

The Black River Lower Morass: a threatened wetland in Jamaica

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The Black River Lower Morass is Jamaica's largest wetland, and is a refuge for two endangered species—the American crocodile and the West Indian manatee—as well as for a host of other plants and animals. It is internationally important for many birds and a vital economic resource for 20,000 people. Proposals for peat mining and drainage for agriculture now threaten this valuable area. The author has a long-standing interest in the wetland, having studied the American crocodile there since 1975.

A proposal to mine peat from the Black River Lower Morass (BRLM) and the Negril Morass, Jamaica, has generated studies of the flora, fauna and socioeconomics of these areas (NRCD, 1981; Coke *et al.*, 1982; Björk, 1983; Svensson,

1983; Digerfeldt and Enell, 1984). A more immediate threat to the survival of the BRLM, however, is a plan for large-scale drainage and irrigation of the marsh for the cultivation of rice and soya beans.

Wetlands cover only 2 per cent of Jamaica's surface area, and the Black River Lower Morass is the most important. Its natural beauty and diversity have been favourably compared with Everglades National Park, USA (Wade, 1984). It is the purpose of this paper to demonstrate that its ecological significance is without parallel in Jamaica, and probably also in the Caribbean Basin, and to urge that it be protected.

The Black River Morass

The Black River Morass dominates the arid



Broad Water, the confluence of Broad River and Black River. Red mangroves line Black River as it nears the sea. The town of Black River is to the right (L.D. Garrick).

Black River Lower Morass

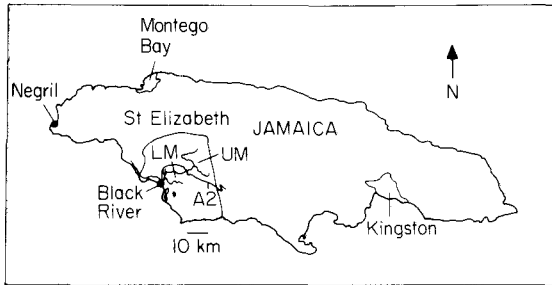


Figure 1. The Black River Upper Morass (UM) and Lower Morass (LM), St Elizabeth Parish, Jamaica. A2 is a highway.

southern portion of St Elizabeth parish, and consists of two separate wetlands, the Upper and Lower Morasses, each of approximately 7000 ha in a basin of 67,000 ha (Figure 1). For the last decade, part of the Upper Morass has been managed for the cultivation of rice, peanuts and sugar cane. The Lower Morass is a low-lying permanent herbaceous marsh, with patches of swamp forest, mangrove forest, and limestone islands with agricultural plots.

Four rivers traverse the morass (Figure 2). The Black River, the largest in Jamaica, originates in the mountains north-east of the basin and meanders 44 miles before emptying into Black River Bay at the town of Black River. The Black River leaves the Upper Morass through a gorge at Lacovia and carries with it the waste from rum production at the Appleton distillery, which makes it the most turbid and nutrient-rich of the waterways within the marsh. Also within the Lower Morass are two large north-south flowing rivers, the Middle Quarters and the YS, and one large east-west flowing river, the Broad River, which is the most scenic. The combined outflow is carried first to the *Thalassia* (turtle grass) beds and then to the patch reef system before being pushed westward along the coast.

Ecological significance

The Lower Morass removes nutrients that the Black River carries from the Upper Morass, and exports substantial organic carbon in the form of particulate detritus to the food web of estuarine and coastal ecosystems. Primary productivity of the marshland is high; the biomass of the dominant sedge species can turnover in six

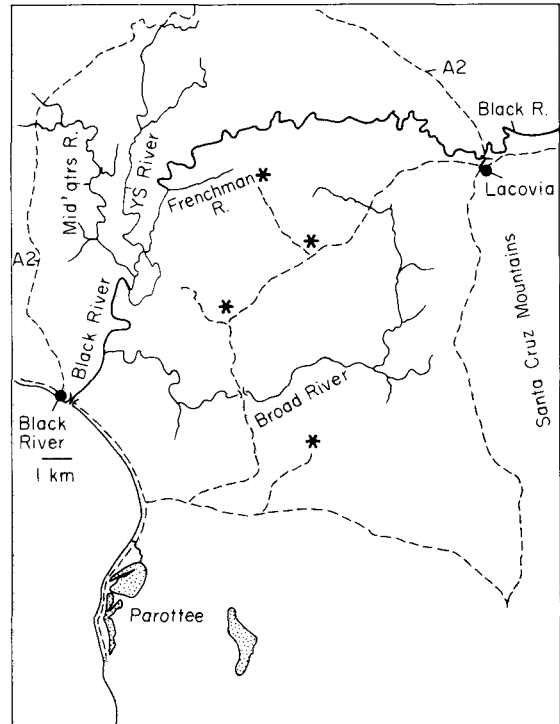


Figure 2. Black River Lower Morass. Asterisks denote settlements. Dashed lines are roads. A2 is a highway.

months (NRCD, 1981). Some marine shrimps and many fish use the Morass as a nursery. Saltwater intrusion, which is determined by rainfall and tides, extends as far as 10 km along the Broad River and 11 km up the Black River (Björk, 1983). Such saltwater dilution is important for shrimp development (Hunte, 1978). The marsh is also important in controlling flood waters from the YS and Black Rivers and as a buffer against the sea.

Flora

The Lower Morass is an important genetic reserve, with 92 species of flowering plant, of which 25 per cent are rare. Nine per cent are endemic to Jamaica, 7 per cent endemic to the Greater Antilles, and 3 per cent endemic to the West Indies.

Most of the Lower Morass is composed of herbaceous marshland of heterogeneous com-

position. Several different associations have been described from four regions within the Morass (Coke *et al.*, 1982) (Table 1). Within the marsh, elevated limestone islands of various sizes permit human habitation, grazing of cattle and goats, and cultivation (Figure 2). The dominant natural plant form on the smaller islands, the economically important *Sabal jamaicensis* (bull thatch), has been replaced and/or complemented by *Haematoxylum campechianum* (logwood), *Mangifera indica* (mango), and all too frequently *Cannabis sativa* (ganja).

Despite significant depletion of riparian forests, good stands of *Rhizophora mangle* (red mangrove) remain along the Black River and lower Broad River. This portion of the Broad River is lined by these splendid tall trees.

The Swamp Forest [Coke *et al.*, (1982) prefer the term 'swamp' to 'marsh'] between the YS and Black Rivers and north of the Frenchman River is the most distinctive floral assemblage in the entire Morass. These small patches of forest, which were extensive 4500 years ago (Digerfeldt and Enell, 1984), are dominated by *Grias cauliflora*, the tall anchovy pear tree, the only native member of the Brazil nut family in the West Indies, and *Roystonea princeps*, the endemic swamp cabbage palm. Also part of this community are various mahoes, *Ficus*, boar gum *Symphonia globulifera* and long thatch *Calyptronoma occidentalis*, bromeliads, vines such as *Philodendron*, tall ferns, and herbs, for example *Dieffenbachia* and *Ludwigia*.

Fauna

The Lower Morass is habitat for hundreds of vertebrates and invertebrates: 150 vertebrate species are found in or are directly dependent on the marsh, of which 92 are protected under Jamaican law and 20 have a range of less than 10 square miles. Two endangered species—the American crocodile *Crocodylus acutus* and the West Indian manatee *Trichechus manatus*—inhabit the marsh or nearby Black River Bay. According to fishermen at Black River, six manatees spent a week in Black River Bay during June 1983, and it is believed that the manatees swim upriver.

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Table 1. Herbaceous plant associations in the Black River Lower Morass

Zone	Associations
Eastern zone Upper Broad River Basin	<i>Typha</i> hummocky swamp <i>Cladium</i> – <i>Sagittaria</i> association
North-western zone Area bound by Middle Quarters, Holland and Luana Upper YS and Frenchman Rivers	<i>Cladium</i> -dominated hummocky swamp Thick <i>Cladium</i> association <i>Typha</i> zone
North-central zone	<i>Typha</i> – <i>Thalia geniculata</i> association <i>Crinum americanum</i> – <i>Sagittaria</i> zone
Southern zone Southern mangrove complex Adjacent to Broad River	<i>Scirpus</i> quaking bog, in which humans and terrestrial vehicles cannot move
Fringing the non-riparian mangrove forest, which extends finger-like from Broad River south to Parottee Ponds, a hypersaline lagoon	<i>Cladium/Conocarpus</i> (buttonwood) association
Dominant plant species	
<i>Cladium jamaicense</i>	sawgrass
<i>Sagittaria lancifolia</i>	pond coco, or arrowhead
<i>Schoenoplectus americanus</i> (syn. <i>Scirpus olneyi</i>)	a sedge
<i>Typha domingensis</i>	reedmace or cat-tail

Because of its relatively large size, the Lower Morass is truly the last refuge for the American crocodile in Jamaica. Our studies (L. D. Garrick, unpublished observations) in this habitat have determined that both very large and hatchling crocodiles are found along the main rivers, an indication that nesting occurs on the limestone islands and on other higher ground. American crocodiles prefer to nest in sand or soil (L. D. Garrick, unpublished observations; Garrick and Lang, 1977). Other reptiles include five species of *Anolis* lizard, the croaking lizard *Aristelliger* sp., and an edible freshwater turtle, *Chrysemys terrapen*. Four amphibians, a native *Hyla*, an *Eleutherodactylus*, and the introduced toad *Bufo marinus* and bullfrog *Rana catesbiana*, are present.



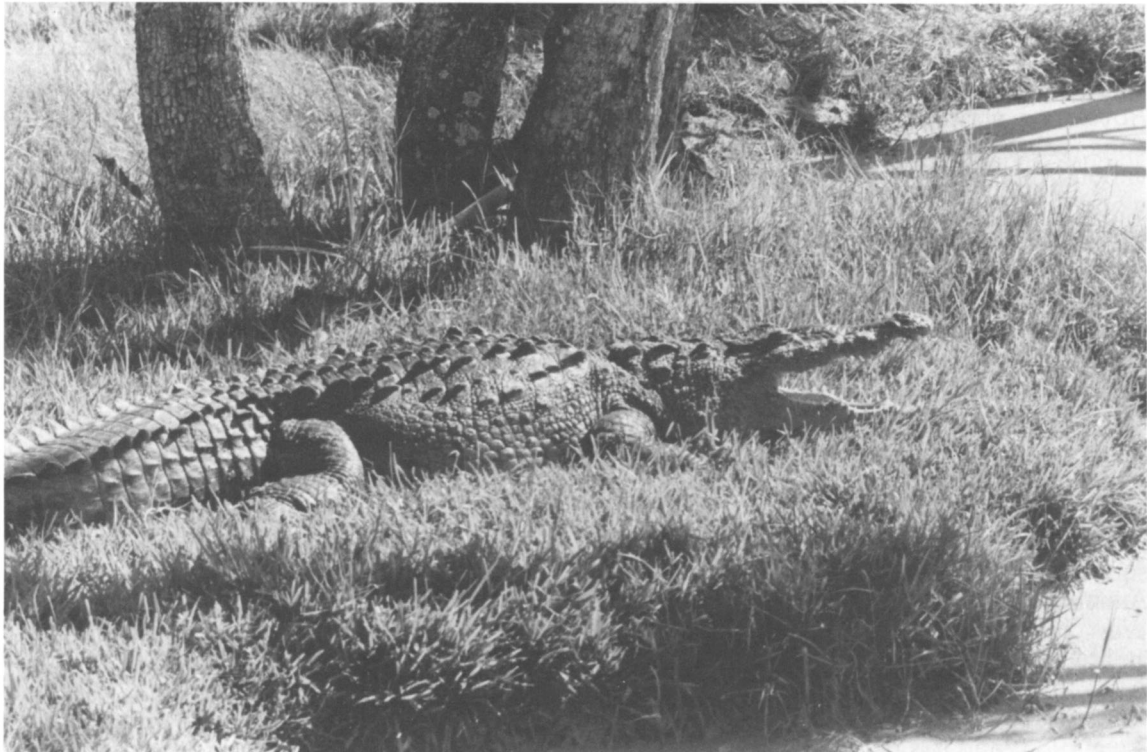
Swamp forest (foreground) at the confluence of Frenchman River and Black River (L.D. Garrick).



Broad River lined by mangroves, and adjacent marsh (L.D. Garrick).

As a habitat for birds the Lower Morass is outstanding: 102 of the 227 species known from Jamaica are found there. Internationally it is an important area for birds because of the variety and the high level of endemism. Seven species, two subspecies and two genera are endemic to Jamaica. Forty-nine of the 111 aquatic species

are present, and 41 migratory species use the Morass. Common and abundant aquatic species include common and purple gallinules, jacana, American coot, pied-billed grebe, least bittern, yellow-breasted crake, great egret, and little blue, green and tri-coloured herons. Uncommon or rare species are the roseate spoonbill, roseate



American crocodile, an endangered species, which inhabits the Black River Lower Morass (L.D. Garrick).

flamingo, glossy ibis, magnificent frigate bird, limpkin and the West Indian tree duck, which breeds within the Lower Morass. Evidence now exists supporting the rediscovery of the black rail *Latterallus jamaicensis* at two localities within the Lower Morass after a century of uncertainty of this species's presence (Svensson, 1983; R. Sutton, pers. comm.). The few mammals in the Lower Morass include rats, bats and the mongoose.

Thirty-five species of fish, 29 marine and six freshwater, of which nine are commercially important, are found in the Lower Morass, as are at least seven species of shrimp (Hunte, 1978), of which the three species of *Macrobrachium* are economically important.

Human uses of the Lower Morass

Some human uses of the Morass may alter ecosystem structure, while others are compatible with the preservation of distinct aspects of the ecosystem. A list of current activities demonstrates the pressure on the Lower Morass as well as its economic importance.

1. Fires, set to clear areas for cultivation and to ease movement on land or by canoe, inhibit the growth of woody species.
2. Trees are removed for timber.
3. Removal of the bark from red mangroves for the preparation of dye kills these trees.
4. Harvesting of palm fronds, thatch and *Phragmites* for construction material and for basket weaving may occur on a sustained yield basis.
5. Construction of drainage canals and paddy fields for rice cultivation, and channels away from the rivers into the marsh in order to create shrimp habitat, may all increase turbidity of the rivers.
6. Cultivation of rice, sugar cane, dasheen (taro root) and ganja displaces natural vegetation.
7. Grazing of goats and cattle on the high ground is small scale.
8. Shrimp trapped in *Phragmites* baskets baited with shredded coconut along the banks of the Black, Broad, YS, Middle Quarters and Frenchman rivers by about 300 men, and sold for the urban and tourist markets, have an annual gross value of about J\$3,000,000.
9. Fishing within the Morass and in nearshore waters for the local market and own consumption has an annual gross value of about J\$800,000.

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10. Digging of Morass mud (peat), which is sold to local farms as fertilizer, is a small-scale operation.

For the 20,000 people in the area, the importance of the Morass as a vital economic resource cannot be overstated. Without the Morass as a fish nursery, fish feeding ground, and source of nutrients for marine organisms, commercial fishing and shrimping would both cease. Moreover, the results of a survey of parish residents conducted by sociologists from the University of the West Indies indicated that 50 per cent of those interviewed cultivate land within the Morass, and that 75 per cent earn more than half of their total household income from the Morass (NRCD, 1981).

Proposals for the development of the Black River Lower Morass

In 1976 a proposal was made to mine wet peat from the Negril and Black River Morasses, to be burned in place of imported oil for electricity generation. Several feasibility studies have been conducted (NRCD, 1981; Björk, 1983). An engineering economic analysis of the peat-based energy system has recommended that the Negril Morass be mined first and that a power-generating plant be constructed on a site north of Negril. The ecological, environmental and socio-economic consequences of this development and the attendant pollution from the proposed power plant have been debated publicly for nearly two years. If mining proceeds at Negril, peat will inevitably be mined in the Black River Lower Morass. The significance of peat mining extends beyond Jamaica: if the problems of mining wet peat at Negril are overcome, peat mining could be proposed for other tropical wetlands.

Peat mining in a coastal zone will have as yet unpredictable effects on nearshore systems. The effects on the marshland itself, however, can be foreseen. Peat would be mined to a depth of 6–9 metres over a 30-year period; in each case the process would create a large lake. In the words of one report (NRCD, 1981), 'Peat mining would irreversibly alter the two largest and most diverse wetlands in Jamaica'. Moreover, in St Elizabeth parish, because of the close association of the local people with the Morass, peat mining would result in severe social disruption, and in Negril,

the mining and burning of peat will potentially damage tourism.

Of equally destructive potential is a plan to drain and irrigate the Lower Morass for the cultivation of rice and soya beans. This plan, supported by the Japan International Co-operation Agency, was begun in the summer of 1985 by the Ministry of Agriculture. Within five years, full scale development, which was chosen as the most economically attractive alternative, will take in about 3100 ha, of which 1500 ha are marshland surrounding the upper Broad River. Deep peat soil areas around the Black and Middle Quarters Rivers, which are not suitable for the growing of either rice or soya, would be left to the peat mining interests. In addition to habitat destruction, this project will pollute and increase the turbidity of the waterways within the Morass and the nearshore marine communities.

Other options for development of the Lower Morass under discussion have included growing fuel woods, the production of biogas, diversified food production, growing craft materials, aquaculture, fish and shrimp farming, paper pulp production, and sewage treatment. Despite the push for development of the Lower Morass, preservation of natural areas has figured prominently in some of these reports (NRCD, 1981; Coke *et al.*, 1982).

The future of the Black River Lower Morass

Jamaica's small size, growing population, and economic plight are obstacles to preserving her natural areas—the mountain forests, the cockpit country [karst formations in the west-central portion of the island that are covered with wet limestone forest (Asprey and Robbins, 1953)], and the coastal wetlands. Nevertheless, in recognition of the value of coastal wetlands, the Natural Resources Conservation Department (NRCD) has proposed national park status for several significant south coast wetlands. As yet no park actually exists. Recently, however, under the leadership of the Prime Minister, the Right Honorable Edward Seaga, Jamaica began making rapid diplomatic strides to overcome years of

conservation neglect. In 1983 Jamaica signed both the UNESCO Convention Concerning the World Cultural and Natural Heritage, and the Cartagena Convention for the Protection of the Marine Environment of the Wider Caribbean Region. In light of this, therefore, it is appropriate that the Black River Lower Morass be nominated as a biosphere reserve so that it can be placed on the World Heritage List.

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