

Nariva Swamp Ramsar Site, Trinidad and Tobago (West Indies) Wetland Habitat Restoration Initiative¹

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Introduction

Trinidad and Tobago, a twin island nation, is the most southerly of the Caribbean islands and lies just 11 km off the coast of Venezuela, near the Orinoco delta. Trinidad, the larger of the two islands, is approximately 5,000 km² and the Nariva Swamp is located on its eastern coast (fig. 1). In 1993, this site was designated as a wetland of international importance under the Ramsar Convention on Wetlands of International Importance (Ramsar Convention Bureau 1996) and received protection under national legislation in 1995.

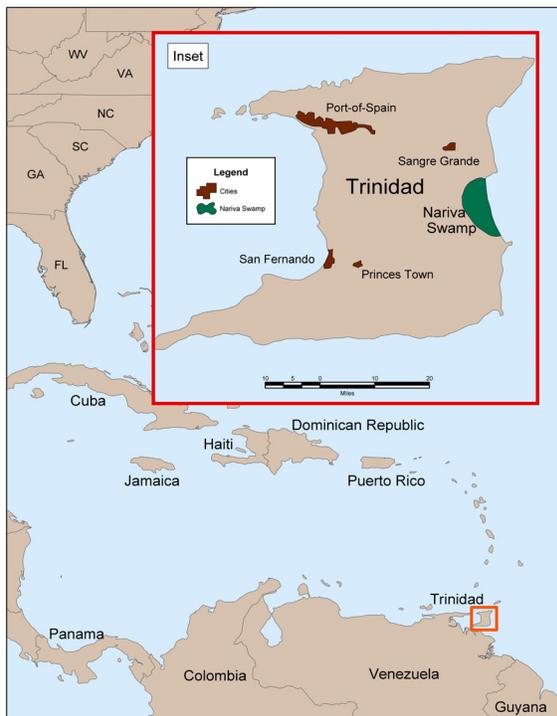


Figure 1— Location of Trinidad and Tobago, and Nariva Swamp.

Nariva Swamp is the largest fresh-water wetland in Trinidad and Tobago, covering almost 7,000 ha, and is one of the largest in the Caribbean. It is fed by a few rivers draining the Central Range, which runs in the middle of the island. Nariva Swamp drains into the ocean through the Nariva River but receives water from the ocean through seepage. The sand barrier that separates it from the ocean is mostly covered by a coconut plantation.

The Nariva Swamp includes a diverse mosaic of vegetation types: tropical forest, swamp forest, palm swamp forest, mangrove areas, marshland, and open waters (Bacon et al. 1979, James et al. 1986, James 1992). Agricultural areas add to the mosaic, and a small area at the northwestern tip was leased to local farmers. This area was illegally expanded through squatting by large rice farmers, and the negative impacts of this incursion will be explained below.

There are three small communities surrounding Nariva Swamp. Most of the inhabitants of these communities depend on the natural resources of the area for food, mainly the cascadura fish (*Hoplosternum littorale*), blue crab (*Cardisoma guanhumi*), and black conch (*Pomacea urceus*). These are highly valued by the local communities not only for subsistence but also for commercial purposes. Many people in the local communities also have gardens with annual crops such as peppers, cucumbers, watermelon, and rice.

The area is exceedingly rich in biological resources. There are over 175 species of birds recorded for Nariva Swamp (Bacon et al. 1979) out of the 433 total bird species for Trinidad and Tobago (French 1980). The star is undoubtedly the Blue and Gold Macaw (*Ara ararauna*), the object of a venture with the Cincinnati Zoo for reintroduction to the area. Despite the diversity existing in Nariva swamp, no comprehensive bird studies or regular bird surveys have been conducted. It is hoped that with the implementation of the restoration work in the area, the development of a monitoring program based on the avifauna may become possible.

Problems

The greatest negative impact to Nariva Swamp was the illegal squatting by large rice farmers who came from the cities and used heavy machinery for their

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operations. Their activity was originally detected in the early 1980s, and by the mid 1990s they had done untold damage. The farmers had dug canals to drain the wetland and set fires to forest and marsh in order to clear the accumulated organic matter for rice cultivation. Local farmers, too, have used fires in their fields, and, because wind direction can change suddenly, often times the fires have gone out of control and jumped into the forest or swamp. Fires are not a natural phenomenon here, so the damage is enormous.

Agrochemicals were heavily used by the illegal rice farmers, but the local farmers also use them. Other problems include the use of illegal fish traps and poaching. Mammals such as agouti (*Dasyprocta leporina*) are killed for meat, and birds such as Orange-winged (*Amazona amazonica*) and Cuban parrots (*A. leucocephala*) and the Red-bellied Macaw (*Ara manilata*) are caught for the pet trade. Both poachers and fishers set fire to the forest and the banks of streams, and again, they get out of control.

Solutions and Restoration

Trinidad and Tobago's Government interest in preserving the Nariva Swamp has become increasingly important. In 1994 the application of the Ramsar Advisory Mission (then known as Monitoring Procedure [MP]) was requested. In collaboration with the National Wetland Committee (NWC), national NGOs, the University of the West Indies (UWI), government personnel, and others, the Ramsar Convention Bureau prepared a report outlining the issues that needed urgent attention if the Nariva Swamp was to be saved. Before the report was published, the Government began to implement several of the recommendations included in it even though the country had gone through elections in the mean time. This was a clear sign of its strong commitment.

The first action the Government undertook was the removal of all squatters from Sector B, i.e. the large rice farmers, followed by the development of an environmental impact assessment (EIA) and a management plan. The Government and the Ramsar Convention Bureau provided the funding, and the Institute of Marine Affairs (IMA) was hired to carry out the task. In 1997 the Government, with partial assistance from the Ramsar Convention Bureau, also began to fill in the channels the large rice farmers had dug out and to carry out a fire fighting and prevention program that included training over 20 people from local communities.

In mid 1999, the Government invited Ducks Unlimited, Inc. (DU) and the USDA Forest Service (USFS) to visit Trinidad and Tobago in order to prepare in conjunction with national experts a "work plan" for the im-

plementation of some of the recommendations made in the management plan and the EIA developed by the IMA. This work plan, and the implementation of the MP and the EIA, were to concentrate on the restoration of the hydrology and the aquatic vegetation, taking into account the role fires have played in the destruction of the site in the past and their use as a management tool in the future. During 2000 and 2003 a series of fire prevention and control workshops were organized to provide further training to local volunteer firefighters as well as Forestry Division personnel. The Government of Trinidad and Tobago has erected a fire control tower at the southern end of the Nariva Protected Area, to be manned by volunteer firefighters from the local communities and is planning to build a second one on the northern side of the swamp.

As of this date, the filling of canals dug out by the large rice farmers has stopped. It was realized that perhaps some of those canals were actually channelized rivers or creeks. Therefore, an analysis of changes occurred during the last 50 years using remotely sensed imagery was necessary before proceeding with the restoration. In 2002 a GIS work plan was developed in conjunction with government agencies, the IMA, and the UWI; financial support came from the USFS and DU. In 2003 the data processing and change analysis were carried out by colleagues in Trinidad and Tobago, and restoration models were discussed with the authorities. At the same time the hydrology was analyzed and carbon sequestration modeling initiated with the intention of developing a project to sell carbon credits to energy companies that will allow the restoration work to proceed on the ground at full scale.

Once the models that are being developed through change analysis and GIS are approved by the Government of Trinidad and Tobago, we will know exactly how much forest and grassland/marsh vegetation needs to be restored. However, we can anticipate that habitat restoration will cover approximately 3,600 ha, of which approximately half will be forest and half will be grassland/marsh vegetation. It is also estimated that restoration work on the ground will begin in 2004 with the involvement of hydrologists, topographers/land surveyors, engineers, and ecologists.

Trinidad and Tobago's legislation, unfortunately, does not include provisions to make those who damage the environment pay for restoration or mitigation of the impact they have caused. So, although the large farmers have been removed, the Government has assumed responsibility for finding a way to restore Nariva's original functions, values, and benefits. This by itself indicates the enormous dedication of the Government of this small nation to restore and protect its natural resources.

Communities

Until recently, there was another serious problem in the Nariva Swamp: unhappiness and unrest that had developed within local communities. It was felt that the government was doing nothing to defend their interests from the large illegal rice farmers' activities. The communities felt that the government was only interested in protecting wildlife. This began to change around 1995 when the Government of Trinidad and Tobago and a number of non-governmental organizations started to handle the situation differently. There were more interactions and the local people's problems and concerns were listened to. These issues were then addressed as part of an integrated approach to the conservation of Nariva Swamp. Slowly, mutual trust and respect was built, and together decisions are made to work collaboratively in the restoration of Nariva Swamp. After DU and the USFS came in, many objectives were achieved, but more needed to be done.

Conclusions

It can be said that the worst is behind us. The partnerships that have been built are strong both at national and international levels, and the volunteer firefighters nurtured by this initiative have become guardians of Nariva and true catalysts of the conservation process at the local level, having established their own Nariva Environmental Trust.

For many years, the Ramsar Convention has been urging Contracting Parties to take a range of actions in order to promote the restoration of wetlands. (e.g. Rec. 4.1, Rec. 6.15, Operational Objective 2.6 of the Strategic Plan 1996-2002, Res.VII.17). However, restoration had been considered a priority mainly by developed countries (e.g., Denmark, The Netherlands, United States), with little being done in less developed countries. In Latin America and the Caribbean, restoration has been or is being carried out, more or less successfully, at a number of other Ramsar sites (e.g., Santa Marta in Colombia and Palo Verde in Costa Rica).

However, these efforts have failed to address the situation in an integral and comprehensive way, not using to their advantage the many instruments available as Contracting Parties to the Ramsar Convention. On the other hand, Trinidad and Tobago not only has used the financial mechanisms available, but also much of the guidance provided through Resolutions and Recommendations adopted by the Conference of the Contracting Parties at their different meetings. Some of these include issues such as wetland policy formulation; revision of laws and institutional structure; involvement of local communities; promotion of communication, education and public

awareness; development of environmental impact assessments and management plans; and monitoring of ecological character of wetlands.

Completion of the restoration work that will bring the Blue and Gold Macaw, the Blue-winged Teal (*Anas discors*), the Dickcissel (*Spiza americana*) and all the other 175-plus bird species back to the skies over Nariva is of paramount importance.

Acknowledgments

The work presented in this paper is the work of many colleagues and friends in Trinidad and Tobago as well as in the United States. The list is very long, and they should all be listed as co-authors. We apologize to those we have forgotten unintentionally, after more than 10 years working on this project with so many great people it is unavoidable that our memories should fail.

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expertise in wetland restoration and GIS/RS has proven to be key to the progress made in the last four years.

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