yes	*Samyda dodecandra* Jacq.	X			1
No	*Serjania polyphylla* (L.) Radlk.	X			**NA**
Yes	*Tournefortia volubilis* L.	X			1
Yes	*Tragia volubilis* L.		X	X	7
Yes	*Zanthoxylum monophyllum* (Lam.) P. Wilson	X			2

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	161

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF FOREST POLYGON 7 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Capparis cynophallophora* L.	X			2
Yes	*Capparis flexuosa* (L.) L.	X			11
Yes	*Capparis hastata* Jacq.	X			1
Yes	*Casearia guianensis* (Aubl.) Urban	X			4
No	*Chiococca alba* (L.) Hitchc.			X	**NA**
Yes	*Citharexylum fruticosum* L.	X			1
Yes	*Coccoloba venosa* L.			X	1
Yes	*Distictis lactiflora* (Vahl.) DC.	X			1
Yes	*Erythroxylum areolatum* L.	X			26
No	*Eugenia biflora* (L.) DC.	X			**NA**
Yes	*Eugenia monticola* (Sw.) DC.	X			8
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			13
No	*Guettarda odorata* (Jacq.) Lam.	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.	X			5
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			6
No	*Passiflora suberosa* L.	X			**NA**
Yes	*Psychotria brownei* Spreng.	X			2
Yes	*Psychotria microdon* (DC.) Urban	X			3
Yes	*Randia aculeata* L.		X	X	10
No	*Samyda dodecandra* Jacq.			X	**NA**
Yes	*Scleria lithosperma* (L.) Sw.		X	X	41
No	*Serjania polyphylla* (L.) Radlk.	X			**NA**
Yes	*Tragia volubilis* L.		X	X	7
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			3

TOTAL NUMBER OF SPECIES IN PLOT	18
TOTAL NUMBER OF INDIVIDUALS IN PLOT	145

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 8 OF FOREST POLYGON 7 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Bourreria succulenta* Jacq.			X	**NA**
No	*Bursera simaruba* (L.) Sarg.	X			**NA**
Yes	*Capparis hastata* Jacq.	X			12
No	*Casearia guianensis* (Aubl.) Urban	X			**NA**
Yes	*Chiococca alba* (L.) Hitchc.		X	X	9
Yes	*Erythroxylum brevipes* DC.	X			5
Yes	*Eugenia monticola* (Sw.) DC.			X	8
Yes	*Guapira fragrans* (Dum.-Cours.) Little		X		38
Yes	*Guettarda scabra* (L.) Vent.	X			1
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	10
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			6
No	*Passiflora suberosa* L.	X			**NA**
No	*Samyda dodecandra* Jacq.	X			**NA**
Yes	*Scleria lithosperma* (L.) Sw.			X	9
Yes	*Serjania polyphylla* (L.) Radlk.	X			1
Yes	*Tragia volubilis* L.		X		11
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			4

TOTAL NUMBER OF SPECIES IN PLOT	12
TOTAL NUMBER OF INDIVIDUALS IN PLOT	114

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF FOREST POLYGON 8 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.			X	13
Yes	*Bursera simaruba* (L.) Sarg.	X			2
Yes	*Capparis cynophallophora* L.	X			11
Yes	*Capparis flexuosa* (L.) L.	X			13
Yes	*Casearia decandra* Jacq.	X			4
Yes	*Casearia guianensis* (Aubl.) Urban	X			7
Yes	*Coccoloba venosa* L.			X	5
Yes	*Commelina diffusa* Burm. f.		X	X	14
Yes	*Cordia alliodora* (R. & P.) Oken	X			1
Yes	*Cordia polycephala* (Lam.) I. M. Johnst.		X	X	12
No	*Elaeodendrum xylocarpum* (Vent.) DC.	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			15
Yes	*Eugenia biflora* (L.) DC.	X			5
Yes	*Eugenia ligustrina* (Sw.) Willd.				2
Yes	*Eugenia monticola* (Sw.) DC.			X	9
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			19
No	*Guettarda odorata* (Jacq.) Lam.	X			**NA**
Yes	*Hylocereus trigonus* (Haw.) Safford	X			10
Yes	*Leucaena leucocephala* (Lam.) De Wit			X	2
Yes	*Psychotria microdon* (DC.) Urban	X			4
Yes	*Randia aculeata* L.	X			8
Yes	*Rauvolfia nitida* Jacq.	X			3
No	*Schaefferia frutescens* Jacq.	X			**NA**
Yes	*Serjania polyphylla* (L.) Radlk.	X			9
Yes	*Tragia volubilis* L.		X	X	9

TOTAL NUMBER OF SPECIES IN PLOT	22
TOTAL NUMBER OF INDIVIDUALS IN PLOT	177

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 2 OF FOREST POLYGON 8 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Abutilon umbellatum* (L.) Sweet	X			**NA**
Yes	*Bromelia pinguin* L.			X	6
Yes	*Bursera simaruba* (L.) Sarg.			X	2
Yes	*Capparis flexuosa* (L.) L.			X	10
Yes	*Centrosema pubescens* Benth.	X			3
Yes	*Centrosema virginianum* (L.) Benth.	X			5
No	*Chamaecrista nictitans* (L.) Moench		X		**NA**
No	*Coccoloba venosa* L.			X	**NA**
Yes	*Cordia collococca* L.	X			2
Yes	*Cordia polycephala* (Lam.) I. M. Johnst.		X	X	6
No	*Crotalaria retusa* L.		X	X	**NA**
No	*Croton lobatus* L.		X	X	**NA**
Yes	*Eugenia biflora* (L.) DC.	X			3
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			3
Yes	*Ipomoea alba* L.	X			12
Yes	*Ipomoea tiliacea* (Willd.) Choisy in DC.		X		9
Yes	*Lasiacis divaricata* (L.) Hitchc.	X			15
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	26
Yes	*Melochia nodiflora* Sw.	X			5
Yes	*Panicum maximum* Jacq.		X	X	Indet.
No	*Paspalum distichum* L.			X	**NA**
No	*Psidium guajava* L.	X			**NA**
Yes	*Senna bicapsularis* (L.) Roxb.		X	X	4
No	*Senna obtusifolia* (L.) Irwin & Barneby	X			**NA**
No	*Senna spectabilis* (DC.) Irwin & Barneby	X			**NA**
No	*Spermacoce verticillata* L.		X	X	**NA**
Yes	*Vigna luteola* (Jacq.) Benth.	X			2

TOTAL NUMBER OF SPECIES IN PLOT	17
TOTAL NUMBER OF INDIVIDUALS IN PLOT	Indet.

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF FOREST POLYGON 8 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Avicennia germinans* (L.) L.			X	2
Yes	*Batis maritima* L.		X	X	4
Yes	*Bursera simaruba* (L.) Sarg.	X			4
Yes	*Capparis cynophallophora* L.	X			3
Yes	*Capparis flexuosa* (L.) L.			X	9
No	*Capraria biflora* L.	X			**NA**
No	*Caraxeron vermiculare* (L.) Raf.	X			**NA**
No	*Cissus verticillata* (L.) Nicolson & Jarvis	X			**NA**
Yes	*Citharexylum fruticosum* L.			X	2
Yes	*Eugenia biflora* (L.) DC.	X			7
No	*Fimbristylis cymosa* R. Br. ssp. spathacea (Roth) Koy.			X	**NA**
No	*Fimbristylis spadicea* (L.) Vahl			X	**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			19
Yes	*Ipomoea triloba* L.	X			2
No	*Laguncularia racemosa* (L.) Gaertn.	X			**NA**
No	*Leucaena leucocephala* (Lam.) De Wit			X	**NA**
No	*Mariscus planifolius* (L. C. Rich.) Urban	X			**NA**
No	*Panicum maximum* Jacq.			X	**NA**
Yes	*Paspalum vaginatum* Sw.			X	1
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			6
Yes	*Randia aculeata* L.		X		15
Yes	*Samyda dodecandra* Jacq.	X			8
No	*Sesuvium portulacastrum* (L.) L.		X		**NA**
No	*Sporobolus virginicus* (L.) Kunth			X	**NA**
No	*Thespesia populnea* (L.) Soland ex Correa		X	X	**NA**

TOTAL NUMBER OF SPECIES IN PLOT	
TOTAL NUMBER OF INDIVIDUALS IN PLOT	

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 4 OF FOREST POLYGON 8 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Abrus precatorius* L.			X	**NA**
No	*Avicennia germinans* (L.) L.		X	X	**NA**
Yes	*Bourreria succulenta* Jacq.			X	1
Yes	*Bursera simaruba* (L.) Sarg.	X			4
Yes	*Capparis cynophallophora* L.	X			8
Yes	*Capparis flexuosa* (L.) L.			X	9
No	*Citharexylum fruticosum* L.	X			**NA**
Yes	*Coccoloba microstachya* Willd.	X			2
Yes	*Cordia collococca* L.	X			3
No	*Cydista aequinoctialis* (L.) Miers	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			6
Yes	*Eugenia biflora* (L.) DC.	X			6
Yes	*Eugenia monticola* (Sw.) DC.	X			5
No	*Fimbristylis cymosa* R. Br. ssp. spathacea (Roth) Koy.		X	X	**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			21
No	*Laguncularia racemosa* (L.) Gaertn.	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	3
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	2
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			3
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			7
No	*Psychotria microdon* (DC.) Urban	X			**NA**
Yes	*Randia aculeata* L.	X			18
No	*Sabinea florida* (Vahl.) DC.	X			**NA**
Yes	*Scleria microcarpa* Nees ex Kunth			X	4
No	*Senna polyphylla* (Jacq.) Irwin & Barneby	X			**NA**
No	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			**NA**
Yes	*Tragia volubilis* L.	X			5

TOTAL NUMBER OF SPECIES IN PLOT	17
TOTAL NUMBER OF INDIVIDUALS IN PLOT	107

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF FOREST POLYGON 8 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.			X	4
Yes	*Bursera simaruba* (L.) Sarg.			X	3
Yes	*Capparis cynophallophora* L.	X			3
Yes	*Capparis flexuosa* (L.) L.	X			4
Yes	*Capparis hastata* Jacq.	X			10
No	*Casearia guianensis* (Aubl.) Urban	X			**NA**
Yes	*Cordia collococca* L.	X			1
Yes	*Crotalaria lotifolia* L.	X			1
Yes	*Distictis lactiflora* (Vahl.) DC.	X			1
Yes	*Erythroxylum brevipes* DC.	X			4
Yes	*Eugenia biflora* (L.) DC.	X			5
Yes	*Eugenia monticola* (Sw.) DC.	X			14
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			26
Yes	*Lasiacis divaricata* (L.) Hitchc.	X			28
No	*Leucaena leucocephala* (Lam.) De Wit			X	**NA**
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			8
Yes	*Melochia nodiflora* Sw.	X			7
No	*Randia aculeata* L.		X		**NA**
Yes	*Rhynchosia reticulata* (Sw.) DC.	X			2
No	*Samyda dodecandra* Jacq.	X			**NA**
Yes	*Schaefferia frutescens* Jacq.	X			2
Yes	*Senna polyphylla* (Jacq.) Irwin & Barneby	X			3
Yes	*Serjania polyphylla* (L.) Radlk.	X			8
Yes	*Tragia volubilis* L.	X			11
Yes	*Trichilia hirta* L.	X			2
No	*Trichostigma octandrum* (L.) H. Walt.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	21
TOTAL NUMBER OF INDIVIDUALS IN PLOT	147

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF FOREST POLYGON 9 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Acacia muricata* (L.) Willd. ex L.		X	X	**NA**
Yes	*Bourreria succulenta* Jacq.		X	X	4
Yes	*Bursera simaruba* (L.) Sarg.	X			1
No	*Capparis flexuosa* (L.) L.	X			**NA**
Yes	*Capparis hastata* Jacq.	X			7
Yes	*Casearia decandra* Jacq.	X			3
No	*Chamaecrista diphylla* (L.) Greene			X	**NA**
Yes	*Citharexylum fruticosum* L.			X	3
No	*Cordia polycephala* (Lam.) I. M. Johnst.		X	X	**NA**
Yes	*Erythroxylum brevipes* DC.	X			10
Yes	*Eugenia monticola* (Sw.) DC.			X	5
Yes	*Guapira fragrans* (Dum.-Cours.) Little		X		6
No	*Guettarda scabra* (L.) Vent.	X			**NA**
No	*Heteropteris purpurea* (L.) Kunth	X			**NA**
No	*Ipomoea tiliacea* (Willd.) Choisy in DC.		X		**NA**
Yes	*Krugiodendron ferreum* (Vahl) Urban	X			1
No	*Lantana camara* L.		X	X	**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.	X			7
No	*Leucaena leucocephala* (Lam.) De Wit		X	X	**NA**
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			11
No	*Melochia nodiflora* Sw.	X			**NA**
No	*Merremia dissecta* (Jacq.) Hall. f.	X			**NA**
Yes	*Mimosa ceratonia* L.	X			1
No	*Panicum maximum* Jacq.			X	**NA**
Yes	*Paspalum conjugatum* Berg.			X	5
Yes	*Passiflora suberosa* L.	X			3
Yes	*Randia aculeata* L.		X	X	2
No	*Rhynchosia reticulata* (Sw.) DC.	X			**NA**
Yes	*Scleria lithosperma* (L.) Sw.		X	X	14
No	*Scleria pterota* Presl			X	**NA**
No	*Securidaca virgata* Sw.	X			**NA**
No	*Senna obtusifolia* (L.) Irwin & Barneby			X	**NA**
No	*Serjania polyphylla* (L.) Radlk.	X			**NA**

No	*Sida cordifolia* L.		X	X	**NA**
Yes	*Tragia volubilis* L.		X	X	12
Yes	*Trichilia hirta* L.	X			2
No	*Waltheria indica* L.		X		**NA**
No	*Zanthoxylum martinicense* (Lam.) DC.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	18
TOTAL NUMBER OF INDIVIDUALS IN PLOT	97

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF FOREST POLYGON 9 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.			X	1
No	*Acacia farnesiana* (L.) Willd.	X			**NA**
Yes	*Acacia retusa* (Jacq.) Howard	X			4
Yes	*Argythamnia candicans* Sw.		X	X	39
Yes	*Bourreria succulenta* Jacq.		X	X	8
No	*Bursera simaruba* (L.) Sarg.	X			**NA**
Yes	*Capparis flexuosa* (L.) L.	X			4
Yes	*Capparis hastata* Jacq.	X			10
No	*Casearia decandra* Jacq.	X			**NA**
Yes	*Centrosema virginianum* (L.) Benth.	X			2
Yes	*Chiococca alba* (L.) Hitchc.			X	2
No	*Citharexylum fruticosum* L.			X	**NA**
No	*Cordia polycephala* (Lam.) I. M. Johnst.		X	X	**NA**
Yes	*Galactia dubia* DC.	X			5
No	*Galactia striata* (Jacq.) Urban			X	**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			21
No	*Guettarda scabra* (L.) Vent.	X			**NA**
No	*Heteropteris laurifolia* (L.) A. Juss.		X	X	**NA**
No	*Ipomoea tiliacea* (Willd.) Choisy in DC.	X			**NA**
Yes	*Lantana camara* L.		X	X	1
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	12
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	2
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			13
No	*Melochia nodiflora* Sw.	X			**NA**
No	*Mimosa pudica* L.		X	X	**NA**
No	*Panicum maximum* Jacq.		X	X	**NA**
Yes	*Passiflora suberosa* L.	X			7
Yes	*Psychotria microdon* (DC.) Urban	X			5
Yes	*Randia aculeata* L.			X	9
No	*Sabinea florida* (Vahl.) DC.	X			**NA**
Yes	*Samyda dodecandra* Jacq.	X			3
No	*Scleria pterota* Presl			X	**NA**
Yes	*Securidaca virgata* Sw.	X			1

No	*Serjania polyphylla* (L.) Radlk.	X			**NA**
Yes	*Tragia volubilis* L.		X		6

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	155

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 5 OF FOREST POLYGON 9 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.	X			2
Yes	*Argythamnia candicans* Sw.		X		9
Yes	*Bourreria succulenta* Jacq.		X	X	1
No	*Bursera simaruba* (L.) Sarg.	X			**NA**
Yes	*Capparis flexuosa* (L.) L.	X			4
Yes	*Capparis hastata* Jacq.	X			3
Yes	*Casearia decandra* Jacq.	X			1
Yes	*Centrosema pubescens* Benth.	X			1
No	*Cissampelos pareira* L.	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			3
Yes	*Eugenia biflora* (L.) DC.	X			2
Yes	*Eugenia monticola* (Sw.) DC.	X			4
No	*Galactia striata* (Jacq.) Urban	X			**NA**
No	*Gouania polygama* (Jacq.) Urban	X			**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			8
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			4
No	*Ipomoea tiliacea* (Willd.) Choisy in DC.			X	**NA**
No	*Krugiodendron ferreum* (Vahl) Urban	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	10
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	7
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			9
No	*Panicum maximum* Jacq.		X	X	**NA**
Yes	*Passiflora suberosa* L.	X			5
Yes	*Rajania cordata* L.	X			6
Yes	*Randia aculeata* L.	X			4
Yes	*Rhynchosia reticulata* (Sw.) DC.	X			2
No	*Sabinea florida* (Vahl.) DC.	X			**NA**
Yes	*Securidaca virgata* Sw.	X			1
Yes	*Senna bicapsularis* (L.) Roxb.	X			1
No	*Tragia volubilis* L.		X	X	**NA**
No	*Turbina corymbosa* (L.) Raf.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	21

TOTAL NUMBER OF INDIVIDUALS IN PLOT	87

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 7 OF FOREST POLYGON 9 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Argythamnia candicans* Sw.		X	X	47
Yes	*Bourreria succulenta* Jacq.			X	4
Yes	*Bursera simaruba* (L.) Sarg.	X			2
Yes	*Capparis flexuosa* (L.) L.	X			8
Yes	*Capparis hastata* Jacq.	X			5
No	*Casearia decandra* Jacq.	X			**NA**
Yes	*Citharexylum fruticosum* L.		X	X	6
Yes	*Dalechampia scandens* L.		X		5
Yes	*Erythroxylum brevipes* DC.	X			3
Yes	*Eugenia monticola* (Sw.) DC.	X			1
Yes	*Galactia dubia* DC.	X			7
Yes	*Gouania polygama* (Jacq.) Urban	X			3
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			18
Yes	*Heteropteris purpurea* (L.) Kunth	X			1
No	*Lasiacis divaricata* (L.) Hitchc.	X			**NA**
No	*Leucaena leucocephala* (Lam.) De Wit	X			**NA**
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			11
Yes	*Passiflora suberosa* L.	X			16
Yes	*Psychotria brownei* Spreng.			X	1
Yes	*Randia aculeata* L.	X			4
Yes	*Rauvolfia nitida* Jacq.	X			5
Yes	*Rhynchosia reticulata* (Sw.) DC.	X			1
Yes	*Sabinea florida* (Vahl.) DC.	X			10
Yes	*Samyda dodecandra* Jacq.	X			4
No	*Schaefferia frutescens* Jacq.	X			**NA**
Yes	*Scleria lithosperma* (L.) Sw.		X	X	52
Yes	*Tragia volubilis* L.		X		12
Yes	*Waltheria indica* L.		X		1
Yes	*Zanthoxylum monophyllum* (Lam.) P. Wilson			X	1

TOTAL NUMBER OF SPECIES IN PLOT	25
TOTAL NUMBER OF INDIVIDUALS IN PLOT	228

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 8 OF FOREST POLYGON 9 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Acacia retusa* (Jacq.) Howard	X			NA
Yes	*Argythamnia candicans* Sw.			X	8
Yes	*Argythamnia fasciculata* (Vahl) Muell. Arg.		X		2
Yes	*Bourreria succulenta* Jacq.			X	2
Yes	*Bursera simaruba* (L.) Sarg.	X			2
Yes	*Capparis flexuosa* (L.) L.	X			11
Yes	*Capparis hastata* Jacq.	X			1
Yes	*Casearia decandra* Jacq.	X			1
Yes	*Casearia guianensis* (Aubl.) Urban	X			3
No	*Centrosema pubescens* Benth.		X		NA
Yes	*Chiococca alba* (L.) Hitchc.			X	2
Yes	*Citharexylum fruticosum* L.	X			1
Yes	*Cordia laevigata* Lam.	X			1
Yes	*Erythroxylum brevipes* DC.	X			10
Yes	*Eugenia biflora* (L.) DC.	X			1
Yes	*Eugenia monticola* (Sw.) DC.	X			2
Yes	*Guapira fragrans* (Dum.-Cours.) Little		X		16
Yes	*Hippocratea volubilis* L.	X			3
No	*Ipomoea tiliacea* (Willd.) Choisy in DC.			X	NA
Yes	*Lasiacis divaricata* (L.) Hitchc.	X			5
No	*Leucaena leucocephala* (Lam.) De Wit		X	X	NA
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			7
No	*Panicum maximum* Jacq.		X	X	NA
Yes	*Psychotria microdon* (DC.) Urban	X			1
Yes	*Randia aculeata* L.	X			5
Yes	*Rhynchosia reticulata* (Sw.) DC.	X			3
No	*Sabinea florida* (Vahl.) DC.	X			NA
Yes	*Scleria lithosperma* (L.) Sw.		X	X	6
No	*Securidaca virgata* Sw.	X			NA
No	*Serjania polyphylla* (L.) Radlk.	X			NA
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			3
Yes	*Tragia volubilis* L.			X	9
Yes	*Trichilia hirta* L.	X			1

TOTAL NUMBER OF SPECIES IN PLOT	25
TOTAL NUMBER OF INDIVIDUALS IN PLOT	106

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 2 OF FOREST POLYGON 10 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Acacia muricata* (L.) Willd. ex L.	X			**NA**
Yes	*Bourreria succulenta* Jacq.		X	X	12
Yes	*Bursera simaruba* (L.) Sarg.	X			2
No	*Cordia alliodora* (R. & P.) Oken	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			15
Yes	*Eugenia biflora* (L.) DC.	X			2
Yes	*Eugenia monticola* (Sw.) DC.	X			26
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			23
Yes	*Guettarda scabra* (L.) Vent.	X			3
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	10
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			4
No	*Merremia quinquefolia* (L) Hall. f.	X			**NA**
Yes	*Miconia laevigata* (L.) DC.		X	X	3
Yes	*Psychotria brownei* Spreng.			X	7
Yes	*Rajania cordata* L.	X			2
Yes	*Randia aculeata* L.	X			4
Yes	*Rhynchosia reticulata* (Sw.) DC.	X			1
Yes	*Sabinea florida* (Vahl.) DC.	X			6
Yes	*Securidaca virgata* Sw.	X			6
Yes	*Senna bicapsularis* (L.) Roxb.	X			1
No	*Senna sophera* (L.) Roxb.			X	**NA**
Yes	*Serjania polyphylla* (L.) Radlk.	X			1
No	*Smilax domingensis* Willd.	X			**NA**
Yes	*Tragia volubilis* L.	X			5

TOTAL NUMBER OF SPECIES IN PLOT	19
TOTAL NUMBER OF INDIVIDUALS IN PLOT	133

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 4 OF FOREST POLYGON 10 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Argythamnia candicans* Sw.		X	X	79
Yes	*Bourreria succulenta* Jacq.			X	5
Yes	*Bursera simaruba* (L.) Sarg.	X			1
Yes	*Capparis cynophallophora* L.	X			2
Yes	*Capparis flexuosa* (L.) L.	X			3
Yes	*Capparis hastata* Jacq.	X			2
No	*Casearia decandra* Jacq.	X			**NA**
No	*Citharexylum fruticosum* L.			X	**NA**
No	*Commelina diffusa* Burm. f.	X			**NA**
Yes	*Cordia collococca* L.	X			2
Yes	*Dalechampia scandens* L.	X			2
No	*Distictis lactiflora* (Vahl.) DC.	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			10
Yes	*Eugenia confusa* DC.	X			1
Yes	*Guapira fragrans* (Dum.-Cours.) Little		X		14
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	37
No	*Macfadyena unguis-cati* (L.) A. Gentry	X			**NA**
No	*Samyda dodecandra* Jacq.	X			**NA**
Yes	*Serjania polyphylla* (L.) Radlk.	X			4
Yes	*Tragia volubilis* L.		X		29

TOTAL NUMBER OF SPECIES IN PLOT	14
TOTAL NUMBER OF INDIVIDUALS IN PLOT	191

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 5 OF FOREST POLYGON 10 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Adelia ricinella* L.	X			1
Yes	*Argythamnia candicans* Sw.		X	X	15
No	*Bidens alba* (L.) DC. var. *radiata* (C. H. Schulz) Melchert		X	X	**NA**
Yes	*Bourreria succulenta* Jacq.			X	2
Yes	*Capparis flexuosa* (L.) L.		X		6
Yes	*Capparis hastata* Jacq.	X			1
Yes	*Casearia decandra* Jacq.	X			2
No	*Chamaecrista diphylla* (L.) Greene			X	**NA**
No	*Chamaecrista nictitans* (L.) Moench		X	X	**NA**
No	*Citharexylum fruticosum* L.			X	**NA**
No	*Distictis lactiflora* (Vahl.) DC.	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			17
Yes	*Eugenia biflora* (L.) DC.	X			1
Yes	*Eugenia monticola* (Sw.) DC.	X			3
No	*Galactia dubia* DC.	X			**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			8
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	3
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			9
No	*Melochia nodiflora* Sw.	X			**NA**
No	*Pueraria phaseoloides* (Roxb.) Benth.	X			**NA**
Yes	*Schaefferia frutescens* Jacq.	X			2
Yes	*Securidaca virgata* Sw.	X			1
Yes	*Serjania polyphylla* (L.) Radlk.	X			4
No	*Sida cordifolia* L.		X	X	**NA**
Yes	*Tragia volubilis* L.		X		5
No	*Trianthema portulacastrum* L.		X		**NA**
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			2
No	*Vigna adenantha* (G. F. W. Meyer) Maréchal & al.			X	**NA**
Yes	*Zanthoxylum monophyllum* (Lam.) P. Wilson	X			4

TOTAL NUMBER OF SPECIES IN PLOT	18
TOTAL NUMBER OF INDIVIDUALS IN PLOT	86

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF FOREST POLYGON 10 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Abrus precatorius* L.			X	NA
Yes	*Argythamnia candicans* Sw.		X	X	19
Yes	*Bourreria succulenta* Jacq.		X	X	15
Yes	*Bursera simaruba* (L.) Sarg.	X			1
Yes	*Capparis flexuosa* (L.) L.	X			7
Yes	*Capparis hastata* Jacq.	X			4
Yes	*Casearia decandra* Jacq.	X			5
Yes	*Chiococca alba* (L.) Hitchc.			X	2
Yes	*Erythroxylum brevipes* DC.	X			24
Yes	*Eugenia biflora* (L.) DC.	X			6
Yes	*Eugenia monticola* (Sw.) DC.	X			11
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			9
No	*Guettarda scabra* (L.) Vent.	X			NA
Yes	*Hippocratea volubilis* L.	X			6
Yes	*Lasiacis divaricata* (L.) Hitchc.	X			2
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			4
No	*Metastelma parviflorum* R. Br. ex J. A. Schultes	X			NA
Yes	*Passiflora suberosa* L.	X			3
Yes	*Randia aculeata* L.	X			4
Yes	*Samyda dodecandra* Jacq.	X			1
Yes	*Schaefferia frutescens* Jacq.	X			1
Yes	*Scleria lithosperma* (L.) Sw.		X	X	27
Yes	*Serjania polyphylla* (L.) Radlk.	X			2
No	*Tournefortia volubilis* L.	X			NA
Yes	*Tragia volubilis* L.		X	X	4
Yes	*Trichilia hirta* L.	X			3
No	*Wedelia lanceolata* DC.		X		NA
No	*Zanthoxylum martinicense* (Lam.) DC.	X			NA

TOTAL NUMBER OF SPECIES IN PLOT	22
TOTAL NUMBER OF INDIVIDUALS IN PLOT	160

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 8 OF FOREST POLYGON 10 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Anoda acerifolia* DC.	X			**NA**
Yes	*Capparis hastata* Jacq.	X			2
Yes	*Centrosema pubescens* Benth.	X			1
No	*Centrosema virginianum* (L.) Benth.		X	X	**NA**
No	*Chamaesyce hirta* (L.) Millsp.		X	X	**NA**
Yes	*Chiococca alba* (L.) Hitchc.			X	16
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			9
Yes	*Citharexylum fruticosum* L.		X	X	2
No	*Cleome spinosa* Jacq.		X	X	**NA**
Yes	*Cordia collococca* L.	X			3
No	*Delonix regia* (Bojer in Hook) Raf.	X			**NA**
Yes	*Euphorbia heterophylla* L.		X	X	5
Yes	*Gouania polygama* (Jacq.) Urban	X			1
No	*Ipomoea tiliacea* (Willd.) Choisy in DC.			X	**NA**
No	*Jatropha gossypiifolia* L.		X	X	**NA**
No	*Kallstroemia maxima* (L.) Hook & Arn.		X	X	**NA**
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	25
No	*Melochia pyramidata* L.			X	**NA**
Yes	*Merremia dissecta* (Jacq.) Hall. f.	X			1
Yes	*Panicum maximum* Jacq.		X	X	Indet.
Yes	*Phyllanthus niruri* L.		X	X	1
Yes	*Randia aculeata* L.	X			5
Yes	*Rhynchosia minima* (L.) DC.			X	2
Yes	*Sabinea florida* (Vahl.) DC.	X			7
No	*Senna bicapsularis* (L.) Roxb.	X			**NA**
No	*Sida stipularis* Cav.		X	X	**NA**
No	*Stachytarpheta jamaicensis* (L.) Vahl		X		**NA**
Yes	*Stictocardia tiliifolia* (Desr.) Hallier f.	X			10
No	*Stylosanthes hamata* (L.) Taubert in Verh.		X		**NA**
Yes	*Trichilia hirta* L.	X			4
Yes	*Trichostigma octandrum* (L.) H. Walt.		X		6
Yes	*Vigna luteola* (Jacq.) Benth.	X			1
No	*Wedelia trilobata* (L.) Hitchc.		X	X	**NA**

TOTAL NUMBER OF SPECIES IN PLOT	19
TOTAL NUMBER OF INDIVIDUALS IN PLOT	Indet.

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF FOREST POLYGON 11 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.	X			2
Yes	*Bucida buceras* L	X			1
Yes	*Capparis hastata* Jacq.	X			3
Yes	*Casearia decandra* Jacq.	X			4
Yes	*Casearia guianensis* (Aubl.) Urban	X			17
Yes	*Centrosema pubescens* Benth.		X	X	5
Yes	*Cissampelos pareira* L.		X	X	5
Yes	*Citharexylum fruticosum* L.	X			1
No	*Dalechampia scandens* L.	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			8
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			10
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			9
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	56
Yes	*Leucaena leucocephala* (Lam.) De Wit			X	3
No	*Paullinia pinnata* L.	X			**NA**
No	*Samyda dodecandra* Jacq.	X			**NA**
Yes	*Securidaca virgata* Sw.	X			2
Yes	*Serjania polyphylla* (L.) Radlk.	X			10
Yes	*Tragia volubilis* L.		X	X	8
Yes	*Trichilia hirta* L.	X			3

TOTAL NUMBER OF SPECIES IN PLOT	17
TOTAL NUMBER OF INDIVIDUALS IN PLOT	147

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 2 OF FOREST POLYGON 11 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.			X	12
Yes	*Capparis hastata* Jacq.	X			2
Yes	*Casearia decandra* Jacq.	X			3
Yes	*Casearia guianensis* (Aubl.) Urban	X			16
No	*Cordia alliodora* (R. & P.) Oken			X	**NA**
Yes	*Cupania americana* L.	X			2
Yes	*Erythroxylum brevipes* DC.	X			4
Yes	*Eugenia biflora* (L.) DC.	X			5
Yes	*Eugenia monticola* (Sw.) DC.	X			3
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			18
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			6
Yes	*Ichnanthus pallens* (Sw.) Munro		X	X	73
No	*Macfadyena unguis-cati* (L.) A. Gentry	X			**NA**
Yes	*Roystonea borinquena* O. F. Cook		X		1
Yes	*Tragia volubilis* L.		X	X	7
Yes	*Trichilia hirta* L.	X			5
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			9

TOTAL NUMBER OF SPECIES IN PLOT	15
TOTAL NUMBER OF INDIVIDUALS IN PLOT	166

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF FOREST POLYGON 11 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Bourreria succulenta* Jacq.			X	4
Yes	*Bucida buceras* L	X			3
Yes	*Bursera simaruba* (L.) Sarg.	X			2
Yes	*Capparis flexuosa* (L.) L.	X			8
Yes	*Capparis hastata* Jacq.	X			3
No	*Casearia guianensis* (Aubl.) Urban	X			**NA**
Yes	*Chiococca alba* (L.) Hitchc.		X	X	3
No	*Citharexylum fruticosum* L.	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			9
Yes	*Eugenia biflora* (L.) DC.	X			10
Yes	*Eugenia monticola* (Sw.) DC.	X			6
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			12
No	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	21
No	*Leucaena leucocephala* (Lam.) De Wit		X	X	**NA**
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			9
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			7
Yes	*Randia aculeata* L.	X			1
No	*Samyda dodecandra* Jacq.	X			**NA**
No	*Serjania polyphylla* (L.) Radlk.	X			**NA**
Yes	*Tragia volubilis* L.		X	X	11
Yes	*Trichilia hirta* L.	X			2

TOTAL NUMBER OF SPECIES IN PLOT	16
TOTAL NUMBER OF INDIVIDUALS IN PLOT	111

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 4 OF FOREST POLYGON 11 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Acacia muricata* (L.) Willd. ex L.			X	**NA**
Yes	*Bursera simaruba* (L.) Sarg.	X			4
Yes	*Casearia decandra* Jacq.	X			6
Yes	*Casearia guianensis* (Aubl.) Urban	X			10
Yes	*Cecropia schreberiana* Miq.	X			3
No	*Ceiba pentandra* (L.) Gaertn.	X			**NA**
Yes	*Cissampelos pareira* L.	X			3
No	*Commelina diffusa* Burm. f.		X	X	**NA**
Yes	*Cordia collococca* L.	X			2
Yes	*Crescentia cujete* L.	X			1
Yes	*Dalechampia scandens* L.	X			2
Yes	*Eugenia biflora* (L.) DC.	X			5
Yes	*Eugenia monticola* (Sw.) DC.	X			2
Yes	*Gonzalagunia hirsuta* (Jacq.) K. Schum.		X	X	9
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			13
No	*Hymenaea courbaril* L.	X			**NA**
Yes	*Ichnanthus pallens* (Sw.) Munro		X	X	150
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	72
Yes	*Leucaena leucocephala* (Lam.) De Wit	X			1
Yes	*Oeceoclades maculata* (Lindley) Lindley	X			6
Yes	*Passiflora suberosa* L.	X			3
No	*Paullinia pinnata* L.	X			**NA**
Yes	*Psychotria microdon* (DC.) Urban	X			2
Yes	*Randia aculeata* L.			X	5
No	*Roystonea borinquena* O. F. Cook		X	X	**NA**
Yes	*Samyda dodecandra* Jacq.	X			3
Yes	*Tragia volubilis* L.		X	X	12
No	*Trema micrantha* (L.) Blume.		X	X	**NA**
Yes	*Trichilia hirta* L.		X		11
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			4

TOTAL NUMBER OF SPECIES IN PLOT	23
TOTAL NUMBER OF INDIVIDUALS IN PLOT	329

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 7 OF FOREST POLYGON 11 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.			X	4
No	*Argythamnia candicans* Sw.		X	X	**NA**
Yes	*Bourreria succulenta* Jacq.			X	5
No	*Bucida buceras* L	X			**NA**
Yes	*Casearia decandra* Jacq.	X			5
Yes	*Casearia guianensis* (Aubl.) Urban	X			3
No	*Chiococca alba* (L.) Hitchc.		X	X	**NA**
Yes	*Erythroxylum brevipes* DC.	X			10
Yes	*Eugenia biflora* (L.) DC.	X			3
Yes	*Eugenia monticola* (Sw.) DC.	X			5
Yes	*Gonzalagunia hirsuta* (Jacq.) K. Schum.		X	X	7
Yes	*Guapira obtusata* (Jacq.) Little	X			11
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			6
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	23
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			7
Yes	*Randia aculeata* L.	X			1
Yes	*Sabicea villosa* Willd. ex R. & S.			X	4
No	*Samyda dodecandra* Jacq.	X			**NA**
Yes	*Scleria lithosperma* (L.) Sw.		X	X	9
Yes	*Tragia volubilis* L.			X	6
Yes	*Trichilia hirta* L.	X			2

TOTAL NUMBER OF SPECIES IN PLOT	17
TOTAL NUMBER OF INDIVIDUALS IN PLOT	111

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 8 OF FOREST POLYGON 11 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.	X			2
Yes	*Bourreria succulenta* Jacq.	X			3
No	*Capparis flexuosa* (L.) L.	X			**NA**
No	*Capparis hastata* Jacq.	X			**NA**
Yes	*Casearia decandra* Jacq.	X			9
Yes	*Casearia guianensis* (Aubl.) Urban	X			2
Yes	*Chiococca alba* (L.) Hitchc.		X	X	8
Yes	*Erythroxylum brevipes* DC.	X			15
Yes	*Eugenia biflora* (L.) DC.	X			9
Yes	*Eugenia monticola* (Sw.) DC.			X	4
No	*Gonzalagunia hirsuta* (Jacq.) K. Schum.		X	X	**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			4
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			4
Yes	*Hymenaea courbaril* L.	X			2
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	8
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			5
No	*Pithecellobium unguis-cati* (L.) Mart.	X			**NA**
Yes	*Randia aculeata* L.	X			4
Yes	*Sabicea villosa* Willd. ex R. & S.			X	2
Yes	*Samyda dodecandra* Jacq.	X			5
Yes	*Scleria lithosperma* (L.) Sw.		X	X	31
Yes	*Tragia volubilis* L.		X	X	7
Yes	*Trichilia hirta* L.	X			3

TOTAL NUMBER OF SPECIES IN PLOT	19
TOTAL NUMBER OF INDIVIDUALS IN PLOT	127

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF FOREST POLYGON 12 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Abrus precatorius* L.			X	NA
No	*Amphilophium paniculatum* (L.) HBK.	X			NA
Yes	*Bourreria succulenta* Jacq.		X	X	2
Yes	*Capparis flexuosa* (L.) L.	X			3
Yes	*Capparis hastata* Jacq.	X			2
Yes	*Cissampelos pareira* L.	X			1
Yes	*Cordia alliodora* (R. & P.) Oken			X	1
No	*Cordia collococca* L.	X			NA
Yes	*Erythroxylum brevipes* DC.	X			10
Yes	*Eugenia biflora* (L.) DC.	X			7
Yes	*Eugenia monticola* (Sw.) DC.	X			23
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			32
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			3
Yes	*Hymenaea courbaril* L.			X	1
No	*Ichnanthus pallens* (Sw.) Munro		X	X	NA
No	*Ipomoea triloba* L.	X			NA
No	*Lasiacis divaricata* (L.) Hitchc.	X			NA
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	3
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			9
No	*Merremia quinquefolia* (L) Hall. f.	X			NA
Yes	*Neea buxifolia* (Hook. f.) Heimerl	X			5
Yes	*Panicum maximum* Jacq.	X			7
Yes	*Randia aculeata* L.	X			1
Yes	*Rhynchosia reticulata* (Sw.) DC.	X			2
Yes	*Samyda dodecandra* Jacq.	X			3
Yes	*Serjania polyphylla* (L.) Radlk.	X			4
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			1
Yes	*Tragia volubilis* L.			X	6
No	*Trichilia hirta* L.	X			NA

TOTAL NUMBER OF SPECIES IN PLOT	21
TOTAL NUMBER OF INDIVIDUALS IN PLOT	126

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF FOREST POLYGON 12 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Bourreria succulenta* Jacq.	X			4
No	*Bursera simaruba* (L.) Sarg.	X			**NA**
Yes	*Capparis flexuosa* (L.) L.	X			7
Yes	*Capparis hastata* Jacq.	X			4
Yes	*Centrosema virginianum* (L.) Benth.	X			2
No	*Chamissoa altissima* (Jacq.) HBK.		X		**NA**
Yes	*Cissampelos pareira* L.		X	X	3
Yes	*Citharexylum fruticosum* L.			X	4
Yes	*Commelina diffusa* Burm. f.		X		22
Yes	*Erythroxylum brevipes* DC.	X			8
Yes	*Eugenia biflora* (L.) DC.	X			7
Yes	*Eugenia monticola* (Sw.) DC.	X			6
No	*Galactia dubia* DC.	X			**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			12
Yes	*Ipomoea alba* L.	X			5
Yes	*Iresine angustifolia* Euphrasén		X		7
No	*Lantana involucrata* L.		X	X	**NA**
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	6
No	*Malvastrum corchorifolium* (Desr.) Britton in Small			X	**NA**
Yes	*Mucuna urens* (L.) Medik.	X			1
Yes	*Panicum maximum* Jacq.		X	X	13
Yes	*Passiflora suberosa* L.	X			6
Yes	*Randia aculeata* L.		X	X	9
No	*Rhynchosia reticulata* (Sw.) DC.			X	**NA**
Yes	*Serjania polyphylla* (L.) Radlk.	X			3
Yes	*Stictocardia tiliifolia* (Desr.) Hallier f.	X			2
No	*Terminalia catappa* L.		X	X	**NA**
No	*Tournefortia volubilis* L.	X			**NA**
Yes	*Trichilia hirta* L.	X			3
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			5
No	*Vigna luteola* (Jacq.) Benth.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	22

TOTAL NUMBER OF INDIVIDUALS IN PLOT	139

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 4 OF FOREST POLYGON 12 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Bourreria succulenta* Jacq.	X			2
Yes	*Bursera simaruba* (L.) Sarg.	X			2
Yes	*Capparis hastata* Jacq.	X			5
No	*Casearia guianensis* (Aubl.) Urban	X			**NA**
Yes	*Cissampelos pareira* L.		X	X	3
Yes	*Citharexylum fruticosum* L.			X	5
No	*Cordia polycephala* (Lam.) I. M. Johnst.		X	X	**NA**
Yes	*Erythroxylum brevipes* DC.	X			15
Yes	*Eugenia biflora* (L.) DC.	X			3
Yes	*Eugenia monticola* (Sw.) DC.	X			8
Yes	*Galactia striata* (Jacq.) Urban			X	1
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			7
No	*Ipomoea alba* L.	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	19
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	4
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			6
No	*Miconia laevigata* (L.) DC.		X	X	**NA**
No	*Mimosa ceratonia* L.		X		**NA**
No	*Passiflora suberosa* L.	X			**NA**
No	*Psidium guajava* L.	X			**NA**
No	*Randia aculeata* L.		X	X	**NA**
Yes	*Rhynchosia reticulata* (Sw.) DC.	X			1
Yes	*Securidaca virgata* Sw.	X			1
Yes	*Serjania polyphylla* (L.) Radlk.	X			2
No	*Stictocardia tiliifolia* (Desr.) Hallier f.	X			**NA**
No	*Stizolobium pruriens* (L.) Medic.	X			**NA**
Yes	*Tragia volubilis* L.	X			9

TOTAL NUMBER OF SPECIES IN PLOT	17
TOTAL NUMBER OF INDIVIDUALS IN PLOT	93

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF FOREST POLYGON 12 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Bourreria succulenta* Jacq.			X	**NA**
No	*Capparis hastata* Jacq.	X			**NA**
No	*Centrosema pubescens* Benth.		X	X	**NA**
Yes	*Citharexylum fruticosum* L.		X	X	2
Yes	*Distictis lactiflora* (Vahl.) DC.	X			1
Yes	*Erythroxylum brevipes* DC.	X			26
Yes	*Eugenia biflora* (L.) DC.	X			4
Yes	*Eugenia monticola* (Sw.) DC.	X			11
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			2
Yes	*Ipomoea tiliacea* (Willd.) Choisy in DC.		X		1
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	3
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	6
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			8
Yes	*Passiflora suberosa* L.	X			2
Yes	*Rhynchosia minima* (L.) DC.	X			1
Yes	*Serjania polyphylla* (L.) Radlk.	X			3
Yes	*Stictocardia tiliifolia* (Desr.) Hallier f.	X			2
Yes	*Tragia volubilis* L.		X	X	10
No	*Trichilia hirta* L.	X			**NA**
Yes	*Vigna luteola* (Jacq.) Benth.	X			1

TOTAL NUMBER OF SPECIES IN PLOT	16
TOTAL NUMBER OF INDIVIDUALS IN PLOT	83

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 8 OF FOREST POLYGON 12 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Bourreria succulenta* Jacq.		X	X	**NA**
No	*Bryophyllum pinnatum* (Lam.) Oken	X			**NA**
Yes	*Bursera simaruba* (L.) Sarg.			X	2
Yes	*Casearia decandra* Jacq.	X			3
No	*Cordia alliodora* (R. & P.) Oken	X			**NA**
Yes	*Cordia collococca* L.	X			2
Yes	*Eugenia biflora* (L.) DC.	X			11
Yes	*Eugenia monticola* (Sw.) DC.	X			4
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			18
Yes	*Guettarda scabra* (L.) Vent.	X			7
Yes	*Ichnanthus pallens* (Sw.) Munro		X	X	13
No	*Lasiacis divaricata* (L.) Hitchc.			X	**NA**
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			4
No	*Neea buxifolia* (Hook. f.) Heimerl	X			**NA**
Yes	*Psychotria microdon* (DC.) Urban	X			5
Yes	*Randia aculeata* L.		X		21
Yes	*Samyda dodecandra* Jacq.	X			3
Yes	*Securidaca virgata* Sw.	X			2
Yes	*Serjania polyphylla* (L.) Radlk.	X			6
Yes	*Tabebuia heterophylla* (DC.) Britton	X			1
Yes	*Tragia volubilis* L.		X	X	12
No	*Trichilia hirta* L.	X			**NA**
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			10

TOTAL NUMBER OF SPECIES IN PLOT	17
TOTAL NUMBER OF INDIVIDUALS IN PLOT	124

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF FOREST POLYGON 13 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.	X			2
Yes	*Argythamnia candicans* Sw.		X	X	7
Yes	*Bourreria succulenta* Jacq.	X			2
Yes	*Bursera simaruba* (L.) Sarg.	X			5
No	*Capparis flexuosa* (L.) L.	X			**NA**
Yes	*Capparis hastata* Jacq.	X			7
No	*Casearia decandra* Jacq.	X			**NA**
No	*Centrosema virginianum* (L.) Benth.	X			**NA**
No	*Citharexylum fruticosum* L.	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			16
Yes	*Eugenia biflora* (L.) DC.	X			3
Yes	*Eugenia monticola* (Sw.) DC.	X			9
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			12
Yes	*Ipomoea indica* (Burman) Merr.	X			1
No	*Ipomoea tiliacea* (Willd.) Choisy in DC.	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	11
Yes	*Leucaena leucocephala* (Lam.) De Wit	X			1
No	*Macfadyena unguis-cati* (L.) A. Gentry	X			**NA**
Yes	*Passiflora suberosa* L.	X			2
Yes	*Randia aculeata* L.			X	10
No	*Samyda dodecandra* Jacq.	X			**NA**
Yes	*Scleria lithosperma* (L.) Sw.		X	X	21
Yes	*Tragia volubilis* L.		X	X	8

TOTAL NUMBER OF SPECIES IN PLOT	16
TOTAL NUMBER OF INDIVIDUALS IN PLOT	117

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 4 OF FOREST POLYGON 13 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Abrus precatorius* L.			X	**NA**
No	*Acacia farnesiana* (L.) Willd.	X			**NA**
Yes	*Argythamnia candicans* Sw.		X	X	47
Yes	*Bourreria succulenta* Jacq.			X	6
Yes	*Bursera simaruba* (L.) Sarg.	X			5
No	*Centrosema pubescens* Benth.	X			**NA**
Yes	*Erythroxylum brevipes* DC.	X			14
Yes	*Eugenia monticola* (Sw.) DC.	X			28
No	*Galactia dubia* DC.			X	**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			10
No	*Ipomoea tiliacea* (Willd.) Choisy in DC.		X	X	**NA**
No	*Krugiodendron ferreum* (Vahl) Urban	X			**NA**
No	*Lantana involucrata* L.		X	X	**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	14
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	3
No	*Panicum maximum* Jacq.		X	X	**NA**
Yes	*Randia aculeata* L.	X			2
No	*Samyda dodecandra* Jacq.	X			**NA**
Yes	*Scleria lithosperma* (L.) Sw.		X	X	35
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			1
Yes	*Tragia volubilis* L.		X	X	15
Yes	*Trichostigma octandrum* (L.) H. Walt.	X			1

TOTAL NUMBER OF SPECIES IN PLOT	13
TOTAL NUMBER OF INDIVIDUALS IN PLOT	181

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 5 OF FOREST POLYGON 13 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Abrus precatorius* L.			X	NA
Yes	*Acacia retusa* (Jacq.) Howard	X			3
Yes	*Bourreria succulenta* Jacq.	X			1
Yes	*Bursera simaruba* (L.) Sarg.	X			12
Yes	*Capparis flexuosa* (L.) L.	X			14
Yes	*Capparis hastata* Jacq.	X			7
Yes	*Centrosema pubescens* Benth.		X	X	5
Yes	*Citharexylum fruticosum* L.			X	2
No	*Distictis lactiflora* (Vahl.) DC.	X			NA
Yes	*Erythroxylum brevipes* DC.	X			9
Yes	*Eugenia biflora* (L.) DC.	X			2
Yes	*Eugenia monticola* (Sw.) DC.	X			12
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			1
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	16
Yes	*Randia aculeata* L.			X	4
Yes	*Rauvolfia nitida* Jacq.	X			3
No	*Rhynchosia reticulata* (Sw.) DC.	X			NA
Yes	*Samyda dodecandra* Jacq.	X			5
Yes	*Scleria lithosperma* (L.) Sw.		X	X	28
No	*Zanthoxylum monophyllum* (Lam.) P. Wilson			X	NA

TOTAL NUMBER OF SPECIES IN PLOT	16
TOTAL NUMBER OF INDIVIDUALS IN PLOT	124

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF FOREST POLYGON 13 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Bourreria succulenta* Jacq.	X			3
No	*Bursera simaruba* (L.) Sarg.	X			**NA**
No	*Capparis flexuosa* (L.) L.	X			**NA**
Yes	*Capparis hastata* Jacq.	X			5
No	*Casearia decandra* Jacq.	X			**NA**
No	*Casearia guianensis* (Aubl.) Urban	X			**NA**
Yes	*Cordia collococca* L.	X			1
Yes	*Erythroxylum brevipes* DC.	X			21
No	*Eugenia biflora* (L.) DC.	X			**NA**
Yes	*Eugenia monticola* (Sw.) DC.	X			13
No	*Furcraea tuberosa* (Miller) Ait. f.	X			**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			12
Yes	*Leucaena leucocephala* (Lam.) De Wit			X	7
No	*Macfadyena unguis-cati* (L.) A. Gentry	X			**NA**
No	*Passiflora suberosa* L.	X			**NA**
Yes	*Randia aculeata* L.	X			4
Yes	*Samyda dodecandra* Jacq.	X			2

TOTAL NUMBER OF SPECIES IN PLOT	9
TOTAL NUMBER OF INDIVIDUALS IN PLOT	68

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 8 OF FOREST POLYGON 13 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.	X			2
Yes	*Acacia tortuosa* (L.) Willd.		X		1
No	*Bryophyllum pinnatum* (Lam.) Oken	X			**NA**
Yes	*Bursera simaruba* (L.) Sarg.	X			5
Yes	*Casearia sylvestris* Sw.	X			1
Yes	*Chiococca alba* (L.) Hitchc.		X	X	1
No	*Cissampelos pareira* L.	X			**NA**
Yes	*Citharexylum fruticosum* L.	X			3
Yes	*Erythroxylum brevipes* DC.	X			11
Yes	*Eugenia biflora* (L.) DC.	X			3
Yes	*Eugenia monticola* (Sw.) DC.	X			17
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			15
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			2
No	*Lantana camara* L.		X	X	**NA**
No	*Lantana involucrata* L.		X	X	**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	28
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	5
No	*Melochia nodiflora* Sw.	X			**NA**
No	*Panicum maximum* Jacq.		X	X	**NA**
No	*Peltophorum pterocarpum* (DC.) Back. ex K. Heyne		X	X	**NA**
Yes	*Randia aculeata* L.	X			6
Yes	*Schaefferia frutescens* Jacq.	X			2
Yes	*Scleria lithosperma* (L.) Sw.			X	7
No	*Stictocardia tiliifolia* (Desr.) Hallier f.	X			**NA**
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			4
No	*Swietenia macrophylla* G. King	X			**NA**
Yes	*Tragia volubilis* L.		X	X	8
Yes	*Zanthoxylum martinicense* (Lam.) DC.	X			1
No	*Zebrina pendula* Schizl.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	19
TOTAL NUMBER OF INDIVIDUALS IN PLOT	122

SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF FOREST POLYGON 14 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.			X	3
Yes	*Bourreria succulenta* Jacq.	X			1
Yes	*Bursera simaruba* (L.) Sarg.	X			4
Yes	*Capparis flexuosa* (L.) L.	X			5
Yes	*Capparis hastata* Jacq.	X			10
Yes	*Casearia decandra* Jacq.	X			5
No	*Citharexylum fruticosum* L.			X	**NA**
Yes	*Cordia collococca* L.	X			1
Yes	*Erythroxylum brevipes* DC.	X			27
Yes	*Eugenia biflora* (L.) DC.				2
Yes	*Eugenia monticola* (Sw.) DC.			X	11
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			14
No	*Krugiodendron ferreum* (Vahl) Urban	X			**NA**
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	24
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	5
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			7
Yes	*Metastelma parviflorum* R. Br. ex J. A. Schultes	X			2
Yes	*Panicum maximum* Jacq.	X			3
Yes	*Randia aculeata* L.	X			1
No	*Rauvolfia nitida* Jacq.	X			**NA**
No	*Schaefferia frutescens* Jacq.	X			**NA**
Yes	*Scleria lithosperma* (L.) Sw.			X	6
Yes	*Serjania polyphylla* (L.) Radlk.	X			2
No	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			**NA**
Yes	*Tragia volubilis* L.		X	X	7

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	140

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 2 OF FOREST POLYGON 14 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Abrus precatorius* L.	X			**NA**
Yes	*Acacia retusa* (Jacq.) Howard	X			4
Yes	*Aristolochia trilobata* L.	X			1
Yes	*Bourreria succulenta* Jacq.			X	1
Yes	*Capparis flexuosa* (L.) L.		X		7
Yes	*Capparis hastata* Jacq.	X			22
No	*Casearia decandra* Jacq.	X			**NA**
No	*Casearia guianensis* (Aubl.) Urban	X			**NA**
No	*Citharexylum fruticosum* L.			X	**NA**
Yes	*Erythroxylum brevipes* DC.	X			12
Yes	*Eugenia biflora* (L.) DC.	X			9
Yes	*Eugenia monticola* (Sw.) DC.	X			10
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			8
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	27
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			11
Yes	*Oeceoclades maculata* (Lindley) Lindley	X			1
Yes	*Passiflora suberosa* L.	X			2
No	*Randia aculeata* L.		X	X	**NA**
No	*Rauvolfia nitida* Jacq.	X			**NA**
Yes	*Samyda dodecandra* Jacq.	X			1
Yes	*Schaefferia frutescens* Jacq.	X			6
Yes	*Scleria lithosperma* (L.) Sw.		X	X	18
Yes	*Serjania polyphylla* (L.) Radlk.	X			1
Yes	*Tragia volubilis* L.		X	X	15

TOTAL NUMBER OF SPECIES IN PLOT	18
TOTAL NUMBER OF INDIVIDUALS IN PLOT	156

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 4 OF FOREST POLYGON 14 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Abrus precatorius* L.	X			**NA**
Yes	*Acacia retusa* (Jacq.) Howard	X			5
Yes	*Bursera simaruba* (L.) Sarg.	X			2
No	*Capparis cynophallophora* L.			X	**NA**
Yes	*Capparis flexuosa* (L.) L.	X			11
Yes	*Capparis hastata* Jacq.	X			12
Yes	*Casearia decandra* Jacq.	X			3
No	*Centrosema pubescens* Benth.	X			**NA**
No	*Coccothrinax alta* (O. F. Cook) Becc.	X			**NA**
Yes	*Distictis lactiflora* (Vahl.) DC.	X			2
Yes	*Erythroxylum brevipes* DC.	X			15
Yes	*Eugenia monticola* (Sw.) DC.	X			4
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			20
Yes	*Leucaena leucocephala* (Lam.) De Wit			X	7
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			9
No	*Merremia quinquefolia* (L) Hall. f.			X	**NA**
No	*Panicum maximum* Jacq.		X	X	**NA**
No	*Rhynchosia reticulata* (Sw.) DC.	X			**NA**
Yes	*Schaefferia frutescens* Jacq.	X			1
No	*Senna nitida* (L. C. Rich.) Irwin & Barneby	X			**NA**
No	*Serjania polyphylla* (L.) Radlk.	X			**NA**
No	*Vigna luteola* (Jacq.) Benth.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	12
TOTAL NUMBER OF INDIVIDUALS IN PLOT	91

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 5 OF FOREST POLYGON 14 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Acacia retusa* (Jacq.) Howard	X			3
Yes	*Capparis flexuosa* (L.) L.	X			7
Yes	*Centrosema pubescens* Benth.	X			1
Yes	*Erythroxylum brevipes* DC.	X			2
Yes	*Galactia dubia* DC.	X			2
No	*Ipomoea alba* L.		X		**NA**
No	*Ipomoea tiliacea* (Willd.) Choisy in DC.	X			**NA**
No	*Lantana camara* L.		X	X	**NA**
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	33
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			27
No	*Merremia quinquefolia* (L) Hall. f.			X	**NA**
Yes	*Metastelma* cf. *lineare* Bello	X			3
Yes	*Rhynchosia reticulata* (Sw.) DC.	X			1
No	*Stictocardia tillifolia* (Desr.) Hallier f.	X			**NA**
Yes	*Trichostigma octandrum* (L.) H. Walt.		X		19

TOTAL NUMBER OF SPECIES IN PLOT	10
TOTAL NUMBER OF INDIVIDUALS IN PLOT	98

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 7 OF FOREST POLYGON 14 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Abrus precatorius* L.			X	8
Yes	*Bourreria succulenta* Jacq.	X			2
Yes	*Bursera simaruba* (L.) Sarg.	X			4
No	*Capparis cynophallophora* L.		X		**NA**
No	*Capparis flexuosa* (L.) L.	X			**NA**
Yes	*Capparis hastata* Jacq.	X			9
Yes	*Casearia decandra* Jacq.	X			1
Yes	*Cayaponia racemosa* (Mill.) Cogn. in DC.	X			1
Yes	*Ceiba pentandra* (L.) Gaertn.	X			1
Yes	*Citharexylum fruticosum* L.		X	X	2
Yes	*Commelina diffusa* Burm. f.		X	X	32
Yes	*Erythroxylum brevipes* DC.	X			17
Yes	*Eugenia biflora* (L.) DC.	X			24
Yes	*Eugenia monticola* (Sw.) DC.	X			14
Yes	*Guapira fragrans* (Dum.-Cours.) Little		X		10
Yes	*Guettarda* sp. aff. *G. ovalifolia* Urban	X			5
Yes	*Heteropteris purpurea* (L.) Kunth	X			4
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	42
No	*Macfadyena unguis-cati* (L.) A. Gentry	X			**NA**
No	*Randia aculeata* L.			X	**NA**
No	*Schaefferia frutescens* Jacq.	X			**NA**
Yes	*Tragia volubilis* L.		X		7
No	*Zanthoxylum monophyllum* (Lam.) P. Wilson			X	**NA**

TOTAL NUMBER OF SPECIES IN PLOT	17
TOTAL NUMBER OF INDIVIDUALS IN PLOT	183

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF FOREST POLYGON 15 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Acacia muricata* (L.) Willd. ex L.		X	X	2
Yes	*Acacia retusa* (Jacq.) Howard	X			4
Yes	*Amyris elemifera* L.	X			8
No	*Argythamnia fasciculata* (Vahl) Muell. Arg.		X		**NA**
Yes	*Bourreria succulenta* Jacq.	X			2
Yes	*Bucida buceras* L	X			2
Yes	*Capparis hastata* Jacq.	X			5
No	*Cayaponia racemosa* (Mill.) Cogn. in DC.	X			**NA**
Yes	*Celtis iguanaea* (Jacq.) Sarg.	X			1
No	*Chiococca alba* (L.) Hitchc.		X	X	**NA**
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			3
Yes	*Citharexylum fruticosum* L.			X	2
Yes	*Coccoloba microstachya* Willd.	X			1
Yes	*Erythroxylum brevipes* DC.	X			4
Yes	*Eugenia biflora* (L.) DC.	X			5
Yes	*Eugenia ligustrina* (Sw.) Willd.	X			9
Yes	*Eugenia* sp.	X			7
No	*Gouania polygama* (Jacq.) Urban	X			**NA**
Yes	*Guapira obtusata* (Jacq.) Little	X			3
No	*Gymnanthes lucida* Sw.	X			**NA**
Yes	*Hippocratea volubilis* L.	X			3
Yes	*Krugiodendron ferreum* (Vahl) Urban	X			1
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			5
Yes	*Neea buxifolia* (Hook.f.) Heimerl	X			4
Yes	*Plumeria alba* L.			X	1
Yes	*Randia aculeata* L.	X			1
No	*Samyda dodecandra* Jacq.	X			**NA**
Yes	*Savia sessiliflora* (Sw.) Willd.			X	6
Yes	*Schaefferia frutescens* Jacq.	X			2
No	*Scleria lithosperma* (L.) Sw.		X	X	**NA**
No	*Serjania polyphylla* (L.) Radlk.	X			**NA**
Yes	*Sesbania sericea* (Willd.) Link	X			4
Yes	*Sideroxylon obovatum* Lam.	X			1

Yes	*Tragia volubilis* L.		X	X	3

TOTAL NUMBER OF SPECIES IN PLOT	26
TOTAL NUMBER OF INDIVIDUALS IN PLOT	89

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF FOREST POLYGON 15 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Acacia retusa* (Jacq.) Howard	X			2
No	*Bourreria succulenta* Jacq.	X			**NA**
No	*Bucida buceras* L	X			**NA**
Yes	*Bursera simaruba* (L.) Sarg.	X			1
No	*Capparis hastata* Jacq.	X			**NA**
No	*Cestrum cf. laurifolium* L'Hér.	X			**NA**
Yes	*Chiococca alba* (L.) Hitchc.		X	X	2
Yes	*Commelina diffusa* Burm. f.		X	X	9
No	*Erythroxylum brevipes* DC.	X			**NA**
Yes	*Eugenia ligustrina* (Sw.) Willd.	X			9
Yes	*Eugenia* sp.	X			8
Yes	*Galactia dubia* DC.	X			1
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			14
Yes	*Gymnanthes lucida* Sw.	X			10
Yes	*Heteropteris purpurea* (L.) Kunth	X			2
Yes	*Krugiodendron ferreum* (Vahl) Urban	X			2
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			16
Yes	*Passiflora suberosa* L.	X			5
No	*Plumeria alba* L.	X			**NA**
Yes	*Randia aculeata* L.			X	2
No	*Samyda dodecandra* Jacq.	X			**NA**
Yes	*Savia sessiliflora* (Sw.) Willd.	X			4
Yes	*Scleria lithosperma* (L.) Sw.		X	X	22
Yes	*Sesbania sericea* (Willd.) Link	X			3
Yes	*Sideroxylon obovatum* Lam.	X			1
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			3
Yes	*Tragia volubilis* L.		X	X	13

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	129

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 4 OF FOREST POLYGON 15 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Acacia muricata* (L.) Willd. ex L.			X	5
Yes	*Acacia retusa* (Jacq.) Howard	X			4
No	*Amyris elemifera* L.	X			NA
Yes	*Bucida buceras* L	X			2
Yes	*Bursera simaruba* (L.) Sarg.	X			1
No	*Capparis cynophallophora* L.		X		NA
No	*Capparis flexuosa* (L.) L.	X			NA
Yes	*Capparis hastata* Jacq.	X			3
Yes	*Cayaponia racemosa* (Mill.) Cogn. in DC.	X			1
Yes	*Centrosema pubescens* Benth.			X	2
No	*Chiococca alba* (L.) Hitchc.		X	X	NA
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			6
No	*Cordia collococca* L.	X			NA
Yes	*Distictis lactiflora* (Vahl.) DC.	X			1
No	*Echinochloa colona* (L.) Link			X	NA
Yes	*Eugenia ligustrina* (Sw.) Willd.	X			7
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			4
Yes	*Gymnanthes lucida* Sw.	X			2
Yes	*Jacquinia armillaris* Jacq.			X	1
No	*Jaquinia berteroi* Spreng.	X			NA
No	*Krugiodendron ferreum* (Vahl) Urban	X			NA
No	*Lasiacis divaricata* (L.) Hitchc.		X	X	NA
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			10
Yes	*Metastelma parviflorum* R. Br. ex J. A. Schultes	X			1
Yes	*Randia aculeata* L.			X	8
Yes	*Savia sessiliflora* (Sw.) Willd.			X	11
Yes	*Scleria lithosperma* (L.) Sw.			X	5
Yes	*Serjania polyphylla* (L.) Radlk.	X			1
Yes	*Tragia volubilis* L.		X	X	9
No	*Trichostigma octandrum* (L.) H. Walt.	X			NA

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	84

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 5 OF FOREST POLYGON 15 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Acacia muricata* (L.) Willd. ex L.		X	X	14
Yes	*Acacia retusa* (Jacq.) Howard	X			4
Yes	*Argythamnia fasciculata* (Vahl) Muell. Arg.		X		6
Yes	*Bourreria succulenta* Jacq.	X			2
Yes	*Bucida buceras* L	X			3
No	*Bursera simaruba* (L.) Sarg.	X			NA
No	*Capparis cynophallophora* L.	X			NA
Yes	*Capparis flexuosa* (L.) L.	X			2
Yes	*Centrosema pubescens* Benth.			X	3
Yes	*Chiococca alba* (L.) Hitchc.		X	X	5
No	*Coccoloba diversifolia* Jacq.	X			NA
Yes	*Comocladia dodonaea* (L.) Urban	X			1
No	*Eugenia ligustrina* (Sw.) Willd.	X			NA
No	*Eugenia monticola* (Sw.) DC.	X			NA
Yes	*Eugenia* sp.	X			8
Yes	*Galactia dubia* DC.	X			1
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			9
No	*Helicteres jamaicensis* Jacq.			X	NA
Yes	*Lasiacis divaricata* (L.) Hitchc.		X	X	2
No	*Macfadyena unguis-cati* (L.) A. Gentry	X			NA
Yes	*Neea buxifolia* (Hook.f.) Heimerl	X			2
No	*Oplonia spinosa* (Jacq.) Raf.	X			NA
Yes	*Psychotria microdon* (DC.) Urban	X			4
Yes	*Randia aculeata* L.		X	X	5
Yes	*Rauvolfia nitida* Jacq.	X			1
Yes	*Samyda dodecandra* Jacq.	X			1
No	*Scleria lithosperma* (L.) Sw.		X	X	NA
No	*Smilax domingensis* Willd.	X			NA
Yes	*Stenandrium tuberosum* (L.) Urban	X			46
Yes	*Tragia volubilis* L.		X	X	11

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	130

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 6 OF FOREST POLYGON 15 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Acacia muricata* (L.) Willd. ex L.			X	4
Yes	*Acacia retusa* (Jacq.) Howard	X			2
No	*Bourreria succulenta* Jacq.		X	X	NA
Yes	*Bucida buceras* L	X			3
Yes	*Bursera simaruba* (L.) Sarg.	X			2
No	*Canella winteriana* (L.) Gaertn.	X			NA
Yes	*Capparis cynophallophora* L.	X			1
Yes	*Capparis hastata* Jacq.	X			2
Yes	*Casearia decandra* Jacq.	X			1
No	*Cissus verticillata* (L.) Nicolson & Jarvis	X			NA
No	*Coccoloba diversifolia* Jacq.	X			NA
No	*Coccothrinax alta* (O. F. Cook) Becc.	X			NA
Yes	*Commelina diffusa* Burm. f.		X	X	5
Yes	*Erythroxylum brevipes* DC.	X			3
Yes	*Eugenia ligustrina* (Sw.) Willd.	X			2
Yes	*Eugenia monticola* (Sw.) DC.	X			3
Yes	*Eugenia* sp.	X			15
No	*Gouania polygama* (Jacq.) Urban	X			NA
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			7
No	*Guapira obtusata* (Jacq.) Little	X			NA
Yes	*Guettarda elliptica* Sw.			X	1
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			3
Yes	*Neea buxifolia* (Hook.f.) Heimerl	X			1
Yes	*Pithecellobium unguis-cati* (L.) Mart.	X			1
Yes	*Randia aculeata* L.	X			4
No	*Samyda dodecandra* Jacq.	X			NA
No	*Savia sessiliflora* (Sw.) Willd.	X			NA
No	*Scleria lithosperma* (L.) Sw.			X	NA
Yes	*Serjania polyphylla* (L.) Radlk.	X			2
No	*Sesbania sericea* (Willd.) Link	X			NA
No	*Stenandrium tuberosum* (L.) Urban	X			NA
No	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			NA
Yes	*Tragia volubilis* L.			X	4

No	*Trichostigma octandrum* (L.) H. Walt.	X			**NA**
No	*Wedelia lanceolata* DC.		X	X	**NA**

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	66

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 1 OF FOREST POLYGON 16 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Bourreria succulenta* Jacq.		X	X	7
Yes	*Bursera simaruba* (L.) Sarg.	X			3
No	*Canella winteriana* (L.) Gaertn.	X			**NA**
Yes	*Capparis cynophallophora* L.	X			1
No	*Capparis hastata* Jacq.	X			**NA**
No	*Cassytha filiformis* L.		X		**NA**
No	*Citharexylum fruticosum* L.			X	**NA**
Yes	*Coccoloba microstachya* Willd.	X			4
No	*Cydista aequinoctialis* (L.) Miers	X			**NA**
No	*Eugenia biflora* (L.) DC.	X			**NA**
Yes	*Eugenia cordata* (Sw.) DC.	X			1
Yes	*Eugenia monticola* (Sw.) DC.	X			21
No	*Gouania polygama* (Jacq.) Urban	X			**NA**
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			16
Yes	*Guettarda elliptica* Sw.			X	3
No	*Guettarda scabra* (L.) Vent.	X			**NA**
Yes	*Heteropteris purpurea* (L.) Kunth	X			5
No	*Lasiacis divaricata* (L.) Hitchc.		X	X	**NA**
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			6
Yes	*Pictetia aculeata* (Vahl) Urban	X			10
Yes	*Randia aculeata* L.	X			9
No	*Samyda dodecandra* Jacq.	X			**NA**
Yes	*Scleria lithosperma* (L.) Sw.	X			2
Yes	*Tragia volubilis* L.			X	1
No	*Turbina corymbosa* (L.) Raf.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	14
TOTAL NUMBER OF INDIVIDUALS IN PLOT	89

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 2 OF FOREST POLYGON 16 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Bourreria succulenta* Jacq.	X			1
No	*Bouteloua repens* (HBK.) Scribn. & Merr.		X		**NA**
No	*Capparis cynophallophora* L.			X	**NA**
Yes	*Capparis flexuosa* (L.) L.		X		3
Yes	*Capparis hastata* Jacq.	X			6
Yes	*Chloris ciliata* Sw.			X	7
No	*Citharexylum fruticosum* L.		X	X	**NA**
No	*Colubrina arborescens* (Mill.) Sarg.	X			**NA**
No	*Cydista aequinoctialis* (L.) Miers	X			**NA**
No	*Dactyloctenium aegyptium* (L.) Beauv.			X	**NA**
Yes	*Elaeodendron xylocarpum* (Vent.) DC.	X			5
Yes	*Eustachys petraea* (Sw.) Desv.			X	2
No	*Guettarda elliptica* Sw.			X	**NA**
Yes	*Heteropteris purpurea* (L.) Kunth	X			19
No	*Jatropha gossypiifolia* L.		X	X	**NA**
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	12
No	*Panicum maximum* Jacq.		X	X	**NA**
Yes	*Pilosocereus royenii* (L.) Byles & Rowley	X			7
Yes	*Randia aculeata* L.			X	5
Yes	*Scleria lithosperma* (L.) Sw.			X	8
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			2
Yes	*Tragia volubilis* L.		X		4

TOTAL NUMBER OF SPECIES IN PLOT	13
TOTAL NUMBER OF INDIVIDUALS IN PLOT	81

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 3 OF FOREST POLYGON 16 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Bourreria succulenta* Jacq.	X			3
Yes	*Bromelia pinguin* L.	X			14
Yes	*Bursera simaruba* (L.) Sarg.	X			3
Yes	*Capparis flexuosa* (L.) L.	X			6
No	*Cenchrus incertus* M. A. Curtis			X	**NA**
No	*Chloris ciliata* Sw.		X		**NA**
No	*Coccoloba uvifera* (L.) L.	X			**NA**
Yes	*Colubrina arborescens* (Mill.) Sarg.	X			1
No	*Cordia rickseckeri* Millsp.		X		**NA**
No	*Croton lobatus* L.		X	X	**NA**
Yes	*Cydista aequinoctialis* (L.) Miers	X			3
Yes	*Dalbergia ecastaphylla* (L.) Taub.	X			2
Yes	*Distictis lactiflora* (Vahl.) DC.	X			2
Yes	*Elaeodendrum xylocarpum* (Vent.) DC.	X			5
Yes	*Erithalis fruticosa* L.		X	X	13
No	*Fimbristylis spadicea* (L.) Vahl		X	X	**NA**
No	*Gossypium hirsutum* L.			X	**NA**
Yes	*Heliotropium curassavicum* L.		X	X	1
Yes	*Ipomoea violacea* L.		X		1
No	*Leucaena leucocephala* (Lam.) De Wit		X	X	**NA**
Yes	*Macfadyena unguis-cati* (L.) A. Gentry	X			9
Yes	*Passiflora suberosa* L.	X			2
Yes	*Pictetia aculeata* (Vahl) Urban	X			9
Yes	*Randia aculeata* L.		X	X	10
No	*Sabinea florida* (Vahl.) DC.	X			**NA**
No	*Scaevola plumieri* (L.) Vahl.		X	X	**NA**
Yes	*Smilax domingensis* Willd.	X			8
No	*Spartina patens* (Ait.) Muhl.			X	**NA**
No	*Sporobolus virginicus* (L.) Kunth		X	X	**NA**
No	*Stigmaphyllon bannisterioides* (L.) C. Anderson	X			**NA**
No	*Suriana maritima* L.		X	X	**NA**
Yes	*Tabebuia heterophylla* (DC.) Britton	X			1
Yes	*Thespesia populnea* (L.) Soland ex Correa		X	X	1

Yes	*Tragia volubilis* L.		X	X	4

TOTAL NUMBER OF SPECIES IN PLOT	20
TOTAL NUMBER OF INDIVIDUALS IN PLOT	98

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 5 OF FOREST POLYGON 16 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* **NA** = not applicable

PLOT	SPECIES	St	Fl	Fr	#
No	*Bursera simaruba* (L.) Sarg.	X			**NA**
No	*Canavalia rosea* (Sw.) DC.		X	X	**NA**
Yes	*Capparis cynophallophora* L.	X			1
No	*Chloris ciliata* Sw.			X	**NA**
Yes	*Cissus verticillata* (L.) Nicolson & Jarvis	X			6
Yes	*Coccoloba uvifera* (L.) L.	X			1
No	*Cocos nucifera* L.		X	X	**NA**
Yes	*Commelina diffusa* Burm. f.		X	X	11
No	*Cordia rickseckeri* Millsp.		X	X	**NA**
No	*Croton lobatus* L.		X	X	**NA**
No	*Cydista aequinoctialis* (L.) Miers	X			**NA**
No	*Dalbergia ecastaphyllum* (L.) Taub.	X			**NA**
No	*Fimbristylis cymosa* R. Br. ssp. spathacea (Roth) Koy.		X	X	**NA**
No	*Fimbristylis spadicea* (L.) Vahl		X	X	**NA**
Yes	*Hymenocallis caribaea* (L. emend Gawl.) Herb.	X			14
Yes	*Jacquinia armillaris* Jacq.	X			2
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	9
No	*Morinda citrifolia* L.		X	X	**NA**
Yes	*Neurolaena lobata* (L.) R. Br.		X		1
Yes	*Panicum maximum* Jacq.			X	4
Yes	*Passiflora suberosa* L.	X			5
No	*Pictetia aculeata* (Vahl) Urban	X			**NA**
No	*Rhynchospora fascicularis* (Michx.) Vahl.		X	X	**NA**
No	*Sesuvium portulacastrum* (L.) L.		X	X	**NA**
No	*Spartina patens* (Ait.) Muhl.		X	X	**NA**
No	*Sporobolus virginicus* (L.) Kunth		X	X	**NA**
Yes	*Stigmaphyllon emarginatum* (Cav.) A. Juss.	X			1
No	*Stylosanthes hamata* (L.) Taubert in Verh.		X	X	**NA**
No	*Tabebuia heterophylla* (DC.) Britton	X			**NA**
Yes	*Terminalia catappa* L.			X	3
Yes	*Thespesia populnea* (L.) Soland ex Correa		X	X	12
Yes	*Tournefortia volubilis* L.		X		2
No	*Wedelia lanceolata* DC.		X		**NA**

No	*Wedelia trilobata* (L.) Hitch.	X			**NA**

TOTAL NUMBER OF SPECIES IN PLOT	14
TOTAL NUMBER OF INDIVIDUALS IN PLOT	72

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

LIST OF ALL VASCULAR PLANTS RECORDED IN PLOT 8 OF FOREST POLYGON 16 AND ITS NEAR VICINITY*

INCLUDES PHENOLOGY AND NUMBER OF INDIVIDUALS OF EACH SPECIES (#) FOUND IN PLOT

Presence in PLOT: Yes = *present within the limits of plot*; No = *not present in plot but recorded in its near vicinity.*
Phenology: St = *sterile*; Fl = *with flowers*; Fr = *with fruits* NA = not applicable

PLOT	SPECIES	St	Fl	Fr	#
Yes	*Bursera simaruba* (L.) Sarg.	X			4
Yes	*Capparis flexuosa* (L.) L.		X		5
No	*Capparis hastata* Jacq.	X			NA
No	*Casearia guianensis* (Aubl.) Urban	X			NA
Yes	*Citharexylum fruticosum* L.		X	X	3
Yes	*Coccoloba microstachya* Willd.	X			1
Yes	*Cordia polycephala* (Lam.) I. M. Johnst.		X	X	5
Yes	*Eupatorium macrophyllum* L.	X			2
Yes	*Guapira fragrans* (Dum.-Cours.) Little	X			10
Yes	*Guettarda elliptica* Sw.	X			18
No	*Guettarda scabra* (L.) Vent.	X			NA
No	*Jacquemontia pentanthos* (Jacq.) G. Don		X		NA
Yes	*Lasiacis divaricata* (L.) Hitchc.			X	9
Yes	*Leucaena leucocephala* (Lam.) De Wit		X	X	2
Yes	*Panicum maximum* Jacq.		X	X	24
No	*Pithecellobium unguis-cati* (L.) Mart.	X			NA
Yes	*Randia aculeata* L.		X		7
Yes	*Samyda dodecandra* Jacq.	X			2
No	*Scleria canescens* Boeck.		X	X	NA
No	*Scleria pterota* Presl			X	NA
Yes	*Smilax dominguensis* Willd.	X			3
Yes	*Tabebuia heterophylla* (DC.) Britton	X			1
No	*Tamarindus indica* L.	X			NA
Yes	*Tragia volubilis* L.		X	X	22
Yes	*Wedelia lanceolata* DC.	X			4

TOTAL NUMBER OF SPECIES IN PLOT	17
TOTAL NUMBER OF INDIVIDUALS IN PLOT	122

*** SEEDLINGS 1 FOOT TALL OR LESS NOT INCLUDED**

APPENDIX C

2002

APRIL 6 – DECEMBER 6

WEEKLY SEA TURTLE NESTING BEACH SURVEY RESULTS

NSRR, PUERTO RICO

Geo-Marine, Inc.
Caribbean Cinemas Building
Centro Punta Del Este, Suite 201
Fajardo, PR 00738

Weekly Sea Turtle Nesting Beach Survey Results, NSRR, Puerto Rico

N62470-95-D-1160; CTO 0055
GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
04.16.2002	Pedestrian Survey										
	Paula Trent	1300	1700	1 to 4	Cloudy/Windy	N/A	1		‡	1630	
	Carlos Laboy						2				Range closed
	Manuel Figueroa-Pagan						3				
							4				
							5				
							6				
							7				
							8				
							9				
							10		‡	1320	
							11		‡	1340	
							12		‡	1348	
							13		‡	1358	
							14		‡	1409	
							15		‡	1421	
							16		‡	1436	
							17	1	possible nest	1425	located under the *Thespesia* sp. branch. Standing on the beach facing the road, the potential nest was on the beach to the right, under the branch, before the rock. No eggs were in the nest.
							18		‡	1445	
							19		‡	1450	Consider using boat for survey
							20		‡	1600	
							21		‡	1614	
							22				
							23				
							24				
							25				
							26				
							27				
							A				
							B				
							C				
							D				
							E				
04.23.2002	Pedestrian Survey										
	Carlos Laboy	830	1330	3 to 4	Cloudy	N/A	1		‡	1230	
	Manuel Figueroa-Pagan						2				
							3				
							4				
							5				
							6				
							7				
							8				
							9				
							10		‡	0850	

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GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
04.23.2002	Pedestrian Survey: Continued						11		‡	0912	
							12		‡	0906	
							13		‡	0920	
							14		‡	0932	
							15		‡	0943	
							16		‡	0957	
							17		‡	0952	
							18		‡	1006	
							19				
							20		‡	1030	
							21		‡	1106	
							22		‡	1130	
							23				
							24				
							25				
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
04.26.2002	Boat Survey										
	Carlos Laboy	800	1130	NR	NR	Dan Wilkinson	1		‡	0830	
	Dan Wilkinson						2		‡	0848	
							3		‡	0935	
							4		‡	0938	
							5		‡	0943	
							6		‡	0945	
							7		‡	0952	
							8		‡	1000	
							9		‡	1000	
							10		‡	1004	
							11		‡	1009	
							12		‡	1005	
							13		‡	1006	
							14		‡	1015	
							15		‡	1017	
							16		‡	1026	
							17		‡	1034	
							18		‡	1039	
							19				
							20				
							21				
							22				
							23		‡	1050	

‡ = No Nest/Track Observations

UID = unidentified

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GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
04.26.2002	Boat Survey: Continued						24		‡	1053	
							25				
							26				
							27				
							A		‡	0850	
							B		‡	0850	
							C		‡	0908	
							D		‡	0915	
							E		‡	0919	
							F		‡	0930	
04.30.2002	Boat Survey										
	Carlos Laboy	740	1230	3	Cloudy/Sunny	Bill Elliott	1		‡	0821	
	Manuel Figueroa-Pagan						2		‡	0815	
							3		‡	0951	
							4		‡	0956	
							5		‡	1000	
							6		‡	1001	
							7		‡	1003	
							8		‡	1006	
							9		‡	1007	
							10		‡	1011	
							11		‡	1017	
							12		‡	1019	
							13		‡	1020	
							14		‡	1023	
							15		‡	1026	
							16		‡	1030	
							17		‡	1040	
							18		‡	1043	
							19		‡	1050	
							20		‡	1145	
							21		‡	1100	
							22		‡	1105	
							23		‡	1112	
							24		‡	1115	
							25		‡	1117	
							26		‡	1126	
							27		‡	1129	
							A		‡	0858	
							B		‡	0915	
							C		‡	0920	
							D		‡	0931	
							E		‡	0940	
							F		‡	0848	
05.03.2002	Pedestrian Survey										
	Carlos Laboy	500	1000	2 to 3	Sunny	N/A	1-A		‡	0900	
	Manuel Figueroa-Pagan						1-B		‡	0944	

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GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
05.03.2002	Pedestrian Survey: Continued						2				
							3				
							4				
							5				
							6				
							7				
							8				
							9				
							10		‡	0836	
							11		‡	0801	
							12		‡	0801	
							13		‡	0758	
							14		‡	0742	
							15		‡	0724	
							16		‡	0728	
							17		‡	0724	
							18		‡	0706	
							19				
							20		‡	0650	
							21		‡	0622	
							22		‡	0515	
							23				
							24				
							25				
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
05.07.2002	Boat Survey										
	Carlos Laboy	800	1115	3 to 5	Rainy/Cloudy/Sunny	Jim Veiga	1-A				
	Manuel Figueroa-Pagan						1-B		‡	0830	
							2	1	track	0854	Unidentified sea turtle track
							3		‡	0954	
							4		‡	0954	
							5		‡	0954	
							6		‡	0957	
							7				Islas de Cabras Range closed for exercises
							8				Islas de Cabras Range closed for exercises
							9				Islas de Cabras Range closed for exercises
							10				Islas de Cabras Range closed for exercises
							11				Islas de Cabras Range closed for exercises
							12				Islas de Cabras Range closed for exercises
							13				Islas de Cabras Range closed for exercises

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GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
05.07.2002	Boat Survey: Continued						14				Islas de Cabras Range closed for exercises
							15				Islas de Cabras Range closed for exercises
							16				Islas de Cabras Range closed for exercises
							17				Islas de Cabras Range closed for exercises
							18				Islas de Cabras Range closed for exercises
							19				
							20		‡	1049	
							21				
							22				
							23		‡	1035	
							24		‡	1029	
							25		‡	1024	
							26		‡	1009	
							27		‡	1001	
							A		‡	0905	
							B		‡	0916	
							C		‡	0923	
							D		‡	0930	
							E		‡	0936	
							F		‡	0947	
05.10.2002	Pedestrian Survey										
	Carlos Laboy	845	1400	3 to 4	Cloudy	N/A	1-A		‡	1300	
	Manuel Figueroa-Pagan						1-B		‡	1340	
	Winston Martinez [NSRR-PWD]						2				
							3				
							4				
							5				
							6				
							7				
							8				
							9				
							10		‡	0850	
							11		‡	0914	
							12		‡	0915	
							13		‡	0924	
							14		‡	0934	Winston was walking with the observers up to Beach 14 and then it was necessary for him to return to his office.
							15		‡	0940	
							16		‡	0945	
							17		‡	0940	
							18		‡	0955	
							19		‡	1013	
							20				
							21		‡	1020	
							22		‡	1045	
							23		‡	1054	
							24		‡	1109	

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
05.10.2002	Pedestrian Survey: Continued						25		‡	1130	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
05.14.2002	Boat Survey										
	Melissa Lopez-Rodriguez	815	1147	3 to 4	Cloudy	Bill Elliott	1-A				
	Manuel Figueroa-Pagan						1-B		‡	0856	
							2	1	track	0909	Possible Hawksbill
							3		‡	1000	
							4		‡	1000	
							5		‡	1005	
							6		‡	1009	
							7		‡	1009	
							8		‡	1013	
							9		‡	1017	
							10		‡	1019	
							11		‡	1023	
							12		‡	1023	
							13		‡	1026	
							14		‡	1027	
							15		‡	1031	
							16		‡	1032	
							17		‡	1040	
							18		‡	1042	
							19		‡	1048	
							20				
							21				
							22				
							23		‡	1057	
							24		‡	1058	
							25		‡	1100	
							26		‡	1107	
							27		‡	1110	
							A		‡	0917	
							B		‡	0928	
							C		‡	0935	
							D		‡	0945	
							E		‡	0957	
							F		‡	0847	
05.19.2002	Pedestrian Survey										
	Melissa Lopez-Rodriguez	730	1145	2 to 3	Sunny/Cloudy	N/A	1		‡	1100	1123: One foraging YSBB (1); □□□□□□□□ó□□□□□□□□□□□□□□í□□□□□□ found with 3 eggs
	Manuel Figueroa-Pagan										

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Weekly Sea Turtle Nesting Beach Survey Results, NSRR, Puerto Rico

N62470-95-D-1160; CTO 0055
GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
05.19.2002	Pedestrian Survey: Continued						2				
							3				
							4				
							5				
							6				
							7				
							8				
							9				
							10		‡	0734	
							11		‡	0748	
							12		‡	0748	
							13				
							14		‡	0808	Large amounts of trash and plastics on the beach.
							15		‡	0833	
							16		‡	0840	Tide very rough
							17		‡	0833	
							18				
							19				
							20		‡	0853	3 American oystercatchers foraging at the end of the shore.
							21		‡	0922	
							22		‡	0932	
							23		‡	0959	
							24		‡	0916	
							25		‡	1000	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
05.21.2002	Boat Survey Melissa Lopez-Rodriguez Manuel Figueroa-Pagan	730	1125	3 to 4	Cloudy	Jim Veiga	1		‡	0806	
							2		‡	0822	Checked scrap on beach
							3		‡	0918	
							4		‡	0923	Abundance of *Thalassia sp.* and Syringodium sp. on the beach
							5		‡	0924	
							6		‡	0925	
							7		‡	0931	
							8		‡	0935	
							9		‡	0936	
							10		‡	0938	
							11		‡	0943	
							12		‡	0943	
							13		‡	0946	
							14		‡	0948	

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GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
05.21.2002	Boat Survey: Continued						15		‡	0950	
							16		‡	0953	
							17		‡	1001	
							18		‡	1003	
							19		‡	1010	One yellowed-crowned night heron roosting on the beach
							20				
							21				
							22		‡	1018	
							23		‡	1054	
							24		‡	1051	
							25		‡	1046	
							26		‡	1038	
							27		‡	1031	
							A		‡	0833	
							B		‡	0849	
							C		‡	0855	
							D		‡	0903	
							E		‡	0907	
							F		‡	0752	
05.24.2002	Pedestrian Survey										
	Carlos Laboy	0650	1340	4	Sunny/Cloudy	N/A	1		‡	1249	
	Melissa Lopez-Rodriguez						2	3	false nests	0652	Other holes in sand—not turtle nests. GPS recorded by Winston Martinez and Jose Montalvo.
							3			0755	High tide
							4				
							5				
							6				
							7				
							8				
							9				
							10				
							11		‡	0811	
							12		‡	0811	Asbestos/ACM was found and identified by Jose Montalvo. Jose returned to his office.
							13		‡	0916	
							14		‡	0927	
							15		‡	0947	Holes in the sand; not sea turtle nests or tracks
							16		‡	0955	
							17		‡	0947	
							18		‡	1004	
							19				
							20		‡	1020	
							21		‡	1048	
							22		‡	1100	
							23		‡	1118	
							24		‡	1125	
							25		‡	1125	

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
05.24.2002	Pedestrian Survey: Continued						26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
05.28.2002	Boat Survey										
	Melissa Lopez-Rodriguez	0645	1115	2	Sunny	Jim Veiga	1		‡	0741	Observed black-bellied plover
	Manuel Figueroa-Pagan						2	1	track	0758	
							3		‡	0844	A lot of garbage on the beach
							4		‡	0849	Rocky beach
							5		‡	0850	
							6		‡	0852	Rocky beach
							7		‡	0855	
							8		‡	0900	
							9		‡	0903	
							10		‡	0905	
							11		‡	0913	
							12		‡	0915	
							13		‡	0916	A small portion of sand, adjacent to Beach 13, is prime location for potential Hawksbill nesting
							14		‡	0920	
							15		‡	0924	People on the beach
							16		‡	0927	
							17		‡	0933	
							18		‡	0936	
							19		‡	0943	
							20				
							21				
							22		‡	1029	
							23		‡	0957	
							24		‡	1000	
							25		‡	1001	
							26		‡	1008	
							27		‡	1011	
							A		‡	0806	
							B		‡	0819	
							C		‡	0824	
							D		‡	0832	
							E		‡	0837	
							F		‡	0730	
05.31.2002	Pedestrian Survey										
	Manuel Figueroa-Pagan	0736	1145	3 to 4	Cloudy	N/A	1		‡	0741	0814: One pair YSBB observed; flew SE of Beach 1
	Melissa Lopez-Rodriguez						2				
							3				

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05.31.2002	Pedestrian Survey: Continued						4				
							5				
							6				
							7				
							8				
							9				
							10		‡	0850	Great Egret foraging on the beach
							11		‡	0907	Motorcycle and car traffic on the beach; wheel marks in sand
							12		‡	0915	Suspected asbestos sheet still on the beach
							13		‡	0918	One juvenile brown pelican flew east over the beach
							14		‡	0931	
							15		‡	0958	One orange flagging found in Cocoloba tree
							16		‡	1006	
							17		‡	0958	
							18	2	Hawksbill	0943	One true nest and one false nest
							19				
							20		‡	1136	
							21		‡	1114	
							22		‡	1100	
							23				
							24				
							25		‡	1037	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
06.04.2002	Boat Survey										
	Melissa Lopez-Rodriguez Manuel Figueroa-Pagan	0750	1115	1 to 2	Rain/Cloudy	Jim Veiga	1		‡	0816	
							2		‡	0837	
							3		‡	0921	Reddish egret foraging on the water
							4		‡	0926	
							5		‡	0928	White-cheeked pintail foraging of the beach
							6		‡	0930	
							7		‡	0934	
							8		‡	0937	
							9		‡	0939	
							10		‡	0948	
							11		‡	0946	
							12		‡	0946	
							13		‡	0940	
							14		‡	0953	
							15		‡	0957	Scrap check
							16		‡	1002	

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06.04.2002	Boat Survey: Continued						17		‡	1010	
							18	1	UID	1012	Possible nest
							19		‡	1022	
							20				
							21				
							22		‡		
							23		‡	1032	
							24		‡	1036	
							25		‡	1039	Two reddish egrets mate on a nearby rock
							26		‡	1047	
							27		‡	1052	
							A		‡	0840	Human activity across the beach
							B		‡	0851	Footprints on the beach
							C		‡	0857	
							D		‡	0909	
							E		‡	0913	
							F		‡	0804	
06.07.2002	Pedestrian Survey Manuel Figueroa-Pagan Melissa Lopez-Rodriguez	0736	1145	2 to 3	Sunny	N/A	1		‡	0803	Two (2) new Wilson Plover nests with 3 eggs each
							2				
							3				
							4				
							5				
							6				
							7				
							8				
							9				
							10		‡	1200	Two jellyfish dead on the beach
							11		‡	1148	
							12		‡	1148	
							13		‡	1142	
							14		‡	1135	A lot of seagrass on half of the beach
							15		‡	1120	People on the beach
							16		‡	1130	
							17		‡	1120	People on the beach
							18		‡	1111	
							19				
							20		‡	1036	Jellyfish dead on the beach
							21		‡	0958	
							22		‡	1008	Sandwich plastics bags on the beach
							23				
							24				
							25		‡	0940	Sandwich plastic bags on the beach
							26				
							27				
							A				
							B				

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
06.07.2002	Pedestrian Survey: Continued						C				
							D				
							E				
							F				
06.11.2002	Boat Survey										
	Melissa Lopez-Rodriguez	0630	1230	2 to 3	Sunny	Bill Elliott	1		‡	0808	0815: Two YSBB flew over the mangrove toward the north
	Manuel Figueroa-Pagan						2		‡	0822	
							3		‡	0914	3 Black-necked stilts foraging on the beach and in the water
							4		‡	0921	
							5		‡	0921	
							6		‡	0925	
							7		‡	0928	
							8		‡	0932	
							9		‡	0932	
							10		‡	0936	
							11		‡	0940	
							12		‡	0940	
							13		‡	0943	
							14		‡	0946	
							15		‡	0950	
							16		‡	0953	
							17		‡	1001	
							18		‡	1003	
							19		‡	1015	2 little blue heron on the water
							20				
							21				
							22		‡	1024	
							23		‡	1031	
							24		‡	1033	
							25		‡	1036	
							26		‡	1041	
							27		‡	1044	
							A		‡	0829	
							B		‡	0845	
							C		‡	0853	
							D		‡	0901	
							E		‡	0905	
							F		‡	0757	
06.14.2002	Pedestrian Survey										
	Manuel Figueroa-Pagan	0600	1100	2 to 3	Sunny	N/A	1		‡	0622	Both Wilson Plover nests remain on the beach, no hatchlings
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5				
							6				
							7				
							8				

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
06.14.2002	Pedestrian Survey: Continued						9				
							10		‡	0943	
							11		‡	0954	Children playing on the sand
							12		‡	0954	Children playing on the sand
							13		‡	1002	
							14		‡	1015	4 Ruddy Turnstones on the beach
							15		‡	1048	
							16		‡	1054	
							17		‡	1048	
							18		‡	1025	
							19				
							20		‡	0930	
							21		‡	0848	Sand was moved with a digger truck
							22		‡	0835	
							23				
							24				
							25		‡	0900	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
06.18.2002	Pedestrian Survey										
	Manuel Figueroa-Pagan Melissa Lopez-Rodriguez	0600	1200	3 to 4	Cloudy/Rain	N/A	1		‡	0619	Syringodium and Thalassia on the beach
							2				
							3				
							4				
							5				
							6				
							7				
							8				
							9				
							10		‡	0721	
							11		‡	0735	
							12		‡	0735	
							13		‡	0745	
							14		‡	0752	2-foot wall of Syringodium and Thalassia on the beach
							15		‡	0804	
							16		‡	0814	Greater Antillean Grackle nest found on the ground with one dead chick
							17		‡	0804	
							18		‡	0822	
							19				
							20		‡	0844	

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
06.18.2002	Pedestrian Survey: Continued						21		‡	0949	
							22		‡	0939	
							23				
							24				
							25		‡	1000	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
06.21.2002	Pedestrian Survey Melissa Lopez-Rodriguez Carlos Laboy	0600	1100	6	Wind/Rain/Thunder	N/A	1		‡	0627	High tide covering the shoreline
							2				
							3				
							4				
							5				
							6				
							7				
							8				
							9				
							10		‡	0837	
							11		‡	0935	
							12		‡	0935	
							13		‡	0927	
							14		‡	0917	
							15		‡	0857	
							16		‡	0853	
							17		‡	0857	
							18		‡	0904	
							19				
							20		‡	0947	
							21		‡	0804	
							22		‡	0748	
							23		‡	1020	
							24				
							25		‡	0814	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
06.25.2002	Boat Survey										
	Melissa Lopez-Rodriguez	0611	0930	3 to 4	Partly Cloudy/Sunny	Bill Elliott	1		‡	0640	
	Manuel Figueroa-Pagan						2		‡	0653	
							3		‡	0743	
							4		‡	0740	
							5		‡	0749	
							6		‡	0749	
							7		‡	0753	
							8		‡	0756	
							9		‡	0756	
							10		‡	0759	
							11		‡	0803	
							12		‡	0803	
							13		‡	0806	
							14		‡	0809	
							15		‡	0812	
							16		‡	0816	
							17		‡	0822	Sandbag on the shoreline
							18		‡	0825	
							19		‡	0832	Two juvenile brown pelicans floating on the water
							20				
							21				
							22		‡	0841	
							23		‡	0847	Two juvenile brown pelicans on the water inside the cay.
							24		‡	0847	Two juvenile brown pelicans on the water inside the cay.
							25		‡	0847	Two juvenile brown pelicans on the water inside the cay.
							26		‡	0858	
							27		‡	0858	
							A		‡	0659	
							B	2	UID nests	0713	Nest 1: Located in the center of Beach B near a tree trunk. The nest passes in from of the tree trunk. Nest 2: Located in the northeast portion of the beach
							C		‡	0726	
							D		‡	0731	
							E		‡	0736	
							F		‡	0630	
06.28.2002	Boat Survey										
	Melissa Lopez-Rodriguez	0615	0920	3 to 4	Partly Cloudy	Bill Elliott	1		‡	0639	
	Manuel Figueroa-Pagan						2		‡	0653	
							3		‡	0738	
							4		‡	0744	
							5		‡	0745	
							6		‡	0745	
							7		‡	0749	
							8		‡	0752	
							9		‡	0752	
							10		‡	0756	

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06.28.2002	Boat Survey: Continued						11		‡	0759	
							12		‡	0759	
							13		‡	0803	
							14		‡	0805	
							15		‡	0810	
							16		‡	0814	
							17		‡	0821	
							18		‡	0823	
							19		‡	0829	
							20				
							21				
							22		‡	0839	
							23		‡	0847	
							24		‡	0847	
							25		‡	0847	
							26		‡	0858	
							27		‡	0901	
							A		‡	0700	
							B		‡	0712	
							C		‡	0719	
							D		‡	0726	
							E		‡	0730	
							F		‡	0628	
07.02.2002	Boat Survey										
	Melissa Lopez-Rodriguez Carlos Laboy	0614	1010	3 to 4	Sunny/Cloudy	Bill Elliott	1		‡	0704	
							2		‡	0717	
							3		‡	0811	
							4		‡	0820	Beach covered with rocks; no sand
							5		‡	0820	
							6		‡	0823	Rocky beach, no sand
							7		‡	0826	
							8		‡	0829	
							9		‡	0832	
							10		‡	0835	
							11		‡	0840	
							12		‡	0842	
							13		‡	0844	
							14		‡	0847	
							15		‡	0850	
							16		‡	0854	
							17		‡	0901	
							18		‡	0903	
							19		‡	0910	
							20				
							21				
							22		‡	0920	
							23		‡	0926	

‡ = No Nest/Track Observations

UID = unidentified

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07.02.2002	Boat Survey: Continued						24		‡	0926	
							25		‡	0926	
							26		‡	0937	
							27		‡	0940	
							A		‡	0724	
							B		‡	0739	
							C		‡	0744	Very difficult to see from the boat because of the coral reefs and boulders along the coastline.
							D		‡	0752	
							E		‡	0756	
							F		‡	0652	
07.05.2002	Pedestrian Survey Manuel Figueroa-Pagan Melissa Lopez-Rodriguez	0656	1045	2 to34	Sunny	N/A	1		‡	0658	
							2				
							3				
							4				
							5				
							6				
							7				
							8				
							9				
							10		‡	0909	
							11		‡	1003	
							12		‡	1003	
							13		‡	0959	
							14		‡	0946	
							15		‡	0924	
							16		‡	0930	
							17		‡	0927	
							18		‡	0936	
							19				
							20		‡	1015	
							21		‡	0840	
							22		‡	0828	
							23				
							24				
							25		‡	0853	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				

‡ = No Nest/Track Observations

UID = unidentified

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07.09.2002	**Boat Survey**										
	Melissa Lopez-Rodriguez	0620	0940	2 to 3	Sunny/Cloudy	Bill Elliott	1		‡	0655	
	Manuel Figueroa-Pagan						2	1	UID	0707	Track: In front of a small roofed building almost in the middle of the grassy area of beach [northwest]
							3		‡	0757	
							4		‡	0802	
							5		‡	0802	
							6		‡	0807	
							7		‡	0811	
							8		‡	0813	
							9		‡	0813	
							10		‡	0817	
							11		‡	0822	
							12		‡	0822	
							13		‡	0825	
							14		‡	0828	
							15		‡	0832	
							16		‡	0836	**0840:** Two bottlenose dolphins east of Cabra's Island
							17		‡	0841	
							18	2	UID	0843	Nests: Both were under trees (*Thespesia populnea)*
							19		‡	0850	
							20				
							21				
							22		‡	0858	
							23		‡	0904	
							24		‡	0904	
							25		‡	0909	
							26		‡	0915	
							27		‡	0918	
							A		‡	0715	
							B		‡	0728	
							C		‡	0735	
							D		‡	0742	
							E		‡	0746	Two (2) white-cheeked pintail's roosting on the beach
							F		‡	0640	
07.12.2002	**Pedestrian Survey**										
	Manuel Figueroa-Pagan	0530	0942	2 to34	Cloudy	N/A	1		‡	0732	
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5				
							6				
							7				
							8				
							9		‡	0650	
							10		‡	0659	
							11		‡	0631	Tire tracks on the sand

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Weekly Sea Turtle Nesting Beach Survey Results, NSRR, Puerto Rico

N62470-95-D-1160; CTO 0055
GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
07.12.2002	Pedestrian Survey						12	1	UID	0638	Nest: In open area
							13		‡	0626	
							14		‡	0616	
							15		‡	0554	
							16		‡	0545	
							17		‡	0554	
							18		‡	0602	Yellow-night crowned on the beach
							19				
							20		‡	0711	
							21		‡	0913	One YSBB in flight to the north toward the mangrove area
							22		‡	0858	
							23				
							24				
							25		‡	0840	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
07.16.2002	Boat Survey										
	Melissa Lopez-Rodriguez Manuel Figueroa-Pagan	0620	1000	2 to 3	Sunny/ Clouds/Rain	Bill Elliott	1		‡	0705	
							2		‡	0719	
							3		‡	0812	
							4		‡	0818	
							5		‡	0820	Brown Pelican inin flight over the beach toward the north
							6		‡	0821	
							7		‡	0822	
							8		‡	0825	
							9		‡	0826	One Reddish Egret
							10		‡	0830	One Reddish Egret
							11		‡	0835	
							12		‡	0835	
							13		‡	0838	
							14		‡	0842	
							15		‡	0847	
							16		‡	0851	
							17		‡	0857	
							18	3	UID	0900	Nest: One nest was under a palm tree and the other two were under *Thespesia populnea* trees
							19		‡	0912	Began to rain
							20				
							21				
							22		‡	0920	
							23		‡	0927	

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
07.16.2002	Boat Survey: Continued						24		‡	0930	
							25		‡	0937	
							26		‡	0938	
							27		‡	0943	
							A		‡	0727	
							B		‡	0736	
							C		‡	0739	
							D		‡	0746	11 Laughing Gulls in flight to the east 07 Brown Pelicans
							E		‡	0800	
							F		‡	0652	
07.19.2002	Pedestrian Survey Manuel Figueroa-Pagan Melissa Lopez-Rodriguez	0530	1230	1 to 2	Cloudy	N/A	1		‡	0925	
							2				
							3				
							4				
							5				
							6				
							7				
							8				
							9		‡		
							10		‡	0854	
							11		‡	0840	
							12		‡	0832	
							13		‡	0832	
							14		‡	0822	
							15		‡	0809	
							16		‡	0815	
							17		‡	0809	
							18	4	Hawksbill	0704	Three (3) new nests and one (1) track were observed. This is in addition to the 3 nests observed during the Tuesday boat survey. The 3 new nests were marked with flagging. All of these were under *Thespesia populnea* and *Terminalia catappa* trees.
							19				
							20		‡	0625	
							21		‡	1046	
							22		‡	1050	
							23				
							24				
							25		‡	1020	
							26				
							27				
							A				
							B				
							C				
							D				

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07.19.2002	Pedestrian Survey: Continued						E				
							F				
07.23.2002	Boat Survey										
	Melissa Lopez-Rodriguez	0730	1330	4 to 5	Sunny/Partly Cloudy	Bill Elliott	1		‡	0915	High tide
	Manuel Figueroa-Pagan						2		‡	0927	
							3		‡	1005	
							4		‡	1010	
							5		‡	1010	
							6		‡	1013	
							7		‡	1016	
							8		‡	1018	
							9		‡	1019	
							10		‡	1023	
							11		‡	1027	
							12		‡	1027	
							13		‡	1031	
							14		‡	1034	
							15		‡	1038	
							16		‡	1041	
							17		‡	1047	
							18		‡	1050	
							19		‡	1057	
							20				
							21				
							22		‡	1106	
							23		‡	1112	Two (2) juvenile Brown Pelicans flew to the south side of the beach
							24		‡	1112	
							25		‡	1117	
							26		‡	1123	
							27		‡	1127	
							A		‡	0933	
							B		‡	0943	
							C		‡	0948	Sea state 4 to 5; very strong seas; poor stability
							D		‡	0953	
							E		‡	0957	One Greater Yellowlegs observed foraging on the beach
							F		‡	0903	
07.25 .2002	Pedestrian Survey										
	Manuel Figueroa-Pagan	0530	1230	3 to 4	Sunny	N/A	1		‡	0625	American Oystercatcher foraging on the beach
	Carlos Laboy						2				
							3				
	Note: Pedestrian turtle survey conducted today in lieu of Vieques Roseate Tern survey [CTO 0015] because of rough sea state [8 to 10 seas]						4				
							5				
							6				
							7				
							8				

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
07.25 .2002	Pedestrian Survey: Continued						9		‡		
							10		‡	0841	One Yellow-crowned Night-Heron
							11		‡	0830	
							12		‡	0822	
							13		‡	0822	
							14		‡	0812	
							15		‡	0754	One Yellow-crowned Night-Heron
							16	1	Leatherback	0804	Track
							17		‡	0754	
							18	1	Hawksbill	0743	Nest: Mangrove Cuckoo
							19				
							20		‡	0715	
							21		‡	1007	
							22		‡	1022	
							23			1029	
							24			1038	
							25		‡	0930	
							26				
							27				
							A				
							B				
							C				
							D				
							F				
07.30.2002	Pedestrian Survey Manuel Figueroa-Pagan Melissa Lopez-Rodriguez	0625	1230	1 to 2	Sunny	N/A	1		‡	0627	Large amounts of algae on the shoreline
							2				
							3				
							4		‡	0721	
							5		‡	0721	
							6		‡	0745	
							7		‡	0755	
							8				
							9		‡		
							10		‡	1101	
							11		‡	0955	
							12		‡	0953	
							13		‡	0953	
							14		‡	0937	
							15		‡	0921	
							16		‡	0928	
							17		‡	0921	
							18	3	Hawksbill	0840	Three (3) nests; one predated probably by mongoose
							19				
							20		‡	1118	
							21		‡	1207	
							22		‡	1157	

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
07.30.2002	Pedestrian Survey: Continued						23		‡	1152	
							24		‡	1149	
							25		‡	1139	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
08.02.2002	Boat Survey										
	Melissa Lopez-Rodriguez Manuel Figueroa-Pagan	0611	1015	1	Sunny	Bill Elliott	1		‡	0650	
							2		‡	0702	
							3		‡	0759	
							4		‡	0804	
							5		‡	0806	
							6		‡	0809	
							7		‡	0812	
							8		‡	0816	
							9		‡	0817	
							10		‡	0823	
							11		‡	0826	
							12		‡	0826	
							13		‡	0830	
							14		‡	0833	
							15		‡	0838	
							16		‡	0842	
							17		‡	0846	
							18		‡	0850	
							19		‡	0856	
							20				
							21				
							22		‡	0906	
							23		‡	0912	
							24		‡	0915	
							25		‡	0917	
							26				
							27				
							A	1	Hawksbill	0712	Track
							B	1	UID	0725	Track
							C		‡	0732	One (1) UID sea turtle floating
							D		‡	0740	One (1) Great Blue Heron roosting on the rock
							E		‡	0748	
							F		‡	0642	Two (2) UID sea turtles floating

‡ = No Nest/Track Observations

UID = unidentified

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
08.06.2002	Boat Survey										
	Melissa Lopez-Rodriguez	0624	0935	1 to 2	Sunny	Bill Elliott	1		‡	0656	
	Manuel Figueroa-Pagan						2	1	Hawksbill	0708	Nest
							3		‡	0756	
							4		‡	0800	
							5		‡	0802	
							6		‡	0806	
							7		‡	0808	
							8		‡	0810	
							9		‡	0810	
							10		‡	0813	
							11		‡	0817	
							12		‡	0817	
							13		‡	0820	
							14		‡	0823	
							15		‡	0828	
							16		‡	0831	
							17		‡	0837	
							18		‡	0840	
							19		‡	0848	
							20				
							21				
							22		‡	0854	
							23		‡	0859	
							24		‡	0902	
							25		‡	0908	
							A		‡	0715	
							B		‡	0727	
							C		‡	0733	
							D		‡	0740	
							E		‡	0748	
							F	1	UID	0644	Track
08.08.2002	Pedestrian Survey										
	Manuel Figueroa-Pagan	0612	1045	2 to 3	Partly Cloudy	N/A	1		‡	0620	
	Melissa Lopez-Rodriguez						2				
							3				
							4		‡	0716	
							5		‡	0716	
							6		‡	0716	
							7		‡	0716	
							8				
							9		‡		
							10		‡	0806	High tide
							11		‡	0922	
							12		‡	0914	
							13		‡	0914	
							14		‡	0907	

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08.08.2002	Pedestrian Survey: Continued						15	3	Hawksbill	0825	Nest: Three new nests located under three different Coccoloba
							16		‡	0820	
							17		‡	0830	
							18	1	Hawksbill	0844	Nest: Located under a *Thespesia populnea* tree; covered with the trees *branches*
							19				
							20		‡	0928	
							21		‡	1024	
							22		‡	1011	
							23		‡	1006	
							24		‡	1002	
							25		‡	0954	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
08.13.2002	Boat Survey										
	Melissa Lopez-Rodriguez Manuel Figueroa-Pagan	0610	0935	2 to 3	Sunny	Bill Elliott	1		‡	0654	
							2		‡	0708	
							3		‡	0752	
							4		‡	0756	
							5		‡	0756	
							6		‡	0759	
							7		‡	0801	
							8		‡	0804	
							9		‡	0804	
							10		‡	0807	
							11		‡	0811	Suspected asbestos material
							12		‡	0811	
							13		‡	0814	
							14		‡	0818	
							15		‡	0822	
							16		‡	0826	Rain began
							17		‡	0832	Rain stopped
							18	2	Hawksbill	0834	Nests: Two old nests confirmed on 12 August 2002
							19		‡	0842	
							20				
							21				
							22		‡	0849	
							23		‡	0854	
							24		‡	0858	
							25		‡	0900	
							A		‡	0715	

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08.13.2002	Boat Survey: Continued						B		‡	0726	
							C		‡	0732	
							D		‡	0737	
							E		‡	0743	Green Turtle: Underwater swimming to the northwest
							F		‡	0640	
08.16.2002	Pedestrian Survey										
	Manuel Figueroa-Pagan	0625	1000	3 to 4	Cloudy/Rain	N/A	1		‡	0635	
	Melissa Lopez-Rodriguez						2				
							3				
							4		‡		
							5		‡		Not surveyed: Steep trail dangerous; rain and slick
							6		‡		Not surveyed: Steep trail dangerous; rain and slick
							7		‡	0730	
							8				
							9				
							10		‡	0750	
							11		‡	0843	Tire tracks on beach
							12		‡	0843	
							13		‡	0843	
							14		‡	0829	
							15		‡	0803	Entrance to Beaches 15, 16, and 17 was closed; sign at gate read Filam MTG is relocated at Community Beach
							16		‡	0803	Same as above
							17		‡	0803	Same as above
							18		‡	0805	Nests: Two depredated nests on beach (northeast)
							19				
							20		‡	0856	
							21		‡	0934	
							22		‡	0924	
							23		‡	0919	
							24		‡	0916	
							25		‡	0943	
							A				
							B				
							C				
							D				
							E				
							F				
08.20.2002	Boat Survey										
	Melissa Lopez-Rodriguez	0700	1015	2 to 3	Sunny	Bill Elliott	1		‡	0742	
	Manuel Figueroa-Pagan						2		‡	0756	
							3		‡	0833	
							4		‡	0842	
							5		‡	0842	
							6		‡	0845	
							7		‡	0848	
							8		‡	0850	

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08.20.2002	Boat Survey: Continued						9		‡	0850	
							10		‡	0855	
							11		‡	0859	
							12		‡	0859	
							13		‡	0902	
							14		‡	0905	
							15		‡	0909	
							16		‡	0912	
							17		‡	0918	
							18		‡	0920	
							19		‡	0927	
							20				
							21				
							22		‡	0935	
							23		‡	0940	
							24		‡	0943	
							25		‡	0944	
							A		‡	0803	
							B		‡	0813	
							C		‡	0818	
							D		‡	0823	
							E		‡	0828	
							F		‡	0720	
08.23.2002	Pedestrian Survey Manuel Figueroa-Pagan Melissa Lopez-Rodriguez	0555	1052	2 to 3	Sun/Partly Cloudy	N/A	1		‡	0600	
							2				
							3				
							4		‡	0714	
							5		‡	0714	
							6		‡	0714	
							7		‡	0714	
							8				
							9				
							10		‡	0702	
							11		‡	0926	
							12		‡	0926	
							13		‡	0926	
							14		‡	0913	
							15	1	Leatherback	0857	Nest
							16		‡	0853	
							17		‡	0857	
							18		‡	0830	**Depredated Nest #1**: Found 08.12.2002–flagged **Depredated Nest #2**: Found 07.30.2002–flagged. A second non-depredated was found next to Nest 2. **Depredated Nest #3**: Not flagged
							19				
							20		‡	0808	

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08.23.2002	Pedestrian Survey: Continued						21		‡	1008	
							22		‡	0956	
							23		‡	0950	
							24		‡	0946	
							25		‡	1019	
							A				
							B				
							C				
							D				
							E				
							F				
08.27.2002	Boat Survey										
	Melissa Lopez-Rodriguez	0610	0930	2 to 3	Sunny	Bill Elliott	1		‡	0653	
	Manuel Figueroa-Pagan						2		‡	0708	
							3		‡	0750	
							4		‡	0753	
							5		‡	0753	
							6		‡	0756	
							7		‡	0800	
							8		‡	0802	
							9		‡	0802	
							10		‡	0805	
							11		‡	0807	
							12		‡	0807	
							13		‡	0812	
							14		‡	0815	
							15		‡	0819	
							16		‡	0823	
							17		‡	0827	
							18	2	Hawksbill	0830	Nest: Marked on 26 August. Under palm, middle of beach, right of entrance.
							19		‡	0839	Roosting Yellow-crowned Night Heron
							20				
							21				
							22		‡	0845	
							23		‡	0851	
							24		‡	0854	
							25		‡	0855	
							A		‡	0715	
							B		‡	0725	
							C		‡	0729	
							D		‡	0733	
							E		‡	0737	
							F		‡	0641	
08.29.2002	Pedestrian Survey										
	Manuel Figueroa-Pagan	0600	1045	2 to 3	Sunny	N/A	1		‡	0608	
	Melissa Lopez-Rodriguez						2				

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08.29.2002	Pedestrian Survey						3				
							4		‡		
							5		‡	0702	
							6		‡	0702	
							7		‡	0702	
							8				
							9				
							10	2	Hawksbill	0745	Nest: West side of beach; at entrance; under *T. populnea*. Track: West side of beach; right of entrance
							11		‡	0909	
							12		‡	0909	
							13		‡	0909	
							14		‡	0901	
							15	1	Leatherback	0814	Nest: Middle of beach under tree
							16		‡	0807	
							17		‡	0831	
							18	2	Hawksbill	0836	Nests: In middle of beach. Flipper pattern indicates same turtle
							19		‡	0924	
							20				
							21		‡	1015	
							22		‡	1003	
							23		‡	0958	
							24		‡	0954	
							25		‡	1024	
							A				
							B				
							C				
							D				
							E				
							F				
09.03.2002	Boat Survey Carlos Laboy	1045	1230	1	Sunny	Bill Elliott	1		‡	1055	
							2		‡	1105	
							3		‡	1135	
							4		‡	1137	
							5				
							6				
							7		‡	1140	
							8		‡	1142	
							9		‡	1143	
							10		‡	1145	
							11		‡	1150	
							12		‡	1152	
							13		‡	1153	
							14		‡	1155	
							15	1	Hawksbill	1158	Nest: Under Coccoloba tree
							16		‡	1200	

‡ = No Nest/Track Observations

UID = unidentified

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N62470-95-D-1160; CTO 0055
GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
09.03.2002	Boat Survey: Continued						17		‡	1204	
							18		‡	1207	
							19		‡	1210	
							20				
							21		‡	1219	
							22				
							23		‡	1222	
							24		‡	1224	
							25		‡	1226	
							A		‡	1109	
							B	1	Hawksbill	1116	Nest: Under vegetation
							C				
							D		‡	1125	
							E		‡	1130	
							F		‡	1045	
09.06.2002	Pedestrian Survey Paula Trent Melissa Lopez-Rodriguez	1058	1628	2	Sunny	N/A	1		‡	1058	
							2				
							3				
							4				
							5		‡	1156	
							6		‡	1156	
							7		‡	1156	
							8				
							9				
							10		‡	1237	
							11		‡	1432	
							12		‡	1427	
							13		‡	1419	
							14		‡	1408	A lot of debris; strong stench
							15		‡	1322	
							16		‡	1314	
							17		‡	1322	
							18	2	UID	1330	Nest: Two depredated nests, east side of beach, under *Thespesia populnea*
							19				
							20		‡	1441	
							21		‡	1554	
							22		‡	1549	
							23		‡	1543	
							24		‡	1539	
							25		‡	1624	
							A				
							B				
							C				
							D				
							E				

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
09.06.2002	Pedestrian Survey: Continued						F				
09.10.2002	Boat Survey										
	Melissa Lopez-Rodriguez Paula Trent	1000	1310	3 to 4	Sunny	Bill Elliott	1		‡	1032	
							2		‡	1043	
							3		‡	1130	
							4		‡	1133	
							5		‡	1134	
							6		‡	1136	
							7		‡	1137	
							8		‡	1142	
							9		‡	1143	
							10		‡	1145	
							11		‡	1148	
							12		‡	1150	
							13		‡	1151	
							14		‡	1154	
							15		‡	1158	
							16		‡	1201	
							17		‡	1206	
							18		‡	1211	
							19		‡	1216	
							20				
							21				
							22		‡	1222	
							23		‡	1227	
							24		‡	1229	
							25		‡	1230	
							A		‡	1049	One (1) flying fish
							B		‡	1100	
							C				
							D		‡	1106	Dead fish insides floating between Beaches D and E
							E		‡	1111	
							F		‡	1020	
09.13.2002[†]	Pedestrian Survey										
	Paula Trent Melissa Lopez-Rodriguez	1141	1550	3	Sunny	N/A	1		‡	1141	
							2				
							3				
							4				
							5		‡	1240	
							6		‡	1240	
							7	1	Dolphin	1240	Dead: Possible bottlenose; decomposing and bloated. Floating in water approximately 15 feet from shore; called and waited for Winston Martinez from PWD-ENV; photographed while in water and once on shore
							8				
							9				
							10				

‡ = No Nest/Track Observations

UID = unidentified

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
09.13.2002†	Pedestrian Survey: Continued						11				
							12				
							13				
							14				
							15				
							16				
							17				
							18				
							19				
							20		‡	1452	
									‡	1510	Water pool formed across portion of beach from the mangrove; beach area saturated/marshy approximately 10 to 20 feet from shore; dead bird between road and wall.
							21				
							22		‡	1529	
							23		‡	1524	Beach not accessible—high tide
							24		‡	1540	Grappling hook on beach
							25		‡	1545	High tide—beach not assessible
							A				
							B				
							C				
							D				
							E				
							F				

† Unable to complete pedestrian survey of beaches; had to depart to pick up fight crew for aerial surveys at Vieques LIA/EMA for COMPTUEX. Beaches will be thoroughly surveyed on Tuesday, by boat if the marina/harbor waters are open. If the marina is closed, pedestrian surveys will be conducted.

09.17.2002†	Pedestrian Survey Carlos Laboy Melissa Lopez-Rodriguez	0935	1555	3	Sunny/Haze	NA	1		‡	1528	
							2				
							3				
							4				
							5		‡		
							6		‡		
							7	2	Hawksbill	1116	Nests
							8				
							9	3	Hawksbill	1209	Nests: Flagged and dated
							10	1	Hawksbill	1050	Nest: Marked as PS 09/17/2002; high tide erased most of track
							11		‡	1033	
							12	1	UID	1033	Nests: Two depredated nests and one possible new nest.
							13		‡	1030	
							14		‡	1021	
							15	2	Hawksbill	1432	Nests: Left side of beach under *Thespesia populnea*
							16		‡	1440	
							17		‡	1432	
							18	1	UID	0953	Nest: New depredated nest was found under a *Terminalis catapa* and a *thespesia populnea* trees. Not previously marked
							19				
							20		‡	0935	

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
09.17.2002[T]	Pedestrian Survey: Continued						21		‡	1303	
							22		‡	1246	
							23		‡	1300	
							24		‡	1311	
							25		‡	1317	
							A				
							B				
							C				
							D				
							E				
							F				
09.20.2002	Pedestrian Survey Melissa Lopez-Rodriguez Carlos Laboy	0956	1402	1 to 2	Sunny	N/A					
							1		‡	1017	Two (2) manatees observed in the water and one (1) UID turtle
							2				
							3				
							4				
							5		‡	1102	
							6		‡	1102	
							7		‡	1102	
							8				
							9				
							10		‡	1145	
							11		‡	1257	
							12		‡	1255	
							13		‡	1255	
							14		‡	1245	
							15	1	UID	1214	Nest: West of the beach under *Thespesia populnea* and *Conocarpus erectus*
							16		‡	1200	
							17	1	Hawksbill	1214	Nest: Found in the middle of the beach. Another hole, west of the nest, was found but no eggshells were observed. Nest under a *Coccoloba sp.* tree
							18		‡	1232	
							19				
							20		‡	0958	
							21		‡	1340	
							22		‡	1326	
							23		‡	1322	
							24		‡	1317	
							25	1	UID	1352	Nest: Under *Thespesia populnea* east of the beach
							A				
							B				
							C				
							D				
							E				
							F				

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
09.24.2002 and 09.25.2002	Pedestrian Survey Melissa Lopez-Rodriguez Carlos Laboy	0957	1252	5 to 6	Cloudy	N/A	1		‡	0732	
							2				
							3				
							4				
							5		‡	1014	
							6		‡	1014	
							7		‡	1014	
							8				
							9				
							10		‡	1106	
							11		‡	1222	
							12		‡	1222	
							13		‡	1218	
							14		‡	1207	
							15		‡	1136	
							16		‡	1134	
							17		‡	1136	
							18		‡	1144	Two (2) depredated nests from 07.26.2002. Crabs were eating the eggshells inside one of the nest
							19				
							20		‡	0957	
							21		‡	0658	
							22		‡	0644	
							23		‡	0637	
							24		‡	0626	
							25		‡	0614	
							A				
							B				
							C				
							D				
							E				
							F				
09.27.2002	Pedestrian Survey Carlos Laboy	0600	1330	2 to 3	Sunny	N/A	1		‡	0856	
							2				
							3				
							4				
							5		‡	0635	
							6		‡	0635	
							7		‡	0635	
							8				
							9	1		0800	Nest: Depredated nest flagged 09.17/2002
							10		‡	0825	

Note 1: Beaches were surveyed over a 2-day period because of the high winds, heavy rain, severe storms, and flooding effects from Tropical Storm Lilli. **09.24.2002 Beaches Surveyed:** 20, 5, 6, 7, 10, 16, 15, 17, 18, 14, 13, 12, and 11. **09.25.2002 Beaches Surveyed:** 25, 24, 23, 22, 21, and 1.

Note 2: Because of the high tides from Tropical Storm Lilli, excess seagrasses and green algaes were found on Beaches 1 and 25.

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
09.27.2002	Pedestrian Survey: Continued						11		‡	1145	
							12		‡	1145	
							13		‡	1039	
							14	0/1	UID	1013/1110	Juvenile turtle, possible Hawksbill, 12' from shore
							15		‡	1013	
							16		‡	1013	
							17		‡		
							18	2	UID	1035	Nests: Unflagged, depredated
							19				
							20		‡	0600	
							21		‡	1229	
							22		‡	1250	
							23		‡	1245	
							24		‡	1217	
							25		‡	1315	
							A				
							B				
							C				
							D				
							E				
							F				
10.01.2002	Boat Survey										
	Carlos Laboy	0700	1045	2	Sunny	Bill Elliott	1		‡	0802	
							2		‡	0820	
							3	1	UID	0852	Nest: In middle of beach
							4		‡	0856	
							5		‡	0859	
							6		‡	0859	
							7		‡	0903	
							8		‡	0903	
							9		‡	0903	
							10		‡	0906	
							11		‡	0909	
							12		‡	0909	
							13		‡	0909	
							14		‡	0914	
							15		‡	0918	
							16		‡	0918	
							17		‡	0925	
							18		‡	0927	
							19		‡	0932	
							20				
							21				
							22		‡	0937	
							23		‡	0943	
							24		‡	0944	
							25		‡	0948	

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
10.01.2002	Boat Survey: Continued						A		‡	0824	
							B		‡	0835	
							C				
							D		‡	0841	
							E		‡	0845	
							F		‡	0738	
10.04.2002	Boat Survey										
	Melissa Lopez-Rodriguez	0827	1229	2 to 3	Sunny	Bill Elliott	1		‡	0918	
							2		‡	0934	
							3		‡	1004	
							4		‡	1026	
							5		‡	1029	
							6		‡	1032	
							7		‡	1033	
							8		‡	1038	
							9		‡	1039	
							10		‡	1041	
							11		‡	1057	
							12		‡	1058	
							13		‡	1059	
							14		‡	1102	
							15		‡	1105	
							16		‡	1109	
							17		‡	1117	
							18		‡	1119	
							19		‡	1215	
							20				
							21				
							22		‡	1152	
							23		‡	1158	
							24		‡	1200	
							25		‡	1204	
							A		‡	0945	
							B	1	Hawksbill	0955	Nest: Northwest side of beach under black mangrove scrub
							C				
							D		‡	1009	
							E		‡	1014	
							F		‡	0859	Recommend a closer observation; movement in the sand southeast of the beach, next to the 2nd sign from east to west
10.08.2002	Boat Survey	0642	1016	2	Partly Cloudy	Bill Elliott					
	Melissa Lopez-Rodriguez						1		‡	0754	
	Carlos Laboy						2		‡	0808	
							3		‡	0854	
							4		‡	0901	
							5		‡	0903	
							6		‡	0905	
							7		‡	0737	

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10.08.2002	Boat Survey: Continued						8		‡	0736	
							9		‡	0731	
							10		‡	0727	
							11		‡	0910	
							12		‡	0912	
							13		‡	0913	
							14		‡	0918	
							15		‡	0923	
							16		‡	0926	
							17		‡	0932	
							18		‡	0934	
							19		‡	0940	
							20				
							21				
							22		‡	0946	
							23		‡	0948	
							24		‡	0949	
							25		‡	0950	
							A		‡	0813	
							B	1	Hawksbill	0825	Nest: Northeast portion of beach
							C				
							D		‡	0833	
							E		‡	0847	
							F		‡	0743	
10.11.2002	Pedestrian Survey										
	Manuel Figueroa	0658	1117	1 to 2	Heavy Rain	N/A	1		‡	1022	
	Melissa Lopez						2	4	Hawksbill	0905	Nests: Northeast portion of beach under *Terminalia catappa*; 9—Pelicans northwest of the beach
							3				
							4				
							5				
							6				
							7		‡	0931	
							8				
							9				
							10		‡	0735	
							11		‡	0658	5—Pelicans on the rocks on the north side of the beach
							12		‡		
							13		‡	0702	
							14		‡	0705	1—Great Blue Heron in the water
							15		‡		
							16		‡	0714	
							17		‡	0711	
							18		‡	0717	
							19				
							20				
							21		‡	0814	

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10.11.2002	Pedestrian Survey: Continued						22		‡	0800	
							23				
							24				
							25		‡	0826	
							A				
							B				
							C				
							D				
							E				
							F				
Note 1: Heavy rain, lightening and thunder prevented observers from walking beaches 5, 6, 9, 20, 23, and 24.Binoculars were used to observe 11, 13, 14, 15, 16, 17, 18, and 10. The remainder of the beaches walked											
10.15.2002	Boat Survey										
	Melissa Lopez-Rodriguez	0618	0948	1 to 2	Partly Cloudy	Bill Elliott	1		‡	0712	2–Black-bellied Plover
	Manuel Figueroa						2	1	UID	0723	Track: In front of artificial structure in the middle of beach
							3	1	UID	0723	Track: Under *Coccoloba* tree near the shoreline
							4		‡	0812	
							5		‡	0812	
							6		‡	0814	
							7		‡	0817	
							8		‡	0819	
							9		‡	0819	
							10		‡	0824	
							11		‡	0829	
							12		‡	0829	
							13		‡	0832	
							14		‡	0836	
							15		‡	0841	
							16		‡	0844	
							17	1	UID	0849	Track: Under *Fabaceae* tree
							18		‡	0852	
							19		‡	0900	
							20		‡	0919	
							21				
							22		‡	0907	
							23		‡	0914	
							24		‡	0916	2—Royal Terns
							25		‡		
							A		‡	0733	
							B		‡	0744	
							C			0749	
							D		‡	0752	
							E		‡	0758	
							F		‡	0700	
10.18.2002	Pedestrian Survey										
	Carlos Laboy	0600	1145	1 to 2	Sunny	N/A	1		‡	0954	
							2				

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10.18.2002	Pedestrian Survey: Continued						3				
							4				
							5		‡	0620	
							6		‡	0620	
							7		‡	0620	
							8				
							9		‡	0712	
							10		‡	0739	
							11		‡	0836	
							12	1	Hawksbill	0838	Nest: Close to the shore on *Sesuvium sp.* grass
							13		‡	0841	
							14		‡	0933	High tide
							15		‡	0901	
							16		‡	0851	
							17	2	Hawksbill	0857	Nests: Under *Thespesia sp.* and *Fabaceae sp.* trees
							18	4	UID	0913	Nests: 4 unmarked nest found under *Thespesia* sp. and *Mimosaceae* sp.
							19				
							20		‡	0615	
							21		‡	1102	
							22		‡	1045	
							23		‡	1058	
							24		‡	1107	High tide
							25	1	Hawksbill	1110	Nest: In the middle of the beach between two *Thespesia* sp.
							A				
							B				
							C				
							D				
							E				
							F				
10.22.2002	Boat Survey Melissa Lopez-Rodriguez Manuel Figueroa	0615	0920	2 to 3	Sunny	Bill Elliott	1		‡	0656	1—Osprey perched on dead tree
							2		‡	0708	
							3		‡	0745	2—Rays close to the beach
							4		‡	0750	
							5		‡	0750	
							6		‡	0753	
							7		‡	0756	
							8		‡	0759	
							9		‡	0759	
							10		‡	0803	
							11		‡	0806	5—Brown Pelicans between Beach 11 and Beach 12;
							12		‡	0806	2 perched and 3 fishing
							13		‡	0809	
							14		‡	0813	
							15		‡	0818	
							16		‡	0821	

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10.22.2002	Boat Survey: Continued						17	1	Hawksbill	0826	Nest: Northeast corner of the beach
							18		‡	0830	
							19		‡	0836	2—Brown Pelicans roost on metal debris in water near pier
							20				
							21				
							22		‡	0842	
							23	1	UID	0848	Track: Middle of beach on *Sesuvium sp.* grass
							24		‡	0853	
							25		‡	0855	
							A		‡	0714	
							B		‡	0725	
							C		‡	0730	
							D		‡	0734	
							E		‡	0737	2—Caribbean Martin perched on Red Mangrove
							F		‡	0644	
10.25.2002	Pedestrian Survey Melissa Lopez Manuel Figueroa	0600	1135	2 to 3	Sunny	N/A	1		‡	0929	
							2				
							3				
							4				
							5		‡	0616	
							6		‡	0616	
							7		‡	0616	
							8		‡	0701	
							9		‡	0701	
							10		‡	0748	
							11		‡	0852	
							12	1	Hawksbill	0849	Nest: Unprotected nest in sand
							13		‡	0849	
							14		‡	0843	
							15		‡	0810	
							16		‡	0805	
							17		‡	0810	
							18		‡	0822	
							19		‡	0905	
							20				
							21		‡	1059	
							22		‡	1038	
							23		‡	1055	
							24		‡	1104	
							25		‡	1109	
							A				
							B				
							C				
							D				
							E				
							F				

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Weekly Sea Turtle Nesting Beach Survey Results, NSRR, Puerto Rico

N62470-95-D-1160; CTO 0055
GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
10.29.2002	Boat Survey										
	Melissa Lopez-Rodriguez	0715	1035	1 to 3	Sunny	Bill Elliott	1		‡	0756	
	Manuel Figueroa						2		‡	0810	
							3		‡	0853	
							4		‡	0857	
							5		‡	0859	
							6		‡	0901	
							7		‡	0903	
							8		‡	0906	
							9		‡	0906	
							10		‡	0910	
							11		‡	0915	
							12		‡	0915	
							13		‡	0918	
							14		‡	0923	
							15	1	UID	0928	Track: Under *Coccoloba* tree and *Thespesia sp.* tree
							16		‡	0932	
							17	1	UID	0937	Track: Under grass *Thespesia sp.* tree
							18		‡	0941	
							19		‡	0949	
							20				
							21				
							22		‡	0956	
							23		‡	1001	
							24		‡	1004	
							25		‡	1007	
							A		‡	0816	
							B		‡	0830	
							C		‡	0833	
							D		‡	0836	
							E		‡	0845	
							F		‡	0745	
11.01.2002	Pedestrian Survey										
	Melissa Lopez	0540	1220	2 to 3	Sunny/Shower	N/A	1		‡	0840	
	Manuel Figueroa						2				
							3				
							4				
							5		‡	0617	
							6		‡	0617	
							7		‡	0617	
							8		‡	0721	
							9		‡	0721	
							10		‡	0755	
							11		‡	1040	
							12		‡	1043	
							13		‡	1043	
							14		‡	1100	

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N62470-95-D-1160; CTO 0055
GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
11.01.2002	Pedestrian Survey: Continued						15		‡	1141	
							16		‡	1154	
							17		‡	1141	
							18	1	Hawksbill	1024	Nest: Unmarked depredated nest found under *Thespesia* tree
							19				
							20		‡	0814	
							21		‡	1004	
							22		‡	0945	
							23		‡	0959	
							24		‡	1013	
							25		‡	1019	
							A				
							B				
							C				
							D				
							E				
							F				
11.05.2002	Boat Survey										
	Melissa Lopez-Rodriguez	0815	1148	2 to 3	Sunny	Bill Elliott	1		‡	0909	High tide
	Manuel Figueroa						2		‡	0920	
							3		‡	0959	
							4		‡	1003	
							5		‡	1003	
							6		‡	1006	
							7		‡	1007	
							8		‡	1010	
							9		‡	1013	
							10		‡	1014	
							11		‡	1018	
							12		‡	1018	
							13		‡	1021	UID turtle surface for air very close to the boat
							14		‡	1025	
							15		‡	1029	
							16		‡	1032	
							17		‡	1037	
							18		‡	1038	
							19		‡	1045	
							20				
							21				
							22		‡	1052	
							23		‡	1058	
							24		‡	1059	
							25		‡	1104	
							A		‡	0926	
							B		‡	0936	
							C		‡		
							D		‡	0944	

‡ = No Nest/Track Observations

UID = unidentified

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GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
11.05.2002	Boat Survey: Continued						E		‡	0952	
							F		‡	0857	
11.08.2002	Pedestrian Survey Melissa Lopez Manuel Figueroa	0600	1200	1 to 2	Sunny	N/A	1		‡	1054	
							2				
							3				
							4				
							5		‡	0630	
							6		‡	0630	
							7		‡	0630	
							8		‡		
							9		‡	0713	
							10		‡	0752	
							11		‡	0908	
							12		‡	0907	
							13		‡	0904	
							14		‡	0859	
							15		—	0825	Operation in progress; gated closed to Isla de Cabras
							16		—	0825	Operation in progress; gated closed to Isla de Cabras
							17		—	0825	Operation in progress; gated closed to Isla de Cabras
							18	3	Green UID	0630	Nests: One (1) green was located under a *Thespesia populnea*. Two (2) UID depredated nests were found next to the green nest. All three nests marked.
							19				
							20		‡	0807	
							21		‡	0952	
							22		‡	0935	
							23		‡	0947	
							24		‡	1000	
							25		‡	1006	
							A				
							B				
							C				
							D				
							E				
							F				
11.12.2002	Pedestrian Survey Melissa Lopez Manuel Figueroa	0550	1225	1 to 2	Sunny	N/A	1		‡	0814	
							2				
							3				
							4				
							5		‡	0615	
							6		‡	0615	
							7		‡	0615	
							8		‡		
							9		‡	0704	
							10		‡	0733	

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GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
11.12.2002	Pedestrian Survey: Continued						11		‡	1152	
							12		‡	1152	
							13		‡	1149	
							14		‡	1139	
							15		—	1100	Closed for exercises
							16		—	1100	Closed for exercises
							17		—	1100	Closed for exercises
							18	2	UID	1110	Nests: One in good condition; the second was depredated.
							19				
							20		‡	0749	
							21		‡	0945	
							22		‡	0930	
							23		‡	0941	
							24		‡	0953	
							25		‡	0959	
							A				
							B				
							C				
							D				
							E				
							F				
11.15.2002	Pedestrian Survey Melissa Lopez Manuel Figueroa	0545	1200	2 to 3	Sunny	N/A	1		‡	0913	
							2				
							3				
							4				
							5		‡	0612	
							6		‡	0612	
							7		‡	0612	
							8				
							9	4	Hawksbill	707	Nest: Three of the 4 nests were depredated. Located under *Thespesia populnea* and trees from the Fabaceae family. All nests were marked with today's date.
							10		‡	0839	
							11		‡	0827	
							12		‡	0827	
							13		‡	0823	
							14		‡	0811	
							15		—	0741	Gate closed; exercise in progress
							16		—	0741	Gate closed; exercise in progress
							17		—	0741	Gate closed; exercise in progress
							18	1	Hawksbill	745	Nest: One flagged (07.19.2002) depredated nest under *Thespesia populnea* tree
							19				
							20		‡	0853	
							21		‡	1122	
							22		‡	1109	

‡ = No Nest/Track Observations

UID = unidentified

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Weekly Sea Turtle Nesting Beach Survey Results, NSRR, Puerto Rico

N62470-95-D-1160; CTO 0055
GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
11.15.2002	Pedestrian Survey						23		‡	1102	
							24		‡	1059	
							25		‡	1051	
							A				
							B				
							C				
							D				
							E				
							F				
11.19.2002	Pedestrian Survey Melissa Lopez Manuel Figueroa	0558	1146	2 to 3	Cloudy	N/A	1		‡	0822	
							2				
							3				
							4				
							5		‡	0623	
							6		‡	0623	
							7		‡	0623	
							8				
							9	1	UID	707	Nest: Located under *Thespesia populnea* tree.
							10		‡	0741	
							11		‡	1045	
							12		‡	1045	
							13		‡	1042	
							14		‡	1037	
							15	1	Hawksbill	1012	Nest: Depredated nest, marked 08.08.2002, was observed under *Coccoloba sp.* tree
							16		‡	1007	
							17		‡	1012	
							18	1	UID	1020	Nest: One nest found under Palmae sp. and Thespesia tree
							19				
							20		‡	0756	
							21		‡	0944	
							22		‡	0930	
							23		‡	0925	
							24		‡	0921	
							25		‡	0912	
							A				
							B				
							C				
							D				
							E				
							F				
11.22.2002	Pedestrian Survey Melissa Lopez Manuel Figueroa	0535	1215	1 to 2	Sun/Cloudy/Rain	N/A	1		‡	1053	
							2				
							3				
							4				

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Weekly Sea Turtle Nesting Beach Survey Results, NSRR, Puerto Rico

N62470-95-D-1160; CTO 0055
GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
11.22.2002	Pedestrian Survey						5		‡	0612	
							6		‡	0612	
							7		‡	0612	
							8		‡		
							9		‡	0655	
							10		‡	0718	
							11		‡	1024	
							12		‡	1024	
							13		‡	1020	
							14		‡	1014	
							15		‡	0924	
							16		‡	0856	Began to rain
							17		‡	0922	
							18	3	Hawksbill	0930	Nest: Three depredated nests. Two were under a *Terminalia catappa* and *Thespesia populnea* trees. The third nest was under a Thespesia populnea tree. All three were new, unmarked nests. Nests marked and flagged with today's date.
							19				
							20		‡		
							21		‡	0836	
							22		‡	0824	
							23		‡	0819	
							24		‡	0815	
							25		‡	0804	
							A				
							B				
							C				
							D				
							E				
							F				
11.26.2002	Boat Survey Melissa Lopez-Rodriguez Manuel Figueroa	0800	1130	0 to 1	Sunny	Bill Elliott	1		‡	0854	
							2		‡	0908	
							3		‡	0944	
							4		‡	0950	
							5		‡	0950	
							6				
							7		‡	0954	
							8		‡	0957	
							9		‡	0958	
							10		‡	1001	
							11		‡	1005	
							12		‡	1005	
							13		‡	1008	
							14		‡	1011	
							15		‡	1015	
							16		‡	1018	

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GMI Project No. 17600.00.55
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
11.26.2002	Boat Survey: Continued						17		‡	1024	
							18		‡	1026	
							19	2	Hawksbill/ UID	1034	Nest: located under white and black mangrove tree Track: Observed under black mangrove
							20				
							21				
							22		‡	1046	
							23		‡	1055	
							24		‡	1055	
							25		‡	1102	
							A		‡	0916	
							B		‡	0926	
							C		‡	—	
							D		‡	0933	
							E		‡	0938	
							F		‡	0837	
12.06.2002	Pedestrian Survey Melissa Lopez Carlos Laboy	0558	1252	3 to 4	Rain/Clouds/Sun	N/A	1		‡	0814	
							2				
							3				
							4				
							5		‡	0628	
							6		‡	0628	
							7	1	UID	0628	Nest: False crawl/nest was observed under a *Thespesia populnea* scrub in the middle of the beach
							8		‡		
							9	1	UID	0720	Nest: Flagged, 11.19.2002, depredated nest was found.
							10		‡	0749	
							11		‡	1214	
							12	2	UID	1213	Nests: Two nests, one old [flagged 09.17.2002] and one new nest under a Coccoloba *sp.* scrub
							13		‡	1210	
							14		‡	1158	
							15		‡	1058	
							16		‡	1051	
							17	1	Hawksbill	1058	Nest Unmarked depredated nest observed under *Thespesia populnea* and Leguminosae trees.
							18	8	Hawksbill	1112	Nests: Eight new depredated nests. Seven were observed under a *Thespesia populnea* tree and the eighth under a Coccoloba *sp.* and *Thespesia populnea* tree
							19				
							20		‡	1241	
							21		‡	1010	
							22		‡	0949	
							23		‡	1005	
							24		‡	1020	
							25		‡	1026	

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
12.06.2002	Pedestrian Survey						A B C D E F				

2004

JANUARY 20 – APRIL 30

WEEKLY SEA TURTLE NESTING BEACH SURVEY RESULTS

NSRR, PUERTO RICO

Geo-Marine, Inc.
550 East 15th Street
Plano, TX 75074

Weekly Sea Turtle Nesting Beach Survey Results, NSRR, Puerto Rico

N62470-02-D-9997; CTO 0031
GMI Project No. 17097.00.31
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
01.20.2004	**Pedestrian Survey**										
	Carlos Laboy Melissa Lopez-Rodriquez	0700	1400	NR	Sunny	N/A	1		‡	0714	High tide at the beginning of the survey.
							2				
							3				
							4				
							5		‡	0835	
							6		‡	0835	
							7		‡	0835	
							8				
							9		‡	0935	
							10		‡	1000	
							11		‡	1325	
							12		‡	1322	
							13		‡	1317	
							14		‡	1254	3 old UID nests (not depredated)
							15		‡	1214	Found depredated old nest.
							16		‡	1223	
							17		‡	1217	
							18		‡	1225	Some unidentified bones found inside the vegetation.
							19				
							20		‡	1332	
							21		‡	1127	
							22		‡	1110	
							23		‡	1122	
							24				
							25		‡	1137	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
01.21.04	**Boat Survey**										
	Melissa Lopez	820	1215	NR	Partly Cloudy	Bill Elliott	1		‡	850	
	Paula Trent						2		‡	909	American Kestral sitting on rock (1); oyster catchers at end of beach
	Carlos Laboy						3		‡	1010	Great egret (1)
							4		‡	1016	Osprey (1)
							5		‡	1017	
							6		‡	1022	
							7		‡	1025	
							8		‡	1029	
							9		‡	1030	
							10		‡	1034	

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Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
01.21.04	Boat Survey Continued						11		‡	1038	
							12		‡	1040	
							13		‡	1042	
							14		‡	1048	
							15		‡	1053	
							16		‡	1058	
							17		‡	1151	
							18		‡	1155	
							19			1203	
							20		‡	1116	
							21				
							22		‡	1130	
							23		‡	1135	
							24		‡	1140	
							25		‡	1142	
							26				
							27				
							A	1	Nest	0915	Old HB; left side of beach (far); left of warning sign, & left of all bushes
							B		‡	0936	
							C		‡	0943	
							D		‡	0952	
							E		‡	1000	Osprey (1)
							F		‡	0839	
01.23.2004	Pedestrian Survey										
	Carlos Laboy	605	1130	NR	Sunny		1		‡	0815	
	Melissa Lopez						2				
	Paula Trent						3				
							4				
							5		‡	0920	
							6		‡	0920	
							7		‡	0920	
							8				
							9		‡	1010	
							10		‡	1030	
							11		‡	1037	
							12				
							13		‡	1044	
							14		‡	1051	
							15		‡	1055	
							16		‡	1105	
							17		‡	1055	
							18		‡	1110	
							19				
				N/A			20				

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Weekly Sea Turtle Nesting Beach Survey Results, NSRR, Puerto Rico

N62470-02-D-9997; CTO 0031
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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
01.23.2004	Pedestrian Survey Continued						21		‡	0659	
							22	1	Nest	0635	Old unidentified sea turtle nest, no depredation.
							23		‡	0652/0709	
							24				
							25		‡	0719	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
01.26.2004	Pedestrian Survey										
	Carlos Laboy	0603	1349	N/A	Cloudy-Windy		1		‡	1236	
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0923	
							6		‡	0923	
							7		‡	0923	
							8				
							9		‡	1014	
							10	1	Nest	0858	Unidentified turtle depredated nest marked.
							11		‡	0753	
							12		‡	0752	
							13		‡	0747	
							14		‡	0718	Possible human depredated nest. Strange UID animal tracks.
							15		‡	0634	
							16		‡	0622	Pieces of wood on the shore.
							17		‡	0630	Light post between Beach 17 & 15 could affect nesting areas.
							18	1	HB	0646	Found HB turtle carcass trapped in the trees. Dogs on the beach.
							19				
							20				
							21		‡	1213	
							22		‡	1153	Old depredated nest to the northwest of the beach
							23		‡	1145	
							24		‡	1137	
							25		‡	1118	
							26				
							27				
							A				
							B				
							C				

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Plano, TX 75074

Weekly Sea Turtle Nesting Beach Survey Results, NSRR, Puerto Rico

N62470-02-D-9997; CTO 0031
GMI Project No. 17097.00.31
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
01.26.2004	Pedestrian Survey Continued						D				
							E				
							F				
01.28.2004	Boat Survey										
	Carlos Laboy	0643	0933		Sunny	Bill Elliott	1		‡	0714	
	Melissa Lopez-Rodriguez						2		‡	0725	*Red flag back of the beach.
							3		‡	0805	
							4		‡	0808	
							5		‡	0809	
							6		‡	0812	
							7		‡	0812	
							8		‡	0818	
							9		‡	0820	
							10		‡	0821	
							11		‡	0825	
							12		‡	0826	
							13		‡	0828	
							14		‡	0832	
							15		‡	0837	
							16		‡	0843	
							17		‡	0846	
							18		‡	0850	4 dogs resting on the beach
							19		‡	0859	
							20				
							21				
							22		‡	0905	
							23		‡	0910	
							24		‡	0913	
							25		‡	0916	3 iguanas: one in a tree & two with different colors on the ground.
							26				
							27				
							A		‡	0732	
							B		‡	0741	
							C		‡	0747	
							D		‡	0753	
							E		‡	0759	
							F		‡	0702	
01.30.2004	Pedestrian Survey										
	Carlos Laboy	0600	1100	N/A	Sunny		1		‡	0853	A dead pelican found (very old) in the middle of the beach in front of a palm tree. Yellow-shouldered blackbird heard.
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0735	Vehicle tracks.

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Project Manager: Paula Trent

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01.30.2004	Pedestrian Survey (Cont'd)						6		‡	0735	Vehicle tracks.
							7		‡	0735	Vehicle tracks.
							8				
							9		‡	0723	Dog tracks
							10		‡	0717	Dog tracks
							11		‡	0630	
							12				
							13		‡	0625	
							14		‡	0655	Old depredated nest found (eggshells around); UID nest.
							15		‡	0614	
							16		‡	0607	
							17		‡		Dog footprints
							18		‡	0638	Dog tracks
							19				
							20				
							21		‡	1037	
							22		‡	1025	
							23		‡	1018	
							24		‡	1013	
							25		‡	0955	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
02.02.2004	Pedestrian Survey Carlos Laboy Melissa Lopez-Rodriguez	0555	1130	N/A	Cloudy – High tides		1		‡	0902	Dog tracks. A dead Tarpon fish on the shoreline.
							2				
							3				
							4				
							5		‡	0757	
							6		‡	0757	
							7		‡	0757	Dead Bluespotted cornelfish on the shoreline.
							8				
							9		‡	0737	
							10		‡	0725	
							11		‡	0628	
							12				
							13		‡	0623	
							14		‡	0657	
							15		‡	0610	A lot of people footprints
							16		‡	0603	

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02.02.2004	Pedestrian Survey Continued						17		‡	0610	A lot of people footprints
							18		‡	0640	
							19				
							20				
							21		‡	1053	A lot of plovers.
							22		‡	1036	
							23		‡	1030	
							24		‡	1023	
							25		‡	1004	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
02.04.2004	Boat Survey										
	Carlos Laboy	0650	0952	Rough	Sunny	Bill Elliott	1		‡	0731	
	Melissa Lopez-Rodriguez						2		‡	0744	
							3		‡	0826	
							4		‡	0833	
							5		‡	0833	
							6		‡	0834	
							7		‡	0834	
							8		‡	0841	
							9		‡	0842	
							10		‡	0843	
							11		‡	0846	
							12		‡	0846	
							13		‡	0850	
							14		‡	0853	
							15		‡	0857	
							16		‡	0900	
							17		‡	0907	
							18		‡	0909	
							19		‡	0915	
							20				
							21				
							22		‡	0923	
							23		‡	0928	An iguana on the beach.
							24		‡	0932	
							25		‡	0934	
							26				
							27				

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02.04.2004	Boat Survey Continued						A		‡	0751	
							B		‡	0801	
							C		‡	0807	
							D		‡	0816	
							E		‡	0822	
							F		‡	0717	
02.06.2004	Pedestrian Survey										
	Carlos Laboy	0557	1100	High tide	Windy Partly Cloudy	N/A	1	1	HB	0844	Dead HB on the shoreline. Contacted Jose Montalvo.
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0745	
							6		‡	0745	
							7		‡	0745	
							8				
							9		‡	0730	
							10		‡	0617	
							11		‡	0631	
							12				
							13		‡	0625	
							14		‡	0659	
							15		‡	0611	
							16		‡	0605	Very windy
							17		‡	0611	
							18		‡	0643	
							19				
							20				
							21		‡	1037	
							22		‡	1025	
							23		‡	1019	
							24		‡	1013	
							25		‡	0955	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				

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02.09.2004	Pedestrian Survey										
	Carlos Laboy	0558	1123	Low tide	Cloudy/Windy		1		‡	1021	
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0925	
							6		‡	0925	
							7		‡	0925	
							8				
							9		‡	0908	
							10		‡	0856	
							11		‡	0630	
							12				
							13		‡	0625	
							14		‡	0655	Old depredated nest found. Marked with flagging.
							15		‡	0614	Footprints all around
							16		‡	0607	
							17		‡	0614	Footprints all around
							18		‡	0641	
							19				
							20				
							21			0834	
							22		‡	0818	
							23		‡	0812	
							24		‡	0804	
							25		‡	0746	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
02.11.2004	Boat Survey										
	Carlos Laboy	0647	0937	3	Sunny	Bill Elliot	1		‡	0726	
	Melissa Lopez-Rodriguez						2		‡	0737	
							3		‡	0811	
							4		‡	0816	
							5		‡	0816	
							6		‡	0816	
							7		‡	0821	
							8		‡	0824	
							9		‡	0824	

‡ = No Nest/Track Observations

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
02.11.2004	Boat Survey (Cont'd)						10		‡	0827	
							11		‡	0831	
							12		‡	0831	
							13		‡	0834	
							14		‡	0836	
							15		‡	0841	
							16		‡	0845	
							17		‡	0849	Foot tracks in the beach.
							18		‡	0852	
							19		V	0900	
							20				
							21				
							22		‡	0908	
							23		‡	0914	
							24		‡	0919	
							25		‡	0919	
							26				
							27				
							A		‡	0745	
							B		‡	0754	
							C				Not included in survey; waves at 6-77 feet
							D		‡	0802	
							E		‡	0805	Osprey in the beach.
							F		‡	0715	
02.13.2004	Pedestrian Survey										
	Carlos Laboy	0553	1050		Sunny		1		‡	0837	
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0739	
							6		‡	0739	
							7		‡	0739	
							8				
							9		‡	0725	
							10		‡	0713	
							11		‡	0627	
							12				
							13		‡	0621	
							14		‡	0653	
							15		‡	0611	Foot tracks of people.
							16		‡	0600	
							17		‡	0611	Foot tracks of people.
							18		‡	0637	2 holes made by dogs.
							19				
							20		‡	1032	

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
02.13.2004	Pedestrian Survey Continued						21		‡	1015	
							22		‡	1022	
							23		‡	0955	
							24		‡	0950	Iguanas in the beach.
							25		‡	0934	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
02.16.2004	Pedestrian Survey										
	Carlos Laboy Melissa Lopez-Rodriguez	0549	1130		Sunny/Windy		1		‡	0835	(1) Brown Booby; (1) Brown Pelican
							2				
							3				
							4				
							5		‡	0739	
							6		‡	0739	
							7		‡	0739	
							8				
							9		‡	0723	
							10		‡	0711	
							11		‡	0623	
							12				
							13		‡	0617	
							14		‡	0650	
							15		‡	0606	
							16		‡	0557	
							17		‡	0606	
							18		‡	0633	
							19				
							20		‡	1113	
							21		‡	1028	
							22		‡	1012	
							23		‡	1005	
							24		‡	0958	
							25		‡	0942	
							26				
							27				
							A				
							B				
							C				
							D				

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02.16.2004	Pedestrian Survey Continued						E				
							F				
02.18.2004	Boat Survey										
	Carlos Laboy	0655	1000	3	Sunny	Bill Elliott	1		‡	0733	1 Osprey
	Melissa Lopez-Rodriguez						2		‡	0742	
							3		‡	0825	
							4		‡	0831	
							5		‡	0831	
							6		‡	0831	
							7		‡	0831	
							8		‡	0839	
							9		‡	0839	
							10		‡	0843	
							11		‡	0847	
							12		‡	0847	
							13		‡	0851	
							14		‡	0855	
							15		‡	0859	
							16		‡	0902	
							17		‡	0907	
							18		‡	0909	Possible turtle track; check during pedestrian survey Friday.
							19		‡	0920	
							20				
							21				
							22		‡	0927	
							23		‡	0933	
							24		‡	0937	Iguanas on the beach.
							25		‡	0941	
							26				
							27				
							A		‡	0749	
							B		‡	0759	A lot of footprints.
							C		‡	0804	
							D		‡	0810	
							E		‡	0820	2 plovers
							F		‡	0719	
02.20.2004	Pedestrian Survey										
	Carlos Laboy	0552	1100		Partly cloudy		1		‡	0832	
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0724	
							6		‡	0724	
							7		‡	0724	
							8				

‡ = No Nest/Track Observations

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
02.20.2004	Pedestrian Survey Continued						9		‡	0807	Osprey in flight.
							10		‡	0710	
							11		‡	0625	Plovers on the beach.
							12				
							13		‡	0619	Foot tracks of a dog.
							14		‡	0650	3 dogs in the beach / (1) Southern sting ray in the water
							15		‡	0609	
							16		‡	0601	
							17		‡	0609	
							18		‡	0636	
							19				
							20		‡	1048	
							21		‡	1032	Many plovers on the beach.
							22		‡	1018	
							23		‡	1013	
							24		‡	1006	
							25		‡	0950	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
02.23.2004	Pedestrian Survey										
	Carlos Laboy	0559	1120		P Sunny/Showers		1		‡	0859	
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	1020	
							6		‡	1020	
							7		‡	1020	
							8				
							9		‡	1102	
							10		‡	1009	
							11		‡	0632	
							12				
							13		‡	0625	
							14		‡	0656	
							15		‡	0616	
							16		‡	0607	
							17		‡	0616	
							18		‡	0639	
							19				

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
02.23.2004	Pedestrian Survey Continued						20		‡	0955	
							21		‡	0810	
							22		‡	0823	
							23		‡	0837	
							24		‡	0747	
							25		‡	0747	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
02.25.2004	Boat Survey										
	Carlos Laboy	0645	0940		Partly Sunny	Bill Elliott	1		‡	0720	
	Melissa Lopez-Rodriguez						2		‡	0730	
							3		‡	0808	
							4		‡	0812	
							5		‡	0812	
							6		‡	0812	
							7		‡	0812	
							8		‡	0821	
							9		‡	0821	
							10		‡	0821	People walking on the beach
							11		‡	0830	
							12		‡	0830	
							13		‡	0830	
							14		‡	0838	
							15		‡	0842	
							16		‡	0845	
							17		‡	0851	
							18		‡	0854	
							19		‡	0902	
							20				
							21				
							22		‡	0907	
							23		‡	0913	
							24		‡	0916	
							25		‡	0916	
							26				
							27				
							A		‡	0736	
							B		‡	0736	
							C	1	Track	0749	UID track

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02.25.2004	Boat Survey Continued						D		‡	0756	
							E		‡	0803	
							F		‡	0708	
02.27.2004	Pedestrian Survey										
	Carlos Laboy	0552	1030		Sunny		1		‡	0817	
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0710	
							6		‡	0710	
							7		‡	0710	
							8				
							9		‡	0752	
							10		‡	0659	
							11		‡	0622	
							12				
							13		‡	0617	
							14		‡	0642	
							15		‡	0607	Two dogs heard
							16		‡	0600	
							17		‡	0607	
							18		‡	0630	Dog tracks.
							19				
							20		‡	1012	1 hole made by an iguana.
							21		‡	0955	
							22		‡	0941	
							23		‡	0934	3 holes made by iguanas. It is iguana nesting season
							24		‡	0927	
							25		‡	0912	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
03.01.2004	Pedestrian Survey										
	Carlos Laboy	0616	1115		Windy/Partly Sunny		1		‡	0915	
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0753	
							6		‡	0753	
							7		‡	0753	

‡ = No Nest/Track Observations

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							8				
							9		‡	0837	
03.01.2004	Pedestrian Survey Continued						10		‡	0741	
							11		‡	0620	
							12				
							13		‡	0727	
							14		‡	0714	
							15		‡	0644	
							16		‡	0638	
							17		‡	0644	
							18		‡	0652	
							19				
							20		‡	0855	
							21		‡	1056	Several vehicle tracks including heavy ones. Many plovers on the shoreline.
							22		‡	1043	
							23		‡	1037	
							24		‡	1031	
							25		‡	1018	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
03.03.2004	Pedestrian Survey Carlos Laboy Melissa Lopez-Rodriguez	0548	1050	5	Sunny/Windy		1		‡	0820	(1) Dead Brown Pelican found in the shoreline (in the water).
							2				
							3				
							4				
							5		‡	0711	
							6		‡	0711	
							7		‡	0711	
							8				
							9		‡	0755	
							10		‡	0659	
							11		‡	0618	
							12				
							13		‡	0612	
							14		‡	0641	
							15		‡	0603	
							16		‡	0555	
							17		‡	0603	

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03.03.2004	Pedestrian Survey Continued						18		‡	0628	
							19				
							20		‡	1030	
							21		‡	1013	Many Wilson plovers.
							22		‡	0959	
							23		‡	0953	(8) *Iguana iguana* nests.
							24		‡	1031	
							25		‡	1018	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
03.05.2004	Pedestrian Survey Carlos Laboy Melissa Lopez-Rodriguez	0548	1030	5	Windy/Partly sunny		1		‡	0819	
							2				
							3				
							4				
							5		‡	0717	
							6		‡	0717	
							7		‡	0717	
							8				
							9		‡	0755	
							10		‡	0706	
							11		‡	0618	
							12				
							13		‡	0613	
							14		‡	0645	Three holes apparently from iguanas.
							15		‡	0604	
							16		‡	0556	Vehicle tracks in the sand.
							17		‡	0604	
							18		‡	0627	
							19				
							20		‡	1019	
							21		‡	1002	
							22		‡	0947	
							23		‡	0940	Iguana nests.
							24		‡	0933	
							25		‡	0920	
							26				
							27				
							A				

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
03.05.2004	Pedestrian Survey Continued						B				
							C				
							D				
							E				
							F				
03.08.2004	Pedestrian Survey										
	Melissa Lopez-Rodriguez Carlos Laboy	0549	1100		Sunny		1		‡	0807	
							2				
							3				
							4				
							5		‡	0653	
							6		‡	0653	
							7		‡	0653	
							8				
							9		‡	0734	
							10		‡	0748	
							11		‡	0615	
							12				
							13		‡	0610	
							14		‡	0636	Dog tracks.
							15		‡	0602	
							16		‡	0555	
							17		‡	0602	
							18		‡	0624	Dog tracks.
							19				
							20		‡	1026	
							21		‡	1006	(1) Dead sea cucumber/(1) Dead jellyfish on the shore.
							22		‡	0953	
							23		‡	0948	
							24		‡	0941	
							25		‡	0926	(1) Dead iguana found in the beach.
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
03.10.2004	Boat Survey										
	Melissa Lopez-Rodriguez	0649	0938		Sunny	Bill Elliott	1		‡	0722	
							2		‡	0733	
							3		‡	0809	
							4		‡	0814	
							5		‡	0814	

‡ = No Nest/Track Observations

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Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
03.10.2004	Boat Survey Continued						6		‡	0814	
							7		‡	0814	
							8		‡	0822	
							9		‡	0822	
							10		‡	0822	
							11		‡	0829	
							12		‡	0829	
							13		‡	0832	
							14		‡	0835	
							15		‡	0840	A lot of footprints.
							16		‡	0843	
							17		‡	0850	
							18		‡	0853	
							19		‡	0859	
							20				
							21				
							22		‡	0907	
							23		‡	0914	
							24		‡	0917	
							25		‡	0921	
							26				
							27				
							A		‡	0739	
							B		‡	0739	
							C		‡	0753	
							D		‡	0758	
							E		‡	0804	
							F		‡	0712	
03.12.2004	Pedestrian Survey										
	Carlos Laboy Melissa Lopez-Rodriguez	0542	0950		Sunny		1		‡	0756	(1) Tricolored Heron *Egretta tricolor*
							2				
							3				
							4				
							5		‡	0646	(2) Oyster Catcher
							6		‡	0646	
							7		‡	0646	
							8				
							9		‡	0725	
							10		‡	0739	
							11		‡	0609	
							12				
							13		‡	0603	
							14		‡	0629	
							15		‡	0555	
							16		‡	0549	

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
03.12.2004	Pedestrian Survey Continued						17		‡	0555	
							18		‡	0617	
							19				
							20		‡	0938	
							21		‡	0918	
							22		‡	0905	
							23		‡	0859	
							24		‡	0852	
							25		‡	0839	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
03.15.2004	Pedestrian Survey										
	Carlos Laboy	0543	1130		Sunny/Windy		1		‡	0824	
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0653	
							6		‡	0653	
							7		‡	0653	
							8				
							9		‡	0734	
							10		‡	0747	
							11		‡	0612	
							12				
							13		‡	0606	
							14		‡	0635	
							15		‡	0558	
							16		‡	0551	
							17		‡	0558	
							18		‡	0621	
							19				
							20		‡	0807	
							21		‡	1003	(1) Osprey
							22		‡	0950	
							23		‡	0943	
							24		‡	0937	
							25		‡	0923	
							26				
							27				

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03.15.2004	Pedestrian Survey Continued						A				
							B				
							C				
							D				
							E				
							F				
03.19.2004	Pedestrian Survey										
	Carlos Laboy	0545	1040		Windy/Cloudy/ High tides		1		‡	0808	
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0657	
							6		‡	0657	
							7		‡	0657	
							8				
							9		‡	0735	
							10		‡	0749	
							11		‡	0613	
							12				
							13		‡	0608	
							14		‡	0634	
							15		‡	0559	
							16		‡	0553	
							17		‡	0559	
							18		‡	0621	
							19				
							20		‡	1022	
							21		‡	1005	
							22		‡	0951	
							23		‡	0946	
							24		‡	0939	Iguanas
							25		‡	0926	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
03.22.2004	Pedestrian Survey										
	Carlos Laboy	0550	1100		Sunny		1		‡	0817	(1) Dead UID Fish; (1) dead UID plover; (1) dead *Iguana iguana*
	Melissa Lopez-Rodriguez						2				

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
03.22.2004	Pedestrian Survey Continued						3				
							4				
							5		‡	0656	
							6		‡	0656	
							7		‡	0656	
							8				
							9		‡	0741	
							10		‡	0756	
							11		‡	0644	
							12				
							13		‡	0639	
							14		‡	0626	
							15		‡	0604	
							16		‡	0557	
							17		‡	0604	
							18		‡	0613	
							19				
							20		‡	1043	
							21		‡	1021	
							22		‡	1007	
							23		‡	1000	
							24		‡	0952	
							25		‡	0937	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
03.24.2004	Boat Survey										
	Carlos Laboy	0645	1000		Rain/Cloudy	Bill Elliott	1		‡	0733	1 Osprey
							2		‡	0742	
							3		‡	0822	
							4		‡	0826	
							5		‡	0826	
							6		‡	0826	
							7		‡	0832	
							8				
							9		‡	0836	
							10		‡	0840	
							11		‡	0845	
							12		‡	0845	
							13		‡	0845	

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03.24.2004	Boat Survey Continued						14		‡	0850	
							15		‡	0855	
							16		‡	0901	
							17		‡	0907	
							18		‡	0912	4 dogs
							19		‡	0919	
							20				
							21				
							22		‡	0926	
							23		‡	0933	
							24		‡	0939	
							25		‡	0942	2 dogs
							26				
							27				
							A		‡	0748	
							B		‡	0756	
							C		‡	0800	
							D		‡	0805	
							E		‡	0809	1 UID turtle ± 25 m from shore; 2 Ruddy Ducks
							F		‡	0722	
03.26.2004	Pedestrian Survey										
	Carlos Laboy	0549	1030		Cloudy/Drizzling/ Partly sunny		1		‡	0823	(3) Dogs on the beach; (1) dead UID in the shore
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0657	
							6		‡	0657	
							7		‡	0657	
							8				
							9		‡	0736	
							10		‡	0750	
							11		‡	0640	
							12				
							13		‡	0635	
							14		‡	0623	
							15		‡	0602	
							16		‡	0555	
							17		‡	0602	
							18		‡	0611	
							19				
							20		‡	0802	
							21		‡	1007	
							22		‡	0954	
							23		‡	0947	

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03.26.2004	Pedestrian Survey Continued						24		‡	0941	
							25		‡	0926	(1) Dead *Iguana iguana*
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
03.29.2004	Pedestrian Survey										
	Carlos Laboy	0547	1130		Raining/Cloudy/ Showers		1	1	HB	0920	(1) Dead HB on the beach. About 3 meters distance from the shore.
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0657	
							6		‡	0657	
							7		‡	0657	
							8				
							9		‡	0735	
							10		‡	1055	
							11		‡	0638	
							12				
							13		‡	0633	
							14		‡	0621	
							15		‡	0601	
							16		‡	0555	
							17		‡	0601	
							18		‡	0609	
							19				
							20		‡	1041	
							21		‡	0845	
							22		‡	0825	
							23		‡	0837	
							24		‡	0854	
							25		‡	0807	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				

‡ = No Nest/Track Observations

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Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
03.31.2004	Pedestrian Survey										
	Carlos Laboy	0715	1000		Sunny		1			0847	An abandoned canoe on the shore (in the middle of the beach).
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0729	
							6		‡	0729	
	Official closing of NSRR; base on high alert, unable to complete survey						7		‡	0729	
							8				
							9		‡	0812	
							10		‡	0826	A dead sea star on the shore.
							11				
							12				
							13				
							14				
							15				
							16				
							17				
							18				
							19				
							20				
							21				
							22				
							23				
							24				
							25				
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
04.02.2004	Pedestrian Survey										
	Melissa Lopez-Rodriguez	0547	1030		Sunny		1	1	‡	0755	
	Carlos Laboy						2				
							3				
							4				
							5		‡	0651	
							6		‡	0651	
							7		‡	0651	
							8				
							9		‡	0730	
							10			0742	Gate closed/No entrance to the beach.

‡ = No Nest/Track Observations

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
04.02.2004	Pedestrian Survey Continued						11		‡	0639	
							12				
							13		‡	0634	
							14		‡	0622	
							15		‡	0601	
							16		‡	0555	
							17		‡	0601	
							18		‡	0609	Several dog tracks.
							19				
							20		‡	1011	
							21		‡	0940	
							22		‡	0924	
							23		‡	0917	
							24		‡	0910	
							25		‡	0957	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
04.05.2004	Pedestrian Survey										
	Carlos Laboy	0541	1100		Sunny		1		‡	0938	
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0643	
							6		‡	0643	
							7		‡	0643	
							8				
							9		‡	0727	
							10		‡	0742	
							11		‡	0632	
							12				
							13		‡	0627	
							14		‡	0615	
							15		‡	0555	
							16		‡	0548	Few dog tracks.
							17		‡	0555	
							18		‡	0603	
							19				
							20		‡	0755	
							21		‡	0912	

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
04.02.2004	Pedestrian Survey Continued						22		‡	0855	(1) manatee swimming and probably feeding in a *Thalassia* area of the beach.
							23		‡	0849	
							24		‡	0836	
							25		‡	0821	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
04.07.2004	Boat Survey										
	Carlos Laboy	0655	0940	2	Clear/Hot	Bill Elliott	1		‡	0726	
							2		‡	0735	UID turtle ± 75 m from shore. Personal of base clean, grass cut, and removed the sand from the beach.
							3		‡	0812	
							4				
							5		‡	0816	
							6		‡	0816	
							7		‡	0816	
							8				
							9		‡	0823	
							10		‡	0827	
							11		‡	0830	
							12		‡	0830	
							13		‡	0830	
							14		‡	0836	
							15		‡	0842	
							16		‡	0845	
							17		‡	0850	
							18		‡	0853	
							19		‡	0859	
							20				
							21				
							22		‡	0906	
							23		‡	0911	
							24		‡	0916	
							25		‡	0919	
							26				
							27				
							A		‡	0743	1 Osprey
							B		‡	0743	1 Osprey
							C				

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04.07.2004	Boat Survey Continued						D		‡	0759	
							E		‡	0807	
							F		‡	0714	
04.09.2004	Pedestrian Survey										
	Carlos Laboy	0553	1030	Low tides	Partly Sunny/Hot		1		‡	0759	
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0651	
							6		‡	0651	
							7		‡	0651	
							8				
							9		‡	0729	
							10		‡	0742	
							11		‡	0639	
							12				
							13		‡	0635	
							14		‡	0622	
							15		‡	0605	
							16		‡	0600	
							17		‡	0605	
							18		‡	0603	
							19				
							20		‡	1014	
							21		‡	0955	
							22	2	Track	0830	(2) UID tracks; appears to be false nest
							23		‡	0925	
							24		‡	0918	(1) dead iguana
							25		‡	0906	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
04.13.2004	Pedestrian Survey										
	Melissa Lopez-Rodriguez	0557	1130		Sunny		1		‡	1006	
							2				
							3				
							4				
							5		‡	0729	
							6		‡	0729	

‡ = No Nest/Track Observations

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04.13.2004	Pedestrian Survey Continued						7		‡	0729	
							8				
							9		‡	0715	
							10		‡	0707	
							11		‡	0557	
							12				
							13		‡	0605	
							14		‡	0611	
							15		‡	0649	
							16		‡	0657	
							17		‡	0649	
							18		‡	0633	
							19				
							20		‡	0812	
							21		‡	0900	
							22		‡	0918	
							23		‡	0912	
							24		‡	0855	
							25		‡	0835	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
04.14.2004	Boat Survey										
	Carlos Laboy	0646	1000	3	Sunny	Bill Elliott	1		‡	0723	
	Melissa Lopez-Rodriguez						2		‡	0736	
							3		‡	0819	(1) Blue Heron on the shore of the beach.
							4		‡	0824	
							5		‡	0824	
							6		‡	0824	
							7		‡	0824	
							8				
							9		‡	0833	
							10		‡	0836	(1) Tricolored Heron in the water; (1) Blue Heron in the water.
							11		‡	0840	
							12		‡	0840	
							13		‡	0843	
							14		‡	0847	
							15		‡	0851	
							16		‡	0854	
							17		‡	0900	

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04.14.2004	Boat Survey Continued						18		‡	0903	Possible turtle track in the middle of the beach; check during next pedestrian survey.
							19		‡	0912	
							20				
							21				
							22		‡	0919	
							23		‡	0924	
							24		‡	0927	
							25		‡	0931	
							26				
							27				
							A		‡	0746	
							B		‡	0757	
							C				
							D		‡	0806	
							E		‡	0813	
							F		‡	0712	
04.16.2004	Pedestrian Survey										
	Carlos Laboy Melissa Lopez-Rodriguez	0555	1030		Sunny		1		‡	0814	
							2				
							3				
							4				
							5		‡	0700	
							6		‡	0700	
							7		‡	0700	
							8				
							9		‡	0741	
							10		‡	0755	
							11		‡	0559	
							12				
							13		‡	0604	
							14		‡	0608	
							15		‡	0637	(1) UID turtle in the water approx 6 m from shore
							16		‡	0648	
							17		‡	0637	
							18	1	Track	0618	Possible nest; evidence of track and hole. SE of the beach.
							19				
							20		‡	0915	
							21		‡	1015	
							22		‡	1000	
							23		‡	0955	
							24		‡	0949	
							25		‡	0937	
							26				

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04.16.2004	Pedestrian Survey Continued						27				
							A				
							B				
							C				
							D				
							E				
							F				
04.19.2004	Pedestrian Survey										
	Carlos Laboy	0555	1030		Partly Cloudy/Sunny		1		‡	0800	(3) UID plover nests in the shore (almost at the end of the beach).
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0650	
							6		‡	0650	(2) Oyster catcher on the rocks in beach 6
							7		‡	0650	
							8				
							9		‡	0729	
							10		‡	0742	
							11		‡	0559	
							12				
							13		‡	0604	
							14		‡	0609	
							15		‡	0631	
							16		‡	0639	
							17		‡	0631	
							18		‡	0618	
							19				
							20		‡	0957	
							21		‡	0939	(1) UID plover nest in the sand.
							22		‡	0926	
							23		‡	0920	
							24		‡	0915	
							25		‡	0903	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
04.23.2004	Pedestrian Survey										
	Carlos Laboy	0552	1000		Cloudy/Sunny		1		‡	0757	
	Melissa Lopez-Rodriguez						2				

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
04.23.2004	Pedestrian Survey Continued						3				
							4				
							5		‡	0649	
							6		‡	0649	
							7		‡	0649	
							8				
							9		‡	0727	
							10		‡	0739	
							11		‡	0557	
							12				
							13		‡	0601	(1) Oyster catcher
							14		‡	0606	
							15		‡	0631	
							16		‡	0637	
							17		‡	0631	
							18	1	Nest	0616	(1) HB nest under the *Thespesid populnea* and Almond trees.
							19				
							20		‡	0947	
							21		‡	0930	
							22		‡	0915	
							23		‡	0911	
							24		‡	0906	
							25		‡	0854	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
04.26.2004	Pedestrian Survey										
	Carlos Laboy	0533	0940	Low tides	Sunny		1		‡	0752	
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0643	
							6		‡	0643	
							7		‡	0643	
							8				
							9		‡	0721	
							10		‡	0733	
							11		‡	0549	

Geo-Marine, Inc.
550 East 15th Street
Plano, TX 75074

Weekly Sea Turtle Nesting Beach Survey Results, NSRR, Puerto Rico

N62470-02-D-9997; CTO 0031
GMI Project No. 17097.00.31
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
							12				
							13		‡	0554	
							14		‡	0558	(1) UID Ray in the water.
04.26.2004	Pedestrian Survey Continued						15		‡	0618	A lot of foot tracks in the sand.
							16	1	Nest	0624	(1) HB nest under *Thespesid populnea* tree and close to black mangrove. Located to the other side of the nesting area.
							17		‡	0618	A lot of foot tracks in the sand.
							18		‡	0608	
							19				
							20		‡	0533	
							21		‡	0924	
							22		‡	0910	
							23		‡	0901	
							24		‡	0906	
							25		‡	0849	
							26				
							27				
							A				
							B				
							C				
							D				
							E				
							F				
04.28.2004	Boat Survey										
	Carlos Laboy	0658	0930	3-4	Sunny	Bill Elliott	1		‡	0732	
	Melissa Lopez-Rodriguez						2		‡	0741	
							3		‡	0814	
							4		‡	0818	
							5		‡	0818	
							6		‡	0818	
							7		‡	0818	
							8		‡	0826	
							9		‡	0826	
							10		‡	0828	
							11		‡	0831	
							12		‡	0831	
							13		‡	0833	
							14		‡	0836	
							15		‡	0839	
							16		‡	0842	
							17			0846	
							18		‡	0848	Possible nest; recheck on pedestrian survey.
							19		‡	0855	
							20				

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N62470-02-D-9997; CTO 0031
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Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
04.28.2004	Boat Survey Continued						21				
							22		‡	0901	
							23		‡	0906	
							24		‡	0909	
							25		‡	0912	
							26				
							27				
							A		‡	0747	
							B		‡	0755	
							C				
							D		‡	0803	
							E		‡	0809	
							F		‡	0721	
04.30.2004	Pedestrian Survey										
	Carlos Laboy	0525	1100	High tides	Sunny/Windy		1		‡	0823	(1) little baby plover sp. Over the *Thalassia grass in the shore.*
	Melissa Lopez-Rodriguez						2				
							3				
							4				
							5		‡	0648	
							6		‡	0648	
							7		‡	0648	
							8				
							9		‡	0729	
							10		‡	0743	
							11		‡	0635	
							12		‡	0635	
							13		‡	00632	
							14		‡	0620	(1) UID Ray in the water.
							15		‡	0539	
							16		‡	0532	
							17		‡	0539	
							18	3 1	Nest Track	0547	Also saw a HB trap under *Thespesia populnea* tree. The turtle made one of the 3 HB nest marked.
							19				
							20		‡	1034	
							21		‡	1014	
							22		‡	1001	
							23		‡	0956	
							24		‡	0950	
							25		‡	0937	
							26				
							27				
							A				
							B				

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Weekly Sea Turtle Nesting Beach Survey Results, NSRR, Puerto Rico

N62470-02-D-9997; CTO 0031
GMI Project No. 17097.00.31
Project Manager: Paula Trent

Date	Observers	Start Time [hrs]	End Time [hrs]	Sea State	Weather	Boat Captain	Beach No.	No. of Sightings	Observations	Beach Arrival Time	Location
04.30.2004	Pedestrian Survey Continued						C				
							D				
							E				
							F				
04.30.2004	Boat Survey										
	Carlos Laboy	1144	1300		Clear/ Partly cloudy	Bill Elliott	1				
							2				
							3				
							4				
							5				
							6				
							7				
							8				
							9				
							10				
							11				
							12				
							13				
							14				
							15				
							16				
							17				
							18				
							19				
							20				
							21				
							22				
							23				
							24				
							25				
							26				
							27				
							A		‡	1213	
							B		‡	1223	
							C				
							D		‡	1231	
							E		‡	1235	
							F		‡	1206	

‡ = No Nest/Track Observations

Pedestrian and Boat Sea Turtle Nesting Surveys for Naval Station Roosevelt Roads, Puerto Rico
April 16, 2002 through June 28, 2002

Pedestrian and Boat Sea Turtle Nesting Surveys for Naval Station Roosevelt Roads, Puerto Rico
July 2, 2002 through September 27, 2002

- Depredated Nest (D)
- Dolphin Corpse
- Hawksbill Nest
- Hawksbill Track
- Leatherback Nest
- Leatherback Track
- Unidentified Turtle Nest
- Unidentified Turtle Sighting
- Unidentified Turtle Track
- Beach

N

Meters: 0 300 600 900

Feet: 0 1,000 2,000 3,000

Pedestrian and Boat Sea Turtle Nesting Surveys for Naval Station Roosevelt Roads, Puerto Rico
October 1, 2002 through December 6, 2002

Pedestrian and Boat Sea Turtle Nesting Surveys for Naval Station Roosevelt Roads, Puerto Rico January 20, 2004 through April 30, 2004.

- Depredated Nest (D)
- Hawksbill Nest
- Hawksbill Corpse
- Hawksbill Track
- Unidentified Turtle Nest
- Unidentified Turtle Sighting
- Unidentified Turtle Track
- Beach

N

Meters: 0 300 600 900

Feet: 0 1,000 2,000 3,000

Pedestrian and Boat Sea Turtle Nesting Surveys
for Naval Station Roosevelt Roads, Puerto Rico
April 16, 2002 through December 6, 2002 and
January 20, 2004 through April 30, 2004.

APPENDIX D

Surveys for the Puerto Rican boa, *Epicrates inornatus*, and the Virgin Islands boa, *Epicrates monensis granti*, at the U.S. Naval Base, Roosevelt Roads, Puerto Rico.

Summary Report

submitted to:

Geo-Marine Inc.
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Prepared by:

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Introduction

The Puerto Rican boa, *Epicrates inornatus*, and the Virgin Island boa, *Epicrates monensis granti*, are two Puerto Rico Bank endemic snakes that are listed as Endangered by the U.S. Endangered Species Act. Both species are found on Eastern Puerto Rico and were considered as likely residents on Naval Station Roosevelt Roads (NSRR). There are several areas on the NSRR that potentially harbor boa populations despite the presence of man-made structures and military activity. This document summarizes the methodology and results of surveys conducted for these two species by Geo-Marine, Inc. staff and consultants from the period 3-9 FEB 04.

Description

***E. inornatus*:** this species is a large snake with a maximum snout vent length (SVL) of 1860 mm. The dorsal scale rows on neck range from 31-34; midbody scales, from 38-42; ventral scales number 263-273 in males, 258-267 in females; sub-caudals number 66-74 in males, 68-75 in females. Color and pattern are variable. The dorsum of the body may have a series of 66-73 narrow angulated blotches (usually indistinct) that do not reaching the dorsal-ventral junction, are hollowed centrally, and have very dark brown to black edges. Tail blotches number12-26. The head is patternless. The venter is very dark brown to gray, heavily stippled with dark brown. Neonates are a brownish-orange. Scale characters and normal coloration of *E. inornatus* are well- summarized in Sheplan and Schwartz (1974) and Tolson and Henderson (1991).

E. monensis granti: This is a small species with a maximum SVL 920 mm; scale rows on neck number 34-39; on midbody 39-48; ventrals number 261-271 in males, 261-266 in females; subcaudals number 80-81 in males, 82-84 in females. The dorsal ground color is chestnut or gray-reddish brown. The dorsal pattern consists of 47-73 angulated dark chocolate-brown blotches, extending from the dorsal midline to the junction of dorsal and ventral scales. Blotches are bold, outlined in dark, and pale centrally. The head, chin, and throat are patternless. The venter is usually stippled with dark brown. Neonates are grayish-white with black blotches. Scale characters and normal coloration of *E. monensis granti* are summarized in Sheplan and Schwartz (1974) and Tolson and Henderson (1991). The Virgin Islands boa can be distinguished from the Puerto Rico boa by its small size and bold pattern. Most Puerto Rican boas, in contrast, are nearly unicolor brown, sometimes with a faint pattern of blotching barely visible. Both boas are

easily distinguished from the Puerto Rican racer, *Alsophis portoricensis*, by the presence of undivided subcaudal scales.

Distribution

***E. inornatus*:** Puerto Rico, particularly the northwest, but it ranges well to the east on the northern side of the Cordillera Central through Bayamón, Río Grande, and Luquillo eastward to Las Croabas (Tolson 1988). Numerous sightings in the Caribbean National Forest have been reported (Reagan and Zucca 1982; Reagan 1984; Wiley 2003). Wiley (2003) reported on two specimens from Ceiba.

***E. monensis granti*:** U.S. and British Virgin Is.; known from St. Thomas, Tortola, Great Camanoe I., Necker I., and Virgin Gorda (Nellis et al. 1983; Mayer and Lazell 1988); also Río Grande and Isla Culebra and Cayo Diablo off the east coast of Puerto Rico. Anecdotally recorded from Humacao and Playa Naguabo, but unrepresented by specimens in scientific collections.

Habitat

The Puerto Rican boa inhabits a variety of habitats under 400-500 m in elevation, including subtropical moist forest, subtropical wet forest, and subtropical dry forest. Wiley (2003) documented the plasticity of this species in terms of habitat selection, describing specimens from mangrove forest, dry limestone karst, wet limestone forest, montane wet forest, remnant coastal rain forest, and pastureland. The Puerto Rican boa is most common in karst forest, particularly in Northwest Puerto Rico. It may also be found in more disturbed habitats, including urban and suburban areas (Schmidt 1928; Rivero 1978; Reagan 1984. The Virgin Islands boa is more commonly associated with subtropical dry forest, coastal forest, and mangrove- with an abundance of tree species with multiple trunks and an interlocking canopy, such as *Coccoloba uvifera* and *Cassine xylocarpa* (USFWS 1986; Tolson 1988), habitats that are common on the NSRR.

The Puerto Rican boa is both arboreal and terrestrial; Garman (1887) reported it to be "very common" at Bayamón along streams on tree branches. U.S. Geological Survey personnel reported to Bird (1994) that specimens were occasionally seen basking on rocks along rivers in

Camuy and Hatillo. Although the boa is nocturnal, during the day it may be found coiled in light gaps or forest edge locations (Grant 1932; Reagan 1984; Tolson pers. obs.), in buildings, or under debris such as brush piles. Large feeding aggregations of the Puerto Rican boa have been reported from caves associated with karst forest by Rodríguez and Reagan (1984), Rodríguez-Duran (1996), and Puente-Rolón (1998).

The Virgin Islands boa is nearly always found actively foraging from eye level to as high as five m in secondary scrub or coastal forest, but also may be encountered in refugia on the ground, such as beneath rocks or within old termitaria, or in arboreal situations such as *Cocos* axils or tree holes (Tolson 1988; Chandler and Tolson 1990).

Survey techniques

Development- The following survey techniques were based upon the ecology and habits of the two boa species (for overviews see Tolson and Henderson 1993), using the author's 27 years of experience with these taxa (including work at the NSGASS and Ft. Buchanan) and a survey of the pertinent literature (see Bibliography).

Survey period - As both boas are nocturnal, most surveying was performed at night between the hours of 1830-2300. *Epicrates* nocturnal activity usually starts at sundown and peaks between 1900-2200. Sundown at NSRR occurred approximately at 1830 h during the survey period of 3-9 FEB 04. The crepuscular/nocturnal activity pattern has been corroborated for *E. inornatus* by both Bird (1994) and Reagan and Zucca (1982). Nocturnal searching for *Epicrates* is most effective during periods of subdued moonlight, i.e. last quarter through new moon, and periods of rainfall following a period of dryness. While active throughout the year, there is evidence of a seasonal activity peak between April and June (Reagan 1984). Although availability of survey participants limited the surveys from first quarter through full moon (Illumination 82.8- 95.5%) there was abundant dry-season rainfall during the survey period at NSRR, a factor very conducive to movement of *Epicrates* during the dry season.

Survey participants- Peter J. Tolson, Ph.D- Manager, David Pitts- Field Supervisor, Chris Petersen- U.S. Navy Liaison, William Barnhill, Christopher Clark, Neftali Ríos-Lopez, and Melissa Tolson- field crew.

Survey duration- The author prefers to survey for at least 20-man/ h for each 5 ha of potential habitat to be reasonably certain of the presence of boas. As NSRR has a total area of more than 3,482 ha (8,600 acres), the team was forced to subjectively sample in the most likely habitat for each species as described below.

Survey methods- Surveys of *Epicrates* were conducted using three methods:

1. Searching at night using headlamps while the snakes are actively foraging. Although Reagan and Zucca (1982) used road cruising in the Caribbean National Forest, success in finding boas was limited to collection of road-killed specimens. ***Epicrates*** are both terrestrial and arboreal, so visual scans were made of the ground as well as the above-ground vegetation, concentrating on those areas that have the best potential for boa habitat.
2. Searching of likely refugia such as wood, brush, and trash piles (including stacks of wooden pallets), hollow trees, and unused buildings (particularly if they contained bat colonies or evidence of rats) in the study areas during the day. Virgin Islands boas often utilize *Nasutitermes* termitaria as daytime refuges.
3. Survey of areas based on anecdotal evidence provided by base residents, especially security personnel (who often respond to reports of snakes on military bases), long-term residents, and Puerto Rican workers with knowledge of the area.

Survey localities- The most likely Virgin Island boa localities on the NSRR included areas of contiguous vegetation of ca. 5-10 m in height with an interlocking canopy and a brushy understory. Virgin Islands boas tend to inhabit the lower canopy of coastal forests, especially groves of *Coccoloba uvifera* and dry forest trees, especially multi-trunked individuals of *Ficus citrifolia* and *Pisonia subcordata.* However, Virgin Islands boas may be absent from suitable habitat where black rat, *Rattus rattus*, densities are high. There was ample evidence of rat abundance in virtually every locality surveyed at NSRR, particularly the coastal areas that were most suitable for the Virgin Islands boa. Puerto Rican boas tend to utilize karst or older

secondary forest where there are abundant large trees, such as *Clusia rosea*, *Ficus citrifolia*, or *Terminalia catappa* with cavities. A thorough search was also made of all abandoned buildings, cisterns, and foundations when these were encountered.

Daytime hours were also spent ground-truthing maps of vegetation of NSRR and choosing those areas most likely to be productive when searched at night. Table I tabulates the effort made in searching these habitats.

Date	Time	Persons	Man/h	Locality
4 FEB	**1100-1200**	**6**	**12**	**Coastline, Puerto Medio Mundo**
	1300-1700	**6**	**24**	**General Base areas, Punta Puerca uplands**
5 FEB	**0800-1200**	**2**	**8**	**Punta Puerca *quebradas***
	1300-1700	**2**	**8**	**Punta Puerca coastal areas**
6 FEB	**0800-1200**	**2**	**8**	**Hills adjacent to North Princeton Road**
	1300-1600	**2**	**6**	**Hills adjacent to North Princeton Road**
7 FEB	**0800-1200**	**2**	**8**	**Hills adjacent to Kula Gulf Road**
	1300-1600	**2**	**6**	**Forest patches NW of NAS**
8 FEB	**0800-1300**	**2**	**10**	**Hills adjacent to Lunga Point Road**
9 FEB	**1000-1200**	**1**	**2**	**Salerno Bay Road, Forest S. of Marcos Road**
	1300-1700	**1**	**4**	**Punta Cascajo, Community Beach**

Table I- Day Survey Periods by Area- Naval Station Roosevelt Roads

Specifically on the NSRR, the habitats encountered that were most likely to harbor populations of the Virgin Islands boa were as follows:

1. Dry forest and scrub in hilly areas and littoral forest of coastal areas of Punta Puerca.
2. Littoral forest and scrub in coastal areas of Punta Medio Mundo and beach areas of Puerto Medio Mundo.
3. Dry forest and scrub in hilly and coastal areas adjacent to Isla de Cabras (potential sea turtle nesting beaches 11-14 and 18-19).
4. Coastal areas east of Forrestal Drive adjacent to Isla Cabrita and south of landfill.
5. Planted housing and border areas of the housing areas north of Punta Algodones, including selected areas of Community Beach.

Specifically on the NSRR, the habitats encountered that were most likely to harbor populations of the Puerto Rican boa are as follows, in order of highest priority:

1. Mature *Terminalia* / mangrove forest on the north side of Punta Cascajo.
2. Hills and surrounding forest encompassed by Langley Drive, Guadalcanal Road, and the magazine roads south of the Naval Air Station (NAS), including the area of South Delicias.
3. Forested areas immediately south of Boxer Drive along the fence line southwest to Langley Drive.
4. Scrub and secondary dry forest of the hills of Punta Puerca.

Due to difficulties in logistics the only potential habitat **not** ground-truthed and surveyed was Punta Medio Mundo.

Date	Time	Persons	Man/h	Locality
4 FEB	**1830-2200**	**6**	**30**	**Coastline, Puerto Medio Mundo**
5 FEB	**1830-2200**	**6**	**21**	**Hills of Punta Puerca**
6 FEB	**1830-2200**	**6**	**21**	***Quebradas* of Punta Puerca, beach areas of Punta Puerca, Isla de Cabras**
7 FEB	**1830-2200**	**6**	**21**	**Hills adjacent to North Princeton Road, Hills adjacent to Kula Gulf Road, Reservoir flumes and adjacent forest, quebradas N. of S. Delicias.**
8 FEB	**1830-2300**	**5**	**22.5**	**Hills S. of Kearsage Road, forest and buildings NE of NAS, mangrove forest E. of FDR Drive, Punta Algodones. Beach areas of Punta Puerca, Forrestal Drive, Isla de Cabras**
9 FEB	**1830-2100**	**2**	**5**	**Punta Cascajo, Community Beach**

Table II- Night Survey Periods by Area- NSRR

Results

Fauna overview

Despite a survey effort of more than 211 man/ h, no boas of either species of *Epicrates* were encountered. A shed skin of *E. inornatus* was discovered in the abandoned building of the NSRR Flying Club (there were numerous signs of rats in this building). The only living snakes encountered were a Puerto Rican racer, *Alsophis portoricensis*, found in the forest under debris south of Kearsage Road, and two specimens of blind snakes, *Typhlops sp.* found under debris in the *Terminalia* forest on Punta Cascajo. Population levels of *Anolis cristatellus*, *Anolis stratulus*, and *Anolis pulchellus* seemed adequate to support populations of boas in several areas, particularly on the beaches and forest edges. Frogs were abundant in nearly all forested areas of the Base, particularly *coquis- Eleutherodactylus coqui* and *E. antillensis*- and the white-lipped frog *Leptodactylus albilabris*. Frogs are an important food source for juvenile *Epicrates inornatus*.

Populations of passerine birds seemed to be reduced at NSRR with the exception of mockingbirds, *Mimus polyglottos,* Zenaida doves, *Zenaida macroura* and the occasional grey kingbird, *Tyrannus dominicensis*.

Signs of dense populations of rats, such as nests, droppings, and caches of seeds, were found in all coastal areas, particularly those of Punta Puerca and Punta Cascajo. Determination of rat density indices were outside the scope of these survey activities. Likewise, feral house cats, *Felis catus*, and the Indian mongoose, *Herpestes auropunctatus*, were commonly encountered on the Base.

Habitat overview

Forested areas surveyed on the Base were all secondary and very young, appearing to be less than 20 years old. The only somewhat mature forest was the *Terminalia catappa* (an introduced exotic)/ mangrove forest north of FDR Drive on Punta Cascajo. Several of the valleys, even in relatively isolated areas, were overgrown with *Panicum*, *Ipomea*, and *Canavalia*- highly invasive and colonizing species. Every area of the Base that was surveyed presented a severely disturbed aspect. Summary comments for each area surveyed follow below:

Puerto Medio Mundo coastline

This area was composed of classic Antillean littoral forest dominated by *Coccoloba uvifera* and *Thespesia populnea*. Dispersed within this matrix were trees of the subtropical dry forest such as *Bourreria succulenta*, *Bursera simaruba*, and *Guapira fragrans,* with the occasional *Cocos nucifera* on the shoreline. This forest was essentially a shallow coastal strip, obviously heavily damaged, probably from Hurricane Hugo in 1989. Approximately 50 m from shoreline the inland area rapidly became dominated by extensive stands of *Conocarpus erectus* and *Avicennia germinans* mangrove. There was substantial forest edge on the roadside of Shangrila Drive leading to the tract that was almost completely dominated by *Leucaena leucocephala*. *Anolis*

cristatellus and *A. pulchellus* were abundant in this area, and it seemed very suitable for *Epicrates monensis granti*.

Punta Puerca uplands

This area was typical subtropical dry forest dominated by a relatively open canopy of *Bursera simaruba*, *Bourreria succulenta*, *Capparis cynophallophora*, and the occasional cactus. At every edge and within the forest there were numerous *Leucaena leucocephala*. On the crests of the hills of Punta Puerca any open area was dominated by the introduced *Panicum maximum*. There was much evidence of former human habitation in the form of old foundations, deteriorated roads, cisterns, and drainage masonry. The entire area had the aspect of complete deforestation within the past 20-30 years. Despite its highly disturbed nature, this area could probably support small boa populations of both species.

Punta Puerca *quebradas*

These areas, with evidence of seasonal standing and intermittent running water, presented a more complex environment with larger, less drought-tolerant trees, such as *Andira inermis*, *Bucida buceras*, *Eugenia axillaris*, and *Zanthoxylum martinicense*. Nonetheless, the area still appeared highly disturbed with a long history of cattle grazing or sugar cane cultivation. Frogs of the genera *Eleutherodactylus* and *Leptodactylus* were extremely common in this habitat. The higher more open canopy was unsuitable for *Epicrates monensis granti* but apparently would support populations of *E. inornatus*.

Punta Puerca coastline.

This area had the greatest potential to support populations of the Virgin Islands boa. There were numerous areas with potential refugia such as *Nasutitermes* termitaria and *Cocos* axils. There were numerous stands of larger *Coccoloba uvifera* (DBH > 10 cm that formed an interlocking canopy with *Thespesia*. This area appears to have been less affected by the catastrophic Hurricane Hugo in 1989. *Anolis* were numerous and *Leucaena* were less invasive, at least in the coastal areas. Lowland areas of slightly higher elevation were dominated by a monoculture of *Leucaena*.

Hills and surrounding forest encompassed by Langley Drive, Guadalcanal Road, and the magazine roads south of the Naval Air Station (NAS), including the area of South Delicias

These areas were typical of *E. inornatus* habitat in disturbed secondary forest. From the air, or from aerial photographs, the areas appear to be lush and verdant, but on the ground it is obviously a very young forest that in the past has been subject to severe disturbance, such as a near complete deforestation from charcoal cutting or agricultural activities. Tree composition appeared very similar to that of the Punta Puerca *quebradas*: *Andira inermis*, *Bucida buceras*, *Eugenia axillaris*, and *Zanthoxylum martinicense*. The largest trees were solitary, widely spaced *Bursera simaruba*. Most of the areas had a dense under-story of the introduced exotic *Triphasia trifolia*. The eastern slopes of this area in general presented adequate habitat for *E. inornatus*. There were small rocky outcrops and shaded,

meandering, seasonal streambeds with standing water filled with *Leptodactylus albilabris* tadpoles. The western slopes led into secluded depressions where significant forest was expected. Instead the survey team found these areas to be completely over grown with *Panicum* with a secondary over-layer of *Impomea* and other vines that often nearly covered the widely-spaced solitary trees. Road cuts and utility right-of ways had edges completely dominated by *Leucaena leucocephala*. Most open areas and light gaps near roads were covered with *Panicum*.

Hills adjacent to Kula Gulf Road

The forest north of the NSRR LOX plant provided habitat similar to that described for the hills and surrounding forest encompassed by Langley Drive, Guadalcanal Road, and the magazine roads. The western slopes of this hill provided some large boulder piles that appeared to be very good foraging habitat for *Epicrates inornatus*. Boulders there had quarrying drill holes that indicated that they have been blasted from another location.

Reservoir flumes and adjacent forest; quebradas north of South Delicias.

This area presented some potential *E. inornatus* habitat, as a bower of forest similar to that describe in the previous section covered the flumes surrounding the northwest end of the reservoir. Frogs and *Anolis* were exceedingly common in the area, which graded into wetland and an almost savanna-like grassland adjacent to the golf course and southeast of the Naval Air Station. More upland areas, particularly the base of the hills of South Delicias, were highly degraded and covered with *Panicum* and *Leucaena*.

Mangrove forest east of FDR Drive, Punta Algodones

This area had a very dense assemblage of *Conocarpus erectus* grading into equally dense stands of *Avicennia germinans* in the lower areas. This area had a very sterile aspect unsuitable for *Epicrates* but had incredibly dense populations of the blue land crab *Cardisoma guanhumi.*

Beach areas of Forrestal Drive (Jet Ski Beach), Isla de Cabras, Northeast Punta Cascajo, and Community Beach

These areas were composed of patchy stands of *Conocarpus erectus*, *Coccoloba uvifera*, and *Thespesia populnea*, separated by open areas of cleared ground. The habitat was too patchy to be considered good habitat for *E. monensis granti*. However, during the period of the survey Jet Ski Beach (designated beach #18 on U.S. Navy PWD Drawing #6322) was covered with sea turtle nests and/ or test digs, apparently those of *Eretmochelys imbricata*.

Forest and buildings northeast of NAS

This area presented typically open stands of subtropical dry forest as described above, and noteworthy only in the respect that a shed skin of *E. inornatus* was found on the second floor of the deserted building of the former NSRR Flying Club. Rodent nesting materials, food caches, and droppings were common in the structure. Significantly, two other *E. inornatus* sightings have been reported from this area.

Hills south of Kearsage Road

This area, upland of the Rio Daguao, had areas that appeared to be suitable for *E. inornatus*. The lowland areas had some areas of open immature forest that is showing signs of recovery. Other areas, similar to the south slopes of the hills above the magazine areas, appeared highly disturbed and dominated by *Leucaena*. Only a cursory examination of this area was performed, as other areas of the Base appeared more promising for boa populations. The area was not hunted at night.

Punta Cascajo

The forest of Punta Cascajo that lies northwest of FDR Drive was the most mature secondary forest encountered on the Naval Station. Although almost entirely dominated by the exotic tree *Terminalia catappa* this forest (which grades into *Avicennia germinans* near the coast) presents the best habitat for *E. inornatus* that the survey team discovered on the base. Mature trees in this forest routinely exceeded 20 cm DBH. Fallen trees were ubiquitous, forming hollows and excavated root systems that were perfect as *E. inornatus* refugia. Bats and *Rattus rattus* were common. There was deep leak litter and numerous *Eleutherodactylus*, *Sphaerodactylus macrolepis,* and *Anolis*. Numerous piles of litter covered the forest floor, including boards and old carpeting. This is the area where the *Typhlops* were discovered.

Discussion

Boas in the genus *Epicrates* can exist in high densities in good habitat. In a recent study of the PR boa on the Naval Security Group Activity Sabana Seca (NSGASS), Tolson (1998) reported a density estimate based on direct counts of 44 boas/ha (17/ac) in one area where they were particularly numerous. Mean home range area (using the convex polygon method) may vary from 5,000 m^2 for males to 7,890 m^2 for females (Puente-Rolón 1998), but neither boa is territorial and home ranges significantly overlap. On a satellite island of Puerto Rico, Tolson (unpubl. data) calculated a density of 125 Virgin Islands boas/ha using a Jolly-Seber estimate of capture/mark/recapture data, but this species, if present on the NSRR, probably exists in much lower densities, and as a result, will be difficult to detect.

Despite their endangerment, West Indian boas are moderately tolerant of human disturbance (Reagan and Zucca 1982), and limited construction, clearing, and military activities need not have adverse effects on these species. Encounters with these boas have increased in recent years (Moreno 1991), perhaps concomitant with the increase in secondary forest in the latter part of the 20th century. Of the two species, *E. inornatus* is the taxon more tolerant of disturbance and is the species most frequent observed in areas with frequent human activity. The apparent resurgence of the population in Puerto Rico in the 20^{th} century may indicate a greater propensity to re-colonize new forest areas where agriculture has been abandoned.

This does not seem to be true for the *Epicrates monensis granti*. Despite much apparently suitable habitat throughout its range, it seems infrequently to be able to re-colonize areas from which it has been extirpated. The best example of this phenomenon is the distribution of

Epicrates monensis granti on St. Thomas, U.S. Virgin Islands, where it is absent from the heavily vegetated areas of the western two-thirds of St. Thomas and totally absent from St. John, despite the fact that cultivation of sugar cane has been abandoned on those islands for 200 years (Nellis et al. 1983). It remains as a relict on the east end of St. Thomas. Although data are incomplete, this is a species that seems completely intolerant of intensive agriculture such sugar cane cultivation, where cane fields are completely burned at the end of the growing season. There is an important parallel here with NSRR, as the land now occupied by the base was apparently cultivated by several sugar cane companies late into the 20th century. Archival photos of the Base examined by the author (some as recent as the late 1960's) show NSRR as being almost completely denuded of vegetation. This explains the young ages of the forest patches now found on the Base, where even the best of habitat seems to be of a very young age. Given the degree of cut–over experienced by the Base in its early history, it is not surprising that *Epicrates monensis granti* seems to be absent from NSRR. Negative evidence is not proof of absence, and it needs to be mentioned that due to budgetary constraints, only a limited survey effort was performed, much less than the recommended 20-man/ h for each 5 ha of potential habitat (Tolson 2003). Given the close proximity of *Epicrates monensis granti* populations at Río Grande, Playa Naguabo, and Humacao, their presence on the Base remains a possibility. More important, the high quality of habitat at coastal localities at Punta Puerca make this area an excellent candidate site for a reintroduction of the Puerto Rican Deme of the Virgin Islands boa.

The presence of *Epicrates inornatus* on the Base- although in apparent low densities- was expected due to the overwhelming amount of anecdotal evidence indicating its presence, and the fact that extant populations exist as close as Las Croabas and Fajardo. What was surprising was the fact that few staff residents were familiar with the snake. None of the current security personnel interviewed had ever seen one.

An important aspect of the biology of *E. inornatus* is that it can coexist with and even benefit from, populations of the black rat, *Rattus rattus*. Wiley (2003) reported that *Rattus rattus* was the most common prey item (61.8% of the 34 items identified). This characteristic makes it likely that boa populations on the Base would continue to expand as the young secondary forest matures into more suitable habitat.

Boa Management Recommendations

Although boa populations are not currently at high levels at NSRR, the development of Eastern Puerto Rico is proceeding at such a pace that little habitat will be left for these species on the eastern coast. The Base could serve as an important refuge for both *E. inornatus* and *E. monensis granti*.

It is very important to retain Punta Puerca and associated beaches and the Puerto Medio Mundo coastline in its current undeveloped state. If the Base is abandoned by U.S. Navy, these areas should be incorporated into the Federal or Departamento de Recursos Naturales de Puerto Rico refuge system. They are associated with and provide an important buffer for the mangrove forest bounded by Lake Chamberlain Road, Tarawa Drive, and Antietam Road.

Similarly, the *Terminalia catappa* forest of Punta Cascajo should remain undeveloped. This is excellent habitat for E. inornatus and provides an important buffer for the mangrove forests to the north.

Of secondary importance is the habitat which is currently present on the hill bounded by Langley Drive, Guadalcanal Road, and the magazine roads south of the Naval Air Station (NAS), including the area of South Delicias. These areas have the potential to develop into excellent habitat for *E. inornatus*, and provide an excellent refuge for this species east of the Luquillo Mountains.

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However, all areas should be surveyed prior to demolition of old buildings (which should be searched), clearing of vegetation, or use of heavy equipment if mortality is to be prevented.

APPENDIX E

YELLOW-SHOULDERED BLACKBIRD SURVEY AND MONITORING REPORT FOR 2004 U.S. NAVAL STATION ROOSEVELT ROADS CEIBA, PUERTO RICO

DRAFT REPORT

Prepared for:

ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
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GEO-MARINE, INC.
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December 2004

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ABBREVIATIONS AND ACRONYMS

AFWTF	Atlantic Fleet Weapons Training Facility
AIMD	Aircraft Intermediate Maintenance Detachment
cm	centimeter
CFR	Code of Federal Regulations
ESA	Endangered Species Act
ft	feet/foot
FR	Federal Register
GMI	Geo-Marine, Inc.
in	inch(es)
m	meter(s)
NSRR	Naval Station Roosevelt Roads
PR	Puerto Rico
PRDNER	Department of Natural and Environmental Resources
unpub	Unpublished
USFWS	U.S. Fish and Wildlife Service

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1.0 INTRODUCTION

As directed by the President and Congress, NSRR was closed on March 30, 2004, and became Naval Activity Puerto Rico [NAPR] on April 1, 2004. The Navy is currently proceeding to dispose of NAPR (hereafter NSRR) as surplus property. The status of the endangered yellow-shouldered blackbird population at NSRR is needed to complete the yellow-shouldered blackbird section of the Biological Assessment (BA) for the transfer of NSRR to a redevelopment authority. This report provides life history information necessary to complete the BA, discusses all known previous yellow-shouldered blackbird observations and provides the results of all past and present yellow-shouldered blackbird surveys on NSRR.

1.1 PROJECT GOALS AND OBJECTIVES

The primary goals of this project were to continue the monitoring the existing endangered yellow-shouldered blackbird population on NSRR, provide a summary of yellow-shouldered blackbird monitoring surveys conducted at NSRR in 2000 (U.S. Navy 2001), 2002 (U.S. Navy 2003), and in 2004; and provide data on the status of this species at and near NSRR.

The objectives of this project were to:

- Conduct a pre-breeding population count for yellow-shouldered blackbirds at NSRR in 2004 with the U.S. Fish and Wildlife Service (USFWS) and Puerto Rico Department of National and Environmental Resources (PRDNER) personnel;
- Conduct surveys in 2004 to document all present yellow-shouldered blackbird nesting and foraging areas and revisit all previous documented nest sites to determine breeding/nesting activity at each site;
- Identify and monitor all located nests and provide a chronology of nesting activities including nest location, number of nests, number of eggs laid, incubation period; number of hatchlings and fledglings, and evidence of parasitism by the shiny cowbird (*Molothrus bonariensis*);
- Discuss all past and present NSRR yellow-shouldered blackbird observations and survey results in a final survey report.

1.2 LOCATION AND DESCRIPTION OF THE STUDY AREA

This study was conducted on NSRR and within the nearby town of Ceiba in eastern Puerto Rico (**Figure 1-1**). The study area lies within the subtropical dry forest zone (Ewel and Whitmore 1973). Extensive tidal flats are present on the eastern and southern boundary of NSRR. Alluvial valleys and low hills (less than 492 feet [ft] [150 meters (m)] above sea level) cover the remainder of NSRR. Vegetation within this area consists of trees, grasses, and various scrub species in intermediate succession stages. Military buildings/facilities, housing, and recreational complexes occupy the remainder of NSRR (U.S. Navy 1996). Annual rainfall in 2002 was 27.4 inches (in) (69.59 centimeters [cm]). Monthly precipitation in 2002 ranged from a high of 4.55 in (11.56 cm) in September to a low of 0.53 in (1.35 cm) in March (U.S. Navy 2002).

1.3 REPORT ORGANIZATION

This report is organized into six sections. Section 1.0 provides an introduction to the project. Section 2.0 discusses the historic and current population status of the yellow-shouldered blackbird in Puerto Rico, the reasons for the species decline, the current USFWS listing status of the species, and the breeding/nesting, foraging/feeding, and roosting habitat requirements of the yellow-shouldered blackbird. Project methodology is provided in Section 3.0. The results of pre-breeding population census, nesting, and foraging surveys are presented and discussed in Section 4.0. Survey results from 2000, 2002, and 2004 are provided, compared, and discussed in Section 5.0. Section 6.0 provides literature cited in this report and literature reviewed during preparation of the report.

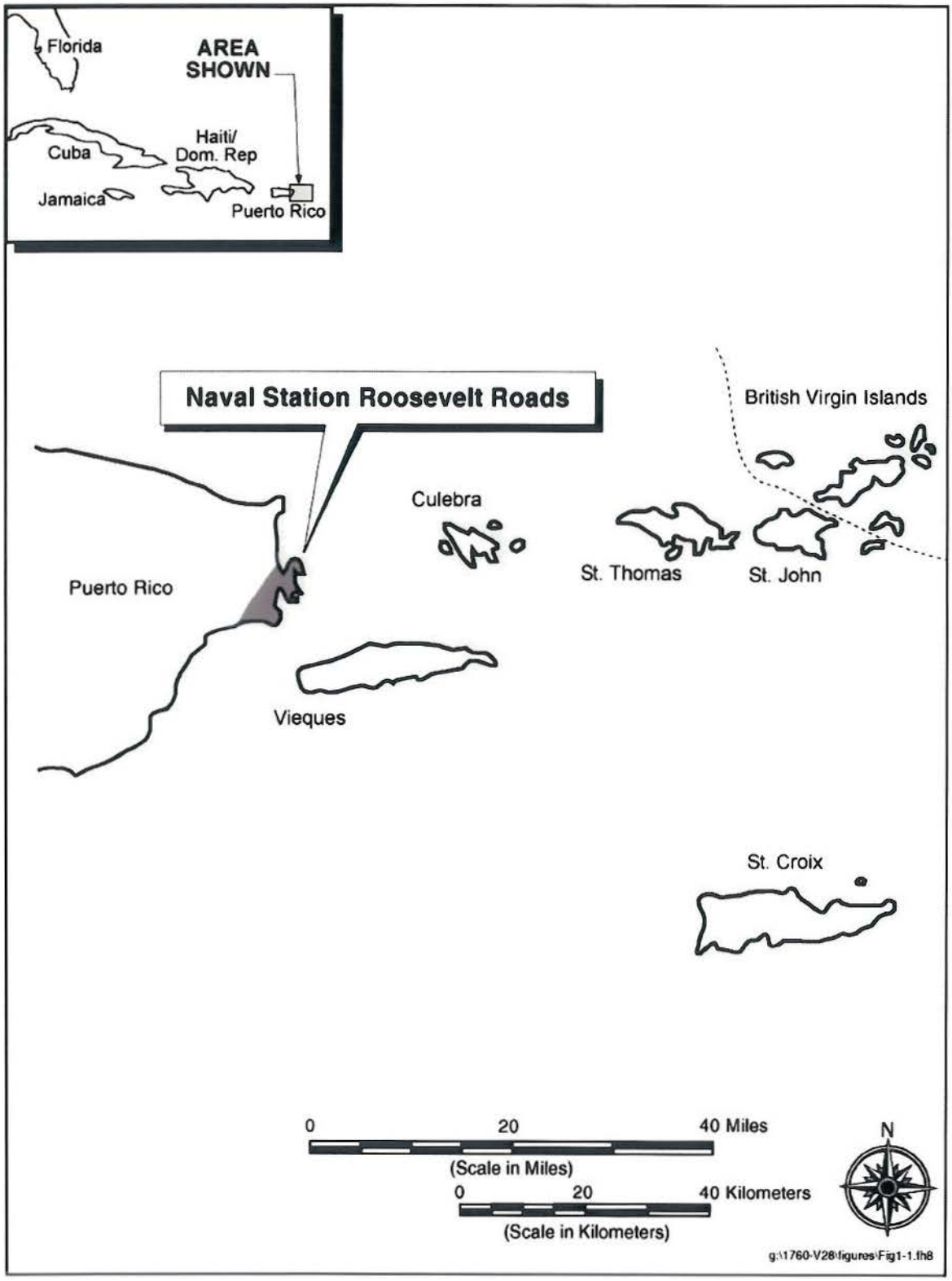

Figure 1-1. General Location of Naval Station Roosevelt Roads (NSRR), Puerto Rico.

2.0 LITERATURE REVIEW

This section reviews yellow-shouldered blackbird literature that is pertinent to the project goals and objectives. The classification status of the species, its physical description, population status and reasons for decline, and the species habitat requirements are discussed in this section.

2.1 Classification Status

The yellow-shouldered blackbird (*Agelaius xanthomus*) was classified as an endangered species in 1976 (41 Federal Register [FR] 51019), pursuant to the Endangered Species Act (ESA) of 1973, as amended (USFWS 1976). Critical habitat was designated during the same year and included all of Mona Island (i.e., southwest of the Puerto Rico mainland); the municipalities of Cabo Rojo, Lajas, and Guanica located around the coastal areas of southwestern Puerto Rico; a circular area with a 1-mile radius in the town of San German; and NSRR, southeast of Ceiba (USFWS 1976; 50 Code of Federal Register [CFR] 17.95 [b]).

2.2 Species Description

The yellow-shouldered blackbird, commonly known as "la mariquita de Puerto Rico" or " Capitán", is endemic to Puerto Rico and Mona Island (Biaggi, 1997; Pérez-Rivera, 1978; Raffaele et al., 1998). In Puerto Rico there are two subspecies of yellow-shouldered blackbird: *A. xanthomus xanthomus*, known only from Puerto Rico and Vieques Island; and *A. x. monensis*, which occurs only on Mona and Monito islands (Barnes, 1946; Cruz-Burgos, 1999). Cruz-Burgos (1999) described the yellow-shouldered blackbird as a monomorphic, medium-sized (20 to 30 cm) bird of glossy black plumage with upper-wing yellow humeral patches. The upper-wing of the humeral patch is usually edged with a narrow white margin; the under-wing is occasionally tinged with orange (Cruz-Burgos 1999; Post 1981b). The plumage of males and females is similar. Immature birds are duller in coloration than adults and possess a brown abdomen (Cruz-Burgos 1999).

2.3 Population Status and Reasons for Decline

2.3.1 Historic (1864-1975) Population Status

The yellow-shouldered blackbird was formally abundant and widespread throughout most habitats on Puerto Rico (USFWS 1996). Wetmore (1916) indicated that the species was found mainly below an altitude of 800 ft, and was most abundant in the coastal region and inland along open valleys. The only exception was a population found in Lares at 1,200 ft (365.8 m) (Wetmore 1916). According to Struthers (1926) and Barnes (1946), the yellow-shouldered blackbird population was common on Mona Island. Post and Wiley (1976) indicated that this species remained widespread and very common until 1940, when the yellow-shouldered blackbird population began to decline. Several causes contributing to the decline were disease (Post, 1981a), loss of feeding and nesting habitats, nest predation by the pearly-eyed thrasher (*Margarops fuscatus*) and introduced mammals (e.g., black rat [*Rattus rattus*] and Norway rat [*R. norvengicus*]) (Post and Wiley, 1976, 1977a,b). However, the main cause of the decline in yellow-shouldered blackbird populations was believed to be due to the extensive brood parasitism of yellow-shouldered blackbird nests by the shiny cowbird (*Molothrus bonariensis*) (Post and Wiley, 1977a,b; Wiley, 1985).

2.3.2 Recent Past (1976-2000) Population Status

In 1976, Post and Wiley estimated the yellow-shouldered blackbird population at 2,400 individuals. Based on roost counts and on surveys of nesting areas they concluded that the population was concentrated in three areas: 1) Mona Island (200), 2) coastal southwestern Puerto Rico (2,000), and 3) coastal southeastern Puerto Rico (200). The species was detected in Barranquitas, Adjuntas, Cidra, Caguas, and Cayey as late as 1978 (Pérez-Rivera 1978) and on Vieques in April 1974 and March 1978 (USFWS 1978). Between 1982 and 1986 the total island-wide yellow-shouldered blackbird population was approximately 771 to 1,212 individuals (Wiley et al. 1991). The current distribution of this species includes

the Boquerón Commonwealth Forest in southwestern Puerto Rico, with the core of regional/local populations near Salinas in southern Puerto Rico, NSRR in eastern Puerto Rico, and Mona and Monito Islands, confining the species to three locations: southwestern Puerto Rico, eastern Puerto Rico (including NSRR), and Mona and the Monito Islands (Post and Wiley 1976, 1977a,b)

2.3.2.1 Mona Island

Raffaele (1973) reported that several hundred yellow-shouldered blackbirds were present on Mona Island in 1971 and 1972. Post and Wiley (1976) estimated the Mona population to consist of 200 individuals. Pérez-Rivera (1978) reported 300 individuals in 1977. Pérez-Rivera and Bonilla (1983) reported that in 1981-1982 the population ranged from 220 to 310 individuals, respectively. Hernández-Prieto and Cruz (1987) reported a mean of 290 yellow-shouldered blackbirds from roost count estimates conducted in the summer of 1986 (counts ranged from 276 to 305 individuals). Hernández-Prieto and Cruz (1989a) suggested that the total yellow-shouldered blackbird population on Mona Island exceeded 400 individuals (an average of 652, ranging between 476 and 908 if all roosts were accounted). In 1992, a total of 310 yellow-shouldered blackbirds were counted in five different locations on Mona Island (PRDNER 1992).

2.3.2.2 Southwestern Puerto Rico

From 1974-75 to 1981-82 the yellow-shouldered blackbird population in southwestern Puerto Rico declined by about 85 percent (%). In contrast to the 2,000 individuals estimated in 1976, the population was estimated at about 300 individuals in 1982 (Wiley et al. 1991).

2.3.2.3 Eastern Puerto Rico

In eastern Puerto Rico, Nuñez-García (1988) observed a minimum of 28 yellow-shouldered blackbirds during the 1985 nesting season with 30 and 26 observations during 1986 and 1987, respectively. After Hurricane Hugo, in September of 1989, this population was though to be extirpated (USFWS 1989, 1991).

The yellow-shouldered blackbird population on NSRR was the second largest population in Puerto Rico in 1976. From 1975-76 to 1982 the NSRR population declined 97% (Wiley et al. 1991). One individual was observed at NSRR in May 1993 and two were reported at NSRR during the December 1994 Christmas Bird Count (U.S. Navy 2001). In 1995, the PRDNER reported 15 yellow-shouldered blackbirds near the main gate of the NSRR and one dead yellow-shouldered blackbird at an electrical substation near NSRR (PRDNER 1995). In 1999 four yellow-shouldered blackbirds were found at the NSRR airport (U.S. Navy 2001). One nest was reported by the PRDNER (1995) and four nests were found at NSRR during the summer of 1999 (U.S. Navy 2001).

2.3.3 Reasons for Decline

A crucial factor in the species decline was the arrival, in 1955, of the shiny cowbird, a nest predator (Grayce 1957). Although Post and Wiley (1977a,b) believed that it might have arrived before 1955. McKenzie and Noble (1990) suggested that the major decline in the yellow-shouldered blackbird population from the 1940s to the 1970s was due to the use of insecticides for the control of pests in cultivated fields. Additional causes contributing to the decline were disease (Post 1981a), loss of feeding and nesting habitats, nest predation by the pearly-eyed thrasher and the introduction of rats (roof rat, Norway rat) (Post and Wiley 1977a,b; Wiley 1985). Post and Wiley have postulated that the major cause in the decline of the yellow-shouldered blackbird was the extensive parasitism of nests by the shiny cowbird (Post and Wiley 1977a,b; Wiley 1985; Wiley 1988).

2.4 YELLOW-SHOULDERED BLACKBIRD HABITAT REQUIREMENTS

2.4.1 Breeding/Nesting

Suitable habitat during the breeding and nesting season is one of the most critical requirements for the yellow-shouldered blackbird because it provides for potential long-term survival of the species. The breeding/nesting season of this species normally extends from April through August. The initiation of pairing coincides with the start of the spring rains (Post 1981b; Post and Wiley 1976). However, depending upon the rainfall pattern, breeding activity may begin as early as February on Mona Island and could last through November (Pérez-Rivera 1978).

Yellow-shouldered blackbirds have been observed utilizing a wide variety of different habitats for nesting including: (1) coastal mangroves, (2) coastal upland dry forest, (3) black mangrove (*Avicennia germinans*) forest, (4) offshore red mangrove (*Rhizophora mangle*) cays, (5) lowland pasture (adjacent to mangrove forest), (6) coconut palm (*Cocos nucifera*) plantations, (7) cactus scrub, (8) coastal cliffs and caves (crevices and ledges), (9) suburban and urban areas (with coconut palms and royal palms [*Roystonea borinquena*]), (10) ucar (*Bucida buceras*), and (11) artificial structures (buildings and lamps) (Post and Wiley 1976; Raffaele 1989; PRDNER 1991, 1992; USFWS 1996; U.S. Navy 2001).

At NSRR in eastern Puerto Rico, yellow-shouldered blackbirds have been observed nesting in dense stands of black mangrove, in coastal dry upland forest, and on axils or middle blades of coconut and royal palms in suburban areas (Heisterberg 1987; Post and Wiley 1976; Ventosa-Febles [PRDNER] 1996). Nests have also been located near the fringe of mangrove forest along small pools and clearings. Hurricane Hugo heavily damaged the mangrove forest (e.g., defoliation, torn branches and uprooted trees) in 1989 on NSRR (USFWS 1989).

2.4.2 Feeding

The yellow-shouldered blackbird is best described as an arboreal insectivore, which occasionally feeds on native plants (USFWS 1996). Plant material (fruit, pulp, seed, nectar, sap and grass leaves) and animal material (arthropods and lizards) was identified in the diet of the yellow-shouldered blackbird (**Table 2-1** and **Table 2-2**).

Wetmore (1916) observed mixed flocks of yellow-shouldered blackbirds and Greater Antillean grackles (*Quiscalus niger*) searching for grubs and insects exposed in newly plowed fields and in newly planted cane fields. Around the municipality of Manatí, large flocks of adults and young birds were found in the citrus groves, feeding on the ground and perched in trees (dead limbs were preferred perch sites). During the spring, yellow-shouldered blackbirds were observed probing blossoms of swamp immortelle trees (*Erythrina* sp.) for nectar with other blackbirds (Wetmore 1916). Post and Wiley (1977a,b) conducted a study that indicated that yellow-shouldered blackbirds and shiny cowbirds fed around cattle feeding lots, monkey feeders, and pastures. Arthropods and plant matter are included in their diet (Post 1981a,b). Post (1981b) recorded yellow-shouldered blackbirds probing for nectar in aloe (Aloe vera) and yucca flowers (Manihot esculenta). McKenzie and Nobel (1990) indicated that yellow-shouldered blackbirds foraged with shiny cowbirds and Greater Antillean grackles. These species foraged primarily on the larvae of *Mocis latipes*, *Melipotis ochrodes*, *Spodoptera* sp., *Molipotis* sp., *Heliothis* sp., and *Anticarsia gemmatalis*.

2.4.3 Roosting

Wetmore (1916) indicated this species roosts in trees or mangroves at night. During the breeding season, yellow-shouldered blackbirds avoid the midday heat by roosting in coffee plantations, clumps of bamboo, and shaded perches (Wetmore 1916). Pérez-Rivera (1978) indicated that yellow-shouldered blackbirds shared roosting sites with Greater Antillean grackles and shiny cowbirds in Caguas. During the 1973-75 and 1981-82 seasons, this species was observed roosting with Greater Antillean grackles and shiny

Table 2-1
Yellow-shouldered blackbird Plant Diet

PLANT TAXON	FRUITS and SEEDS	NECTAR
Agavaceae		
Furcraea tuberosa		Y
Comocladia dodonaea	Y	
Metopium toxiferum	Y	
Apocynaceae		
Plumeria obtuse		Y
Bignoniaceae		
Bourreria succulenta		Y
Burseraceae		
Bursera simaruba	Y	
Cactaceae		
Cephalocereus royenii	Y	
Harrisia portoricensis	Y	Y
Hylocereus trigonus	Y	
Melocactus intortus	Y	
Opuntia sp.	Y	
Selenicereus sp.	Y	
Casuarinaceae		
Casuarina equisetifolia	Y	
Euphorbiaceae		
Croton discolor		Y
Croton rigidus	Y	
Gramineae		
Panicum maximum	Y	
Leguminosae		
Inga fagifolia		Y
Pithecellobium ungus-cacti	Y	
Lilaceae		
Aloe vera	Y	Y
Malvaceae		
Thespesia populnea		Y
Moracea		
Ficus citrifolia	Y	
Ficus sp.	Y	
Plumbaginaceae		
Plumbago scandens	Y	
Verbenaceae		
Lantana involucrate	Y	Y
Vitaceae		
Cissus trifoliate	Y	

Sources: Hernandez-Prieto and Cruz 1987, 1989a,b; Pérez-Rivera and Bonilla, 1983

Table 2-2
Yellow-shouldered blackbird Animal Diet

PREY TAXON	PUERTO RICO	MONA ISLAND
Gastropoda		
Arachnida	Y	
Aranaeae		
Anyphaenidae	Y	
Saticidae	Y	
Araneidae	Y	
Unidentified	Y	Y
Insecta		
Orthoptera		
Gryllidae	Y	
Blattidae	Y	
Unidentified		Y
Hemiptera		
Cicadidae	Y	
Naucoridae	Y	
Homoptera		
Fulgoridae	Y	
Tropiduchidae	Y	
Membracidae	Y	
Aphididae	Y	
Coleoptera		
Buprestidae	Y	
Elateridae	Y	
Curculionidae	Y	
Anthicidae	Y	
Chrysomelidae	Y	
Cerambycidae	Y	
Unidentified	Y	
Lepidoptera		
Olethreutidae	Y	
Noctuidae	Y	Y
Notodontitae	Y	
Gelechiidae		Y
Unidentified	Y	Y
Diptera		
Stratiomyidae	Y	
Syrphidae	Y	
Unidentified	Y	
Reptilia		
Squamat		
Iguanidae		Y

Sources: Cruz et. al (unpub.), Wetmore 1916, 1927, Danforth 1926, Post 1981b, Hernandez-Prieto and Cruz 1987,

cowbirds in mangrove cays off NSRR (Raffaele 1989; Wiley et al. 1991). Rasmussen (1995) observed yellow-shouldered blackbirds roosting with Greater Antillean grackles in mangroves near La Parguera. Yellow-shouldered blackbirds have been known to utilize Piñeros Island within NSRR as a nocturnal roost (USFWS 1988; Ventosa-Febles (PRDNER) 1996).

3.0 METHODOLOGIES

This study includes pre-breeding population count surveys and nesting/foraging surveys at NSRR during the first and last month of the breeding/nesting season. Survey methods, including figures depicting the locations of the pre-breeding population count survey sites and the breeding/nesting survey areas, are discussed and illustrated in this section.

3.1 PRE-BREEDING POPULATION COUNT SURVEYS

Biologists from the USFWS, PRDNER, and Geo-Marine, Inc. (GMI) met on the afternoon of March 8, 2004 to evaluate and select pre-breeding survey sites and assign survey teams to each of the selected survey sites. Potential sites for the pre-breeding population count survey were evaluated and subsequently selected based on the presence of at least one of the following criteria:

- Areas where yellow-shouldered blackbirds were previously observed nesting
- Known Greater Antillean grackle roosting sites
- Known flight paths of Greater Antillean grackles and yellow-shouldered blackbirds
- Areas around and/or near suitable yellow-shouldered blackbird nesting habitat

The sites selected included the Nimitz Housing/Carribean Lanes area, the old weapons area (buildings) on the south side of the airport, the north side of the airport including the Aircraft Intermediate Maintenance Detachment AIMD (building), and the Dagua Electrical Station near NSRR (**Figure 3-1**).

The pre-breeding surveys were started on the afternoon of March 8, 2004, and were completed on the morning of Wednesday, March 10, 2004. One biologist surveyed the Nimitz/Carribean Lanes area; two biologists and/or a biologist and a volunteer surveyed the remaining areas. Each observer was equipped with binoculars, started and finished at the same time in the morning (0630-0830) and afternoon (1630-1830), counted the number of yellow-shouldered blackbirds and shiny cowbirds observed, recorded the time of each observation, and the flight direction. All observers had previous yellow-shouldered blackbird field identification experience with the exception of one volunteer who was supervised by an experienced biologist (Appendix A).

3.2 BREEDING/NESTING SEASON SURVEYS

Breeding/nesting season surveys during the first month of the nesting season were initiated on March 23, 2004, and completed on April 29, 2004. The survey effort was concentrated in areas on NSRR where yellow-shouldered blackbirds had previously nested from 2000-2004 and included the Nimitz Housing/Caribbean Lanes area, the weapons facility, and the Airport/Aircraft Intermediate Maintenance Department (AIMD) area (**Figure 3-2**). Theses areas were classified as primary survey areas. Other areas with suitable nesting habitat were selected for surveys and were classified as secondary survey areas. These sites included the housing area along Coral Sea Drive/Saratoga Drive, Tarawa Drive (mangroves), the area surrounding the elementary school and high school, the area from the marina to the animal clinic, the Los Machos mangroves, the area around the Navy Lodge and Naval Exchange, the Atlantic Fleet Weapons Training Facility (AFWTF), and the National Guard Facility in nearby Ceiba, Puerto Rico (see **Figure 3-3**).

Surveys were conducted twice weekly during the last two weeks of March and three times a weeks in April. From March 23 through March 30, 2004, surveys were conducted from approximately 0645 to 0945. All surveys were conducted between 0630 and 1030 in April. The primary survey areas were visited on 10 of the 12 survey days scheduled for first survey period (March-April). Secondary survey areas were visited from one to four times during the survey period. The survey location (number of surveys) were: Atlantic Fleet Weapons Training Facility [AFWTF] (4); Housing areas (4); Tarawa Drive (2); Marina/animal clinic (2); Navy Exchange/Lodge (1); and National Guard Facility in Ceiba (1).

Nesting season surveys were reinitiated on August 2, 2004, to determine nesting success and identify locations of any additional nesting yellow-shouldered blackbirds and were completed on August 30.

Surveys were conducted for three times per week and occurred between 0500 and 1100. The survey effort was concentrated in areas (primary) where yellow-shouldered blackbirds were known or suspected to be nesting on NSRR in 2004 or the recent past (e.g., weapons, Nimitz Housing/Bowling, housing are near middle/high school, Airport/AIMD). The primary survey areas were visited on at least half (6 of the 13) survey days scheduled for the survey period. In addition, areas that had not been previously surveyed for yellow-shouldered blackbird were surveyed; these areas were classified as secondary sites. Secondary survey areas were visited from one to six times during the survey period and included areas around/adjacent to: Tarawa Drive (6); the National Guard Facility in Ceiba (3); Golf Course (2); Commissary (1); U.S. Army Reserve (1): U.S. Post Office (1); hospital (1); Navy Exchange/Lodge (1); U.S. Customs (1); Road to Beach 5-7 (1); Road to Beach 2 (1); Road to Beach 15-18 (1); Langley Rd. (2); Kearsage Rd. (1); Boxer Rd (3); Forrestral Rd./Tow Way Rd. (1); Baseball Park (1); CBQ Building (1), Quebrada Seca (1); Gate 1 (2); Beach 1 (1); and the Capehart wastewater treatment plant and mangrove forest trail (1).

Two biologists walked slowly through each potential primary/secondary survey area looking for yellow-shouldered blackbirds and/or evidence of breeding/nesting yellow-shouldered blackbirds. Each biologist was equipped with either 8 X 40 or 10 X 50 binoculars. Biologists recorded the presence/absence of yellow-shouldered blackbirds, any evidence of breeding activity, the location of any located yellow-shouldered blackbird nest, the number of eggs in the nest, including evidence of egg predation by the shiny cowbird, the actual (or approximate) date the eggs were laid, the number of eggs hatched, number of young, the number of fledglings, and the number of shiny cowbirds observed during the survey. All observations were recorded on a Bird Survey Data Form.

Figure 3-1. Location of Pre-Breeding Survey Sites on NSRR, Ceiba, Puerto Rico. [11x17]

Figure 3-1 page 2 [11x17]

Figure 3-2. Location of Primary Nesting Season Survey Areas.

Figure 3-2—11x17 2nd page

Figure 3-3. Location of Breeding/Nesting Season Secondary Survey Areas.

Figure 3-3—11x17 2nd page

4.0 SURVEY RESULTS

Results of the 2004 pre-breeding, breeding/nesting, and foraging surveys for yellow-shouldered blackbirds and pre-breeding and breeding/nesting surveys for shiny cowbird are provided in this section.

4.1 YELLOW-SHOULDERED BLACKBIRD

4.1.1 PRE-BREEDING POPULATION COUNT SURVEYS

Two yellow-shouldered blackbirds were observed near the old weapons facility (**Figure 4-1**). No yellow-shouldered blackbirds were found at the other survey locations.

4.1.2 BREEDING/NESTING SEASON

During the first month of the breeding/nesting season surveys, 3 pairs of yellow-shouldered blackbirds were found (**Figure 4-2**). One pair of yellow-shouldered blackbirds was consistently observed in the weapons area just south of the NSRR airfield from March 23 through April 08, 2004. On April 08, 2004 the female began constructing a nest on a rail/ledge of an outdoor hallway of Building Number (No.) 376.

The pair of yellow-shouldered blackbirds remained in the area adjacent to Building 376 through April 29, 2004. Although no eggs were found in the nest, it is likely that the pair made a nesting attempt at the site. The nesting status of this pair is classified as probable. Another pair of yellow-shouldered blackbirds was found in the royal palms between Building Nos. 2202 and 2337 (i.e., the chapel) near Caribbean Lanes on March 30, 2004. Although this area was consistently checked after the initial sighting, this pair was not relocated until April 20, 2004, when the pair was found near the dental clinic. This pair was not observed after April 20, 2004 and its nesting status is unknown. One pair of yellow-shouldered blackbirds was found in the National Guard Facility in Ceiba on March 30, 2004, its nesting status is classified as unknown.

The primary and secondary potential nesting locations for yellow-shouldered blackbird were checked numerous times during the August 2004 surveys. Yellow-shouldered blackbirds were not found during the August surveys.

In summary, one pair of yellow-shouldered blackbirds probably made a nesting attempt at NSRR in 2004. The nesting status of the other two pairs (one on NSRR and one pair in Ceiba) is unknown. No evidence of successful nesting (i.e., adults with or feeding young) was noted during the 2004 surveys.

4.1.3 Foraging Areas

Yellow-shouldered blackbirds were observed feeding in areas around their nesting site. Prior to initiation of nesting activity, the pair of yellow-shouldered blackbirds found in the area around the old weapons facility was observed foraging in an Australian pine tree next to Building 2350 and foraging in other trees (i.e., *Tabebuia heterophyllata*). This pair of birds was rarely observed foraging on subsequent visits; activity was primarily related to nest site selection and construction. The pair found in the Caribbean Lanes area was observed in royal palms and foraging in a ucer (*Bucida buceras*) tree. The National Guard facility pair was also found foraging in a tree (*Tabebuia rosea*). These observations verify previous studies that classified the yellow-shouldered blackbird as primarily an arboreal species (USFWS 1996).

4.2 SHINY COWBIRD

4.2.1 PRE-BREEDING POPULATION COUNT SURVEYS

A total of 44 shiny cowbirds were counted during the pre-breeding surveys at NSRR; 28 were observed around the old weapons facility, 14 were observed in the Nimitz/Caribbean Lanes area, and two were observed in the airport/AIMD area. An average of 22 shiny cowbirds were observed per survey day. The possibility exists that some of these individuals may have been counted twice (i.e., birds observed on the

first afternoon survey may have been counted on subsequent surveys). Most of the shiny cowbirds observed at NSRR were perched, observed foraging, or actively following birds (e.g., black-cowled oriole [*Icterus dominicensis*]) to find the host species nest site. At the nearby Dagua Electrical Station near NSRR, an estimated 300 shiny cowbirds were observed flying from their nighttime roost site at the electrical station. These shiny cowbirds flew to the northeast/northwest (i.e., away from NSRR).

4.2.2 *Breeding/Nesting Season Surveys*

Shiny cowbirds were observed during most the March/April nesting season survey sites. A total of 80 shiny cowbirds were counted during the 12-breeding/nesting survey days (an average of 6.7 per survey day) in March and April. Forty-two of the 80 shiny cowbirds were found at the primary breeding/nesting survey site. Over half of the shiny cowbirds (24) were found in the Nimitz/Caribbean Lanes area. Thirty-eight shiny cowbirds were found at the secondary survey sites. Most of the shiny cowbirds at the secondary nesting survey sites were found in the housing area along Coral Sea Drive (14) and AFWTF (8).

Shiny cowbirds were present at less than half of the of survey areas during August 2004. However, several locations had counts ranging from 20 to 80 per day. A total of 247 shiny cowbirds were observed, an average 17.5 per survey day. The average number of shiny cowbirds may be lower than reported since several sites were surveyed more than once during the month (i.e., some individuals may have been counted more than once).

Figure 4-1. Location of yellow-shouldered blackbirds found during pre-breeding survey.

Figure 4-1. 2nd page 11x17

Figure 4-2. Location of yellow-shouldered blackbirds found during breeding/nesting season surveys

Figure 4-2. 2nd page 11x17

5.0 SUMMARY

Observation locations and the results of pre-breeding, breeding/nesting, and foraging surveys conducted for yellow-shouldered blackbirds from 1995-2004 on and adjacent to NSRR are summarized and discussed in this section.

5.1 YELLOW-SHOULDERED BLACKBIRD

Known observation locations of yellow-shouldered blackbirds on NSRR from 1995-2004 are depicted in **Figure 5.1**. Most of the recent observations (2004) of the species were near the weapons facility adjacent to the airfield and in the Nimitz housing/Caribbean Lanes area.

5.1.1 PRE-BREEDING POPULATION COUNT SURVEYS

Pre-breeding yellow-shouldered blackbird population counts declined from 2000 to 2004 (**Table 5-1**). The decrease in the number of observers participating in the pre-breeding count decreased from 14 in 2000 to 5 in 2002 (U.S. Navy 2001) and 7 in 2004. Although the decrease in the number of observers probably had some affect on the count results, the site (AIMD) where 18 of 26 yellow-shouldered blackbirds were found in 2000 was surveyed in 2002 and 2004. Numbers of pre-breeding yellow-shouldered blackbirds at AIMD declined from 18 in 2000 to 10 in 2002, to zero in 2004. Some of these yellow-shouldered blackbirds could have moved to other locations within NSRR that were not included in the survey area. However, the potential exists that the observed decline in yellow-shouldered blackbird numbers may reflect a general downward trend in the yellow-shouldered blackbird population at NSRR. Additional long-term pre-breeding surveys are needed to confirm if the general downward trend observed from 2000 to 2004 will continue into the future.

Table 5-1
Summary of Recent Survey and Monitoring Data for Yellow-shouldered blackbirds on NSRR

Parameter	2000	2002	2004
Pre-breeding Count	24-26	10	2
Nesting			
Nesting Pairs	5	3	1[1]
Nesting Attempts	11	8	UNK
Known Number –Eggs	25	11	UNK
Number Hatched	7	6	UNK
Number Fledged	6	6	UNK
Non-breeders	16	4	UNK
Post-breeding Count	1	0	No Survey

[1] One probable nesting pair; 2 pair of unknown nesting status but possible nesting pairs
UNK = unknown

5.1.2 Breeding/Nesting

The number of yellow-shouldered blackbird nesting pairs has been low since the beginning of more comprehensive survey efforts in 2000 (see **Table 5-1**). Therefore, it is difficult to make any conclusions about the trend in the yellow-shouldered blackbird breeding population at NSRR. One pair of yellow-shouldered blackbirds was thought to be nesting on NSRR in 2004 (see **Table 5-1**). Breeding yellow-shouldered blackbirds appear to be declining on NSRR.

5.2 SHINY COWBIRD

5.2.1 *PRE-BREEDING POPULATION COUNT SURVEYS*

During pre-breeding surveys in 2000, less than 25 shiny cowbirds were observed on NSRR by a total of 14 observers. In 2004, 44 shiny cowbirds were found on NSRR during the pre-breeding surveys by seven observers.

5.2.2 *POPULATION COUNT SURVEYS*

A total of 327 shiny cowbirds were observed during the 27 days of 2004 breeding/nesting surveys at NSRR. Since survey data on adult shiny cowbirds was not collected prior to 2004, population trends for this species cannot be determined. One of the biologists, who conducted some of the prior yellow-shouldered blackbird surveys on NSRR, remarked that in general shiny cowbirds were noticeably more common in 2004 than 2002. The 2004 pre-breeding and nesting season surveys seem to indicate an increase in the shiny cowbird population on NSRR.

5.2.3 *NEST PARASITISM*

Nest parasitism was not observed in any of the active nests found in 2000 or 2002 (U.S. Navy 2001, 2003). Egg deposition had not occurred prior to completion of the spring surveys in 2004. However, biologists did observe female shiny cowbirds following potential avian host species during the 2004 study. The potential exists that the shiny cowbird population is increasing on NSRR and that nest parasitism may increase with potential affects on the yellow-shouldered blackbirds that nest on NSRR.

Figure 5-1. Yellow-shouldered blackbird observations on NSRR 1995-2004

Figure 5-1 2nd Page 11x17

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6.1 LITERATURE CITED

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APPENDIX A

LIST OF PRE-BREEDING POPULATION CENSUS SURVEY OBSERVERS

LIST OF PARTICIPANTS FOR THE YELLOW-SHOULDERED BLACKBIRD (*AGELAIUS XANTHOMUS*) *PRE-BREEDING COUNT CENSUS* AT NSRR, MARCH 8-10, 2004

NAMES	AGENCY
Mr. Ricardo Lopez	Biologist, Yellow-shouldered Blackbird Recovery Program (YSBRP), PRDNER
Mr. Jose Camacho	Biologist, YSBRP, PRDNER
Ms. Katsi Ramos	Biologist, YSBRP, PRDNER
Mr. Wilfredo Abreu	Biologist, Puerto Rican Parrot Recovery Program, USFWS
Mr. Ross Rasmussen	Biologist, Geo-Marine, Inc.
Mr. Carlos Laboy	Biologist, Geo-Marine, Inc
Mr. Felix Collazo	Volunteer

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APPENDIX F

MANATEE ASSESSMENT AND CONDITION SUMMARY FOR NAVAL ACTIVITY PUERTO RICO

PRE-FINAL REPORT

Submitted to:

Naval Facilities Engineering Command, Atlantic
6506 Hampton Blvd
Norfolk, Virginia 23508-1278

Submitted by:

Geo-Marine Inc.
550 East 15th Street
Plano, Texas 75074

Under

Contract No. N62470-02-D-9997
CTO 0031, Modification 1

JULY 2004

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LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

BA	=	Biological Assessment
ESA	=	Endangered Species Act
ft	=	foot/feet
gal	=	gallon(s)
km	=	kilometer(s)
L	=	liter(s)
m	=	meter(s)
mi	=	mile(s)
MMPA	=	Marine Mammal Protection Act
NAPR	=	Naval Activity Puerto Rico
NDAA	=	National Defense Authorization Act
NM	=	nautical mile(s)
NMFS	=	National Marine Fisheries Service
NSRR	=	Naval Station Roosevelt Roads
P.L.	=	Public Law
USGS	=	U.S. Geological Survey
U.S.	=	United States
U.S.C.	=	U.S. Code
USFWS	=	U.S. Fish and Wildlife Service
WWTP	=	wastewater treatment plant

1.0 INTRODUCTION

This manatee assessment and condition summary was contracted by Naval Facilities Engineering Command, Atlantic on 12 May 2004 under modification 1 to task order 0031 of Navy contract N62470-02-D-9997. The intent of this study is to ensure Naval compliance with the Marine Mammal Protection Act (MMPA) and the Section 7 consultation process of the Endangered Species Act (ESA).

1.1 Purpose and Need

The following report is an assessment of the potential impacts to West Indian manatees from the proposed cessation of operations at three wastewater treatment plants (WWTPs)—Capehart, Forrestal, and Bundy—at Naval Station Roosevelt Roads (NSRR), now known as Naval Activity Puerto Rico (NAPR). Manatees occurring in the vicinity of NSRR are often seen utilizing WWTP effluents as a source of freshwater (Rathbun et al. 1985). Therefore, any reduction or elimination of a WWTP effluent could potentially impact manatees.

The main objectives of this manatee assessment and condition summary are to:

- Ascertain the status and distribution of manatees in Puerto Rico with an emphasis on the country's east coast,
- Identify natural and artificial freshwater sources available to manatees throughout Puerto Rico, and
- Assess the potential impacts that cessation of WWTP operations might have on manatees occurring in Puerto Rico.

These objectives are a result of federal legislation that was passed on 31 March 2004 to close NSRR and transfer lands within six months of that date. Due to the ongoing withdrawal of personnel resulting from the station's recent closure, the Navy has determined that by the end of June the freshwater outfalls at each of the WWTPs will be significantly reduced. This decision warrants advance consultation on the impacts that freshwater effluent reduction may have on the West Indian manatee.

This interim report will provide the Navy an assessment of manatee impacts prior to the development of a complete Biological Assessment (BA). The findings of this report will ultimately be assimilated into the BA for the transfer of NSRR lands to private ownership and the resulting commercial and residential redevelopment that might occur afterwards.

1.2 Relevant Legislation

There are two U.S. federal resource laws that require Navy compliance with regards to the protection of West Indian manatees in Puerto Rican waters: the MMPA and the ESA. The following are brief synopses of both environmental statutes.

1.2.1 Marine Mammal Protection Act

The MMPA of 1972 established a moratorium on the "taking" of marine mammals in waters or on lands under U.S. jurisdiction. The act further regulates "takes" of marine mammals in the global commons (i.e., the high seas) by vessels or persons under U.S. jurisdiction. The MMPA defines taking as "harassing, hunting, capturing, killing, or attempting to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. 1312[13]). It also prohibits the importation into the U.S. of any marine mammal or parts or products thereof, unless it is for the purpose of scientific research or public display, as permitted by the Secretary of the Interior or the Secretary of Commerce. In the 1994 amendments to the MMPA, two levels of "harassment" (Level A and Level B) were defined. The National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2004 amended this definition of harassment in the case of military readiness activities (defined in section 315(f) of Public Law [P.L.] 107-314; 16 U.S.C. 703 note) or scientific research activities conducted by or on behalf of the Federal Government consistent with section 104 (c)(3) (16 U.S.C. 1374(c)(3)). The NDAA for FY 2004 adopted the definition of "military readiness activity" as set forth in the

NDAA for FY 2003 (P.L. 107-314). The proposed action constitutes a military readiness activity as that term is defined in P.L. 107-314 because these activities constitute "training and operations of the Armed Forces that relate to combat" and constitute "adequate and realistic testing of military equipment, vehicles, weapons and sensors for proper operation and suitability for combat use." Therefore, the relevant definition of harassment is: (1) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild (Level A) or (2) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behavioral patterns are abandoned or significantly altered (Level B) (16 U.S.C. 1362 (18)(B)(i),(ii)).

Section 101(a)(5) of the MMPA directs the Secretary of the Department of Commerce to allow, upon request, the incidental (but not intentional) taking of marine mammals by U.S. citizens who engage in a specified activity (exclusive of commercial fishing), if certain findings are made and regulations are issued. Permission will be granted by the Secretary for the incidental take of marine mammals if the taking will have a negligible impact on the species or stock and will not have an unmitigable adverse impact on the availability of such species or stock for taking for subsistence uses. A permit is required to take marine mammals; this is referred to as a take authorization (either in the form of an Incidental Harassment Authorization or Letter of Authorization). The permit is issued by the NMFS and requires that regulations be promulgated and published in the Federal Register outlining:

- Requirements pertaining to the monitoring and reporting of such taking; and
- Permissible methods of taking and the means of effecting the "least practicable adverse impact" on the species or stock and its habitat.

Endangered Species Act

The ESA of 1973 provides for the designation and protection of species that are in danger of becoming extinct and conserves the ecosystems on which such species depend. An "endangered" species is a species that is in danger of extinction throughout all or a significant portion of its range. A "threatened" species is one that is likely to become endangered within the foreseeable future throughout all or in a significant portion of its range. Critical habitat areas as defined by the ESA are specific geographic areas with physical and/or biological features that are essential for the conservation of threatened or endangered species and that may require special management considerations or protection. The USFWS and NMFS jointly administer the ESA and are responsible for the listing, or labeling of a species as either threatened or endangered, of all "candidate" species. A "candidate" species is a species that is the subject of a petition to list or status review and for which the NMFS or USFWS has determined that listing may be or is warranted (NMFS 2004). The NMFS is further charged with the listing of all "species of concern" that fall under its jurisdiction. A "species of concern" is one about which the NMFS has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA (NMFS 2004). In accordance with the regulations implementing Section 7 of the ESA, federal agencies must consult with the USFWS or NMFS when their actions may affect a listed species or result in destruction or adverse modifications of critical habitat.

2.0 PROPOSED ACTION AND GEOGRAPHIC LOCATION

This section details the proposed action and describes the geographic area where the proposed action will take place.

2.1 Description of the Proposed Action

On 31 March 2004, NSRR ceased operations. Immediately following the station's closure, a reduction in activities and personnel was implemented. Currently there are approximately 300 caretakers (including 83 security force personnel) residing at NSRR. With fewer personnel and activities at NSRR, less freshwater will be used and less wastewater will be produced. The daily flow of water through each of the station's

three WWTPs will probably be much less than the historical average of approximately 3 million liters (L) (0.8 million gallons [gal]) per day.

The proposed action is to reduce flows by 77% at the Bundy WWTP, 31.38% at the Capehart WWTP, and 66.78% at the Forrestal WWTP (Garcia 2004). Following the initial reductions, the Navy may propose to ultimately shut down each of the WWTPs prior to the official land transfer of NSRR.

2.2 Area of the Proposed Action

NSRR is located on the east coast of the Commonwealth of Puerto Rico and covers approximately 3,500 hectares (8,627 acres) of land area. Most of NSRR is located within the municipality of Ceiba (90%), while the remainder is located within the municipality of Naguabo. The nearest major town is Fajardo, located approximately 16 kilometers (km) (10 miles [mi]) north of the station. San Juan, the capital of Puerto Rico, is located approximately 64 km (40 mi) to the northwest. The islands of Culebra and Vieques, sites of prior naval training activities associated with NSRR, are located to the east of NSRR across the Vieques Passage.

The wastewater collection system at NSRR consists of approximately 52 km (32.5 mi) of gravity lines, 15.2 km (9.5 mi) of force mains, 28 lift stations, and 6 grinder pumps (Garcia 2004). This system collects wastewater and conveys it to one of three on-site WWTPs (Bundy, Capehart, or Forrestal). The locations of these three WWTPs and their outfalls are shown in **Figure 1**. Bundy, Capehart, and Forrestal WWTPs provide advanced secondary biological treatment with denitrification. The Bundy and Forrestal systems use trickling filters, while the Capehart system uses activated sludge. Following secondary treatment through denitrifying filters, the freshwater effluent from each of the WWTPs is then discharged through an outfall directly into the ocean (Garcia 2004).

The ocean outfall from the Capehart WWTP has already been documented as being a freshwater drinking source for aggregations of manatees that inhabit the waters of NSRR and nearby Vieques (Powell et al. 1981; Rathbun et al. 1985; Lefebvre et al. 2001). As a result, much is known about it. Constructed between 1959 and 1960, the Capehart plant outfall was known to discharge 1.67 million L (0.44 million gal) of treated water per day in 1985. The outfall has two diffusers that are located at distances of 50 and 150 meters (m) (164 and 492 feet [ft]) offshore and in about 4.0 and 4.5 m (13 and 15 ft) of water, respectively. Each of these outlets has two 30.5-centimeter (12-inch) diameter openings on opposite sides of the pyramidal structures.

The Bundy and Forrestal WWTP outfalls are also freshwater sources; however, manatee drinking activity has not been investigated at these two outfalls. There is little information available regarding the history and architecture of the outfalls of these two WWTPs (Worthy 1999).

3.0 STATUS AND CONDITION OF THE WEST INDIAN MANATEE IN EASTERN PUERTO RICO

The following section is an in-depth discussion on the population status and distribution of West Indian manatees in Puerto Rico, with an emphasis on manatees found in the waters around NSRR and Vieques. Supplemental maps are included in this section to depict areas of known occurrence and to illustrate potential freshwater sources and feeding habitats for manatees.

3.1 Legal Status

The West Indian manatee was listed as an endangered species throughout its range in 1985 (Rathbun and Possardt 1986). Since that time there has been no change in the protected status of the West Indian manatee in Puerto Rican waters. Critical habitat has not been designated for this species in Puerto Rico. The USFWS has consistently concluded in Section 7 biological opinions, pursuant to the ESA, that the take of a single Puerto Rican manatee would jeopardize the continued existence of the species in Puerto Rican waters (USFWS 2000).

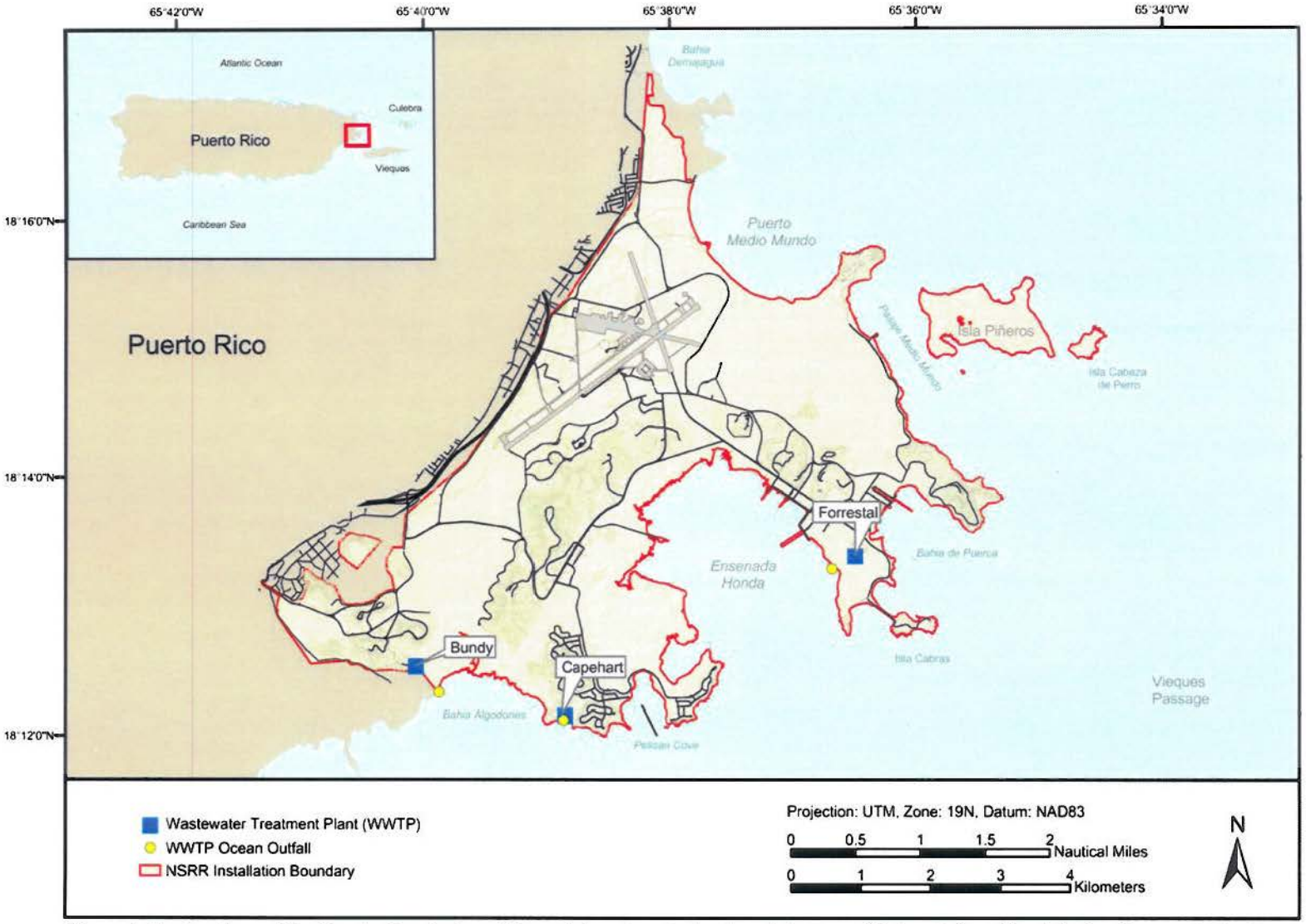

Figure 1. The locations of the Bundy, Capehart, and Forrestal wastewater treatment plants and their outfalls at Naval Station Roosevelt Roads, Puerto Rico. Source: Aero-Dynamics, Corp. 1999.

3.2 Population Size and Mortality

The USFWS Caribbean Field Office has conducted aerial surveys for manatees throughout Puerto Rico's nearshore waters since 1984 in order to determine population size and monitor trends in abundance (USFWS 2004). The exact number of manatees in Puerto Rican waters is unknown, although the number of manatees counted during aerial surveys has ranged from 43 to 101 individuals. Lefebvre et al. (2001) noted that the number of manatees in Puerto Rico probably has not declined, and may have increased, since 1978.

There is no evidence that natural disasters, competition, habitat loss, disease, or natural predation cause any significant mortality of manatees in Puerto Rico, although each of these factors should not be overlooked (Rathbun and Possardt 1986). Rathbun et al. (1985) suggested that the principal source of human-related mortality in Puerto Rico was from entanglement in gill and/or turtle nets. The most recent stock assessment has indicated that fisheries interactions significantly affect the status of the manatee in Puerto Rico (USFWS 2000). More recently, however, Mignucci-Giannoni et al. (2000) found that most human-related manatee deaths were being caused by collisions with watercraft due to increased boat traffic in Puerto Rico's waterways. There have been over 100 confirmed manatee deaths since the inception of the manatee salvage program in 1974 (USFWS 2000). A large number of these records have been documented in the vicinity of Fajardo and Ceiba (Mignucci-Giannoni et al. 2000).

3.3 Distribution and Habitat Use

Puerto Rican manatees are found in coastal waters well inside the continental shelf and rarely, if at all, near the shelf edge. Manatees occur throughout the country, although they are most abundant along the south and east coasts, particularly in the area of Fajardo and Ceiba (near NSRR) and in the Jobos Bay area between Guayama and Salinas. In general, manatees are not abundant on the north coast and are infrequently seen in areas immediately to the west of San Juan. Manatees are also rarely seen around Culebra (Powell et al. 1981; Rathbun et al. 1985; Mignucci-Giannoni 1989; USFWS 2000; Lefebvre et al. 2001; DoN 2002; **Figure 2**).

Slightly over one-third of all manatee sightings in Puerto Rico are around NSRR, on the eastern end of the island near Fajardo and Ceiba, and along the northwestern shore of Vieques (Powell et al. 1981; Rathbun et al. 1985; **Figure 2**). The nearshore waters off the northwest coast of Vieques, to the west of Mosquito Pier, are a well-known manatee feeding and resting area (Magor 1979; Rathbun et al. 1985; Reid and Kruer 1998). Manatees also use areas along the southern shore of Vieques that are protected from strong currents (Reid 1994).

From 1992 through 1996, the U.S. Geological Survey (USGS) Sirenia Project, in cooperation with the Navy, tagged seven manatees at NSRR (Reid 1997). This tracking study revealed that manatees make regional movement patterns, including directed movements between eastern Puerto Rico and Vieques (Reid and Bonde 1993). Most individuals remained near, or frequently returned to, NSRR; however, one manatee swam 50 km (27 nautical miles [NM]) south to Puerto Patillas and another swam 40 km (22 NM) north to Luquillo (Lefebvre et al. 2001). Four of the seven radio-tagged manatees repeatedly traveled 10 km (5 NM) to Vieques (Reid and Kruer 1998).

Manatee distribution in Puerto Rico (as well as in other locales where this species is found) is likely influenced by the availability of freshwater (Powell et al. 1981). These authors further ascertained that most manatees in Puerto Rico (over 85% during their surveys) would be found within 5 km (3 mi) of a natural or artificial freshwater source. The locations of natural (rivers) and artificial (WWTPs with ocean outfalls) freshwater sources available to manatees in Puerto Rico are depicted in **Figure 2**.

In addition to the Bundy, Capehart, and Forrestal WWTPs at NSRR, there are nine regional WWTP facilities found throughout Puerto Rico, all of which discharge their treated effluent through ocean outfalls (Molina-Rivera 1996; EPA 2004). In eastern Puerto Rico, manatees are most often observed drinking from the Capehart WWTP effluent, as it is a dependable, year-round source of freshwater for manatees

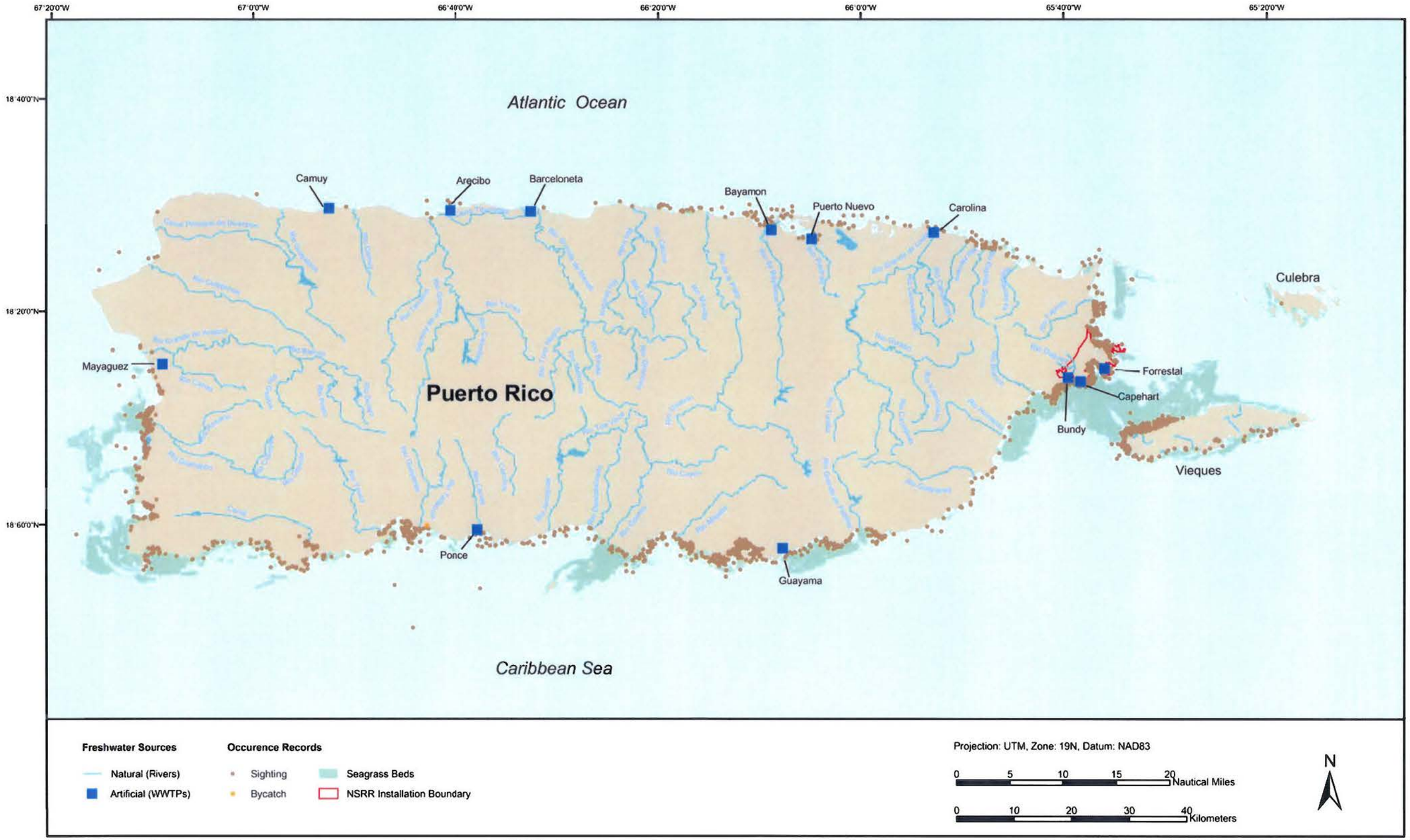

Figure 2. The distribution of manatee occurrence records, available natural and artificial freshwater sources, and seagrass beds throughout Puerto Rico. Sources: Aero-Dynamics, Corp. 1999; DoN 1987, 2002; EPA 2004; NOS 2001; USFWS 2004; and USGS 2003.

that inhabit the seagrass bed-laden waters surrounding NSRR and Vieques (Powell et al. 1981; Rathbun et al. 1985). From 1984 to 1985, the average number of manatees sighted per hour in the effluent zone of the Capehart treatment plant was 20.6 ± 12.6 individuals. Manatees were attracted to the freshwater effluents at the Capehart WWTP during all times of the day with no preference for high or low tide. Manatees principally used the outer effluent during the first five months of observations (May through September 1984) and then switched to the effluent closest to shore during the last five months of surveys (October 1984 through February 1985). Over 80% of the sightings in the Capehart area occurred within a 10-m radius of each outfall and along a 20-m corridor between the two effluents. When manatees approached the effluent, they swam directly to the pipe opening and stuck their heads in for 0.5 to 3.5 minutes (Rathbun et al. 1985).

As for natural sources of freshwater, manatees have been observed drinking from the mouths of the Río Blanco and Río Humacao in southeastern Puerto Rico and the Río Guanajibo in western Puerto Rico (Lefebvre et al. 2001; **Figure 2**). Interviews with coastal residents have indicated that manatees also visit the mouths of the Río Grande de Loíza and Río Fajardo in northeastern Puerto Rico, and may ascend the rivers for short distances after heavy rains (Powell et al. 1981; **Figure 2**). Navy personnel have even documented 'Moises' the manatee drinking from the Río Daguao at NSRR.

Although Puerto Rico's rivers likely provide an abundant source of freshwater, they may become impenetrable during the dry season. Without a river or WWTP at their disposal, manatees may end up having to solicit freshwater from garden hoses. Manatees have been observed drinking from freshwater hoses at boat marinas along the east coast of Puerto Rico since 1990 (Mignucci-Giannoni personal communication 2004). In 1994, 'Moises' the manatee was regularly offered freshwater from a garden hose around NSRR during rehabilitation efforts, as there were no rivers that flowed into the cove where he was enclosed (CSN 1994). Manatees drinking from hoses are common occurrences in areas where coastal residents use hoses to wash down their boats and docks (Reid 2000; UFSWS 2001).

Although Puerto Rican manatees may occasionally enter freshwater environments to drink, the remainder of the time they are much more common in marine environments (Lefebvre et al. 2001). It is believed that this is due primarily to Puerto Rico's lack of broad sluggish rivers, which are the preferred habitats for manatees in most other regions of the world (Lefebvre et al. 2001). Powell et al. (1981) concluded that most Puerto Rican rivers (especially quebradas, or intermittent streams, on Vieques) are generally too shallow for manatees to ascend, especially during the dry season (December to July). Others believe that the reduced numbers of manatees seen in freshwater habitats is attributable to the silting up of river mouths, which prevents manatees from grazing on shoreline grasses found at river mouths and also presumably limits their access to freshwater for drinking (Barrett 1935).

Manatee distribution in Puerto Rico is also likely influenced by the availability of seagrass (Mignucci-Giannoni 1989). Seagrass beds are extensive on the eastern and southern coasts of Puerto Rico and throughout the coastal waters of Vieques (NOS 2001; **Figure 2**). Tagging studies revealed a heavy reliance on the seagrass beds and nearshore waters adjacent to NSRR and the northwest coast of Vieques (Lefebvre et al. 2000). The higher incidence of manatees (in particular, cow/calf pairs) in these two areas is directly related to seagrass abundance (Rathbun et al. 1985; Reid and Kruer 1998; Lefebvre et al. 2000). It should be noted, however, that although seagrass beds extend several kilometers offshore and are found in waters with bottom depths greater than 20 m (66 ft), most observations of feeding manatees at NSRR and Vieques are close to shore and in shallow water (bottom depths of 1 to 5 m [3 to 16 ft]) (Lefebvre et al. 2000). Manatees likely utilize the mouths of the Río Fajardo, Río Daguao Río Blanco, and Río Humacao as freshwater sources because they are located in close proximity (within one km) to several of eastern Puerto Rico's extensive seagrass beds.

In eastern Puerto Rico, manatee sightings are often concentrated in the shallow coves and bays of NSRR, where both manatees and their primary food source (seagrasses) receive protection from wave action and strong currents. Pelican Cove and Ensenada Honda are two seagrass-laden areas where feeding manatees are most often spotted (Rathbun et al. 1985; Freeman and Quintero 1990; Lefebvre et al. 2000). Manatees also frequently utilize seagrass bed habitats in Bahía Algodones and nearby waters located along the southern perimeter of NSRR (Reid 1994). Sightings are also very common off

northwestern Vieques, where seagrass biomass appears to be even higher than at NSRR. However, the habitats off Vieques are likely not as attractive to manatees since freshwater sources there are much more difficult to locate (Diaz et al. 1992; **Figure 3**).

4.0 DETERMINATION OF IMPACTS TO THE WEST INDIAN MANATEE

Osmoregulatory studies demonstrate that while manatees can subsist in brackish water environments, most are unable survive extended periods in the marine environment unless they can visit freshwater sources on a regular basis (Ortiz et al. 1998). Manatees do not drink salt water voluntarily and, as a result, need to have regular access to either freshwater or low salinity brackish water (Worthy 1999; Ortiz 2001). Alternatively, if available, manatees can derive water directly from freshwater vegetation (USFWS 2001). However, feeding on freshwater vegetation is highly uncommon in Puerto Rican waters, as the activity requires manatees to penetrate the country's shallow rivers (Powell and Rathbun 1984; Mignucci-Giannoni and Beck 1998).

Although some manatees have been known to survive long periods without freshwater, it is not known whether these are common occurrences (Reid 2000). The observations of two West Indian manatees near the Dry Tortugas and another in the Bahamas (locations not normally considered to be part of the species' range) provide evidence of an ability to tolerate a lack of freshwater over several weeks (Ortiz et al. 1998). Their capacity to move between and adapt to both freshwater and marine environments without deleterious effects will likely allow manatees currently utilizing the ocean outfalls of the Bundy, Capehart, or Forrestal WWTP as a freshwater source to subsist during their search for alternate freshwater sources.

Several Puerto Rican manatees, including 'Moises,' have learned to acquire freshwater from garden hoses (Mignucci-Giannoni personal communication 2004). If manatees attempt to solicit freshwater from garden hoses rather than natural sources, there is a potential for negative human/manatee interactions to occur. These types of interactions could cause manatees to adopt unnatural behavioral patterns, collide with boats, and become entangled in ropes and/or fishing gear.

There are no published studies assessing the impacts of freshwater effluent reduction or elimination on manatees that primarily inhabit marine environments. The only study that is of relevance to the proposed action and its potential impacts to manatees is a study on the interruption of a thermal effluent in the Caloosahatchee and Orange rivers near Fort Myers, Florida (Packard et al. 1989). The USFWS and Florida Cooperative Fish and Wildlife Research Unit tasked Packard et al. (1989) to observe the responses of manatees to the interruption of a thermal effluent coming from a Fort Myers power plant, since concern was raised if manatees would be exposed to cold stress during winter months if power plant operations in the area ceased.

During the study, manatees exhibited behavioral changes (i.e., they gathered in an area of deep water that cooled more slowly than river and bay water) in response to the thermal effluent interruption. Packard et al. (1989) concluded that because they had no other short-term alternative, manatees would probably have suffered high levels of mortality if the power company had not resumed discharge of the heated effluent shortly after the study was completed. A similar scenario to the one above, where manatees respond by changing their behavior and distribution, could potentially occur if the Bundy, Capehart, and Forrestal WWTP effluents are reduced or shut down, although regular access to warm water is much more vital to manatees than access to freshwater.

In summary, impacts to manatees stemming from the reduction or cessation of NSRR WWTP operations should be minimal since manatees are both physiologically and behaviorally capable of exploiting alternative freshwater sources in areas near their feeding grounds.

5.0 PROPOSED MITIGATION

On 13 July 2004 the Navy had an informal consultation meeting with the USFWS to determine an appropriate set of measures to mitigate potential impacts to West Indian manatees that might result from

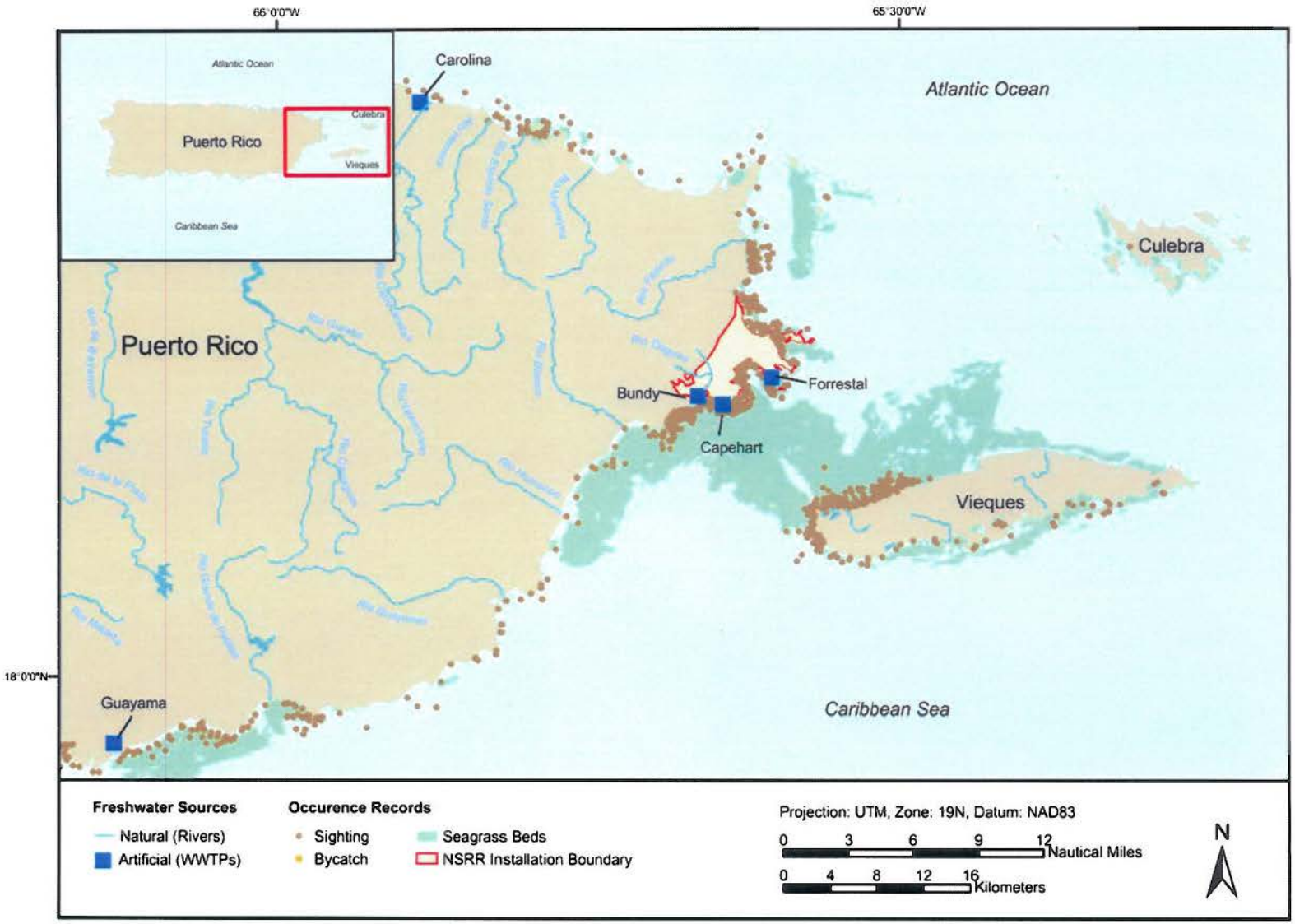

Figure 3. The distribution of manatee occurrence records, available natural and artificial freshwater sources, and seagrass beds in eastern Puerto Rico. Sources: Aero-Dynamics, Corp. 1999; DoN 1987, 2002; EPA 2004; NOS 2001; USFWS 2004; and USGS 2003.

the cessation of freshwater effluents coming from the Bundy, Capehart, and Forrestal WWTPs. The following mitigation measures were agreed upon:

- It was recommended that the manatee observation program at NSRR continue throughout the Section 7 Consultation process since manatees routinely use the base's shallow, protected waters as a foraging, resting, and calving habitat. In July 2004, Navy personnel began documenting manatee sightings two to three times per week from the observation tower located near the Capehart sewage treatment plant. The number of manatees and their locations relative to the ocean outfall are currently being recorded. Weather conditions, plant flow rate (correlated to the observation periods), and the direction of manatee ingress and/or egress are also being documented when possible. Information collected by manatee observers assists scientists to determine the temporal trends in manatee abundance within highly utilized feeding and drinking areas.

- To further assist the scientific community, the Navy purchased 10 TMT-240 ARGOS (Advanced Research and Global Observation Satellite) linked satellite tags that can be used to monitor manatee movement patterns and habitat utilization in the vicinity of NSRR. The Navy plans to work concurrently with the USFWS and U.S. Geological Survey (USGS) Sirenia Project and will serve as the keeper of the tracking data at the project's conclusion.

6.0 CONCLUSIONS

The proposed action may affect but is not likely to adversely affect West Indian manatees. The reduction or cessation of a dependable, artificial source of freshwater will not jeopardize the continued existence of manatees, as manatees can survive for extended periods (several weeks) without access to freshwater (Reid 2000). Not having a dependable drinking source at their disposal in the marine environment could potentially cause manatees to change their distribution and behavior so that they can more frequently enter freshwater habitats or occupy areas where they can solicit freshwater from hoses. However, since several rivers in eastern Puerto Rico are located in close proximity to the extensive, highly utilized seagrass beds near NSRR and Vieques, manatees may not have to leave these known foraging areas following the cessation of WWTP operations.

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APPENDIX G

Sea Turtle Nesting Habitat

Legend

- Naval Activity Puerto Rico Boundary

Parcels

- Sale Parcels
- Conservation Parcels
- Parcel Boundaries

Sea Turtle Nesting Beaches

- Nesting Habitat in Conservation Zones
- 70 Meter Setback for Sea Turtle Conservation

0 500 1,000 2,000 Meters

0 1,250 2,500 5,000 7,500 Feet

N

Puerto Rican and Virgin Islands Boa Habitat

Legend

- Naval Activity Puerto Rico Boundary
- 15% or Greater Slopes (Deed Restricted)

Parcels

- Sale Parcels
- Conservation Parcels
- Parcel Boundaries

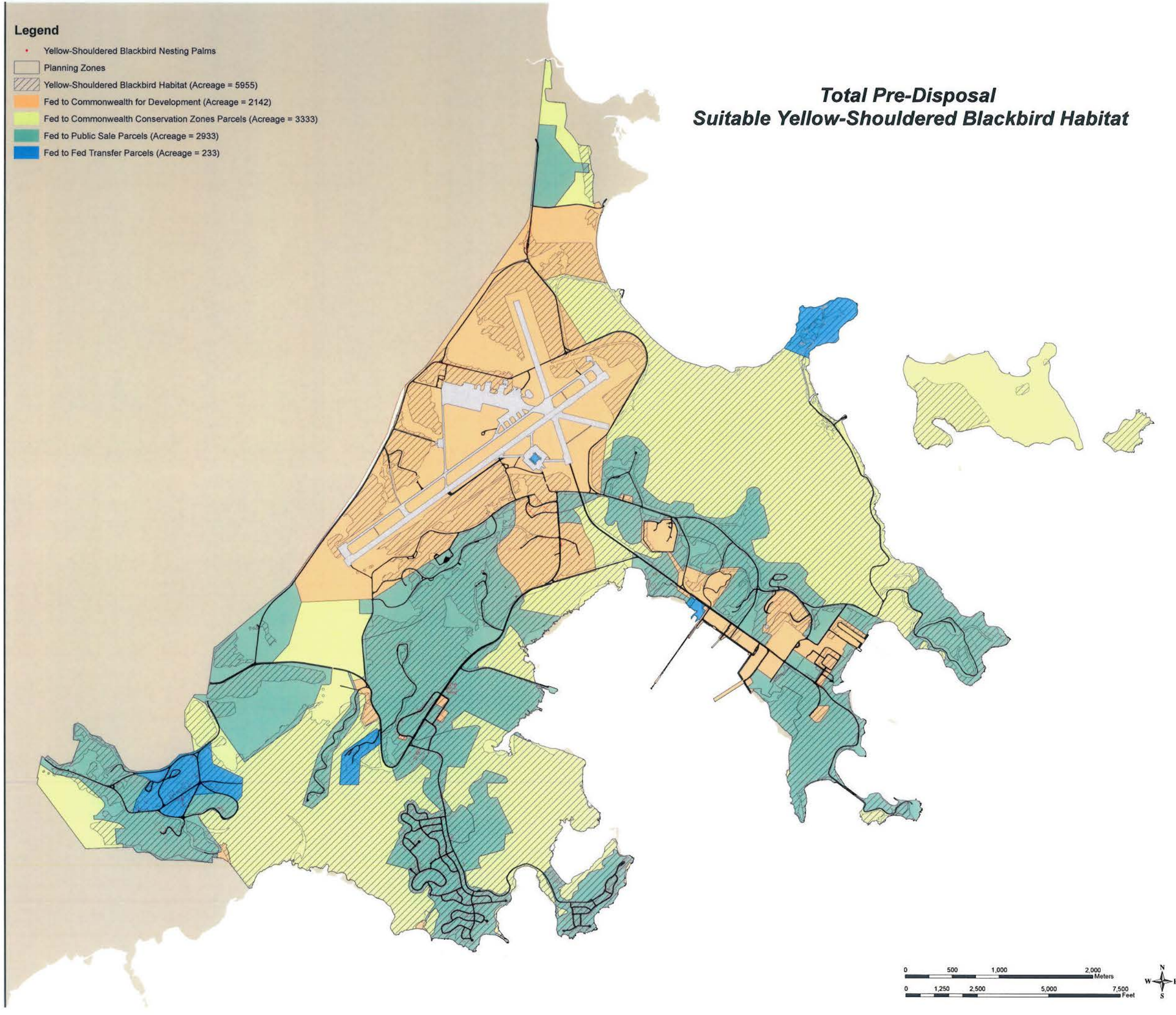
Boa Habitat

- Puerto Rican Boa Habitat (Sale Parcels)
- Puerto Rican Boa Habitat (Conservation and Fed to Fed Transfer Parcels)
- Potential Virgin Islands Boa Habitat for Reintroduction

0 500 1,000 2,000 Meters

0 1,250 2,500 5,000 7,500 Feet

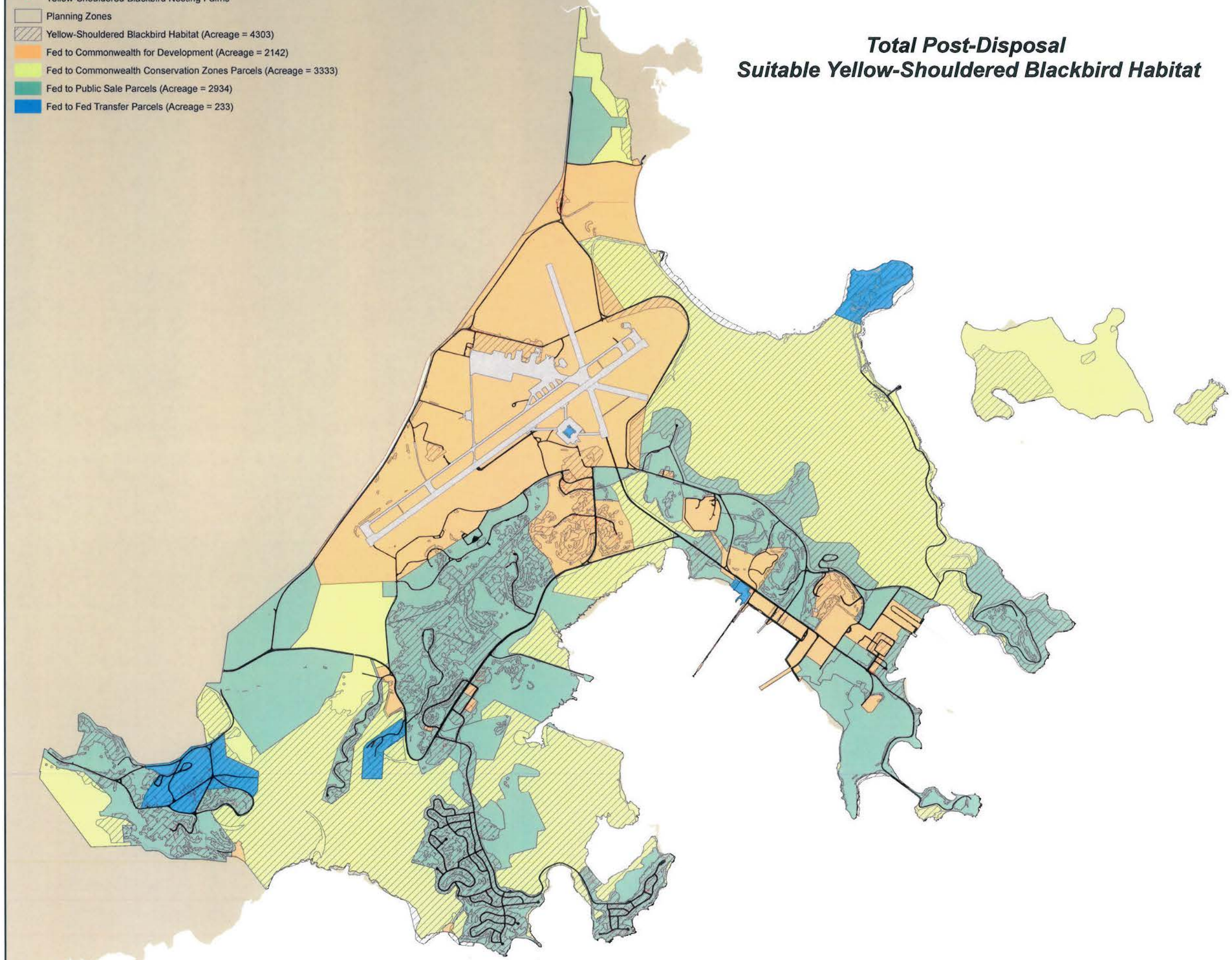
N


Legend
Yellow-Shouldered Blackbird Nesting Palms
Planning Zones
Yellow-Shouldered Blackbird Habitat (Acreage = 5955)
Fed to Commonwealth for Development (Acreage = 2142)
Fed to Commonwealth Conservation Zones Parcels (Acreage = 3333)
Fed to Public Sale Parcels (Acreage = 2933)
Fed to Fed Transfer Parcels (Acreage = 233)
Total Pre-Disposal
Suitable Yellow-Shouldered Blackbird Habitat
0 500 1,000 2,000 Meters
0 1,250 2,500 5,000 7,500 Feet
N
W E
S

Total Post-Disposal Suitable Yellow-Shouldered Blackbird Habitat

Legend

- Yellow-Shouldered Blackbird Nesting Palms
- Planning Zones
- Yellow-Shouldered Blackbird Habitat (Acreage = 4303)
- Fed to Commonwealth for Development (Acreage = 2142)
- Fed to Commonwealth Conservation Zones Parcels (Acreage = 3333)
- Fed to Public Sale Parcels (Acreage = 2934)
- Fed to Fed Transfer Parcels (Acreage = 233)



0 500 1,000 2,000 Meters

0 1,250 2,500 5,000 7,500 Feet

N W E S