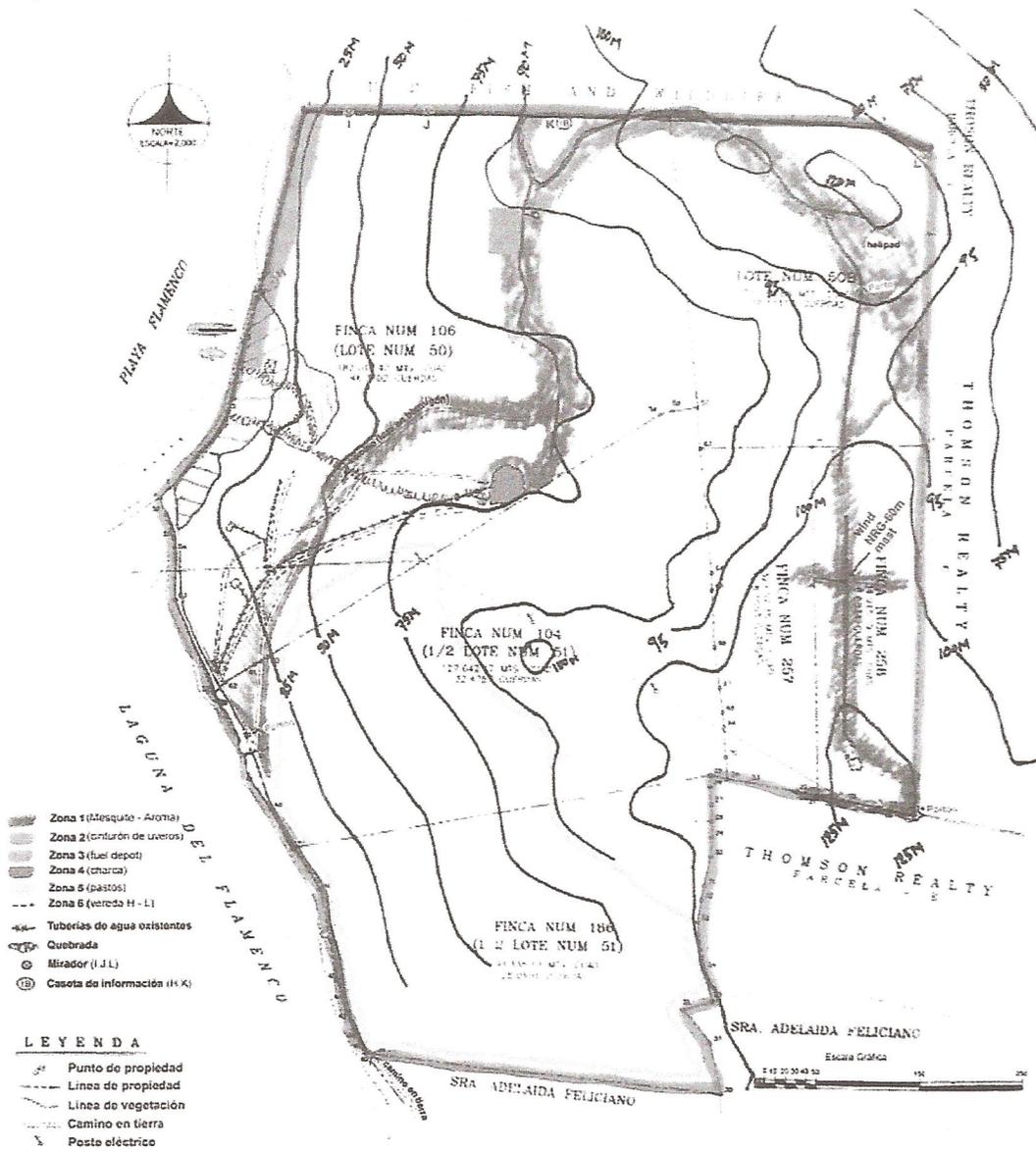


Figure 1.



### *Areas to be restored*

We will initiate the forest restoration project in four areas indicated in Figure 1: 1) margins of existing roads, 2) sea grape belt to the east of the old pier, 3) former Navy fuel depot and surrounding areas, and 4) pond.

#### 1) Road Margin Area

The margins (5 m on each side) of 2,029 m of existing roads will revegetated with native trees. The total area to be restored measures 20,290 m<sup>2</sup> (2.0 ha). These road areas are: a) from the entrance booth to the helipad (1,160 m), b) road to the gate of the NWR (129 m), c) road to the pond (95 m), d) road to the communication tower (575 m), and e) steep road recently stabilized with concrete (70 m).

At present, both sides of the roads are covered mainly by grasslands and secondary shrubwoods dominated by Guinea grass (*Panicum maximum*), mesquite (*Prosopis juliflora*) and twisted acacia (*Acacia tortuosa*). Approximately 400 mesquite and acacia trees will be replaced with some 800 native trees (see Table 1) featuring the following species:

St. Bartholomy ( <i>Cordia rickseckeri</i> )	White cedar ( <i>Tabebuia heterophylla</i> )
Gumbo-limbo ( <i>Bursera simaruba</i> )	Black mampoo ( <i>Guapira fragrans</i> )
Greenheart ( <i>Colubrina arborescens</i> )	White cherry ( <i>Adelia ricinella</i> )
Fish poison ( <i>Piscidia carthagenensis</i> )	Brisselet ( <i>Erythroxylum brevipes</i> )
Old woman bitter ( <i>Citharexylum fruticosum</i> )	Boislaglu ( <i>Ficus citrifolia</i> )
Red manjack ( <i>Cordia collococca</i> )	Black olive ( <i>Bucida buceras</i> )

Mesquites and acacias trees will be removed gradually. Removal will be accomplished by cutting them at ground level with chainsaws or other hand tools. Stumps will be left in the ground in order to minimize disturbance. Wood from larger mesquite trunks will be offered to cabinet-makers and craft workers. Branches and trunks not suitable for furniture or crafts will be processed into charcoal or ground into mulch.

The existing roads won't be widened, nor will new paths or tracks be opened. Bulldozers or other heavy equipment will not be used to clear the vegetation, nor will any kind of earth movement be performed. Existing roads will be used to move the necessary tools and equipment to the work areas.

The native trees will be planted as the mesquite and acacia are removed. Along roads, holes for planting trees will be opened mechanically. Away from roads, holes will be opened using one/two-man hole digger.

#### 2) Sea Grape Belt

Indicated in Figure 1, the sea grape belt is located just behind the beach. It begins to the north of the old pier and is not included in the *zona marítimo-terrestre*. The area to be restored measures 373 m long and 15 m wide, for a total area of 5,595 m<sup>2</sup> (0.6 ha). In

addition to sea grape (*Coccoloba uvifera*), other trees in this plant community are cork tree (*Thespesia populnea*), manchineel (*Hippomane mancinella*), fish poison (*Piscidia carthagenensis*), gumbo-limbo (*Bursera simaruba*) and St. Bartholomy (*Cordia rickseckeri*). Mesquites and acacias do not dominate this community as they do in more upland areas, but a total of about 30 mesquite and acacia will be removed (following the methodology previously described) and replaced with 60 native trees. This is the area where *Eugenia fajardensis*, *Peperomia wheeleri* and *Bastardiopsis eggersii* (Bastard maga wood) would be reintroduced. The later is an endemic species discovered in Culebra in 1906 by N. L. Britton and W. M. Wheeler. By 1916, it was considered extirpated from Culebra.

### 3) Former Fuel Depot

Measuring 8,000 m<sup>2</sup>, this is a very disturbed area with several concrete platforms and structures. It will eventually be used to construct a nursery facility. In this initial phase of the restoration project, we will plant 30 native trees of the species indicated in the attached list.

### 4) Pond

A small pond measuring about 200 m<sup>2</sup> was originally constructed to provide water to livestock. It now is mostly filled in with sediment and colonized by about 50 mesquite trees, but it still manages to hold some water throughout most the year.

Our plan is to remove the mesquite and most of the sediment so that the pond can serve to collect and store rainwater to irrigate the forest restoration project. We will revegetate the pond margins with the native *Stahlia monosperma* (*Cobana negra* in Spanish). Through a cooperative agreement, wetland specialists from DNER will provide technical assistance for this project activity.

### *Other considerations*

The key to the survival of the seedlings will be irrigation. Until the pond is rehabilitated and can serve as a reservoir, the plants will be watered using a 250 gallons water tank carried on a pickup. Two caretakers will carry out this activity.

Until the nursery is constructed, a temporary nursery facility will be established at the former fuel depot. This will consist on a steel frame covered with shade cloth. The nursery will be the staging area for the native trees imported from various sources in Puerto Rico, primarily the Metropolitan Arboretum. We will also use it to germinate seeds collected from native plants growing in the property.

### III. Responsibilities

The institutions that will be involved in the project are: Puerto Rico Land and Fruit, Metropolitan Arboretum (Parque Doña Inés at Fundación Luis Muñoz Marín), DNER, and USFWS. Their tasks and responsibilities would be as follows:

- Puerto Rico Land and Fruit (PRLF), the project applicant and owner of the property, will be responsible for the mesquite/acacia removal and tree planting, as well as the maintenance to ensure the survival of the plantings. It will provide the personnel, supplies, and equipment to perform these activities. Forester Victor Gonzalez will direct the project. Plant ecologist Julio Lazcano and botanist Fabiola Areces will manage restoration activities. Two caretakers at the property will handle most of the mesquite and acacia removal and tree planting. Occasionally, a work crew from PRLF's other farms will visit the site to advance the project.
- The Metropolitan Arboretum will supply most of the native trees to plant. Botanist Alberto Areces and agronomist Gabriela Ocampo of Metropolitan Arboretum will provide technical assistance to maximize survivorship and restore native plant communities.
- DNER through José L. Chabert will provide technical assistance to restore the pond. DNER forest rangers stationed on Culebra will patrol the project area on a regular basis to protect the plantings.
- USFWS through Carlos Pacheco and Beverly Yoshioka will provide technical assistance on plant community restoration, as well as advice on the reintroduction of two rare species, *Peperomia wheeleri* and *Eugenia fajardensis*.

**Table 1. List of the native species that will be used to replace invasives.**

FAMILIA	NOMBRE CIENTÍFICO	NOMBRE COMÚN
EUPHORBIACEAE	<i>Adelia ricinella</i>	Escambrón
RUTACEAE	<i>Amyris elemifera</i>	Tea
MALVACEAE	<i>Bastardiopsis eggersii</i>	-----
BORAGINACEAE	<i>Bourreria succulenta</i>	Palo de vaca
COMBRETACEAE	<i>Bucida buceras</i>	Úcar
BURSERACEAE	<i>Bursera simaruba</i>	Almácigo
CAPPARACEAE	<i>Capparis cynophallophora</i>	Burro prieto
CAPPARACEAE	<i>Capparis indica</i>	Sapo prieto
FLACOURTIACEAE	<i>Casearia guianensis</i>	Cafeílo
SAPOTACEAE	<i>Chrysophyllum pauciflorum</i>	Caimito de perro
VERBENACEAE	<i>Citharexylum fruticosum</i>	Palo de guitarra
RHAMNACEAE	<i>Colubrina arborescens</i>	Abeyuelo
BORAGINACEAE	<i>Cordia collococca</i>	Capá rojo
BORAGINACEAE	<i>Cordia rickseckeri</i>	Palo de lija
ERYTHROXYLACEAE	<i>Erythroxylum areolatum</i>	Indio
ERYTHROXYLACEAE	<i>Erythroxylum brevipes</i>	Jibá
MORACEAE	<i>Ficus citrifolia</i>	Jagueílo
NYCTAGINACEAE	<i>Guapira fragans</i>	Corcho
MYRTACEAE	<i>Myrciaria floribunda</i>	Mirto
FABACEAE	<i>Piscidia carthagenensis</i>	Ventura
APOCYNACEAE	<i>Rauvolfia viridis</i>	Cachimbo blanco
FABACEAE	<i>Stahlia monosperma</i>	Cobana negra
BIGNONIACEAE	<i>Tabebuia heterophylla</i>	Roble



**Wildlife:**

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

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**14- Flamenco Lagoon, Culebra, Puerto Rico**

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**Area Description:**

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

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

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

## *Puerto Rico Critical Wildlife Areas*

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

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