



Introduction and General Description

The Caribbean Islands compose one of the most diverse ecosystems within the United States. The U.S. Caribbean is in the eastern extreme of the Caribbean archipelago half way between the Florida peninsula and Venezuela. Puerto Rico and the U.S. Virgin Islands provide great opportunities to protect and restore tropical forests ecosystems, neotropical migratory bird wintering grounds, and habitat for more than 75 federally listed species. In just a few miles an observer can travel from a tropical rain forest to the sub-tropical dry forest ecosystem. Coral reefs, mangrove swamps, gorgeous rivers and streams, forested and herbaceous wetlands are within the most prominent ecosystems in the Caribbean Islands.

The U.S. Fish and Wildlife Service manages nine national wildlife refuges in the Caribbean providing one of the most diverse array of ecosystems within the National Wildlife Refuge System. Five of these are located in Puerto Rico: Cabo Rojo NWR, Laguna Cartagena NWR, Desecheo Island NWR, Culebra, NWR, and Vieques NWR; three are on the Virgin Islands: Sandy Point NWR, Green Cay NWR, and Buck Island NWR; and Navassa NWR located just west of the Hispaniola.

Puerto Rico & U.S. Virgin Islands



Puerto Rico – a Caribbean jewel.

Photo: Leonardo Mirando

Habitats of Special Concern

The combination of tropical forest, wetlands, mangrove swamps, streams, coral reefs and many other habitat types makes the Caribbean Islands an area with unique challenges for habitat restoration and protection. Due to this diversity, and the rare and endangered species present, the Service together with our many partners have identify some habitats of special concern.

Karst Forests

In Puerto Rico, more than one third of the island is covered by limestone. This region harbors the richest biodiversity on the islands where more than 1,300 species of plants and animals are present, including 30 threatened and endangered species. The northern karst belt has been identified as a viable release site for the establishment of a second wild

flock of the endangered Puerto Rican parrot (*Amazona vittata*), the only native parrot living within the United States.

Due to rapid urban and industrial development karst ecosystems are being lost at a rapid rate, endangering this important wildlife habitat and the most important aquifer on Puerto Rico.



Karst forest topography in Puerto Rico.

Photo: Leonardo Mirando

Rivers and Stream Habitats

In agricultural and urban areas, the forest fringe along stream corridors may provide the only cover for many species and serve as the only link to other forest areas. Rivers and streams are especially important due to their limited area and relatively small watersheds. These ecosystems provide important functions for society such as moving excess water, supplying drinking and irrigation water, recreation, recharging aquifers, replenishing sand on beaches, and nourishing floodplain farmlands by depositing fertile sediments. Many island rivers have been modified for flood control, water supply, and hydro-power projects.



Agricultural lands along the Arecibo River.

Photo: Leonardo Mirando

Shade Coffee

Puerto Rico is the only area within the U.S. where coffee is grown under the shading canopy of tropical forests. This practice provides excellent habitat for many resident and migratory birds and other fish and wildlife. The shading canopy of many coffee plantations has been cut to make way for “sun” coffee plantations. This practice destroys the habitat for most of the native and migratory bird species, promotes

soil erosion, reduces biodiversity and increases pollution due to the heavy use of chemical fertilizers and pesticides.

By restoring the shading canopy of these agro-ecosystems we can enhance Federal trust species habitat on private lands and provide a smooth transition between urban and natural protected areas. Approximately 90,000 acres are covered with coffee plantations, of these about 40 percent are cultivated under the shade.

Tropical Dry Forest

Dry forests in the Caribbean have come under intense pressure from agriculture and urban development. The protection and restoration of dry forests is essential to reducing the decline of many rare, threatened and endangered species as well as of an array of neotropical migratory birds and endemic species.

Due to the extreme environmental conditions, natural dry forest regeneration is very slow, and disturbed habitats remain degraded and with very little wildlife value for very long periods. Due to these facts permanent damage to dry forest ecosystems is very often observed. National wildlife refuges provide unique opportunities for private lands restoration on adjacent areas. The Sandy Point National Wildlife Refuge habitat is home to several endangered species including, the leatherback, green, and hawksbill sea turtles, the Sandy Point orchid (*Psychilis macconelliae*) and the Vahl's boxwood (*Buxus vahlii*). Other refuges with dry forest

ecosystems are the Culebra NWR and the Cabo Rojo NWR where many other endangered species inhabit including the yellow-shouldered blackbird (*Agelaius xanthomus*). There are other areas on the islands where non-profit organizations have managed for the protection and conservation, providing more opportunities for the Partners for Fish and Wildlife Program in the Caribbean.

Wetlands



A sharp-shinned hawk in a Puerto Rican forest.

Photo: C. Delannoy

The prominent wetland types in the Caribbean Islands include mangrove forests, herbaceous marshes, freshwater swamps, and riverine forests. These wetlands provide habitat that sustains commercial fisheries and many endangered species as well as reduce the impact of floods in adjacent areas.

Threats

Habitat modification and destruction is the most significant threat to the fish and wildlife resources in the Caribbean. Urban and industrial development projects within or adjacent to important wildlife areas, including national wildlife refuges, is jeopardizing these important tropical resources, unique within the U.S.

Wetlands in the U.S. Caribbean have been reduced by more than 50 percent, mostly due to drainage for agriculture, flood control projects, and urban and industrial development.

Economic pressures spurs development in sensitive areas. Excessive land clearing, overgrazing and deforestation of stream banks results in increased quantities of sediment deposits in the rivers streams, wetlands and salt ponds, reducing their habitat value.

Also, the conversion of the traditional shade coffee plantation into **“sun” coffee monocultures** is destroying perhaps the best example of sustainable agriculture in the tropics. Shade coffee allows for the wildlife habitat value of the land to be preserved at the same time an agricultural and economic activity is taking place.



A typical sun coffee plantation.

Photo: Leopoldo Miranda

Conservation Strategies

Tropical Forest Restoration

Tropical forest restoration is one of the most important activities in the Caribbean for the Partners Program. Restoration is accomplished by carefully selecting plant species for reforestation projects keeping in mind the local conditions at the restoration site. Habitat requirements for trust species present at the site are carefully designed in order to maximize its wildlife habitat value. Tropical forest restoration cost between \$400-\$600/acre for humid areas. In coastal dry forests the cost is between \$700-1,200/acre due to the extreme environmental conditions.

Shade Coffee

Another important conservation strategy is to convert “sun” coffee plantations back to “shade” coffee. This activity provides excellent habitat on private lands while maintaining the agricultural production on the same parcel of land. These practices are closely coordinated with the local Department of Natural Resources and Department of Agriculture. Approximately 50,000 acres are suitable for the reestablishment of shade coffee. The average cost of this practice is between \$300-\$600/acre.



A shade coffee plantation.

Photo: Leonardo Miranda

Stream Habitat Restoration

Rivers and streams are the natural highways connecting forested mountains with the coastal plains and the sea. New ways are being developed to live with natural river systems. Conservation practices for these important ecosystems include establishing vegetative buffers along the rivers and stream banks, constructing fishways on dams and restoring the natural channel of degraded streams. These practices restore the natural functions of degraded rivers and result in a more natural landscape. Riparian buffers cost an average of \$400-\$600/acre, while stream channel restoration has an average of \$30,000/mile.



A bananaquit with nestlings – the official bird of Puerto Rico and the U.S. Virgin Islands.

Photo: Leonardo Miranda

Wetlands

Wetland restoration projects are closely coordinated with other State and Federal agencies and local non-governmental organizations. One of the focus areas for wetland restoration is the northern karst region where thousands of isolated wetlands occur in the valleys of limestone hills. These projects include the restoration of hydrology and the reforestation of adjacent uplands. The average cost of wetland restoration in the Caribbean is \$1,000/acre.

Partners

Puerto Rico Department of Natural Resources
U.S. Forest Service
Natural Resources Conservation Service
Soil Conservation Districts Association
Puerto Rico Department of Agriculture
Agricultural Extension Service
Guardianes de la Montaña
Ciudadanos del Karso
Sociedad Ornitologica
Saint Croix Environmental Association
Puerto Rico Conservation Trust
Mariposario Las Limas
Teen Challenge of Puerto Rico, Inc.
Puerto Rico Rural Development Corporation
Colegio San Antonio Abad
University of Puerto Rico
Metropolitan University
Municipio de Caguas
University of the Virgin Islands Cooperative Extension Service
University of the Virgin Islands Eastern Caribbean Center
The Nature Conservancy
Virgin Islands Department of Agriculture
St. Croix Environmental Association
Virgin Islands Non-point Source Pollution Committee
Virgin Islands Urban Forestry Council
Friend of the Virgin Islands National Park
Virgin Islands Watershed Committee

Accomplishments

The Partners Program has been working in the Caribbean for just 2 years. This short period has been very productive. During this time, we have restored or protected:

- more than 100 acres of wetlands
- 200 acres of tropical forests
- 3 miles of riparian buffers
- 60 acres of shade coffee.

Future Needs

While much has been accomplished in the Caribbean with the Partners for Fish and Wildlife Program there is a lot more to do. The restoration needs for Puerto Rico and the U.S. Virgin Islands are to:

- Restore 400 miles of riparian habitat.
- Restore 50,000 acres of wetlands.
- Restore 65,000 acres of sun coffee plantations.
- Restore 100,000 acres of tropical forest habitat.

The Partners Program has been so successful that every day more and more landowners want to become a partner. We have been successful in leveraging at least three non-Federal dollars per Federal dollar spent in the Caribbean. The Service is the leading agency proposing and conducting private lands restoration projects in the Caribbean.

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