NATIONAL FOREST MANAGEMENT AND CONSERVATION PLAN

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ACRONYMS

BUBADAC	Buff Bay Development Action Committee
CANARI	Caribbean Natural Resources Institute
CBO	Community Based Organisation(s)
CIDA	Canadian International Development Agency
CIF	Cost, Insurance and Freight Included
CL	Crown Land
cm	Centimetre
CO_2	Carbon dioxide
CPI	Consumer Price Index
DBH	Diameter (at) Breast Height
EFJ	Environmental Foundation of Jamaica
ETF	Environmental Trust Fund
ENACT	Environmental Action Programme
EU	European Union
FAO	Food and Agricultural Organisation of the United Nations
FCP	Forestry Capacity (Bridging) Project
FCCC	(UN) Framework Convention on Climate Change
FD	Forestry Department
FIDCO	Forest Industries Development Company
FPDC	Forestry Planning and Development Committee
FR	Forest Reserve
GCT	General Consumption Tax
GHG	Greenhouse gases
GIS	Geographic Information System(s)
GOJ	Government of Jamaica
GPS	Global Positioning System
ha	hectare
HRD	Human Resources Development
IRR	Internal Rate of Return
IUCN	The World Conservation Union
J$	Jamaican Dollar
JAS	Jamaica Agricultural Society
JCDC	Jamaica Cultural Development Commission
JCDT	Jamaica Conservation and Development Trust
JET	Jamaica Environmental Trust
JHTA	Jamaica Hotel and Tourist Association
LFMC	Local Forest Management Committee(s)
LFMP	Local Forest Management Plan
LICJ	Land Information Council of Jamaica
LUDC	Land Utilities Development Commission
MCM	Million cubic metres
MLE	Ministry of Lands and Environment
M&E	Monitoring and Evaluation
MOF	Ministry of Finance
MOU	Memorandum of Understanding

NECC	National Environmental Communications Campaign
NEEC	National Environmental Education Committee
NEPT	Negril Environmental Protection Trust
NEST	National Environmental Societies Trust
NFAP	National Forestry Action Plan
NFMCP	National Forest Management and Conservation Plan
NGO	Non-Governmental Organisation(s)
NIC	National Irrigation Commission
NIWMP	National Integrated Watershed Management Programme
NPAC	National Public Awareness Campaign
NRCA/NEPA	Natural Resources Conservation Authority/National Environmental Planning Agency
NWC	National Water Commission
NWMC	National Water Management Council
ODA/UK	Overseas Development Agency/United Kingdom
PA	Protected Area
PCJ	Petroleum Corporation of Jamaica
PEPA	Portland Environmental Protection Association
PSOJ	Private Sector Organisation of Jamaica
RADA	Rural Agricultural Development Authority
RPPU	Rural Physical Planning Unit
SMRDP	St. Mary Rural Development Project
SPP	Strategic Planning Process
STEA	South Trelawny Environment Association
STEPA	St. Thomas Environmental Protection Association
TFT	Trees for Tomorrow
TNA	Training Needs Analysis
UK	United Kingdom
UN	United Nations
UNB	University of New Brunswick
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
US$	United States (of America) Dollar
US	United States (of America)
USAID	United States Agency for International Development
UWI	University of West Indies
WMU	Watershed Management Unit(s)
WRA	Water Resources Authority
WRI	World Resources Institute

EXECUTIVE SUMMARY

The National Forest Management and Conservation Plan ("Forest Plan") is presented in three parts. Part I provides background information on forest policy and law, a description of forest lands and an overview of the forestry sector. The environmental and economic values of forests to society are presented in Part II together with the goals of the forestry sector, consistent with these values. Part III provides recommendations for implementation, including strategies, activities, projects and budgets.

PART I: BACKGROUND

E1.0 Introduction

The purpose of the Forest Plan is to promote and improve the conservation and sustainable use of the forest resources of the country to meet local and national needs through protecting, managing and restoring the resource for the benefit of present and future generations.

The Forest Plan has been prepared in accordance with the provisions of section 16 of the Forest Act of 1996. A draft plan was completed in January 2000. The draft plan was widely distributed and presented to the public in a series of well-attended meetings and workshops. The consultative process generated valuable contributions to the Forest Plan.

E2.0 Policy and Legal Framework

The development of the Forest Plan was influenced by a number of related national plans and policies, including the *Forest Land Use Policy* approved by Parliament in 1996.

Stakeholders and the public identified policy issues requiring resolution prior to implementation of the Forest Plan. The 1996 Forest Land Use Policy has been updated to reflect these inputs, and legislative, institutional and other developments that have occurred since 1996.

E3.0 Inventory and Description of Forest Lands

The most recent assessment of forest cover and land use in Jamaica was completed in 1998. About 30 percent of Jamaica, approximately 336,000 hectares is classified as forest. The majority of forest land has been disturbed and degraded, and only about 8 percent of the island remains as natural forest showing little evidence of human disturbance. Forests are threatened by industrial, agricultural and urban development. Approximately 110,000 hectares of land are designated as forest reserves, but over one-third of forests in reserves or other protected areas have been significantly disturbed by human encroachment.

E4.0 Overview of Forestry Productive Sector

The decentralised, transient and unregulated nature of wood production industries in Jamaica makes it difficult to collect information on production.

Reliable data are not available on lumber and other wood production from Jamaica's forests. Very approximate estimates of annual production are:

- hardwood lumber: 59,000 cubic metres;
- softwood lumber: 3,000 cubic metres;
- charcoal: 37,000 to 60,000 tonnes;
- fuelwood: 300,000 cubic metres; and
- yam sticks: 150 million.

A priority activity in the implementation of the Forest Plan is an assessment of the production, consumption, values and markets for forest products.

E5.0 Constraints

Constraints exist which, unless removed or minimised, will obstruct or impair achievement of the goals of the forestry sector. The Forest Plan has identified strategies to address these constraints:

- Indifference to forest degradation, destruction and theft of forest resources, illegal occupation of forest land, non-sustainable land use practices and uncontrolled grazing of livestock are public attitudes and behaviours which must be changed.
- Commitment to acceptance and advancement of environmental laws, policies and plans will have to be demonstrated by all but especially by senior levels of Government.
- The Forestry Department in particular, and the forestry sector in general, lack sufficient numbers of trained, motivated and properly supported personnel to implement the Forest Plan.
- The high cost of investing in forestry and the required long-term commitment are disincentives to private investment. In addition, budget allocations of public funds are inadequate to support forestry investment programmes.
- At least 14 Government offices have statutory interest and often conflicting interest in forest land.
- Large information gaps in the forestry sector presently constrain effective decision making.

PART II: FOREST VALUES AND GOALS

E6.0 Forest Values to Society

Jamaica's forests provide essential **environmental** services:

- Quality water production: Forested areas allow percolation and reduce runoff, providing a regular flow of water to reservoirs. Tree cover near rivers reduces

siltation. Highly silted water entering a reservoir decreases its storage capacity and increases treatment costs.

- Soil conservation: Maintaining a tree cover decreases the force of rain hitting the ground and helps to slow the flow of water, particularly on steep slopes, thereby reducing soil loss. Soil loss is not only a threat to upland agriculture, but the increased siltation is also a serious threat to coral reefs and beaches.
- Forests support biological diversity: Jamaica has many endemic species and a growing number are identified as vulnerable to extinction, critically imperilled or rare. Many are dependent on forest or woodland habitats.
- Mitigating adverse climate changes: Forests remove carbon dioxide from the atmosphere and contribute to climate protection. The emergence of emission reduction targets and protocols among industrialised countries may provide Jamaica with an opportunity to obtain compensation for forest restoration from countries or businesses trading in "carbon credits".

Forests provide **economic** benefits to society. These include timber and non-timber products, employment, energy and recreation and tourism:

- The production of forest products provides many opportunities for income generation and employment in rural areas. Activities include timber production, sawmilling operations, collection of forest materials for making handicrafts and furniture, and charcoal and yam stick production.
- The Forestry Department provides employment through its seedling production, reforestation and forest management activities. In 1999 the Forestry Department provided direct employment to 1,863 people in rural areas as well as employing casual labour on an "as needed" basis.
- Forests are an important source of energy. A study on charcoal production carried out in 1988[1] estimated demand at 60,000 tonnes per year, the equivalent of nearly 445,000 cubic metres of wood. The same study calculated fuelwood consumption at 300,000 cubic metres per year.
- The country's scenic beauty is a major component of Jamaica's attraction as a holiday destination. Nature tourism based on the area's forests also presents direct employment opportunities.

E7.0 Goals of the Forestry Sector

The goals of the forestry sector identified in this Forest Plan address four broad values to society: environment; national wealth and rural development; energy; and recreation and tourism.

The primary goals of the Jamaican forestry sector are to:

- Protect the forest resource;
- Restore tree cover;
- Conserve biodiversity;

[1] Joint UNDP/World Bank Energy Sector Management Assistance Program. September 1988. *Jamaica Charcoal Production Project*.

- Improve the economic contribution of forests to the well-being of the Jamaican people;
- Produce fuelwood on a sustainable basis;
- Maintain the visual quality of forests; and
- Enhance the use of forests for recreation and tourism.

PART III: IMPLEMENTATION STRATEGIES

E8.0 Community Participation

The participation and co-operation of local communities, particularly those living on the fringes of the forest are recognised as necessary factors in the sustainable use, management and protection of forest resources. Community participation will be mobilised through the creation of Local Forest Management Committees (LFMCs) involving various stakeholders. Forestry Department staff will work with communities to co-operatively manage the forest resource. Income-earning activities based on sustainable use of forest resources will be introduced to attract community interest.

E9.0 Public Education

Public education on the importance of the forest environment is essential to build popular and political support for the forestry sector and implementation of the Forest Plan. The public awareness strategy will be grounded in credible, up-to-date and relevant information. Key messages, promotional vehicles and potential sponsors will be identified. Forestry-related information will be promoted through the formal and non-formal education sectors. The Forestry Department will work closely with the Ministry of Education and the National Environmental Education Committee to build a strong environmental awareness component, including specific attention to the importance of forests, into the national school curriculum.

E10.0 Forestry Research

A forestry research programme will be prepared. The programme's focus will be to provide data, information and guidelines for efficient forest management practices and conservation strategies, reforestation planning and development, agroforestry practices and social/participatory forestry initiatives.

E11.0 Local Forest Management Plans

Local Forest Management Plans (LFMPs) will be prepared for forest reserves, forested Crown lands and other protected areas. An LFMP is under development for the Buff Bay/Pencar pilot area; eight additional local plans will be completed during the five-year planning period. The plans, which will include biophysical and socio-economic information, will be the basis for management and sustainable use of forest resources. The Forestry Department and the LFMCs will be responsible for the preparation and implementation of the local plans.

E12.0 Co-operative Management Agreements

Protection and conservation of Jamaica's forests will be most effectively achieved through co-management agreements between the Forestry Department and other Government and non-governmental agencies. The Forestry Department has already signed a co-management agreement with the Natural Resources Conservation Authority/National Environmental Planning Agency and the Jamaica Conservation Development Trust for the Blue and John Crow Mountains National Park. It is in the process of entering into agreements with the Environmental Foundation of Jamaica and the National Water Commission.

E13.0 Forest Protection

Forest protection and conservation strategies will focus on critical emphasis areas: geographic locations where interventions are both urgently needed and likely to be the most effective. Urgency for forest protection has been prioritised on the basis of the presence and severity of a number of threats. These include, among others, degradation of water quality or supply; degradation or loss of soil; unsustainable and illegal removal of timber; cultivation on unsuitable sites; and despoiling of recreational and scenic values. Institutional and socio-economic factors have also been considered in identifying critical emphasis areas.

Guidelines for forest land use have been prepared with permitted uses identified according to slope and soil depth, type of forest cover and present land use. Required interventions will be scheduled by the local forest management planning process based on the advice of the LFMCs.

The highest priority will be protecting what is left of Jamaica's rich and unique forest biodiversity from further encroachment. The Forestry Department will continue to review areas for gazetting to forest reserve status. Where private lands are identified as urgently requiring protection, a recommendation will be made to the Minister to acquire such land or enter into a forest management agreement with the owner.

The following activities will be regulated on forest reserves or any other land managed by the Forestry Department pursuant to the Forest Act:

- road construction and use;
- fires and charcoal kilns;
- agricultural use, including cattle and other livestock;
- removal, transport and sale of forest produce;
- use of power saws;
- sawmilling;
- hunting;
- recreational use; and
- leasing of land.

Sawmilling activities, and the trade, storage and purchase of locally produced lumber, will not be permitted anywhere in Jamaica without a valid licence or permit.

The operation of equipment and the cutting or removal of forest produce will normally be prohibited in buffer zones adjacent to waterways, streams, rivers or wetlands.

The destruction of forests by the mining industry is a special case of great importance to the people of Jamaica. Much of the damage to forests occurs in the limestone areas adjacent to bauxite deposits and disturbed by pit access development. A no-net-loss policy will be vigorously applied. Where destruction of forest is unavoidable, the industry should compensate the loss by reforesting an equivalent area elsewhere.

E14.0 Forest Production Programme

An expanded forest production programme will be undertaken to reduce the pressure on natural forests. The programme will endeavour to meet national demands for wood products from trees planted on the most economically productive lands, largely by private growers. Some 69,000 hectares of land have been identified as having good potential for reforestation, however only 2,200 hectares are within forest reserves.

Different strategies have been developed for potentially commercial disturbed broadleaf forests, remaining Pine plantations, deforested Crown lands and forest reserve lands under permanent cultivation.

The proposed total area to be reforested during the period 2001 to 2005 is 4,750 hectares, of which Pine timber comprises 15 percent and hardwood timber makes up the balance. These species proportions are based on their relative demands. Increased seedling production will be needed to meet the target area.

In view of the varying estimates of fuelwood use and charcoal production, no reforestation plan for wood energy is included. Special studies are first needed to determine present production and how the wood cutters, charcoal producers, landowners and potential investors can reach satisfactory arrangements.

E15.0 Investment and Incentives

Incentives will be provided to encourage investment in forestry development and conservation. These include:

- remission of property tax on private lands designated as protected areas or forest management areas declared as forest reserve;
- income tax exemption, duty concession on motor vehicle purchase, and waiver of GCT on capital goods, activities and supplies for qualifying commercial forestry operations; and
- long-term conditional leasing at competitive rates of public land for reforestation and agroforestry uses.

In addition, the following incentives will be provided, subject to the availability of capital in a Forest Fund (see below):

- subsidised production of tree seedlings;

- grants for plantation establishment on suitable lands;
- direct acquisition or leasing of lands for maintenance as protection forest;
- annual grants to landowners for maintaining protection forests;
- grants for community forestry and forest-based recreational or eco-tourism ventures;
- maintenance of boundaries, trails and fire breaks; and
- surveying of suitable Crown lands for leasing to forestry or agroforestry uses.

New funding mechanisms are needed to supplement the resources provided by Government. The Jamaica Forest Management and Conservation Fund ("Fund" or "Forest Fund") will provide long-term funding for reforestation and forest conservation. The Fund will be used exclusively for implementation of activities and projects specified in a National Forest Management and Conservation Plan approved by the Government of Jamaica under the Forest Act. Contributions to the Fund will be sought from:

- bilateral and multilateral donors;
- debt reduction agreements;
- private sector sponsorship;
- Government grants; and
- income from forest products, fees and services.

E16.0 Role of the Forestry Department

The role of the Forestry Department is defined in the Forest Act, 1996. Fulfilling these roles and implementing the Forest Plan requires that the FD strengthen its capabilities in community liaison, extension and enforcement.

The objective of human resources development in the Forestry Department is to provide effective leadership and service at all levels in order to attain the goals of the forestry sector. The human resources development programme will address such priority areas as:

- gender equity (expanding the role of women);
- staff motivation and morale;
- Forestry Department staff training needs;
- performance management system; and
- monitoring Forestry Department performance.

E17.0 Role of the Private Sector

Given the right incentives, the private sector has greater capacity to meet national reforestation requirements than any Government agency. The availability and general productivity of private land offers good potential.

Over the period of the Forest Plan, the area planted by the Forestry Department will decline reflecting the much greater potential for reforestation on private land. Only approximately 20 percent of scheduled reforestation will be by the Forestry Department, the rest will be accomplished by the private sector.

Such a radical shift in investment and land use is unlikely to happen quickly without encouragement, hence the introduction of incentives described above (E15.0).

E18.0 Co-ordination and Monitoring

The co-ordination and monitoring of the implementation of the Forest Plan will be conducted by an independent Forestry Planning and Development Committee. The Committee, with techical support from the Forestry Department, will monitor performance against the specific objectives of the Forest Plan, using measurable and verifiable indicators. The Committee will also have an advisory role in: recommending courses of action to remedy problems; providing guidelines for prioritising Forest Plan objectives; and providing guidance to the Conservator.

E19.0 Implementation of the Forest Plan

Activities by goal, consistent with strategies stated in the Forest Plan and feedback received from the general public and reviewers of the Forest Plan have been proposed. Objectives with verifiable indicators have been developed based on the Forestry Department's interpretation of required or achievable targets. The targets relate to a 5-year implementation period which commences from the approval date of the Forest Plan by the Minister of Agriculture.

The activities of the Forest Plan are organised into recurrent and development components and associated costs have been estimated. Government of Jamaica costs are separated from externally funded activities and projects although this separation is open to revision. Implementation of the Forest Plan requires a minimum annual operating budget of approximately J$120 million, plus a minimum 5-year development budget of approximately J$375 million. This is in addition to current forestry project funding and assumed maintenance of the Forestry Department budget at current levels (J$66 million per year, recurrent and capital A).

National Forest Management and Conservation Plan

PART I: BACKGROUND

Part I of the Forest Plan begins with a brief statement of the contribution that forests make to society at large. This is followed by an explanation of the legislative requirement for the Forest Plan and the policy and legal framework in which the Forest Plan is being developed (Section 2). A description of Jamaica's forest lands is provided in Section 3. This is followed by an overview of the forestry productive sector in Section 4.

1.0 INTRODUCTION

1.1 Background

Jamaica is blessed with abundant sloping land and steep mountainous countryside, originally covered with dense forest and woodland. Over the years, these forest and woodland areas have been subjected to various impacts and pressures which have threatened their existence and their ability to contribute to the country's socio-economic development and the maintenance of the environment.

Some factors contributing to the decline of the forest resource include population growth, agricultural expansion, shifting cultivation and mining, land clearing for housing and the consumption of wood for energy. The decline has been evidenced by obvious deforestation particularly in upper watershed areas, increased threat to water quality and yield, soil erosion and a general deterioration of the environment.

To fully appreciate the consequences of this trend, the following serves as a reminder of the contribution that the forest makes to sustainable human development in this country:

At the local level, our forests:

- regulate water supplies;
- prevent or reduce natural disasters caused by flooding and land slides;
- support food production through the use of yam sticks, fence posts and fish pots;
- indirectly maintain soil fertility for agriculture and the regulation of micro-climate;
- provide shelter and materials for construction and household use, especially in rural areas;
- provide the wood fuel requirements for large numbers of people in both rural and urban areas;
- provide income-generating activities in wood harvesting and transport; small-scale wood processing activities; non-wood product harvesting and processing; and nature-related tourism; and
- provide for cultural and aesthetic values important to society.

At the national level, our forests:

- increase the development potential of rural areas and decrease the need for rural-urban migration;
- provide opportunities for the development of a wide range of both wood and non-wood-based industries;
- provide for the creation of employment opportunities in the various phases of the production and marketing chain and for earning export revenues to improve the balance of payments;
- provide a source of renewable energy;
- enhance environmental stability and security; and

- provide possibilities for recreation and related services for local use and for the expansion of the tourist industry.

At the global level, our forests:

- act as sinks and reservoirs for carbon released from the burning of fossil and organic fuels which would otherwise enter the atmosphere as a greenhouse gas;
- play an important role in the regulation of global climatic conditions; and
- have a key role in maintaining the biological diversity of plants and animals.

Successive governments have been aware of the adverse impacts and problems encountered by the forestry sector. Some of these problems are documented in two early reports, one in 1886 by Hooper[2] and the other by Wimbush[3] in 1935. Both reports served to highlight the problems that existed in those times. It was against this background that in 1942 the Forestry Department was created.

Tree planting has been done in order to resolve some of the problems associated with deforestation. Projects of this nature have been undertaken by the FD since its inception. Reforestation activities peaked during the period 1974 to 1977 when 3,000 hectares of plantations were established under a project supported by the United States Agency for International Development (USAID).

Largely based on the success of this project, plans were made to expand the programme on commercial lines commencing in 1979 with the establishment of the Forest Industries Development Company (FIDCO). However the reforestation activities were abandoned following Hurricane Gilbert in 1988 which destroyed most of the poorly managed immature stands.

Undaunted by this catastrophe, the Government requested the United Nations Development Programme (UNDP) to provide assistance in its plans to rehabilitate and develop the dwindling forest resources of the country on a sustainable basis. The main output of this work was the preparation of a National Forestry Action Plan (NFAP) in 1990. The Food and Agricultural Organisation (FAO) took the lead role in its preparation, supported by the Canadian International Development Agency (CIDA), United Nations Environmental Programme (UNEP) and Overseas Development Agency/United Kingdom (ODA/UK).

Since then, the Government has been implementing some of the priority activities in the NFAP. Two important constraints to sustainable forestry development are now being addressed. The first is the lack of detailed information on the extent, composition and condition of the forest resource without which, it has not been possible to make realistic short- and long-term plans. The second constraint is the institutional limitations of the sector particularly with respect to legislation, policy framework and a decline in the strength and capacity of the Forestry Department.

[2] Hooper, E.D.M. 1886. *Report Upon the Forests of Jamaica*. Waterlow and Sons Limited, Printers. London.
[3] Wimbush, A. 1935. *Report on the Forestry Problems of Jamaica*.

These constraints are being alleviated in part with support from CIDA's *Trees For Tomorrow Project* which started in 1992, and from a two-year UNDP-funded initiative, *Forestry Capacity (Bridging) Project*, which started in July 1998.

1.2 Statutory Requirements for the Forest Plan

The Forest Act, 1996, which repealed the Forest Act 1937, requires the Conservator of Forests[4] to prepare a draft national Forest Management and Conservation plan containing:

- a statement of the forest resource management and conservation policy;
- an inventory and description of forest lands;
- provision for the protection, conservation and production of forest resources;
- proposals for the protection of watersheds, soil, water, wildlife and other forest resources;
- an outline of the economic objectives for the sustainable development of wood-based industries in Jamaica;
- programmes for social forestry, community development and forest-related education; and
- proposals for implementation.

The Act also requires that the Conservator shall:

- in preparing the draft plan, consult with the relevant statutory authorities, Government departments or agencies, and private conservation organisations; and
- make the draft plan available for public comment.

The Conservator may revise the draft plan as may be appropriate, taking into consideration any comments received from the general public.

As provided for in the Forest Act, 1996, the Forestry Department is the implementing agency for the approved National Forest Management and Conservation Plan (hereinafter referred to as the "Forest Plan"). Section 18 of the Forest Act stipulates the Conservator shall review, and revise as necessary, the Forest Plan every five (5) years.

The full text of the Forest Act, 1996 is reproduced in Appendix I.

1.3 Preparation and Approval

1.3.1 Basic Principles

The following basic guiding principles have been used in the preparation of the Forest Plan. These principles have been recognised by the United Nations Commission on Sustainable Development and the FAO as enhancing the efficiency and effectiveness of national planning and implementation of forestry activities. They contribute significantly to the achievement of sustainable forestry development.

[4] Forest Act, 1996, section 16.

Sustainability of forest development: The essence of the Forest Plan and its main purpose are to ensure the conservation and the sustainable development of the forest resources of the Nation.

Holistic and inter-sectoral approach towards forest values and resources: The Forest Plan recognises the forests as diverse ecosystems comprising many interdependent elements in dynamic equilibrium. Forestry, which includes trees in urban and rural areas, closed or disturbed broadleaf forests, tall and short, dry and wet land forests, and mangroves, is practised within the context of sustainable land management and environmental stability. The Forest Plan recognises that forestry cannot be conducted independently from other sectors of the economy and it has a vital role to play in providing a variety of goods and services.

Consistency with national development policies and the socio-economic environment: The Forest Plan is linked with national development plans and broader scope programmes such as the National Environmental Policy, the National Land Policy, the National Industrial Policy and the draft Watershed Policy.

Partnership, participation and transparency: The Forest Plan strives to bring together all stakeholders in a process which will enable them to express concern and become committed. Policies and strategies are reached and agreed upon through participatory decision making and consensus building among all the interested partners.

National policy commitment: The Forest Plan must be backed by the long-term commitment of all national actors, particularly at the policy and decision-making levels.

International commitment: The long-term commitment of the international community is essential and will be sought. In developing the Forest Plan, consideration was given to Jamaica's commitments as a signatory to various international conventions related to the environment.

Raising awareness: The Forest Plan must raise the visibility of the forestry sector and its priority in the national agenda. The full value of trees and forests and their contribution to social, economic and environmental issues must be recognised.

A long-term iterative process: The Forest Plan is a cyclic process comprising planning as well as implementation, monitoring and evaluation activities. It is also an iterative process which continuously reflects changes in the environment and the acquisition of new knowledge even during implementation.

1.3.2 Consolidation of the Forest Plan

The draft plan, completed in January 2000, was the result of a series of analyses and consultations and was intended to provide a basis for public review and input, leading to further analysis and consolidation.

The preparation of the Forest Plan began in 1998 with a review of issues and constraints, an initial inventory of forest lands, consultation with relevant statutory authorities and identification of partners. Preliminary planning got underway in October at a round-table discussion with representation from a cross section of Government agencies with a statutory interest in forest lands.

A working document, *National Forest Management and Conservation Plan: Preparation and Outline for the Planning Process*, was produced in early 1999 and served to guide the series of technical consultations which followed. The consultations involved both Forestry Department personnel and identified partners and provided guidance for prioritising and analysing issues, as well as strategy development.

Technical assistance in developing the Forest Plan was provided to the Forestry Department by the CIDA-funded *Trees for Tomorrow Project* and the *Forestry Capacity (Bridging) Project* funded by the UNDP.

1.3.3 Public Consultation Process

The draft National Forest Management and Conservation Plan was widely distributed to all Government ministries, environmental NGOs, relevant Government agencies, the international development agencies, and other stakeholders with an interest in forest management. Copies were also placed in a variety of locations island wide. Members of the public were able to view the draft plan at parish and branch libraries, the Social Development Commission office in each parish capital, the offices of the Rural Agricultural Development Authority (RADA), and selected Jamaica Agricultural Society offices.

A series of workshops and meetings were held during the first half of 2000 to provide information about the plan and to obtain public input. These were convened as follows:

- March 22: Workshop in Kingston (also the official launch of the plan)
- March 29: Public meeting held at the College of Agricultural Sciences and Education, Passley Gardens, Portland
- April 5: Public meeting held at the Edwin Allen Comprehensive School, Frankfield, Clarendon
- April 8: Public meeting held at the Albert Town High School, Albert Town, Trelawny
- April 17: Workshop in Montego Bay
- June 1: Public meeting held at Savanna-la-Mar, Westmoreland (facilitated by the Westmoreland Environs Development Company Ltd.)

1.3.4 Analysis of Comments and Public Input

Both workshops and public meetings were well attended and generated meaningful discussions concerning forests, forest management and conservation. A very large number of comments were received from these fora, as well as written comments from a number of Government offices and private citizens.

The comments were initially screened to identify those that had major implications for Government policy and implementation of the Forest Plan. The concerns or suggestions which had to be addressed met one or more of the following criteria:

- could be implemented but requires strong political support and commitment;
- implied changes to existing policy or legislation;
- extended beyond current Forestry Department mandate and/or capability; and
- were likely to require substantial increases in Government or external funding.

The suggestions were sorted and grouped based on similarity and affinity. This resulted in the identification of 20 policy issues which required resolving prior to consolidation and implementation of the Forest Plan. Table 1 summarises the concerns and suggestions, grouped by issue.

Table 1: Public Concerns and Suggestions

ISSUE	CONCERN/SUGGESTION
Commitment	Clear policy framework prerequisite to credibility, Plan implementation
	Need an updated forest policy
	GOJ should move rhetoric to reality
	Clearer project definition needed for Plan implementation
	Adherence and commitment to policy
	Need champions of cause
	Establish performance indicators for Plan implementation
	Political will to ensure implementation of the Forest Plan
	Political will to provide forestry incentives
	Political will to monitor Plan implementation
	Continuation of participatory process after external projects finish
	Need for ongoing public fora
	Mangrove destruction being endorsed by Government
	Commitment of Forestry Planning & Development Committee members
Overlapping jurisdiction	Overlapping jurisdiction of NRCA/NEPA and FD
	Need to form proper interagency linkages
	Interagency collaboration - networking
	Where do NRCA/NEPA and FD start and end?
	FD efforts to manage watersheds negated by activities such as effluent dumping
Forestry Planning and Development Committee (FPDC)	Will lack power
	Unwieldy, but needs more focus-group representation
	Accountability
	Lacks private sector representation
Policy integration	Involvement of National Integrated Watershed Management Programme
	Mechanism for collaboration on policy
	Must recognise importance of community capacity development
	Dovetailing with other land use and watershed policies
Legislative harmonisation	Multiple laws pertaining to forest land use confuse the public
	Need clear rules and regulations
	New fire legislation required
	Alignment of Country Fires Act and Forest Act

ISSUE	CONCERN/SUGGESTION
Co-management	Need to clearly define co-management
	Communities need to assume greater responsibilities for forest management – through co-management agreements
	Commitment and accountability to co-management obligations
Private sector role	Private sector strategy should be given higher priority – two-thirds of forest land is privately owned
	Need to involve private sector, especially tourism
	Missing true strategic alliance between public and private sector
	Outsource work to private sector: seedlings, stand management
	Commitment of private sector
Conservation of forests on private lands	Declaration of private land as forest reserves
	Protection of private land under the Forest Act
Reclamation	Reforestation plans for mined lands
	Bauxite companies are destroying forests
Forest land use allocation	Specify objectives for use of forest land
	Proper zoning of land
	Identification and declaration of protection forest
	Plant to reap or plant to stay?
	FIDCO freehold land
Enforcement	Non-enforcement of legislation regarding livestock on forest reserves
	Unlikely anyone would pay for fuelwood when it can be gathered free
	Police role in enforcement is insufficient
	Need strong enforcement in combination with strong public education
	Rationalise enforcement entities
	Enforcement of land use zoning
	Better policing required
	Enforcement of seizure provisions in Forest Act
	Licensing of power saws
	Burning of hillsides
Mangrove management	Mangroves insufficiently addressed in Forest Act and Forest Plan
	Mangrove denudation highest priority concern
Encouraging compliance	Unemployment adversely affects feasibility of enforcement
	Participation and support for enforcement conditional on continued benefit
	Involve youth
	Absence of community policing and monitoring
	Poor farming practises on forest lands leased to Coffee Industries Board
	Ability to enforce legislation without alienating the community
	Foresters need to play leading role in communities
	FD needs trust of community
	FD needs to be seen as friend, partner, ally
Public education	Introduce forestry into school curriculum
	Need for forestry education in Jamaica at various levels
	Target young people
	Lack of public awareness
	Plan needs to be seen and heard by many more people
	Ability to educate and change public attitudes regarding protection

ISSUE	CONCERN/SUGGESTION
Forestry Department capacity	Attract and retain qualified staff – improve staff morale
	Number of wardens available for forest protection
	FD needs to employ more wardens
	Inadequate institutional support for enforcement of forest law
	No forest research being done
	Will educational staff be readily available to communities?
	Non-availability of seedlings
Incentives – general and fiscal	Incentives required for tree planting, agroforestry and soil conservation
	Incentives not articulated
	Incentives – tax relief
	Incentives to private farmers for permanent crops through Government funding (tax relief or cash)
	Loans, subsidies and incentives should be made available to farmers
	Incentives for preserving/maintaining forest; change idle land designation
	Compensation for protection forest
	Rationalisation of incentives to conflicting land uses
	Amelioration or insurance of investment risks
	Articulate measurable investment benefits
	Loggers should replant after they cut
	Increasing praedial larceny will discourage investment
Incentives - land	Permit leasing of Crown land for forestry (eg, Coffee Industries Board lands)
	Make waste land available for planting by farmers
	Lease land to young people
	How to make forest land available to private sector
Incentives - seedlings	Free seedlings for schools/farmers/large organisations/other
Forest fund	Legal and regulatory framework must be very clear
	How will the fund work?
	Can fund be used for compensating owners for preserving forests?
	What mechanisms to finance the Forest Plan?
Funding sources	Proceeds from forest harvesting should be used for forestry, and not returned to consolidated fund
	Place tax on lumber imports
	NWC should contribute to fund
	NWC user fees?
	Water use charges not endorsed because they would be passed on to consumer
	WRA no legal authority to charge water user fees
Miscellaneous	Gender equity is not a role of the FD, but sensitisation is required
	Disaster management mitigation needs more emphasis in Plan
	Resolution of Maroon land boundaries
	Bamboo utilisation
	Policy for fuel forests and wood substitution should be clarified

1.3.5 Approval and Implementation of the Forest Plan

As provided for in the Forest Act, 1996 the draft plan, including all revisions was submitted to the Minister in December 2000 for his approval. Being satisfied that implementation of the draft plan will be in the public interest, the Minister approved the plan in March 2001 and will table the approved Forest Plan before both Houses of Parliament for adoption.

The duration of the Forest Plan is five (5) years from this approval date, however, the Conservator may review the Forest Plan at any time before the five years and make the appropriate and necessary amendments.

2.0 POLICY AND LEGAL FRAMEWORK

2.1 Forest Policy

The earliest statement on record that could be regarded as a national forest policy recommendation is contained in Hooper's report (1886) on the forests of Jamaica. In 1935, Wimbush also reported on the forestry problems of the country with emphasis on deforestation, the protection of existing forest lands, reforestation and shelterbelts.

Although there was a gap of almost 50 years between the two reports, their policy recommendations were essentially the same … "to reserve, demarcate, survey, and protect against fire, theft, and trespass." During this period, forest degradation escalated to the extent that the Jamaica Agricultural Society (JAS) passed a resolution expressing concern about what was described as frequent droughts and floods caused by deforestation.

2.2 Swabey Policy Statement (1945)

In 1945, the then Conservator of Forests, Christopher Swabey[5] wrote what is considered to be Jamaica's first formal Forest Policy Statement. The document contains eight Basic Considerations which could be regarded as a list of guiding principles on which the Statement is based.

The section which deals with General Policy lists four recommendations and these are reproduced below (in bold italics) with comments on how they have since fared.

- ***Establishment of adequate areas of forest reserves under public ownership.*** The present publicly owned forest reserve system owes its existence to the wisdom and foresight of the early foresters who successfully implemented this policy objective.
- ***Development of the use of native timbers and other forest products to provide the highest possible proportion of the island's requirements.*** The achievement of this policy without adequate sustainable management plans can be measured by the extent to which the closed broadleaf forests have been cleared. The demand for immature smaller trees in the form of fuelwood, posts and yam sticks is now such that the natural recovery of the forest in many of the reserves can no longer be taken for granted.
- ***Encouragement of sound forest management on private lands.*** This was never achieved but in recognition of this need, the Forestry Department has, over the years, been providing advice and free seedlings to interested farmers.
- ***Managing the reserves on the basis of conservation and development for multiple use.*** Although the technical measures for managing forests on a sustainable basis are fairly well known, the forests of Jamaica are still not under sustainable management. This has been largely due to the fact that until recently, only very general estimates were available on the country's forest resource area,

[5] Swabey, Christopher. 1945. *Forestry in Jamaica*. Forestry Bulletin No. 1. Forest Department, Jamaica.

its location, species composition, volume, growth rates and site conditions as well as the lack of local management plans.

Although the record of the formal approval of this policy by Government was not found, there appears to be little doubt that successive governments and the forestry organisation accepted the above four recommendations as the national forest policy of Jamaica.

2.3 Policy Statements (1984)

The decade of the 1980s was marked by a resurgence of interest to protect and conserve the Nation's deteriorating environment and awareness of forestry's potential role in ameliorating some of the adverse effects. Recognising the need to revise and bring the forest policy in line with the renewed environmental dimension, two policy statements were prepared with assistance from the UNDP/FAO-funded JAM/82/006 project. One policy statement was on forestry and the other was on soil conservation as part of UNDP's support in strengthening the Department of Forestry and Soil Conservation as it was then known. Two policy statements were considered necessary in view of the uncertainty at that time of the survival of both subjects under the umbrella of a single agency.

The statements asserted that forestry and soil conservation were essential disciplines in Jamaica if the remaining natural resources were to be managed and conserved for the national benefit. They represented broad long-term statements of Government aims and were considered to be sufficiently wide to allow flexibility in coping with diversity and minor programme adjustments that might become necessary at a later date. Both policies were approved in 1983 at the level of a Forestry Development Committee under the chairmanship of the Director of Technical Services of the Ministry of Agriculture but were never put into practice.

2.4 NFAP Policy Statements (1990)

During the planning process for the production of the National Forestry Action Plan (NFAP), the development policies of the Government relevant to the forestry sector were analysed to help identify development objectives for the sector. Based on these objectives, it was expected that a revised policy statement complete with priorities and strategies would have been formulated. Except for some minor editing, however, the NFAP did not make any changes to the 1984 version. Instead it addressed forest policy as it related to two of the NFAP focus areas, namely "Forestry in Land Use" and "Fuelwood and Energy".

2.5 National Report on the Environment (1992)

The above-mentioned NFAP policy statements were not formally endorsed by Government. However, in the report submitted to the United Nations Conference on Environment and Development (UNCED) held in Brazil in 1992, the Government confirmed, on the international stage, its commitment to sustainable forestry development and summarised the economic and social benefits gained from the sector.

2.6 Forest Land Use Policy (1996)

In 1996 Parliament gave assent to a document entitled *Forest Land Use Policy* which contains a statement relating to forest policy. Following a brief introduction, the statement presents a list of 33 goals under the following subject areas:

- Conservation and Protection of Forests
- Management of Forested Watersheds
- Management of Forest Lands
- Promotion and Regulation of Forest Industries
- Forest Research
- Public Awareness and Environmental Education
- Forest Education and Training

Section 2 of the 1996 forest policy statement "indicates how the Government intends to implement the Forest Land Use Policy by defining the roles and responsibilities of each of the agencies involved in forest land use".

2.7 Watershed Policy

A Green Paper (No. 2/99) entitled *Towards a Watershed Policy for Jamaica* has been prepared and is now in general circulation for public discussion and review. The document identifies the Natural Resources Conservation Authority/National Environmental Planning Agency (NRCA/NEPA) as the lead policy and monitoring agency for watershed management.

The Forestry Department is named as the implementing agency with overall responsibility for watershed protection and conservation. Additional duties as they relate to watershed management will become part of the FD's mandate. When a national watershed policy is adopted, the FD will review the activities of this Forest Plan as they relate to its new watershed management duties.

2.8 Other Related Policies

In developing the Forest Plan, a number of higher order national policies were taken into consideration and reference is made to the following:

- National Industrial Policy (1996)
- National Land Policy (1996)

Developments or changes to these higher order plans will be reflected as necessary in amendments and implementation of the Forest Plan.

Other national policies and plans having a bearing on the Forest Plan were consulted to ensure the highest possible degree of harmonisation:

- Policy for Jamaica's System of Protected Areas (1997)

- Watershed Policy (draft) (1999)
- Jamaica National Environmental Action Plan (first prepared in 1995)
- National Environmental Education Action Plan for Sustainable Development (1998)

Two other programmes that will have a bearing on Forestry Department activities are presently under development: the National Biodiversity Strategy and Action Plan Project and the National Integrated Watershed Management Programme (NIWMP). The NIWMP is at a very early development stage. As the FD's role in these programmes become known, appropriate revisions to this Forest Plan will be made.

2.9 Forest Policy Issues

As previously discussed in Section 1.3.4 the stakeholder and public input received on the draft plan identified 20 policy issues which needed to be resolved prior to implementation of the Forest Plan.

The identified policy issues were grouped into three categories, depending on whether they related to:

1. Governance (commitment, overlapping jurisdiction, enforcement roles, mangrove management, FD capacity, Forestry Planning and Development Committee, policy integration, legislative harmonisation);
2. Investors (forest fund, funding sources); and
3. Stakeholder participation (co-management, private sector role, conservation of private land, reclamation of mined lands, forest land use allocation, incentives, compliance and public education)

The draft plan lacked specificity on how the above issues were to be resolved. To address the issues obtained from the public consultations, strategic options for each were developed. Preferred options were identified at a Forest Policy Workshop[6] held in June 2000 and in subsequent discussions held within the Forestry Department.

The preferred options for addressing issues arising from stakeholder and public input are shown in Table 2. These options will serve to guide the development of Forestry Department's programmes and activities

[6] Participants included representatives of Ministry of Lands and Environment, Ministry of Tourism and Sport, Ministry of Agriculture, Water Resources Authority, Lands Department, Caribbean Coastal Area Management Foundation, Caribbean Natural Resources Institute, Jamaica Conservation Development Trust, Natural Resources Conservation Authority/National Environmental Planning Agency, and the consulting profession in addition to the Forestry Department.

Table 2: Strategic Options for Addressing Public Input

ISSUE	STRATEGIC OPTION
1. Commitment to implementation of Plan	Plan carried forward for approval by Minister and Parliament
	Update 1996 Forest Land Use Policy
	Formal commitment to Plan strategies by GOJ (to donor community)
	Formal commitment by GOJ to multi-year Plan budget contribution
	Obtain multi-stakeholder endorsement from political and civil sectors
	Revise Forest Act to bind Crown
2. Overlapping jurisdiction/role of Forestry Department	FD responsible for enforcing Act in forest reserves (whether or not in parks/protected areas)
	FD implementing agency for NIWMP in forest reserves once NIWMP is launched
3. Enforcement roles	By strengthened FD in all forest reserves
	Shared enforcement formalised in co-management agreements or MOU
	FD enforcement expanded to inspection of all types of primary conversion facilities for verification of legal wood supply
4. Mangrove management	Provide for co-management: FD/NRCA/NEPA/Fisheries Dept./Coast Guard/NGO
	Declare as forest reserves or forest management areas all mangrove areas not already protected
5. Forestry Department capacity requirements	As required to carry out core functions as defined in section 4 of the Forest Act
	Strong community liaison to provide extension service in forestry, agroforestry and watershed protection on lands outside reserves
6. Forestry Planning and Development Committee	As proposed in Plan, appointed by Minister of Agriculture on recommendation of Conservator, produces published report
	Sub-committee of NWMC when council becomes active
7. Policy integration	Plan harmonised with other policies, programmes and plans
	Plan recognises "high order" plans, policies and programmes that must be followed
8. Legislative harmonisation	Harmonise Forest, NRCA/NEPA, and Watershed Protection Acts and Regulations with respect to parks, protected areas, management areas, enforcement provisions, etc.
	Review and amend Country Fires Acts, prepare drafting instructions for Regulations
	Land with natural vegetation cover should not be considered "idle" if serving a conservation function
9 (a). Jamaica Forest Management and Conservation Fund - organisation	Board: contributors, GOJ, public Financial Administrator: international/local financial management firm Technical Coordinator: Forestry Department
9 (b). Jamaica Forest Management and Conservation Fund - beneficiaries	Non-profit non-government and community-based organisations, educational institutions
	Lessees and owners of private lands
	Contractors
10. Funding sources	ETF/debt reduction agreements
	International donors (bilateral and multilateral)
	NWC & NIC contribution to watershed management
	User fees – tourism, recreation
	Carbon credits
	Government forest production revenues (noted as essential)
	Personal and corporate endowments

ISSUES	STRATEGIC OPTION
11. Co-management	FD will enter into management agreements with Government executing agencies
	FD will enter into arrangements for conservation easements directly with private sector on private land
12. Private sector role	Seedling production
	Protection and reclamation of natural forests on private land
	Forest reclamation on leased Crown lands
	Commercial forest management of Crown and private land
	Other forestry activities on Crown land
	Support forestry public awareness programme
13. Conservation on private lands	Voluntary declaration by owner
	Compulsory acquisition
	Forest management agreement
14. Reclamation of mined forest lands	End-use must be forest if land was forest before disturbance
	End-use defined by the Mining Act and Regulations, 1979
	All costs borne by operator, except FD promotional and regulatory functions specified in the Forest Act
15. Forest land use allocation	Retain strategy in Plan as general guidelines
	Establish and promote strategy as policy
16. Financial incentives for private forestry	Re-institute grant for plantation establishment
	Grant for dedication and maintenance of protection forest
	Long-term, nominal interest loans
	Property tax deduction or remission – de-rating system as for developed agriculture
	Duty concession on motor vehicle purchase
	Waiver of GCT on capital goods
	Income tax exemption for prescribed activities
	Other tax deductions or remission for purchase of supplies
17. Land incentives	49-year conditional lease of public land for sustainable forest management
	Conditional lease of public land for other purposes (eg, bee-keeping)
	Lessees vested full ownership of planted trees
18. Seedling supply incentive	Timber seedlings free to all from nursery site
	Subsidised cost depending on species
	Subsidised cost depending on quantity
19. Encouraging compliance	FD foresters and wardens trained in community liaison
	Work through Local Forest Management Committees
20. Public education and awareness	Forest education programmes delivered by FD to target groups identified in Forest Plan
	Collaboration between FD – NEEC – Ministry of Education to incorporate forest conservation into core school curriculum
	Teacher/educator pre-service training
	Teacher/educator in-service training

2.10 Forest Policy Development

During the development of the draft plan it became increasingly clear that the existing 1996 *Forest Land Use Policy* needed to be updated in light of the values, goals and strategies outlined in the Forest Plan.

The process used in formulation of the draft plan involved analysis of problems, setting of goals and objectives, definition of courses of action, identification and use of policy tools, implementation, and monitoring – all of which are also part of the policy process. Hence the Forest Plan contains many elements that amount to policy statements.

To update the 1996 policy statement, a workshop for Forestry Department staff was held in early February 2001 to prioritise policy issues and identify strategic policy tools. Additional input was received during individual meetings with the NRCA/NEPA, Jamaica Bauxite Institute, Petroleum Corporation of Jamaica and the Environmental Foundation of Jamaica.

The updated Forest Policy 2001 is organised into three sections. Section 1 states the priorities and goals of the forestry sector. Section 2 lists the strategies and tools to achieve priorities and goals and Section 3 lists the roles and responsibilities of each of the agencies involved in forest land use. Updates relative to the 1996 policy statement reflect legislative, institutional and other developments that have occurred since 1996, and public input received during the development of the National Forest Management and Conservation Plan.

The full text of the Forest Policy 2001 is provided in Appendix II.

2.11 Forest Regulations

A set of Forest Rules (1945) is presently under revision. The final draft will be presented to the Minister for approval. When adopted, the new Forest Regulations will enable the Forestry Department to carry out its mandated functions as elaborated in the Forest Act, 1996. Among other things, the Regulations will provide for and address:

- Approval and distribution of Forest Management Plans as well as specifying content;
- Permitted uses of roads within forest reserves and penalties for non-compliance;
- Burning permits and fire restrictions within forest reserves;
- Trespass by cattle and people;
- Conditions surrounding timber extraction from forest reserves, including the requirement for permits to transport power saws, sawmill licenses and permits, records to be kept by licensees, right of seizure and search, and authority of FD officers to request information;
- Illegal removal of produce from forest reserves or protected areas;
- Protection of wildlife;
- Establishment of community catchment areas;
- Conditions for leasing of forest reserve lands; and
- Development and management of forest reserves for recreation sites.

Under the Regulations the Minister may provide incentives to encourage private forestry, including provision of technical advice, provision of tree seedlings at special rates, duty-free concessions for inputs and remission of property taxes.

3.0 INVENTORY AND DESCRIPTION OF FOREST LANDS

3.1 Forest Cover and Land Use Classification System

The most recent assessment of forest cover and land use in Jamaica is based on LANDSAT^{TM} satellite imagery acquired in 1996 and 1998, combined with aerial and ground reconnaissance. The work was conducted by the Forestry Department, with support from the CIDA-funded *Trees for Tomorrow Project*. The resulting classification of forest cover was combined with information on protection status, watershed boundaries and priority, accessibility, topography and soils provided by the Natural Resources Conservation Authority/National Environmental Planning Agency (NRCA/NEPA), the Survey Department, the Rural Physical Planning Unit of the Ministry of Agriculture, and Spatial Innovision Ltd. The assessment generated databases and maps (at scales of 1:100 000 and 1:250 000) showing land use, forest cover, watersheds, protected areas, reforestation potential and critical areas for protection and conservation.

Details of the system for classifying land use and forest cover used in this Forest Plan are documented in Table 3 below. Land use/forest cover is divided into three broad classes: Forest, Mixed and Non-forest. Each of the three classes is further divided into several sub-classes which provide the detailed land use/forest cover description. The Forest classification includes closed and disturbed broadleaf forests, open dry forests, swamp and mangrove as well as bamboo areas. The Mixed classification is composed of Forest sub-classes where anthropogenic activities take place. Wholly cultivated lands, water bodies, urban and industrial areas, etc. make up the Non-Forest classification.

Table 3: Definitions of Land Use and Forest Cover Types Used in Broad Inventory

LAND USE / COVER		DEFINITION
Class	**Sub-class**	
Forest	Closed Broadleaf	Closed primary forest with broadleaf trees at least 5 m tall and crowns interlocking, with minimal human disturbance.
	Disturbed Broadleaf	Disturbed Broadleaf forest with broadleaf trees at least 5 m tall and species-indicators of disturbance such as *Cecropia peltata* (trumpet tree).
	Bamboo	*Bambusa vulgaris* (Bamboo brakes) on the lower shale hills (disturbed forest).
	Tall Open Dry	Open natural woodland or forest with trees at least 5 m tall and crowns not in contact; in drier part of Jamaica with species-indicators such as *Bursera simaruba* (red birch).
	Short Open Dry	Open scrub, shrub, bush or brushland with trees or shrubs 1-5 m tall and crowns not in contact, in drier part of Jamaica with species-indicators such as *Prosopis juliflora* (cashaw) or *Stenocereus hystrix* (columnar cactus).
	Swamp	Edaphic forest (soil waterlogging) with a single tree storey with species-indicators such as *Symphonia globulifera* (hog gum) and *Roystonea princeps* (royal palm).
	Mangrove	Edaphic forest (areas with brackish water) composed of trees with stilt roots or pneumatophores, species-indicators such as *Rhizophora mangle* (red mangrove).

LAND USE / COVER		DEFINITION
Class	**Sub-class**	
Mixed	Fields or Disturbed Broadleaf Forest and Pine Plantation	>50% fields or Disturbed Broadleaf forest; >25% Pine plantation
	Disturbed Broadleaf Forest and Fields	>50% Disturbed Broadleaf forest; >25% fields
	Bamboo and Disturbed Broadleaf Forest	>50% bamboo; >25% Disturbed Broadleaf forest
	Bamboo and Fields	>50% bamboo; >25% fields
	Fields and Disturbed Broadleaf Forest	>50% fields; >25% Disturbed Broadleaf forest
	Bauxite Extraction and Disturbed Broadleaf Forest	>50% bauxite extraction; >25% Disturbed Broadleaf forest
Non-Forest	Plantations	Tree crops, shrub crops like sugar cane, bananas, citrus and coconuts
	Fields	Herbaceous crops, fallow, cultivated grass/legumes
	Herbaceous Wetland	Edaphic vegetation (soil waterlogging) with herbaceous plants
	Water Bodies	Lakes, rivers
	Small Islands	Mostly sand/limestone, unvegetated small islands (cays)
	Bare Rock	Bare sand/rock
	Bauxite Extraction	Surface mining/bauxite
	Buildings and Other Infrastructure	Buildings and other constructed features such as airstrips, quarries, etc.

Source: Forestry Department, December 1999

3.2 Present Land Use

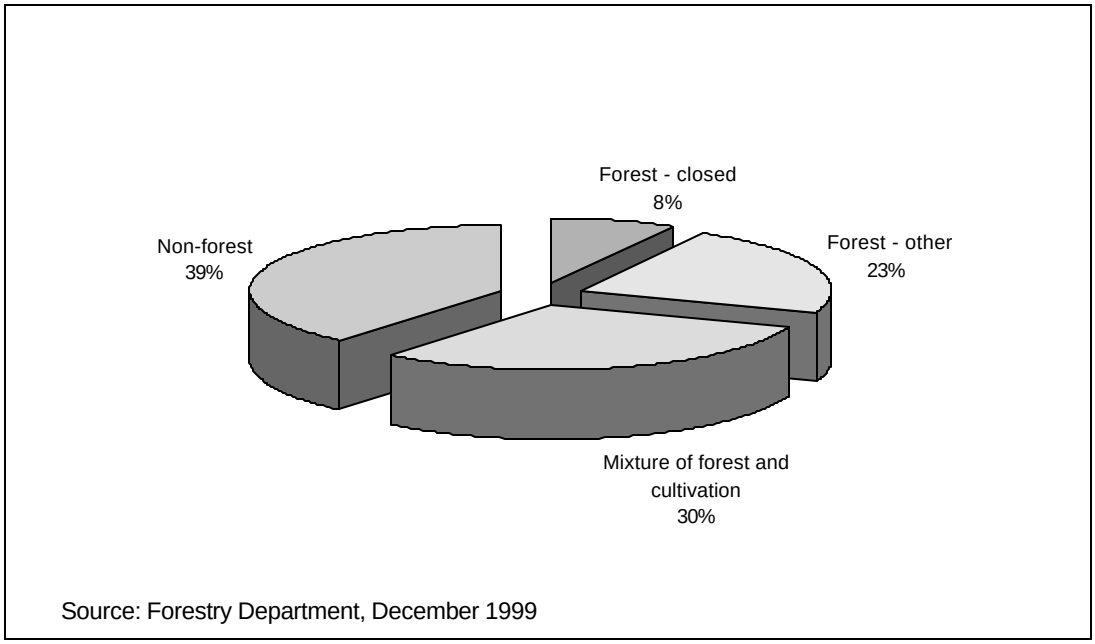
Map 1 in Appendix III shows land use and forest cover at a scale of 1:250 000. The associated areas are broken down by land use/forest cover class, sub-class, and protection status. Table III-1 in Appendix III shows a breakdown, by hectare, of the area of Jamaica using the land use/forest cover classification discussed in the above section, and its protection status.

Over 30 percent of Jamaica, approximately 335,900 hectares, is classified as Forest (see Figure 1). Approximately 88,000 hectares of this is classified as closed broadleaf forest with a closed canopy and minimal human disturbance. Most of the remaining forest is "disturbed broadleaf" (showing varying degrees of human disturbance) or natural dry open forest. Although the latter is often referred to as woodland or scrub, dry limestone forests are a key component of Jamaica's forest ecology and economy.

Just over 30 percent of the country is classified as Mixed use. These are areas of disturbed broadleaf forest mixed with another land use/forest cover, ie, Pine plantation, agricultural field, bauxite extraction site or bamboo.

The remaining 39 percent of the area of Jamaica is classified as Non-forest and consists of wholly cultivated areas, water bodies, bare rock, bauxite mines, and buildings/other infrastructure.

Figure 1: Proportion of Jamaica Covered by Forests



Source: Forestry Department, December 1999

3.3 Protection Status and Ownership

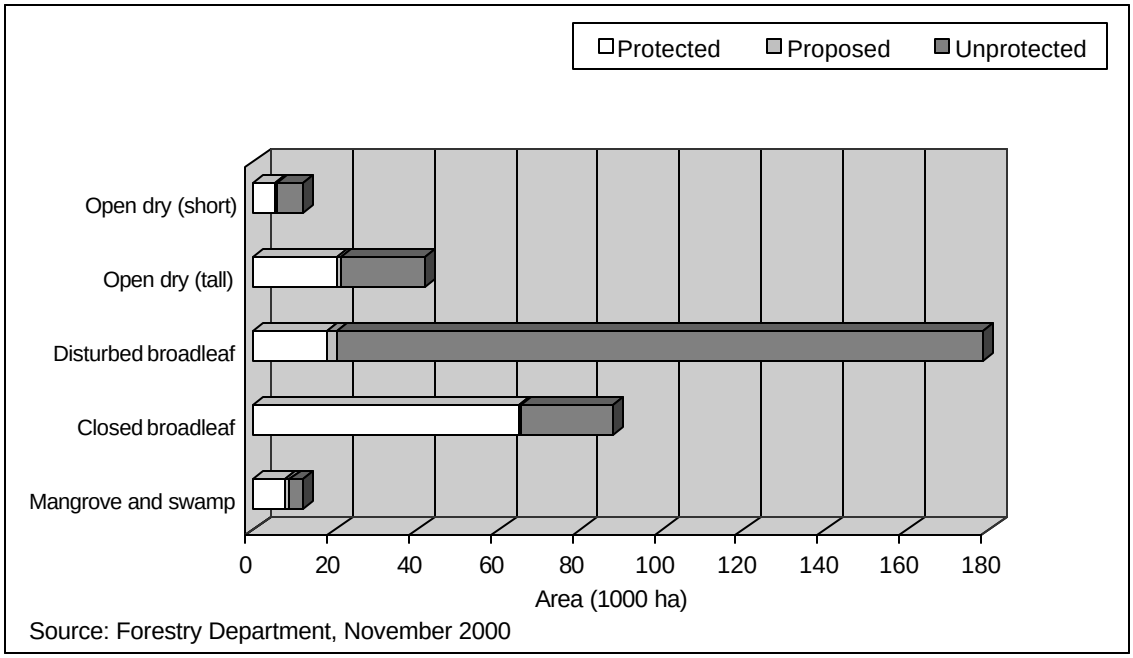
For the purpose of identifying protection status, areas are considered "protected" if they fall into one or more of the following categories:

- *forest reserve* declared by or under the Forest Act;
- *national park* declared under the Natural Resources Conservation Authority Act;
- *game reserve* or *bird sanctuary* protected under the Wildlife Protection Act; and
- other *protected areas* designated under the Natural Resources Conservation Authority Act or the Forest Act.

Figure 2 shows the forested area distribution by forest type and protection status. The Forest classification encompasses approximately 335,900 hectares. Of this, almost 64 percent is unprotected and comprises privately owned and Crown lands. A laudable proportion of classified forest land is designated as protected: nearly 35 percent of all forests, and over 73 percent of closed broadleaf forest. The largest category of forest area in Figure 2 is unprotected disturbed broadleaf forest (approximately 158,000 hectares). Details of protected areas are shown in Table III-1 in Appendix III.

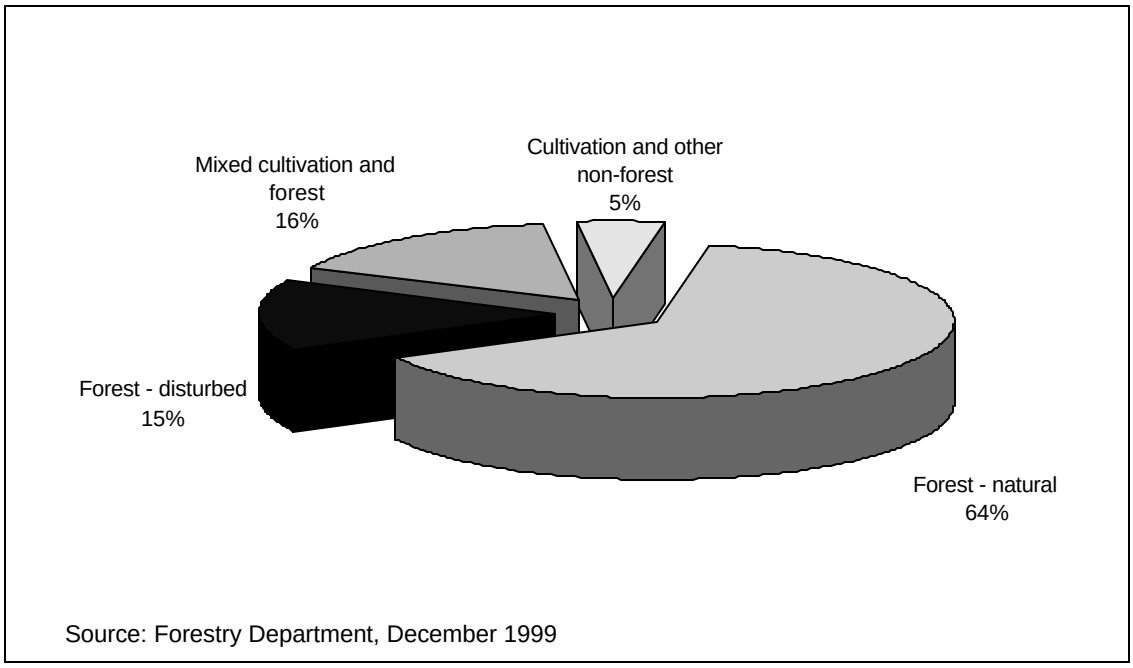
Although much of Jamaica's forest is ostensibly protected, Figure 3 indicates serious encroachment of forest reserves (including the Blue and John Crow Mountains National Park) has occurred. More than 20 percent of land within forest reserves has been impacted by human activity and is classed as disturbed broadleaf forest with another land use. Over one-third of all forest reserves and other protected areas has been significantly disturbed.

Figure 2: Forest Area by Type and Protection Status



Source: Forestry Department, November 2000

Figure 3: Present Land Use within Forest Reserves



Source: Forestry Department, December 1999

3.4 Lands Managed by the FD

According to *The Jamaica Gazette,* the area of forest reserves and Crown lands[7] managed by the FD is 109,514 hectares, of which 98,962 hectares are forest reserves and 10,552 hectares are Crown lands.[8] The difference in forest reserve areas between the *Gazette* and those in Table III-1 (in Appendix III) can be explained by:

- the forest reserve areas in the *Gazette* are estimates, based on descriptive (not surveyed) boundaries; and
- the forest reserve areas shown in Table III-1 were digitised from FD 1:250 000 maps and not from actual surveyed forest reserve boundaries.

A programme of surveying forest reserve boundaries has begun and survey data are being digitised which will produce more accurate areas in future. Just over one-half of the Crown lands managed by FD are protected. These lands lie within the Portland Bight Protected Area.

A Cabinet Decision (No. 19/99) dated 31 May 1999 approved the recommendation that approximately 2000 ha of freehold lands owned by FIDCO are to be transferred to the the Commissioner of Lands for management by the Forestry Department.

3.5 Forest Cover Change over Time

Jamaica is relatively well documented with studies on forest depletion, but the results vary widely with estimates of the annual deforestation rate ranging from between 0.1 to 11.3 percent (Table 4, below).[9] The causes of these differences in the forest cover estimates and the related deforestation rate are as follows:

- the definition of Forest and the Forest Classes included (forest and/or wooded land);
- the reference area (entire country or region);
- the reference year (photographs/images year or study publication year);
- the type of the study (mapping or field sampling or both);
- the precision of the estimates (photographs or satellite imagery or field survey);
- the information sources used (traditional forest inventory or research plots); and
- the objectives of a particular study (agriculture, forestry or conservation).

[7] Crown lands refer to lands owned by the Government. Forest reserves are a special designation of Crown lands set aside by the Government.

[8] These areas have been compiled from various issues of *The Jamaica Gazette*.

[9] This Section summarises the findings of a paper, *Forest Cover and Deforestation in Jamaica – An Analysis of Forest Cover Estimates over Time,* prepared by O.B. Evelyn and R. Camirand and presented at the Public Awareness Workshop, U.N. Convention on Desertification, Kingston, Jamaica, March 2000.

Table 4: Studies of Forest Cover Change in Jamaica

Period / Region	Annual Rate (%)	Reference
??? / Jamaica	3.0	FAO/UNDP (1981) *in* Eyre (1986)
??? / Jamaica	3.0	US Congress (1984) *in* Eyre (1986)
??? / Jamaica	2.1	Allen & Barnes (1985) *in* Eyre (1986)
1980-1986 / Jamaica	3.3	Eyre (1986)
1980-1986 / Jamaica (Rural Districts)	4.3	Eyre (1986)
1980-1986 / Jamaica (Land altitude > 1000 m)	1.0	Eyre (1986)
CRIES Studies 1981-1987 / Cockpit Country	2.8	Eyre (1989) *in* Miller (1998)
??? / Jamaica	5.3	FAO/WRI (1994) *in* Eyre (1994, 1996)
1980-1990 / Jamaica	11.3	FAO (1995)
1982-1993 / Hope & Upper Yallahs Watersheds	2.0	Graaff de (1997)
1990-1995 / Jamaica	7.2	FAO (1998)
1961-1991 / Cockpit Country	0.1	Miller (1998)
1989-1998 / Jamaica	0.1	Forestry Dept./TFT Project (1999)

EVELYN, O.B., 1997. "Deforestation in Jamaica: An analysis of the data". Forestry Department, Kingston, 9 p.

EYRE, L.A., 1986. "Deforestation in Jamaica: Its rate and implications". Department of Geography, University of the West Indies, Kingston, 29 p.

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FORESTRY DEPARTMENT/TREES FOR TOMORROW PROJECT, 1999. "Land use/cover types areas 1989 and 1998 per watershed management unit and protection status". Technical report, Kingston, 69 p. + 1:100 000 and 1:250 000 scale colour maps.

In March 2000 the Forestry Department and the *Trees for Tomorrow Project* carried out an analysis of forest cover change over the period 1989 to 1998 using the following LANDSAT™ images:

- Full scene 012/047 (10 Dec 1989) and Full scene 011/047 (03 Dec 1989) + Quarter scene 011/047 (12 Nov 1990); and
- Full scene 012/047 (07 April 1998) + Quarter scene 012/047 (02 Feb 1998) and Full scene 011/047 (04 Oct 1996).

The Project devised a classification system for the LANDSAT™ interpretation and limited this to a mapping scale of 1:100 000. The smallest area or polygon resolved was 25 hectares. A supervised classification system was used and over 100 locations island wide were visited (and photographed) and the co-ordinates taken by GPS for verification purposes. Aerial photographs (1991 and 1999) were also used to verify seven large blocks, which were very difficult to interpret because of clouds and

shadows. Table 5 below gives the 1989 and 1998 land use areas derived from the analysis.

Table 5: Land Use/Cover Change in Jamaica, 1989 to 1998

LANDUSE		1989 (hectares)	1998 (hectares)	Difference (hectares)	Loss/gain (%)
Forest land use/cover (> 75%)					
BB	(Bamboo)	2,791.20	2,979.41	188.21	6.74
MG	(Mangrove)	9,751.46	9,731.37	-20.09	-0.21
PF	(Closed Broadleaf)	88,716.63	88,230.54	-486.09	-0.55
SF	(Disturbed Broadleaf)	181,154.01	178,624.64	-2,529.37	-1.40
SL	(Short Open Dry)	12,083.37	12,104.02	20.65	0.17
SW	(Swamp)	2,357.51	2,247.03	-110.48	-4.69
WL	(Tall Open Dry)	42,124.98	41,998.54	-126.44	-0.30
	Sub-total	**338,979.17**	**335,915.55**	**-3,063.62**	**-0.90**
Mixed land use/cover (first class > 50%, second class > 25%)					
BC	(Bamboo and Fields)	29,818.44	29,155.59	-662.84	-2.22
BF	(Bamboo and Disturbed broadleaf)	12,311.14	12,687.17	376.03	3.05
BS	(Bauxite and Disturbed broadleaf)	1,590.46	2,851.38	1,260.92	79.28
CS	(Fields and Disturbed broadleaf)	118,897.77	117,966.13	-931.64	-0.78
PP	(Pine Plantations/Other)	4,956.22	4,286.94	-669.28	-13.50
SC	(Disturbed broadleaf and Fields)	166,837.72	165,953.86	-883.87	-0.53
	Sub-total	**334,411.75**	**332,901.08**	**-1,510.68**	**-0.45**
Non-forest land use/cover					
BA	(Buildings/Other infrastructure)	51,909.59	52,259.78	350.20	0.67
BE	(Bauxite)	1,193.29	4,921.94	3,728.66	312.47
BR	(Bare rock)	866.98	933.88	66.90	7.72
FC	(Fields)	273,176.05	274,478.64	1,302.59	0.48
HW	(Herbaceous wetland)	10,914.08	10,914.08	0.00	0.00
PC	(Plantations)	83,145.25	82,341.34	-803.91	-0.97
WA	(Water)	1,656.17	1,586.03	-70.14	-4.23
	(Small islands)	164.00	164.00	0.00	0.00
	Sub-total	423,025.41	427,599.70	4,574.29	1.08
	TOTAL	**1,096,416.33**	**1,096,416.33**		

Source: Forestry Department, March 2000

Over the 10-year period, there has been a loss of Forest land amounting to 3,063.6 hectares (0.91 percent of the forest land in 1989). On an annual basis this amounts to a decrease in Forest land use classes of approximately 0.1 percent. The land use with the largest increase over the same 10-year period is in the bauxite areas, which have increased by 4,989.6 hectares.

In the future, to resolve the problem of different definitions of land use/cover types and methodologies being used, the Forestry Department is establishing a Change Detection and Monitoring Unit within the Department. The steps in the establishment of this Unit are as follows:

- The Forestry Department will be the single agency responsible for the sustainable collection, analysis and distribution of the forest cover data for Jamaica;

- Interpretation will be done using satellite images every 5 or 10 years with the same definition of land use/cover types and the same methodologies for interpretation;
- Periodic detailed analysis will be carried out using aerial photography for management planning purposes; and
- Destructive changes that are taking place in the forests will be monitored and mitigation measures will be developed to deal with them.

3.6 Existing Plantations

Prior to Hurricane Gilbert in 1988, plantations of Caribbean Pine (*Pinus caribaea)* in Jamaica covered approximately 11,250 hectares. The Hurricane reduced the extent of these plantations to less than half. An inventory carried out in 1990, two years after the Hurricane, reported a total of 5,172 hectares of Caribbean Pine: 4,416 hectares formed the Forest Industries Development Company (FIDCO) estates and the balance (756 hectares) was non-FIDCO plantations. The present extent of Pine plantations is estimated at around 4,300 hectares[10] and they are located mainly in the Eastern Region with a few smaller areas in the Central Region. Caribbean Pine is the dominant species with other Pine species making up approximately 5 percent.

By 1983 FIDCO had established 572 hectares of hardwood plantations, mainly Mahoe, Teak, Eucalyptus and Honduras Mahogany, in the Eastern and Central Regions (mostly Eastern). Up to the same year, the Forestry Department had established 3,309 hectares of hardwood plantations throughout Jamaica. Mahoe and Honduras Mahogany accounted for 40 percent and 45 percent respectively of trees planted. Other species included Cedar, Santa Maria, Teak, Jamaican Mahogany and Broadleaf.

The extent of plantations established by bauxite companies (as part of land rehabilitation) and other Government agencies is not known, nor is the extent of privately owned plantations.

3.7 Forest Inventory

The Forestry Department, assisted by the *Trees for Tomorrow Project*, is presently in the process of carrying out a broad national inventory based on LANDSAT™ imagery. Images for 1996 and 1998 have been interpreted, field-checked and areas have been calculated. A biophysical inventory has been completed in Buff Bay/Pencar pilot area and volume calculations using the local data are now possible.

The total timber and biomass volumes of Jamaican forests have not been estimated previously. The values in Table 6 below represent the first ever attempt at estimating the total volume of standing timber and above ground forest biomass in the country. The forest lands have been categorised according to the forest cover classification discussed in Section 3.1 (for areas see Table III-1 in Appendix III). The volume calculations are based on the per hectare volumes of different forest types, as calculated from data collected during the biophysical inventory of Buff Bay/Pencar pilot area and the area of

[10] Plantation is defined as an area with more than 50 Pine trees per hectare.

the forest type. Per hectare volumes as reported in another publication[11] were used for closed broadleaf forests and open dry forests.

The forest biomass estimate represents the above ground biomass in the trees and does not account for the biomass in the understorey, roots, forest floor litter or dead wood.

Table 6: Estimate of Total Volume of Jamaica's Forests

Forest Lands (1)	Area (2) (ha)	Volume (3) (m^3/ha*)	Volume (m^3)	Biomass (4) (t/ha*)	Biomass (tonnes)
Natural Forests					
Closed Broadleaf	88,231	195	17,205,045	250	22,057,750
Disturbed Broadleaf	178,625	155	27,686,875	233	41,664,003
Open Dry [Tall & Short]	54,102	60	3,246,120	96	5,193,792
Swamps and Mangroves	11,978	135	1,617,030	218	2,609,541
Disturbed Broadleaf and Fields	165,954	95	15,765,630	183	30,393,315
Sub-total Natural Forests	***498,889***		***65,520,700***		***101,918,400***
Forest Plantations					
Pines	4,287	165	707,355	109	468,976
Hardwoods	3,900	185	721,500	255	992,756
Sub-total Forest Plantations	***8,187***		***1,428,855***		***1,461,732***
TOTAL	**507,076**		**66,949,555**		**103,380,132**
*m^3/ha = cubic metres per hectare; t/ha = tonnes per hectare					
(1) Estimate for main forest types (not included: Bamboo, Mixed types dominated by other land use/cover types.					
(2) Forest areas from LANDSAT^{TM} 1996-98 interpretation (Forestry Department, 1998-99), except for hardwood plantation areas (Forestry Department, 1982).					
(3) Total volume outside bark (all species, DBH = >10 cm) based on biophysical inventory of Buff Bay/Pencar pilot area (Forestry Department, 2000), except for closed broadleaf forest and open dry forest (Thompson *et al*, 1986). Rotation for forest plantations: 20 years (Pines); 30 years (hardwoods)					
(4) Estimates of above-ground biomass in trees without understorey, roots, forest floor fine litter and dead wood; calculations according to FAO method (Forestry Paper No. 134, 1997), except for closed broadleaf forest and open dry forest (Thompson *et al*, 1986).					

Source: Forestry Department, November, 2000

[11] Thompson, D.A., Bretting, P.K. and M. Humphreys (eds). 1986. *Forests of Jamaica*. The Jamaican Society of Scientists and Technologists: Kingston. 162p.

4.0 OVERVIEW OF FORESTRY PRODUCTIVE SECTOR

4.1 Lumber Supply and Demand

The decentralised nature of the sawmilling industry in Jamaica makes it difficult to collect lumber production figures. One report approximated total production by estimating the capacity of approximately 120 permanent sawmills and adding the estimated output from numerous portable sawmills (chainsaws).[12] Thus, in 1993, annual production was estimated at 59,000 cubic metres of hardwoods and 3,000 cubic metres of softwoods.

In the past few years there has been an increase in the number of chainsaw mills. These highly portable operations can be taken deep into the forest to extract and convert timber trees previously considered inaccessible. The number of these portable operations and their production levels cannot be estimated with accuracy.

A new set of Forest Regulations is presently being prepared. Among other things, the Regulations specify procedures for all aspects of timber harvesting operations, including the requirement for the licensing of sawmills, permits for the transport of timber and portable power saws and for records to be kept by licensees. These licenses and records will facilitate the systematic collection of production data.

The quantity of lumber produced legally from state-owned lands can be estimated from total wood volumes on cutting licenses issued by the Forestry Department and the application of an appropriate recovery rate. The recorded amount of timber taken from state-owned lands in recent years is, however, less than 500 cubic metres per year: no estimates are available for the volume of timber illegally removed.

In 1999 lumber imports amounted to approximately 137,590 cubic metres with a CIF value of J$1.538 billion. A comparison of lumber imports for 1997, 1998 and 1999 is shown in Table IV-1 in Appendix IV.

Table 7 estimates 1999 national lumber consumption by combining the 1993 estimates of domestic production, adjusted by the annual population growth rate[13], with 1999 import data. There is a greater dependence on imported softwood lumber, while self-sufficiency for hardwoods is higher. Overall, local production satisfies about 32 percent of total lumber demand. Softwood lumber imports since the early 1980s have increased, however a distinct upward trend for hardwood lumber imports cannot be discerned. Figures IV-1 and IV-2 in Appendix IV show the softwood and hardwood lumber imports for the period 1980 to 1999.

[12] Campbell, Keith. March 1993. *Jamaica: The Rationalisation of Sawmills*. Report prepared for the Forestry and Soil Conservation Department, Ministry of Agriculture, Government of Jamaica.

[13] Statistical Institute of Jamaica. *Statistical Yearbook of Jamaica*. (var. editions) (approx. 1.1% per year between 1994 to 1999)

Table 7: Estimated Annual Demand for Lumber in 1999

Species	1999 Actual Imports (m^3)	Estimated Local Production (m^3) (adjusted by population growth)	Estimated Total (m^3)
Softwoods	119,034	3,210	122,244
Hardwoods	18,555	63,065	81,620
Totals	137,589	66,275	203,864

Source: Developed from data in *External Trade* (var. issues), Statistical Institute of Jamaica and Campbell (1993)

Softwood lumber is used primarily in construction while hardwood lumber is used for furniture making and for private house and shed building. The majority of furniture for the domestic market is made from locally produced hardwoods. The local hardwood is also used to make fences, pallets, boxes and crates, and coffins. Few furniture manufacturers in Jamaica are geared to produce the high quality required for export nor is Jamaica able to compete with the highly efficient plants of North America in the bulk manufacture of low-cost utility furniture. At present, Jamaica's limited export market is of quality reproduction period pieces which are made exclusively from hardwoods.

4.2 Lumber Quality and Price

Few sawmills in Jamaica are geared to produce high grade lumber.[14] Lumber from many mills is often poorly sawn and not properly dimensioned with defects left in the finished product such as wane, large knots and checked ends. Local lumber is often not properly dried, a factor of critical importance to furniture makers. Manufacturers of better quality furniture prefer to use imported lumber which has been properly graded and kiln dried. An additional factor is that imported lumber is produced from mature trees with superior composition to that of local material, which is often obtained from young trees felled prematurely.[15]

The higher quality imported lumber, particularly hardwoods, commands a higher price than the local product. The quality of local lumber often results in high wastage in subsequent processing and negates its price advantage. Many local furniture operations include a sawmill operation and it is important to note that these small producers utilise the local lumber to make basic household items which are sold in the domestic market at relatively low prices, compared to furniture made from imported hardwoods.

The selling price of locally produced lumber varies depending on quality and the specific demand for a particular species at a given time. Table 8 shows the range of prices received by woodcutters (portable sawmillers) and small holder farmers in the Buff Bay/Pencar watershed (the only area for which data has been collected) for the more popular species of lumber.

[14] This Section draws information from *Jamaica – The Rationalisation of Sawmills*, March 1993 prepared by Keith Campbell, ODA.

[15] The observation that local hardwood producers are taking immature timber still holds today and seems to back up assertions that availability of good quality, accessible hardwood trees is declining.

Table 8: Lumber Prices for Selected Species in Buff Bay/Pencar Watershed

Species	Price per bd ft (J$)
Cedar	25 to 40
Mahoe	25 to 30
Mahogany	25 to 60
Pine	18
Spanish Elm	25 to 40
Sweetwood	25 to 40
Note: These are prices received by woodcutters (sawmillers) and small holder farmers. A lumber yard in Buff Bay retails hardwoods such as cedar, mahoe and spanish elm for approximately $55 per bd ft.	

Source: Forestry Department, survey of small holder farmers and interviews with woodcutters, April to June 2000.

4.3 Timber Market and Stumpage

Little information is available about private sector logging and sawmilling in Jamaica: for example, the number of permanent and portable sawmill operations, sources and costs of roundwood, logging and transport costs, lumber production levels and costs, and selling prices.

What is known is that in recent years the supply of timber (legally obtained) from state-owned lands has declined. The bulk of the log supply is from private land, originating from land clearing activities and direct timber sales.[16] Logs are mostly purchased directly by sawmill owners, but there are some independent log buyers. There is probably a significant volume of owner-felled and sawn timber for personal consumption and/or sale.

The Forestry Department has established stumpage rates for a wide range of tree species. Stumpage is generally calculated as the difference between the local selling price of the products and the stump-to-market processing costs, including an allowance for profit and risk. The FD stumpage rates listed in Table 9 were revised in 1996 using a mark-up factor over the previous rates and not calculated using the product price to processing cost relationship. Thus these rates may not accurately reflect the value of the wood resource.

Table 9: Forestry Department Stumpage Price for Selected Species, 1996

Species	Large end of log (> 20 cm)		Small end of log (< 20 cm)	
	Cubic feet (J$)	Cubic metre (J$)	Cubic feet (J$)	Cubic metre (J$)
Jamaica Mahogany	120	4236	100	3530
Cedar	110	3883	90	3177
Mahoe	80	2824	60	2118
Sweetwood	60	2118	50	1765
Spanish Elm	80	2824	60	2118
Caribbean Pine	70	2471	60	2118
Note: The above are the main species for which FD presently issues cutting licences.				

[16] Most of the timber from private land is legitimately purchased. The degree of illegal removal of trees from private and state-owned lands is not known.

4.4 Fuelwood, Charcoal and Yam Stick Production

While it is likely that production of fuelwood and charcoal is currently the largest user of forest biomass in Jamaica, no recent survey data is available with respect to consumption and production. Charcoal use remains widespread at the urban and rural levels for both households and the commercial sector, especially by the "jerk" food vendors.

Fuelwood consumed through direct burning is still used as a cooking fuel in rural areas by low income households. The most recent comprehensive household energy survey[17] estimated national monthly wood consumption at 1,050 tonnes. The sugar factories utilise wood (in addition to bagasse, oil and grid electricity) for their energy needs and wood is also used in the construction industry as a fuel source for melting tar used for roofing, as well as bakeries, lime kilns, and brick and ceramic factories.

A study carried out in 1988[18] estimated charcoal demand at 60,000 tonnes per year, including commercial usage, and projected future demand to increase at the annual population growth rate of 1.6 percent. An assessment[19] of the bioenergy sector in Jamaica carried out in 1992 by the Petroleum Corporation of Jamaica, put charcoal production at 37,000 tonnes per year. This figure was based on a survey of 10 percent of all charcoal producers which the 1992 assessment reckoned to be about 2,500 island wide.

The difference between the 1988 estimate of charcoal demand and the 1992 estimate is significant and shows how little reliable data is available about fuelwood use in Jamaica.

The number of persons engaged in charcoal production varies and is not known but it is acknowledged that new entrance into the sector is related to availability of alternative employment opportunities. The lack of control of wood access and low or zero capital requirements makes charcoal production an easy and obvious income-earning activity for the rural unemployed.

The total value of the charcoal sector varies depending on the production figure used. Based on 60,000 tonnes of production, its value at wholesale level in 1988 was calculated at J$50 million.[20]

Annual production of yam sticks, of 3 to 4 metres in length and 6 to 8 cm in diameter, has been estimated at around 15 million sticks.[21] This corresponds to an annual roundwood consumption of 150,000 cubic metres. As hardwood species (Sweetwood, Maiden Plum, Wild Coffee and Rodwood) are preferred for yam sticks, extensive

[17] The Ministry of Mining and Energy. *1989 Household Energy Survey*.
[18] Joint UNDP/World Bank Energy Sector Management Assistance Program. September 1988. *Jamaica Charcoal Production Study*.
[19] Potopsingh, Ruth. 1992. *Bioenergy Resources Assessment Study*. Petroleum Corporation of Jamaica, Kingston.
[20] Applying annual CPIs published by STATIN, this J$50 million is the equivalent of J$633 in 1999 dollars.
[21] Integrated Watershed management Investment Programme. November 1996. *Investment Preparation Report: The Forestry Consultants Report*.

production of yam sticks will have a negative impact on natural regeneration of forests in the yam-growing areas of Jamaica.

4.5 Minor Forest Products

Plant material collected from the forest is used for a variety of purposes. The principal source of materials for making hats, bags, table-mats, etc., is Jippi jappa (*Carludovica palmata*). Bamboo and thatch are used most often for temporary construction. Strips from the Rose Apple (*Eugenia jambos*) are used to make baskets and hampers. Wicker is widely used in furniture making. The bark from the bastard cabbage tree is used to make rope to bundle agricultural produce and for lashing poles together in temporary construction. Fern root is collected for the horticultural sector for use as a growing medium, particularly in orchid production. Mahogany bark is still collected for use as a dye.

Many trees and other forest plants are used medicinally: for example, Chainy root is used in the making of restorative tonics, chewsticks are collected for cleaning teeth, nettle is steeped to make a drink rich in mineral salts and vitamins, and the extract of bitterwood bark is used as a liver tonic, for fevers and for eliminating round worm.

How much of these materials are removed from the forest is not known nor is there current information with respect to their relative social and economic importance. A survey (with quantity data) of the utilisation of minor forest products would provide valuable information for use in assessing forest management options.

4.6 Sustainable Development of Wood-based Industries

The Forest Act requires the Forest Plan to include economic objectives for the sustainable development of wood-based industries. An assessment of the available information on the wood industry sector has been provided in the preceding section. The Forest Plan and Appendices also include rationalisation of proposed reforestation targets. However the conclusion of those involved in preparing the Forest Plan is that the information base is not sufficient for establishing definitive economic objectives for the industry. To do so will require a considerable body of additional information, hence activities have been proposed in Section 19 (Plan Implementation) to assess forest values and to survey the charcoal and fuelwood sector as well as yam stick production. Once this information is analysed, economic objectives for the forestry sector and strategies to achieve them will be developed.

5.0 CONSTRAINTS TO FOREST MANAGEMENT

Serious constraints exist which, unless addressed, will obstruct or impair achievement of the goals of forest management and conservation listed in Section 7. The following constraints were identified by representatives of statutory authorities and Government agencies who have an interest in the management of Jamaica's forests and environmental non-governmental organisations (NGOs) concerned with forest conservation. The strategies in Part III aim to reduce the impact of these constraints on the forestry sector's goals.

5.1 Public Awareness, Co-operation and Compliance

Public attitudes and behaviours which must be changed if programme goals are to be met include: indifference to forest degradation (at all levels of society); destruction and theft of forest resources; illegal occupation of forest land; non-sustainable land use practices and uncontrolled grazing of livestock. Lack of awareness is exacerbated because in forest management realisation of benefits and manifestation of negative results are often not immediate or obvious. Praedial larceny is a major issue already negatively affecting the agricultural sector and likely to discourage forestry investment.

5.2 Commitment to Enforcement

The most serious constraint observed by several environmental NGOs is a lack of demonstrated commitment and accountability by senior levels of Government to enforce environmental laws, policies and plans. Similarly, lack of resolve in addressing socio-politically difficult issues like praedial larceny is perceived by many as a major obstacle to forestry development.

5.3 Human Resources and Enforcement Capability

There are currently insufficient trained, motivated and properly supported personnel to implement the Forest Plan. This applies particularly to the need for:

- enforcement of forest protection in reserves, parks and other protected areas;
- extension services to involve the private sector in reforestation; and;
- public awareness activities to inform people about the Plan.

5.4 Barriers to Investment

Reforestation requires long-term commitment and heavy investment (eg, approximately US$1,500 per hectare for establishing and maintaining a forest plantation over the first three years), and is probably economic only on the most productive and accessible sites. Both public and private investors are confronted by conflicting needs and alternatives. Budget allocations of public funds may be inadequate to support such programmes, and are often insufficient to maintain initiatives started by externally funded projects. Funding approvals may be delayed or re-routed to address more immediate crises. Beneficiaries of forest conservation are not always identified and forest protection or production costs are typically not reflected in the pricing of services/products such as water, tourism or charcoal. Private investment is severely constrained by insecure land

tenure. Other incentives will probably be necessary to encourage private sector participation.

5.5 Overlapping Responsibilities

At least fourteen[22] Government offices, ministries, departments, authorities, commissions or boards have statutory and sometimes conflicting interests in forest land management. Overlapping responsibilities have resulted in uncoordinated planning and decision making, which in turn have created problems in accountability, efficiency, prioritisation, programme implementation, evaluation and conflict resolution. Although a good deal of co-operation exists between agencies, a number of crucial institutional arrangements are lacking, notably:

- agreement on a common and comprehensive system of land use zoning;
- formal co-operative management arrangements between implementing agencies; and
- effective participation in forest planning at a senior level of Government having sufficient authority to resolve differences between the management agencies.

5.6 Information

Integrated and participatory decision making requires meaningful information on land use alternatives to be available and shared by participants. Three main constraints have been identified in this regard and an attempt is being made to address these in the current planning process:

- lack of basic and consistent *inventory* information (and associated information management systems) on forest resources facilitating identification of rates of deforestation and degradation, values at risk, development opportunities, and sites requiring or justifying interventions;
- information gaps in forecasting the costs and benefits of forest conservation measures, and financial returns and risks for forestry investments; and
- delivery of information and messages to targeted participants, who may not be readily accessible or functionally literate.

Although the planning process is focussed on alleviating the above constraints, it also recognises that constraints, particularly the availability of investment and human resources, will likely remain limiting factors to the protection and development of forests. Therefore, limited human and financial resources will be focussed on *critical emphasis areas*: geographic locations where interventions are both urgently needed and likely to be effective.

[22] Office of the Prime Minister, Ministry of Agriculture, Ministry of Finance, Ministry of lands and Environment , Ministry of Mining and Energy, Water Resources Authority, National Water Commission, Rural Physical Planning Unit, Survey Department, Natural Resources Conservation Authority/National Environmental Planning Agency, Rural Agricultural Development Authority, Planning Institute of Jamaica, Coffee Industry Board, Forestry Department.

National Forest Management and Conservation Plan

PART II: VALUES AND GOALS

Forests provide many valuable services to society. They contribute to water production, soil conservation, conservation of biodiversity, and recreation and tourism. Other key forestry values to society include employment, energy, and timber and non-timber products. The goals of the forestry sector are formulated to ensure that forests are managed on a sustainable basis to maintain and increase the services and products they provide.

6.0 FOREST VALUES TO SOCIETY

6.1 Environmental

There is growing recognition that the value of forests to Jamaica is related to their crucial role in protecting and conserving the primary resources of water, soil, biological diversity and air quality. The potential direct market value of forests for the production of wood-based industries is significant but it is secondary to the fundamental need to protect forests and these primary resources. Unfortunately, the value of forests in environmental protection is difficult to measure and consequently its role is often overlooked. Yet it is essential that these values be known and understood before the Government, private investors and society in general can be expected to take forest conservation seriously.

6.1.1 Water Production

The reliable safe yield[23] of water for Jamaica has been estimated at 4,084 million cubic metres (MCM) per annum, of which surface water accounts for 16 percent. Although much of the water used in the country is groundwater, surface water is particularly important for Kingston. The Blue Mountains, the main source of water for the capital city, produce a reliable safe yield of 604 MCM in the north and 149 MCM in the south, however, most of this water is from surface sources (55 percent in the north and 76 percent in the south). Water shortages have been experienced and Kingston was in deficit of 28 MCM in 1990.[24] Based on present consumption trends, Kingston will require 115 MCM in 2015.

Forested areas which protect upper watersheds perform a critical function by reducing run-off and allowing percolation thus ensuring a more regular flow of water to reservoirs. Plant cover acts as a filter and helps to maintain good water quality. Tree cover near rivers also helps to reduce soil siltation. In Kingston, storage losses due to reduced water storage capacity resulting from siltation in the two main reservoirs have been estimated at approximately 85 million gallons representing nearly 22 percent of the city's reservoir capacity.

The effect of changes in land use (deforestation) on water flows and sediment yield have been the subject of a number of studies over the years. While the findings are variable depending on the study methodology, they are in general agreement that the higher the deforestation rate, the greater the sediment yields (increasing siltation of surface water flows) and the greater the frequency of increased water flows.

The forest, therefore, plays an important role in the maintenance of a reliable supply of high quality water. The value of this service is not easy to measure and suffers from the fact that water is seen as a "free good". However, an indication of value can be approximated in a number of ways. For example, a proportion of its value could be

[23] This is the amount of water that can be reliably extracted from ground and surface sources. It takes into account recharging of the aquifer and ensuring that saline intrusion of groundwater does not occur. It does not take into account the potential ecological damage caused by extraction from rivers.

[24] Water Resources Authority. 1990. *Water Resources Development Master Plan*.

linked to the cost of providing clean water (the extra processes, such as increased filtration efforts, chemical treatment, dredging of reservoirs, etc, required to make silted water potable). Another way to look at the value of forests is the mitigation of flood damage where the floods occur as a consequence of forest cover loss in upper watersheds.

Since the passage of the Water Resources Act in 1996, the Government has introduced the ability to charge for the use of water. The mechanism to collect a user charge has been proposed however it has not been implemented (see Section 15.2.2).

6.1.2 Soil Conservation

The severity of soil erosion depends on a number of local factors, eg, force and frequency of rain, slope of land, soil type, vegetative cover, etc. A certain level of erosion can be tolerated without significant effects on soil fertility but more serious soil loss normally results from a change in vegetation cover, eg, from deforestation, conversion from perennial to annual crops and over grazing by livestock. Landslides are an extreme form of soil erosion and often cause damage to property, loss of life and livestock as well as incurring agricultural and sedimentation costs. Increased siltation from rivers is a serious threat to the coral reefs and beaches on which much of the country's fishing and tourist industry depends. The presence of tree cover decreases the force of rain hitting the ground and helps to slow the flow of water which reduces soil wash.

6.1.3 Biological Diversity

Jamaica is home to about 3,200 known species of flowering plants, 600 species of ferns, and 256 known species of birds, together with other faunal groups like bats, lizards and butterflies. A high proportion of these species are found only in Jamaica and a growing number are listed as vulnerable to extinction, critically imperilled, or rare. Many are dependent on forest or woodland habitats thus conservation of these habitats is essential for their survival.

In 1995 Jamaica ratified the International Convention on Biological Diversity. Recognising the value of its biological diversity, Jamaica committed to ensure the most sustainable use and conservation of its biological resources, and is obligated under the Convention to prepare a *National Biodiversity Strategy and Action Plan* which is now under development.

6.1.4 Carbon Dioxide Sequestration

Jamaica's forests can be sources, sinks or reservoirs of carbon dioxide (CO_2) which is the major factor in creating what is commonly referred to as a "greenhouse effect." Carbon dioxide in the atmosphere has been increasing to levels which may cause climate change by increasing the greenhouse effect (global warming). When forests are destroyed or damaged through burning, they release CO_2 into the atmosphere. When restored, forests remove (sequester) carbon dioxide from the atmosphere.

The use of our forests as carbon sinks not only contributes to atmospheric carbon sequestration and climate protection but may create opportunities for generating financial resources for the sector as a whole (refer to discussion in Section 15). The 1997 UN Framework Convention on Climate Change (FCCC) Kyoto Protocol adopted the 'net' accounting approach which established the basis for the offset of greenhouse gas emissions from fossil fuel by carbon sequestration through forestry activities.

Appropriate forestry activities include the protection of the dwindling closed broadleaf forest and biodiversity, reforestation of forest reserves, watersheds and privately owned forest land, energy plantations and the consolidation of Jamaica's system of parks and protected areas. This initiative will also provide tangible support for Jamaica's commitment to the FCCC.

6.2 Timber and Non-timber Products

The value of the timber and non-timber products obtained from the country's forests can only be estimated as much of the production takes place outside the formal economy. However, the value is significant: for example, in 1993 an estimated 59,000 cubic metres of hardwood lumber were produced locally. Lumber prices vary across the island by species and quality. Using an average price of J$30.00 per board foot for lumber purchased from the sawmill, the value of this locally produced hardwood is J$750 million.[25]

There also exists an active market for yam sticks and fence posts. Prices paid by farmers currently range from J$8 to J$10 per stick. Taking the 1996[26] estimated annual production figure of 15 million sticks, the annual value of yam stick production is between J$120 million to J$150 million.

In addition, unknown quantities of minor forest products are used in thatching of roofs, furniture construction and handicrafts. It is difficult to assign a specific value to these uses but a value could be approximated in an indirect way by using a percentage of the selling price of the final product.

6.3 Employment

Total employment in the forestry sector cannot be accurately estimated due to a number of factors, eg, little information on number and size of sawmills, itinerant nature of the portable chainsaw operations, the part-time nature of many jobs, etc. However, timber production provides many jobs, particularly in rural areas.

The Forestry Department utilises a considerable amount of labour through its seedling production, reforestation and forest management activities. In 1999, the FD provided direct employment for 1,863 persons in rural areas. In addition, the Forestry Department employs a considerable amount of casual labour on an "as needed" basis.

[25] One cubic metre is equal to 423.776 board feet.

[26] Integrated Watershed Management Investment Programme. November 1996. *Investment Preparation Report*.

6.4 Energy

Wood-derived fuels account for only a very small percentage of national energy use but they provide a substantial proportion (estimated to be between 25 to 37 percent) of total energy used in household cooking. Fuelwood consumed through direct burning is still widely used as a household cooking fuel and in industrial processing.

The most recent comprehensive study[27] of the charcoal sector in Jamaica was completed in 1988. Although the pattern of charcoal use has undoubtedly changed, the study's estimate of 60,000 tonnes of charcoal consumption per year may be used to give an indication of the dollar value of the wood energy provided by Jamaica's forests. At current wholesale prices, this quantity of charcoal is valued at J$500 million.[28]

6.5 Recreation and Tourism

An extensive study on ecotourism in the Blue and John Crow Mountains National Park indicated that some 35,000 tourists visit the Park and spend as much as US$2.5 million per annum there.[29] It also estimated that the Park may be able to generate as much as US$420,000 per annum from fees.

Although care should be taken in interpreting these figures, the value of recreation is of course higher than the predicted potential fee revenue. The value to the economy includes the goods and services purchased by visitors. In addition to paying the tour operator, visitors buy local food and other items from local community shops and restaurants and may stay at local guest houses.

Despoiling of visual amenities has been identified as a major threat to Jamaica's tourism industry. Forests are a fundamental, intrinsic and traditional component of the Jamaican landscape, internationally renowned as the *land of wood and water*.[30] Although the total value of the visual quality of Jamaica's forests to the tourism industry is almost impossible to measure, it can be expected to exceed the direct revenues from specific niche markets like ecotourism.

[27] Joint UNDP/World Bank Energy Sector Management Assistance Program. September 1988. *Jamaica Charcoal Production Project.*

[28] Calculation is based on 30 kg per bag of charcoal, at an estimated wholesale price of J$250.00 per bag.

[29] Agricultural Research Programme, School of Agriculture. North Carolina A&T State University. 1998.

[30] Jamaica's mountains and forests are usually highlighted as the feature which makes the island unique among Caribbean tourist destinations.

7.0 GOALS OF THE FORESTRY SECTOR

Table 10 below shows the goals of the forestry sector relative to the forest values to society identified in Section 6. These goals were developed in consultation with a cross section of Government agencies with a statutory interest in forest lands and are consistent with the Forestry Department's mandate as set out in the Forest Act, 1996.

Strategies for achieving these goals are described in Part III of the Forest Plan. Activities to achieve the goals, indicators of achievement and specific objectives (operational targets) are included in Section 19.

Table 10: Goals of the Forestry Sector

Values to Society	Goal
ENVIRONMENTAL **Water Production** **Soil Conservation** **Conservation of Biodiversity** **CO_2 Sequestration**	Protect forest resource
	Restore tree cover
	Manage selected areas for biodiversity
	Manage forest lands for CO_2 sequestration
NATIONAL WEALTH AND RURAL DEVELOPMENT **Timber and Non-timber Products** **Employment**	Improve the economic contribution of forests
ENERGY	Produce fuelwood on a sustainable basis
RECREATION AND TOURISM	Maintain the visual quality of forests
	Plan and organise the use of select forests for recreation and tourism

National Forest Management and Conservation Plan

PART III: IMPLEMENTATION STRATEGIES

The strategies to achieve the goals of the forestry sector involve a wide range of programmes aimed at changing public perception of forests with respect to its environmental, productive and aesthetic values. The following Sections discuss the various strategies in detail. Strategies are not independent but complementary; any single goal requires several strategies to achieve.

8.0 STRATEGY 1: COMMUNITY PARTICIPATION

Until recently, communities were not involved in the planning for forest management or conservation and gained few benefits from local forests except for temporary employment opportunities during infrequent tree planting and harvesting operations.

It is now widely accepted that sustainable use, management and protection of the Nation's forest resources requires the participation and co-operation of local communities, particularly those living on the fringes of the forest. Further, the communities must derive real benefits from their efforts. The significance of this point was recognised by Government in 1996 with its ratification of the Forest Act.

The following sections show the first steps being taken through the Forest Plan to effect change in this direction and, as can be seen, they are closely related to the new role of the Forestry Department (as discussed below and referred to in other Sections).

It is expected that these steps will enhance and promote community participation in forestry and lead to:

- better understanding and respect for the Forest Act;
- improved partnership relations between Government of Jamaica (GOJ) agencies, NGOs and the communities involved;
- legal and sustainable economic benefits to communities from planned forest use;
- improved community values in support of forest conservation; and
- more effective and economic use of limited Government financial resources.

The Forestry Department will collaborate with the other Government agencies, donors and related projects working to promote sustainable community-driven rural development. In undertaking this initiative, the FD will address one of the goals of the forestry sector which is to increase the economic contribution of forests. This strategy is also expected to contribute to the forestry sector's goal to protect the forest resource through the participation of local communities in forest management.

8.1 Local Forest Management Committees

The formation of Local Forest Management Committees (LFMCs) is provided for by the Forest Act, 1996 and is an integral component of the "Community Participation" strategy. The LFMC is the institutional body to be created in watersheds for enabling the participation of the communities in the co-management of forested areas (specifically those managed by the Forestry Department).

8.1.1 Participation in LFMCs

Membership on the LFMCs is open to all community groups, organisations, NGOs, private sector entities and Government agencies present in the particular forest area and whose members are willing to participate. Each stakeholder entity will be asked to select a representative and an alternate to serve on the Committee. Membership in the

LFMC will be ratified by the Minister of Agriculture on the recommendation of the Conservator. There is no limit to the number of entities represented on the Committee.

8.1.2 Functions of LFMCs

The purpose of LFMCs is to:

- monitor the condition of natural resources in the Committee's area;
- hold discussions, public meetings and the like about the state of the natural resources;
- advise the Conservator on matters relating to the development of the Local Forest Management Plan (LFMP) and the making of regulations;
- propose incentives for conservation practices in the Committee's area;
- assist in the design and execution of conservation projects in the area; and
- any other functions as may be provided for by or under the Forest Act.

The Committee itself may identify functions which they need to undertake.

The operations of the LFMC will benefit overall watershed protection and management. The role of the Committee may be expanded in the future to take in watershed responsibility as a result of changes in the structure of national watershed administration and management.

8.1.3 Development of LFMCs

For the Buff Bay/Pencar pilot watershed area, an LFMC was proposed for each sub-watershed – one for Buff Bay and one for Pencar with a joint meeting to be held at intervals to be decided by the Committees. This arrangement has been endorsed by stakeholders through a formal vote taken during meetings held in the two sub-watersheds. The formation of the Buff Bay LFMC and the Pencar LFMC is moving forward and it is anticipated that membership on the Committee will be ratified by early 2001.

The formation of LFMCs in other areas will follow the schedule for the implementation of the Local Forest Management Plan (see Section 11, Table 12). Work has begun on the Local Forest Management Committee for the Rio Minho watershed. FD foresters, extensionists and wardens have been identifying and contacting stakeholders to inform them about Forestry Department's activities in the local area and to solicit their interest to participate in the LFMC.

8.2 The Role of Forestry Department in Community Forestry

Community forestry has not been a part of traditional forestry activities in Jamaica and foresters are not trained in this practice. Consequently, all levels of staff of the Forestry Department will receive training in participatory methods and practice. Special emphasis will be placed on training community-based foresters and wardens who will be working closely with the LFMCs. This training has already started with technical

assistance support provided jointly by GOJ/UNDP *Forestry Capacity (Bridging) Project* and GOJ/CIDA *Trees For Tomorrow Project*.

Similar training and forest education programmes to build general awareness will be provided at a level suitable for community-based organisations, relevant NGOs and other Government agencies.

It will take some time for community forestry practices to become standard FD procedure, hence the programme started up on a pilot basis in the Buff Bay/Pencar watershed. The Government is committed to building a strong cadre of wardens and foresters, trained as forest extension specialists, to help effect a paradigm shift in the way Forestry Department staff view their role in forest management.

8.3 Community Activities

To make local forest management more attractive to communities, the strategy will be to develop new initiatives and technical approaches of both the Forestry Department and NGOs which aim at providing immediate earnings for local communities. Some of the activities falling within this category are:

- Ecotourism and nature tourism;
- Recreational park conservation;
- Agroforestry;
- Craft production;
- Furniture production;
- Plant nurseries, including exotic species;
- Medicinal plant production;
- Bamboo for low-cost housing and crafts;
- Bee-keeping;
- Portable sawmilling operations;
- Fuelwood and charcoal production; and
- Yam stick production.

Where suitable sites on forest reserve lands have been identified in Local Forest Management Plans (see Section 11), individuals and groups will be approached to lease parcels for use in accordance with the conditions prescribed in the Forest Act and in any subsequent Forest Regulation. In certain situations and where feasible, co-management arrangements or memorandums of understanding will replace standard lease agreements.

9.0 STRATEGY 2: PUBLIC EDUCATION

In order to build popular and political support for the forestry sector and the Forest Plan's implementation, public awareness must be raised as to the importance of the forest environment. The forest's linkages with water quality, health, soil conservation, agricultural production, the tourism industry, climate regulation and biodiversity need to be widely publicised, as does the important role of the forest in the social and economic development of the communities located on its periphery.

Protection of forest cover and conservation of forest resources must also be emphasised through public education at the national level. A basic level of public awareness as to the importance of the forest environment is essential to establish a meaningful context for conservation and protection activities. The provisions provided under the Forest Act, 1996 and Forest Regulations (in draft) will also need to be disseminated widely.

Some environmental education campaigns are being implemented through the formal education system as well as through publicly and privately sponsored campaigns. Many NGOs are active in environmental education programmes, but there is a place for a forestry-specific programme.

Based on emphatic and widespread recommendations from the public, the Forestry Department, the National Environmental Education Committee (NEEC) and the Ministry of Education have agreed to work together to build a strong environmental awareness component, not only into teacher training programmes, but also directly into the national school curriculum. This will include specific attention to the importance of forest conservation and forestry.

The National Forestry Awareness Programme is, therefore, a key element in both setting the context for the implementation of the Forest Plan and in raising forest conservation awareness and understanding across the country.

9.1 Guiding Principles

The public awareness strategy will be grounded in credible, up-to-date and relevant information on the state of the forest, its value to society and the cost/benefit of alternative actions. Consequently, the forest-related messages being developed and delivered to the various target groups need to be positive and stress the economic value of trees for timber and fuelwood, particularly to rural people. The forest also has to be perceived as integral to Jamaican life at all levels and considered as a source of water, biodiversity, recreation, national pride, and aesthetic and spiritual values. Messages delivered to schools and the general public will reflect this approach.

With a limited budget to mount a National Forestry Awareness Programme, collaboration will be sought with successful programmes at both the national and local levels. Collaboration will help avoid overlap with the work of other projects and programmes and enable the National Forestry Awareness Programme to focus on forest-related topics. Private sector resources will also be sought to sponsor environmental messages that relate to forestry. In particular, companies that benefit directly or

indirectly from the existence of our forests, such as those in the tourism industry, will be targeted. Sponsored messages could be in the form of radio and television programmes (acknowledging the sponsor) on the value and upkeep of forests, as well as posters, road and forest boundary signs, etc.

9.2 Target Groups

Primary Public: Those people who do, or have the potential to, impact on the forest reserves and the deforestation process, eg, the rural farmer, women (as farmers, fuelwood users and family heads), fuelwood producers, coffee plantation owners, agricultural workers, agro-chemical manufacturers and users, landowners, loggers and sawmill operators. These specific segments of the population will be sensitised through messages that correspond to their reality, capture their interest and motivate them to participate in the Programme.

Secondary Public: Those people who contribute, or have the potential to contribute, to forest conservation, eg, educators and students at all levels, organisations such as the Rural Agricultural Development Authority (RADA), the Jamaica Agricultural Society (JAS), the 4H Clubs and NGOs that are active and involved with forests and watershed management. A key group, between ages 11 to 21, will be targeted in schools and via the National Environmental Communications Campaign (NECC). Teacher training will be critical, as the "train-the-trainer" process has an important dispersal or "ripple" effect.

Special Interest Public: This group includes the FD staff and the enforcement community, eg, environmental rangers, park wardens, the police, judiciary, etc. The image of the FD will be rebuilt and improved. Personnel will be motivated through various techniques. An effective internal communications structure will be developed so that regional staff are kept up-to-date.

In addition, the training of the police, judiciary, Forestry Department staff and environmental wardens in the application of the Forest Act and Forest Regulations is fundamental in order to advance the legislative basis for forest protection.

9.3 Communications Programme

The National Forestry Awareness Programme will encompass the following actions:

- Define existing context: research, collect and evaluate existing environmental education materials and programmes from all appropriate sectors.
- Evaluate other community participation and environmental awareness campaigns to identify specific elements of success/problems that arose.
- Research key messages, promotional vehicles and potential sponsors. Utilise the National Environmental Communications Campaign to co-ordinate with participating public sector agencies that play a role in environmental public awareness. Ensure that forestry messages and symbols are highlighted. Test new messages and materials at public events, school programmes and summer camps.

- Collaborate with existing projects and programmes such as the Environmental Action Programme (ENACT), the NEEC programmes, and NGO-run Schools for the Environment Programme to contribute to, and extend forestry messages and minimise overlap.
- Adapt the communications and implementation strategy for the identified target group. Use popular education techniques such as stage drama and video. Identify and assess key media vehicles and use to disseminate materials. Engage intermediary organisations, eg, the Ministry of Agriculture, the Jamaica Cultural Development Commission, NGOs, etc. with a view to ensuring the long-term sustainability of the programme.
- Design, develop and pilot promotional and educational materials. Promote materials through the formal and non-formal education sectors at all levels of responsibilities.
- Build on the experiences and success of programme in the Buff Bay/Pencar pilot watershed area.

10.0 STRATEGY 3: FORESTRY RESEARCH

The Forestry Department is mandated by the Forest Act, 1996 to promote, establish and maintain a forest research programme. Areas of research specified in the Act are:

- enhance forest management and development;
- identify and obtain silvicultural data to be used in improving financial yields of species important to the national economy; and
- ensure reforestation/afforestation of suitable lands.

10.1 Past Forestry Research

Forestry research in Jamaica has been carried out at different times by various organisations with little co-ordination and only limited exchange of ideas/information. The main research entities have been the Forestry Department, University of West Indies (UWI) - Life Sciences Faculty in association with UK universities/academics, British Overseas Development Agency, bauxite companies, sugar companies and other Government science agencies. Simple adaptive research has been carried out in many donor-funded projects. Most of the research done by the FD took place during the 1980s and included the following:

- Pine plantation research: covered seed collection and nurseries management, provenance trials, weed control, spacing and thinning.
- Fuelwood: trials of fast-growing species to test adaptability, growth and yield for charcoal producing potential.
- Pathology and entomology: documentation and monitoring of insect and disease pathogens of nursery stock and forest plantations.
- Soil conservation: testing cost-effectiveness and impacts of various measures such as bench terraces, hillside ditches, reforestation, vegetative gully plugs, etc.

Research in the closed and disturbed broadleaf forests was carried out by the University of the West Indies and concentrated mainly on forest ecology. Description of forest types, nutrient cycling, forest succession and gap dynamics were some of the subjects investigated.

10.2 Direction of Present Forestry Research

The Forestry Department's focus has shifted from a supervisory, timber production-oriented organisation to one which promotes conservation and sustainable production of forest resources through extension, public education and public participation. The new direction of forest research will be to provide data, information and guidelines for:

- efficient forest management practices;
- sustainable management plans;
- conservation strategies;
- reforestation planning and development; and
- agroforestry, social/participatory forestry initiatives.

The most important priority is for trials to support the reforestation programme by evaluating and verifying species selection, silvicultural and agroforestry systems, and growth rates. The FD will use available information and seek assistance from the international forestry research community to design an applied research programme for this purpose.

10.3 Collaboration in Research

Given that research in other scientific and social fields may be applicable to the forestry sector, the FD will seek opportunities to collaborate with public and private sector organisations in research programmes of mutual interest. The Forestry Department has collaborated with the UWI (Mona campus) on research projects in the past and will continue this partnership.

Two collaborative research programmes being undertaken at present with other organisations are:

- A Memorandum of Understanding (MOU) has been signed between the Forestry Department, the National Arboretum Foundation, and Public Gardens Division - Hope Gardens, to engage in the establishment, management and operation of a Central Germplasm Bank and Nursery.
- An MOU has been signed with the Caribbean Natural Resources Institute (CANARI) to undertake research on developing participatory methods in watershed management.

Fuelwood research and demonstration projects initiated in 1995 by the Petroleum Corporation of Jamaica (PCJ) represent an invaluable contribution to knowledge of species suitability, growth rates, financial returns, and integrated use options associated with intensive fuelwood production. The trials have already provided information highly relevant and important to the goals and objectives of the national forestry programme, and have great potential for further contribution over the next two to three years. The Forestry Department will collaborate with PCJ in the maintenance, analysis and interpretation of these trials.

11.0 STRATEGY 4: LOCAL FOREST MANAGEMENT PLANS

The Forest Act, 1996 provides guidelines for the preparation of Local Forest Management Plans (LFMPs). The Forestry Department will elaborate Local Forest Management Plans for:

- forest reserves;
- any Crown lands not in a forest reserve; and
- private lands declared by the Minister to be Forest Management Areas.

This strategy is expected to contribute to several of the forestry sector's goals including: protecting forest resources, restoring tree cover and increasing the economic contribution of forests.

11.1 Content of Plans

The guidelines for preparing the forest management plans are contained in several articles of the Forest Act, 1996 and specify:

- the procedures for the acquisition of land for gazetting forest reserves or declaration of forest management areas;
- the content of the Local Forest Management Plan;
- formation of Local Forest Management Committees (as detailed in Section 8.1);
- functions of Local Forest Management Committees; and
- determination of allowable annual cut.

Before writing the LFMP, the Forestry Department will carry out two studies to collect information for the area to be managed. These are:

- a biophysical inventory, which will include mapping of present land use at a scale of 1:15 000; and
- a socio-economic assessment of the main uses and users of forest land and forest products including the identification of the major stakeholders to participate in the Local Forest Management Committees.

Existing forestry studies, if any, for the area to be managed will be critically reviewed to complete the information needed to write the Local Forest Management Plan.

The LFMP will include the following documents:

- a main report (the proposed Table of Contents in shown in Appendix V);
- a series of maps at a scale of 1:10 000 and 1:25 000 showing the actual land use for forestry and the forest management options;
- a series of maps at scales of 1:10 000 and 1:25 000 showing the recommended uses of forest land, consistent with the guidelines stated in Section 13.2; and

- timber supply analyses, including proposed annual allowable cut levels for each forest reserve and forest management area.[31]

For the areas where timber harvesting is permitted, a second inventory will be done by the FD when applications for timber harvesting licences are received. The purpose of this inventory will be to provide a detailed knowledge of the characteristics of the trees to be harvested. This operational inventory is not a sampling but a full inventory and will be followed by the preparation of a "harvesting plan". The content of the harvesting plan will be specified in the Local Forest Management Plan.

Local Forest Management Plans with a management option of timber harvesting will include all provisions related to the protection of the area's cultural and environmental heritage such as:

- streams and river banks;
- recreational and tourist sites;
- archaeological sites;
- slopes and natural sites; and
- threatened flora and fauna.

A Local Forest Management Plan with a timber harvesting option will also include a replanting schedule and the bio-engineering guidelines for road construction and maintenance.

11.2 Preparation of Plans

The process to prepare a Local Forest Management Plan will be similar to that used in the development of this Forest Plan. Key stakeholders will be consulted at an early stage to identify critical local issues. These stakeholders may subsequently be part of the Local Forest Management Committee. A draft LFMP will be prepared and circulated for public review. Community meetings will be held to present the local plan and to receive comments and input which, where relevant, will be incorporated into the final plan.

With the collaboration and assistance of local NGOs and CBOs, the Forestry Department will prepare a local public awareness programme for the implementation of each local forest management plan, including the public consultation process.

11.3 Planning Schedule

As mentioned above, the Local Forest Management Plan will require field and office studies prior to its preparation. Twenty stages or activities are identified in the preparation process which is scheduled to take place over 17 months for each LFMP. The list of activities together with the detailed planning schedule of the biophysical

[31] In certain forest reserves or forest management areas, the annual allowable cut level may be zero if the recommended land use is for protection forests.

inventory and Local Forest Management Plans are presented in Table V-1 in Appendix V. The first LFMP will be prepared for the Buff Bay/Pencar watershed.

The majority of the critical emphasis areas identified by the Forestry Department lie within WMUs that are classed by the NRCA/NEPA as having high priority under the National Watershed Classification and Monitoring Programme. Two of the FD's critical emphasis areas are in low priority WMUs as defined by NRCA/NEPA criteria. However, these WMUs contain significant portions of the country's forest reserves. Table 11 compares the NRCA/NEPA WMU priority levels with Forestry Department management priorities in terms of the area of forest reserves, national parks and proposed protected areas within the selected WMUs.

Table 12 is a preparation schedule of Local Forest Management Plans for the years 2001 to 2005. It lists the Crown lands, forest reserves, protected areas and proposed protected areas, the WMU in which these are located and the estimated completion date (critical emphasis areas are shown underlined). Limited additional local forest management planning activites will take place where required to support non-government agency projects in critical emphasis areas (eg, in the Dolphin Head and Dunn's River areas).

Table 11: NRCA/NEPA WMU Priorities and FD Forest Management Priorities

Watershed Management Unit (WMU)	NRCA/NEPA WMU Priorities (1)		Forestry Department – Forest Management Priorities (2)				
	Physical Condition	Socio-economic Condition	Critical Emphasis Areas (3)	% of Total Proposed or Protected Area			
				Forest Reserve	National Park	Protected Area	Proposed Protected Area
Buff Bay/Pencar River	Priority 2	Priority 1	Part of the Blue Mountains FR	0.2	5.5	0.0	0.0
Rio Minho	Priority 1	Priority 2	Portland Ridge PA, Brazilleto Mountains PA, Peake Bay FR, Bull Head FR	1.4	0.0	37.1	0.0
Martha Brae River	Low Priority	Low Priority	Part of Cockpit Country FR	30.3	0.0	0.4	0.0
Hope River	Priority 1	Priority 2	Part of the Blue Mountains FR	2.4	1.8	0.0	3.0
Wag Water River	Priority 1	Priority 2	Part of the Blue Mountains FR	0.0	7.5	0.0	0.0
Yallahs River	Priority 1	Priority 2	Part of the Blue Mountains FR	1.2	4.5	0.0	0.0
Rio Bueno/White River	Low Priority	Low Priority	Mount Diablo FR, part of Cockpit Country FR	26.5	0.0	0.1	0.0
Rio Grande	Priority 2	Priority 1	Part of Blue Mountains FR, part of John Crow Mountains FR	0.0	28.1	0.0	8.7
Rio Cobre	Priority 2	Priority 1	Hellshire Hills FR, part of Mount Diablo FR	16.2	0.0	8.0	0.0
Other 17 WMUs				21.8	52.5	54.3	88.3

(1) CADI/NRCA/NEPA. 1999. *Development of a National Watershed Classification and Monitoring Programme, Jamaica*. Technical Assistance Report, Fort Collins/Kingston, 24 p.
(2) Forestry Department/TFT. 1998-99. *Land use/cover type areas per watershed management unit and protection status.* Technical Report, Kingston, 69 p. + 1:250 000 scale colour map.
(3) FR = forest reserve; PA = protected area

Source: Forestry Department, November 2000.

Table 12: Schedule of the Local Forest Management Plans: 2001 to 2005

Crown Lands Managed by the Forestry Department (1) (2) (3)	Location (4)	Estimated Completion Date
Blue Mountains FR (part), Dover FR, Fort Stewart FR, Grays Inn CL	Buff Bay/Pencar River WMU	April 2001
Portland Ridge PA, Braziletto Mts. PA, Peake Bay FR, Bull Head FR, Pennants (Douces) FR, Pennants FR (part), Peckham FR, Teck Pen FR (part), Mason River PA, Kemps Hill PA, Stepheney-John's Vale FR (part)	Rio Minho WMU	October 2001
Cockpit Country (part), Hyde FR (part), Chatsworth FR	Martha Brae River WMU	June 2002
Blue Mountains FR (part), Trumpet Tree FR, Elleston Run/Dallas Mountains FR, Rockfort FR, Flamstead CL, Bellevue CL (part), Good Hope CL	Hope River WMU	February 2003
Blue Mountains FR (part), Tremolesworth CL	Wag Water River WMU	October 2003
Blue Mountains FR (part), Bellevue CL (part), Orchard FR, Chesterfield FR, Lloyds FR (part)	Yallahs River WMU	June 2004
Mount Diablo FR (part), Cockpit Country FR (part), Industry Field-Rowkamp FR, St. Faith's FR, Camperdown CL, Stepheney-John's Vale FR (part), Greenock FR, Armadale FR, Baron Hill FR, Love River CL, Litchfield Matheson's Run FR, Brislington CL, Hyde Hall Mountain FR, Pike & Ravens FR, Hyde FR (part), Fergis Ramsay FR, Llandaff FR, Belmont FR	Rio Bueno – White River WMU	February 2005
Blue Mountains FR (part), John Crow Mountains PA (part), Bellevue II FR, Windsor FR, Fellowship FR, Adam Brandon FR, Friendship Hall FR	Rio Grande WMU	October 2005
Hellshire Hills FR, Mount Diablo (part), Treadways FR, Dawson Mountain CL, Kellets Camperdown FR	Rio Cobre WMU	Starting

(1) Underlined Crown lands are considered "critical emphasis areas".
(2) Forest mapping for the WMU is needed to propose new forest reserves, as well as a biophysical inventory, for all Crown lands in the WMU, starting in the critical emphasis areas.
(3) CL = Crown lands; FR = forest reserve; PA = protected area
(4) WMU = Watershed Management Unit (Water Resources Authority)

Source: Forestry Department, November 2000.

11.4 Co-management of Forest Reserves and Crown Lands

The Forestry Department is mandated to prepare Local Forest Management Plans for forest reserves and other forested Crown lands. In areas where other agencies have some form of jurisdiction over forest reserves or forested Crown lands,[32] the FD will work with these agencies to develop the local management plans.

[32] For example, the Blue and John Crow Mountains National Park, which encompasses large areas of forest reserves, is under the jurisdiction of the NRCA/NEPA.

The FD will, where appropriate and practical, enter into co-management agreements with other Government agencies and NGOs in order to ensure a co-ordinated and sustainable approach to managing forest reserves and other Crown lands. In such cases, preparation and implementation of the Local Forest Management Plan will be a collaborative effort with the identified Government agency or NGO. An agreement between the Forestry Department and NRCA/NEPA and the Jamaica Conservation Development Trust has been signed for the co-management of Blue and John Crow Mountains National Park.

12.0 STRATEGY 5: CO-OPERATIVE MANAGEMENT AGREEMENTS

12.1 Co-management Agreements

Protection and conservation of Jamaica's forests will be most effectively achieved through co-management agreements between the Conservator of Forests and other agencies. The Government of Jamaica has designated, or intends to designate, most of the large remaining forests as protected areas or national parks, under the Natural Resources Conservation Authority/National Environmental Planning Agency (NRCA/NEPA) Act. Many of these areas are already forest reserves, under the authority of the Forest Act, whereby the Conservator of Forests is responsible for their sustainable management and effective conservation. The NRCA/NEPA Act has provisions for delegating and entrusting certain functions to non-governmental agencies. Both the NRCA/NEPA Act and the Forest Act have provisions for controlling the use of private lands for the protection of the national interest.

These arrangements create both the need and the opportunity for joint management of forest lands. The implementation of the Forest Plan will depend to a large extent on the development of co-management agreements for specific forest areas between the Conservator of Forests, NRCA/NEPA, delegated non-government agencies, and/or private landowners. Such agreements will specify:

- the identity and interests of each party;
- the specific purpose and area of agreement;
- responsibilities of the parties;
- requirements for planning and zoning land uses;
- provisions for enforcement of land use controls, including provision and training of staff, inspection and patrolling of the area, and applicable sanctions;
- management and administrative arrangements, including designation of an area manager, forest management committee, steering committee; and
- mechanisms for termination and dispute resolution.

Appendix VI contains the agreement governing co-operative management of the Blue and John Crow Mountains National Park between the Forestry Department, NRCA/NEPA and the Jamaica Conservation Development Trust.

Additional agreements are currently under development. In particular, a memorandum of understanding is being finalised between the Environmental Foundation of Jamaica and the Forestry Department, aimed at expanding forest reserves and restoration of tree cover along Jamaica's central mountain ridge. An agreement is also being developed between the Forestry Department and the National Water Commission (NWC) for the protection, restoration and conservation of forests on lands owned by the NWC.

12.2 Co-operative Management of Mangrove Areas

The Forestry Department, in association with NRCA/NEPA and the Department of Fisheries, will encourage NGOs and private landowners to participate in co-operative management of mangrove areas requiring protection as forest reserves or forest management areas.

13.0 STRATEGY 6: FOREST PROTECTION

13.1 Forest Inventory Programme

The Forestry Department has embarked on a management inventory of areas scheduled for detailed forest management planning. The key elements of the management inventory are:

- detailed photo-interpretation and stratification of vegetation into classes, groups, formations, communities and further subdivisions using 1:15 000 scale colour photography;
- map transfer of photo-interpretation, preferably to digital orthophoto base maps combining planimetric and topographic features with geographically corrected aerial photography at a production scale of 1:15 000;
- update, at least once every five years, maps and photo-interpretation using aerial photography and/or satellite imagery;
- systematic stratified ground sampling to obtain data on vegetation, terrain features, soils, and fauna; and
- production of spatial and attribute databases.

The sequence and priorities for this level of inventory will be based on the schedule and priorities for Local Forest Management Plans (see Section 11).

A Monitoring and Evaluation (M&E) Unit is being established within the FD. The Unit will utilise data generated from this programme to monitor and evaluate evolution and change in the forests of Jamaica and provide analysis to aid in decision making.

13.2 Guidelines for Forest Land Use

Jamaica has an established system for assessing agricultural land capability, based mainly on slope and other limiting soil, drainage and climatic factors. In addition, various supplementary or alternative approaches have been recommended to address crop potential, treatment orientation for soil conservation, land settlement and landslide susceptibility. However, up to now there has been no system which specifically addresses the evaluation and classification of land for forestry activities.

Land use allocation within any specific forest area will depend on local management planning which takes into account site-specific information on environmental, social and economic factors. However, the following general guidelines are proposed for forest land use allocation on Crown lands and on private lands in designated forest management or protected areas.

- Permitted uses will be limited according to slope and soil depth as indicated in Table VII-1 in Appendix VII. These land use allocations have been developed in consultation with NRCA/NEPA, the Rural Physical Planning Unit (RPPU) and the Land Information Council of Jamaica (LICJ).
- Where the existing forest cover is closed broadleaf forest or mangrove in forest reserves, parks or protected areas, no timber harvesting will be permitted.

- Where the existing forest cover is disturbed broadleaf forest in forest reserves, parks or protected areas, the land will be retained under forest land use: industrial, selection, or protection. Choice of forest land use will depend on slope and soil depth as indicated in Table VII-I in Appendix VII, socio-economic considerations, and values at risk as identified in the Local Forest Management Plan.
- In areas where cultivation or industrial forestry are permitted, but soil conservation measures are indicated as necessary, regulations (including those limiting vegetation removal near streams and to small openings) made under the Forest and NRCA/NEPA Acts will apply, together with any additional measures specified and approved in the Local Forest Management Plan.
- Industrial forestry development involving plantation establishment will normally be restricted to accessible sites, avoiding steep and very steep slopes and shallow soils (see Section 14).

13.3 Critical Emphasis Areas

13.3.1 Criteria for Identifying Priority Areas for Protection

Limited human and financial resources will constrain implementation of the Forest Plan. Protection and conservation efforts need to be concentrated where they are most urgently needed and where they are likely to be effective.

Urgency for forest protection is dependent on the presence and severity of a number of threats:

- degradation of water supply or water quality;
- degradation or loss of soil;
- loss of biological diversity;
- non-sustainable harvesting (over-cutting) of timber or fuelwood;
- illegal removal of timber or fuelwood;
- legal cultivation on unsuitable sites;
- illegal cultivation;
- damage resulting from illegal or excessive grazing by livestock;
- fire;
- despoiling of recreational and scenic values; and
- other non-forest uses of the land.

Effectiveness in dealing with these threats is likely to be highest where:

- there exists broad consensus between Government, non-governmental and community-based organisations regarding both the threats and the required interventions;
- forest reserve status has been declared under the authority of the Forest Act;
- park or protected area status has been designated under the authority of the NRCA/NEPA Act;
- environmental non-governmental agencies are active and have been delegated responsibilities under the NRCA/NEPA Act;

- local communities are active, or interested in becoming active, in environmental conservation;
- opportunities exist for resolving conflicting land uses, rewarding co-operating stakeholders, and/or compensating displaced land users;
- benefits of forest protection can be quantified and demonstrated; and
- protection resources and effort can be shared.

13.3.2 NRCA/NEPA Priority Watersheds

Since the early 1970s, several efforts have been made to classify or rank Jamaica's watersheds with a view to establishing priorities for investment, protection and other interventions. The most recent and comprehensive was conducted for the NRCA/NEPA Watershed Protection and Management Branch.[33] Two categories of data were used: physical and socio-economic. The former included geology, soils, slope, land use and vegetative cover, rainfall, landslide potential, stream density and road density. The socio-economic data consisted of poverty levels, population density and the existence of downstream interests such as water storage locations, cities and tourism attractions.

The study identified ten watersheds with unstable upper areas and significant downstream interests. Of these ten, the highest priority in terms of physical condition and management needs are the Hope River, Wag Water River, Yallahs River, Rio Minho and Morant River, but the highest priority in terms of population pressure and poverty levels are the Rio Grande, Swift River, Buff Bay River, Rio Cobre and Oracabessa Pagge River.

13.3.3 Forestry Department Critical Emphasis Areas

Identification of critical emphasis areas for forest management and conservation by the Forestry Department has focussed on:

- threatened closed broadleaf forests, both within and outside forest reserves and other protected areas;
- the need to rationalise and regulate land use on disturbed lands within existing forest reserves;
- physical, management and socio-economic rankings of watersheds by the NRCA/NEPA study; and
- potential for effective interventions through partnering arrangements.

Two levels of focus and intervention are planned. The *broad level* will include large tracts of land designated as, or adjacent to, parks, protected areas or forest reserves containing significant areas of relatively undisturbed forest threatened by many or all of the threat factors listed above. There are five main *broad level* areas, totalling approximately 400,000 hectares:

[33] Computer Assisted Development, Inc. April, 1999. *Development of a National Watershed Classification and Monitoring Programme, Jamaica*.

1. Blue and John Crow Mountains National Park, plus buffer areas in the Rio Grande, Swift, Buff Bay, Morant, Yallahs, Hope and Wag Water watersheds.

2. Cockpit Country Forest Reserve, plus outlying reserves and adjacent areas of closed broadleaf forest.

3. Litchfield Matheson's Run and Stepheney-John's Vale Forest Reserves, adjacent Crown lands subject to conflicting land uses, outlying reserves (Bull Head and Mount Diablo) extending into the upper portions of the Rio Minho, Rio Cobre and Rio Bueno/White River watersheds, and Crown lands in the Dunn's River watershed.

4. Inland portion of the Negril Protected Area, plus the forested area in and around Raglan Mountain, Bath Mountain and Burnt Savannah.

5. Terrestrial portion of the Portland Bight Sustainable Development Area, located in the lower Rio Minho and Rio Cobre watersheds.

Note that areas 1 through 3, properly reserved, managed, and reforested, would essentually constitute a spinal forest along the length of Jamaica's central mountain ridge.

The second *detailed level* of intervention will be based on selection of priority areas within the five *broad level* areas and will narrow the focus down to approximately 100,000 hectares.

The identification of critical emphasis areas at the *detailed level* (narrow focus) has been refined by the initial participatory planning activities in the five *broad level* critical emphasis areas. The following *detailed level critical emphasis areas* have been identified, based on their being designated as "critical" by either the Forestry Department, NRCA/NEPA, NRCA/NEPA-delegated non-governmental organisations, and/or the Environmental Foundation of Jamaica.

- Western Blue Mountains: park, forest reserve and National Water Commission lands, plus surviving unprotected areas of closed broadleaf forest, in the upper Hope, Wag Water, Buff Bay/Pencar and Yallahs watersheds;
- park and forest reserves, plus adjacent surviving unprotected areas of closed broadleaf forest in the Rio Grande watershed;
- forest reserves (Bull Head, Mount Diablo) and other forested Crown lands (eg, Guys Hill, Bogue) in the upper Rio Minho, Rio Cobre and Rio Bueno/White River watersheds;
- Portland Ridge Protected Area, Hellshire Hills, Peake Bay Forest Reserves, and Crown lands in the Braziletto Mountains (detailed inventory to be limited to selected areas);
- Cockpit Country Forest Reserve (priority areas to be identified by local consultation).

All the above areas except the Cockpit Country lie within watersheds designated as Priority 1 or 2 under the National Watershed Classification and Monitoring Programme.

Map 2 in Appendix VII shows the location of identified critical emphasis areas.

13.4 Conservation and Protection Strategies

The initial approach to planning forest protection and conservation actions in the *broad level* critical emphasis areas will be as follows:

- Identify and contact partner agencies and community-based organisations for input on planning priorities and required interventions (see Section 8).
- Establish a basis for co-operative management agreements with relevant Government and non-governmental management agencies to develop and implement Local Forest Management Plans.
- Process available land use, forest inventory, land suitability and related data as a basis for initial land use zoning and identification of areas for detailed focus (see below). These data will include orthophoto base maps (or where these are not available, satellite images) combined with thematic map data, facilitating participation in the planning process by community representatives lacking in technical forestry training.

Within the *detailed level* critical emphasis areas, required interventions will be scheduled by the local forest management planning process (see Section 11). For public lands, initial actions will include:

- photo-interpretation, mapping and inventory of forest resources at a map scale of 1:15 000;
- appointment of Local Forest Management Committee(s) by the Minister of Agriculture consistent with sections 12 and 13 of the Forest Act (see Section 8);
- participatory planning of permitted and restricted land uses;
- boundary survey and/or demarcation of forest reserves;
- gazette forested Crown lands managed by the Forestry Department as forest reserves (see Appendix VII, Table VII-2 for details of proposed forest reserves); and
- entry into co-operative management arrangements with Government agencies and non-governmental agencies (where management delegations are approved or planned), for enforcement and implementation.

Where private lands are identified as urgently requiring forest conservation or protection, the Conservator will recommend to the Minister either:

- acquisition of the land for the purpose of forest reservation under the Land Acquisition Act and section 9 of the Forest Act; or
- declaration of the land as a forest management area, and enter into a forest management agreement with the owner of the land, conferring on the owner

obligations to conserve and protect the forest and entitlement to benefits, such as remission of property taxes under section 25 of the Forest Act.

The Forestry Department, in association with relevant Government agencies such as the NRCA/NEPA, the Jamaica Fire Brigade, the Jamaica Constabulary Force, etc. proposes to undertake an integrated approach to wild fire management and control through programmes involving NGOs as well as the Local Forest Management Committee. The programmes will provide equipment for and training in wild fire management and control techniques to FD forest officers and wardens, as well as to a voluntary community-based wild fire response team.

13.5 Declaration of Forest Reserves, Forest Management Areas and Protected Areas

The Forestry Department's highest priority will be protecting what is left of Jamaica's rich and unique forest ecosystems from further encroachment by cultivators, livestock owners and timber cutters. The intent is to preserve these forests intact for biodiversity, watershed protection and ecotourism.

Addressing this intent requires rationalisation and agreement on acceptable land uses in disturbed and undisturbed forests, operational definition of forest land use zones, and enforceable guidelines for limiting deleterious land uses within these zones. Such guidelines (see Section 13.2) will form the basis for initial forest land use planning, and can be refined at the local level through participatory planning taking into account local environmental, sociological and economic factors.

It also requires declaration of threatened areas requiring protection as forest reserves, forest management areas, or protected areas.

Under the Forest Act, the Minister may declare to be forest reserves any Crown land, or private land if the owner requests such a declaration. He may order or declare any land not in a forest reserve to be a forest management area, including private land if he is satisfied that the use of the land should be controlled for the protection of the national interest. Forest reserves and forest management areas may be used for conservation of naturally existing forests, establishment of forest plantations, generation of forest products, conservation of soil and water, recreation, and protection of flora and fauna.

The Minister, on the recommendation of the Conservator, also may declare Crown land (or private land if the owner requests such a declaration) to be a protected area if required for a number of purposes specified in the Act, including flood and landslide protection, soil preservation, erosion, maintenance of water supply and protection of amenities, flora and fauna. On protected areas, the following land uses will be prohibited or strictly regulated:

- cultivation;
- grazing;
- burning; and
- clearing of vegetation.

Where protected areas are declared on private land, the Forest Act provides for:

- remission of property tax (this also applies to forest reserves and forest management areas);
- leasing of the land from the owner by the Government in order to place it under the control of the Conservator; and
- acquisition of the land by the Government.

Subject to available funding, additional incentives will be provided to private landowners for the protection of forests (see Section 15). Private lands declared as forest reserves, forest management areas or protected areas will not be deemed "idle" by the GOJ or the Land Utilities Development Commission (LUDC).

13.6 Restoration of Forests Disturbed by Mining

The destruction of forests by the mining industry is a special case of great importance to the people of Jamaica because bauxite mining and associated access development are currently the most significant agents of deforestation in the country. Much of the damage to forests occurs in the limestone areas adjacent to bauxite deposits and disturbed by pit access development. This is particularly problematic, because whereas reclamation of pits is legally required, reclamation of roads is not required and is often socially impractical. The high quality roads built by the bauxite mining industry are frequently perceived as a social benefit but they provide public access into previously inaccessible forest, resulting in further forest degradation.

Two strategies are proposed for ameliorating this situation:

1. Mining lessees are already required by law to remove trees only subject to the direction of the Conservator of Forests. Increased diligence in notification and consultation prior to the location of roads will provide some opportunity to ameliorate or avoid damage to forests with high ecological, social or economic values.

2. A no-net-loss policy will be vigorously applied. Where destruction of forest is unavoidable, the industry should compensate the loss by reforesting an equivalent area elsewhere. The restoration may be undertaken directly by the industry, or be financed by the industry through another party, such as the Forest Fund. If restoration is in the form of agroforestry or other practices that produce only a partial tree cover, the equivalent forest area may be approximated based on the number of trees established (eg, 625 trees established under an approved agroforestry system may be deemed equivalent to one hectare of forest).

14.0 STRATEGY 7: FOREST PRODUCTION PROGRAMME

14.1 Forest Cover Types and Use

Primary Forest, Non-commercial Secondary Forests or Forests within Declared Protected Areas: The following categories of forest should be considered as non-commercial:

- all undisturbed broadleaf forests, including tall open dry forests;
- natural disturbed broadleaf forests on very steep slopes (over 30 degrees) and with shallow rocky soil; and
- forests and mangroves, either within declared protected areas or otherwise earmarked as having special ecological or eco-tourism value.

These forests will be preserved intact for watershed protection, biodiversity and eco-tourism. Protection is paramount and there is little or no justification for silvicultural interventions in these existing forests except for enrichment planting in certain categories of disturbed broadleaf forests.

Potentially Commercial Disturbed Broadleaf Forests: Disturbed broadleaf forests meeting the threshold slope, soil and accessibility criteria will be considered potentially commercial. The silvicultural objectives of this forest cover type are:

- preserve and encourage plant and animal species diversity;
- improve the commercial value of these forests by enrichment planting with commercially valuable hardwood species and allow low-intensity selection harvesting on strictly controlled diameter limits to maintain permanent tree cover;
- encourage the use of indigenous species for enrichment planting and particularly discourage the introduction of non-indigenous invasive species; and
- promote ecotourism and support visual quality objectives.

Existing Pine and Hardwood Plantations: Given the existence of the FIDCO road network and the FD forest roads and that some Pine and hardwood plantations still exist, the proposed policy is to continue managing the most productive of these plantations on moderate to steep slopes and reasonably deep productive soils for timber production. This will involve rehabilitating selected access roads (particularly drainage on the roads) and thinning dense stands.

Pine left on isolated upper ridges and inaccessible steep slopes represents a dilemma. On one hand, harvesting these stands is almost certainly uneconomic and environmentally damaging; on the other hand, dense Pine stands provide little or no soil protection, since the thick Pine needles suppresses ground vegetation and can actually exacerbate erosion. Opening up these stands by non-extractive thinning to encourage ground vegetation would seem to be the best course, however a full survey of all remaining Pine plantations is needed to determine their designations as “commercial”, “protective” or removal.

Deforested Crown Lands: Those lands meeting the threshold slope, soil and accessibility criteria will be put to their most economically productive use, preferably under timber trees or perennial agroforestry systems.

Clearing, repeated cultivation and burning have left vast areas covered in a thick mat of Guinea grass, fern or huge clumps of bamboo. The grass and fern sites outwardly seem appropriate for reforestation, but the thick mat and the risk of annual burning make for difficult conditions. The Forestry Department has, on occasion, replanted trees several times on grass sites following high mortality from cattle damage or fire. All these sites will be inspected and surveyed before deciding to plant, but there has to be strong economic justification for trying to reforest them.

The Forestry Department and the Commissioner of Lands will work towards repossession of lands leased for coffee production that are either abandoned or no longer economically viable, or lands where lease conditions are not being met. The most productive of these lands will then be available for reforestation, either by the Government or through the proposed forestry leasing arrangement.

Forest Reserve Land Under Permanent Cultivation: Some areas in forest reserves have been encroached upon for growing vegetables and coffee, even on rocky hillsides. These are lucrative enterprises with the vegetables supplying the nearby tourist industry, while the coffee is grown for export through the CIB. Evicting occupiers of this land cannot be considered realistic. In such cases, the Forestry Department will rationalise the use of land, strictly enforcing regulations against fresh encroachments, but regularising current land uses where it is appropriate. Any cultivators permitted to stay within reserve boundaries will be required to lease the land (under pre-established conditions), to install soil and water conservation measures and to establish a required cover of trees.

14.2 Criteria for Selecting Lands for Reforestation

The following variables were analysed using the Forestry Department GIS database, mapped at a scale of 1:250 000 and combined to identify the land with the greatest reforestation potential:

- land use and vegetation type;
- slope;
- accessibility (distance from the nearest road);
- various soil characteristics;
- forest reserve boundaries; and
- watershed boundaries.

A detailed discussion of these and other criteria used is provided in Appendix VIII(1).

Land on gentle to steep slopes (0-30 degrees), with moderately deep soil (more than 50 cm), and with reasonably good road access, will be considered as potentially suitable for reforestation. Table VII-1 in Appendix VII provides guidelines for potential forestry and other land uses based on slope and soil characteristics.

Closed broadleaf forests, tall open dry forests, disturbed broadleaf forests on steep slopes or shallow soils and lands declared or earmarked as having special biodiversity (eg, mangrove areas) or ecotourism values, will not normally be considered for either harvesting or commercial reforestation (See Table 13 below).

Table 13: Classes of Land Use/Vegetation Cover Selected or Eliminated for Reforestation Potential

Broad class of land use/vegetation cover	**Sub-classes SELECTED as having reforestation potential**	**Sub-classes ELIMINATED as having no reforestation potential**
Forest land use (cover>75%)	None	All
Mixed land use/cover	Bamboo and fields; Fields and disturbed broadleaf forest; Bauxite extraction and disturbed broadleaf forest.	Fields or disturbed broadleaf forest and Pine plantations; Disturbed broadleaf forests and fields; Bamboo and disturbed broadleaf forest
Non-forest land use/cover	Bauxite extraction	All except bauxite extraction

14.3 Lands with Reforestation Potential

It must be emphasised that the reforestation criteria used here for national planning are extremely broadly based. The resulting maps and area summaries should not be interpreted or used for operational purposes, for which local knowledge or survey (as developed in the Local Forest Management Plan) is needed to identify plantable areas much more specifically. Firstly, because the reforestation criteria included mixtures of forest and disturbed areas (in unknown proportions), some of the land identified as having reforestation potential (on the disturbed areas) will actually be covered by disturbed broadleaf forest (and thus be unsuitable). Secondly, the elimination and selection of complete and highly variable soil types will undoubtedly have eliminated some suitable sites, or included unsuitable ones. Thirdly, the use of very broad (250-foot) contour lines to calculate slope will have smoothed out many topographic irregularities and thus wrongly eliminated some land with acceptable slope.

This said, the outcome of combining these criteria should generally indicate which watersheds or regions within watersheds have the greatest reforestation potential.

Map 3 in Appendix VIII shows the areas identified with reforestation potential. Table VIII(2)-1 lists the areas with reforestation potential by watershed and Table VIII(2)-2 lists potential areas by slope classes and accessibility. The following are the main conclusions:

- The five watersheds with greatest potential for reforestation are Rio Grande, Wag Water River, Spanish River, Buff Bay-Pencar River, and Hope River.

- Of the 69,244 hectares identified with reforestation potential, only 2,190 hectares (3 percent) are within forest reserves, which confirms that by far the greatest potential for reforestation is on private land.[34]
- Some 50 percent of the identified forest reserve land is on moderately steep to steep land (16 to 30 degrees), while 80 percent of identified land outside forest reserves is on gentle to moderately sloped land (0 to 15 degrees), again confirming that private land is likely to be the more productive.

14.4 Reforestation Targets

Three factors were reviewed for setting Forestry Department and private sector reforestation targets for the 5-year period of this Forest Plan:

- area of land with reforestation potential:
- demand for wood products; and
- Forestry Department capacity for seedling production

The first factor has been covered above in Section 14.3 while the latter two factors are discussed in detail in Appendix VIII(2) - Rationale for Setting Targets. Table 14 below summarises the proposed reforestation targets.

The criteria for species selection and estimated yields and financial returns from reforestation are provided in Appendices VIII(3) and VIII(4) respectively.

The total area to be reforested during the 5-year Forest Plan is estimated to be 4,750 hectares, of which Pine for timber production would comprise 716 hectares (15 percent), and hardwood for timber 4,034 hectares (85 percent). Of the total area to be reforested, 890 hectares (19 percent) would be planted by the Forestry Department, the rest by the private sector. Between the years 2001 and 2005, the area planted by the Forestry Department would decline from 200 hectares (about 40 percent of the reforestation target for the year 2001) to 150 hectares (10 percent of the reforestation target for the year 2005).

[34] See Table VIII(2)-1 in Appendix VIII for detailed list of areas identified with reforestation potential.

Table 14: Targets for Government and Private Reforestation

Item	Area to be planted each year (hectares)					
	2001	**2002**	**2003**	**2004**	**2005**	**Total**
Government planting						
- pine	24	23	22	20	18	107
- hardwood	176	167	158	150	132	783
Sub-total	***200***	***190***	***180***	***170***	***150***	***890***
Private planting						
- pine	67	92	126	155	169	609
- hardwood	233	368	594	875	1181	3251
Sub-total	***300***	***460***	***720***	***1030***	***1350***	***3860***
Total						
- Government planting	200	190	180	170	150	890
- Private planting	300	460	720	1030	1350	3860
Grand Total	**500**	**650**	**900**	**1200**	**1500**	**4750**

Based on the estimated demand for fuelwood, charcoal and yam sticks (see Appendix VIII(2) – Demand for Wood Products), some 35,700 hectares of plantation would be needed to provide for the annual roundwood demand for these products. Less than this area would suffice if some wood still continued to be cut from disturbed broadleaf forests on a sustainable basis, but the scale is far beyond available resources. Special studies are needed to determine how to bring wood cutters, charcoal producers and yam stick cutters together with landowners and potential investors to negotiate acceptable funding and implementation arrangements. In view of this, no targets are included at this stage for establishing energy/yam stick plantations.

The seedling requirements to meet the proposed reforestation targets, estimated direct costs of seedling production and reforestation are detailed in Appendix VIII(3) together with the expected sustainable outputs and value resulting from the above levels of reforestation.

14.5 Identification of Potential Investors

Potential investors in forestry can range from a smallholder farmer planting a half-dozen timber trees to an NGO establishing a multi-hectare plantation for sustainable fuelwood production. Potential investors include:

- smallholder farmers;
- large estate farms and commercial farmers with mid-sized holdings;
- absentee owners whose lands are not presently being used;
- bauxite industry;
- National Water Commission;
- energy sector, eg, Petroleum Corporation of Jamaica, Jamaica Public Service Company, other private energy companies;
- tourism industry; and
- pension funds and long-term financial investors.

14.6 Urban Forestry

The Forestry Department will continue in its role as a major provider of seedlings for ornamental and shade purposes in the urban areas of the country. Adequate stocks of suitable seedlings will be kept to satisfy demand for seasonal planting in established and newly developed urban communities.

Advice on the maintenance and care of particular tree species and individual trees, as well as on species selection and effective protection methods for young tree seedlings, is provided to private and public interest groups when requested.

Urban planting programmes add an important "hands-on" component to the FD's public education programme especially for schools in lower income urban areas and communities which are often bereft of trees and green spaces.

15.0 STRATEGY 8: INVESTMENT AND INCENTIVES

The forests of Jamaica provide many goods and services and have a substantial impact on the island's economy at large, mainly through wood-based fuels, water supplies, tourism and various forest products. *The Forest Land Use Policy* (1996) explicitly recognises that the forests of Jamaica are essential for the protection of the country's soil and water resources as well as for increasing production of forest products.

To date, however, public investment in the forestry sector and in watershed protection has been modest. Government budget allocations have been inadequate to fund the necessary management and conservation practices on forest lands and watersheds on a sustainable basis. If the sector is to achieve the goals identified in this Forest Plan, substantially increased funds will be required. Success also depends on stability in funding levels to achieve continuity.

While recognising that the first priority of forestry investment is to safeguard existing forests for their watershed, biodiversity and ecotourism values, national demand for products from our forests must also be addressed. Investment in plantations to supply timber, yam sticks and fuelwood/charcoal is needed to satisfy demand and to reduce the pressure on natural forests. Most of the land with the greatest potential for forestry development is privately owned, hence the private sector must be encouraged to engage in forestry/plantation development.

15.1 Establishment of the Jamaica Forest Management and Conservation

To fill the funding gap for forest management and conservation, the Forestry Department will establish the Jamaica Forest Management and Conservation Fund ("Forest Fund" or "Fund"). During his address[35] at the launch of the NFMCP in March 2000, the Prime Minister, the Rt. Hon. P.J. Patterson, recognised the need for long-term funding in the forestry sector and gave his endorsement to such a fund.

15.1.1 Supported Activities and Beneficiaries

The Fund would be used to support activities and projects identified in Section 19 as requiring external funding. Eligible activities include, but are not limited to:

- protection of forest reserves, including maintenance of boundaries, trails and fire breaks;
- forest conservation on private lands (grants, leasing, easements, and/or acquisition);
- reforestation and agroforestry on suitable private and public lands;
- expansion and operation of the nursery system to support private sector reforestation;
- mangrove protection and restoration; and

[35] Excerpt from the Prime Minister's address, "… New funding mechanism will be needed to supplement the resources provided by Government. As the role of Government changes, it will develop new policies and involve the private sector, communities, and NGOs in implementing the [Forest] Plan. To meet this need a Jamaica Forest Fund is being proposed to provide long-term funding for reforestation and forest conservation. …"

- local forest-based community projects.

Funds will be disbursed to agencies and individuals implementing the above activities, namely:

- non-profit, non-governmental and community-based organisations;
- educational institutions;
- lessees and owners of private lands; and
- contractors.

15.1.2 Organisation of the Fund

Successful procurement of funds will require a structure that is acceptable to multiple contributors. Investors must have the necessary control and assurances that their contributions are spent on activities consistent with their investment criteria. Financial management must be highly credible and perceived as free from governmental or political intervention. At the same time the Government must retain the necessary control to meet its responsibilities under the Forest Act and to ensure resources are directed at implementation of the approved Forest Plan.

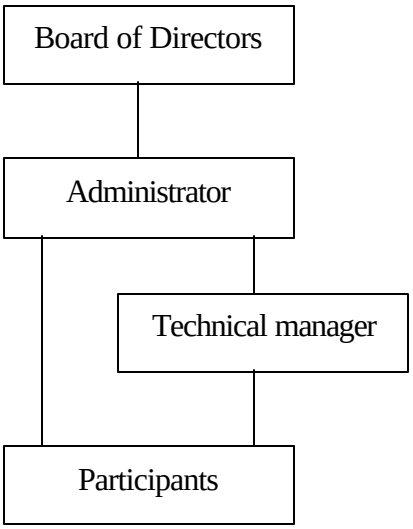
Towards these ends, the following elements are recommended:

- *Legal Entity.* The Fund would be incorporated under section 13, the Companies Act 1967 as a company limited by guarantee without a share capital. The Memorandum and Articles of Association would limit the objectives and activities of the Fund to implementation of a Forest Plan approved by the Government of Jamaica under the Forest Act.
- *Members*. Members would be agencies or persons subscribing to the Fund. They would have the option of tying their contributions to specific implementation activities or projects. The Government of Jamaica would always be a member.
- *Directors*. The Board of Directors would be structured to include at least:
  - one director appointed by the Government of Jamaica;
  - three directors elected from the members at large; and
  - one director appointed from the public at large.
- *Administrator (Financial Manager)*. An internationally recognised management consulting firm would be contracted to provide financial administration services, including accounting, Fund revenue collection, disbursement of funds, and reporting.
- *Technical Manager*. Delivers technical services including planning, extension, and monitoring of conformance (to the Plan, the Forest Act and pertaining regulations, and standards of practice). The Forestry Department would assume the lead role, given its responsibilities under the Forest Act. The technical services provided would continue to be covered under the Government's recurrent budget to Forestry Department. Additional technical services may be provided by contractors, and paid for by the Fund (see "participants" below).

- *Participants.* Parties engaged in operational implementation of the Forest Plan, would include contractors, community based-organisations and lessees or owners of forest lands.

The basic relationships between the Board, administrator, technical manager, and participants are illustrated in Figure 4.

Figure 4: Jamaica Forest Management and Conservation Fund - Reporting Relationships



15.2 Sources of Funding

The primary sources so far identified for initial capitalisation and start-up of the Fund are:

- *Bilateral and Multilateral Contributions*. Donors have expressed interest in supporting implementation of the Forest Plan, either through individual development projects or contributions to an appropriately organised Fund.
- *Debt Reduction Agreements.* Environmental funds from existing agreements might be incorporated into the Forestry Fund through appropriate arrangements with agencies like the Environmental Foundation of Jamaica. Further debt relief under the US Tropical Forest Conservation Act (1998) could create additional funding.
- *Sponsorship from the Private Sector*. A well-organised and marketed Fund is likely to attract private sector sponsorship or endowments. Targeted sponsors would include the bauxite, tourism, petroleum and agriculture industries (domestic and international), landowners, and international non-government organisations.

It is stressed that the purpose of the Fund is to implement the Forest Plan. Contributors to Plan implementation will have the option of contributing to the Fund, and/or directly participating in the implementation of planned activities and projects.

Other sources that will be investigated are discussed below.

15.2.1 Government Contribution

The Government of Jamaica may wish to seed the Fund, but its most crucial and essential contribution will be to maintain a basic but effective Forestry Department organisation that will facilitate and audit funded activities consistent with the Forest Act, regulations, and Forest Plan.

15.2.2 Water User Fees

Water user charges are an important potential source for establishing a viable fund. A prerequisite for sustainable management of water as a scarce and vulnerable resource is that its full cost should be acknowledged in all planning and development. The economic value of water must reflect the cost of maintaining regular supplies at high quality, and not merely the cost of treatment and transportation.

The Water Resources Authority (WRA) has authority to charge for the abstraction of water from surface or underground sources. The present charges are J$15,000 for the drilling application fee and J$15,000 for the abstraction application fee. The WRA further proposes that an annual licence fee of J$0.20/1000 gallons be charged to abstractors for funding the capital works and monitoring programmes of the WRA. The Forestry Department suggests that a portion of any annual licence fee should be used to fund watershed forest management activities. This could provide a significant annual contribution to the Jamaica Forest Management and Conservation Fund.

15.2.3 Carbon Sequestration

Carbon sequestration is another potential source of funds already successfully utilised by some Latin American and Caribbean countries. Under the Clean Development Mechanism of the Kyoto Protocol to the United Nations Framework Convention on Climate Change, countries can get credit for reducing carbon emissions or from absorbing carbon from other countries under a Joint Implementation project. These projects provide an opportunity for obtaining long-term financing for forestry development and conservation.

Deforestation in tropical countries contributes about 20 percent of the annual global emissions of carbon dioxide and a reduction in Jamaica's rate of deforestation could have far-reaching environmental as well as financial benefits.

The Forestry Department will work with the Government to develop policy support for Joint Implementation of carbon sequestration projects and encourage the involvement of the local private forestry sector and foreign companies.

15.2.4 National Park Fees

Forest reserve areas make up the bulk of the country's national parks. A portion of entrance and other user fees collected by national parks should be made available to the Fund to support management activities of the parks' forests.

15.3 Investment in the Forestry Sector

The Forestry Department will address the problem of low investment in the forestry sector by working to promote an environment which encourages investment by creating incentives and by reducing the barriers to investment in forestry.

15.3.1 Public Land Management and Utilisation

The Forestry Department will develop a programme that allows tenure on Crown lands in return for money or services such as maintaining a prescribed type and amount of tree cover and would be tied to good land management practices. More specific criteria guiding tenure on Crown lands is discussed in Appendix IX(2).

Crown lands with any reasonable commercial potential for reforestation are frequently under illegal permanent or temporary use by cultivators and herders. Legally evicting them from Crown lands carries little or no political support and is often extremely difficult. It is more logical to seek co-operation with illegal occupants than to work against them. The FD will explore the option of creating buffer zones around adjacent remaining forests and enlist the involvement of local people in forest management.

The Forestry Department will clearly mark boundaries which are in dispute and take steps to resolve border disputes. In cases where there is clear encroachment, the FD will attempt to work with farmers to acquire other suitable lands or help them to obtain tenure, under controlled land use conditions.

15.3.2 Reduce Praedial Larceny

The FD will intensify their enforcement programme and increase their monitoring of sawmills and furniture manufacturers to reduce the theft of lumber. The arrests and other enforcement actions taken by the environmental service wardens of the Blue and John Crow Mountains National Park and members of the Forestry Department have been successful in reducing the amount of lumber stolen.

15.3.3 Fire and Animal Damage

The Forestry Department will work with NGOs to implement community education programmes to control animals as well as fire management and control. The existing Country Fires Act will be revised; fines will be increased and enforced. New regulations to accompany the revised Act will be drafted.

15.4 Incentives for Investment

The following incentives will be provided to encourage investment in forestry development and conservation:

- free timber seedlings (from nursery site), and subsidised cost on other species;
- remission of property tax on lands declared as forest management areas or forest reserves;
- income tax exemption, duty concession on motor vehicle purchase, and waiver of GCT on capital goods, activities and supplies prescribed under a forest management agreement and approved forest management plan; and
- long-term conditional leasing at competitive rates of public land for reforestation, agroforestry and other purposes prescribed in an approved Local Forest Management Plan, including investiture of full ownership of planted trees on the lessee.

In addition, the following incentives will be provided, subject to the availability of capital in the Jamaica Forest Management and Conservation Fund, and priorities established by the Fund's Board of Directors:

- grants for plantation establishment on lands qualifying for reforestation under the Forest Plan;
- direct acquisition or leasing of lands for maintenance as protection forest;
- annual grants to landowners, of up to 50 percent of the land rental value, for maintaining protection forests;
- grants and/or long-term low-interest loans for community forestry and recreational ventures;
- maintenance of boundaries, trails and fire breaks; and
- surveying of suitable Crown lands for leasing to forestry or agroforestry uses.

All incentives will be subject to activities being prescribed in an approved Local Forest Management Plan and performance verification by the Forestry Department.

16.0 STRATEGY 9: ROLE OF THE FORESTRY DEPARTMENT

16.1 Present Organisation and Capacity

The present organisational structure for the Forestry Department was approved in 1997 – see Appendix X(1). One objective of this structure was to provide for staff positions to prepare the FD to expand its scope of activities proposed through the CIDA-funded *Trees for Tomorrow Project*. Several of the staff positions approved in the 1997 organisational structure remain unfilled due to budgetary constraints and this has limited the ability of Forestry Department to carry out its role.

The existing FD structure was analysed by the UNDP *Forestry (Bridging) Capacity Project*. Recommendations made to strengthen the Forestry Department's capacity in forest protection and management, developing community participation in forest protection and management, and providing information are under review.

As part of a general programme to increase overall efficiency and effectiveness of Forestry Department personnel, job descriptions have been reviewed and rewritten for operational and administrative staff and procedures manuals have been written for a number of field operations.

16.2 Recent and Current Projects

The projects presently being implemented by the Forestry Department are:

- *Trees for Tomorrow Project:* The Project is funded by the Canadian International Development Agency and the Government of Jamaica. The objectives of the Project are to strengthen the institutional capability of the forestry sector, primarily the Forestry Department, to implement sustainable forest management and other soil and water conservation measures in Jamaica's upper and middle watersheds, and at the same time increase awareness of the importance of forests throughout the country.
- *Forestry Capacity (Bridging) Project:* This Project, funded by UNDP and the Government of Jamaica, was designed to achieve improved capacity of the forestry sector by encouraging participatory approaches to the planning and management of the forestry resources. It is also aimed at improving the project planning and management capacity of the Forestry Department, selected National Environmental Societies Trust (NEST) members and Government institutions.

Recently completed projects undertaken by the Forestry Department are:

- *Agroforestry Development in North-Eastern Jamaica:* The Project assisted small-scale farmers in the Rio Grande watershed in establishing suitable agroforestry systems on their farms. The Project also increased the capabilities of the Forestry Department to implement agroforestry programmes on a sustainable basis.
- *Morant Yallahs Agriculture Development - Forestry Sub-component:* The Forestry Department was contracted to replant the public lands and assist private farmers in establishing timber and fruit trees in the Morant and Yallahs watersheds.

16.3 Expanding Capacity

The role of the Forestry Department is defined in section 4 of the Forest Act, 1996. Fulfilling these roles and implementation of the National Forest Management and Conservation Plan are impossible without the Forestry Department strengthening its capabilities in community liaison, extension and enforcement.

The FD presently collaborates with the Rural Agricultural Development Authority (RADA) for its extension needs. The Forestry Department will continue to forge close links with RADA by providing them with technical forestry information, and where possible, provide "hands-on" training to RADA extensionists on specific forestry subjects.

But RADA is primarily agricultural and also has very limited resources, and collaboration with it alone is not sufficient. It has been identified that by far the greatest potential for reforestation is on private land (see Section 14.3). Therefore the Forestry Department will work towards becoming more of a service-oriented agency for the private sector by improving its capacity to liaise with individuals and communities. The kind of services aimed at will include:

- involve communities in forest protection, management and conservation activities;
- public education about trees, forests and the environment;
- creation of a database of tree growers, with details of their situation and requirements;
- creation of a timber/lumber market database, including a list of primary timber/lumber producers;
- provision of free timber seedlings of the desired quality, and at the desired time, provision of other tree species at subsidised cost;
- documenting case studies, including costs and returns;
- collection, preparation and dissemination to tree growers of technical, management and marketing information; and
- monitoring and evaluation of private forestry participants and programmes.

Green Paper 2/99, *Towards a Watershed Policy for Jamaica*, identifies the Forestry Department as the implementing agency for national watershed management. When the FD's additional duties are defined, the Department's organisation structure and capacity will be carefully reviewed to ensure that the FD will be provided with the appropriate resources to fulfil the new watershed management mandate.

16.4 Human Resources Development

The human resources development (HRD) objective is to establish new facilities while utilising existing ones for the education and training of personnel to provide effective leadership and service at all levels in the Forestry Department, in other Government agencies and in the private sector (including NGOs) in order to attain the goals of the forestry sector as set out in this Forest Plan.

In pursuing this objective, the following strategies will be used.

16.4.1 Gender Equity (Expanding the Role of Women)

In view of the fact that only a few women are employed at the technical level within the Forestry Department, the gender strategy will seek to focus on the role of women by:

- making the FD a more gender-sensitive organisation that is fully equipped to incorporate gender issues in its operations;
- promoting the recruitment of women into professional and technical levels within the Forestry Department; and
- improving the socio-economic condition of rural women in the communities served by the FD.

These aims will be attained, in part, through the following institutional support actions:

- design and implement gender sensitisation programmes;
- encourage and assist young women to pursue forestry as a career;
- address concerns of women in relation to facilities, conditions of work and terms of employment, particularly in the nurseries; and
- widely advertise training opportunities, with special attention paid to women, in order to offer staff mobility and opportunities for promotion.

The Forestry Department will make a special effort to involve women at all levels within its activities to develop community participation in forest management.

16.4.2 Staff Motivation and Morale

To develop and maintain a motivating climate and to build staff morale, the following initiatives will be utilised:

- the use of a range of psychological rewards to recognise excellent performance;
- deliver value-added service internally and externally;
- improve working conditions/work environment;
- implement controls for handling unsatisfactory behaviour and performance; and
- involve staff in decision making.

The Forestry Department has prepared a Customer Care Charter which sets down the service standards that FD personnel must provide to internal and external customers. The Charter was presented to Forestry Department staff at a series of one-day workshops held in each Region and Head Office. A Customer Care Team has been set up to receive and promptly resolve complaints from any staff member or external customer.

16.4.3 Forestry Department Training Needs

A training needs analysis (TNA) undertaken in 1998 within the Forestry Department (see Appendix X(2)) indicated that the level of technical and general forestry knowledge is very low at most levels of the Forestry Department below the Director level.

This lack of knowledge is being addressed by the preparation and carrying out of annual training plans. Resources for undertaking these training activities are presently being provided by the FD, the *Trees for Tomorrow Project* and the *Forestry Capacity (Bridging) Project*.

A Field Skills Training Analysis was completed in mid-2000. This analysis focussed on the FD's field personnel and identified areas in which skills and/or knowledge was lacking. A curriculum is being prepared to address these weaknesses and a series of specialised courses will be given to all Forestry Department field staff.

16.4.4 Forestry Sector Training Needs

The Forestry Department will undertake a TNA for each NGO, CBO and private organisation with which it becomes involved and will assist other Government agencies with TNAs when requested.

16.4.5 Periodic Training Needs Assessment

- Existing and new instruments will be employed to conduct periodic training/ development needs assessment of staff within the Forestry Department and the wider forestry sector.
- All training programmes and interventions will be provided only within the context of the needs identified and analysed.
- All training activities will be monitored and evaluated (at Level 4)[36] to ensure they produce significant and positive changes to benefit the Department, the forestry sector and the Nation.

16.4.6 Performance Management

- Design and implement an objective Performance Management System to ensure the highest possible levels of performance and productivity by a competent and committed workforce.
- Provide for close monitoring and evaluation of the system.

[36] In Human Resource terminology, Level 4 Evaluation refers to the assessment of the impact of training on the organisation.

16.5 Monitoring FD Performance

The systematic monitoring and evaluation of the Forestry Department's routine activities, the intervention of donor-sponsored projects, as well as community-based and NGO-supported activities will be undertaken by the Forestry Department's Monitoring and Evaluation Unit[37]. These monitoring roles will be carried out through a combination of participatory monitoring, accessing existing information from partners, developing new approaches with other stakeholders and utilising internal reports.

[37] To be fully operational by end of 2001.

17.0 STRATEGY 10: ROLE OF THE PRIVATE SECTOR

17.1 Private Sector Investors

Given the right incentives, the private sector has a much greater capacity to meet national reforestation requirements than any Government agency. The availability and general productivity of private land offers much greater potential for reforestation than does Crown land. Of the 69,244 hectares of forested or partially forested land identified with reforestation potential, only 2,190 hectares are within forest reserves. The majority is on private land. More land is becoming marginal or idle for agricultural use as farmers struggle with global competition and other problems. Growing trees can provide farmers an alternative viable use for such lands. Jamaica enjoys very high site productivity relative to many timber-producing nations.

Notwithstanding the strong reasons above for encouraging private forestry in Jamaica, such a radical shift in investment and land use is unlikely to happen quickly without encouragement. Hence the introduction of the incentives described in Section 15.

As the Forestry Department focusses its resources on public liaison, extension, and regulation, there will be increased opportunities for the private sector in seedling supply and nursery production. Incentives and co-management arrangements for the participation of the private sector in both forest protection and production have already been outlined. The implementation of this Forest Plan will rely heavily on the involvement of the private sector in all the following activities:

- seedling production;
- commercial reforestation, agroforestry and plantation establishment on private lands;
- commercial agroforestry and plantation establishment on leased Crown lands;
- protection of natural forests on private lands;
- recreation and water production services on Crown and private forests; and
- reclamation of mined forest lands.

As mentioned previously (Section 13.6), the restoration or replacement of forests disturbed by mining is a special case and of great importance to the people of Jamaica. All costs of reclamation should be borne by the operator. However, provision has been made in the Forest Plan for the FD to dedicate a Senior Officer to reclamation support, technical assistance, liaison and regulation.

17.2 Tree Growers' Associations

The Forestry Department ultimately has to deal with individuals when extending forestry services or mobilising lease arrangements, since farmers traditionally act independently. The process can be greatly facilitated by organising tree growers' associations, or working through existing community-based organisations. Grouping can aid communication, sharing of ideas and resources, and mobilisation of participants.

If encouraged to take up tree growing on their own or on leased public land, people living in critical emphasis areas and adjacent to forest reserves could help protect remaining forest and create an effective buffer around the reserves. As peers, they could convey environmental messages to their community more effectively than any outside Government agency. Three models can be considered for groupings:

- the co-operative model with equity participation;
- the association as a forum for communication and sharing between stakeholders; or
- an informal unstructured grouping simply to receive Forestry Department seedlings and technical assistance.

The second model seems the most logical, as the first is more suited to agriculture than to reforestation (given the long waiting period for any income from forestry) and the third serves little purpose.

17.3 Privatisation of Seedling Production

The Forestry Department's policy of providing free seedlings is a necessary incentive for the foreseeable future to encourage farmers to grow trees. But this also works against the development of an open market in seedlings and is a disincentive for private operators to raise seedlings. In most jurisdictions throughout the world, internal nursery operations have been phased out and the work contracted out. Ample expertise exists in Jamaica's private sector for raising fruit, coffee and ornamentals, which could easily be adapted to timber treeseedlings. During the term of this Forest Plan, the Forestry Department will undertake a review of its seedling policy and an investigation into privatising seedling production.

17.4 Land Tenure

One way the private sector will be encouraged to participate in forestry is through the controlled leasing of public land for growing timber trees or adopting agroforestry systems. This will enable the Forestry Department to collaborate closely with private growers and jointly achieve the following goals:

- increase tree cover in forest reserves and other public watershed lands;
- make productive use of currently under-utilised deforested lands;
- provide Treasury with income from otherwise under-utilised land;
- build up a valuable asset and future income for small-scale farmers and tree growers;
- contribute to the national wood supply, thereby reducing the pressure on broadleaf and open dry forests;
- ensure the vested interest of tree growers to protect their own plots of trees from encroachers; and
- create greater environmental awareness among the lessees, and possibly their co-operation in protecting adjacent areas of forest.

18.0 STRATEGY 11: CO-ORDINATION AND MONITORING

18.1 Review Process

The Forest Act, 1996 requires that the Forest Plan be reviewed and amended as necessary at intervals not exceeding five years. Performance will be monitored against the specific objectives of the Forest Plan, using measurable and verifiable indicators. This task will be conducted and reported to the Minister and the public by an independent Forestry Planning and Development Committee (referred to in the draft plan as the "Strategic Planning and Development Committee"), with technical monitoring and evaluation support from the Forestry Department. The indicators will be refined by the Committee, but are essentially predicated by the objectives of the Forest Plan (see Table 15). These are listed below by goal:

Goal: Protect forest resource/biodiversity conservation

- hectares reserved and effectively patrolled;
- current biophysical inventory and vegetation change data provided;
- hectares of private forest acquired or under protection agreement;
- km of new and existing forest reserve boundaries surveyed;
- km of boundaries, trails and fire breaks maintained;
- number of Local Forest Management Plans (LFMPs) approved by Minister and endorsed by Local Forest Management Committee (LFMC);
- number of LFMCs appointed and functioning;
- the percentage of critical emphasis areas covered by LFMPs;
- forest policy update completed;
- percent of Nation's school children receiving environmental forestry education; percent of residents in critical emphasis areas receiving local public awareness programme;
- number of residents in critical emphasis areas participating in forest management activities; and
- km of forest roads maintained or restored.

Goal: Restore tree cover

- hectares planted and maintained to defined standards;
- hectares of Crown land leased for suitable agroforestry use;
- number of seedlings produced;
- hectares of forest, disturbed by mining and related activities, reclaimed/replaced; and
- hectares of mangrove forest protected or restored.

Goal: Carbon dioxide sequestration

- manage forests to contribute to carbon sequestration – specific indicators for this objective will be developed in a proposed feasibility study to investigate a carbon sequestration programme for Jamaica.

Goal: Economic contribution of forests

- the contribution of the forestry sector to national gross domestic product – the value indicators will be developed in three proposed studies, "Forest Resource Valuation ", Yam Stick Market Study" and "Fuelwood/Charcoal Studies";
- revenue collected from wood and other goods produced on Crown forests;
- number of wardens and forest officers trained in forestry and agroforestry extension;
- hectares of commercial plantation established by private sector;
- number of small community projects started and successfully operating; and
- capital value of Jamaica Forest Management and Conservation Fund.

Goal: Sustainable fuelwood production

- establish plantations and manage forests to ensure sustainable fuelwood production – indicators will be developed following a survey of the fuelwood and charcoal industries.

Goal: Recreation and tourism

- number, size, and use levels of recreational facilities operating in forest areas.

18.2 Forestry Planning and Development Committee

To facilitate this undertaking, the Minister of Agriculture will appoint a high level Forestry Planning and Development Committee (FPDC or "Committee"). The role of the Committee is to:

- Provide leadership and guidance in the strategic planning process in the FD.
- Facilitate intersectoral linkages and linkages between the public and private sectors.
- Keep the Forestry Department focussed on achieving the goals of the forestry sector and the objectives of the Forest Plan, whilst being open and responsive to the need for change in strategies.
- Act as a lobby group on behalf of the forestry sector.
- Be independent, objective and impartial, to be an enabler and facilitator.

The major responsibilities of the FPDC are to:

- Monitor the implementation of the Forest Plan and report annually to the Minister and the public on implementation achievement relative to the Plan objectives.
- Recommend strategies and courses of action to the Minister to remedy problems, failures or difficulties encountered in implementation of the Forest Plan.
- Keep abreast of international trends and developments in forestry, environmental and conservation issues.

- Conduct/lead the annual strategic planning review and provide an objective assessment of progress towards achievement of the goals of the forestry sector as identified in the Forest Plan.
- Provide guidelines for prioritising Forestry Department objectives for the coming year.
- Provide advice and guidance to the Conservator in issues related to forestry.

The Forestry Planning and Development Committee will consist of seven members representing regional, community, private sector and forestry interests:

- One public representative from each of the Eastern, Central and Western Forest Regions. These three members will be active participants in their Local Forest Management Committee and have a strong interest in and commitment to the protection and conservation of forests, soil, and water.
- Financial specialist with experience and status in the banking, financial management and economic sectors.
- Representative of national tourism and recreation interests.
- Wood industry representative, with interest and knowledge in growing timber or fuelwood, wood processing and forest product marketing.
- Conservator of Forests.

The Forestry Planning and Development Committee will serve as a sub-committee to any national-level watershed management committee that may be formed when the Watershed Policy is implemented.

The FPDC will be supported in its role by the Management Committee of the Forestry Department and by a number of *ad hoc* sub-committees called Focus Groups.

18.3 Management Committee

The Management Committee consists of the senior managers of the Forestry Department and will, *inter alia*, prepare internal appraisals of the Forest Plan, undertake technical and operational planning and provide technical assistance and support to the as part of a strategic planning process.

18.4 Focus Groups

Focus Groups, representing the large number of Government and non-governmental agencies involved in forest management, may be convened by the Committee to:

- facilitate inputs from stakeholders related to specific issues; and
- provide additional specialised planning expertise to the Forestry Department as needed.

The agencies which will form Focus Groups include:

- Ministry of Agriculture;

- Ministry of Lands and Environment;
- Ministry of Water and Housing;
- Planning Institute of Jamaica;
- Natural Resources Conservation Authority/National Environmental Protection Agency;
- Cabinet Office/Office of the Prime Minister;
- National Water Commission;
- Urban Development Corporation;
- Water Resources Authority;
- Environmental NGOs (eg, STEPA, STEA, PEPA, NEPT); and
- Private forest growers.

19.0 IMPLEMENTATION OF THE FOREST PLAN

It is recognised that formal commitment to the Forest Plan is implied by its approval, but explicit commitment by the Government of Jamaica to donors and other investors, including commitment to a budget contribution sustained for at least the 5-year period of the Forest Plan, will be sought. Forestry Department will seek broad-based endorsement from both political and civil sectors of society for the Forest Plan.

19.1 Activities and Objectives

Table 15 below itemises the activities and targets by goal, consistent with strategies stated in the Forest Plan; feedback received from the general public and reviewers of the Forest Plan; and Forestry Department's interpretation of required or achievable targets. The targets relate to a 5-year implementation period which commences from the approval date of this Forest Plan by the Minister of Agriculture.

Table 15: Activities and Quantified Objectives of the Forest Plan

ACTIVITY	OBJECTIVE (Indicators and Targets)
GOAL: PROTECT FOREST RESOURCE	
Establish and operate protection system	100,000 ha currently reserved, plus additional remaining closed broadleaf forest (approximately 23,000 ha), and mangrove (5,600 ha), effectively patrolled and protected by staff of 60 trained wardens
Establish and maintain inventory and monitoring system	Current broad biophysical inventory of all forest land; detailed inventory of critical emphasis areas; change detection system in place for assessing forest cover change at 5-year intervals
Protection/forest conservation on private lands	Preservation of threatened undisturbed forest on private land in critical emphasis areas (assumed 5000 ha) through acquisition or incentives to landowners
Survey existing forest reserve boundaries	400 km (consisting of the 100 km being surveyed at present by FD plus an additional 300 km)
Survey new forest reserve boundaries	75 km
Maintain boundaries, trails, fire breaks	300 km per year
Produce Local Forest Management Plans (LFMPs)	LFMPs approved by Minister and endorsed by public for all forest reserves in critical emphasis areas within 5 years (including new declarations and forest management areas)
Establish and support Local Forest Management Committees	10 committees appointed and functioning, focussed on critical emphasis areas
Forest policy update	Updated Forest Policy
Public awareness	Local public awareness programme reaching all residents and stakeholders within critical emphasis areas; national public awareness programme reaching all school children
FD training	All FD staff trained and functionally competent in areas of responsibility
Community training	Effective community participation in forest management in 10 critical emphasis areas
Forest road maintenance and restoration	100 km per year

ACTIVITY	OBJECTIVE (Indicators and Targets)
GOAL: RESTORE TREE COVER	
Reforestation (planting, maintenance, silviculture)	1000 ha per year planted and maintained (20% Government; 80% private)
Survey Crown land for leasing	1100 ha of suitable Crown land leased for approved agroforestry use
Establish nursery system	3 nurseries with combined capacity of 1.5 million seedlings per year
Operate nursery system	1.1 million seedlings per year (to support 1000 ha per year); includes 65,000 seedlings for urban use
Develop and implement research programme	Reforestation programme supported by trials evaluating and verifying species selection, silvicultural and agroforestry systems and productivity
Mining reclamation support	No net loss of tree cover
Mangrove protection and restoration	Protect or restore mangrove forests to maintain at least 10,000 ha
GOAL: CO_2 SEQUESTRATION	
Develop $C0_2$ sequestration programme	Exploratory studies and trials completed; definitive programme in place
GOAL: BIODIVERSITY CONSERVATION	
The activities for this goal are encompassed within the goals for "Protect Forest Resource" and "Restore Tree Cover"	Habitat for native flora and fauna is maintained by increasing the extent of forest reserves and other protected areas together with effective patrolling and protection of these areas.
GOAL: ECONOMIC CONTRIBUTION OF FORESTS	
Forest resource valuation	Established financial values for forest services including wood products, non-wood products, water, soil conservation, recreation
Revenue collection and administration	Fair stumpage value being paid by users for all wood harvested on Crown land
Develop extension capability	60 wardens, 31 foresters trained and competent in extension
Extension operations	Reforestation and protection objectives met; private sector establishing minimum of 800 ha per year of productive forest
Support community project start-up	50 small projects started and successfully operating
Tree growers' association	Tree growers' association formed and functioning
Manage the Jamaica Forest Management and Conservation Fund	Fund established and independently administered with a capitalised value, or equivalent income, of at least J$500 M
Yam stick market study	Production, consumption, utilisation and economics evaluated; production programme established
GOAL: SUSTAINABLE FUELWOOD PRODUCTION	
Fuelwood/charcoal studies	Production, consumption and economics evaluated; definitive implementation programme established
GOAL: RECREATION AND TOURISM	
Develop and maintain recreational facilities	3 sites operating in forest areas
	See also forest protection objectives and activities

19.2 Estimated Implementation Costs

To develop a budget for the implementation of the Forest Plan, the Activities in Table 15 above were sorted, and sub-divided if necessary, into recurrent (annual cost) and development (one-time cost) components. Associated costs were estimated and further categorised into committed, "approved", and proposed components. Note that "approved" here refers to costs associated with GOJ positions that have been approved for the FD but not budgeted or filled.

Government of Jamaica costs are separated from externally funded projects (although this separation is obviously open to revision). Results are shown in Table 16. Nominal capitalised values are shown for recurrent as well as development costs, based on an assumed real interest rate of 10 percent. The intent here is to provide a basis for establishing capitalisation targets for the Jamaica Forest Management and Conservation Fund.

A baseline GOJ funding level of J$66 million per year is assumed. The costs for the "unfilled approved positions" component of the expanded annual operating programme are all additional to the baseline.

The costs for the "other" component of the expanded operating programme are partially covered by the Capital A portion of the baseline budget. Because of this, the Capital A amount (J$13 million) is subtracted from the costs of the expanded operating programme.

Table 16: Estimated Implementation Costs

Item	Type	Cost by Source (J$ million)		Capitalised Cost (J$ million)			Total (J$ mil.)
	D/R	GOJ	Ext.	GOJ	Ext.	Total	5-yr Cost
GOJ BASELINE ANNUAL PROGRAMME							
Baseline FD budget - recurrent	R	53.00		530		530	265
Baseline FD budget - Capital A	R	13.00		130		130	65
Total GOJ baseline		**66.00**		**660**		**660**	**330**
CURRENT FORESTRY PROJECTS – ANNUAL PROGRAMME (AVERAGE)							
Trees for Tomorrow Project	D	17.60	42.40	88	212	300	300
Bridging Project	D	11.40	8.10	23	16	39	39
Total current forestry projects		**29.00**	**50.50**	**111**	**228**	**339**	**339**
EXPANDED ANNUAL OPERATING PROGRAMME – UNFILLED APPROVED POSITIONS (GOJ)							
Maintain & operate protection system		7.90		79		79	40
Maintain inventory & monitoring system		1.46		15		15	7
Produce LFMPs for forest reserves		1.62		16		16	8
Implement research programme		2.01		20		20	10
Mining reclamation support		1.01		10		10	5
Revenue collection & administration		0.40		4		4	2
Extension operations		8.43		84		84	42
Other FD unfilled overhead positions		2.80		28		28	14
Sub-total (1) - approved positions		***25.63***		***256***		***256***	***128***

Item	Type	Cost by Source (J$ million)		Capitalised Cost (J$ million)			Total (J$ mil.)
	D/R	GOJ	Ext.	GOJ	Ext.	Total	5-yr Cost
EXPANDED ANNUAL OPERATING PROGRAMME – OTHER							
Maintain inventory & monitoring system	R		3.80		38	38	19
Forest conservation incentives	R		15.60		156	156	78
Maintain boundaries, trails, fire breaks	R		3.96		40	40	20
Establish & support LFMCs	R		1.10		11	11	6
Public awareness programme	R		2.05		21	21	10
FD training	R		4.69		47	47	23
Community training	R		2.65		27	27	13
Forest road maintenance	R		4.00		40	40	20
Reforestation (planting, maintenance, silviculture) – Crown lands	R		9.22		92	92	46
Reforestation - private sector	R		40.00		400	400	200
Operate nursery system	R		10.51		105	105	53
Maintain recreational facilities	R		0.75		8	8	4
Manage Jamaica Forest Management and Conservation Fund	R		6.60		66	66	33
Sub-total (2) - other (less baseline Capital A)			***91.93***		***920***	***920***	***460***
Total expanded annual operating programme Sub-total (1) + Sub-total (2)		**25.63**	**91.93**	**256**	**920**	**1176**	**588**
PROPOSED DEVELOPMENT PROJECTS							
Establish protection system	D		10.20		10	10	10
Establish inventory & monitoring system	D		13.25		13	13	13
Protection forest acquisition	D		125.00		125	125	125
Survey existing forest reserve boundaries	D		27.20		27	27	27
Survey new forest reserve boundaries	D		6.80		7	7	7
Produce local LFMPs for forest reserves	D		5.30		5	5	5
Forest policy update	D		4.20		4	4	4
Develop public awareness programme	D		10.60		11	11	11
Establish nursery system	D		2.10		2	2	2
Restoring mined bauxite lands with trees	D		48.90		49	49	49
Develop research programme	D		3.63		4	4	4
Mangrove protection & restoration	D		11.10		11	11	11
Develop $C0_2$ sequestration programme	D		4.20		4	4	4
Forest resource valuation	D		7.95		8	8	8
Survey Crown land for leasing	D		6.80		7	7	7
Develop extension capability	D		30.80		31	31	31
Support community projects start-up	D		5.00		5	5	5
Tree growers' association	D		1.33		1	1	1
Design and establish the Jamaica Forest Management and Conservation Fund	D		9.60		10	10	10
Yam Stick Market Study	D		9.50		10	10	10
Fuelwood/charcoal studies	D		14.00		14	14	14
Develop recreational facilities	D		15.00		15	15	15
Total proposed development projects			**372.46**		**373**	**373**	**373**

D = Development (one-time) Activity
R = Recurrent (annual ongoing) Activity
Ext = External

Note that the estimates do not include the operating costs of mining reclamation.

19.3 Development Project Descriptions

Table 17 below gives a brief description of the proposed development projects of the Forest Plan.

Table 17: Development Project Descriptions

Proposed Development Project	Cost (J$ million)	Brief Description
Establish Protection System	10.20	Effective protection of forest lands managed by FD requires adequately equipped and trained personnel. This project will provide radios, vehicles (six - 4x4s) and motorcycles, fire fighting equipment, and training to wardens, forest officers and community groups in wild fire management/control techniques. Equipment purchase and training will be completed within 1 year.
Establish Inventory and Monitoring System	13.25	Additional information is required to accurately monitor and analyse the state of Jamaica's forests. The project will undertake field inventory work including comprehensive biodiversity baseline and forest land suitability studies over a 2-year period, in areas not completed by *Trees for Tomorrow Project*. The project will also produce new aerial photographs (ie, in year 2004) to enable monitoring of land use changes.
Protection Forest Acquisition	125.00	Large areas of unprotected closed broadleaf forest, and other forest types representing unique eco-systems have been identified. This 5-year project will purchase approximately 2500 hectares of lands containing such forests and declare them protected areas under an appropriate institutional mechanism.
Survey Existing Forest Reserve Boundaries	27.20	The boundary survey of forest reserves being undertaken by the CIDA-funded *Trees for Tomorrow* project covers only a portion of reserves under threat of encroachment (or already encroached upon). This project will extend the present survey to other critical areas by surveying an additional 300 km of most disputed boundaries.
Survey New Forest Reserve Boundaries	6.80	The NFMCP has identified a number of areas totalling nearly 1300 hectares for gazetting as forest reserves. The project will carry out 75 km of boundary survey and demarcation for the new forest reserves.
Produce Local Forest Management Plans for Forest Reserves	5.30	This project will extend the work of the *Trees for Tomorrow* project by providing an internationally recruited Land Use Specialist for one year to assist FD in preparing and implementing Local Forest Management Plans in the remaining critical emphasis areas.
Forest Policy Update	4.20	The *Trees for Tomorrow Project* will prepare an updated forest policy for presentation to the Minister. This project will support the public consultation process, if required, for the forest policy from Green Paper to White Paper.
Develop Public Awareness Programme	10.60	This project also builds on the work already completed through the *Trees for Tomorrow Project*. The project will fund a specialist in sustainable forestry education for 2 years who will continue to develop new programmes and to initiate, in collaboration with appropriate agencies, development of a forestry/environmental section to be included in the core school curriculum.

Proposed Development Project	Cost (J$ million)	Brief Description
Establish Nursery System	2.10	The FD's nurseries (Mt. Airy, Moneague, Williamsfield, and Clydesdale) will have to increase production to provide sufficient seedlings for the expanded reforestation programme proposed in the NFMCP. The project will support the rehabilitation of and equipment purchase for the four nurseries. Work will be completed within 6 months.
Restoring Mined Bauxite Lands with Trees	48.90	This 3-year applied research project will establish 5 tree growing systems to demonstrate their effectiveness in restoring mined bauxite lands. A methodology for installation, management and monitoring and evaluation will be developed (including assessment of areas disturbed by mining and mine access); and training provided to enable FD staff to work with mining companies and communities to continue and expand the restoration activities.
Develop Research Programme	3.63	FD has prepared a paper to identify and prioritise areas for forestry research. The project will contract the services of a forestry research development specialist for a 2 to 3-month period to develop specific research projects. The project will also provide one vehicle, two motorcycles and miscellaneous equipment to start up the research unit.
Mangrove Protection and Restoration	11.10	In recent years these important ecosytems have come under increasing threat as a result of urban development and unsustainable extraction rates (for charcoal production). This project will engage the services of, and provide equipment for a mangrove management specialist and a local counterpart to carry out a comprehensive biophysical inventory of the island's mangroves, and prepare a management plan, involving consultation with local communities, for their protection, restoration and utilisation. Work will be completed within 18 months.
Forest Land Use and CO_2 Sequestration	4.20	This short-term (3 to 4-month) project will fund a feasibility study to investigate how a carbon sequestration programme for Jamaica could be set up, and will include identification of potential sources of carbon credits as well as potential joint venture partners.
Forest Resource Valuation	7.95	A major drawback in convincing decision makers about the importance of forestry is the lack of information as to what our forests are worth. The project will provide for the services of a multidisciplinary international team, totalling 12 months of work, to place a value on the various components of the forest.
Survey Crown Land for Leasing	6.80	Approximately 2200 ha of forest reserves have been identified as suitable for leasing for private forestry investment. The project will provide the funding to enable surveying of boundaries for each lease. The surveys will be carried out over the 5-year period of the NFMCP.
Develop Extension Capability	30.80	The participatory forest management strategy proposed in the NFMCP requires field personnel with skills in community liaison and extension methods. This project will provide an extension training/community forestry specialist for each region for a period of 2 years to work alongside wardens and forest officers to provide hands-on (and classroom) training.
Support Community Projects Start-up	5.00	To encourage participation in local forest management, the NFMCP proposes that financial and technical assistance be provided to start up local income-generating activities, especially those based on non-extractive use of the forest resource. The project will assist about 10 enterprises each year over a 5-year period.

Proposed Development Project	Cost (J$ million)	Brief Description
Tree Growers' Associations	1.33	This project will fund the services of one or two persons who have had extensive involvement with tree growers' associations to assist local interest groups in the development, establishment, organisation and management of local associations. *Note: the project will likely draw on assistance of a programme such as Canadian Executive Services Overseas.*
Design and Establishment of Jamaica Forest Management and Conservation Fund	9.60	The project will design and set up the Jamaica Forest Management and Conservation Fund as a legally registered entity, and develop administrative and operational procedures. Strategies for Fund capitalisation will be identified and put in place. Overall implementation time is 2 years.
Yam Stick Market Study	9.50	This project will provide additional information for the development of an industrial forestry policy. The study will determine the number of sticks used annually, preferred species, coppicing ability, longevity, size, etc. of yam sticks. This is a 6-month project.
Fuelwood/Charcoal Studies	14.00	The lack of reliable data on the extent of forest extraction for fuelwood, charcoal production and yam sticks is hampering the development of a coherent industrial forestry policy. The project will provide personnel and equipment to carry out a socio-economic assessment and market survey, in selected areas, of fuelwood use and charcoal production. Elapsed time to completion is 1 year.
Develop Recreational Facilities	15.00	The project will provide funds over 5 years to build cabins for public recreational use at 3 forest reserves. A local NGO or CBO will be contracted to operate the sites on a concession basis.

19.4 Other Proposed Projects

Parallel to the preparation of the Forest Plan, the UNDP-funded *Forest Capacity (Bridging) Project* identified and prepared the following project proposals:

1. Restoring Mined Bauxite Lands with Trees
2. Design and Establishment of a Forest Fund for Jamaica
3. Fuelwood Use and Charcoal Production Market Study
4. Bamboo Audit and Conversion Technology Investigation to Determine the Potential for a Bamboo Industry in Jamaica
5. Pilot Project for Management of Forested Crown Lands for Yam Stick Production
6. Establishment of Fuelwood Plantations on Public Lands (Phase I)

The first three project proposals coincide with activities of the Forest Plan and they are already included in the implementation costs in Table 16 and the project descriptions in Table 17.

Brief descriptions of the remaining three project proposals are provided below:

Bamboo Audit and Conversion Technology Investigation to Determine the Potential for a Bamboo Industry in Jamaica: This 3-year project will investigate the potential for

developing a bamboo industry in Jamaica. The project will assess the existing bamboo resource; develop silviculture, harvesting and preservation techniques; investigate uses of bamboo; document growing and processing costs; undertake a review of its potential and demonstrate its use in low-cost housing; and prepare a plan of action of development of a bamboo industry. *Cost: Local component – US$280,000; Foreign component – US$1,130,000.*

Pilot Project for Management of Forested Crown Lands for Yam Stick Production: This 3-year technical assistance project is designed to develop appropriate forest management systems for the sustainable production of yam sticks to reduce the degradation of natural forests arising from the increasing cutting of yam sticks. The project will establish plantations of suitable fast-growing tree species and develop a management regime for each species. The project will also develop sustainable management systems for yam stick production from natural forests on a pilot basis. *Cost: Local component – US$484,000; Foreign component – US$2,099,000.*

Establishment of Fuelwood Plantations on Public Lands (Phase I): This 6-year community-based project is intended to demonstrate the feasibility of establishing fuelwood plantations which will be managed and utilised by the local charcoal-producing communities. Four – 50 hectare fuelwood plantations will be established in phases over a 5-year period near key charcoal producing areas. A collaborative approach involving community members will be taken to develop a system for "leasing" plots to local charcoal producers. Training will be provided to charcoal producers and Forestry Department staff in fuelwood plantation management. *Cost: Local component – US$486,500; Foreign component – US$2,656,500.*

These three projects were not included in the budget for implementation of the Forest Plan as there is flexibility in the scope and scale of their activities. However, the objectives of these projects address the stated goals and they will be promoted, alongside the Forest Plan, to prospective development partners for assistance with implementation.

GLOSSARY OF TERMS

afforestation	The establishment of a forest or plantation in an area where the preceding vegetation or land use was not forest – compare with "Reforestation".
agroforestry	A land use system that involves deliberate retention or introduction of trees in crop and animal production systems to benefit from their economic and ecological interactions.
biodiversity	The variety and abundance of life forms, functions and structures of plants, animals and other living organisms on earth. It includes genetic differences among species, the variety of species that live within a particular area (ecosystem) and the many such ecosystems or homes that exist on the planet.
biomass	**1.** *Ecology* The total dry organic matter at a given time of living organisms of one or more species per unit area (species biomass) or of all the species in the community (community biomass) **2.** The living or dead weight of organic matter in a tree, stand, or forest in units such as living or dead weight, wet or dry weight, etc. **3.** *Harvesting* the wood product obtained from in-woods chipping of all or some portion of trees including limbs, tops, and unmerchantable stems, usually for energy production.
board foot (bd ft)	The amount of wood contained in an unfinished board 1 inch thick, 12 inches long and 12 inches wide (2.54 cm x 30.5 cm x 30.5 cm).
carbon offset	The planting of trees on non-forested land such that the uptake of carbon dioxide from the growing trees will offset the production of carbon dioxide from industrial sources.
carbon sequestration	The incorporation of carbon dioxide into permanent plant tissues.
co-management agreements	The sharing of power, responsibility and benefits between the Government and resource users; provides a middle ground upon which the two can meet and co-operate.
community forest	A forest owned and generally managed by a community, the members of which share its benefits.
community forestry	Managing forests with the expressed intent of benefiting neighbouring communities. See also "social forestry".
cubic metre	A unit of volume that measures 1 x 1 x 1 metres, most often used for volumes of standing timber or otherwise unsawn timber.
database	A collection of data stored in a systematic manner such that the data can be readily retrieved, modified and manipulated to create information, most often computerised.
deforestation	The removal of a forest where the land is put to a non-forest use.
dendrology	A branch of botany devoted to the study of trees and their identifying characteristics.
ecosystem	A self-regulating natural community of living things interacting with one another and with their non-living physical environment.
ecotourism	Travel undertaken to sites or regions of unique natural quality, or the provision of services to facilitate such travel.

forest	An ecosystem characterised by a more or less dense and extensive tree cover, often consisting of stands varying in characteristics such as species, composition, structure, age classs, and associated processes, and may include meadows, streams, fish, and wildlife. Note that forests include special designations such as *industrial forests, non-industrial private forests, plantations, protection forests*.
forest inventory	A set of objective sampling methods designed to quantify the spatial distribution, composition and rates of change of forest parameters within specified levels of precision for the purposes of management.
forest reserve	An area designated under a forest act in which timber production is allowed but not conversion to agriculture or other non-forest uses.
forestry	The profession embracing the science, art and practice of creating, managing, using, and conserving forests and associated resources for human benefit and in a sustainable manner to meet desired goals, needs and values. Note the broad field of forestry consists of those biological, quantitative, managerial and social sciences that are applied to forest management and conservation; it includes specialised fields such as agroforestry, urban forestry, industrial forestry, non-industrial forestry, and wilderness and recreation forestry.
fuelwood	Wood used for conversion into some form of energy, eg, cooking fires, charcoal production, energy -generating plants.
greenbelt	A park-like strip of unoccupied land with little or no development, usually surrounding or partially surrounding urban areas.
greenhouse effect	The warming effect exerted by the atmosphere upon the earth because the atmosphere (mainly its water vapour and carbon dioxide) absorbs radiant energy from the earth and re-emits infrared radiation or heat.
hectare	Approximately 2.5 acres (approx. 25 squares).
inventory	See “forest inventory”.
LANDSAT™	(land satellite) One of a series of US satellites designed in 1972 to transmit multispectral images of portions of the earth’s surface to ground stations.
lumber	The sawn product from a tree – synonym is sawn wood.
natural forest	A forest in nearly natural condition, without any direct human intervention.
overstorey	That portion of the trees, in a forest of more than one story, forming the upper or upper-most canopy layer.
plantation forest	A forest or stand composed mainly of trees established by planting or artificial seeding.
reforestation	The re-establishment of forest cover either naturally or artificially. Note reforestation usually maintains the same forest type and is done promptly after the previous stand or forest was removed.
roundwood	A length of cut tree generally having a round cross section, such as a log.

silviculture	The art and science of controlling the establishment, growth, health and quality of forests to meet the diverse needs and values of society.
social forestry	Forestry programmes that purposefully and directly involve local people, their values and their institutions (also called development forestry, community forestry).
sustainable development	**1.** Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment & Development Report, 1987). **2.** Sustainable development is used to mean: improving the quality of human life while living within the carrying capacity of supporting ecosystems (IUCN, Caring for the Earth, 1991).
sustainable forest management	Practicing a land stewardship ethic that integrates the reforestation, managing, growing and harvesting of trees with the conservation of soil, air and water quality, wildlife and fish habitat, and aesthetics (UN Conference on Environment and Development, Rio de Janeiro, 1992).
timber	Wood, other than fuelwood, potentially useable for lumber.
tonne	1000 kg: in the context of "tonnes of fuelwood" in this document for air-dried hardwood, 1 tonne is approx. 1.38 cubic metres of wood.
understory	All forest vegetation growing under an overstory.
urban forestry	The art, science and technology of managing trees and forest resources in and around urban community ecosystems for the physiological, sociological, economic and aesthetic benefits trees provide society.
watershed	A region or land area drained by a single stream, river, or drainage network. Jamaica is divided into 26 Watershed Management Units (WMUs), and these may include one or more rivers (ie, WMUs may include one or more watersheds).
yam stick	A pole, usually wood or bamboo, of 3 to 4 metres in length and 6 to 8 cm in diameter, used in yam growing to support the above ground plant biomass in an upright position to enable the plant to obtain maximum sunlight for photosynthesis. A yam stick supports one plant.
<	Symbol for "less than"
>	Symbol for "greater than"

Glossary terms adapted from: *The Dictionary of Forestry* (1998, Society of American Foresters) and *The Global Biodiversity Strategy* (WRI, IUCN 1992)