PN-ABN-018

BACKGROUND ASSESSMENT:

ANALYSIS OF NEEDS FOR CONSERVATION OF JAMAICAN BIOLOGICAL DIVERSITY AND TROPICAL FORESTS

Prepared for USAID/Kingston

by Loren B. Ford, Ph.D
USDA Forest Service
Rio Piedras, Puerto Rico

BACKGROUND ASSESSMENT:

ANALYSIS OF NEEDS FOR CONSERVATION OF JAMAICAN

BIOLOGICAL DIVERSITY AND TROPICAL FORESTS

Executive Summary

A sizeable body of legislation exists in Jamaica that supports conservation of biological diversity and tropical forests. However, penalties for lack of compliance are light, enforcement is given little priority by police and magistrates, and potential violators have little incentive to behave otherwise. Inadequate budgets largely in the Ministry of Agriculture, restrain government agencies with the mandate to protect the environment, as a result of GOJ financial problems. Nevertheless, GOJ awareness of the interrelationship of such important sectors as tourism, agriculture and public health with natural ecosystem conservation and watershed protection is growing. Requirements for assessment of environmental impacts of development projects are needed, either through new legislation, or through amendments of the approval procedures specified by existing laws.

Coastal resources are especially important to the economic well-being of Jamaica, due to the importance of the tourist industry, yet these resources are among the first to suffer from lack of conservation. The attractiveness of coastal ecosystems fades quickly under the siltation from dredging, landfills and poor agricultural practices in the hills. Freshwater wetlands and mangroves are important as habitat and as settling basins for turbid rivers, yet wetlands are under constant pressure for conversion to agriculture and peat mining, and mangroves are cut for charcoal or filled for industrial and tourist development. Marine parks present a promising opportunity to conserve representative coastal habitat, while at the same time attracting tourists, but must be coupled with ecologically sound development on the shore.

Traditional hillside cropping techniques impact biological diversity and tropical forests, when eroding soils force farmers to clear new land to maintain farm productivity. Incorporation of trees and permanent crops into farming systems, as an extension of the Jamaican concept of the "yard", offers promise to stabilize hillside agriculture at the same time that farmer incomes are increased. Incentives such as technical assistance, agricultural credit, marketing assistance and land titling programs can help to promote permanent crops.

Protection of habitat is the most critical need for conserving Jamaica's animal and plant diversity. Legislation authorizing and regulating a system of National Parks and Protected Areas is needed. Essential for establishment of representative protected areas is a categorization of the major animal and plant associations of Jamaica. A non-governmental National Parks Trust might facilitate cooperation with international NGOs for training and funding of recurrent management costs of a parks system. The Wild Life Protection Act should be amended to allow Jamaica to join CITES.

More emphasis should be given to management of natural forests by the Forest and Soil Conservation Department. Currently, hardwood species are not managed for sustained production; those species utilized are "mined" from the forest. Rural populations use many non-timber products from the forest, for medecine, food, shelter and fuelwood, but no scientific management of these resources is practiced to assure sustainability. Damaging floods in recent years have renewed GOJ awareness of the importance of forests for infiltration and storage of rainwater. Lack of recognition of the contribution of natural forests to the economy has led to GOJ policy to replace them with coffee and pine plantations. Increasing the industrial efficiency of hardwood lumber and charcoal production would augment the economic production from forest lands, while conserving the benefits provided by natural forests. Technical assistance should be provided to private landowners to manage on-farm trees, either in association with crops or in woodlots. Conservation of Jamaica's tropical forests will only be supported by the public and private sectors if the economic contribution of these forests is appreciated.

This report recommends that USAID/Jamaica engage in policy dialogue with the GOJ to promote recognition of the importance of biological diversity and tropical forests, as well as taking definitive steps to rationalize the complex institutional framework for environmental management. Further, design work should begin as soon as possible on a project aimed at the preservation of representative areas of Jamaica's natural ecosystems as protected areas or national parks.

Table of Contents

I Introduction.....1

II Legislation and Institutions.....1
A. GOJ Legislation and Institutions.....1
B. Non-governmental Organizations.....5
C. International Organizations.....6

III Status and Management of Protected Areas.....8
A. Forest Reserves.....8
B. National Parks.....10
C. Other Reserves.....10

IV Status and Protection of Endangered Species.....10

V Conservation Outside of Protected Areas.....13
A. Managed Natural Ecosystems.....13
B. Impacts of Development Projects.....16
C. Ex-situ Conservation.....18

VI Conservation of Economically Important Germplasm.....19

VII Major Biological Diversity and Tropical Forestry Issues.....20
A. Government Policy.....20
B. Coastal Zones.....21
C. Water.....21
D. Wildlife.....22
E. Forests.....22

VIII Recommendations for Proposed Actions.....24
A. Actions Required.....24
B. Actions Required by USAID.....26
C. The PARC Project.....27

Appendix One - Bibliography.....28
Appendix Two - Biographical Sketch.....29
Appendix Three - Persons Contacted.....30

BACKGROUND ASSESSMENT:

ANALYSIS OF NEEDS FOR CONSERVATION OF JAMAICAN

BIOLOGICAL DIVERSITY AND TROPICAL FORESTS

I. Introduction

This report was prepared based on published information, unpublished reports and interviews with Jamaican government employees and other citizens. The recently published Jamaica Country Environmental Profile (MOA 1987), produced by the Natural Resources Conservation Division (NRCD) of the Ministry of Agriculture (MOA), was a valuable resource, with information compiled in a concise format by subject area.

The author of the report reviewed publications and reports, and interviewed people, during three trips to Jamaica, in October, 1986, and July and November, 1987. In addition, this report was edited and expanded upon by USAID/Jamaica staff in Feb. 1988.

II. Legislation and Institutions

A. GOJ Legislation and Institutions

The conservation of the natural resources of Jamaica is regulated by a broad range of legislation, which generally specifies a GOJ institution responsible for its implementation. These resources, and the legislation and GOJ agencies regulating their use, can be grouped by 1) Coastal Zones, 2) Water Resources, 3) Wildlife Resources and 4) Forestry. The following discussion is extracted from the Jamaica Country Environmental Profile (CEP).

1. Coastal Zones

The Beach Control Act of 1956 invests in the Crown the foreshore and ocean floor. Commercial enterprise is permitted only with license from the MOA's Recreation and Conservation Division (RCD). The RCD can declare areas to be protected from fishing, dredging and waste disposal.

The removal, sale or possession of turtle eggs and immature fish, fishing with explosives or poison, and discharge of industrial waste into harbors, lagoons, estuaries and streams is prohibited by the Wild Life Protection Act of 1973. Enforcement is the responsibility of the NRCD.

The Petroleum Act of 1979 allows the Minister of Mining, Energy and Tourism to make regulations for prevention of pollution in areas of petroleum operations, including in coastal areas. The Act gives the Petroleum Company of Jamaica exclusive right to explore and develop petroleum, as well as coastal peat, resources.

Broad-based land use plans and regulations to control development in rural and urban areas, subject to approval by the Town and Country Planning Authority/Town Planning Department of the Ministry of Finance and Planning, are required by the Town and Country Planning Act of 1957. These plans are prepared by parish councils, for submission to the Town Planning Department. The affiliated Local Improvements Act requires developers to submit plans for approval for any subdivision or major land use change to parish councils and the Town Planning Department prior to this change.

The Urban Development Act of 1968 gives the Urban Development Corporation (UDC) authority to acquire, manage and dispose of land in designated UDC areas, most of which are coastal. The UDC is a statutory corporation of the Ministry of Finance and Planning.

2. Fisheries

Through its Fisheries Division, the MOA regulates fisheries, licensing of fishermen and vessels in Jamaican waters, establishment of closed seasons, creation of fish sanctuaries, and penalties for possession and sale of illegally caught fish, under authority of the Fisheries Industry Act of 1975. The Inland Fisheries Unit is responsible for promoting freshwater fish farming.

The Morant and Pedro Cays Act of 1907 requires a license for fishing, slaying, startling or capturing of birds, and capture of turtles.

The catching of fish with explosives or poison, and capture of immature fish and turtles are prohibited by the Wild Life Protection Act of 1964.

The Beach Control Act of 1955 prohibits the use of public beaches for fishing.

3. Water

Although the Water Act of 1922 designated no agency to oversee water resources, control of development and use of surface water resources was legislated. The National Water Commission of the Ministry of Public Utilities has designated responsibility under the Water Act of 1980 for domestic water supply and most of the sewerage installations in the Kingston/St. Andrew corporate area. The Water Resources Division of the Ministry of Local Government gives technical assistance and information on water resources, such as streamflow, critical water levels, etc., to other GOJ agencies.

The Watershed Protection Act of 1963 controls development in watersheds, under the authority of the NRCD. A Watershed Protection Commission oversees watershed activities of the division, with the assistance of the Watershed Engineering Division.

The Underground Water Authority administers the Underground Water Control Act of 1959, controlling exploitation of subterranean water resources by licensing wells.

The Irrigation Act of 1956 establishes local Irrigation Authorities under the Ministry of Agriculture to control irrigation.

Standards for domestic water consumption and waste disposal are provided by the Environmental Control Division, Ministry of Health, under the Public Health Act of 1974.

Control of water developments in areas under mining lease is vested in the Mines and Quarries Division, Ministry of Mining, Energy and Tourism, by the Mining Act of 1947.

4. Wildlife

The Wild Life Protection Act of 1973 authorizes NRCD to designate protected species, and prohibits possession of any part of 10 protected species. This includes protection of rare, endemic and endangered species and their habitats. The Act authorizes hunting seasons, regulates freshwater fish traps and prohibits river pollution. Enforcement of the law is the responsibility of the Ecology Division of the NRCD, which delegates nominal powers of arrest, entry into lands, and search and seizure of property to a corps of Game Wardens. In practice, public policy does not support Game Wardens in strict enforcement of the law. This lack of support is due in part to the weak penalties for violation of the law, and the tendancy of police and magistrates to concentrate on laws carrying stiffer penalties.

All Forest Reserves (except one) are designated as Game Sanctuaries, so the MOA Forest and Soil Conservation Department is responsible for managing land that serves as wildlife habitat. No department personnel has received training in wildlife management, however. The MOA Veterinary Division and Public Gardens Division (which includes the Hope Zoo) are also involved in Wildlife Resources Management. Additionally, the Natural History Division of the Institute of Jamaica and the Trade Board have wildlife involvement.

The Beach Control Act of 1956 authorizes creation of Marine Protected Areas and protects marine benthic organisms.

As mentioned above under Fisheries, the Morant and Pedro Cays Act of 1907 requires a license for fishing, slaying, startling or capturing of birds, and capture of turtles.

5. Forestry

The Forest Act of 1937 provides for establishment and regulation of Forest Reserves, under the administration of the Forest Department (now the Forest and Soil Conservation Department, FSCD). The FSCD is responsible for development of forest plantations (especially hardwood), management of plantations and state-owned natural forest, forestry research, training of forestry staff, soil conservation and watershed management in collaboration with the NRCD, forest extension and development of private forestry, and forest recreation development and management.

In 1978, the Forest Industries Development Company Ltd (FIDCO) was set up as an autonomous corporation under the National Investment Bank of Jamaica, an institution of the Ministry of Finance and Planning. FIDCO is responsible for logging, transport and processing of pine timber, as well as establishment and maintenance of new plantations on land leased from other government agencies. FIDCO is now wholly-owned by the Ministry of Finance and Planning, but still maintains its autonomous corporate organization.

The Watershed Protection Act of 1963 provides for protection of watersheds, which are nominally administered by the NRCD. No laws currently exist to require sustainable land use on private land in watersheds. In fact, watersheds dedicated to provision of public water supplies are managed (maintained under forest) by the NWC. In some cases, where previously deforested watersheds had been planted with pine, FIDCO has purchased stumpage and harvested pine from these watersheds.

No comprehensive National Parks legislation exists, although the above-mentioned Morant and Pedro Cays Act, Wild Life Protection Act, Beach Control Act, Forest Act and Watershed areas. The 1978-98 National Physical Plan included a definition of National Parks. The National Parks Branch of the NRCD was established in 1975, and has carried on the work of identifying potential National Parks that was started by the Forest Department in 1970. Since 1984, the National Parks Branch has received international funding to work with the NRCD Ecology Branch to develop what is to be Jamaica's first national Park at Canoe Valley on the south coast. Until National Parks legislation and regulations are passed, the future of National Parks in Jamaica will remain uncertain.

Best Available Copy

As can be seen above there are many overlapping jurisdictions in management of Jamaica's biological and forest resources, which complicates management of these resources. Several bills are currently being considered to rectify this situation.

The majority of GOJ institutions involved with conservation of biological diversity and tropical forests are in the Ministry of Agriculture, and as such, ultimately answer to the Minister and his Permanent Secretary. The two principle agencies responsible for these areas are the NRCD and the FSCD. The current interest of the government in promoting environmental conservation was expressed at the National Consultations on the Environment on November 23, 1987 by the Minister of Agriculture, who called for the establishment of a Ministry of the Environment, to draw together all GOJ agencies responsible for this sector. Whether or not an environmental ministry is formed, true commitment will be shown when adequate budgets are provided to concerned agencies, and when support is given to police and wardens for enforcement of existing laws.

Jamaica participated in the 1972 UNESCO Conference on the Human Environment in Stockholm, which galvanized a worldwide commitment to conservation, and founded the United Nations Environment Program. The same year saw the adoption in Paris of the Convention Concerning the Protection of the World Cultural and Natural Heritage, joined by Jamaica in 1983 (Goodland and Webb 1987). While the GOJ has recently joined the Convention on Wetlands of International Importance Especially as Wildfowl Habitat (Ramsar, 1971) (personal communication, Dr. Karl Aiken, University of the West Indies), to date the nation has not signed the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, concluded in Washington, 1973). According to Aiken, the GOJ supports CITES in principle, but must amend the Wild Life Protection Act before it can legally enforce the convention. Jamaica also has yet to sign the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere (Washington, 1940) or the Convention on Conservation of Migratory Species of Animals (Bonn, 1979) (MOA 1987).

B. Non-governmental Organizations

Non-governmental organizations (NGOs) play an ever-increasing role in conservation of biological diversity and tropical forests in Jamaica. Some of the Jamaican NGOs concerned with environmental conservation in Jamaica include the Zoology, Botany and Geography Departments of the University of the West Indies (UWI), the Natural History Society of Jamaica, the Jamaica Junior Naturalists, the Jamaica Society of Scientists and Technologists, the Geological Society of Jamaica, the Jamaica Geographical Society, the Jamaica Camping and Hiking Association, the Negril Association for the Conservation of Nature, the Association of Science Teachers of Jamaica and the Gosse Bird Club. Also, at the College of Agriculture, there is interest in incorporating forestry and agroforestry studies into the curriculum.

Initial involvement of NGOs in environmental issues dealt mostly with resource conservation, especially wildlife, and outdoor recreation. Activities now include environmental education of the public, and public discussions on water quality, forest harvesting and peat mining. Participation of NGOs in the development of nature-related tourism is likely to grow in the future. Currently, negotiations are being made for the development of a marine park on the north coast, to be managed by an NGO, with authority over the marine area delegated by the GOJ as a result of a debt-equity swap. Individuals in many of the organizations mentioned in the previous paragraph support the development of an NGO to raise domestic and international funds for management of a Jamaican National Park System.

C. International Organizations

1. Multi-lateral Organizations

The United Nations Food and Agriculture Organization (FAO) office in Jamaica is responsible for developing and implementing FAO training and technical assistance projects. FAO assistance was provided to the FSCD, in drafting a bill with new regulations for the department. This bill has yet to be acted on by the Jamaican parliment. Included in the FAO portfolio is a project to promote agroforestry in the Rio Cobre watershed, as a means of counteracting the negative impacts of agricultural expansion on steep slopes. Through the FSCD, the GOJ participates in the Eastern Caribbean Upper Watershed Technical Cooperation Network, organized by the FAO Regional Office in Santiago, Chile. Jamaica is also a member of the FAO Latin American Forestry Commission.

The Organization of American States maintains an office in Jamaica, which engages in development and implementation of rural development activities, including training and technical cooperation in forestry. An OAS trial of Leucaena provenances is being carried out in cooperation with the FSCD. OAS has also worked with the NRCD in development of the Alligator Hole River Project.

The Regional Coordinating Unit of the United Nations Environment Programme (UNEP) Seven Seas Programme was established in Kingston in 1986. This presence should support GOJ efforts to conserve coastal resources.

Best Available Copy

Jamaica is a member of the Caribbean Conservation Association (CCA), but has maintained a low level of activity with the organization. Increased activity should improve the ability of GOJ natural resource managers to conserve their resources, by benefitting from experiences from other CCA member nations.

As a member of CARICOM, Jamaica maintains a Caribbean Agricultural Research and Development Institute (CARDI) office. Although to date there has been no formal CARDI activity in agroforestry, this is a promising area that could contribute to development and promotion of sustainable farming systems for hillside lands.

FIDCO has received funding from the World Bank for establishment of its sawmilling and logging operations.

2. Bi-lateral Organizations

a. USAID--Support for past, present and future development projects have, and will continue to, strengthen the ability of the GOJ and Jamaican private sector to effectively conserve biological diversity and tropical forests. Two decades ago, USAID provided funds for planting of pines in areas in the Blue Mountains that had been degraded due to inappropriate agricultural practices. While these trees were planted to protect watersheds and provide income to rural inhabitants as an alternative to farming, this pine resource now provides the raw material for FIDCO's operations.

The Integrated Rural Development II Project (532-0046) promoted sustainable hillside farming technologies, including tree planting. Two thousand acres of trees were planted in the project, and productive cropping technologies were promoted, to increase production on existing agricultural land so that forests would not have to be converted to agriculture.

The Energy Sector Assistance Project (532-0065) included a component for fuelwood species trials.

The Hillside Agriculture Project (532-0101) promotes perennial crops in two target watersheds. The project is focused on extending technologies to make tree crops more productive and profitable for small hillside farmers in two of the most critical watersheds. Participation of the FSCD is being encouraged by the mission.

USAID also provided financial support for the production of the Jamaica Country Environmental Profile (JCEP). The JCEP which took two and a half years to produce, is a comprehensive document that catalogues the environmental resources, problems, issues, programs and plans of Jamaica. It pulls together in one document facts, figures, policies and programs from the wide diversity of sectors that impact upon the Jamaican environment.

b. Other Bi-lateral--The Canadian International Development Agency (CIDA) is in the process of developing a forestry project in cooperation with the FSCD. This project will provide training and technical assistance support to promote improved management of forest lands (public and private), establish a Natural Forest Utilization Unit, increase private sector forest development, and implement a rural forestry demonstration activity.

The British Commonwealth Development Corporation (CDC) helped fund the establishment of FIDCO, and is negotiating funding for development of a new sawmill that would be located nearer to the pine plantations in the Blue Mountains. Other British assistance has been provided by the Overseas Development Administration (ODA), which has provided technical cooperation officers. One utilization specialist currently is assigned to FIDCO.

Fourteen small hydroelectric projects are being funded by Canadian, German and Italian government agencies. These will be managed by the Ministry of Mining, Energy and Tourism (MOA 1987).

III Status and Management of Protected Areas

A. Forest Reserves

The FSCD manages 92 Forest Reserves, totalling 288,450 acres. Of these, 67 percent are in three large blocks in the Blue Mountains, while the remainder consists of small blocks scattered throughout the island (Jones, 1985). These reserves are managed for conservation of soil and water resources, production of timber and wood products to meet local demands, and outdoor recreation. On these government lands, about 24,700 acres of plantations have been established, mostly in Honduran pine (Pinus caribaea var. hondurensis). As stated above, Forest Reserves, with the exception of the Peak Bay Reserve, are Game Sanctuaries, in which hunting is not allowed.

In some areas of the Blue Mountains, land from gazetted Forest Reserves is leased from the FSCD by the Coffee Industries Development Company (CIDCO). Forest, either natural or plantation, is cleared, and coffee is planted. These areas suffer considerable erosion in the first year, after the vegetative cover is removed. Current GOJ policy places more importance on generation of foreign exchange through the sale of Blue Mountain coffee (with the world's highest F.O.B. price) by the para-statal CIDCO than it does on conservation of biological diversity and tropical forests by the FSCD.

A 49-year lease has been given to FIDCO for 41,657 acres of the Forest Estate, concentrated in the eastern portion of the Blue Mountains. About seven million board feet of pine are harvested annually, mostly from plantations established within the lease area. These plantations are managed on a 20-year rotation, producing about 10.6 thousand board feet per acre (personal communication, Eric Budhlall, Director, FIDCO Logging Department). By October of 1985, FIDCO had planted about 14,500 acres to pine (Jones 1985), in areas where pine had been harvested or in areas with low-grade hardwoods. About 50-60 percent of the land in the FIDCO leasehold area is commercially manageable (personal communication, Guy Symes, FIDCO managing director). Land that is not currently feasible to manage includes the higher reaches of the Blue Mountains, being too steep and wet, and other areas that are remote or too rocky. Considering that FIDCO's land leases are for 49 years, the company can be considered to be dedicated to long-term land management. The economic future of the institution depends on re-establishment of plantations after harvest, although there are cases where no such planting has occurred. FIDCO's mandate is to manage just one resource, pine. The company has been criticized for erosion caused by roadbuilding, and for removing hardwood forest to establish new pine plantations. However, FIDCO's managing director has shown concern for environmental matters, and has been active in promoting environmental education in the country.

For the most part, the Forest Reserves have been gazetted from land that was left in forest cover because it was too remote, steep or poorly drained to practice agriculture. Thus, although it is estimated that as much as 24.3 percent of Jamaica is forested (MOA 1987), this forest probably does not adequately represent all forest types native to the island. Of the seven Life Zones (Holdridge) in Jamaica, only the Premontane Rain Forest, Premontane Wet Forest and Tropical Very Dry Forest Life Zones have appreciable areas remaining, due largely to their remoteness and/or unsuitability for cropping. Almost all of the Tropical Dry Forest, Tropical Moist Forest, Tropical Wet Forest and Premontane Moist Forest has been converted to agriculture. The exceptions, such as forest on limestone outcroppings, coastal mangroves and freshwater wetlands, are threatened by charcoal cutting, and development of industry and tourism. Mining of peat and projects to drain wetlands for conversion to agriculture are potential threats to the Negril and Black River Morass wetlands.

B. National Parks

Figure 1, drawn directly from the CEP, shows existing and proposed parks and protected areas. Plans are well underway for the development of what is to be Jamaica's first land-based National Park at Canoe Valley. This park has been developed around the Alligator Hole River Project, carried out jointly by the OAS and the NRCD (MOA 1987). Twelve other areas are proposed for National Park status in the Jamaica CEP (Table 1). A scientific evaluation of the natural habitat types of Jamaica should be made, to determine what areas are most in need of protection. Comprehensive National Parks legislation is also needed, and assured funding sources for additional parks need to be identified. The Urban Development Corporation has proposed a National Park in the Hellshire Hills. This area, which is under intense pressure for development and charcoal cutting due to its proximity to Kingston, needs urgent protection, since it may be the last remaining habitat of the endangered Jamaican iguana (Cyclura collei, that may already be extinct). The two Marine National Parks, at Montego Bay and Ocho Rios, have been gazetted, but as yet there are no management plans or enforcement regulations.

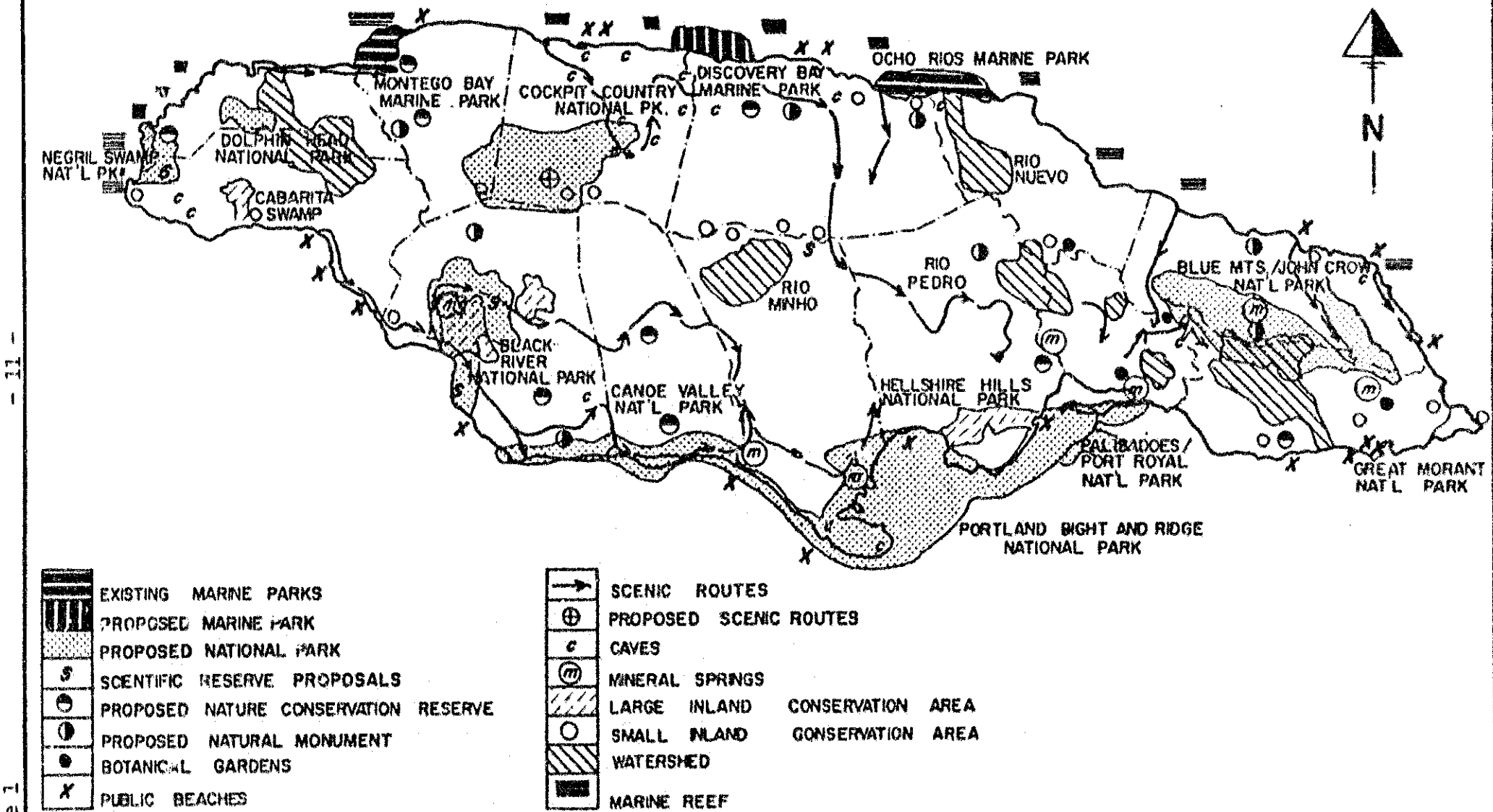
C. Other Reserves

The Petroleum Corporation of Jamaica will develop the Luana Point Wildlife Reserve, which was initially proposed by the NRCD. This reserve would protect habitat for the American crocodile (Crocodylus acutus). PCJ currently manages the Negril Royal Palm Reserve, for recreation and preservation of a stand of the endemic Royal Palm (Roystonea princeps). Sooty terns (Sterna fuscata) are protected on Middle Cay of the Morant Group, in an agreement between the NRCD, Jamaican Defense Forces and the Fisheries Division. Other reserves are recommended in the Jamaica CEP (Table 1).

IV Status and Protection of Endangered Species

As an island in the Caribbean Sea, Jamaica has developed unique associations of plants and animals. All of the native species have either migrated there from the mainland or other islands, or have evolved in Jamaica from species that migrated there long ago. A large proportion of Jamaica's animal and plant species are endemic, that is, they are found nowhere else in the world.

EXISTING AND PROPOSED PARKS AND PROTECTED AREAS



Source: National Physical Plan, Jamaica. (1978-'98)

Figure 1

For Table 1. List of Some Proposed Protected Areas for Jamaica.

Scientific Reserves/Nature Reserves

Mason River Field Station
Holland Swamp Forest

National Parks

Great Morass
Canoe Valley
Palisadoes, Port Royal Cay
Cockpit Country
Dolphin Head
Ocho Rios Marine Park
Discovery Bay Marine Park
Blue Mountains
John Crow Mountains
Hellshire
Black River Lower Morass
Negril (Marine and Terrestrial)
Montego Bay Marine Park
Marine Parks in St. Mary

Natural Monuments/National Landmarks

Fern Gulley
Rio D'Oro Natural Arch
Windsor Cave
Ys River Falls
Blue Mountain Peak
Thatchfield Cave
Lovers Leap

Nature Conservation Reserves/Wildlife Sancturaries

Middle Cay (Morant Group)
Belvedere
Bogue Fish Sanctuary
Rocklands Bird Sanctuary
West Harbour Fish Sanctuary
Galleon Harbour Fish Sanctuary
Cuguar Bay Fish Sanctuary
Falmouth Bay Fish Sanctuary
Bloody Bay Fish Sanctuary
Port Royal Fish Sanctuary (Mangrove and Cays)
Southwest Cay (Pedro Group)
Portland Bight Fish Sanctuary
San San Tree Preservation Area
Luana/Font Hill
Old Harbour Bay Fish Sanctuary
Long Bay Fish Sanctuary
Manatee Bay Fish Sanctuary
Folly Bay Fish Sanctuary
Discovery Bay Fish Sanctuary

Protected Landscape or Seascape

East Coast Scenic Route
Cockpit Country Scenic Route
Buff Bay Scenic Route

Multiple Use Management Areas

Jacks Hill
All Watershed Areas
Kingston and St. Andrew Game Reserve
All Forest Reserves

World Heritage Site

Cockpit Country

Source: Jamaica Country Environmental Profile (MOA 1987)

For instance, of 19 Jamaican frog and toad species, 15 are endemic. Twenty of the 24 species of lizards are endemic, as are 784 of the 3000 flowering plant species, 27 of the 256 nesting bird species, four of the 23 bat species, 46 of the 200 orchid species, and 82 of the 579 fern species. Few areas in the world have such a high rate of endemism. If Jamaica's natural heritage is to be preserved, a turnaround is necessary in the trend that has left eight vertebrate species extinct in the last 150 years, and many more endangered, threatened or rare.

The biggest problem in biodiversity conservation in Jamaica is the loss of habitat for endangered plant and animal species. The Jamaica CEP (MOA 1987) lists eight critically endangered or extinct species of animals, and five endangered species. Sixteen threatened animal species are listed, as are ten rare species or groups. In the Plant Kingdom, 81 species are listed as endangered, threatened or rare (MOA 1987).

Individual species are protected in the Wild Life Protection Act, including all birds except for those listed as specific game or pest species. No animals may be hunted in Game Sanctuaries, which include all but one Forest Reserve. However, as discussed above, enforcement of these laws is far less than adequate. Even if the wildlife protection laws are enforced, many animal and plant species will become extinct if measures are not taken to assure conservation of habitats representative of all of Jamaica's major animal and plant associations. Development of a National Park and Protected Areas system, with concise regulations and adequate funding mechanisms, is necessary if the island's biological diversity is to be conserved.

V Conservation Outside of Protected Areas

A. Managed Natural Ecosystems

1. Forests--When Columbus discovered Jamaica on his second voyage in 1494, the island was almost completely covered by forests. Indeed, the name for the island came from the Arawak work "Xamayca", meaning the "land of wood and water". As mentioned above, the natural terrestrial ecosystems of Jamaica are distributed in seven Life Zones (Holdridge 1967). Within these Life Zones, the degree of natural and man-caused disturbance, and edaphic conditions, result in an undetermined number of plant associations. In most of the Tropical Dry, Tropical Moist, Tropical Wet and Premontane Moist Life Zones, natural vegetation has been substituted by agriculture, except in areas unsuitable for agriculture, such as the wetlands of the Negril and Lower Black River Morasses. Remaining forest has experienced intervention in the form of selection cutting of timber trees. Traditionally, these are felled and sawn on the

spot by pit sawyers. In order to design a comprehensive protected area system, a detailed study describing the composition and remaining inventory of Jamaica's natural plant associations is urgently needed. Throughout her history, one of the main economic contributions of Jamaica's forests has been as a source of new land for agricultural expansion, necessary to feed the expanding population. As such, the forest has been a non-renewable resource, except in areas where swidden agriculture is practiced, where the secondary, or "ruinate" forest replenishes soil organic matter and chokes out weeds during the fallow period.

Another important economic contribution of forests, more important every day, is the infiltration and storage of rainwater, vital for domestic, agricultural and industrial uses in the countryside and towns. Damaging floods in the last two years have increased the level of concern in the GOJ and the public about the effect on river flow of deforestation in the hills. Freshwater wetlands and mangroves are also important as areas where silt can settle out of stormwater. The tourist industry depends to a large degree on clean water and beaches to attract tourists. Additionally, the fishery industry benefits from wetland, as mangroves serve as fish nurseries, and reefs that are protected from silty storm runoff are more productive.

Natural forests receive little scientific management for production of wood products, but are still important as sources of fuelwood, poles and timber. Current exploitation is nearly akin to mining, with no measures taken to assure regeneration of desireable species. Efforts are needed to introduce management and increase the industrial efficiency of charcoal and hardwood lumber production. Economic participation of rural populations in the benefits of this management and production is essential if these same populations are to maintain these forests. The FSCD carries out a program with private landowners to promote the plantation of timber trees. This program does not currently cooperate actively with the existing network of agricultural extension agents, to promote management of natural forests and agroforestry.

An extensive knowledge of the medecinal uses of wild plants has developed throughout history; additional support should be provided for efforts to record this folklore, and studies should be made for pharmaceutical applications.

While not natural ecosystems, the pine plantations of Jamaica now meet about 20 percent of the annual demand for softwood lumber products. Most of this effective import subsitution is produced by FIDCO, which harvests, transports and saws pine, mostly from Blue Mountain plantations established prior to the existence of FIDCO. While FIDCO currently operates at a profit, it is unclear

if the company's profit margin would cover the cost of establishment and maintenance of plantations over the 20-year commercial rotation, because of the high cost of its operations. This high cost is due in part to the steep slopes where pines are growing, which result in high road-building and yarding costs. The relatively small size of trees means high yarding, transport and sawmilling cost, as well. As an import-substitution endeavor, FIDCO could improve its performance with respect to energy consumption. A dehumidifier dry kiln that uses electricity is employed, while sawmill residues (58% of the log volume) are totally unused (personal communication, Don Bennett, FIDCO Sawmill Mgr.). Currently, most of Jamaica's electrical power comes from imported fossil fuel.

While Jamaica has no large native terrestrial mammals, other vertebrates such as iguanas and pigeons have provided a source of protein for rural people, and populations of many species have consequently reached dangerously low levels.

2. Coastal zones--The coastal resources of Jamaica, as the meeting place of sun, sea and sand, are of utmost importance for the success of the tourism industry, the nation's greatest source of foreign exchange. The coast itself is about 500 miles in length, punctuated by numerous inlets and bays. Part of the attraction to tourists is the broad range of ecosystems presented by the variation in the coastline--rocky headlands, bays, beaches, estuaries, mangrove swamps and cays. However, many areas have suffered some degree of degradation because the island's principal commercial and population centers are situated on the coast, and because these coastal resources are especially sensitive to over-use and mismanagement.

Jamaica's beaches are of international fame. Along the north and west coasts are vast stretches of white sand beaches, which provide the basis for the principal resort areas, such as Montego Bay, Negril and Ocho Rios. This white sand is eroded from offshore corals and calcareous algae and is deposited in the lagoons behind the reefs. The beaches of the south coast are more typically composed of black sand, that has been carried to the sea by rivers. In spite of the importance of beaches to tourism, they are frequently used as a source of sand for construction. Illegal sand mining and consequent beach erosion have caused serious problems in Johnson Town (Hanover), Hope Wharf (Westmoreland), Crane River (St. Elizabeth), Mahoe Bay/Rose Hall (St. James) and along the Portland coast (MOA 1987).

Seagrass beds and coral reefs suffer from the effects of increased sedimentation and pollution. Sediment erosion, transport and deposition are natural processes, which over geologic time have reached a dynamic equilibrium to which all physical and biological processes have adjusted. Coral reefs and seagrass beds reflect a long-established pattern of sediment discharge (Dubois, Berry & Ford 1985). As a result of inappropriate land use in the hills and near the shore, this equilibrium has changed, resulting in the burying of seagrass beds and suffocation of coral because of increased sediment loads. Pollution from domestic and industrial sewerage also has a negative impact on these resources. Oil-using industries, and the oil industry itself, result in coastal pollution, in the form of leaks from pipelines, storage tanks and tankers. A major source of Jamaica's foreign exchange, the bauxite industry, has polluted coastal environments, especially at Port Kaiser, Port Esquivel, Port Rhodes, Rocky Point and Reynolds Pier. This has included smothering of corals at Reynold's Pier in Ocho Rios, and impacted seagrass beds at Port Esquivel and Port Kaiser (MOA 1987). These two ecosystems are important for populations of fin and shellfish, so their deterioration has a negative impact on local fisheries. Also affected is the tourist industry, which utilizes these resources as a source of fresh seafood and as a site for snorkeling and glass bottom boat viewing.

Tourism itself has an impact on coastal resources. The filling of coastal mangroves, leveling of dunes and other disturbance of coastal ecosystems for the construction of hotels and other tourist facilities has an impact on the biological diversity of these areas. Pollution from these installations, and sedimentation resulting from construction, can affect nearby coral reefs and seagrass beds. Lights along beaches confuse sea turtles that lay their eggs there. The use of coastal organisms as souvenirs has contributed to the degradation of coastal resources. Black coral is protected by the Beach Control Act, but is still illegally harvested and used to make jewelry. Conch, starfish, elkhorn coral and other reef organisms are also collected for souvenirs.

B. Impacts of Development Projects

No Jamaican legislation requires an assessment of the environmental impact of public or private development projects. The review of industrial development plans by the Town Planning Department, required under the Town and Country Planning Act and the Local Improvements Act, takes into consideration impacts on traffic, conformation with current zoning ordinances, sources of employment, etc., but not environmental impacts. Although not currently legislatively mandated, environmental impacts could be studied, and serve as criteria for approval of development

projects, in the Town Planning Department review. The Environmental Control Division of the Ministry of Health looks primarily at occupational hazards (MOA 1987). No legislative authority is vested in the NRCD to perform, or require, an environmental impact assessment of development projects, nor to require mitigative measures for adverse impacts.

Jamaica's natural forests, which mostly remain only in areas unfit for agriculture due to soil conditions or remoteness, such as upper watersheds, wetlands or excessively rocky areas, are theoretically protected from a change in use by the Watershed Protection Act and Forest Act. However, conversion of forests to coffee plantations by CIDCO in the Blue Mountains is taking place, without an evaluation of the impact of this activity on the amount of remaining premontane forest. FIDCO is also converting hardwood forest to pine plantations in the Blue and John Crow Mountains, with no impact assessment. No doubt, the perceived lack of contribution of natural forests to the economy results in public policy that favors economic development projects such as coffee or pine planting over conservation of biological diversity and natural forests. The pressure for housing sites in the Kingston Metropolitan Area is forcing development of the Hellshire Hills, without an assessment of the impact on the sole remaining habitat of the Jamaican iguana, which may already be extinct. Additionally, wetlands have undergone draining for agricultural development, without comprehensive environmental impact assessment.

The economic pressure for tourism development makes assessment and mitigation of environmental impacts unlikely to restrict this activity, as Jamaica's number one source of foreign exchange. Education of the public and private sector about the degree of interdependence between the health of natural ecosystems and the attractiveness of Jamaica to tourists would do a lot to promote effective environmental impact assessments for tourism development projects. The Town Planning Department could require environmental assessments prior to approval of tourism developments, as described above. In certain areas, the Urban Development Authority could also implement assessments. Public policy will continue to favor development of foreign exchange sources, however, so environmentally sound development needs to be promoted.

Agricultural development projects have potential impacts on the conservation of biological diversity and tropical forests, which need to be analyzed. The planting of new coffee in the Blue Mountains is an example discussed above. Current projects by USAID and other agencies promote on-farm income generation through increasing the productivity of known and/or potential crops. As such, these projects tend to have a positive environmental impact, because they reduce the pressure on natural forests by increasing

the production of existing plots and promoting agricultural sustainability through vegetative soil conservation measures such as permanent crops. Nevertheless, the impact of agricultural chemicals needs to be assessed, and measures taken to minimize this impact, for these agricultural projects. No current Jamaican legislation exists requiring such assessment.

USAID has been required to evaluate potential environmental impacts of its projects for several years. Canada has recently passed legislation that requires CIDA to evaluate the environmental impacts of its projects. The mechanism for this CIDA evaluation is now being worked out. In the World Bank, a new organizational structure is being implemented, which will integrate environmental criteria into the development project design and approval process. Environmental concern by international development agencies can only help the adoption of environmental impact assessment by Jamaican public and private institutions.

C. Ex-situ Conservation

The Ministry of Agriculture maintains the Royal Botanical Gardens at Hope, Cinchona, Castleton and Bath. While many of the collections in these gardens are of introduced plants, native plants are represented, as well, and research is carried out on their care (MOA 1987). Additionally, these sites are utilized for public education.

Also under MOA direction is the Hope Zoo, which displays and breeds selected indigenous and endemic species. The Zoo manages a small watershed and reservoir, and would like to develop this resource to further its public education activities (personal communication, Rema Kerr, Hope Zoo). The Hope Zoo Trust, an NGO, promotes the upgrading and development of the Hope Zoo.

The Jamaica Orchid Society manages the Spur Tree Orchid Reserve, in which native and introduced species and hybrids of orchids are tended and propagated.

The University of the West Indies at Mona maintains an Herbarium in the Botany Department, and a collection of preserved native animals in the Zoology Department. Plant and animal specimens from Jamaica are contained in the Smithsonian Institution, the British Museum and other natural history collections.

The NRCD maintains a collection of environmental information, but needs technical and financial assistance to develop this into a full-fledged conservation data base.

VI Conservation of Economically Important Germplasm

It would be difficult to state categorically that any of Jamaica's native plant or animal species has no economic value. While few native Jamaican species have obtained worldwide economic importance, the value of a particular species to the healthy maintenance of a specific habitat, and its interaction with other species in that habitat, give economic importance to all native species. The economic contribution of native ecosystems to the human ecosystem, through protection of watersheds and amelioration of climate, cannot be overstressed. Rural populations utilize a large number of native plants as sources of medicines, food, beverages and shelter. This economic use of these species may appear to have little impact on Jamaica's national economy, but loss of this source of goods would require a substitution through import, if the quality of rural life were to be sustained. Work has been done to catalogue folk medicines and remedies by botanists from the University of the West Indies, but no studies have been made of the effect of rural communities on the populations of these plants. The use of wild animals for food, such as iguanas and doves, has no doubt impacted their populations, but likewise, no statistical studies have been made of this impact. The need for conservation of these resources through habitat protection provided by a comprehensive system of national parks and protected areas is widely recognized by Jamaican scientists and bureaucrats.

The number of flowering plants in Jamaica is estimated to be about 2,800 species. This is about twice the number of species found in the British Isles (which is 25 times bigger), and about the same as in Sri Lanka (which is 6 times bigger). More than 20% of the species of plants are endemic, a figure much higher than other islands in the Caribbean (Trinidad 7%, Lesser Antilles 12%, and Puerto Rico 13%). For the most part, the specific economic value of Jamaica's genetic resources has still not been assessed. Orchids, ferns, bromeliads, gesneriads, and tree ferns are among the groups which have so far attracted attention. Many plants may be expected to have horticultural, genetic, and pharmaceutical values which are yet to be discovered. The Jamaica Country Environmental Profile provides detailed information on the flora and fauna resources of Jamaica.

The native Jamaican species with probably the greatest worldwide economic importance is pimento, Pimenta dioica, from which allspice and allspice oil are derived. While this species is not endemic, originating also in Cuba, Central America and Mexico, Jamaica is the world's largest supplier of the spice. Cultivation of the tree is somewhat haphazard, usually intercropped with other fruit trees, permanent crops, annual crops and pasture.

Harvesting techniques are unsophisticated, involving breaking of branches, which results in large scars, and possibly a poor crop the following year (Adams 1971). The MOA has developed asexual propagation techniques, and has established collections of native and introduced clones (MOA 1973).

Blue mahoe, Hibiscus elatus, is another species, native only to Jamaica and Cuba, with international economic value. This valuable timber tree has been planted throughout the Lesser Antilles and in Puerto Rico, where it has shown good adaptability and growth. Apparently the species hybridizes with the closely related, pantropical species H. tiliaceus, from which it has probably evolved (Adams 1973). The growth and wood characteristics of both H. tiliaceus and the hybrid are vastly inferior to blue mahoe. Conservation of pure gene pools of blue mahoe should be undertaken by establishing stands of superior phenotypes at the upper extension of its range, well away from populations of H. tiliaceus, which frequents lower elevations. Seeds for establishment of blue mahoe plantations should also be collected from higher-elevation stands of the species.

While ackee, Blighia sapida, is native to Africa, having been brought to Jamaica by slaves, it is an important Jamaican plant, has been chosen as the national fruit, and constitutes an ingredient of the national dish, ackee and saltfish. The export of canned ackee, largely to Jamaican expatriate populations in the United States, Canada and Great Britain, offers tremendous potential. However, soft flesh types of ackee break up in processing. Ackee established from seedlings results in groves of mixed fruit types. The MOA has identified individual trees with good fruit quality, has vegetatively propagated these, and in 1969 established a gene bank at Lawrencefield (MOA 1973).

The FSCD annually collects forest seed, for its own planting purposes and for sale to other countries. A refrigerated seed locker is maintained at Constant Spring road. No seed orchards have been established with improved, grafted stock. Seeds are collected from superior phenotype trees in plantations or natural stands.

VII Major Biological Diversity and Tropical Forestry Issues

A. Government Policy

The GOJ must show true commitment to conserving Jamaican biological diversity and tropical forests. Much existing legislation provides for adequate protection of resources; however, government policies often do not support enforcement of these laws. Adequate budgets need to be provided to GOJ agencies responsible for conserving biological diversity and tropical forests. Sufficient funding will result if policy makers are

educated about the interrelation of healthy natural ecosystems and protected watersheds with important sectors of the economy such as tourism, agriculture and public health.

In many cases, penalties for transgressions of laws are insufficient. Since police and magistrates enforce laws in proportion to the potential penalties, conservation laws receive little priority. Of course, with slight penalties, potential violators have little incentive to obey conservation laws.

New development projects must be assessed for their potential environmental impact, including the impact on biological diversity and tropical forests. New legislation creating a Ministry of the Environment could include such a requirement. However, existing legislation, such as the Town and Country Planning Act, Local Improvement Act and Urban Development Act call for review of development plans, and GOJ policy could require that these reviews be expanded to include environmental assessments. Monitoring of industries and other enterprises is necessary to assure compliance with conservation laws and mitigation measures identified in environmental assessments.

GOJ support for public environmental education should be increased. Support of the Royal Botanical Gardens and Hope Zoo would support this effort.

The GOJ should become a more active member of the Caribbean Conservation Association. This NGO could provide technical assistance and policy analysis to government agencies and local environmental NGOs.

B. Coastal Zones

Most development projects impact coastal zones. Since coastal resources are so important to tourism, GOJ commitment to protecting these resources should exist. Environmental assessments for new projects, and monitoring of ongoing activities, should be adequate to protect these resources.

Sedimentation has a heavy impact on coral reefs and other coastal resources. In dredging and filling along the coast, precautions must be taken to minimize sedimentation. Rivers provide the link between hillside land use and coastal impacts. Improper agricultural practices in the hillsides can negatively impact coastal biological resources.

Mining of beach sands must be managed, such that removal of sand is compensated by deposition. Impacts on tourism must be minimized, as well.

Marine parks present a promising opportunity to conserve respresentative coastal habitat, while at the same time attracting tourists. Such parks should include integrated management on the foreshore.

C. Water

Watershed protection involves many aspects of conservation of biological diversity and tropical forests. Inappropriate agricultural practices are non-sustainable, with the result that forests are felled to provide new agricultural land. With the loss of forests, wildlife habitat disappears, jeopardizing the survival of many species. Unprotected soil is carried into streams and rivers, eventually being transported to the ocean, where it suffocates coral reefs and other marine ecosystems.

GOJ policies must encourage appropriate land use, by providing to farmers technical assistance in conservation farming. Incentives can be provided to encourage conversion to soil-protecting permanent crops, in the form of agricultural credit, marketing assistance and land titling programs.

Freshwater wetland and mangroves are under constant threat of conversion to other uses. Wetlands have been drained for conversion to agriculture, and mangroves are cut for charcoal production and filled for industrial and tourist development. GOJ policies should be adopted to protect these ecosystems, not only to conserve biological diversity, but because they are natural settling basins for turbid streams and rivers, and as such can help to conserve coastal resources so important for tourism and fisheries.

D. Wildlife

The most crucial need for conserving Jamaica's wildlife diversity is the protection of habitat. While existing Forest Reserves are also Game Sanctuaries, many ecotypes are not well represented in this reserve system. A comprehensive study of Jamaica's major plant and animal associations is needed, coupled with a review of how well they are represented in existing Forest Reserves and proposed National Parks.

Legislation is required, authorizing and regulating a National Parks and Protected Areas system. Mechanisms for assuring adequate funding to cover training of park personnel and recurring management costs need to be found. Since such resources would contribute to the tourist industry, it is logical that this industry participate in their funding and management. A NGO National Parks Trust would provide more opportunities for cooperating with international NGOs.

FSCD personnel should receive training in wildlife management. In order that Forest Reserves be meaningful Game Sanctuaries, department policies need to be drafted that consider habitat management, in addition to prohibition of hunting.

The GOJ should become a signatory of CITES. This requires acting on the draft legislation that would amend the Wild Life Protection Act to allow compliance with CITES.

E. Forests

A comprehensive National Parks and Protected Areas system would include representative samples of Jamaican forests. However, conservation implies wise use, which includes reaping of trees and other forest products in a sustainable fashion.

With the exception of a few hardwood species, Jamaica's natural forests are generally viewed as non-economic. These exploited species are utilized in a manner more akin to mining a non-renewable resource, rather than being managed in a sustainable manner. Most FSCD management in Forest Reserves is directed towards plantations of softwoods and hardwoods. Inventory, stand management and improved utilization of natural forest species are needed.

The view that natural forests are uneconomic explains in part the conversion of these forests to coffee and pine plantations. The value of these forests for wildlife habitat and watershed protection needs to be weighed against the potential economic benefit of coffee and pine production. Management techniques for these forests, and utilization of a wider range of species, should help with their conservation.

The FSCD operates a program to promote establishment of plantations on private lands. This program should be expanded, to cooperate with the existing network of agricultural extensionists to provide technical assistance to private landowners for management of natural forests in woodlots, and for management of agroforestry associations. Certain timber trees, such as cedar (Cedrela odorata), are commonly found growing with agricultural crops. These trees are sold to sawmills or middlemen when they attain a commercial size, and the farmer needs cash. However, since most farmers do not know how to determine the number of board feet in a tree or log, they frequently are grossly underpaid for this timber. A poor return from timber trees discourages farmers from investing land and labor in their management.

Studies should be made of the use of non-timber forest products by rural populations. The economic significance of these resources to on-farm budgets should be determined. Additionally, management guidelines should be developed to allow sustainable use of these resources.

Tree cutting for charcoal production has a major impact on ecosystems in an ever-widening radius around major towns. This occupation offers much potential to unskilled workers, but needs to be controled. Management systems need to be developed to produce fuelwood from plantations and natural forests, so that a source of income is available to the rural poor.

VIII. Recommendations for Proposed Actions

Based on the above discussion, recommendations for proposed actions in order to conserve biological diversity and tropical forests for the Government of Jamaica, international development organizations and non-governmental organizations, can be summarized as follows:

A. Actions Required

1. Short Term

a. Representative areas of the remaining forest, other terrestrial, and near-shore coastal habitat types in Jamaica need to be protected.

i. A system of National Parks and Protected Areas needs to be established.

ii. Legislation needs to be passed, and regulations need to be promulgated, to clarify the definition, criteria and objectives of protected areas.

iii. Management plans for protected areas need to be prepared that include an ecosystem approach to resource management.

b. A National Conservation Strategy is needed for Jamaica.

i. Policy dialogue is necessary with the GOJ in support of a National Conservation Strategy.

ii. A National Conservation Strategy should fit into a National Environmental Policy and National Development Strategy.

iii. The National Conservation Strategy should form a part of the IUCN World Conservation Strategy.

2. Medium Term

a. The diverse and often overlapping institutional framework for management of environmental affairs in Jamaica needs to be rationalized and streamlined so as to clarify responsibilities and eliminate duplication of effort.

b. Public education is needed on the potential contribution of protected areas to the economy, especially to tourism, near shore fisheries and water system protection. Environmental education should be supported at all levels in Jamaica, to educate the public about their natural heritage.

c. An inventory of the major Jamaican habitat types should be made. This would involve 24 person-months of field-based Technical Assistance. Candidate areas for protection, of a size that can be efficiently managed, should be nominated. Ideally, these areas would be compatible with other development in the area, by providing recreation areas for tourists and local residents, protecting watersheds for communities, etc.

d. Systems for sustainable production on hillside farms need to be developed.

   i. Policy dialogue is needed in order that the GOJ supports consistent policies in its land management, extension and marketing agencies.

   ii. Sustainable technologies for farming hillsides need to be adapted to Jamaican conditions. Cost/benefit information needs to be transferred to farmers.

   iii. Community involvement is needed to develop and promote sustainable hillside production and marketing systems.

e. Jamaican forest land management institutions need a clear allocation of responsibilities, with legislation, regulations and sufficient budget to support them.

f. All development projects in Jamaica should include an initial environmental examination (IEE). If the IEE shows a potential negative effect, an environmental assessment (EA) should be done to determine what negative effect, if any, the project will have on both terrestrial and near-shore coastal biological diversity.

g. Training is needed in the planning, management and administration of Managers for protected areas.

3. Long Term

a. Non-protected natural forests of Jamaica need to be productively managed.

   i. Policy dialogue is needed, and possibly legislation, so that natural forest management activities are encouraged and recognized, protecting managed natural forests from agricultural conversion.

   ii. Efficient natural forest management technologies need to be transferred to public and private-sector land managers. This should include multiple-use management.

   iii. Appropriate technology to utilize a larger number of native tree species for house construction, furniture, artisanry and other uses is needed.

   iv. Rural farmers need to receive more economic benefit from timber trees, as an incentive to manage them.

b. Jamaican forest plantations need to be managed under consistent economic guidelines.

   i. Costs for reforestation should be taken directly from the sale of timber.

   ii. Appropriate technology needs to be adapted to increase the level of utilization of Jamaican hardwood plantations.

   iii. Methods to more economically and successfully establish timber plantations, especially hardwoods, are needed.

   iv. Methods and incentives for economic participation of small farmers in timber plantation management need to be developed.

B. Actions Required by USAID

In order to achieve the maximum effectiveness for limited funds available to USAID/Jamaica, efforts to conserve biological diversity and protect tropical forests should be concentrated in two areas.

A. Policy dialogue with the GOJ to promote recognition of the importance of biological diversity and the role of forests in the Jamaican economy. Discussions should focus on the rationalization of the institutional framework for environmental management as a top priority.

B. A critical need exists for protection of representative habitat types in Jamaica. As National Parks, these areas could attract tourists, help protect watersheds, serve as a resource for environmental education and protect Jamaica's national biological heritage. AID programming would strengthen host-country ability to manage protected areas by:

i. funding the drafting of parks legislation,

ii. developing management plans for selected National Parks,

iii. promoting nature-related tourism,

iv. training Jamaicans to manage protected areas, and

v. developing and implementing alternative protected area funding possibilities.

C. The PARC Project

USAID/Jamaica should begin design work as soon as possible on the Protected Areas Resource Conservation (PARC) Project (532-0148) for possible FY 88 funding. The project should be aimed directly at the conservation of representative areas of Jamaica's natural habitat.

The purpose of the PARC project is to provide the mechanism and framework for the protection of representative habitat areas of Jamaica's natural ecosystems. This will enable the preservation of the vast and diverse biological resources endemic to the Jamaica. These biological resources are the basis for the natural beauty that makes the island a primary tourist destination.

The project will: (1) provide a system and methodology for the establishment of protected areas in Jamaica, and (2) finance capital and non-recurrent costs for the establishment of one national park/protected area. The project will also provide a model to integrate the protection of biological diversity with the simultaneous demands inherent in economic development

Specifically, the PARC project will seek to overcome constraints to the establishment of protected areas/national parks. It is expected that the constraints, as well as the opportunties for development, will be catalogued and analyzed in the project preparation process. The team assigned the task of project development will draw from Jamaican, Regional, and U.S. based sources of expertise in order to blend the specific issues and constraints of Jamaica with the best knowledge and expertise available from external sources.

APPENDIX ONE

Bibliography

Adams, C. Dennis 1971. The Blue Mahoe and Other Bush: An Introduction to Plant Life in Jamaica. McGraw-Hill Far Eastern, Singapore 159 pp.

DuBois, Random, Leonard Berry & Richard Ford 1985. Catchment land use and its implications for coastal resources conservation. p. 444-508 in John R. Clark (ed.) Coastal Resources Management: Development Case Studies. Renewable Resources Information Series. Coastal Management Publication No. 3. USDI National Park Service & USAID. Washington, D.C.

Goodland, Robert & Maryla Webb 1987. The Management of Cultural Property in World Bank-Assisted Projects: Archaeological, Historical, Religious and Natural Unique Sites. World Bank Technical Paper No. 62. Washington, D.C. 102 pp.

Jones, Roy S. 1985. Country Report on Jamaica. Prepared for Caribbean Development Bank Workshop: Regional Forestry Sector Study. Barbados, October 2-4 1985. 16 pp.

Ministry of Agriculture 1973. Investigations 1964-1970. Agricultural Information Service. Kingston, Jamaica. Bulletin No. 63 (New Series) 558 pp.

Ministry of Agriculture 1987. Jamaica Country Environmental Profile. Natural Resource Conservation Division. Kingston, Jamaica. 361 pp.

Thompson, D.A., P.K. Bretting & Marjorie Humphreys 1986. Forests of Jamaica. Papers from the Caribbean Regional Seminar on Forests of Jamaica held in Kingston, Jamaica 1983. Jamaican Society of Scientists and Technologists. Kingston, Jamaica. 162 pp.

APPENDIX TWO

Biographical Sketch

Loren Bennett Ford was born in Columbus, Ohio, in 1950. He grew up in Vermont and New Hampshire, graduating from the Phillips Exeter Academy in 1968. University studies were pursued at the University of Washington, Seattle, where the degree of Bachelor of Sciences (Forest Sciences) was conferred in 1976, Master of Sciences (Forestry) in 1977 and Doctor of Philosophy (Forestry) in 1986.

He served as a Peace Corps Volunteer in Costa Rica from 1978-80, where he carried out a survey of pests of plantations of fast-growing trees for the Tropical Agriculture Center for Research and Training (CATIE) in Turrialba.

After Peace Corps, he continued to work in Costa Rica for three years, as a professor and researcher in forestry at the Costa Rican Technological Institute (ITCR). During this time, he also gave technical training two groups of forestry Peace Corps Volunteers, and carried out two short-term consultations for USAID/San Jose.

Dr. Ford currently works for the USDA Forest Service, on an interagency agreement as Regional Forestry Advisor for the Caribbean to USAID. He is stationed at the Caribbean National Forest, in Rio Piedras, Puerto Rico.

APPENDIX THREE

Persons Contacted

Government of Jamaica

Roy Jones, Director, Forestry and Soil Conservation Department
Calvin Cotterell, Asst. Director, FSCD
Keith Porter, FSCD
Lennox Taylor, FSCD
Albert McKenzie, FSCD
York Reid, FSCD
Patrick Virgo, FSCD
Devlin Anderson, FSCD
Dunbar Wright, FSCD
Marcel Anderson, Department of Science, Technology and Environment, MOA
Dr. Lloyd Coke, Director, R&D, Scientific Research Council
Joe Suah, Mgr, Hillside Agriculture Project, MOA
Rema Kerr, Hope Zoo
Jerico Hanson, Ministry of Mining, Energy & Tourism
Guy Symes, Executive Director, FIDCO
Eric Budhlall, Logging Operations Mgr., FIDCO
Don Bennett, Sawmill Mgr., FIDCO

University of the West Indies

Professor G.H. Sidrak, Director, Botany Department
Professor Karl Aiken, Zoology Department

NGOs

Mrs. Catherine Levy, Gosse Bird Club and Natural History Society of Jamaica
Mrs. Marjorie Humphreys, Grace Kennedy Foundation

FAO

Allan Furman, Representative for Jamaica and the Bahamas

Canadian International Development Agency

Rob Lothian, Development Officer
Fred Meth, Consultant
Hubert Simard, Development Officer

USAID

William Joslin, Director
Charlie Mathews, Chief Engineer
Steve French, Chief Agriculture and Rural Development Officer
Nancy Hardy, Program Officer
Lee Voth, ARDO
Mark Nolan, ARDO