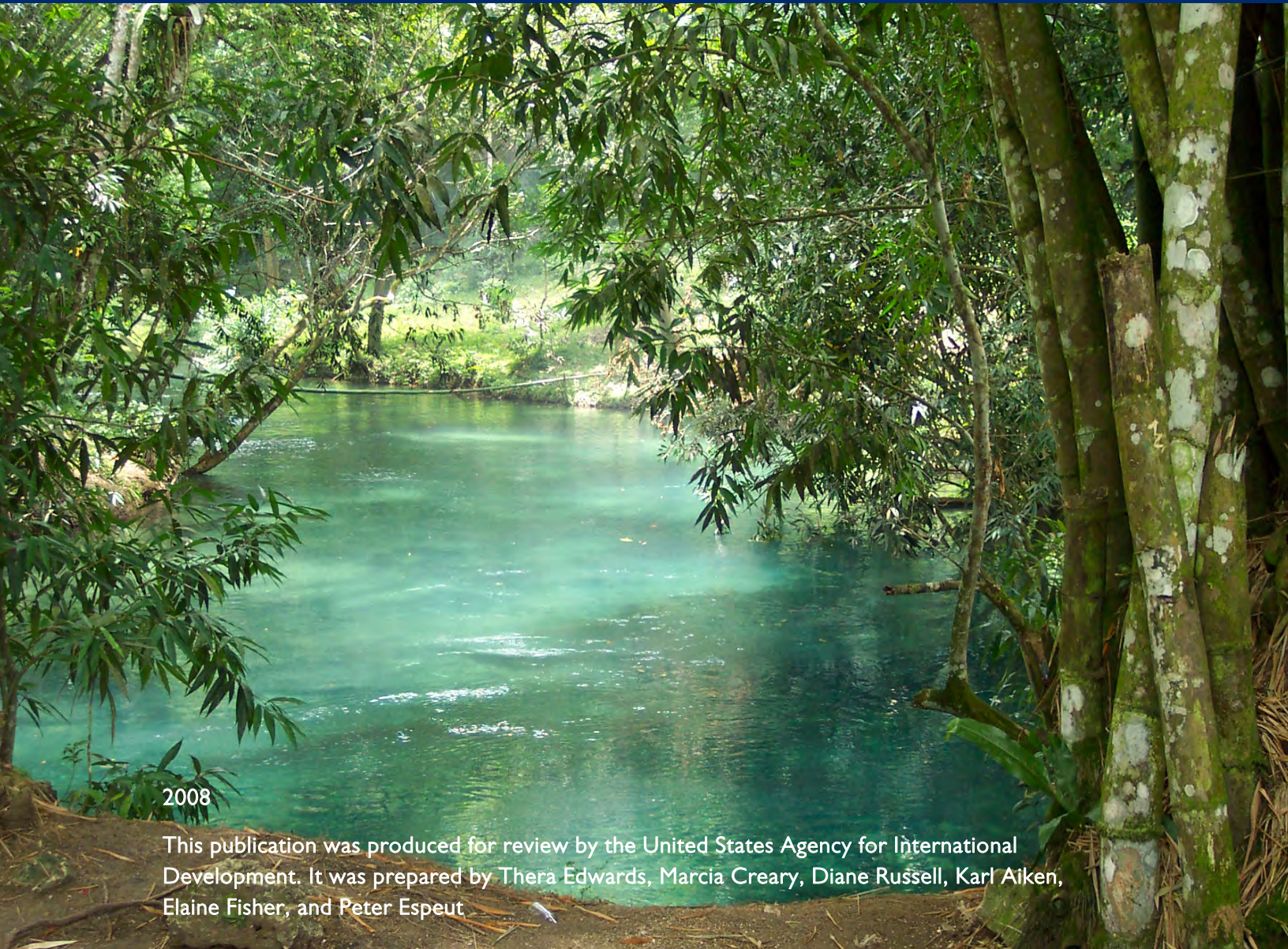




**USAID**  
FROM THE AMERICAN PEOPLE

# FAA 118/119 TROPICAL FORESTS AND BIODIVERSITY ASSESSMENT JAMAICA

(2008)



2008

This publication was produced for review by the United States Agency for International Development. It was prepared by Thera Edwards, Marcia Creary, Diane Russell, Karl Aiken, Elaine Fisher, and Peter Espeut



# FAA 118/119 TROPICAL FORESTS AND BIODIVERSITY ASSESSMENT REPORT FOR JAMAICA

2008

## DISCLAIMER

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

# CONTENTS

Contents	ii
List of Figures	v
List of Tables	vi
List of Acronyms	I
Executive Summary	6
Introduction	18
Purpose	19
Method	20
Status of Biodiversity	21
Ecosystem Diversity	21
Species Diversity	23
Threatened and endangered species	23
Species of special economic importance	24
Genetic Diversity	25
Ecosystem Services	26
Values and Economics of Biodiversity and Forests	27
Status of Forests	28
Coverage	28
Forest Diversity	28
Forest Species Diversity	31
Social, Economic and Political Context	33

Social and Economic Environment	33
Institutions, Policies, Laws affecting conservation	34
Institutions	34
Laws	36
Water Resources Act (1995)	37
The National Water Commission Act (1980)	38
The Natural Resources Conservation Act (1991)	38
The Natural Resources (Marine Parks) Regulations (1992)	38
The Natural Resources Conservation (Blue and John Crow Mountains) National Parks Regulations (1993)	38
The Exclusive Economic Zone Act (1991)	39
The Town and Country Planning Act (1958)	39
The Land Development and Utilisation Act (1966)	39
The Watersheds Protection Act (1963)	40
The Irrigation Act (2003)	40
The Forest Act, 1996 and Forest Regulations 2001	41
The Wild Life Protection Act (1945) and relevant amendment orders and regulations	41
The Country Fires Act (1942)	41
The Endangered Species (Protection, Conservation and Regulation of Trade) Act (2000)	42
The National Solid Waste Management Act (2001)	42
The Fishing Industry Act	42
The Beach Control Act (1956) and the Prescription Act	43
National policies and plans	43
National Irrigation Development Master Plan (1998)	43
The Forest Policy (2001)	44
Jamaica Water Sector Policy, Strategies and Action Plans (2000)	45
Vision 2030 Jamaica	45
National Strategy and Action Plan on Biological Diversity in Jamaica, 2003	46
Other Policies	46
Other Plans	46
Multi-lateral Environmental Agreements (MEAs)	47
Government, NGO, and Donor Programs and Activities	48
Government Activities	48
National Environment and Planning Agency	48
The Forestry Department	49
The Water Resources Authority	50
The Fisheries Division	51
Non-Government Organisations	52
The Nature Conservancy	52

Environmental Foundation of Jamaica	53
Fishing Cooperatives	54
Jamaica Coral Reef Monitoring Network (JCRMN)	54
University of the West Indies (UWI)	54
Jamaica Conservation and Development Trust	54
Bi-Lateral and Multi-lateral Initiatives	54
United States Agency for International Development (USAID)	54
Global Environment Facility (GEF)	55
United Nations Development Programme (UNDP)	56
European Union	56
Japan International Cooperation Agency (JICA)	56
Canadian International Development Agency (CIDA)	56
Regional Initiatives	57
Caribbean Sea Ecosystem Assessment (CARSEA)	57
Caribbean Regional Fisheries Mechanism (CRFM)	57
Integrating Watershed and Coastal Area Management (IWCAM) in the Small Island Development States (SIDS) project	57
Threats to Biodiversity and Forests and recommendations for Conservation	58
Direct Threats	58
Fresh Water Biodiversity	58
Climate Change	58
Tourism	59
Urban Development, Industry and Agriculture	59
Fishing Practices	59
Invasive Species	59
Indirect Threats and Root Causes	60
Actions Needed to Conserve Biodiversity	61
USAID Proposed Strategy & Program	70
Key Gaps and Opportunities identified in the FAA 118/119 Analysis	70
Recommendations for USAID/Jamaica	72
Sites	72
Principles and actions	72
USAID/Jamaica's New Country Assistance Strategy	74

2010-2014 Assistance Objectives for USAID – Jamaica	75
Extent to which proposed actions meet needs	77
Threats from Proposed Activities	77
Bibliography	79
Appendix 1: Critically Endangered Species – IUCN Red List	82
Appendix 2: Endangered species - IUCN RED List	85
Appendix 3. Forest Reserves of Jamaica by Parish	88
Appendix 4. List of Proposed Highest Priority Projects in the NBSAP and their Status	92
Appendix 5. Former and New Watershed Management Boundaries	93
Appendix 6. GEF Biodiversity Projects 2005-2008	94
Appendix 7. Team Biographies	99

## LIST OF FIGURES

Figure 1. Map of Jamaica	17
Figure 2. Bimodal rainfall pattern of Jamaica	18
Figure 3. Distribution of coral reefs within Jamaica's territorial waters	22
Figure 4. Coral cover at a various locations around Jamaica	22
Figure 5. Major banks of Jamaica	25

# LIST OF TABLES

Table A: Major Overarching Threats 9

Table 1: Economic valuation for the Ocho Rios Marine Park and Montego Bay Coral Reefs 27

Table 2. Definitions of forest cover and land use types at 1:100,000 mapping scale 29

Table 3: Biodiversity at Country level in Jamaica and selected Caribbean islands 32

Table 4: Forest Diversity in Jamaica 32

Table 5. Real GDP (Constant Factor Prices) 33

Table 6. Number of farmers disaggregated by farm size 34

Table 7. List of Legislation and policies related to forestry, watersheds and biodiversity 36

Table 8. Summary of Threats to Watersheds and Forestry Resources 62

Table 9. Summary of threats to coastal and marine resources and proposed actions to address these threats 64

Table 10. Summary of threats to fisheries resources 65

Table 11. Summary of threats to freshwater biodiversity and proposed actions to overcome these threats 67

Table 12. Summary of threats to terrestrial biodiversity and proposed actions to overcome these threats 69

# LIST OF ACRONYMS

ACIJ	African Caribbean Institute of Jamaica
AGRRA	Atlantic and Gulf Rapid Reef Assessment
BB	Banana Board
BCH	Biodiversity Clearing House
BOD	Biological Oxygen Demand
BJCMNP	Blue and John Crow Mountains National Park
CABI	Commonwealth Agricultural Bureau International
CARICOM	Caribbean Community
CARICOMP	Caribbean Marine Productivity Program
CARSEA	Caribbean Sea Ecosystem Assessment
CAS	Country Assistance Strategy
CBD	Convention on Biological Diversity
CBO	Community Based Organization
CCAM	Caribbean Coastal Area Management Foundation
CCCCC	Caribbean Community Climate Change Centre
CCDC	Caribbean Coastal Data Centre
CDB	Caribbean Development Bank
CIB	Coffee Industry Board
CIDA	Canadian International Development Agency
CITES	Convention of the International Trade in Endangered Species
CFRAM	CARICOMP Fisheries Resources Assessment & Management Project
CLME	Caribbean Large Marine Ecosystem
CMA	Caribbean Marine Atlas
CMS	Centre for Marine Sciences
CoIB	Cocoa Industry Board
CoML	Census of Marine Life
CRFM	Caribbean Regional Fisheries Mechanism

DNA	Deoxyribonucleic Acid
EEZ	Exclusive Economic Zone
EFJ	Environmental Foundation of Jamaica
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EU	European Union
FAA	Foreign Assistance Act
FAD	Fish Attracting Devices
FAO	Food and Agriculture Organisation of the United Nations
FD	Forestry Department
FiD	Fisheries Division
FIP	Fisheries Improvement Project
FOS	Friends of the Sea
GEF	Global Environmental Facility
GDA	Global Development Alliance
GOJ	Government of Jamaica
HACCP	Hazard Analysis and Critical Control Points
IN	IABIN Invasive Information Network
IABIN	Inter-America Biodiversity Information Network
IAS	Invasive Alien Species
ICCAT	International Convention on the Conservation of Atlantic Tuna
IDB	Inter-American Development Bank
IDRC	International Development Research Centre
IOC	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data and Information Exchange
IOJ	Institute of Jamaica
IPCC	Inter Governmental Panel on Climate Change
IUCN	International Union for the Conservation of Nature
IWCAM	Integrated Watershed and Coastal Area Management
JaNEAP	Jamaica National Environment Programme and Action Plan

JAS	Jamaica Agricultural Society
JCDT	Jamaica Conservation and Development Trust
JCRAP	Jamaica Coral Reef Action Plan
JCRMN	Jamaica Coral Reef Monitoring Network
JET	Jamaica Environment Trust
J-PAN	Jamaica Protected Areas Network
KMA	Kingston Metropolitan Area
LAC	Latin America and the Caribbean
LFMC	Local Forest Management Committees
MA	Millennium Ecosystem Assessment
MACC	Mainstreaming Adaptation to Climate Change
MBMPT	Montego Bay Marine Park Trust
MEA	Multilateral Environmental Agreements
MTF	Medium Term Socio-economic Framework
MHE	Ministry of Health and Environment
MLGE	Ministry of Local Government and Environment
MoA	Ministry of Agriculture
MOU	Memorandum of Understanding
MGD	Mines and Geology Division
MMT	Ministry of Mining and Telecommunications
MPUT	Ministry of Public Utilities and Transport
MTW	Ministry of Transport and Works
MWH	Ministry of Water and Housing
NCRPS	Negril Coral Reef Preservation Society
NCSA	National Capacity Self Assessment
NEGAR	National Eco-Regional Gap Assessment
NEPA	National Environment and Planning Agency
NBSAP	National Biodiversity Strategy and Action Plan
NEPT	Negril Area Environmental Protection Trust
NGO	Non - Government Organization

NHD	Natural History Division (IOJ)
NIBJ	National Investment Bank of Jamaica
NIC	National Irrigation Commission
NIDP	National Irrigation Development Plan
NLA	National Land Agency
NPA	National Programme of Action
NPV	Net Present Value
NRM	Natural Resources Management
NWA	National Works Agency
NWC	National Water Commission
PA	Protected Area
PARE	Protected Areas and Rural Enterprise Project
PEPA	Portland Environmental Protection Association
PES	Payment for Environmental Services
PIOJ	Planning Institute of Jamaica
RADA	Rural Agricultural Development Authority
REACT	Rural Enterprise, Agriculture and Community Tourism Project
REDD	Reduction in Emissions from Deforestation and Forest Degradation
SPAW	Protocol Concerning Specially Protected Areas and Wildlife to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region
TFC	The Forest Conservancy
TNC	The Nature Conservancy
TPDCO	Tourism Product Development Company
TRA	Threat Reduction Assessment
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
USDA	United States Department of Agriculture

UWI	University of the West Indies
WMU	Watershed Management Unit
WRA	Water Resources Authority
WUA	Water Users Association

# EXECUTIVE SUMMARY

The purpose of this assessment was to

- 1) help USAID/Jamaica comply with country analysis requirements set out under the Foreign Assistance Act, Sections 118(e)<sup>1</sup> and 119(d)<sup>2</sup> for tropical forest and biodiversity, and
- 2) make recommendations to USAID/Jamaica on program opportunities that address conservation in a cross-sectoral context in its new 5-year Country Assistance Strategy (CAS) as well as ongoing program decisions.

To carry out the assessment, a team of six persons was assembled: Ms. Thera Edwards, Team Leader and lead author for watersheds and forestry; Dr. Marcia Creary, marine and coastal issues; Dr. Karl Aiken, fisheries; Dr. Elaine Fisher, biodiversity; Peter Espeut, livelihoods, protected areas and fisheries; Dr. Diane Russell, editor and advisor on USAID/Jamaica options and recommendations. Except for Dr. Russell, all the consultants are local experts in the field with many years of experience. The assessment builds on a previous analysis of threats to biodiversity and program options for USAID/Jamaica (Russell, Edwards and Clarke, 2006) as well as a 2007 assessment of USAID/Jamaica's programs for fit with USAID's biodiversity code requirements (Russell, 2007). The last formal 118-119 analysis was carried out in 2005 by Chemonics (Catterson, Gardner and Huth, May 2005).

Information for this assessment mainly draws on existing literature and key informant interviews. However, Dr. Russell visited two project sites that she had not previously visited: Cockpit Country, where the Protected Areas and Rural Enterprises (PARE) project led by the US Forest Service (USFS) in collaboration with The Nature Conservancy (TNC) supports Local Forest Management Committees (LFMCs) in small enterprise and management actions, and sites in the foothills of the Blue and John Crow Mountains where JA FARMS (Jamaica Farmers Access to Regional Markets) works with local farmers groups and cooperatives to move farmers into high value and protected agriculture and off the slopes and buffer zone of the Blue and John Crow Mountains National Park (BJCMNP).

## Overview

**Jamaica is a fragile and vulnerable island that contains spectacular landscapes and globally important biodiversity.** For example, Jamaica is rated fifth in islands in terms of endemic

---

<sup>1</sup> For tropical forests, Section 118(e) of the FAA requires that "Each country development strategy statement or other country plan prepared by the US Agency for International Development shall include an analysis of (1) The actions necessary in that country to achieve conservation and sustainable management of tropical forests, and (2) The extent to which the actions proposed for support by the Agency meet the needs thus identified."

<sup>2</sup> Similar language exists for biodiversity conservation in FAA Section 119(d): "Country Analysis Requirements. -- Each country development strategy statement or other country plan prepared by the US Agency for International Development shall include an analysis of (1) the actions necessary in that country to conserve biological diversity, and (2) the extent to which the actions proposed for support by the Agency meet the needs thus identified."

plants. There is also a high level of endemism for many species of animals including land snails (505), insects (butterflies (20)), terrestrial grapsid crabs (9), amphibians and reptiles (55) and land birds (26). Of the 3,304 species of vascular plants that occur in Jamaica, 27.9% are endemic. Jamaica's exclusive economic zone, which is 27 times that of its terrestrial area and contains extremely valuable fisheries, presents both challenges and opportunities. In addition, its topography of steep mountains and streams flowing into the sea means that there is a tight connection between terrestrial, coastal and ocean management.

**The island and its marine territory face numerous direct and immediate threats** such as increased bauxite mining, severe weather damage and destruction of native habitat and species by alien invasive species, sedimentation and pollution from inland sources including agricultural run-off, coastal development and overfishing. Longer term threats include the impact of climate change on habitats and species and revenue losses from degradation and depletion of resources. The Caribbean has shown an increasing trend in temperature and extreme rainfall events and Jamaica is expected to experience a 2°C rise in temperature by about 2050 as well as more extreme rainfall conditions. Root cause threats include high levels of debt service, leaving few resources and little flexibility in government coffers, and planning processes that emphasize growth on vulnerable coastlines and other fragile areas at the expense of sound environmental management. Land ownership and use patterns involve structural inequities that exacerbate rural poverty and likely lead to environmental degradation.

#### **Jamaica's flora and fauna contribute significantly to the island's economy.**

Tourism remains the major foreign exchange earner for this island nation so marine and terrestrial ecosystems on which tourism depends must be valued and sustained.

In the terrestrial domain, high value coffee and to a certain extent cocoa are key export earners. Jamaican Blue Mountain is an exclusive brand that is among the most expensive coffees in the world. Cocoa involves about 5,000 farmers at present but they receive a small share of the market price, according to the recent cocoa evaluation. These crops and other agricultural products such as bananas depend on climate, soils, water and vegetative buffers against wind damage. Non-timber forest and gathered products of value include nutmeg, bull thatch (an endemic palm) and herbal products and ingredients for "roots drinks".

Species of special economic importance include timber species such as mahogany, cedar, mahoe and lignum vitae. Jamaica's Forestry Department earned almost \$US6m in 2006 with little marketing (timber licenses, sales) and they could earn much more with expansion of the private planters program and more targeted marketing programs. At the local level, with new policies and capacity building, LFMCs are poised to earn income and increase their capacity for local governance. One species alone, the Yellow Billed Parrot, has been valued at a total \$50m for the whole population; 200 per year can be sustainably harvested for an annual return of \$1m without discounting for future value.

In the marine domain, a living, viable and healthy coral reef is critical to both the tourism and fishing industries. Both regionally and nationally the Pedro Bank is an important commercial, biological and historical area. It represents Jamaica's main commercial and artisanal fishing grounds and serves as the primary harvesting area for the largest export of Queen Conch from the Caribbean region. Queen Conch is endangered according to the Convention on International Trade in Endangered Species

(CITES). Jamaican conch exports have in the past generated more foreign revenue than Blue Mountain coffee.

**Environmental services are also extremely valuable to Jamaicans.** These services include maintaining watersheds and wetlands for water quality and flood control, soil fertility for agricultural production and biodiversity including fisheries for economic and use value. For instance, mangroves offer protection from flooding and hurricanes. They soak up excess water and slowly release it. Mangroves also block the force of strong winds caused by hurricanes and storms and protect Jamaica's seas from becoming contaminated with land-based pollutants, as they filter the water running off from the land before it enters the sea. The Buff Bay/Pencar watershed alone was valued at \$60.3m for services and products produced.

Coastal ecosystems offer critical shoreline stabilization services. Coral reefs protect Jamaica's coastline, particularly beaches from coastal erosion by waves and storm surges, while mangroves and seagrasses help to bind marine and terrestrial sediments, reducing coastal erosion while maintaining clear water quality for offshore reefs and for recreational use.

New strategies for sustaining environmental services in Jamaica include conservation easements, a private planters program and organizing LFMCS to manage forests in return for benefits. The strategy of NGOs managing protected areas (PAs) is hotly debated and hard data is needed to guide decisions, including issues of tourism fees, capacity of NGOs and government and the potential for public-private partnerships. In any case, it is clear that PAs and biodiversity in general could generate considerably more revenue and benefit more of the rural population than they do at present. While only 8 out of 16 proposed parks and PAs have been actually established, the ecosystem values of the candidate areas—including their function as habitat for endangered biodiversity—are still largely intact, although the threats to ecosystem integrity from unsustainable use and inappropriate development have increased.

**Jamaica's GDP is now largely centered on services and industry;** however tourism delivers few benefits to most Jamaicans despite accounting for 45% of foreign income. Remittances and bauxite are the other two largest foreign exchange earners. Traveling beyond the well-manicured zones around Montego Bay and other tourist areas, one sees a landscape of neglect, poverty and decline. While the major corridors are being rehabilitated, little is being done to improve agricultural feeder routes; waterways and beaches are littered with trash and few well managed small farms are visible. Jamaicans are hardworking and keen to increase investment at both the local and national levels however a culture of government giveaways and uncertain economic prospects leads smallholders to mainly invest in real estate or trade enterprises rather than in productive assets. It is ironic that one of the most profitable rural enterprises, jerk barbecue, entails using firewood and charcoal that are unsustainably harvested.

**The Jamaican government's concerns center around the linked problems of poverty reduction and violence prevention.** The violence problem is a threat to tourism and other industries and is linked to youth unemployment as well as factors such as drugs, gangs and guns. Poverty is a persistent problem despite Jamaica's relatively large middle class, its robust Diaspora and its highly valuable industries. The cost of imported food is increasing concerns about food security in Jamaica. An additional grave problem is severe weather events, which damage and destroy infrastructure, necessitating costly repairs, harm tourism, agriculture and other industries.

**Key considerations for poverty reduction** include potential for job creation, opportunities for youth, contribution to food security and revenue generation potential for smaller-scale actors. At present, the agriculture sector absorbs the most labor in rural areas. Service industries such as call centers are increasing in importance in urban areas. Tourism will continue to be a key economic driver depending on the impact of world financial markets, violence and natural disasters. Bauxite mining is also growing in importance. **All of these sectors have potential to contribute to both poverty reduction and biodiversity conservation.**

**Biodiversity and forestry can make major contributions to food security.** Fisheries, both freshwater and marine, contribute greatly to food security and income generation. Forestry and agroforestry systems include fruit trees, ackee and other valuable products. Beyond immediate food crises, food security tends to be more about increasing overall rural growth and options than increasing production in staple crops as staple crops typically are not high revenue earners. However a diversified portfolio that includes high value tree crops as well as staples that can be sold commercially buffers risk. Longer term, the aim must be to increase investment in productive assets, factoring in the importance of remittances and Diaspora investment.

**Peace and security**, including violence prevention and longer term conflict management are intimately related to management of land and natural resources. Historical land inequities resulted in a dual system of large scale plantations contrasted with very small holdings and many squatters. Over 90 percent of all farms had four hectares or less. Farms having more than 20 hectares contain 43 percent of total cultivated land. This pattern resulted in large scale population movement overseas and into cities and towns creating the problems we see now. The situation of weak marine management, which intersects with drug and gun running, is dire as the Government of Jamaica (GOJ) does not have the resources to patrol these areas. There is an assumption that jobs for youth will diminish violence however informants say that violence is now related to the spread of gangs and is moving outward to suburbs and towns. Community-based solutions such as the LFMCS, community tourism and strengthening farmer groups that build pride of place within rural areas could help to contain the spread of this violence.

**Disaster management** involves planning for future weather events and not just reacting to each one. Clearly environmental management is key to a disaster strategy. Management steps include protection and restoration of mangrove and wetland areas, management of slopes and waterways for flood and erosion control and limitations to beach and sea grass clearing. In addition, steps to restore coral reefs and other natural barriers that protect beaches need to be taken.

### Threats to biodiversity and tropical forests

The team identified multiple threats to Jamaica’s different ecosystems as well as a number of root cause threats that relate to management, policies and overall situation of the country. This table below summarizes the major overarching threats.

TABLE A: MAJOR OVERARCHING THREATS

DIRECT THREATS	IMPLICATIONS & IMPACTS	ACTORS INVOLVED
Increased bauxite mining especially in Cockpit Country; increasingly also sand and	Loss of habitat and species Clogging rivers and streams:	Large mining companies, NGOs such as TNC, PARE

TABLE A: MAJOR OVERARCHING THREATS

DIRECT THREATS	IMPLICATIONS & IMPACTS	ACTORS INVOLVED
gravel mining	loss of ecosystem function	project, LFMCs
Climate change	Loss of valuable species; potential for huge economic losses with sea level rises; changes in species composition and die-off	International and national actors involved in both mitigation and adaptation, Forestry Department, coastal agencies and actors
Hurricanes and severe storm events	Loss of valuable species; economic losses from degradation	Disaster agencies; tourism agencies and private sector; farmers
Land clearing, erosion and degradation including “enclave tourism”	Loss of habitat and environmental services	Tourism agencies; private sector; farmers; NEPA
Alien invasive species	Marine: Indo-pacific lionfish is a predator potentially harmful to humans; destroy native species, contribute to coral die-off  Terrestrial threats such as bamboo and white ginger degrade habitats and outcompete native species	Tourism actors, fishers, forestry actors, farmers
Terrestrial threats such as bamboo and wild ginger degrade habitats and outcompete native species	Loss of biodiversity and ecosystem integrity	Forestry actors; farmers
Limited valuation and knowledge of value of biodiversity	Poor planning and decision-making  Undervaluing of ecosystem services and species	Scientists, policymakers, donors, communities

Specific threats to freshwater biodiversity include:

- Nutrient loading from small and large scale agriculture, malfunctioning of sewage plants and septic pits
- Competition of invasive species
- Deforestation and removal of riparian vegetation

- Overharvesting of freshwater biodiversity

Specific threats to terrestrial biodiversity in Jamaica include:

- Habitat conversion
- Habitat degradation such as the harvesting of wood for charcoal
- Overharvesting of terrestrial biodiversity
- Competition of invasive species
- Bird shooting
- Removal of trees
- Fires
- Solid waste
- Ground water pollution from pit latrines

Specific threats to coastal biodiversity include:

- Tourism and poorly planned coastal development
- Mangrove harvesting
- Severe weather

Specific threats to marine biodiversity include:

- Diseases and die-offs
- Alien invasives
- Overfishing and fishing practices
- Anthropogenic underwater noise
- Foreign offshore poaching of conch and lobster
- Weak enforcement
- Climate change and associated effects

Specific threats to tropical forests include:

- Encroachment from farming and informal settlements
- Fire

- Alien invasives (bamboo, white ginger)
- Yamstick harvesting
- Charcoal making

### **Indirect threats and root causes of biodiversity loss and forest degradation**

- Lack of legislation and incomplete legislation
- Poor enforcement of laws and regulations
- Land policies and practices including inequities in land distribution, squatters
- Insufficient monitoring; inadequate data and collection protocols; inadequate staffing of agencies responsible for enforcement and monitoring
- Insufficient financial resources for conservation and sustainable forestry (although sustainable forestry should be able to pay more of its costs and tourism could contribute a lot more)
- Lack of understanding of the consequences of biodiversity loss to the island as a whole and links between biodiversity conservation and other national goals
- Lack of a management plan for the protected area and lack of formal agreements to manage the reserves
- Debt service
- Conflicting agency mandates (e.g., National Environment and Planning Agency's dual function to issue building licenses and environmental regulation)

### **Key gaps and opportunities**

USAID is mandated to consider the threats to biodiversity and forests presented above in its planning, as well as gaps and opportunities based on this threat analysis. Note that these gaps and opportunities do not have to be addressed directly by USAID; the next section will deal with recommended USAID actions. However, even if USAID does not address the threats directly, USAID activities should not contribute to threats either directly or indirectly. Thus strategies such as the promotion of biofuels that may involve clearing forest or increases in root crop production where over-harvesting saplings for yam-stakes are a threat to forests (such as in Cockpit Country), must be carefully considered. Coffee and cocoa production can also be harmful to forests, thus environmentally friendly production systems should be supported.

Key gaps and opportunities based on the analysis include:

- Improve marine and fisheries management for food security and conservation, including help to implement national policies, reduce and redirect fishing effort and boost enforcement.
- Fill gaps in protected areas (PAs) and in management plans for PAs. Gaps have been identified for terrestrial, freshwater and marine ecosystems. Freshwater gaps identified in the

report include large rivers, wetlands, ponds and lakes as well as freshwater caves that occur in the eastern part of the island and high-altitude streams in the western part that have no representation in any of Jamaica's protected areas. Also of concern is the design of current protected areas that do not account for the longitudinal (or linear) continuity of freshwater systems from high to low altitudes.

- Invest in PA policy and management, focusing on sustainability (e.g., payments for environmental services approaches, targeting tourism revenues). Some local non-government organizations (NGOs) and CBOs have been involved in the co-management or management of protected areas. However not all have been successful. The NGO, Jamaica Conservation and Development Trust, has been very successful in the management of the Blue and John Crow Mountains National Park, however, the financing of the protected areas has been challenging for some NGOs. There is now a move by government to reduce or eliminate the role of NGOs in managing PAs but it is unclear if this will be played out and if so how government will fill the gap.
- Develop synergies among agencies involved in the use of biodiversity such as Jamaica Trade and Invest, Team Jamaica, Tourism Product Development Company (TPDCO) and the Ministry of Tourism, the Jamaica Bauxite Institute, the Ministry responsible for Development and the biodiversity agencies such as the Fisheries Division, Forestry Department and NEPA. Biodiversity concerns are still not integrated in the policies of the public sector entities.
- Increase the contribution of tourism to local populations and the environment (e.g., recycling tourism revenue and expanding tourism base). Link this to the Convention on Biological Diversity (CBD) and National Biodiversity Strategy and Action Plan (NBSAP) section on how tourism can contribute to poverty reduction and conservation.
- Improve disaster management and buffer shocks through improved environmental management of coasts, reefs and upland watersheds.
- Link income generation/poverty reduction to community based strategies for environmental management such as forest and fisheries management.
- Support emerging co-management approaches. For example, there is recently a distinct move away from the largely failed top-down managerial approach to co-management and community-based fisheries and forest resource management. Learn lessons from the several NGOs that have attempted to undertake fisheries management with various levels of success. Bring in lessons from outside of Jamaica on community forestry and decentralized natural resource management.
- Engage the private sector and Diaspora in environmental actions that involve direct investment, planning and marketing of environmentally sound destinations, enterprises and products.
- Help the GOJ and partners prepare for REDD (Reduction in Emissions from Deforestation and Forest Degradation), as UN climate change negotiations move towards this powerful new mechanism for compensating tropical countries for their nation-wide reductions of greenhouse gas emissions from deforestation and forest degradation. Key needs are to integrate biodiversity concerns into mechanisms designed to reduce greenhouse gas

emissions and to assure that forest users and dwellers benefit from these mechanisms. LFMCS in Jamaica could become key stewards and beneficiaries.

GOJ institutions, donors and other investors that can fill gaps include:

- National Environmental and Planning Agency (NEPA)
- The Forestry Department – now an executive agency, responsible for forests
- The Fisheries Division – responsible for fisheries management
- The Institute of Jamaica – through its Natural History Division (NHD) and to a lesser extent the African Caribbean Institute of Jamaica (ACIJ). The NHD is responsible for the Mason River Protected Area and the national collections of flora and fauna. The ACIJ is responsible for protecting the nation's oral heritage, including traditional knowledge.
- The Office of the Prime Minister (OPM), Ministry responsible for the Environment

Other institutions involved in biodiversity and forest conservation include the UN agencies: United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP), the World Bank, USAID, Canadian International Development Agency (CIDA), the European Union (EU) and a number of local NGOs and community-based organizations (CBOs). Potential partners could include the Jamaica Bauxite Institute, University of the West Indies, and tourism agencies including private sector actors and associations.

The international NGO, The Nature Conservancy, has been very involved in the conservation of biodiversity. It has developed a number of initiatives and partnered with the Jamaican government in a debt-for-nature swap resulting in the Tropical Forest Conservation Fund.

## **Recommendations for USAID/Jamaica**

### **Sites**

It is recommended that USAID/Jamaica retain a focus (not necessarily exclusively) around PAs, especially Cockpit Country and the Blue and John Crow Mountains (BJCM) to enable activities to meet both poverty reduction and biodiversity objectives. Keeping the focus on a couple of areas would increase USAID's impact as in the past there was concern over too much spread. Also there has been clear threat analysis at both these sites so planning for biodiversity actions is facilitated.

Working in and around PAs has multiple benefits. Because effective natural resource management (NRM) within PAs leads to enhancement of the natural resources they contain, this will automatically lead to increased yields of economically valuable species, e.g. in fisheries and forestry. Effective natural resource management (NRM) within marine protected areas will inevitably lead to sustainable fisheries and increased incomes for fishers. Consultants to the South Coast Sustainable Development Study (1999) projected that if the fisheries on Jamaica's south coast were sustainably managed, over the long term the lobster catch would increase by 16%, the finfish catch would increase by 190%, and the conch catch would increase by 2,600%. There is an intrinsic relationship between effective NRM within PAs on the one hand and rural development and poverty alleviation (sustainable development) on the other.

It is understood however that Jamaica is a small island and that opportunities and issues can emerge that must be addressed. In addition, depending on the type of funds available (earmarked or non-earmarked) it would be ideal to plan activities that could be carried out in both biodiversity and non-biodiversity priority areas. For example, some protected or high value agriculture could be supported in and around PAs but also in high potential areas where there are active farmers groups. These groups could be networked.

### **Principles and actions**

Given the need to focus and be strategic with reduced resources, the following principles and actions are recommended because they align with the emerging strategy and build on USAID/Jamaica's comparative advantage while also addressing threats and gaps outlined above.

Guiding **principles** may include:

1. Supporting environmentally sound and profitable community based enterprises and increasing governance abilities and technical capacity of local managers for enterprise and environmental management.
2. Assuring that attention to Jamaica's fragility, vulnerability and biodiversity value are integrated into all activities. Integrate monitoring for impact on biodiversity and tropical forests into all activities; this would go hand in hand with planning and monitoring for disaster risk and vulnerability reduction.
3. Taking an "honest broker" and convener role with stakeholders to provide knowledge, lessons, information and data for decision-making especially in contentious arenas such as decentralization/local management and environmental policies and enforcement.

Specific **actions** could include:

- Support policy processes that promote sound decentralized management of key assets such as forests, commodities (coffee, cocoa) and PAs (Portland Bight model). This is not at all an easy path because decentralization in the short term can lead to poorer management if systems are not put into place to clearly outline and enforce roles and responsibilities. USAID has considerable experience in supporting decentralization of NRM and also of dismantling marketing boards in favor of a market based/private-sector led approach. A key lesson is there is a need to simultaneously build the capacity of local groups, private sector associations, institutions or governments to manage while also moving to give them more power and control. Confusion and conflict over roles and responsibilities leads to poor management.
- In conjunction with the point above, continue support to community based groups such as LFMCS and successful farmer cooperatives; monitoring the links from these investments back to rural investment and conservation. Support networking groups into associations for larger-scale impact. Link enterprise development with co-management of forests and protected areas. Link groups to microenterprise credit sources as appropriate.

- Engage agriculture, rural development, forestry and protected area actors in active dialogue to craft technologies and approaches to boost smallholder agricultural productivity and revenue while improving protection of natural areas.
- Provide technical assistance to farmers, GOJ and NGO actors on integrated agroforestry options for improved productivity and environmental benefits, including assistance on how to integrate tree crop production with conservation. These technologies could include diverse cocoa agroforestry systems, windbreaks and riverine buffer strips to reduce disaster risk and nursery management to increase tree diversity and raise incomes from seedling sales. Test technologies for natural forest regeneration suited to Jamaica that may be more efficient and effective than tree planting.
- Prepare a detailed disaster recovery plan that includes ways in which natural resource management must be improved to reduce risk and vulnerability. USAID/LAC and DCHA are actively involved in such planning at present. Convene other donors in this planning process to assure coverage of gaps and opportunities.
- Provide training and bring in lessons in co-management skills to natural resource managers (and government functionaries) to increase the potential for success in biodiversity conservation.
- Use Jamaica's biodiversity as a centerpiece for educational initiatives, going beyond "environmental education" and into field-based activities at all educational levels. Put an emphasis on practical science training that can be linked to jobs in the tourism, fisheries or forestry sectors.
- Support trade initiatives that boost environmentally friendly products and sectors, for example bird-friendly coffee and organic or low-input cocoa.

For the longer term:

- Consider technical assistance to the GOJ on payments for environmental services (PES) approaches as well as farmer-led environmental management approaches such as LandCare (Jamaica already has some links to the International LandCare movement).
- Reach out to the mining sector through a Global Development Alliance (GDA) with options such as biodiversity offsets, which can add value to the sector both environmentally and in engaging community participation in offset planning.
- Engage the private sector and Jamaican Diaspora on community tourism and sustainable protected areas through ecotourism, donations, enterprises and trust funds.
- Work with Coast Guard and the US Navy to develop security strategies for the Pedro Cays and other vulnerable marine areas and fisheries.
- Support natural resource valuation and efforts to integrate the value of NRM and biodiversity conservation into national budgets.

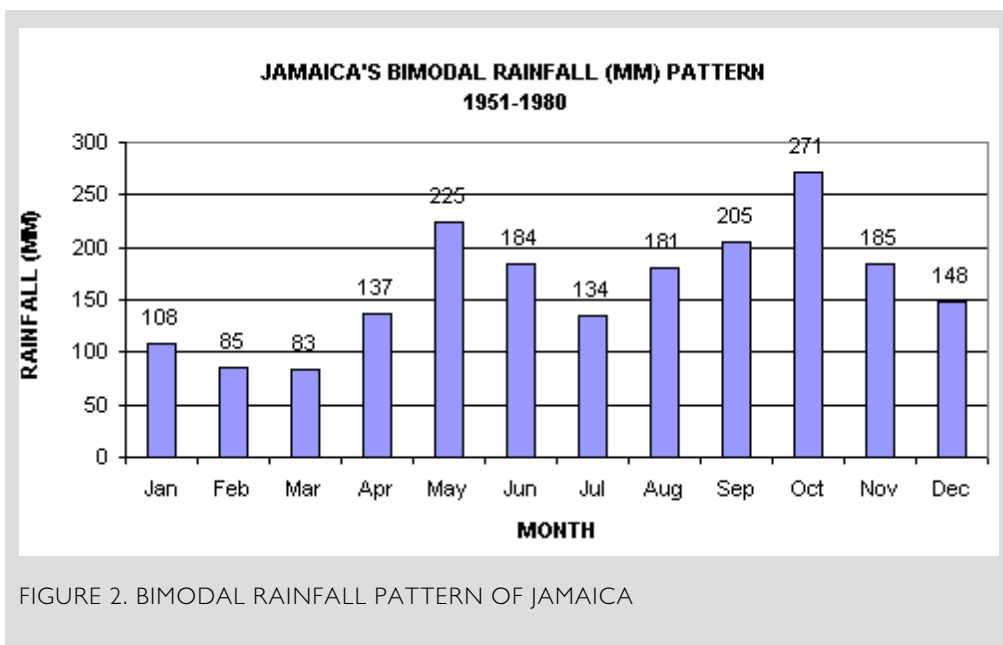


FIGURE I. MAP OF JAMAICA

(sourced from [http://www.lib.utexas.edu/maps/americas/jamaica\\_rel\\_2002.jpg](http://www.lib.utexas.edu/maps/americas/jamaica_rel_2002.jpg))

# INTRODUCTION

Jamaica has a total area of 10,990 km<sup>2</sup> and an Exclusive Economic Zone (EEZ) of 298,000 km<sup>2</sup> giving an EEZ to land ratio (land km<sup>2</sup>: EEZ km<sup>2</sup>) of 1:27 and a coastline to land ratio (coast km: land km<sup>2</sup>) of 1:12. The climate is a tropical maritime climate influenced by northeast trade winds and land and sea breezes. Mean daily temperature ranges from a seasonal low of 26° C in February to a high of 30° C in August. On average, the temperature changes by 2°C with every 300 m change in altitude. The topography rises to its highest extent in the eastern section of the island with the highest point in the Blue Mountains at 2,290 m. Most of the island is over 300 m with steep slopes giving rise to short, fast-flowing rivers. Seventy percent (70%) of the island's surface area is covered by limestone while the remaining 30% is covered by igneous and metamorphic rock, shale, and alluvium cover. The central and western parts of the island are mainly limestone hills and plateaux with well-developed karst in the Cockpit Country. The country can be divided into three landform regions: the eastern mountains, the central valleys and plateaux, and the coastal plains. Two types of climate are found on Jamaica. An upland tropical climate prevails on the windward side of the mountains, whereas a semiarid climate predominates on the leeward side. Warm trade winds from the east and northeast bring rainfall throughout the year. There is a bimodal rainfall pattern with peaks in May and October. The rainfall is heaviest from May to October, with peaks in those two months. The average rainfall is 196 cm/year. Rainfall is much greater in the mountain areas facing the north and east, however. Where the higher elevations of the John Crow Mountains and the Blue Mountains catch the rain from the moisture-laden winds, rainfall exceeds 508 cm per year. Since the southwestern half of the island lies in the rain shadow of the mountains, it has a semiarid climate and receives fewer than 762 mm of rainfall annually.



## PURPOSE

The purpose of this assessment was to 1) help USAID/Jamaica comply with country analysis requirements set out under the Foreign Assistance Act, Sections 118(e)<sup>3</sup> and 119(d)<sup>4</sup> for tropical forest and biodiversity, and 2) make recommendations to USAID/Jamaica on program opportunities that address conservation in a cross-sectoral context in its new 5-year Country Assistance Strategy (CAS) as well as ongoing program decisions.

For clarification the key elements of the biodiversity code, the FAA sections, components of the analysis as well as definitions of forestry and biodiversity are set out below.

### There are four key criteria in the biodiversity code:

1. The program must have an explicit biodiversity objective
2. Activities must be identified based on an analysis of threats to biodiversity
3. The program must monitor associated indicators for biodiversity conservation
4. Site-based programs must impact biologically significant areas

### FAA Sections 118 and 119 Requirements

Country Analysis Requirements:—Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of:

1. The actions necessary in that country to achieve conservation and sustainable management of tropical forests and/or biodiversity, and
2. The extent to which the actions proposed for support by the Agency meet the needs thus identified.

The analysis should:

- Employ a watershed, landscape, integrated or ecosystem approach to areas (can be urban or peri-urban) within a sphere of influence from a nucleus of some natural and/or protected area
- Establish links between activity and conservation outcome supported by data and documentation

---

<sup>3</sup> For tropical forests, Section 118(e) of the FAA requires that "Each country development strategy statement or other country plan prepared by the US Agency for International Development shall include an analysis of (1) The actions necessary in that country to achieve conservation and sustainable management of tropical forests, and (2) The extent to which the actions proposed for support by the Agency meet the needs thus identified."

<sup>4</sup> Similar language exists for biodiversity conservation in FAA Section 119(d): "Country Analysis Requirements. -- Each country development strategy statement or other country plan prepared by the US Agency for International Development shall include an analysis of (1) the actions necessary in that country to conserve biological diversity, and (2) the extent to which the actions proposed for support by the Agency meet the needs thus identified."

- Fill gaps in data where possible
- Allocate resources if possible
- Identify ways to monitor links and results

For the purposes of this analysis the following definitions will be used:

Biological diversity, or biodiversity, is the variety and variability of living organisms broadly including a wide diversity of plant and animal species, communities, and ecosystems. The Earth's biodiversity consists of genes, species, and ecological processes making up terrestrial, marine, and freshwater ecosystems that both support and result from this diversity.

A forest is best defined as an ecosystem or assemblage of ecosystems dominated by trees and other woody vegetation. Forests (according to the U.S. National Vegetation Classification system) consist of trees with overlapping crowns forming 60% to 100% cover. Woodlands are more open, with 25% to 60% cover.

## METHOD

To carry out the assessment, a team of six persons was assembled: Ms. Thera Edwards, Team Leader and lead author for watersheds and forestry, legislation, policies and planning; Ms. Marcia Creary, marine and coastal issues; Dr. Karl Aiken, fisheries; Dr. Elaine Fisher, biodiversity; Mr. Peter Espeut, livelihoods, protected areas and fisheries; Dr. Diane Russell, editor and advisor on USAID/Jamaica options and recommendations. Except for Dr. Russell, all the consultants are local experts in the field with many years of experience (Professional Biographies appear in Appendix 7). The assessment builds on a previous analysis of threats to biodiversity and program options for USAID/Jamaica (Russell, Edwards and Clarke, 2006) as well as a 2007 assessment of USAID/Jamaica's programs for fit with USAID's biodiversity code requirements (Russell, 2007). The last formal I18-I19 analysis was carried out in 2005 by Chemonics (Catterson, Gardner and Huth, 2005).

A number of key documents, legislation and policies were reviewed. The information from these documents was supplemented by key informant interviews. In addition to presenting the current status of the selected sectors, actions to address identified issues are set out. The recommended actions seek to minimize conflicts between different uses of the land; to ensure the protection of coastal and wetland areas; to conserve and protect water resources and catchments; to protect coastal, marine and terrestrial ecosystems; to maintain ecological balances; to ensure the participation of local populations; to allow natural resources to be used wisely and sustainably; and to ensure integrated and inter-sectoral linkages. The economic, social and environmental importance of forests and land resources should as far as possible be reflected in and factored into all activities and initiatives. Thus the approach employed seeks to integrate the reviews from all sectors to provide a holistic analysis.

# STATUS OF BIODIVERSITY

## ECOSYSTEM DIVERSITY

The biodiversity of the island of Jamaica can be categorized as three main ecosystems: terrestrial, freshwater and marine. As a small island state with an elevated interior, activities which affect the island's terrestrial and freshwater ecosystems significantly affect the marine ecosystem. Jamaica's freshwater biodiversity includes a number of habitats such as freshwater wetlands, freshwater caves, springs, streams and rivers which support diverse flora and fauna communities, which are a source not only of fresh water for the island, but also food and commercial activity for communities. Endemic freshwater species include three fish species and one freshwater turtle. The terrestrial ecosystem includes various forest types and savannas. Farming and building construction have had significant impacts on the terrestrial biodiversity and informal settlements, particularly along gully courses and on hillsides have also had a significant impact.

The majority of marine flora and fauna found in the Caribbean Sea is distributed throughout the region. The vastness of the territorial waters of Jamaica makes research a challenge; hence the status of the knowledge on our marine biodiversity is limited. Studies carried out at the University of the West Indies (UWI) have identified over 50 species of phytoplankton and approximately 40 species of zooplankton in the waters around Jamaica (Life Sciences Dept, 2007).

The Pedro Cays, because of their size and distance (50 miles or 80 kilometers south) from the mainland and relatively intact biological systems, are one of the country's last remaining healthy marine ecosystems. The cays are regionally important seabird nesting and roosting areas (Masked Boobies, Roseate Terns and others) and also provide several endangered turtle species such as Hawksbills and Loggerheads with nesting grounds. They are a potential refuge and source of larvae for several regionally-threatened *Acropora* coral species (now being considered for US Endangered Species Act protection). With an estimated 99 percent of mainland Jamaica's reefs in danger, the coral reefs on Pedro Bank are vital to long-term reef conservation (The Nature Conservancy, 2008).

Jamaica has 891 km of coastline and a coral reef area of 1,240 km<sup>2</sup>. The better developed reefs occur along most of the north and east coast while patchy fringing reefs have developed on the broader shelf of the south coast and on the neighboring banks of Pedro and Morant Cays (Wilkinson & Soutar, 2008). Eighteen of 53 sites around the island had a live coral cover of less than 10% indicating that these have been subjected to severe stressors. The overall percentage live coral cover (14.79%) is much lower than the regional Caribbean average (20%). Figure 2 shows the distribution of coral reefs within Jamaica territorial waters and Figure 3 shows coral cover at a number of sites around the island (NEPA, 2008a).

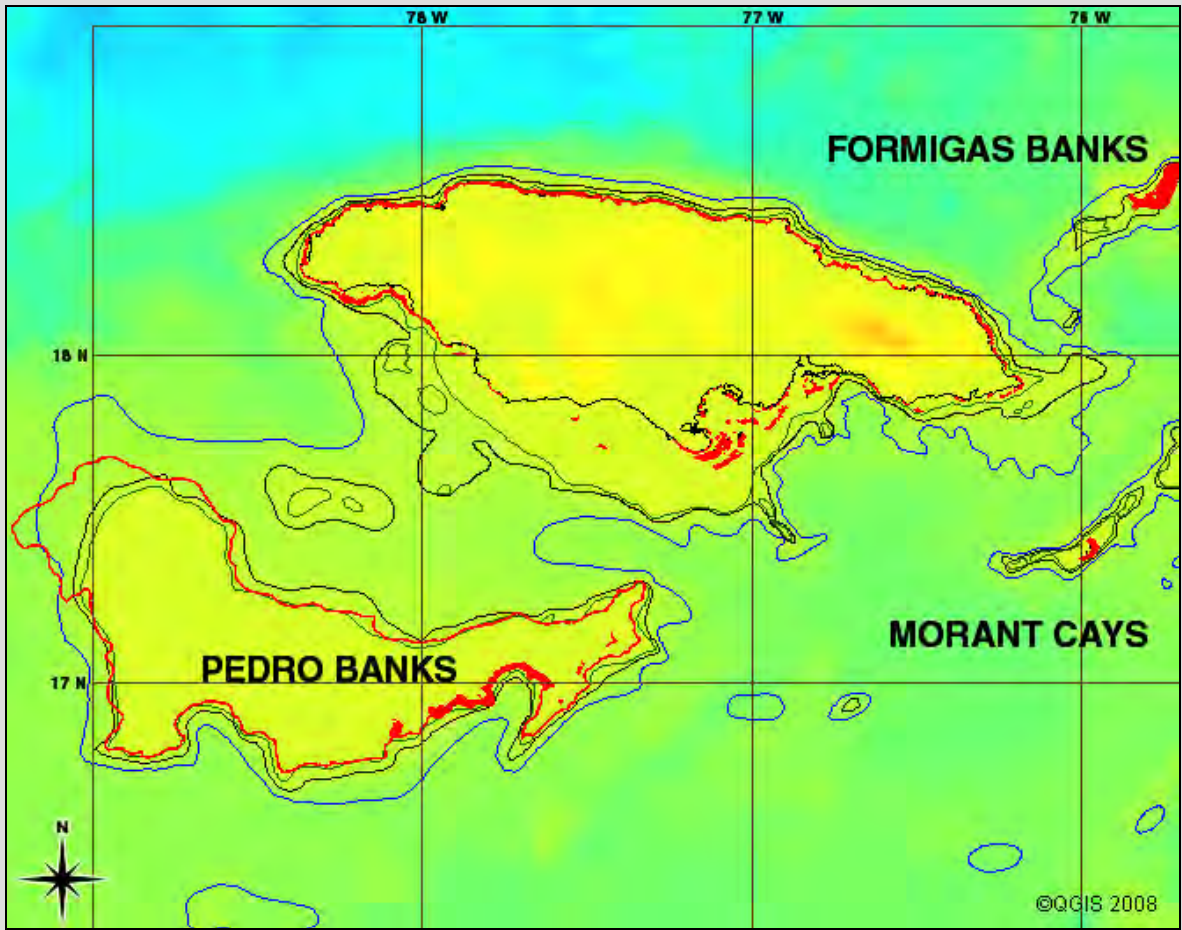


FIGURE 3. DISTRIBUTION OF CORAL REEFS WITHIN JAMAICA'S TERRITORIAL WATERS

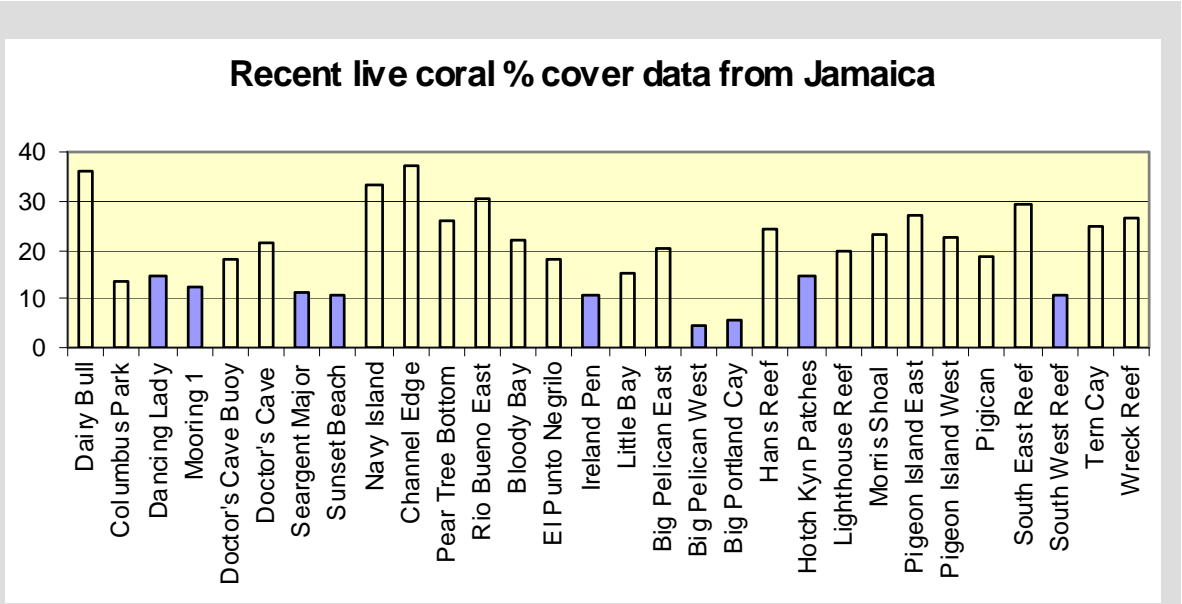


FIGURE 4. CORAL COVER AT A VARIOUS LOCATIONS AROUND JAMAICA

With the growth of Kingston on the south coast, and Montego Bay, Ocho Rios and Port Antonio on the north coast and associated harbour and infrastructure development, much of Jamaica's original mangroves and coastal wetlands have been destroyed and many of the remaining ones are threatened or severely degraded (NEPA, 1997). Jamaica presently has three wetlands that have been designated as Ramsar sites (Wetlands of International Importance), with a combined surface area of 37,765 ha. These are the Black River Lower Morass; the Palisadoes-Port Royal Protected Area and the Portland Bight Wetland and Cays. There are three additional wetlands of significance; these are the Negril Morass in Westmoreland, the Black River Upper Morass in St Elizabeth and the Great Morass in St Thomas. Wetlands are estimated to cover 2% of Jamaica's total surface area.

Although seagrasses occur throughout the coastal areas of Jamaica, they are most abundant on the broad island shelf of the south. Three species are found in Jamaican waters (*Halodule wrightii*, *Thalassia testudinum* and *Syringodium filiforme*). Some animals, such as the protected and endangered manatees (*Trichechus manatus*), feed on the blades and other animals derive nutrition from eating algae and small animals that colonize seagrass leaves.

## SPECIES DIVERSITY

Jamaica is rated fifth in islands globally with respect to endemic plants (Davis et al, 1997). There is also a high level of endemism for many species of animals including land snails (505), insects (butterflies (20)), terrestrial grapsid crabs (9), amphibians and reptiles (55) and land birds (26). Within amphibians and reptiles there is 100% endemism with respect to frogs. Of the 3,304 species of vascular plants that occur in Jamaica, 27.9% are endemic. (NBSAP, 2003.)

Goodbody (2004 & 2006) has estimated that there are at least 3,500 species of marine flora and fauna representing approximately 800 species of algae and 2,700 species of animals. These are primarily near-shore species with a bias towards the groups for which taxonomic information already exists. They include corals, fishes, lobsters and other well recognized inhabitants of the sea but also include tiny worms and shrimp up to large whales and dolphins.

## THREATENED AND ENDANGERED SPECIES

At least six species of terrestrial vertebrates are thought to have become extinct in Jamaica in the last 150 years and more are considered endangered, threatened, or rare). Appendix 1 and 2 contains a listing of species on the IUCN Red List considered to be critically endangered or endangered. Information on the current status of several of the listed species is clearly in needed. Conservation/rehabilitation work is ongoing on the following species:

The Jamaican Iguana (*Cyclura collei*)

The Giant Swallowtail Butterfly (*Pterorum homerus*).

Sea turtles

The Manatee (*Trichechus manatus manatus*)

The Crocodile (*Crocodylus acutus*)

The West Indian Manatee (*Trichechus manatus manatus*), commonly called Sea Cow, is considered endangered and declining, estimated at less than 10 individuals inhabiting the Alligator Pond area. There are four main dolphin species; the most numerous is the Bottlenose Dolphin (*Tursiops*)

*truncatus*). These species along with 28 additional species of cetaceans known from Caribbean waters are all migratory. The international trade in Bottlenose Dolphins is regulated and monitored by CITES. The American Crocodile, *Crocodylus acutus*, which is largely restricted to mangrove swamps, marshes, shallow bays, rivers, and other water bodies along the south coast, enjoys complete legislative protection. Four species of sea turtles are known to frequent Jamaican waters, two of which are listed as Critically Endangered by the IUCN. In addition to the IUCN Red List status, all sea turtle species are also protected by the CITES Convention, and in Jamaica, all species are fully protected by the Wildlife Act. A large number of sea birds use Jamaica's territorial waters for foraging and nesting along coastal areas and on offshore cays. All sea birds are protected under Jamaica's Wildlife Act, and many of them enjoy international protection as well (Life Sciences Department, 2007).

### SPECIES OF SPECIAL ECONOMIC IMPORTANCE

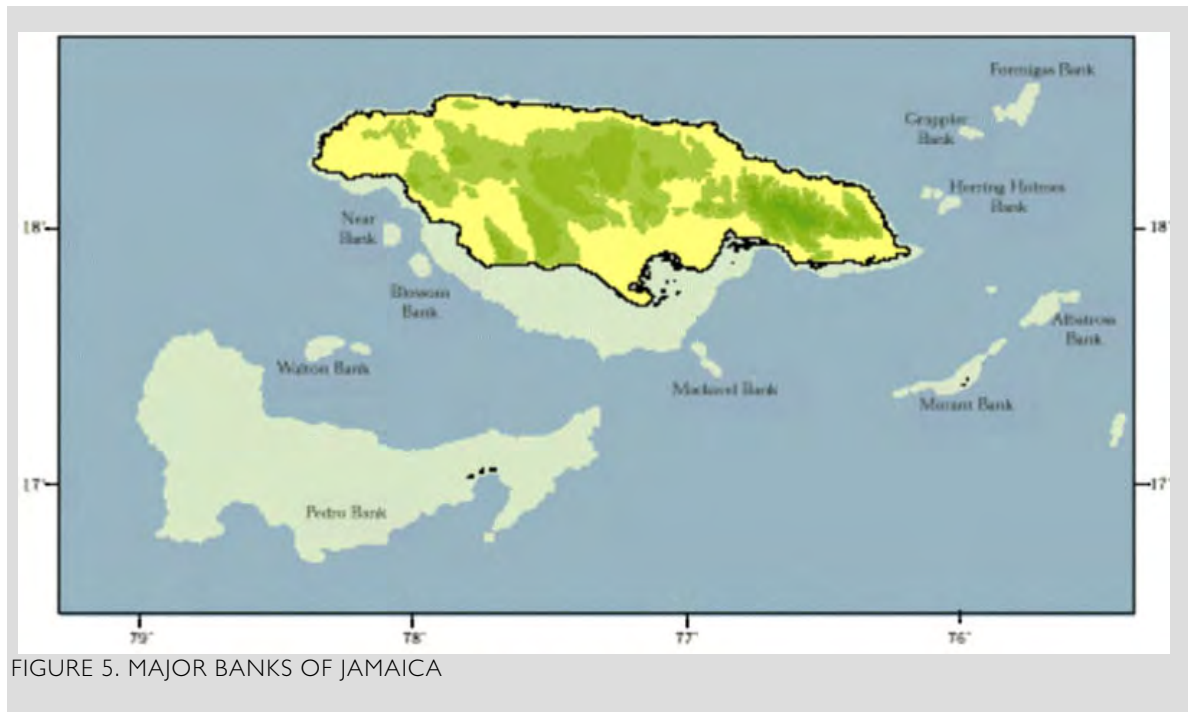
Jamaica's flora and fauna contribute significantly to the island's economy. Species of special economic importance include timber such as Mahogany, Cedar, Mahoe and Lignum Vitae. A number of Jamaica's native species are listed in Appendix II of the Convention on the International Trade in Endangered Species (CITES) of Fauna and Flora, and includes all orchid species, Lignum Vitae and the mollusk *Strombus gigas* (Queen Conch). International trade in these species is regulated at the national level through the Endangered Species (Protection, Conservation and Regulation of Trade) Act 2000. While international trade, (and hence harvesting) in the Queen Conch is based on a quota system which is derived from periodic abundance surveys, there is little or no data to scientifically determine export quotas for orchids. Some work is currently being done by NEPA and the UWI to determine the distribution and abundance of orchids in Jamaica, but the work has been restricted to 2 or 3 parishes. The NEPA has started work on the distribution and use of the Lignum Vitae plant.

Agriculture is one of Jamaica's main economic activities, with the majority of farmers existing on relatively small farms in the hilly interior. The 'small farm' sector supports an estimated 150,000 rural families and is the country's largest source of employment (NBSAP, 2003). Most of Jamaica's agricultural crops such as Sugar Cane, Bananas, Coffee, Cocoa and Citrus are non indigenous. Indigenous plants of economic importance are the Pineapple and *Zamia amblyphyllidia* (Branching Cycad).

Freshwater or associated freshwater species of economic importance include shrimp species such as *Macrobrachium acanthurus* and *M. faustinum*, fish species such as Tarpon (*Megalops atlantica*) and Snook (*Centropomus undecimalis*) and the endemic Bull Thatch, *Sabal jamaicensis*.

The main landings are derived from coral reef fishes (Munro, 1983; Aiken & Haughton, 1987, Koslow, et al., 1988 & Aiken, 1993). Though 445 marine bony and cartilaginous fish species are recorded from the island by Caldwell (1966), only 96 species of fishes and two lobster species were described from trap fishing among the Port Royal Reefs near Kingston by Munro (1983). The main fishing activities take place on the island shelf and on the nine small oceanic banks. One larger oceanic bank called Pedro Bank, found 150 km southwest of Kingston, is also regularly fished (See Figure 4). The main fisheries resources may be categorised as coral reef fishes, spiny lobsters, conch, small coastal pelagic finfish and large offshore pelagic finfish. The reef fish species of major importance come from about ten families and constitute 80% of all landings (Fisheries Division, 1997). With regards to the commercial species a comparison of the data collected on species diversity in reef fish catches

between 1983 and 1998 suggest that there has been genuine changes in species diversity since the 1970's with the loss of predatory species and the replacement by less valuable ones.



There has also been a serious reduction in large-scale lobster fishing and landing since about 1990. Generally there has been a decline in abundance of medium and large conch due to the high fishing effort levels but controlled reduction in catches has been introduced to attempt to ensure sustainability. Other molluscs taken (from mangrove areas) include the bivalve mangrove oysters (*Crassostrea rhizophora*) and the flat or false oyster, (*Isognomon alatus*). Stocks of the former species are declining in all areas probably due to over collecting. Small coastal pelagics which include a variety of surface dwelling fishes have been extensively reviewed by the UWI, Mona, Fisheries Ecology Research Project between 1980 and 1984 (Goodbody, 1986) and by Harvey (1986). Coastal pelagics contributed 12% to south coast landings in 1996. There is no direct commercial fishery for large pelagics as yields are small and highly seasonal but they were determined to contribute 2.6% to south coast landings in 1996. Four species of shrimp form the basis of small local artisanal fishery, stocks are small in biomass and make up 0.5% on all landings. The four marine turtle species found in Jamaica are threatened by poaching and unregulated coastal development which has significantly reduced their overall abundance.

## GENETIC DIVERSITY

The tissue culture/gene bank at the Scientific Research Council houses many species of non indigenous plant material such as Anthuriums, orchids, African Violet (*Saintpaulia ionantha*) and other ornamentals. It also houses one of the largest collections of *in-vitro* germplasm collections of the banana *Musa* sp. in the Western Hemisphere (NBSAP, 2003).

A number of plants and animals have been investigated for their commercial potential. Examples include Red Nickel (*Ormosia jamaicensis*) which is being used to develop a commercial drug while the

ultrasound capability of the Mustached Bat (*Pteronotus parnellii*) is being used in physiological and anatomical studies to better understand hearing loss in humans. Investigations into the medicinal potential of marine organisms by overseas organizations has revealed the presence of pharmaceutical compounds such as that found in the Sea Squirt (*Ecteinascidia turbinata*) for treatment of cancer. Important compounds have also been extracted from organisms such as sponges, algae and gorgonians.

NEPA has responsibility for regulating the access to all genetic material in Jamaica and grants permits for the collection, possession and export of marine plant and animal material. Endangered rare and endemic species are governed by CITES and require Material Transfer Agreements for export.

## ECOSYSTEM SERVICES

Ecosystem services can be defined in terms of natural resource economics as indirect use values. Watersheds provide services such as soil conservation, water supply, water quality, flood/storm protection, fisheries protection. Forests provide such services as carbon storage and carbon fixing. Other services provided in watersheds and forests include biodiversity services (habitat, food etc) and amenity values for local communities.

The role that marine resources play in sustaining the productivity of the near shore fisheries and thus the livelihood of a significant number of persons is often underestimated. For example, both regionally and nationally the Pedro Bank is an important commercial, biological and historical area. It represents Jamaica's main commercial and artisanal fishing grounds and serves as the primary harvesting area for the largest export of Queen Conch from the Caribbean region. Jamaican conch exports have in the past generated more foreign revenue than the country's world-famous Blue Mountain coffee (The Nature Conservancy, 2008).

The economic value of shoreline protection provided by coral reefs is difficult to determine as it is expressed in the prevention of the destruction of property, lives and infrastructure, hence is often calculated as a replacement cost. These services make the reef the most valuable marine ecosystem. Economic valuations of mangrove wetlands fail to take into account their value in acting as buffers against natural catastrophes, refuges for wildlife, nurseries for marine life, fishing and shell fishing areas, sources of organic detritus, and as natural filters for improving water quality. Mangrove forests also offer protection from flooding and hurricanes. They soak up excess water and slowly release it. Mangroves also block the force of strong winds caused by hurricanes and storms. Mangrove forests protect our seas from becoming contaminated with land-based pollutants, as they filter the water running off from the land before it enters the sea.

Studies have been carried out in Negril, Ocho Rios and Montego Bay on the economic valuation of various aspects of the island natural resources primarily as they related to marine protected areas. The total economic value of the marine and coastal resources assessed in the Ocho Rios Marine Park was found to be US \$ 245.2 million per annum (Environmental Management Unit, 2001). For Montego Bay an estimate of the net present value (NPV) of readily identified local uses was determine to be US\$381 million, which translates into approximately US\$8.93 million per hectare net present value, or US\$893,000/ha/yr on an annualized basis. This is based on an estimated coral reef area within Montego Bay of 42.65 ha (Ruitenbeek & Cartier, 1999). Cesar & van Beukering (2006) estimated the cost and benefits of physical planning to the Negril Marine Park at US\$ 15 million

representing an increase in recreational value with improved management. Table I below provides a comparison of the details of the analysis conducted for Ocho Rios and Montego Bay.

**TABLE I: ECONOMIC VALUATION FOR THE OCHO RIOS MARINE PARK AND MONTEGO BAY CORAL REEFS**

Contribution	Ocho Rios Marine Park Economic value (million \$US)	Montego Bay, NPV (million \$US)
Fishery	4.7	1.31
Tourism	134.0	315 (tourism & recreation)
Recreation	60.8	-
Coastal Protection	44.9	65
Biodiversity	0.8	
Total (million \$US)	245.2	381.31

Source: Environmental Management Unit, 2001 and Ruitenbeek & Cartier, 1999

## VALUES AND ECONOMICS OF BIODIVERSITY AND FORESTS

A watershed valuation has been prepared by Dennis Pantin using the Buff Bay-Pencar Watershed Management Unit in 2005. In this study using a variety of valuation techniques to estimate direct and direct use values the respective valuations were US\$27.203 million and US\$33.06 million respectively giving a total valuation of US\$60.3 million. Pantin was unable to estimate water quality, soil conservation, and biodiversity protection values. He however provided estimates of values at risk of flooding which he ascribed to being the result of declines in soil conservation. This estimate was derived from estimating the replacement cost for main assets such as roads, other physical infrastructure, housing, commerce, industry and agricultural land. The total estimate for replacing these assets was US\$57 million.

Another study conducted in 2005 by the Marine Geology Unit of the University of the West Indies addresses the matter of soil erosion when it prepared a sediment budget survey of the Rio Grande Watershed. The Buff Bay-Pencar and Rio Cobre watersheds share some similarities and are thus comparable. They have headwaters in the Blue Mountains, flow northwards and have erodible volcanic soils. The sediment budget survey of the watershed describes the inherent processes that deliver sediment from slopes to streams, the rates of transport through streams, and the contribution of human activities to erosion and transport. Various approaches were taken for the construction of each budget parameter because of the nature of the available information on erosion processes and rates, and the nature of the erosion processes. All the parameters were ultimately tallied to estimate the volume of sediment transport in the watershed, under both existing conditions and those that would have prevailed prior to Hurricane Ivan.

Most of the sediment influx is derived from in stream erosion (channel incision and bank collapse) and road, erosion, accounting for some 31,620 metric tons/year, with relatively insignificant inputs from mass wasting, in the order of 6,220 metric tons. Surface erosion processes, such as soil loss may also be a significant sediment source, depending upon the estimate of the rate of soil erosion that is used. The soil erosion figure could be as much as 1.6 million metric tons per year. Bank collapse over time potentially steepens the stream gradient inducing further downcutting of the channel bed and bank.

The Rio Grande watershed has a significant sediment store of 1,200,800,000 metric tons. Although the thickness of sediment in the storage areas varies across the watershed, it is found to be greater at river confluences in the upper part of the watershed and takes the form of 50 m to 100 m wide alluvial aprons and plains.

At St. Margaret's Bay the survey provided data on the changes over the year of the sub aerial beach topography and the changes in volume of beach sediment. There was a net gain of sediment to the beaches over the year of some 5,000 cubic metres. The change in beach areas over the year amounted to about 7% of total area, not an unusual annual variation. However, the beach segments on the western side of the Rio Grande estuary responded quickly, over the period November 2004 to February 2005, to the significant flood events of December and January, by accreting as much as 20 m, suggesting a close correlation between the floods and beach growth.

## STATUS OF FORESTS

### COVERAGE

The forest reserve areas listed in Appendix 3 are garnered from The Jamaican Gazette. The records show that the area of forest reserves and Crown lands managed by the Forestry Department is 109,514 hectares, of which 98,962 hectares are forest reserves and 10,552 hectares are Crown lands. These figures from the Gazette show a variation from those compiled by the Forestry Department in its assessment of forest cover and land use. The reasons for the difference are:

- the forest reserve areas shown in the Gazette are estimates, based on descriptive, not surveyed, boundaries
- the forest reserve areas compiled by the Forestry Department during its assessment were digitised from 1:250 000 maps and not from actual surveyed forest reserve boundaries. A table showing forest reserves by parish is found in Appendix 3

### FOREST DIVERSITY

The ecological land classification system of the Forestry Department (FD) is set out below in Table 2. The table correlated the FD classification to other well recognised classification systems. A discussion of the various classification systems used over time in Jamaica can be found in the publication "Ecological land classification for forest management and conservation in Jamaica" (Camirand and Evelyn, 2003)

TABLE 2. DEFINITIONS OF FOREST COVER AND LAND USE TYPES AT 1:100,000 MAPPING

FORESTRY DEPARTMENT CLASSES (Landsat TM; 1:100000 mapping scale)		CORRESPONDING TNC CLASSES (1)	CORRESPONDING FAO CLASSES (2)
TYPE (CODE)	DEFINITION		
Forest Land Use/Cover (> 75 %, Minimum unit: 25 ha)			
Closed Broad-leaf (PF)	Closed primary forest with broadleaf trees at least 5 m tall and crowns interlocking ,with minimal human disturbance	Upper Montane Forest Lower Montane Forest Semi-evergreen Moist Broadleaf Forest (Natural Communities)	Undisturbed Closed Forest
Disturbed Broadleaf (SF)	Disturbed broadleaf forest with broadleaf trees at least 5 m tall and species-indicators of disturbance such as <i>Cecropia peltata</i> (Trumpet Tree)		Disturbed Closed Forest
Bamboo (BB)	<i>Bambusa vulgaris</i> ( Bamboo brakes)on the lower shale hills (disturbed forest)	Disturbed Natural Forest (Modified Communities)	Other Wooded Land
Tall Open Dry (WL)	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 <i>Bursera simaruba</i> (Red Birch)	Deciduous/Semi-deciduous Broadleaf Forest (Natural Communities)	Open Forest
Short Open Dry (SL)	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 <i>Prosopis juliflora</i> (Cashew) or <i>Stenocereus hystrix</i> (Columnar Cactus)	Thorn Forest (Natural Communities)	Other Wooded Land
Swamp (SW)	Edaphic forest (soil waterlogging) with a single tree storey with species-indicators such as <i>Symphonia globulifera</i> (Hog Gum) and <i>Roystonea princeps</i> (Royal Palm)	Freshwater Swamp Forest (Natural Communities)	Disturbed Closed Forest

TABLE 2. DEFINITIONS OF FOREST COVER AND LAND USE TYPES AT 1:100,000 MAPPING

FORESTRY DEPARTMENT CLASSES (Landsat TM; 1:100000 mapping scale)		CORRESPONDING TNC CLASSES (1)	CORRESPONDING FAO CLASSES (2)
TYPE (CODE)	DEFINITION		
Mangrove (MG)	Edaphic forest (areas with brackish water) composed of trees with stilt roots or pneumatophores, species-indicators such as <i>Rhizophora mangle</i> (Red Mangrove)	Mangrove (Natural Communities)	Disturbed Closed Forest
<b>Mixed Land Use/Cover</b>			
Fields or Disturbed Broadleaf Forest and Pine Plantation (PP)	>50% fields or Disturbed Broadleaf forest; >25% Pine plantation	Forest Plantations (Modified Communities)	Plantations
Disturbed Broadleaf Forest and Fields (SC)	>50% Disturbed Broadleaf forest; >25% fields	Disturbed Natural Forest (Modified Communities)	75% Other Wooded Land 25% Other Land
Bamboo and Disturbed Broadleaf Forest (BF)	>50% bamboo; >25% Disturbed Broadleaf forest	Disturbed Natural Forest (Modified Communities)	Other Wooded Land
Bamboo and Fields (BC)	>50% bamboo; >25% fields	Disturbed Natural Forest (Modified Communities)	75% Other Wooded Land 25% Other Land
Fields and Disturbed Broadleaf Forest (CS)	>50% fields; >25% Disturbed Broadleaf forest	Disturbed Natural Forest (Modified Communities)	25% Other Wooded Land 75% Other Land
Bauxite Extraction and Disturbed Broadleaf Forest (BS)	>50% bauxite extraction; >25% Disturbed Broadleaf forest	Disturbed Natural Forest (Modified Communities)	25% Other Wooded Land 75% Other Land
<b>Non Forest Land Use/Cover</b>			
Plantations (PC)	Tree crops, shrub crops like Sugar Cane, Bananas, Citrus and Coconuts	Non-forest Land Cover (Agriculture)	Other Land
Fields (FC)	Herbaceous crops, fallow, cultivated grass/legumes	Non-forest Land Cover (Agriculture)	Other Land

**TABLE 2. DEFINITIONS OF FOREST COVER AND LAND USE TYPES AT 1:100,000 MAPPING**

FORESTRY DEPARTMENT CLASSES (Landsat TM; 1:100000 mapping scale)		CORRESPONDING TNC CLASSES (1)	CORRESPONDING FAO CLASSES (2)
TYPE (CODE)	DEFINITION		
Herbaceous Wetland (HW)	Edaphic vegetation (soil water-logging) with herbaceous plants	Non-forest Land Cover (Natural Communities)	Other Land
Water Bodies (WA)	Lakes, rivers	Water Bodies (Open Water)	Inland Water
Small Islands (SI)	Mostly sand/limestone, unvegetated small islands (cays)	Non-forest Land Cover (Natural Communities)	Other Land
Bare Rock (BR)	Bare sand/rock	Non-forest Land Cover (Natural Communities)	Other Land
Bauxite Extraction (BE)	Surface mining/bauxite	Non-forest Land Cover (Urban/Industrial)	Other Land
Buildings and Other Infrastructure (BA)	Buildings and other constructed features such as airstrips, quarries, etc.	Non-forest Land Cover (Urban Industrial)	Other Land

(1) Mapping types from Grossman, Iremonger and Muchoney (1992) and Muchoney, Iremonger and Wright (1994). (2) Guidelines from FAO (1998a, 1998b).

## FOREST SPECIES DIVERSITY

Species diversity and abundance can be found in the National Forest Inventory last prepared in 2003. This inventory was based on sample plot surveys. In addition to that inventory a number of scientific and research publications have documented the species diversity of different forest types such as wet limestone, dry limestone and montane forests. Some of these papers can be found in the book “Forests of Jamaica” (Humphries and Bretting, 1986)

Table 3 below indicates some general biodiversity trends for Jamaica and some other forested Caribbean islands.

TABLE 3: BIODIVERSITY AT COUNTRY LEVEL IN JAMAICA AND SELECTED CARIBBEAN ISLANDS<sup>5</sup>

COUNTRY	AREA (km)	MAMMALS TOTAL	MAMMALS ENDEMIC	MAMMALS NO. THREATENED	BIRDS BREEDING TOTAL	BIRDS ENDEMIC	BIRDS NO THREATENED	PLANTS TOTAL	PLANTS ENDEMIC
Jamaica	11 425	24	2	5	113	26	12	3 308	923
Cuba	114 525	31	12	11	137	21	18	6 522	3 229
Dominican Republic	48 440	20	0	5	136	0	15	5 657	1 800
Haiti	27 750	20	0	4	75	1	14	5 242	1 623
Puerto Rico	8 960	16	0	2	105	12		2 493	235
Dominica	751	12	0	1	52	2	3	1 228	11
St Lucia	619	9	0	1	50	4	5	1 028	11
St. Vincent	389	8	1	2	108	2	2	1 166	-
Grenada	345	15	0	0	50	1	1	1 068	4

With respect to Jamaica details of plant and animal diversity within four major forest areas representing four different forest types, viz. montane, wet limestone, dry limestone and mesic forest (unbracketed numbers = total number of species and bracketed numbers = number of endemic species) can be seen in Table 4.

TABLE 4: FOREST DIVERSITY IN JAMAICA

INDICATOR	Jamaica	Blue & John Crow Mountains	Cockpit Country	Hellshire Hills	Dolphin Head
Flowering Plants	3003 (828)	1165	215 (65)	269	606 (171)
Ferns	609 (82)	260	19 (2)	2	81 (14)
Amphibians	26 (22)	11(11) [5] <sup>6</sup>	15 (3)	3 (2)	12 (9)
Reptiles	39(34)	5	20 (2)	16 (11)	12
Birds	223 <sup>7</sup> (30)	220 (29)	27 (0)	25 <sup>8</sup> (7)	52 (18)

<sup>5</sup> World Atlas of Biodiversity (Groombridge and Jenkins, 2002)

<sup>6</sup> The number in [ ] square brackets indicates the the number of species that are endemic to the Blue and John Crow Mountains

<sup>7</sup> This number represents resident and migrant birds

TABLE 4: FOREST DIVERSITY IN JAMAICA

INDICATOR	Jamaica	Blue & John Crow Mountains	Cockpit Country	Hellshire Hills	Dolphin Head
Bats	21 (5)		3 (0)		4 (1)

## SOCIAL, ECONOMIC AND POLITICAL CONTEXT

### SOCIAL AND ECONOMIC ENVIRONMENT

The island's population is estimated at 2,682,100. Approximately 50.4 % of the population lives in rural areas. Employment is recorded as 1,134,600 and unemployment as 152,700 with the agriculture sector employing approximately 200,000 persons.

Agriculture, tourism and mining are the sectors that impact the most on the forestry and biodiversity and by extension the environment. Table 5 sets out total GDP at constant factor prices and the percentage contribution of agriculture (which includes fisheries), tourism (hotels and restaurants) and mining to the total GDP.

TABLE 5. REAL GDP (CONSTANT FACTOR PRICES)

YEAR	TOTAL \$J Billion	AGRICULTURE (%)	TOURISM (%)	MINING (%)
2003	476.7	6.0	4.8	4.0
2004	483.4	5.2	4.9	4.1
2005	488.4	4.8	5.1	4.1
2006	501.6	5.4	5.4	4.1
2007	508.8	5.0	5.4 <sup>9</sup>	3.9
2008	505.8	4.8	5.5	3.8

<sup>8</sup> The total of 25 includes 4 winter migrants and 2 summer residents

<sup>9</sup> A study of the tourism sector in 2007 estimated that the contribution of tourism to GDP was 7.3 %. The figures given in Table 5 comprise the contribution of hotels and restaurants and more than likely exclude the revenue from attractions, transportation and other goods and services associated with the tourism sector.

The estimated number of farmers contributing to the agricultural sector disaggregated by farm size is set out in Table 6. The figures show that over half the total number of farmers operate on farms less than 1 ha in size and most farmers have access to farms of 5 ha and under. There is a significant number of “landless” farmers operating under various tenure arrangements or no tenure. The data shows the inherent difficulty of addressing the role of farmers and agricultural practices in land degradation. To impact a significant area of land would involve working with numerous farmers including those with very little vested interest due to lack of tenure.

**TABLE 6. NUMBER OF FARMERS DISAGGREGATED BY FARM SIZE**

SIZE	NUMBER OF FARMERS
Landless	14,980
< 1ha	115,267
1 – <2 ha	28,548
2 - <5 ha	22,332
5 - <10 ha	3,886
10 - < 20 ha	1,351
20 - <50 ha	795
50 - < 100ha	263
100 - < 200 ha	164
>200 ha	205
<b>TOTAL</b>	<b>187,791</b>

## INSTITUTIONS, POLICIES, LAWS AFFECTING CONSERVATION

### INSTITUTIONS

#### NATIONAL ENVIRONMENT AND PLANNING AGENCY

This executive agency has management responsibility for coastal zones, watersheds, biodiversity and protected areas. Under the current organizational structure watershed management and biodiversity are the mandate of the Ecosystems Management Branch while protected areas fall within the Protected Areas Branch. Both of these branches are in the Conservation and Protections Sub-Division of the Integrated Planning and Environment Division. The agency also has responsibility for planning, air and water quality as well as legislation and policy development.

## **WATER RESOURCES AUTHORITY**

The Water Resources Authority (WRA) is responsible for the management, protection, and controlled allocation and use of Jamaica's water resources. The Authority's mission is:

“To ensure the sustainability of Jamaica's water resources through continual assessment and proper management, promotion of conservation and protection, and optimal development of these resources;

“To ensure rational and equitable allocation of the nation's water resources; and to reduce conflicts among water users.”

The WRA maintains a hydrological database and provides data, information, and technical assistance to government and non-government institutions.

The major activities of the Water Resources Authority include hydrologic data collection, compilation, and analysis; water resources investigation, assessment, and planning; water resources allocation through its licensing system for water abstraction; and environmental monitoring and impact assessment.

The permit and licence information feeds into the WRA database as abstractors are asked to state their intent, volume of water and the source. This information is mapped and recorded in the Geographical Information System database. Based on the known available water the water balance can be determined using fixed formulas.

## **FORESTRY DEPARTMENT**

Currently the Forestry Department is undertaking a major transition from a Department within the Ministry of Agriculture and Land to an Executive Agency. The current year is the transition year within which the recommendations of the consultants will be implemented. Through consultancies the Department has prepared a Modernisation Plan with Annex A, Framework Document and an Annex B, Medium Term Financing Plan. To date the Chief Executive Officer and an Advisory Board have been appointed. The final organisational structure is being determined and posts will be filled upon its completion.

The general direction is that the agency will be split into 2 sections a corporate section similar to other executive agencies and a technical side which will require realignment of existing sections. Governance will shift from the three regions of the past into two zones each with a zonal office. The zones will be an Eastern and Western Zone centred around the Blue Mountain Reserve and the Cockpit Reserve Forestry. The main service delivery areas will be Client Services, Forest Management and Enforcement. Client Services will include Public Relations, Recreation, Local Forest Management Committees and Private Planter's Programme. Forest Management will include Harvesting, Inventory and Research. Enforcement will be an arm of Legal Unit and not report to the regional manager. Thus each region will have Client Services and Forest Management.

Within the new construct, the Science and Technology Section will undertake bigger research initiatives to supply information to the management of the agency. It is anticipated that a silviculturalist, ecologist and biologist will be on staff. This indicates a paradigm shift of managing the forests and not just the trees of the forest.

Forest Planning will also become another area of initiative. It is anticipated that planners and marketing personnel will be on staff. Employees in this section will report to the technical part of the agency but have links to the corporate part.

#### NON-GOVERNMENT ORGANISATIONS

A number of Non-Government organisations (NGOs) are involved in work supporting forestry and watershed management. Some of these organisations such as Local Forest Management Committees or Local Watershed Management Committees were established by government agencies as part of the new governance approach to management of natural resources. Worthy of mention are The Forest Conservancy (TFC), The Nature Conservancy (TNC), the Jamaica Conservation and Development Trust, the Caribbean Coastal Area Management Association, the Dolphin Head Trust, Cockpit Country Stakeholders Group, Friends of the Sea, Portland Environmental Protection Association and the Southern Trelawny Environmental Agency. Some of these NGOs confine their activities to a particular geographic area while others such as TFC and TNC are island-wide in their activities. Interventions from these NGOs cover a wide range from direct on-the-ground conservation activities such as resource assessment, species management, monitoring through to skills training, enterprise development, financing, advocacy, area management and extend to policy development and sustainable planning.

#### LAWS

Table 7 sets out the legislative and policy framework for forestry, watershed management in Jamaica. Only the main legislation and policies are included. Some of the more central laws are briefly described after.

**TABLE 7. LIST OF LEGISLATION AND POLICIES RELATED TO FORESTRY, WATERSHEDS AND BIODIVERSITY**

LEGISLATION/POLICY	INSTITUTION
The Coffee Industry Regulation Act (1951)	CIB
The Country Fires Act (1942)	
The Fishing Industry (Amendment) Act*	MoA
The Flood-Water Control Act (1958)	WRA-NWA
The Forest Act (1996)	MoA _FD
The Irrigations Act (1949) [amended 2003]	NIC
The Land Development and Utilization Act (1966)	NEPA
The Mining Act (1947)	MoA –MGD
The National Solid Waste Management Act (2001)	NSWMA
The Natural Resources Conservation (NRCA) Act (1991)	NEPA

TABLE 7. LIST OF LEGISLATION AND POLICIES RELATED TO FORESTRY, WATERSHEDS AND BIODIVERSITY

LEGISLATION/POLICY	INSTITUTION
The Quarries Control Act (1984)	MHE-MGD
The Rural Agricultural Development Act (1990)	MoA-RADA
The Town and Country Planning Act (1958)	NEPA
The Water Commission Act (1980)	NWC
The Water Resources Act (1995)	WRA
The Watersheds Protection Act (1963)	NEPA
The Wildlife Protection Act (1945)	NEPA
Draft Fishery Policy (2004)	MoA/FiD
Forest Policy (2001)	MoA
Jamaica Water Sector Policy - Strategies and Action Plans (2000)	MWH
Jamaica's Land Policy (1996)	NLA
National Forest Management and Conservation Plan	MoA/FD
PIOJ Rural Development Strategy (2004)	PIOJ
The Environmental Codes of Practice for the Coffee Industry of Jamaica (2001)	MoA/CIB/ENACT
Towards a Watershed Policy for Jamaica (Green Paper 2008)*	MHE/NEPA
Water Resources Master Plan (2008)*	WRA

NOTE: \* denotes pending legislation or policy

### **WATER RESOURCES ACT (1995)**

With the enactment of the Water Resources Act of 1995, users of surface water now have to obtain licenses. The Water Resources Act (1995) was promulgated in the Jamaican Parliament in September 1995 and enacted into law on 1st April 1996. This marked a 25-year effort to address the deficiencies in legislation for the proper administration, development and optimal use of the island's water resources.

The Act gives to the Water Resources Authority (WRA) the responsibility for planning. The orderly development and equitable allocation of water resources, including the analysis of alternative methods of developing and supplying water, can now be executed. The alternative methods will examine how best to supply water without damage to the environment and economic setback. This can prevent conflicts between sectors in areas with expansion of urbanization, or population growth as within a

short time the system cannot meet demands. The WRA maintains an inventory of resources and demands by sector (domestic, irrigation, industrial and tourism), and determines the growth in demand well into the future, to ensure that available water can be optimally allocated while at the same time preserving the environment.

#### **THE NATIONAL WATER COMMISSION ACT (1980)**

The National Water Commission Act makes provisions for the Commission to prepare and submit proposals for the establishment of an efficient, coordinated and economical water supply system capable of meeting the island's water supply needs. It also allows for the preparation and submission of schemes for the development of water resources and water supply in particular areas and after approval to execute the scheme. The Commission should constantly review the quality, reliability and availability of water supply services as a whole and the rates charged for such services. It is expected that within the limits of its resources that the Commission should improve water supply services throughout the island. The Portfolio Minister should be advised on matter related to water supplies by the NWC.

#### **THE NATURAL RESOURCES CONSERVATION ACT (1991)**

The Natural Resources Conservation Authority Act provides for the management, conservation and protection of the natural resources of Jamaica. The Act establishes the Natural Resources Conservation Authority, a body of persons appointed by the Minister of the Environment. The functions of the Authority include the taking of such steps that are necessary to ensure the effective management of the physical environment of Jamaica; and the management of marine parks and protected areas. Section 9 of the Act creates a Ministerial discretion to declare parts of or the entire island a 'prescribed area', in which specified activities require a permit, and for which activities an environmental impact assessment may be required. The Natural Resources (Prescribed Areas) (Prohibition of Categories of Enterprise, Construction and Development) Order, 1996 and the Permits & Licensing Regulations was passed pursuant to section 9 of the Natural Resources Conservation Authority Act, 1991 and was revised in 2004. The Order provides that the entire island of Jamaica is a prescribed area and lists specified categories of enterprise, construction or development that require a permit. The Act also addresses Sewage and Trade Effluent discharges as well as air emissions (Regulations are being developed to specifically address these sources of pollution). Under the new regulations the "Polluter Pays Principle" will be incorporated.

#### **THE NATURAL RESOURCES (MARINE PARKS) REGULATIONS (1992)**

These Regulations were enacted pursuant to Section 5 of the Natural Resources Conservation Authority Act. The objective of the regulations is the establishment of marine protected areas, for the conservation of marine resources. The Montego Bay Marine Park, the Negril Marine Park and the Ocho Rios Marine Park were established in 1992, 1998 and 2000 respectively.

#### **THE NATURAL RESOURCES CONSERVATION (BLUE AND JOHN CROW MOUNTAINS) NATIONAL PARKS REGULATIONS (1993)**

The Blue and John Crow Mountains National Park is located in the Blue and John Crow mountains in Jamaica, which traverse the four easternmost parishes in the island. It is the first and only declared national park in Jamaica and was so declared pursuant to Section 5 of the Natural Resources Conservation Authority Act which also allows the Authority to designate any area of land as a national park

to be maintained for the benefit of the public, or any area of land or water as a protected area for the protection of natural and inanimate objects that is of aesthetic, educational or scientific interest. The protected areas system is guided by a Policy on Protected Areas, which was endorsed by Cabinet in 1997.

### **THE EXCLUSIVE ECONOMIC ZONE ACT (1991)**

This Act codifies Article 56 of the United Nations Convention on the Law of The Sea and establishes the Exclusive Economic Zone. The Act provides for the exploration and exploitation of the living and non-living resources within the exclusive economic zone and establishes a system of licensing of such activities. Under Section 21, the Minister may make regulations for the preservation and protection of the marine environment and the prevention and control of marine pollution, as well as the proper conservation and management of

### **THE TOWN AND COUNTRY PLANNING ACT (1958)**

Jamaica's Town and Country Planning Act (hereinafter referred to as "TCPA") was passed in 1958 and is based primarily on the English Town and Country Planning Act of 1947. The last amendments to the TCPA were made in 1999 chiefly to aid in the process of enforcement of the Act. These amendments make provision for a Stop Order under Section 22A of the Act where a development is unauthorized, hazardous or otherwise dangerous to the public. Section 23 B also now provides for an application for an injunction by the relevant Authority where person fails to comply with the provisions of an Enforcement Notice or where necessary or expedient for a perceived breach of planning control. The amendments also extended the time within which an unauthorized development becomes immune to enforcement action to twelve years.

The Local Authority has general jurisdiction over granting planning permission except where an area is called in or the development is not in conformity to the development order where the Town and Country Planning Authority has jurisdiction. The Local Authority also has general jurisdiction over carrying out surveys to assess breaches under the Act and also has primary jurisdiction over the conduct of enforcement. The Government Town Planner and the Town and Country Planning Authority are also given jurisdiction over the service of enforcement notices and stop orders. The jurisdiction of these authorities is over private development on private land as the Town and Country Planning Act does not bind the Crown. Therefore no planning permission is required for developments taken on by the Government. This is further emphasized by the fact that there is a separate Housing Act and Urban Development Commission Act that prescribe the way in which Government is entitled to conduct Development. The only act that requires permission for development undertaken by the Government is the Natural Resources Conservation Authority Act.

### **THE LAND DEVELOPMENT AND UTILISATION ACT (1966)**

This act appoints a Commission which with the approval of the Minister may from time to time by order designate as agricultural land any land which, having regard to its situation, character and other relevant circumstances, the Commission considers ought to be brought into use for agriculture. However, no order shall be made under this section in relation to-

- (a) land the use of which for some development purpose other than agriculture has been approved under the Town and Country Planning Act,

(b) such land in the possession of recognized bauxite producers or recognized alumina producers within the meaning of the Bauxite and Alumina Industries (Encouragement) Act as may for the time being be exempted by the Minister by notice in the Gazette.

Before making an order under this section the Commission shall consult with the Watersheds Protection Commission (the Natural Resources Conservation Authority now serves as the Watershed Commission) established under the Watersheds Protection Act, and with every Authority established under the Irrigation Act, or the Rural Agricultural Development Authority Act in relation to the area in which is situated the land which is to be the subject of the order

For the purposes of this Act, it shall be the responsibility of an occupier of an agricultural unit to farm the agricultural land in the unit to such extent as may be practicable having regard to the character and situation of the unit and other relevant circumstances.

Where it appears that the occupier of an agricultural unit is not fulfilling his responsibility under this Act to farm any agricultural land comprised in such unit the Commission, if so satisfied after affording to the occupier an opportunity of making representations to the Commission whether in writing or on being heard by a person named by the Commission may by order published in the Gazette declare such unit or any of the agricultural land therein to be idle land for the purposes of this Act: Provided that no such order shall be made in respect of land of less than 10 acres, but subject to section 23.

### **THE WATERSHEDS PROTECTION ACT (1963)**

The purpose of this Act is to provide for the protection of watersheds and areas adjoining watersheds and promote the conservation of water resources. The entire island however is considered to be one watershed, but for management purposes is divided into smaller units. The Act makes provision for conservation of watersheds through the implementation of provisional improvement schemes whereby soil conservation practices are carried out on land. A Watershed Policy is now under consideration with a view to taking watershed management to another level of greater effectiveness. This includes a review of the Act and the development of regulations.

### **THE IRRIGATION ACT (2003)**

The Irrigation Act outlines the duties of the Authority which is the National Irrigation Commission (NIC). The Act allows the NIC to:

- make such investigations and surveys and do such work as may be necessary for the preparation of, and to prepare and submit to the Minister one or more provisional irrigation schemes in relation to an irrigation area
- do all such acts or things as may be necessary to be done to give effect to any confirmed irrigation scheme
- manage, control and operate, subject to any directions given by the Minister, any irrigation works established in an irrigation area under any confirmed irrigation scheme and the distribution of water under such scheme
- make such investigations into any matter affecting or relating to the irrigation of an irrigation area or any irrigation works therein as may be required by the Minister and if so required or

without being so required if the Authority consider it expedient so to do to make recommendations to the Minister upon any such matter

- prepare and submit to the Minister for approval “a reclamation scheme” in relation to an irrigation area

The Authority shall prepare so many and such provisional irrigation schemes as they may consider expedient for securing the most advantageous and economic use of water conveniently available for irrigation within an irrigation area.

### **THE FOREST ACT, 1996 AND FOREST REGULATIONS 2001**

This Act addresses the sustainable management of forests on lands in the possession of the crown and vests management responsibility in the Conservator of Forests. The Act provides for the establishment of forests reserves, the establishment of protected areas, the promotion of forestry research areas, reforestation initiatives and the preparation of a forestry management plan. The latter has been prepared and is being implemented. The Forest Regulations 2001 incorporate additional provisions related to the regulation of forest reserves, offences against burning without a permit in forest reserves and timber licences.

### **THE WILD LIFE PROTECTION ACT (1945) AND RELEVANT AMENDMENT ORDERS AND REGULATIONS**

This is the only statute in Jamaica specifically designated to protect species of animals and regulates hunting in Jamaica. Main provision that ensures the protection is found in Section 6 of the Act which states that (1) No person shall hunt any protected animal or protected bird. (2) Every person who

- (a) contravenes the provisions of subsection 1; or
- (b) has in his possession the whole or any part of any protected animal or bird; or
- (c) takes or has in his possession the nest or egg of any protected bird, shall be guilty of an offence.

The act designates all birds except the 22 birds in schedule 2 and birds kept as domestic birds as not protected and 14 animals as protected e.g. Hawksbill turtle, American Crocodile, Jamaican Iguana and West Indian Manatee.

The act regulates the hunting of game birds, designates game birds, hunting times and limits. It also prescribes the licence, provides for the declaration of game sanctuaries and games reserves.

### **THE COUNTRY FIRES ACT (1942)**

The act states that every person who sets fire to any crop shall be guilty of an offence. So too is every person who sets fire to any trash on any land unless the occupier of such land first serves on the officer or sub-officer in charge of the nearest police station and the occupiers of all adjoining lands the nearest boundaries of which lie within half a mile (0.8 km) of the place where it is intended to set fire to such trash, notice of his intention to set fire to such trash on the dates, not exceeding seven, specified in such notice; and clears an open space of at least fifteen feet(4.5 m) in width round such trash and removes from such open space all inflammable material or other matter likely to burn, land, unless the occupier of such land first-shall be guilty of an offence against this Act. Notices shall be

served three clear days at least before the first of the dates specified in the notice. Every person who sets unattended fire to any trash between the hours of six in the evening and six in the morning; or leaves unattended any fire he may have lit or used in the open air before it is thoroughly extinguished, shall be guilty of an offence against this Act.

Fires lit on any plants or trash to eradicate or prevent the dissemination of, any disease within the meaning of the Plants (Protection from Disease) Act as well as those lit for lime or charcoal kiln are noted exemptions to the main provisions of this act.

### **THE ENDANGERED SPECIES (PROTECTION, CONSERVATION AND REGULATION OF TRADE) ACT (2000)**

This Act was promulgated to ensure that Jamaica meets its obligations under the Convention for the International Trade in Endangered Species of Wild Fauna and Flora. The Act governs international and domestic trade in endangered species to and from Jamaica. It establishes a Management Authority, which is the Natural Resources Conservation Authority, as well as a Scientific Authority. The functions of the Management Authority include the grant of permits and certificates for the purpose of international trade, the determination of national quotas and the monitoring the trade in endangered species. The primary role of the Scientific Authority is to determine whether a species is at risk, vulnerable or threatened, to advise on trade matters and to monitor the grant of permits and certificates. Offences under the act relate to trading in any specimen of a species without a permit or certificate; enclosing in or with any letter, parcel, packet or other matter sent by post, any endangered species; or knowingly using for the transportation of any endangered species any mail bag or mail van, aircraft, ship or other vehicle used for the carrying of mail.

### **THE NATIONAL SOLID WASTE MANAGEMENT ACT (2001)**

This act makes provision for a National Solid Waste Management Authority and mandates inter alia that the Authority take such steps as are necessary for the effective management of solid waste in Jamaica in order to safeguard public health as well as the collection, transportation, re-use and recycling of waste in an environmentally sound manner. The Act establishes a licensing regime for operators of solid waste management facilities, and the operators of collection and transfer services.

### **THE FISHING INDUSTRY ACT**

The 1975 Fishing Industry Act which has sections for

- a) fishing licenses,
- b) registration and licensing of boats,
- c) fishery protection, and
- d) general matters.

The first two sections relate to requirement that all fishers and their vessels be licensed and registered by the licensing authority (FD). Significantly, such licensing for both is done only once. Section c covers the management of fishery resources and such matters as fish sanctuaries, close season (periodic bans on landing named resources), inspection of catches, theft of gear, illegally caught fishes, etc. The general section of the schedule as it is termed, deals with requirements of operators of deep-sea fish-

ing and transport vessels, regulations (pertaining to various previous sections), forfeiture of seized items, etc.

Importantly, since 1995 there have been discussions and draftings of a new Fisheries Bill that is designed to replace the Fishing Industry Act. However, due to a number of reasons mostly related to technicalities of legal language and new developments, this bill has not been passed into effect up to the time of writing. This has been a great setback for the fisheries as the proposed greatly increased fines and penalties have not been able to save much of the countries fishable resources. The matter of the speedy enactment of the new bill is of vital importance to the sustainability of Jamaica's fishery resources.

### **THE BEACH CONTROL ACT (1956) AND THE PRESCRIPTION ACT**

The two principal laws concerning policy on beach access in Jamaica are the Beach Control Act and the Prescription Act. The Beach Control Act vests all rights of the foreshore in the Crown. The Act preserves the rights of persons having a registered title over the foreshore prior to 1956 and those of fishermen who acquire rights by prescription. Owners of private property adjoining the foreshore may pass over or use the Crown's property for private domestic purposes (this extends to family and friends), subject to the rights of certain members of the public to use the seashore for purposes approved by law. The public has unrestricted access only to those beaches which have been declared to be 'public recreational beaches' pursuant to Section 52 of the Beach Control Act and upon payment of a fee (if a fee has been set). The public may also claim the right of unrestricted access where a right of access has been established pursuant to section 4 of the Prescription Act.

The Beach Control Authority was established under the Beach Control Act "to control the use of the foreshore so as to advance on a fair basis the interests of developing commercial enterprises and in particular the hotel industry, the interest of the public who have a right to have places for recreation, to have the means of access to the sea for their own amusement and for the interests of the fishermen which must be protected and developed". The NRCA Act, 1991 vested in the NRCA the power to administer the Beach Control Act. The NRCA Act also gives the Authority power to require environmental impact assessments where certain proposed activities may have a negative effect on the environment. The Authority's wide powers include the protection of flora and fauna, the establishment of national parks, the setting of standards for water quality, etc. The NRCA approves all plans for the development of beaches, inspects beaches to ensure adherence to prescribed safety and sanitation standards and enforces regulations relating to declared protected areas.

## **NATIONAL POLICIES AND PLANS**

### **NATIONAL IRRIGATION DEVELOPMENT MASTER PLAN (1998)**

The National Irrigation Development Master Plan was prepared as part of Phase I of the National Irrigation Development Plan (NIDP) and Preparation of an Irrigation Investment Study. The NIDP Master Plan contains the following:

The NIDP

The proposed implementation strategy

The state of agricultural production with irrigation development

Recommendations on irrigation policy and strategies for successfully implementing the NIDP

Proposals for institutional strengthening

Generic environmental assessment of the irrigation sector

Identification of projects and a priority ranking of the projects

A training program in irrigation

The study team identified 125 projects under nine categories: major irrigation (area >400 ha), NIC rehabilitation, private irrigation, small scale irrigation (area <400 ha), surface water storage, ground water recharge, waste water reuse, small tank program and land reclamation. From this number 83 projects were evaluated and 51 were proposed for implementation. The recommended projects all have an EIRR > 10%. Twenty seven (27) of the recommended projects are proposed for implementation within the first 5 years of the scheduled 17 year life time of the plan. The CDB is funding the first 3 projects (Flagship Projects) and the IDB the other 5 projects identified for immediate support.

### **THE FOREST POLICY (2001)**

The policy addresses a number of areas but central to the purpose of this plan is the Conservation and Protection of Forests. The policy states that forest lands, especially the last remaining areas of natural forests, will be conserved to protect and enhance the native and endemic flora and fauna of the Island. No harvesting will be permitted of primary closed natural forest in forest reserves, national parks, or protected areas. Forest management will support the development of the National Park and Protected Areas System that will assist in the conservation of all natural resources.

The protection of forests from all threats forests including damage from fires, illegal cutting and theft of trees, illegal hunting of birds and animals, soil erosion and other processes which damage soil, water, plants, birds, animals and landscape features is also clearly stated.

The policy adopts the position that no net loss of forest cover will be permitted on lands owned by the Government of Jamaica. Where forest stands are wholly or partially cut or otherwise damaged, they should be promptly reforested with the same, or other suitable species. Where destruction of forest cover is unavoidable, the loss will be compensated by reforesting an equivalent area elsewhere.

Community participation, public awareness and environmental education are seen as major vehicles for implementing the policy, promoting and supporting forest development as well as imparting the importance of forests to Jamaica's economy, environment and society.

Co-operative Management Agreements will be used to achieve forest protection and conservation. For public lands, agreements normally will be made between the Conservator of Forests, the National Environmental Planning Agency and/or delegated non-governmental agencies. For private lands, an agreement may be entered into between the Conservator of Forests and any owner designating their land as a forest management area, as provided for in the Forest Act.

Such agreements will specify:

- the identity and interests of each party;
- the specific purpose and area of agreement;
- responsibilities of the parties;
- designation of permitted land uses;

- provisions for enforcement of land use controls;
- incentives and payments (if applicable);
- management and administrative arrangements; and
- mechanisms for termination and dispute resolution.

### **JAMAICA WATER SECTOR POLICY, STRATEGIES AND ACTION PLANS (2000)**

The Water Sector Policy, Strategies and Action Plans were developed following a comprehensive desk study of the Water Sector, undertaken by a NIBJ team under the World Bank funded Public Sector Modernisation Project. The Policy was developed to complement and be consistent with the National Industrial Policy, the National Land Policy, the Green Paper on Parks and Protected Areas, the National Environmental Protection Plan and the National Policy on Science and Technology. It represents a shifting of national priorities from water resources development to restoration of existing resources and enhancement of water quality as means to reduce the amount of capital otherwise required. It promotes that systematic planning as a matter of policy, based on reliable information and a range of plausible alternatives has the potential for containing demand and reducing the amount of capital expenditure needed. The Policy recognises that existing legislation must be re-examined in light of contemporary water problems with a view to establish an appropriate regulatory framework to protect consumers, investors and the environment. This Strategies were prepared by relevant agencies NIC, WRA and NWC and are expected to indicate how the policies are to be implemented, and will ensure an integrated and co-ordinated approach among all the agencies.

Based on recommendations of the NIDP Water Users' Associations (WUA) were clearly articulated in the section on Irrigation Strategies as a means towards achieving several objectives such as better resource use, improved care of infrastructure and more economic operations. A WUA organises private farmers into a cohesive self-governing unit, which manages an irrigation system, or a part of an irrigation system. Farmers are members and shareholders who have the power to govern the organisation through democratic processes.

### **VISION 2030 JAMAICA**

Vision 2030 Jamaica is Jamaica's first twenty-five year development plan. Its goal is the achievement of development status for Jamaica by 2030. The long-term development plan is based on a comprehensive vision "Jamaica, the place of choice to live, work, raise families, and do business," and on guiding principles which put 'people' at the centre of Jamaica's transformation. Several strategic priorities have been identified, as critical elements in fulfilling the objectives of the Plan, including the development of human resources, international competitiveness, environmental sustainability, health, social protection, science, technology and innovation, effective governance, and law and order. Public consultations are currently being conducted on the draft plan. A Plan Advisory Group (PAG) has been established to provide strategic guidance, national perspective in the formulation of the Plan, and to champion support for the process among the private sector and civil society groups. The PAG is chaired by a private sector leader and its membership is drawn from private-public sector and civil society having a range of professional disciplines. Thirty (30) predetermined task forces covering all major sectors of the economy have been established. Representatives on these have been drawn from sector ministries, other relevant public sector bodies, the private sector, civil society and

International Development Partners (IDPs); each task force is being co-Chaired by Public/Private sector representatives.

## **NATIONAL STRATEGY AND ACTION PLAN ON BIOLOGICAL DIVERSITY IN JAMAICA, 2003**

In fulfillment of one of its obligations as a Party to the Convention on Biological Diversity, Jamaica prepared its National Biodiversity Strategy and Action Plan (NBSAP) “*National Strategy and Action Plan on Biological Diversity in Jamaica, 2003*”.

Implementation of the NBSAP has involved a number of entities, the main players being

1. NEPA ;
2. Environment Management Division of the Ministry responsible for the environment;
3. Forestry Department
4. Institute of Jamaica; and
5. The Nature Conservancy.

Thirty seven project concepts have been identified in the Action Plan of the NBSAP, 8 of them have been ranked “highest priority” and 10 “priority”. There has been a fair amount of success in the implementation of the highest priority projects. Details can be seen in Appendix 4. There has been moderate success with those classified as priority. Despite the successes in implementation, there is currently no formal mechanism to implement or monitor the implementation of the NBSAP.

## **OTHER POLICIES**

- Beach Policy for Jamaica: a policy for the use of the foreshore ,beach and floor of the sea, draft 2000 (Green Paper)
- Coral Reef Protection and Preservation Policy and Regulation, 1997 (Draft)
- Mangrove and Coastal Wetlands Protection Draft Policy and Regulations, 1998 (Draft)
- National Policy for the Conservation of Sea grass, 2001 (Draft)
- Towards a National Strategy and Action Plan on Biological Diversity in Jamaica, 2001 (Green Paper)
- National Policy on Ocean and Coastal Zone Management, 2000 (White Paper)
- Policy for Jamaica’s System of Protected Areas, 1997 (White Paper)
- Policy Toward Dolphin Conservation in Jamaica November 2003 (Draft)
- Mariculture Policy

## **OTHER PLANS**

The following Action Plans include strategies for the protection of the environment.

- Jamaica Coral Reef Action Plan (JCRAP), 1998
- Jamaica National Environmental Action Plan (JaNEAP)
- Jamaica's National Programme of Action (NPA) for the Protection of the Coastal and Marine Environment from Land Based Sources and Land Based Activities
- National Education Action Plan for Sustainable Development in Jamaica 1998-2010
- Ocean and Coastal Zone Management Action Plan
- Marine mammals Action Plan
- National Biodiversity Strategy and Action Plan (NBSAP)

## MULTI-LATERAL ENVIRONMENTAL AGREEMENTS (MEAS)

These Multilateral Environmental Agreements (MEA) impact activities related to the conservation of the environment, biodiversity and forests

- The Convention on Biological Diversity
- Biosafety Protocol to the Convention on Biological Diversity
- The United Nations Framework Convention on Climate Change
- Convention on Wetlands of International Importance (Ramsar Convention)
- Cartagena Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region
- A Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region
- A Protocol Concerning Specially Protected Areas and Wildlife (SPA) in the Wider Caribbean Region
- United Nations Convention on the Law of the Sea
- International Convention for the Prevention of Marine Pollution from Ships
- Convention on the International Trade in Endangered Species (CITES)

# GOVERNMENT, NGO, AND DONOR PROGRAMS AND ACTIVITIES

## GOVERNMENT ACTIVITIES

### NATIONAL ENVIRONMENT AND PLANNING AGENCY

The Ecosystems Management Branch has a number of activities it is currently undertaking. These activities cover both marine and terrestrial biodiversity as well as watershed management. These initiatives include long needed attention to flora as much of the work done previously has focused on fauna. The Agency along with the Forestry Department is undertaking work on 3 endangered species *Malpighia proctorii*, *Turnera campaniflora* and *Guaiacum officinale* (Lignum Vitae) such as artificial propagation and the preparation of fact sheets to raise awareness on these species. Three other rare and vulnerable plant species to be collected from the parishes of St Thomas, St Andrew and St Elizabeth will also be selected for conservation through propagation and awareness activities. It is anticipated that these species and others over time will be planted out at Hope Gardens on “Endemic Way”. . An Orchid Policy has been prepared but a survey to provide quantitative information is planned.

Work on faunal issues also continues. In addition to population assessments around particular caves, a bat assessment to determine the extent of foraging areas around “home” caves is also slated for start up.

With respect to watershed management the Ecosystems Branch is looking toward slope stabilisation works and reforestation. The streamlining of information gathering procedures for watersheds is also being developed. Management plans for the Hope and Rio Cobre WMUs are almost complete.

A new development order is being prepared for St Catherine. This will have far reaching impact as this parish which is part of the Kingston Metropolitan Area (KMA) has a number of environmental, watershed and planning issues. These include agricultural land versus housing land, irrigation water versus domestic water, industrial discharge into the Rio Cobre and soil erosion among others.

With respect to protected areas it is expected that a new five year system plan will be ready at the end of 2008. It was noted that the Protected Areas Policy is now quite dated. Some of the current issues being grappled with include equipment, boundaries of protected areas (moorings in marine PAs).

### NATIONAL CAPACITY SELF ASSESSMENT

A UNDP/GEF/GOJ funded project, the NCSA was completed in 2005. The purpose of the National Capacity Self-Assessment Project (NCSA) is to provide Jamaica the opportunity to conduct a thorough self-assessment and analysis of national capacity needs, priorities and constraints with respect to its efforts at meeting global environmental management objectives.

The capacity development initiative is intended to further assist compliance with the various obligations, under the three “Rio” Conventions separately, namely, the Convention on Biological Diversity (CBD), the United Nations Convention to Combat Desertification (UNCCD), and the United Nations Framework Convention on Climate Change (UNFCCC). Jamaica is a party to each of these Conventions and has found it very challenging to implement the various decisions, programs and or recommendations of these Conventions. The country had not yet examined its capacity needs across the three “Rio” Conventions and hence the National Capacity Self Assessment Project (NCSA) provided Jamaica with the opportunity to conduct its stocktaking.

In this assessment a number of capacity constraints and areas for action were identified. The process facilitated a cross-sectoral process of consultations, stocktaking, assessments, sequencing, and prioritization of capacity needs, particularly for identifying obstacles that impede the country from fully meeting its obligations under the “Rio” Conventions.

The project officially began in March 2004 and was expected to be completed over 15 a fifteen month period, ending date being June 30, 2005, however, this was extended to September 30, 2005. The official launch took place on June 30, 2004. The specific objectives that were to be accomplished through the project implementation were inter alia:

- identify, confirm and review priority issues for action within the thematic areas of Biodiversity, Climate Change and Desertification;
- explore related capacity needs within and across the three thematic areas;
- elaborate a national action plan that focuses on capacity building to address the global environmental commitments;
- provide a solid basis for the preparation of requests for future external funding and assistance;
- link country action to the broader national environmental management and sustainable development framework; and
- monitor and evaluate the implementation of the action plan as part of a process of continuous improvement.

The full report is available from the NEPA website,

[http://www.nrca.org/projects/ncsa/NCSA\\_Report/National%20Capacity%20Self%20Assessment%20Report.doc](http://www.nrca.org/projects/ncsa/NCSA_Report/National%20Capacity%20Self%20Assessment%20Report.doc)

## **THE FORESTRY DEPARTMENT**

Biophysical inventories have been completed in the following watershed management units: Buff Bay-Pencar, Rio Minho, Yallahs and Wagwater (90% complete) and in the following reserves: Dolphin Head and Cockpit Country. To streamline this process the Department had a consultant prepare a manual on establishing and monitoring permanent plots.

The department currently is seeking to address gaps such as research on the use of native species in reforestation as well as information on stand history for commercial species. Native species research needs to include aspects such as nursery propagation, planting out and establishment and the mix of species to be used in planting so as to best mimic natural composition. This is critical to provide in-

formation to private planters who hold the majority of forest lands. Road access is two sides of a coin as the agency needs to have access to forest areas as well as nurseries but does not want to provide too much access for persons who will conduct illegal activities.

The agency has a Co-Management agreement with the Jamaica Conservation and Development Trust for management of the Blue Mountain and John Crow Mountain Forest Reserves (Blue and John Crow Mountain National Park) along with the National Resources Conservation Authority for The National Environment and Planning Agency. Memoranda of Understanding are also held with the Dolphin Head Trust and The Southern Trelawny Environmental Association for management of the Dolphin Head Reserves and parts of the Cockpit Country respectively.

It is anticipated that under executive agency status the department will institute a staff training program for in service courses which will impart on-the-job skills versus scientific/technical information. Planned courses include nursery management and mensuration. These courses will be mandatory after particular service periods and participation in them will be tied to performance evaluation.

A number of documents have been prepared to guide the department to executive agency status. These include a framework document, a medium term financing plan and a modernisation plan. As per the provisions of its guiding legislation the department is in the process of developing a new strategic management plan. Terms of reference have been developed for the review of the current forest policy.

Public awareness will focus around environmental issues as well as the private planters programme, which will be a major area of activity for the department. To support the private planters programme, the department has plans for the preparation of forest management information and other technical information to ensure the growth of stands of trees.

## **THE WATER RESOURCES AUTHORITY**

The WRA routinely monitors river flows at 133 gauging stations and groundwater at 1,802 sites throughout the Island. It has a database of quality checked data, stored in computerized format dating back to the 1950's. Projects like the Rio Cobre Dam Reconstruction benefited greatly from the use of this data base. A series of pollution vulnerability maps for the Island delineating the susceptibility of the aquifers to pollution is almost completed. Allocation is the main tool for management via the issue of licences. Licences are issued for five (5) years after which renewal is due.

The WRA ensures that the rate of use does not exceed the rate of natural replenishment by granting licences which limit the rate at which users may abstract water. Licences are currently issued by the WRA for the abstraction of groundwater. With the new Water Resources Act in place, users of surface water will also have to obtain licences.

In Jamaica persons can abstract and use water without a licence if they have right of access to the source of water, and the water is required only for domestic use (where the area of the land does not exceed 0.5 hectares). Alteration of a well (deepening, change of pump, widening) requires a licence application.

Flood water control was being transferred to the WRA and the legislation amended to that effect. Chief Parliamentary Counsel returned the draft legislation however the WRA and the National Works Agency are no longer in the same ministry so the necessary cooperation to effect the changes is no longer in place.

Following on the flood in Manchester in 2004 and other rainfall events a hydrological assessment was undertaken of the affected areas. This assessment has led to the boundaries in just about half of the Watershed Management Units (WMUs) being adjusted. The most dramatic changes were in the boundaries of the Milk River, Gut – Alligator Hole, Montego River, Great River, Martha Brae, Deans River and Black River WMUs. See Appendix 5 for map.

The new Water Resources Master Plan is still not complete as of September 2008 for a number of reasons. The WRA has applied to the Inter-American Development Bank for a three month extension to December 2008 to allow the plan to be complete.

In responding to new environmental issues such as climate change the authority is looking at sea level rise and its effects on the Clarendon Plain using a Climate Change Model.

## **THE FISHERIES DIVISION**

There is a strong upsurge in concern about the rather poor status of the fisheries and declines in marine biodiversity since about 1997. Partly related to this was a major integrated multidisciplinary study for the sustainable development of the south coast fisheries conducted in 1998 (Halcrow, 1998) which is intended to address ways to ensure rehabilitation and sustainability of the fishable resources. A major review of the fisheries legislation with assistance from FAO has produced a new draft Fisheries Bill. This Bill is being reviewed, for intended introduction by 2000. Hinging on this new Bill, is the implementation of the plan for managing the marine fisheries compiled by the Fisheries Division with assistance from the CFRAMP (Fisheries Division/CFRAMP, 1997). This is a comprehensive plan for addressing the specific needs of each resources group (shallow shelf, deep slope, coastal and larger pelagics, conch, lobster, etc.). Within the plan is the formation of an overseeing Fisheries Advisory Board with a multidisciplinary composition. There is recently a distinct move away from the largely failed top-down managerial approach to co-management and community-based fisheries resource management. There are several non-government organizations that have attempted to undertake fisheries management with various levels of success. A few of the successful projects include the Fisheries Improvement Project (FIP) in Discovery Bay, St. Ann (1988 to 1998) and the Caribbean Coastal Area Management Foundation (CCAM) in Old Harbour Bay, St. Catherine (1997 – present), the largest bay in Jamaica. Both have had a focus on the involvement of stakeholders in decision-making and enforcement of management measures. These projects may serve as corrective models for careful introduction later islandwide. The Fisheries Division would still have a role in coordinating the enforcement activities and offering legal and technical advice, as well as administering the fishery.

## **FISHERIES ADVISORY BOARD**

Formed in 2008 the Fisheries Advisory Board is comprised of a group of individuals with a wide cross-section of skills. The focus is a drive towards introduction of fish sanctuaries and other marine protected areas as part of a strategy to reduce fishing effort on reefs generally.

## **IMPROVEMENT OF INFRASTRUCTURE AND OTHER DEVELOPMENT**

Improvement of infrastructure to improve sanitation on landing sites, and support of coastal fishing communities are planned as part of the program for sustainable fisheries development islandwide. The capacity of these communities to both understand and participate in co-management is to be addressed. Regular catch monitoring and assessments is necessary, and would run alongside these programs. A main focus would be the prevention of further declines and/or increase of yields from overexploited shelf and bank areas by reducing fishing effort and removal of unsustainable fishing practices through a co-management approach.

Additionally, options for the exploration for increasing yields from larger pelagics and other areas through enhancement (fish attraction devices, FADs) are to be explored.

Controlled nearshore lobster stock enhancement by the use of Cuban inspired casitas (artificial dens) is being undertaken on an experimental basis in a few selected areas. Larger pelagics and the introduction of small-scale longlining are both in need of re-assessment. Upgrading of processing, distribution and post-harvest handling standards are among other plans. The Fisheries Division's capability would also be upgraded. Rehabilitated and properly managed, these fisheries have the potential to produce sustainable long-term yield of valuable, high quality seafood for both local and tourist consumption as well as for export.

#### **LINKAGES WITH MARICULTURE**

From around 1978 there was a drive to introduce oysterculture using mangrove species. This was achieved on an experimental basis with assistance from Cuba in training in methodologies (Wade et al., 1981). In the early 1980s this grew into trial grow-out ventures at selected sheltered coastal bays around Jamaica (Bowden, St. Thomas, Port Antonio, Portland, Green Island, Hanover). The overall intention was to develop an economic alternative for fishers and coastal communities. A combination of technical persons from the International Development & Research Centre (IDRC), Canada, the UWI Zoology Department, Mona and the Fisheries Division, Ministry of Agriculture undertook a largely successful introduction of oysterculture on wooden racks in shallow bays. However, this program fell into disuse, largely due to theft, frequent tropical storms, and declining commercial interest by the mid-1990s. About this latter period, research with similar objectives began into saltwater culture of red tilapia hybrids in cages in coastal waters. Though largely technically successful (Aiken & Steele et al., 1995; Aiken et al., 2002), the commercial follow-up did not materialize (fish growth rate was slower than in ponds and cage costs were higher than expected) and the program is dormant at the time of writing. This is regrettable, because if implemented such a program could likely result in some easing of fishing pressure on coastal reef fisheries resources.

## **NON-GOVERNMENT ORGANISATIONS**

### **THE NATURE CONSERVANCY**

The National Implementation Support Partnership was a collaborative Partnership agreement with the Government of Jamaica, (through the Ministry of Land and Environment, the National Environment and Planning Agency, Institute of Jamaica, Forestry Department.), and The Nature Conservancy TNC), the Jamaica Conservation and Development Trust (JCDDT) and Heritage Design, (an enterprise unit of the USDA) during the period 2004-2006. The NISP was intended to support a number of protected areas-related projects identified in the NBSAP.

These projects included:

- Preparation of an Ecological Zonation Plan;
- Involvement of Private Land Owners in Protected Areas Management;
- Building Management Capacity of the Jamaica Protected Areas Network (J-PAN);
- Development of Increased Resource Management Capacity; ; and
- Extension of the Biodiversity Secretariat.

Other Jamaica government initiatives with TNC include:

- Caribbean Challenge, (2008), focusing on the CBD's programme of work on Protected Areas, and which involves *inter alia*, the establishment of a trust fund.
- Forest Conservation Fund (2004)
- The Jamaica Eco-regional Plan (2006)
- The National Eco-regional Gap Assessment (NEGAR) for the Protected Areas Master Plan; and
- Water Resource Management Traditions and Practices in Blue Mountains National Park, 2007.

## ENVIRONMENTAL FOUNDATION OF JAMAICA

The Environmental Foundation of Jamaica provides funding for Environmental Management and Natural Resources Conservation through its Grants Programme. The EFJ used to have grant calls twice per year but now has one annual grant call with a tightened focus. The foundation also awards discretionary grants for sums not exceeding j\$200,000. The foundation now employs 'universal' indicators to track the effectiveness of the projects they fund. The five main themes and sub-themes are set out below.

### ENVIRONMENTAL MANAGEMENT AND NATURAL RESOURCES CONSERVATION

#### 1. WASTE MANAGEMENT & WATER MANAGEMENT

- Waste Water Recycling and Reuse
- Solid Waste Recycling
- Hazardous Waste Management
- Community systems for efficient/effective use of water (e.g. Water harvesting systems and water savings)

#### 2. WATERSHED & COASTAL ZONE MANAGEMENT

- Beach Management
- Coastal Habitat Protection
- Upper Watershed Reforestation & Management (including techniques to reduce soil erosion & improved farming practices)

#### 3. BIOLOGICAL DIVERSITY

- Habitat Conservation and Management
- Endemic & Endangered Species Conservation & Management

#### 4. ALTERNATIVE ENERGY SYSTEMS

- Installing Alternative Energy systems (with emphasis on Hybrid Systems – wind, solar, biogas)

- 5. COMMUNITY GREEN SPACES (e.g. upgrade and/or establishment of Community parks for aesthetic and social value)

In addition to environment and natural resources the EFJ also supports Child Survival and Health initiatives.

### **FISHING COOPERATIVES**

These presently exist only on three beaches (Old Harbour Bay, St. Catherine, Rocky Point, Clarendon and Whitehouse, Westmoreland) from a larger number in the 1970s. There has been a decline in number of such cooperatives since that time and their effect on fishers is now minimal, although it must be noted that these last three coops are on Jamaica's three largest fishing beaches. They largely function to retail duty-free fishing gear. The expansion of coops is unlikely due to traditional internal distrust and poor internal business management practices.

### **JAMAICA CORAL REEF MONITORING NETWORK (JCRMN)**

Launched in 2003 and coordinated through the UWI the JCRMN is a network of agencies and institutions involved in coral reef monitoring, research and management whose objective is to develop a sustainable coral reef monitoring program. To date 53 sites around the island, including the Pedro Cays have been assessed.

### **UNIVERSITY OF THE WEST INDIES (UWI)**

Various departments at the UWI are involved in research related to and fisheries resources and biodiversity. These include

- The St Thomas Habitat Protection Project. Ecological Assessment of the Morant Wetlands being implemented by the Department of Life Sciences.
- Various coral gardening and restoration projects supported by local (Environmental Foundation of Jamaica) and overseas funding.
- Caribbean Marine Atlas, a regional project involving NEPA in conjunction with the Intergovernmental Ocean Commission (IOC).
- In collaboration with UNDP, FOA, Fisheries Division and CFRAMP on assessment of the fishable resources and status of the reef fisheries

### **JAMAICA CONSERVATION AND DEVELOPMENT TRUST**

The mission of the JCDT is to promote environmental conservation and sustainable development with particular emphasis on the Blue and John Crow Mountains National Park, for the benefit of Jamaica and the people. The organisation has agreements with the two relevant government agencies (NEPA and the Forestry Department) which guide its operational management of the National Park. Activities are implemented under six Programmes described in the National Park's Management Plan 2005 – 2010. These include reforestation with native, non-lumber species, and invasive species control, environmental education in buffer zone schools, bird and freshwater biological monitoring.

## **BI-LATERAL AND MULTI-LATERAL INITIATIVES**

### **UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID)**

- **USAID - Protected Areas and Rural Enterprise (PARE) project** supports Government of Jamaica (GOJ) and community partners to advance conservation of biodiversity and protected areas and develop natural resource-friendly rural enterprises in targeted Jamaican sites, through technical assistance and grant funding. The US Forest Service – International

Programs Office is implementing the PARE project in partnership with USAID, through a local project management office. All activities undertaken in PARE's FY 08 work plan were designed to contribute to USAID – Jamaica's strategic objective "Natural Assets Managed for Rural Development and Sustainable Economic Growth." In addition to national initiatives, project interventions were focused primarily in the Blue and John Crow Mountains and the Cockpit Country Forest Reserve. Most of the project's accomplishments were realized through collaborations with the Forestry Department, the Ministry of Agriculture, The Nature Conservancy and other government and nongovernmental organizations. emphasis was placed on the demonstration of an effective model for successful and sustainable community-led tourism establishments in conservation areas such as the Cockpit Country, strengthening of biodiversity conservation and management in the Blue and John Crow Mountains National Park, national forest governance and private and community- led forestry efforts, capacity building to address the threat of bushfires on forests, biodiversity and livelihoods and an assessment of opportunities and threats in the Jamaican cocoa agro forestry system.

- **USAID - the recently closed Rural Enterprise, Agricultural and Community Tourism (REACT) project** provided assistance to The Dolphin Head Trust preparing the Dolphin Head Biodiversity Management Plan.
- **Jamaica Farmers Access to Regional Markets (JA-FARMS)** has been promoting the use of greenhouses to reduce the environmental footprint of agriculture while improving yields and protecting crops. The Jamaica Farmers Access to Regional Markets (JA FARMS) bridging extension will support activities that will result in the development of sustainable agricultural economic alternatives that reduce threats to Jamaica's unique biodiversity. The proposed strategy emphasizes capacity building and biodiversity conservation in addressing the low productivity and underperformance currently being experienced in Jamaica's agriculture sector. Essential to this strategic approach is the introduction of best practices in sustainable protected agricultural to local farmers, while simultaneously strengthening the capacity of the Rural Agriculture Development Authority (RADA) and other key stakeholders to provide expanded and improved services to their constituents. Through the proposed JA FARMS extension Citizens Development Corps (CDC) will also facilitate the introduction and commercialization of improved production and marketing technologies to increase rural incomes while limiting potentially negative environmental impacts of agriculture. JA FARMS will achieve its goals through the following program components:
  1. Marketing Support/Value Chain Development
  2. Demonstrate the Use of Reclaimed Mined-out Bauxite Lands for Protected Agriculture
  3. Rationalizing the Current Market Information System to Support Real Time Market Intelligence.
  4. Capacity Building for RADA Extension Officers and Farmers
  5. Facilitating Public Private Partnerships

## GLOBAL ENVIRONMENT FACILITY (GEF)

There are a number of projects funded in part by the GEF. The implementing agencies involved are the UNDP and UNEP. A list of the projects for the period 2005-2008 is provided below while details on their status can be seen in Appendix 6.

- Early Action Grant
- National System of Protected Areas (full size Project)
- Natural Resources (Cockpit Country) Valuation
- Integrated Watersheds and Coastal Areas Management Project (IWCAM)

- Sustainable Management of the Shared Marine Resources of the Caribbean Large Marine Ecosystem (CLME) and Adjacent Regions including a pilot project on the Management and Conservation of Reef Biodiversity and Reef Fisheries
- Assessment of Capacity Building Needs, Preparation of the Third National Report (CBD) and the Clearing House Mechanism
- Building Capacity for effective Participation in the Biosafety Clearing-House (BCH).

## UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP)

UNDP connects countries to global knowledge, experience and resources and assists them in strengthening capacity to create their own solutions to development challenges. To achieve this, we employ high-quality policy advice and advocacy, innovation at the grassroots, and strategic partnerships, focusing on the priority areas of Poverty Reduction, Democratic Governance, Environment and Energy, Crisis Prevention and Recovery, and HIV/AIDS<sup>10</sup>.

In Jamaica UNDP tries to accelerate sustainable land management and the effective governance of increasingly precious water resources, to promote effective adaptation to climate change, and to encourage the adoption of good energy practices. Conservation and sustainable use of biodiversity likewise is a priority, given that the poor, especially in rural areas, depend on biodiversity for food, fuel, shelter, medicines and livelihoods and that it reduces vulnerability to some natural disasters. At the policy level, all this is underpinned by support to the formulation of frameworks and strategies for sustainable development, as pledged in the Millennium Development Goals. In so doing, UNDP addresses broader challenges such as poverty, political instability and conflict, population growth, and disease, as well as integrate environmental sustainability into development policy and practice.

In energy initiatives, UNDP supports the Government in implementation and monitoring of the national Energy Policy and increase energy efficiency in hospitals and schools. We also study the feasibility of uses of alternative energy. increased awareness into action and improved accountability for environmental and public health damages.

The Global Environment Facility's Small Grants Programme in Jamaica is managed by UNDP. The Small Grants Programme in Jamaica started operations in late 2004 and since then has disbursed grants to 40 projects benefiting more than two dozen non-Government and community-based organizations. For 2007/2008 it has an allocation of US\$485,000. Small Grants have been concentrated in the areas of prevention of land degradation, climate change mitigation, and biodiversity conservation. Jamaica is one of 10 pilot countries, representing a diversity of ecosystems, socioeconomic context and climate impacts, for implementation of a project on community-based adaptation to climate change.<sup>11</sup>

## EUROPEAN UNION

This donor is currently focussing on issues of debt and crime.

## JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

In Jamaica JICA is working in the areas of natural disaster management and environmental conservation. It also offers opportunities for technical cooperation and provides grants for agriculture and environment activities.

## CANADIAN INTERNATIONAL DEVELOPMENT AGENCY (CIDA)

<sup>10</sup> Source: <http://www.jm.undp.org/content/what-we-do>

<sup>11</sup> Source: [http://www.jm.undp.org/gef\\_sgp](http://www.jm.undp.org/gef_sgp)

This donor has very focused activities supporting good environmental practices, environmental awareness and environmental education in schools.

## REGIONAL INITIATIVES

### **CARIBBEAN SEA ECOSYSTEM ASSESSMENT (CARSEA)**

CARSEA, a project under the Millennium Ecosystem Assessment (MA) has sets out a detailed picture of the condition and trends of the Caribbean ecosystems, and developed a number of scenarios aiming to simulate the likely outcome of different plausible future paths for the region and reviewed the responses available to decision-makers.

### **CARIBBEAN REGIONAL FISHERIES MECHANISM (CRFM)**

Based in Belize, regular meetings are held in order to discuss joint regional (and national) policy on fisheries management, training and catch monitoring and other relevant issues. The CRFM still allows for contact and collaboration with other fishing nations regionally to exchange of data, ideas and policy approaches related to fisheries management and to regional challenges. Additionally, Jamaica benefits from the participation of the CRFM in various major international scientific meetings such as ICCAT (International Convention on the Conservation of Atlantic Tunas).

### **INTEGRATING WATERSHED AND COASTAL AREA MANAGEMENT (IWCAM) IN THE SMALL ISLAND DEVELOPMENT STATES (SIDS) PROJECT**

The Project Integrating Watershed and Coastal Area Management (IWCAM) in the Small Island Development States (SIDS) of the Caribbean, with a value of USD 22 Million, was approved by the Global Environment Facility (GEF) in May 2004. Implementing agencies are the United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP). Executing agencies are the Secretariat of the Cartagena Convention (UNEP-CAR/RCU) and the Caribbean Environmental Health Institute (CEHI).

The thirteen participating SIDS are; Antigua & Barbuda, The Bahamas, Barbados, Cuba, Grenada, Dominica, Dominican Republic, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent & the Grenadines, and Trinidad & Tobago. The length of the Project is 5 years and commenced in the second quarter of 2005. The overall objective of this Project is to strengthen the commitment and capacity of the participating countries to implement an integrated approach to the management of watersheds and coastal areas. The long-term goal is to enhance the capacity of the countries to plan and manage their aquatic resources and ecosystems on a sustainable basis. In particular, project activities will be focusing on improvements in integrated freshwater basin-coastal area management on each island of the regional groupings of Caribbean SIDS. Under this project Jamaica has a country demonstration project “An integrated approach to managing the marine, coastal and watershed resources of east-central Portland”.

# THREATS TO BIODIVERSITY AND FORESTS AND RECOMMENDATIONS FOR CONSERVATION

Threats can be either direct or indirect; that is some affect watershed areas and forests on the ground whilst others cause an impact remotely or through a chain of connected effects.

## DIRECT THREATS

### FRESH WATER BIODIVERSITY

Threats to Freshwater biodiversity in Jamaica include:

Nutrient loading from small and large scale agriculture, malfunctioning of sewage plants and septic pits;

Competition of invasive species;

Deforestation and removal of riparian vegetation;

Overharvesting of freshwater biodiversity.

Habitat conversion;

Habitat degradation such as the harvesting of wood for charcoal;

[Source: National Ecological Gap Assessment Report 2008]

## CLIMATE CHANGE

Climate change affects biodiversity in a number of ways. The Caribbean has shown a trend in increasing temperature and extreme rainfall events and it is predicted that Jamaica is likely to experience a 2°C rise in temperature by about 2050 as well as more extreme rainfall conditions (Taylor et al 2007). Between August and October of 2005 there were prolonged periods of high sea surface temperature around Jamaica and other countries of the region. This 5-6 weeks of elevated temperatures resulted in 10-95% bleaching of corals with subsequent infestation by coral diseases. Diseases in the marine environment are natural, but may be introduced by ships, or susceptibility increased by external stressors such as hurricanes or increased sea surface temperatures. Sea level rise combined with increased in temperature, CO<sub>2</sub>, precipitation and extreme weather events will threaten the resilience of mangroves as this is expected to lead to the reduction and eventual loss of significant mangrove cover (McLeod & Salm, 2006). Hurricanes are a natural phenomenon in the Caribbean and their frequency and intensity are thought to be increasing with climate change. A

projected 0.5 m sea-level rise in the Caribbean could cause a 35% decrease in turtle nesting habitat (Djoghla, 2008). The links between biodiversity and climate change run both ways: biodiversity is threatened by climate change, but the conservation and sustainable use of biodiversity can reduce the impacts of climate change.

## **TOURISM**

Negative environmental impacts associated with the growth in tourism include the concentration of infrastructure along narrow coastal zone, destruction of wetlands and mangrove to facilitate hotel construction and erection of piers and marinas. In addition, there is the destruction of marine habitat due to dredging, sea grass removal, damage to coral reefs and discharge of sewage into off-shore areas.

## **URBAN DEVELOPMENT, INDUSTRY AND AGRICULTURE**

Approximately 50% of the Jamaican population lives in urban areas, most of which are located along the coast and this has resulted in high population pressures on the coast for residential, resort and industrial development through the reclamation and dredging of land. Poorly managed coastal development threatens coral reefs through dredging, landfill, mining of sand and limestone, dumping of spoils, and runoff from construction. Indirectly, nutrient and sediment pollution associated with urban settlements impact reef health (Burke & Maidens, 2004). Many squatter communities have inadequate infrastructure and contribute to environmental degradation. The major impacts arising from agriculture include; soil erosion, excessive land clearing, uncontrolled use of fire, loss of biodiversity and wildlife habitat. In addition, the over-use of agro-chemicals such as fertilizers, pesticides and weedicides have adversely affected water quality in many locations. There are places along the south coast of Jamaica where there is saline intrusion due to over-abstraction of water from coastal aquifers for irrigation. Manufacturing and industrial processing have negatively affected water quality both in rivers and in places such as the Kingston Harbour. This is primarily due to effluent (sewage and trade) discharge in these bodies, increasing biological oxygen demand (BOD).

## **FISHING PRACTICES**

The fisheries of Jamaica are viewed as overfished. This overfishing has brought about changes in the species composition that have important fisheries effects (Munro, 1983; Aiken & Haughton, 1987 & Haughton, 1988). The top carnivorous predatory fishes such as the higher-valued snappers, groupers and jacks have been greatly reduced and further these have been replaced by lesser valued herbivorous and omnivorous species such as parrotfishes, surgeonfishes and wrasses. Thus, the biodiversity has been directly affected by overfishing. Complicating the picture are the other elements such as, severe hurricane damage to reefs in 1980 & 1988, poorly understood waterborne viral diseases which killed nearly all the black sea urchins which are important algal croppers which ensure (with herbivorous fishes) that the reefs do not become overgrown with algae. Also, marine pollution and wetland and seagrass nursery losses due to coastal development are related factors affecting species changes.

## **INVASIVE SPECIES**

The management of invasive alien species is a major concern for Jamaica, and is listed in the NBSAP as a highest priority project. Some progress has been made in this area. As a partner in the Inter-American Biodiversity Information Network (IABIN), Jamaica has been participating in the IABIN Invasives Information Network (I3N). Between 2006 and 2007 Jamaica implemented a project "IABIN Invasive Species Thematic Network Content Building Project: Implement, Update and

Maintain an I3N IASs Database in Jamaica”. The main deliverables of the project were the digitization of a comprehensive list of all known invasive species in Jamaica and the development of educational materials. Jamaica is currently participating in a regional UNEP/CABI project Mitigating the Threats of Invasive Alien Species in the Insular Caribbean. One output of this project will be the development of National IAS strategies.

Other projects on invasive alien species include work on introduced fish species in the Black River, and control of plant invasives in the Blue and John Crow Mountains National Park. Two new terrestrial invasive alien species have recently been accidentally introduced into Jamaica. These are the red palm mite and the hibiscus pink mealy bug. Control of these two plant pests has been initiated by the Ministry of Agriculture. Also recently found is the citrus butterfly.

There are two newly arrived marine invasive species that have been observed in Jamaican waters, which have the potential of severely impacting the coastal marine ecosystem. These are the green mussel and the lionfish. An invasion of lionfish (*Pterois volitans*) would be devastating to reef fisheries as they feed on small grazing fish that keep seaweed from overwhelming coral reefs. In addition, the dorsal spines are venomous and potentially dangerous to divers, swimmers and tourists. The Ministry of Health and the Tourism have been advised by NEPA of the presence and potential hazard of the lionfish in the Jamaican waters (NEPA 2008b). The green mussel *Perna viridis* was first observed in Kingston Harbour in 1998 and poses a potential health hazard if it is to be used for food. Studies have already shown excessively high levels of bacterial coliform in the mussel and the presence of four potentially toxic micro algae. *Perna viridis* is an important invasive species in Kingston Harbour as its high rate of colonization and exceptionally high rate of growth allows it to dominate its substrate and displaces other species as well as compete successfully for food (Buddo et al, 2003).

While there has been a fair amount of work in this area there are still gaps, an important one being legislation to address the importation of invasive alien species.

## INDIRECT THREATS AND ROOT CAUSES

Indirect threats include:

- Lack of legislation;
- Poor enforcement of laws and regulations;
- Insufficient monitoring;
- Inadequate staffing of agencies responsible for enforcement and monitoring;
- Insufficient financial resources;
- Lack of understanding of the consequences of biodiversity loss to the island as a whole.

# ACTIONS NEEDED TO CONSERVE BIODIVERSITY

The following are recommended actions needed to conserve biodiversity.

1. Strengthening of legislative framework to include protection of plants, access to genetic resources, benefit sharing, introduction of alien species and Ramsar sites
2. Allocation of responsibility for implementation of the NBSAP;
3. Develop synergies among agencies involved in the use of biodiversity such as Jamaica Trade and Invest and the Ministry of Tourism, Ministry responsible for Development with the biodiversity agencies such as the Fisheries Division and NEPA.
4. Strengthening of the agency responsible for biodiversity conservation.
5. Completion and implementation of the Protected Areas (System) Master Plan, including closing representational gaps.
6. Taxonomic Research - Complete inventory of resources to create a complete database of Jamaica marine Biodiversity including dolphins, crocodile, turtles and sea birds.
7. Pharmaceutical Research - identifying new and useful pharmaceutical compounds
8. Biodiversity valuation to determine the economics of the goods and services related to local communities and national economics, also losses that would result from degradation and loss of productivity in the areas of fisheries, tourism and shoreline protection to include climate change considerations such as sea level rise, increased surface temperature and acidification.
9. Ecosystem Restoration - Coral reefs, mangroves and seagrass to restore the natural protective functions of coastal erosion and barriers against abnormal seas.
10. Technical Expert Group - Technical Expert Group on Biodiversity and Climate Change with a mandate to provide scientific and technical advice on biodiversity, as it relates to climate change impacts, vulnerability and adaptation

For this section a modified Threat Reduction Assessment (TRA) Approach was used to examine threats as initially the TRA methodology was developed for site based direct threats. A recommendation for reduction of the threats is provided and the area, urgency and intensity of these threats are scored relatively to give a Threat Reduction Assessment Index. The analysis is set out in five tables (Tables 8-12) by ecosystem or sector area. The TRA used in this report utilised the following steps:

- The area was assumed to be the island of Jamaica and its territorial waters
- A list of all threats both indirect and direct by sector was generated. The threat type was noted in the second column.
- A suggested action to bring about reduction (ideally 100% reduction) was described

- The total **area** affected by that threat was used to assign an area rank by listing the ranking of the threats based on the area affected, with the largest number (equal to the total number of threats) assigned to the threat affecting the largest area and continuing down to a rank of #1 for the smallest area.
- A similar process was done for **intensity**, where the rankings were assigned to the threats based on the impact or severity of destruction, again with the largest number (equal to the total number of threats) assigned to the threat of greatest intensity and continuing down to a rank of #1 for the least intense threat.
- For **urgency** the rank ordering established for the threats was listed, with the largest number (equal to the total number of threats) assigned to the most immediate threat and continuing down to a rank of #1 for the least immediate or urgent threat.
- For each threat, the ranking numbers across the three columns area, intensity and urgency was added. The total was recorded in the column headed **total ranking**. Thus the highest number in the total ranking column indicates the highest threat based on the three criteria of area, intensity and urgency.

Table 8 below provides a summary of the most important threats to watersheds and forestry resources. Seven threats were identified with deforestation, mining and squatting (houses and other structures) posing the highest threats. Mining and deforestation are linked as vegetation cover is often removed to access mineral deposits. Squatting while covering both the construction of dwelling as well as the clearance of land for small farming has two different total rankings as the legal process of removing persons from land once a building has been constructed is much more involved and requires action by more than one section of government (e.g. Forestry Department and Commissioner of Lands). The planning framework which moved very slowly to create new overarching plans or development orders was seen as a more urgent threat than the legislative and policy framework as there had been a number of new or amended laws as well as polices.

**TABLE 8. SUMMARY OF THREATS TO WATERSHEDS AND FORESTRY RESOURCES**

Threats	Threat Type	Criteria Ranking			Total Ranking	Suggested Action(s)
		Area	Intensity	Urgency		
Mining	Direct	3	6	5	14	<ul style="list-style-type: none"> <li>• Economic valuation of forests and watershed to show true contribution of environmental services or existence values.</li> <li>• Declaration of proposed protected areas or other protective designation for threatened sites.</li> </ul>
Squatting – structural e.g.	Direct	5	5	4	14	<ul style="list-style-type: none"> <li>• New assessment of current situation as a follow</li> </ul>

TABLE 8. SUMMARY OF THREATS TO WATERSHEDS AND FORESTRY RESOURCES

Threats	Threat Type	Criteria Ranking			Total Ranking	Suggested Action(s)
		Area	Intensity	Urgency		
houses						up to 2004 study.
Squatting – agriculture e.g. farms	Direct	3	4	3	10	<ul style="list-style-type: none"> <li>• Programmatic regularisation of land tenure.</li> <li>• Identification of suitable sites for relocation.</li> </ul>
Poor agricultural practices	Direct	1	3	2	6	<ul style="list-style-type: none"> <li>• Improved extension services to small farmers especially in upper watersheds and on steep slopes</li> </ul>
Policy and legislative framework	Indirect	2	1	6	9	<ul style="list-style-type: none"> <li>• New legislation for watershed management or amended legislation with regulations promulgated.</li> <li>• Watershed Policy to be made White Paper.</li> <li>• Water Resources Master Plan to be completed and implementation commence</li> </ul>
Planning Framework	Indirect	4	2	7	13	<ul style="list-style-type: none"> <li>• New national spatial plan and/or development orders to guide development.</li> </ul>
Deforestation	Direct	7	7	1	15	<ul style="list-style-type: none"> <li>• Minimum of 1000 ha/yr of forest to be replanted to cancel out loss of 360 ha/yr and increase forest cover</li> </ul>

Table 9 below provides a summary of the major threats to the coastal and marine environment which are ranked in order based on calculations of the TRA Index. The factors that pose significant threat to coastal and marine biodiversity include the increased incidence of hurricanes and severe storm events, the impact of enclave tourism as manifested in the all-inclusive resorts, the paucity of knowledge as a consequence of limited scientific research, the lack of economic valuation studies, the

presence of numerous uncoordinated plans and policies, the threat of alien invasive marine species, the increased frequency of coral bleaching and diseases, the removal of mangroves forests and the dredging of seagrass beds. Proposed actions to address these threats include but are not limited to coastal vulnerability and risk assessment studies, the promotion of sustainable tourism, inventory studies of coastal and marine resources, island wide economic valuation studies and the rationalization of plans and policies. Research is required to combat the impacts of invasive species and coral beaching while implementation of rehabilitation program for mangrove forests and seagrass beds is recommended.

**TABLE 9. SUMMARY OF THREATS TO COASTAL AND MARINE RESOURCES AND PROPOSED ACTIONS TO ADDRESS THESE THREATS**

Threats	Criteria Ranking			Total Ranking	Suggested Actions
	Area	Intensity	Urgency		
Hurricanes and severe storm events.	4	9	8	21	<ul style="list-style-type: none"> <li>• Conduct vulnerability and risk assessments</li> <li>• Implement protective measures in specific areas</li> </ul>
Enclave Tourism	7	8	4	19	<ul style="list-style-type: none"> <li>• Sustainable tourism certification</li> <li>• Participation in JCRMN coral reef monitoring program.</li> <li>• Promote community tourism and eco-tourist attractions</li> </ul>
Limited Research	9	1	6	16	<ul style="list-style-type: none"> <li>• Conduct marine resources inventory</li> <li>• Identify and develop marine genetic resources</li> </ul>
Limited Economic valuations	6	3	7	16	<ul style="list-style-type: none"> <li>• Identification and selection of economic valuation tools</li> <li>• Economic evaluation of the marine and coastal resources</li> </ul>
Limited Implementation of Plans and Policies	8	2	5	15	<ul style="list-style-type: none"> <li>• Rationalization of plans and policies.</li> <li>• Uniformity and transparency in enforcement</li> </ul>
Invasive Indo Pacific Lionfish ( <i>Pterois volitans</i> )	1	4	9	14	<ul style="list-style-type: none"> <li>• Research impact on the ecological balance</li> <li>• Public education and outreach program on dangers to marine life and humans</li> </ul>
Coral bleaching and diseases	5	5	3	13	<ul style="list-style-type: none"> <li>• Coral reef restoration</li> <li>• Identification of coral species/strains resistant to bleaching and diseases.</li> </ul>
Mangrove forest loss	3	7	2	12	<ul style="list-style-type: none"> <li>• Conduct mangrove rehabilitation and replanting</li> </ul>
Loss of seagrass	2	6	1	9	<ul style="list-style-type: none"> <li>• Rehabilitation of sea grass beds through relocations and replanting.</li> </ul>

A summary of the major threats to the fisheries resources is provided in Table 10 and are ranked in order based on calculations of the TRA Index. The over-fishing of reef resources was identified as the most significant threat to Jamaica's fisheries resources followed by the limited availability of catch & effort, economic and biological data, inadequate legislation and poor enforcement, ineffective and poor management of fisheries activities, foreign offshore poaching, unplanned coastal settlements, fisheries disasters, poorly educated fisher population, illegal "guns for drugs" trade and variable seafood quality. A number of actions were proposed to address these threats and some are outlined here. There should be reduced fishing effort with the identification of alternative activities also regular collection of catch, economic and biological data should be carried out. The new Fisheries Bill should be fast-tracked, funding for enforcement and co-management should be made available, policies and priorities examined and a fisheries disaster fund established. Other recommendations include offshore surveillance and collaboration between local and US security organizations, the implementation of a long-term education program for fishers and the adoption of a seafood (HAACP) inspection program.

TABLE 10. SUMMARY OF THREATS TO FISHERIES RESOURCES

Threats	Criteria Ranking			Total Ranking	Suggested Actions
	Area	Intensity	Urgency		
Overfishing	13	13	13	39	<ul style="list-style-type: none"> <li>• Reduction in fishing</li> <li>• identification of alternate activities</li> <li>• More closed seasons.</li> <li>• Restricted licensing</li> <li>• Marine protected areas</li> </ul>
Poor enforcement	12	12	12	36	<ul style="list-style-type: none"> <li>• Funding for Fisheries Division enforcement personnel &amp; activities</li> <li>• Increased funding for co-management outreach program</li> </ul>
Inadequate legislation and poor attitude towards management	11	11	11	33	<ul style="list-style-type: none"> <li>• Fast-track and implement New Fisheries Bill</li> </ul>
Assessment of status of fisheries.	10	9	10	29	<ul style="list-style-type: none"> <li>• Collection of catch and effort data at regular</li> </ul>

TABLE 10. SUMMARY OF THREATS TO FISHERIES RESOURCES

Threats	Criteria Ranking			Total Ranking	Suggested Actions
	Area	Intensity	Urgency		
					intervals (two years)
Unplanned coastal settlements.	6	10	5	21	<ul style="list-style-type: none"> <li>• Closer monitoring and control of coastal development</li> </ul>
Inadequate economic data	9	4	8	21	<ul style="list-style-type: none"> <li>• Involvement of economists in data collection and analyses</li> </ul>
Foreign offshore poaching	7	7	7	21	<ul style="list-style-type: none"> <li>• Increased funding for monitoring &amp; offshore surveillance by JDF Coast Guard</li> <li>• Stronger Linkages with CITES</li> </ul>
Annual fisheries disaster	8	8	4	20	<ul style="list-style-type: none"> <li>• Dedicated fisheries disaster fund</li> </ul>
Ineffective prioritization of fisheries activities.	6	6	6	18	<ul style="list-style-type: none"> <li>• Re-examination of policy and priorities,</li> <li>• Introduction of Fish Attraction Devices and artisanal long-lining</li> </ul>
Fisher educational gap	4	5	2	11	<ul style="list-style-type: none"> <li>• Long term island wide educational program</li> <li>• Co-management with fishers island wide,</li> </ul>
Illegal drugs and gun trade	3	2	3	8	<ul style="list-style-type: none"> <li>• Collaborate with US security organizations</li> </ul>
Inadequate biological data	2	3	2	7	<ul style="list-style-type: none"> <li>• Collection of biological data in conjunction with research institutions and NGOs</li> </ul>
Variable seafood quality.	1	1	1	3	<ul style="list-style-type: none"> <li>• Integrated seafood HACCP inspection</li> </ul>

TABLE 10. SUMMARY OF THREATS TO FISHERIES RESOURCES

Threats	Criteria Ranking			Total Ranking	Suggested Actions
	Area	Intensity	Urgency		
					program

Table 11 below outlines the major threats to freshwater biodiversity which are ranked in order based on calculations of the TRA Index. Deforestation and the removal of riparian vegetation was ranked the highest threat to freshwater biodiversity followed by the lack of appropriate legislation, poor enforcement of existing legislation, nutrient loading from malfunctioning treatment plants, competition from alien invasive species, lack of understanding of the importance of biodiversity, over harvesting, insufficient monitoring and lack of financial and human resources. Proposed actions to overcome these threats include a review of the policies and legislation and the development of appropriate legislation, strengthening of the Squatter Management Unit, allocation of adequate resources to enforcement, improvement of waste disposal, control of the introduction and movement of alien invasive species and improved penalties for over harvesting. In addition, synergies should be developed among agencies, biodiversity considerations should be included in the Medium Term Socio-Economic policy and monitoring agencies should be strengthened.

TABLE 11. SUMMARY OF THREATS TO FRESHWATER BIODIVERSITY AND PROPOSED ACTIONS TO OVERCOME THESE THREATS

Threats	Criteria Ranking			Total Ranking	Suggested Actions
	Area	Intensity	Urgency		
Deforestation and removal of riparian vegetation	9	10	10	29	<ul style="list-style-type: none"> <li>Review the various policies and legislation</li> <li>Develop the attendant legislation</li> <li>Strengthen the Squatters Management Unit</li> </ul>
Lack of legislation	10	7	9	26	<ul style="list-style-type: none"> <li>Develop legislation for the protection of plants, access to genetic resources, introduction and control of invasive alien species and for the protection of Ramsar sites.</li> </ul>
Nutrient loading	6	9	7	22	<ul style="list-style-type: none"> <li>Review the existing regulations governing waste disposal</li> <li>Maintain and/or build treatment plants</li> <li>Develop and implement public</li> </ul>

TABLE 11. SUMMARY OF THREATS TO FRESHWATER BIODIVERSITY AND PROPOSED ACTIONS TO OVERCOME THESE THREATS

Threats	Criteria Ranking			Total Ranking	Suggested Actions
	Area	Intensity	Urgency		
					awareness programs
Competition from invasive species	4	8	8	20	<ul style="list-style-type: none"> <li>Develop legislation to control the introduction, movement and the control of invasive alien species.</li> </ul>
Understanding of consequences	7	6	6	19	<ul style="list-style-type: none"> <li>Develop synergies among agencies involved in the use of biodiversity</li> </ul>
Poor enforcement	8	4	4	16	<ul style="list-style-type: none"> <li>Allocate adequate resources to agencies responsible for the enforcement of laws and regulations.</li> <li>Mainstream the sustainable use of biodiversity in the development plans</li> </ul>
Over harvesting	5	3	5	13	<ul style="list-style-type: none"> <li>Stronger penalties for the illegal harvesting of freshwater biodiversity</li> </ul>
Insufficient financial resources	3	5	1	9	<ul style="list-style-type: none"> <li>Continue to include biodiversity issues in the country's Medium Term Socio-Economic Policy,</li> <li>Place more emphasis on their implementation.</li> <li>Source external funding for biodiversity projects and programs.</li> </ul>
Insufficient monitoring	1	2	3	6	<ul style="list-style-type: none"> <li>Review the ability of the existing monitoring agencies to perform</li> </ul>
Inadequate staffing	2	1	2	5	<ul style="list-style-type: none"> <li>Strengthen agencies responsible for biodiversity conservation.</li> <li>Benefiting entities assume some of the monitoring costs.</li> </ul>

TABLE 12. SUMMARY OF THREATS TO TERRESTRIAL BIODIVERSITY AND PROPOSED ACTIONS TO OVERCOME THESE THREATS

Threats	Criteria Ranking			Total Ranking	Suggested Actions
	Area	Intensity	Urgency		
Habitat conversion	8	10	9	27	<ul style="list-style-type: none"> <li>Review / complete the review of the National Land Policy with a view to protecting important biodiversity areas.</li> </ul>
Habitat degradation such as the harvesting of wood for charcoal	6	9	7	22	<ul style="list-style-type: none"> <li>Develop legislation for the protection of plants. Complete the Protected Areas Master Plan; and continue to implement the projects relevant to protected areas as outlined in Table 4 above.</li> </ul>
Overharvesting of terrestrial biodiversity	7	8	8	23	<ul style="list-style-type: none"> <li>Develop legislation for the protection of plants, Also, develop regulations for the domestic sale of CITES Appendix II species such as orchids and lignum vitae. Design and implement community projects/programmes to provide alternate livelihoods for those dependent on the harvesting of biodiversity.</li> </ul>
Competition from invasive species	4	6	6	16	<ul style="list-style-type: none"> <li>Develop legislation to control the introduction, movement and the control of invasive alien species.</li> </ul>
Lack of legislation	10	7	10	27	<ul style="list-style-type: none"> <li>Strengthen the legislative framework to include protection of plants, access to genetic resources, and the introduction and control of invasive species.</li> </ul>
Poor enforcement of laws and regulations	9	5	5	19	<ul style="list-style-type: none"> <li>Allocate adequate resources, human and financial, to agencies responsible for the enforcement of laws and regulations. Mainstream the sustainable use of biodiversity in the development plans of all agencies.</li> </ul>
Insufficient monitoring	5	2	4	11	<ul style="list-style-type: none"> <li>Review the ability of the existing monitoring agencies to perform their tasks and strengthen where necessary.</li> </ul>

TABLE 12. SUMMARY OF THREATS TO TERRESTRIAL BIODIVERSITY AND PROPOSED ACTIONS TO OVERCOME THESE THREATS

Threats	Criteria Ranking			Total Ranking	Suggested Actions
	Area	Intensity	Urgency		
In adequate staffing of agencies responsible for enforcement and monitoring	3	3	2	8	<ul style="list-style-type: none"> <li>Strengthen agencies responsible for biodiversity conservation. Develop processes whereby entities directly benefitting from using the natural resources assume some of the monitoring costs.</li> </ul>
Insufficient financial resources	1	1	1	3	<ul style="list-style-type: none"> <li>Continue to include biodiversity issues in the country's Medium Term Socio-Economic Policy, placing more emphasis on their implementation. Also, continue to source external funding for biodiversity projects and programmes</li> </ul>
Lack of understanding of consequences of biodiversity loss to the island as a whole	2	4	3	9	<ul style="list-style-type: none"> <li>Develop synergies among agencies involved in the use of biodiversity such as Jamaica Trade and Invest, Ministry of Tourism and ministry responsible for development with the biodiversity agencies such as the Forestry Department and NEPA.</li> </ul>

# USAID PROPOSED STRATEGY & PROGRAM

## KEY GAPS AND OPPORTUNITIES IDENTIFIED IN THE FAA 118/119 ANALYSIS

Key gaps and opportunities based on the analysis include:

- Improve marine and fisheries management for food security and conservation, including help to implement national policies, reduce and redirect fishing effort and boost enforcement.
- Fill gaps in protected areas (PAs) and in management plans for PAs. Gaps have been identified for terrestrial, freshwater and marine ecosystems. Freshwater gaps identified in the report include large rivers, wetlands, ponds and lakes as well as freshwater caves that occur in the eastern part of the island and high-altitude streams in the western part that have no

representation in any of Jamaica's protected areas. Also of concern is the design of current protected areas that do not account for the longitudinal (or linear) continuity of freshwater systems from high to low altitudes.

- Invest in protected areas policy and management, focusing on sustainability (e.g., payments for environmental services approaches, targeting tourism revenues). Some local non-government organizations (NGOs) and CBOs have been involved in the co-management or management of protected areas. However not all have been successful. The NGO, Jamaica Conservation and Development Trust, has been very successful in the management of the Blue and John Crow Mountains National Park, however, the financing of the protected areas has been challenging for some NGOs. There is now a move by government to reduce or eliminate the role of NGOs in managing PAs but it is unclear if this will be played out and if so how government will fill the gap.
- Develop synergies among agencies involved in the use of biodiversity such as Jamaica Trade and Invest, Tourism Product Development Company (TPDCo) and the Ministry of Tourism, the Jamaica Bauxite Institute, the Ministry responsible for Development and the biodiversity agencies such as the Fisheries Division, Forestry Department and NEPA. Biodiversity concerns are still not integrated in the policies of the public sector entities.
- Increase the contribution of tourism to local populations and the environment (e.g., recycling tourism revenue and expanding tourism base). Link this to the Convention on Biological Diversity (CBD) and National Biodiversity Strategy and Action Plan (NBSAP) section on how tourism can contribute to poverty reduction and conservation.
- Improve disaster management and buffer shocks through improved environmental management of coasts, reefs and upland watersheds.
- Link income generation/poverty reduction to community based strategies for environmental management such as forest and fisheries management.
- Support emerging co-management approaches. For example, there is recently a distinct move away from the largely failed top-down managerial approach to co-management and community-based fisheries and forest resource management. Learn lessons from the several NGOs that have attempted to undertake fisheries management with various levels of success. Bring in lessons from outside of Jamaica on community forestry and decentralized natural resource management.
- Engage the private sector and Diaspora in environmental actions that involve direct investment, planning and marketing of environmentally sound destinations, enterprises and products.
- Help the GOJ and partners prepare for REDD (Reduction in Emissions from Deforestation and Forest Degradation), as UN climate change negotiations move towards this powerful new mechanism for compensating tropical countries for their nation-wide reductions of greenhouse gas emissions from deforestation and forest degradation. Key needs are to integrate biodiversity concerns into mechanisms designed to reduce greenhouse gas emissions and to assure that forest users and dwellers benefit from these mechanisms. LFMCs in Jamaica could become key stewards and beneficiaries.

GOJ institutions, donors and other investors that can fill gaps include:

National Environmental and Planning Agency (NEPA) – responsible for planning and the environment including biodiversity conservation, ecosystem monitoring and protection.

The Forestry Department – transitioning to an Executive agency, responsible for forests

The Fisheries Division – responsible for fisheries management

The Institute of Jamaica – through its Natural History Division (NHD) and to a lesser extent the African Caribbean Institute of Jamaica (ACIJ). The NHD is responsible for the Mason River Protected Area and the national collections of flora and fauna. The ACIJ is responsible for protecting the nations oral heritage, including traditional knowledge

The Office of the Prime Minister, Ministry responsible for the Environment

Other institutions involved in biodiversity and forest conservation include the UN agencies United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP), the World Bank, USAID, Canadian International Development Agency (CIDA), the European Union (EU) and a number of local NGOs and community-based organizations (CBOs). Potential partners could include the Jamaica Bauxite Institute, University of the West Indies, and tourism agencies including private sector actors and associations.

The international NGO, The Nature Conservancy, has been very involved in the conservation of biodiversity. It has developed a number of initiatives and partnered with the Jamaican government in a debt-for-nature swap resulting in the Tropical Forest Conservation Fund.

## RECOMMENDATIONS FOR USAID/JAMAICA

### SITES

It is recommended that USAID/Jamaica retain a focus (not necessarily exclusively) around PAs, especially Cockpit Country and the Blue and John Crow Mountains National Park (BJCMNP) to enable activities to meet both poverty reduction and biodiversity objectives. Keeping the focus on a couple of areas would increase USAID's impact as in the past there was concern over too much spread. Also there has been clear threat analysis at both these sites so planning for biodiversity actions is facilitated.

Working in and around PAs has multiple benefits. Because effective natural resource management (NRM) within PAs leads to enhancement of the natural resources they contain, this will automatically lead to increased yields of economically valuable species, e.g. in fisheries and forestry. Effective natural resource management (NRM) within marine protected areas will inevitably lead to sustainable fisheries and increased incomes for fishers. Consultants to the South Coast Sustainable Development Study (1999) projected that if the fisheries on Jamaica's south coast were sustainably managed, over the long term the lobster catch would increase by 16%, the finfish catch would increase by 190%, and the conch catch would increase by 2,600%. There is an intrinsic relationship between effective NRM within PAs on the one hand and rural development and poverty alleviation (sustainable development) on the other.

It is understood however that Jamaica is a small island and that opportunities and issues can emerge that must be addressed. In addition, depending on the type of funds available (earmarked or non-earmarked) it would be ideal to plan activities that could be carried out in both biodiversity and non-biodiversity priority areas. For example, some protected or high value agriculture could be supported in and around PAs but also in high potential areas where there are active farmers groups. These groups could be networked.

## PRINCIPLES AND ACTIONS

Given the need to focus and be strategic with reduced resources, the following principles and actions are recommended because they align with the emerging strategy and build on USAID/Jamaica's comparative advantage while also addressing threats and gaps outlined above.

Guiding principles may include:

1. Supporting environmentally sound and profitable community based enterprises and increasing governance abilities and technical capacity of local managers for enterprise and environmental management.
2. Assuring that attention to Jamaica's fragility, vulnerability and biodiversity value are integrated into all activities. Integrate monitoring for impact on biodiversity and tropical forests into all activities; this would go hand in hand with planning and monitoring for disaster risk and vulnerability reduction.
3. Taking an "honest broker" and convener role with stakeholders to provide knowledge, lessons, information and data for decision-making especially in contentious arenas such as decentralization/local management and environmental policies and enforcement.

Specific actions could include:

- Support policy processes that promote sound decentralized management of key assets such as forests, commodities (coffee, cocoa) and PAs (Portland Bight model). This is not at all an easy path because decentralization in the short term can lead to poorer management if systems are not put into place to clearly outline and enforce roles and responsibilities. USAID has considerable experience in supporting decentralization of NRM and also of dismantling marketing boards in favor of a market based/private-sector led approach. A key lesson is there is a need to simultaneously build the capacity of local groups, private sector associations, institutions or governments to manage while also moving to give them more power and control. Confusion and conflict over roles and responsibilities leads to poor management.
- In conjunction with the point above, continue support to community based groups such as LFMCS and successful farmer cooperatives; monitoring the links from these investments back to rural investment and conservation. Support networking groups into associations for larger-scale impact. Link enterprise development with co-management of forests and protected areas. Link groups to microenterprise credit sources as appropriate.
- Engage agriculture, rural development, forestry and protected area actors in active dialogue to craft technologies and approaches to boost smallholder agricultural productivity and revenue while improving protection of natural areas.
- Provide technical assistance to farmers, GOJ and NGO actors on integrated agroforestry options for improved productivity and environmental benefits, including assistance on how to integrate tree crop production with conservation. These technologies could include diverse cocoa agroforestry systems, windbreaks and riverine buffer strips to reduce disaster risk and nursery management to increase tree diversity and raise incomes from seedling sales. Test technologies for natural forest regeneration suited to Jamaica that may be more efficient and effective than tree planting.
- Prepare a detailed disaster recovery plan that includes ways in which natural resource management must be improved to reduce risk and vulnerability. USAID/LAC and DCHA are actively involved in such planning at present. Convene other donors in this planning process to assure coverage of gaps and opportunities.

- Provide training and bring in lessons in co-management skills to natural resource managers (and government functionaries) to increase the potential for success in biodiversity conservation.
- Use Jamaica's biodiversity as a centerpiece for educational initiatives, going beyond "environmental education" and into field-based activities at all educational levels. Put an emphasis on practical science training that can be linked to jobs in the tourism, fisheries or forestry sectors.
- Support trade initiatives that boost environmentally friendly products and sectors, for example bird-friendly coffee and organic or low-input cocoa.

For the longer term:

- Consider technical assistance to the GOJ on payments for environmental services (PES) approaches as well as farmer-led environmental management approaches such as LandCare (Jamaica already has some links to the International LandCare movement).
- Reach out to the mining sector through a Global Development Alliance (GDA) with options such as biodiversity offsets, which can add value to the sector both environmentally and in engaging community participation in offset planning.
- Engage the private sector and Jamaican Diaspora on community tourism and sustainable protected areas through ecotourism, donations, enterprises and trust funds.
- Work with Coast Guard and the US Navy to develop security strategies for the Pedro Cays and other vulnerable marine areas and fisheries.
- Support natural resource valuation and efforts to integrate the value of NRM and biodiversity conservation into national budgets.

## USAID/JAMAICA'S NEW COUNTRY ASSISTANCE STRATEGY

USAID/Jamaica's new Country Assistance Strategy (CAS) highlights reducing crime and violence (peace and security) as its top priority with a focus on youth-at-risk and food security. Under this rubric, the need for improved law enforcement and anti-corruption measures to deliver critical services could be a boon to biodiversity and forest management if extended to these sectors. Enforcement of existing environmental regulations is lax and management highly centralized making it unaccountable to local stakeholders. Jamaican environmental agencies are experimenting with many avenues of better governance and should be supported. Crime and violence within Jamaica's maritime zone, especially Pedro Cays, is highly correlated with biodiversity as well as economic losses.

In terms of economic opportunities, especially for youth, the mission intends to focus on the agricultural sector. This may be warranted given Jamaica's comparative advantage in some high value crops however one needs to question if this sector is a high growth sector overall and offers clear pathways for youth as opposed to other sectors such as tourism or light manufacturing (which could draw people off more fragile land in the long run). Land tenure constraints may be an obstacle and lack of expertise in management and marketing of higher value products may be a barrier to entry for youth. Putting more land into agriculture could threaten forests, vulnerable uplands and coastal areas. Increasing the production of root crops that require stakes made of saplings needs to be carefully monitored. The JA FARMS activity aims to integrate agriculture and biodiversity by targetting groups around protected areas for protected higher value agriculture that may also play a role in forest management. This is a creative strategy and one that can be monitoring for effectiveness. If it is effective in attracting farmers and building co-management capacity it could be replicated with the assistance of the Forestry Department.

The CAS mentions ecotourism in addition to agriculture as an economic growth option and also indicates the need to address environmental degradation and integrity (although related particularly to agriculture and food security). We recommend thinking more broadly about the need for environmental integrity as the foundation of all economic growth in a fragile island buffeted by storms and threatened by climate change. Not only agriculture but tourism and all endeavors can be threatened. There is no mention of the importance of fisheries and threats that menace this sector, a critical one for economic growth, food security and biodiversity.

Water is another important resource not only for agriculture but for people and other industries. Over the years USAID has made major investments in watershed management and the GoJ has followed with a comprehensive watershed strategy. Given the topography of the island, continuing some investment in this area is warranted, if only to prevent catastrophic erosion. This consideration should be factored into ongoing work with US Forest Service in partnership with Forestry Department and other Jamaican partners under the Protected Areas and Rural Enterprises (PARE) program.

Support to Cockpit Country under PARE is warranted given its importance for biodiversity as well as high levels of poverty. USAID/Jamaica should consider more intense engagement with the mining sector as this is seen as one of the major, if not the major threat to biodiversity in this area. This engagement could be through a Global Development Alliance with a private sector partner to explore biodiversity offsets of any bauxite or other mineral extraction.

The proposed activities do not seem in the opinion of the authors to pose any threat to biological or forest resources nor to the environment in watersheds. Squatting and the attendant issue of land tenure and access is always very difficult to address and can become very contentious. However if a fair and transparent process is conducted and affected persons are matched with alternate locations or provided with secure tenure it can be handled without any “fallout”.

The approved CAS has the following goals:

Goal 1, Increasing Peace and Security by Reducing Crime and Corruption

Goal 2, Promoting Economic Prosperity and Sustainable Development

Goal 3, Investing in People

Goal 4, HIV/AIDS

## **2010-2014 ASSISTANCE OBJECTIVES FOR USAID – JAMAICA**

As its country goal for these AOs, USAID/Jamaica has chosen the MTF goal of: “Supporting Jamaica’s transition to the place of choice to live, work, and do business.” Under this country goal, USAID’s five AOs are:

AO 1: More Peaceful and Transparent Democracy

AO 2: Profitability and Competitiveness of Key Agricultural Crops Increased

AO 3: Economic Enabling Environment Improved

AO 4: Education Transformation Program Strengthened

AO 5: HIV prevalence in most-at-risk populations reduced and effects mitigated

The five AOs reflect USAID's response to the four Priority Goals under the CAS. Notably, the CAS adopts a focused approach by addressing in particular those social and economic issues that contribute most directly to Jamaica's high level of crime and violence, and its vulnerability to transnational crime. The AOs respond to the CAS goals as follows:

AO 1: responds to CAS Priority Goal 1, Increasing Peace and Security by Reducing Crime and Corruption

AO 2 and AO 3: respond to CAS Priority Goal 2, Promoting Economic Prosperity and Sustainable Development

AO 4: responds to CAS Priority Goal 3, Investing in People

AO 5: responds to CAS Priority Goal 4, HIV/AIDS

The AOs are linked to the following Functional Objectives under the Foreign Assistance Framework (FAF):

**AO 1:** Peace and Security, Governing Justly and Democratically (GJD)

**AO 2:** Economic Growth (Program Area, Agriculture)

**AO 3:** Economic Growth (Program Areas, Trade and Investment, Financial Sector, Private Sector Competitiveness, Economic Opportunity)

**AO 4:** Investing in People (Program Area, Education)

**AO 5:** Investing in People (Program Area, Health)

The AOs will begin to address the underlying social and economic problems that have contributed to Jamaica's cycle of low performance, as follows:

- Under AO 1, the Peace and Security and GJD Objective, USAID assistance aims to reduce crime and violence (IR 1) and to increase accountability and integrity in government (IR 2). Over time, the resulting improvements in citizen security and government integrity at the national and local levels will increase political stability and help to restore and maintain citizen confidence in democracy.
- Under AO 2, the Agriculture Objective, assistance aims to improve agricultural marketing systems (IR 1), the agricultural enabling environment (IR 2), and the production and marketing of specialty crops with high export potential (IR 3). Resulting improvements in agricultural income will reduce poverty and revitalize rural communities; these improvements also carry significant implications for other sectors, impacting on health and nutrition, rural education, and employment, including employment for at-risk youth.
- Under AO 3, the Economic Growth Objective, assistance will focus on improving the business enabling environment through policy and administrative reform (IR 1) and increasing private sector capacity and engagement (IR 2). Over time, improvements in this sector will build confidence and stimulate investment, making Jamaica more competitive in regional and global markets and a more attractive environment for domestic and foreign investment. This AO is also expected to generate jobs, reduce poverty, and improve livelihoods.
- Under AO 4, the Education Objective, assistance will focus on the quality of basic education, with results directed at improvements in reading fluency (IR 1), mathematics skills (IR 2), private sector engagement in the delivery and financing of education (IR 3), and school

performance (IR 4). With improvements in student achievement and institutional performance, students will be better prepared for further education and ultimately to contribute in productive and enriching ways to the economic, social, and cultural life of the country.

- Under AO 5, the HIV/AIDS Objective, assistance will focus on reducing sexual transmission of HIV by supporting the most-at-risk populations (IR 1), improving the use of strategic information for evidence based programs, policies, and decision-making (IR 2), and reducing stigma and discrimination (IR 3). Over time, progress in this area will reduce the prevalence rate of HIV/AIDS and reduce discrimination against persons living with HIV/AIDS.
- Youth as the beneficiaries of assistance are given special consideration across the portfolio.
- Gender is also taken into account for each AO, and the special needs of women and men and girls and boys, are recognized for particular AOs. Based on its analysis, the mission will address gender utilizing a matrix approach taking risk and need into consideration for each AO

## EXTENT TO WHICH PROPOSED ACTIONS MEET NEEDS

This section will respond only to those proposed actions that impact tropical forests and biodiversity.

**Assistance Objective 2 is the only one of the five objectives that will directly impact tropical forests and biodiversity.** The analysis conducted by the team of experts has identified a plethora of marine, coastal, terrestrial and freshwater threats and issues requiring action. Some of the highest ranked threats occur in freshwater and marine ecosystems. It seems that the proposed actions will not address most of the issues and threats identified as the actions are focussed in the terrestrial ecosystem and even more narrowly on the agricultural sector and in even narrower focus on two crops Coffee and Cocoa. Of the three Intermediate Results (IRs), only one **IR 3, Production and marketing of select speciality crops improved**, will have any forest or biodiversity implications. The crops selected, Coffee and Cocoa are permanent crops with potentially high market value. Thus support for these crops is expected to encourage high value, permanent crops versus more transient agricultural crops.

## THREATS FROM PROPOSED ACTIVITIES

Intermediate Result 3 (IR3) Production and marketing of select speciality crops improved of Assistance Objective 2 (AO 2), Profitability and Competitiveness of Key Agricultural Crops Increased has the potential to have negative forest and biodiversity impacts.

The growing of **Coffee** in Jamaica has a chequered past. Coffee is recognised as permanent tree crop with the potential for positive biodiversity and environmental impacts in mixed agricultural systems and shade systems including bird friendly Coffee cultivation. However, care should be exercised as Coffee cultivation is also linked to steep slopes in excess of the recommended gradient in mountain areas with high quality forest which is often cleared for its cultivation. In addition the use of agricultural chemicals and inorganic fertilisers is often employed on Coffee farms.

**Cocoa** is cultivated from limited number of clones used as parents for the production of hybrid seedlings. The crop also suffers from Black Pod disease. These two issues indicate the possibility of the gene pool being diversified with new material and the need to control the pathogen causing the Black Pod. These actions could have negative consequences with respect to the material sourced for the gene pool and the chemicals or parasitic organisms that could be employed for Black Pod control.

Support for both crops would have to carefully consider the details of the activities utilised to prevent or minimise adverse effects.

# BIBLIOGRAPHY

- Adams, C.D and duQuesney, M.C 1970 Vegetation Section in The Hellshire Hills Scientific Survey. Woodley, J. D. (ed) University of the West Indies/Institute of Jamaica.
- Aiken, K.A.1993. Jamaica, in Marine Fishery Resources of the Antilles: Lesser Antilles, Puerto Rico, Cuba, Jamaica & Hispaniola. FAO Fish. Tech. Pap. 326, Rome: 1160-1180
- Aiken, KA. & M.O. Haughton, 1987. Status of the Jamaica reef fishery and proposals for its management. Proc. Gulf & Carib. Fish. Instit. 38:469-484
- Aiken, K.A, Morris, D. Hanley, F.C., Manning, R. 2002. Aquaculture in Jamaica. Naga, Worlfish Centre Quarterly, Vol. 25, No 3 & 4 July-December:10-15 (ISSN 1511-8533)
- Aiken, K.A., R. D. Steele.1995. Introduction of aquaculture training at the UWI, mona. Fishbyte, ICLAM, manila, Philippines:4-9
- Buddo, D., R. Steele, E. Ranston D'Oyen. 2003. Distribution of the Invasive Indo-Pacific Green Mussel, *Perna viridis*, in Kingston Harbour, Jamaica. Bull. Mar. Sci. Volume 73, Number 2 433-441
- Burke, L and J. Maidens 2004. Reefs at Risk in the Caribbean. World Resources Institute, pp
- Caldwell, D.K. 1966. Marine and freshwater fishes of Jamaica. Instit. of Jamaica, Science Series no. 17, Kingston:120pp
- Camirand R and Evelyn O, 2003. Ecological Land Classification for Forest Management and Conservation in Jamaica. Trees for Tomorrow Project. Tecslut International.
- Catterson, M.T, Gardender, L., Huth,M., 2005. Biodiversity and tropical forestry sssessment of the USAID/Jamaica bilateral and Caribbean regional programs. BIOFOR IQC No. LAG-I-00-99-00014-00, Task Order #819. Chemonics International Inc
- Cesar, H., & P. van Beukering . 2006. Economic analysis of local and global threats to Caribbean Coral Reefs *In* new Developments in Ecological Research. Ed A. R. Burk pp 205 – 254. Nova Science Publishers, Inc.
- Davis, S.D., V.H. Heywood, O. Herrera-MacBryde, J. Villa-Lobos, and A.C. Hamilton, editors. 1997. Centres of plant diversity: a guide and strategy for their conservation (Volume 3. The Americas). Cambridge, U.K.: WWF-World Wide Fund for Nature and IUCN-The World Conservation Union. IUCN. IUCN Publications Unit.
- Davis-Mattis, Laleta 2003 Recent developments in environment and planning laws in Jamaica. Prepared for Judicial Symposia held at the Renaissance Jamaica Grande.
- Djoghla, A. 2008 Biodiversity and Climate Change., Executive Secretary, Convention on Biological Diversity (CBD) <http://www.iisd.ca/climate-1/bulletin/guestarticle/guestarticle3.html>
- Environmental Management Unit. UWI. 2001. Socio Economic Valuation Study of the Ocho Rios Marine Park.

- Evelyn, O B and Camirand R, 2003. Forest cover and deforestation in Jamaica: an analysis of forest cover estimates over time. *International Forestry Review* Vol 5 No 4.
- Excell, Carole 1993 The Enforcement of Planning Laws in Jamaica. Prepared for Judicial Symposia held at the Renaissance Jamaica Grande.
- Fisheries Division, 1997. Fish production survey for 1996. Unpublished report, Min. of Agriculture, Kingston:35pp
- Fisheries Division/CFRAM. 1997. Plan for managing the marine fisheries of Jamaica. Belize City & Kingston:54pp
- Goodbody, I.M. 1986. Coastal Pelagic Fisheries Resources in the Caribbean: Parts I, II & III, Dept. of Zoology, U.W.I., Mona. Res. Rep. No.7.
- Goodbody, I., 2004. Port Royal as a focal point for marine biodiversity in Jamaica. *The Jamaica Journal of Science and Technology*. Vol. 15 December 2004. pp37-53.
- Goodbody, I., 2006. Jamaica's Marine Biodiversity. Jamaica's Clearing House Mechanism <http://www.jamaicachm.org.jm/Article/July2006.asp>
- Groombridge, B and M.D. Jenkins 2002. *World Atlas of Biodiversity*. Prepared by the UNEP World Conservation Monitoring Centre. University of California Press, Berkeley, USA
- Grossman, D.H., S. Iremonger, and D.M. Muchoney. 1993. Jamaica: map of natural communities and modified vegetation types. *Jamaica: A Rapid Ecological Assessment. Phase I: An island-wide characterization of mapping of natural communities and modified vegetation types*. The Nature Conservancy, Washington, D.C., USA.
- Halcrow, Sir William & Partners Ltd., 1998. South coast sustainable development study: Phase I. Prepared for the Government of Jamaica. Tech. Rept. 2, (of 14 vols.) Marine Resources, Kingston
- Harvey, G. C. McN. 1986. Aspects of the biology and artisanal fishery of three Caribbean clupeids (Pisces: Clupeidae) in Jamaican waters. Unpublished PhD. Thesis, Zoology Department, U.W.I., Mona:522pp
- Haughton, M.O. 1988. An analysis of statistical data from the Jamaican inshore fisheries. *FAO Fish. Rep. No. 389:434-4543*
- Koslow, J.A., F. Hanley & R. Wicklund. 1988. Effects of fishing on reef fish communities at Pedro Bank and Port Royal Cays, Jamaica. *Mar. Ecol. Progr. Series*. Vol.43:201-212
- Life Sciences Department, 2007. Baseline Study - Offshore Oil & Gas Exploration in Jamaica – Jamaica Joint Venture. Desk-Top Literature Review. Dept. of Life Sciences, UWI. July 2007
- McLeod, E & R. Salm 2006. *Managing Mangroves for Resilience to Climate Change*. IUCN, Gland, Switzerland. 64 pp
- Munro, J.L., 1983. Caribbean coral reef fishery resources. *ICLARM Studies & Reviews 7:Manila, Philippines:276pp*
- NEPA. 1997. *Mangroves and Coastal Wetland Protection (Draft)*. [www.nepa.gov.jm/policies/draft](http://www.nepa.gov.jm/policies/draft)

NEPA. 2008a. CORAL REEF of JAMAICA - Status and Trends. Jamaica's National Report. Prepared by Ecosystems Management Branch, National Environment and Planning Agency, March 2008

NEPA 2008b Invasive Alert New Species Found: Lionfish. Aliens of Xayama – a newsletter on non-indigenous species in Jamaica. Vol. I Issue 3, June 2008.

[http://www.nepa.gov.jm/publications/newsletters/Alien-nvasive/AI%20newsletter\\_June%202k8.pdf](http://www.nepa.gov.jm/publications/newsletters/Alien-nvasive/AI%20newsletter_June%202k8.pdf)

Pantin, D and V. Reid (2005) 'Economic Valuation Study: action learning project on incentives for the Buff Bay/Pencar Watershed.' Who Pays for Water Project Document No.2, CANARI Laventille.

Robinson, E., Miller, D., Khan, S., Ramsook, R. , & Rowe, D-A. 2005. The sediment budget study of the Rio Grande Watershed Portland Parish, Jamaica . Prepared for the Government of Jamaica's National Environment and Planning Agency and the United States Agency for International Development Ridge to Reef Project under USAID Contract # 532-C-00-00-00235-00.

Ruitenbeek, J, C. Cartier 1999. Issues in Applied Coral Reef Biodiversity Valuation: Results for Montego Bay, Jamaica. Project RPO# 682-22. March 1999" Marine System Valuation: An Application to Coral Reef Systems in the Developing Tropics" Final Report World Bank Research Committee

Russell, D. with OSDG team, USAID/Jamaica. 2007, Biodiversity Assessment for USAID/Jamaica

Russell, D., Edwards, T., Clarke. 2006 , Biodiversity: The Foundation of Economic Growth. A report to USAID/Jamaica on threats to biodiversity and opportunities for activity design informed by threat analysis

Taylor, M. A., Centella, A., Charlery, J., Borrajero, I., Benzanilla, A., Campbell, J. Rivero, R., Stephenson, t. s., Whyte, F. Watson, R. 2007 *Glimpses of the Future: A briefing from the PRECIS Caribbean Climate Change Project*. Caribbean Community Climate Change Centre, Belmopan, Belize. 24pp

The Natural Resources Conservation Authority, the National Environment Planning Agency and Ministry of Land and the Environment 2003. "Towards a National Strategy and Action Plan on Biological Diversity in Jamaica"

The Nature Conservancy. 2008. The Pedro Bank

<http://www.nature.org/wherewework/caribbean/jamaica/work/art14722.html>

Thompson, D.A., Bretting, P.K. and Humphreys, M. (eds) (1986), Forests of Jamaica: papers from the Caribbean Regional Seminar on Forests of Jamaica held in Kingston, Jamaica 1983. The Jamaican Society of Scientists and Technologists, Kingston, Jamaica

USAID Jamaica (2009) Assistance Objectives 2010-2014. Supporting Jamaica's transition to the place to live, work and do business.

Wade, B. A. , Lopez, B. & R. Brown. 1981. Introduction and development of mangrove oysterculture in Jamaica. Proc. Gulf & Carib. Fish. Instit.33:68-83

Wilkinson, C., Souter, D. 2008. Status of Caribbean Coral Reefs after Bleaching and Hurricanes in 2005. Global Coral Reef Monitoring Network and Rainforest Research Centre. Townsville, 152p

# APPENDIX I: CRITICALLY ENDANGERED SPECIES – IUCN RED LIST

Scientific Name	Common name(s)	Action
<i>Alsophis ater</i>	BLACK RACER	
<i>Cyclura collei</i>	JAMAICAN IGUANA	Conservation Strategy
<i>Eleutherodactylus alticola</i>		
<i>Eleutherodactylus cavernicola</i>		
<i>Eleutherodactylus fuscus</i>		
<i>Eleutherodactylus griffus</i>		
<i>Eleutherodactylus junori</i>		
<i>Eleutherodactylus orcutti</i>		
<i>Eleutherodactylus sisypodemus</i>		
<i>Epinephelus itajara</i>	GOLIATH GROUPER, JEWFISH	
<i>Eretmochelys imbricata</i>	HAWKSBILL TURTLE	Sea Turtle Recovery Plan
<i>Pristis pectinata</i>	SMALLTOOTH, WIDE SAWFISH	
<i>Pterodroma caribbaea</i>	JAMAICAN PETREL	
<i>Siphonorhis americana</i>	JAMAICAN PAURAUQUE	
<i>Speleoperipatus spelaeus</i>		
<i>Antirhea tomentosa</i>		
<i>Ardisia byrsonimae</i>		
<i>Buxus vahlii</i>	VAHL'S BOXWOOD	
<i>Calypttranthes acutissima</i>		
<i>Calypttranthes uniflora</i>		
<i>Cassipourea subcordata</i>		

Scientific Name	Common name(s)	Action
<i>Cassipourea subsessilis</i>		
<i>Chionanthus proctorii</i>		
<i>Comocladia parvifoliola</i>		
<i>Dendropanax cordifolius</i>		
<i>Dendropanax filipes</i>		
<i>Dendropanax grandiflorus</i>		
<i>Dendropanax grandis</i>		
<i>Eugenia aboukirensis</i>		
<i>Eugenia hanoverensis</i>		
<i>Eugenia kellyana</i>		
<i>Eugenia polypora</i>		
<i>Eugenia rendlei</i>		
<i>Exostema orbiculatum</i>		
<i>Guettarda longiflora</i>		
<i>Ilex subtriflora</i>		
<i>Malpighia proctorii</i>		Management Plan
<i>Maytenus harrisii</i>		
<i>Mitranthes macrophylla</i>		
<i>Ocotea harrisii</i>		
<i>Ouratea elegans</i>		
<i>Portlandia albiflora</i>		Conservation Plan, status unknown.
<i>Psychotria bryonicola</i>		
<i>Psychotria danceri</i>		
<i>Psychotria hanoverensis</i>		
<i>Ravenia swartziana</i>		
<i>Reynosia jamaicensis</i>		

Scientific Name	Common name(s)	Action
<i>Rondeletia cincta</i>		
<i>Sebastiania crenulata</i>		
<i>Sebastiania howardiana</i>		
<i>Spathelia coccinea</i>		
<i>Ternstroemia bullata</i>		
<i>Ternstroemia glomerata</i>		
<i>Ternstroemia granulata</i>		
<i>Wercklea flavovirens</i>		

Data from IUCN 2007. 2007 IUCN Red List of Threatened Species. <[www.iucnredlist.org](http://www.iucnredlist.org)>.

Downloaded on 05 September 2008

# APPENDIX 2: ENDANGERED SPECIES - IUCN RED LIST

(Information on many of these species needs updating)

Scientific Name	Common Name(s)	Action
<i>Caretta caretta</i>	LOGGERHEAD	Sea turtle recovery Plan
<i>Chelonia mydas</i>	GREEN TURTLE	Sea turtle recovery Plan
<i>Eleutherodactylus andrewsi</i>		
<i>Eleutherodactylus grabhami</i>		
<i>Eleutherodactylus jamaicensis</i>		
<i>Eleutherodactylus luteolus</i>		
<i>Eleutherodactylus nubicola</i>		
<i>Epinephelus striatus</i>	NASSAU GROUPE	
<i>Hypolestes clara</i>	JAMAICAN HYPOLESTES	
<i>Macroperipatus insularis</i>		
<i>Nesopsar nigerrimus</i>	JAMAICAN BLACKBIRD	
<i>Osteopilus crucialis</i>	JAMAICAN SNORING FROG	
<i>Osteopilus marianae</i>	YELLOW BROMELIAD FROG	
<i>Osteopilus wilderi</i>	GREEN BROMELIAD FROG	
<i>Papilio homerus</i>	GIANT SWALLOWTAIL	Recovery Plan
<i>Phyllonycteris aphylla</i>	JAMAICAN FLOWER BAT	
<i>Sphyrna mokarran</i>	HAMMERHEAD SHARK	
<i>Ardisia brittonii</i>		
<i>Bourreria velutina</i>		
<i>Bursera hollickii</i>		
<i>Calypttranthes discolor</i>		
<i>Cassipourea brittoniana</i>		

Scientific Name	Common Name(s)	Action
<i>Chionanthus adamsii</i>		
<i>Coccoloba proctorii</i>		
<i>Conostegia subprocera</i>		
<i>Eugenia abbreviata</i>		
<i>Eugenia acutisepala</i>		
<i>Eugenia crassicaulis</i>		
<i>Eugenia eperforata</i>		
<i>Eugenia laurae</i>		
<i>Eugenia nicholsii</i>		
<i>Eugenia pycnoneura</i>		
<i>Eugenia sachetae</i>		
<i>Eugenia sulcivenia</i>		
<i>Gordonia villosa</i>		
<i>Guaiacum officinale</i>	LIGNUM VITAE TREE	Preliminary work on distribution and use
<i>Ilex jamaicana</i>		
<i>Lasiocroton trelawniensis</i>		
<i>Malpighia cauliflora</i>		
<i>Manilkara excisa</i>		
<i>Miconia nubicola</i>		
<i>Miconia pseudorigida</i>		
<i>Mitranthes nivea</i>		
<i>Ocotea staminoides</i>		
<i>Ormosia jamaicensis</i>		
<i>Phialanthus jamaicensis</i>		
<i>Phialanthus revolutus</i>		
<i>Phyllanthus axillaris</i>		

Scientific Name	Common Name(s)	Action
<i>Pimenta richardii</i>		
<i>Podocarpus purdieanus</i>		
<i>Psychotria clarendonensis</i>		
<i>Psychotria clusioides</i>		
<i>Psychotria siphonophora</i>		
<i>Rhamnidium dictyophyllum</i>		
<i>Rondeletia amplexicaulis</i>		
<i>Rondeletia brachyphylla</i>		
<i>Rondeletia clarendonensis</i>		
<i>Rondeletia dolphinensis</i>		
<i>Schefflera stearnii</i>		
<i>Scolosanthus howardii</i>		
<i>Sebastiania fasciculata</i>		
<i>Sebastiania spicata</i>		
<i>Sophora saxicola</i>		
<i>Swietenia mahagoni</i>	WEST INDIAN MAHOGANY	
<i>Tabernaemontana ovalifolia</i>		
<i>Terminalia arbuscula</i>	WHITE OLIVE	
<i>Ternstroemia calycina</i>		
<i>Tetrasiphon jamaicensis</i>		
<i>Tetrazygia albicans</i>		
<i>Zanthoxylum negrilense</i>		

Data from IUCN 2007. 2007 IUCN Red List of Threatened Species. <[www.iucnredlist.org](http://www.iucnredlist.org)>. Downloaded on 05 September 2008

# APPENDIX 3. FOREST RESERVES OF JAMAICA BY PARISH

Parish Name	Forest Reserve/ Crown Land Name	Area (ha)		Reference in the		Remarks
		Forest R.	Crown L.	Date	Page	
Hanover	Blenheim	20.57		01-12-1950	436	Part of Blenheim Land Settlement
	Content II	56.29		21-07-1955	369	Lot 144, Content II Land Settlement
	Georges Plain Mountain	12.36		23-09-1965	424	(part)
Total Hanover		190	736			
West- moreland	Bog A	4.16		21-07-1955	368	Block A (lot 137, Bog Land Sett.)
	Bog B	7.18		21-07-1955	368	Block B (lot 157, Bog Land Sett.)
	Burnt Ground		106.03	Crown		
	Burnt Savannah A	39.26		01-12-1950	414	Block A
	Burnt Savannah B	40.49		01-12-1950	414	Block B
	Canaan Mountain		5.46	Crown		
	Dean's Valley	445.17		02-12-1954	336	Formerly Water Works and Ferris Mountain
Total Westmoreland		1413	554			
St. James	Belfont	62.75		01-12-1950	431	
	Chatsworth A	242.92		01-12-1950	418	Block A
	Chatsworth B	313.64		01-12-1950	418	Block B
	Chatsworth C	27.92		01-12-1950	418	Block C
	Chesterfield	5.91		21-07-1955	367	Lot 166, Chesterfield Land Settlement
	Fyffe & Rankine's	966.34		01-12-1950	418	
	Garlands A	20.55		21-07-1955	368	Block A (lot 60, Garlands Land Sett.)
Total St. James		2156	329			
St. Eliza- beth	Bogue	111.98		21-07-1955	369	Lot 78, Bogue Land Settlement (part)
	Cook's Bottom	197.49		21-07-1955	369	Part of Cook's Bottom Land Sett.
	Lovers Leap	175.64		01-12-1950	425	Prev. 28-03-1946 (Yardley Land Sett.)
Total St. Elizabeth		1192	0			

Parish Name	Forest Reserve/ Crown Land Name	Area (ha)		Reference in the		Remarks
		Forest R.	Crown L.	Date	Page	
Trelawny	Baron Hill	149.74		24-10-1968	727	Vol 240 Fol 28 and Vol 996 Fol 375
	Belmont	37.06		04-02-1964	77	Vol 990 Fol 525
	Bottom Hampden	118.79		01-12-1950	419	
	Brislington		232.60	Crown		Vol 629 Fol 88
	Cockpit Country	22327.30		01-12-1950	415	
	Discovery			01-12-1950	414	Discovery Mtn, formerly Nightingale Grove
	Dromilly A	148.93		01-12-1950	431	
	Dromilly B	32.78		01-12-1950	432	Block A (lots 98 and 101)
	Forest Mountain	25.96		13-04-1967	159	Block B (lots 8 and 17)
	Hyde A	134.36		01-12-1950	432	Vol 465 Fol 34
	Hyde C	74.06		01-12-1950	432	Block A (part of Hyde & Gibraltar L. Sett.)
	Hyde Hall Mountain	433.03		01-12-1950	438	
	Llandaff I	662.07		04-02-1964	74	Block C
Total Trelawny		26119	638			
Manchester	Denham Farm	20.00		27-09-1956	486	Part of Devon Land Settlement
	Gourie		141.65	Crown		
	Hudson's Bottom		226.63	Crown		
	John Anderson		121.40	Crown		
Total Manchester		472	623			

Parish Name	Forest Reserve/ Crown Land Name	Area (ha)		Reference in the		Remarks
		Forest R.	Crown L.	Date	Page	
St. Ann	Armadale	29.14		01-12-1950	436	
	Ballintoy A	244.94		01-12-1950	421	Block A
	Ballintoy B	93.12		01-12-1950	421	Block B
	Ballintoy C	439.68		01-12-1950	421	Block C
	Ballintoy D	37.65	807.93	01-12-1950	421	Block D
	Camperdown			Crown		Vol 831 Fol 88
	Cedar Valley	242.91		01-12-1950	424	
	Fergis-Ramsay	112.91		01-12-1950	433	
	Greenock	49.37		01-12-1950	433	Part of Greenock Land Settlement
	Industry Field-Rowkamp	95.91		01-12-1950	424	
		4484.89	2.00	01-12-1950	416	Dry Harbour Mountain (West)
	Litchfield Matheson's Run			Crown		
	Moneague	853.19		01-12-1950	423	Block A (Main block)
Mr. Diablo A	231.57		01-12-1950	423	Block B (Charlton block)	
Total St. Ann		14036	810			
Clarendon	Bull Head	220.06		01-12-1950	417	
	Kellets-Camperdown	1497.79		01-12-1950	417	
	Kellits Stream A	8.30		01-12-1950	425	Block A (Miller's Spring)
	Kellits Stream B	1.62		01-12-1950	425	Block B (Mosquito River)
	Peace River	116.70		25-06-1959	423	
	Peak Bay A	302.72		01-12-1950	433	Block A
	Peak Bay B	152.57		01-12-1950	433	Block B
Total Clarendon		3375	5612			
St. Catherine	Dawson Mountain 1		55.04	Crown		Lot 101, Mount Dawson Land Settlement
	Dawson Mountain 2		75.86	Crown		
	Harkers Hall	6.82		01-12-1950	425	Lot 104, Mount Dawson Land Settlement
	Healthshire Hills	4856.40		01-12-1950	422	Prev. 06-09-1945 (Harkers Hall Land
Total St. Catherine		5102	133			

Parish Name	Forest Reserve/ Crown Land Name	Area (ha)		Reference in the		Remarks
		Forest	Crown	Date	Page	
St. Mary	Dover	25.29		21-12-1955	364	Lot 33, Dover Land Settlement (part)
	Fort George	535.03		25-06-1959	422	
	Fort Stewart A	71.55		21-07-1955	363	Block A (Vol 363 Fol 23; Fort Stewart
Total St. Mary		691	101			
St. Andrew	Bellevue		150.95	Crown		Vol 403 Fol 114
	Dallas Mountain	60.70		01-12-1950	434	Part of Hope Estate, formerly Elleston Run
	Flamstead	25.00		18-04-1963	133	Part of Flamstead Land Settlement
	Good Hope A	23.00		18-04-1963	133	Section 1, Survey Dep. Exam. No. 63733
	Good Hope B	29.00		18-04-1963	134	Section 2, Survey Dep. Exam. No. 63733
	Head Office Compound		1.16	Crown		Section 2, Survey Dep. Exam. No. 63733
Total St. Andrew		152	152			
Portland	Blue Mountain	41939.87		01-12-1950	426-430	14 gazetted blocks
	Caenwood			21-07-1955	362	South Caenwood Land Settlement
	Cambridge Backlands	51.29		26-03-1959	196	
	Chepstowe	430.05		01-12-1950	435	Part of Chepstowe & Catalina Land Sett.
	Ecclesdown A	149.74		01-12-1950	420	Prev. 06-09-1945; Block A
	Ecclesdown B	19.72		01-12-1950	420	Prev. 06-09-1945; Block B
	Ecclesdown C	7.58		01-12-1950	420	Prev. 06-09-1945; Block C
	Ecclesdown Addition	8.73		06-09-1945	204	Blue Mountain Addition
Total Portland		42870	1			
St. Thomas	Chesterfield	196.68		06-05-1971	192	Vol 414 Fol 48
	Citron Valley	5.26		21-07-1955	361	Lot 26, Citron A Valley Land Settlement
	Lloyds A	8.74		01-12-1950	436	Block A
	Lloyds B	8.08		01-12-1950	436	Block B
	Lloyds C	8.97		01-12-1950	437	Block C
Total St. Thomas		567	413			
Total Jamaica (ha)		99734	10102	Forest Reserve + Crown Land = 109,836		

# APPENDIX 4. LIST OF PROPOSED HIGHEST PRIORITY PROJECTS IN THE NBSAP AND THEIR STATUS

Highest Priority Projects	Status
Establishment of the National Biodiversity Secretariat as a Supporting Mechanism to Implement and Monitor the National Biodiversity Strategy and Action Plan	A Secretariat was established for approx. 2 ½ years at NEPA, and a Biodiversity Committee established with one of its functions to monitor implementation of NBSAP. Secretariat and Biodiversity Committee no longer functioning
Preparation for the Declaration of Protected areas: Black River, Mason River, Port Antonio, Dolphin Head, Cockpit Country and Rozelle/Rozelle Falls	Mason River complete, work ongoing with respect to Dolphin Head,
Rehabilitation of Coral Reef Ecosystems	Work being carried out by UWI.
Reduction of Pollutants in Freshwater and Marine Environments	Status unknown at this time
Preparation of an Alien Invasive Species Management Plan	Regional Project being implemented
Implementation/Preparation of Recovery Strategies for Critically Endangered Species	Developed for plant <i>Malpighia proctorii</i> and yellow snake
Preparation of Policies and Legislation to Facilitate Access to Biological Resources and Equitable Benefit Sharing	GEF/UNDP/GOJ project now starting to develop capacity needs in these areas.
Sensitization of the Judiciary and Training for Customs and Immigration Officers and the Constabulary	On going, being done by NEPA

# APPENDIX 5. FORMER AND NEW WATERSHED MANAGEMENT BOUNDARIES

## FORMER AND NEW WATERSHED MANAGEMENT UNIT BOUNDARIES



### LEGEND

- |                                      |  |
|--------------------------------------|--|
| <b>New Watershed Boundaries 2007</b> | 18, Hope River                                     |
| 1, South Negri - Orange River        | 19, Rio Cobre                                      |
| 2, Lucrea River                      | 20, Rio Minho                                      |
| 3, Great River                       | 21, Milk River                                     |
| 4, Montego River                     | 22, Gut - Alligator Hole                           |
| 5, Martha Brae                       | 23, Black River                                    |
| 6, Rio Bueno - White River           | 24, Deans Valley River                             |
| 7, Rio Nuevo                         | 25, Cabarita River                                 |
| 8, Oracabessa - Pagee River          | 26, New Savannah River                             |
| 9, Wagwater River                    |  |
| 10, Pencar - Buff Bay River          |  |
| 11, Spanish River                    |  |
| 12, Swift River                      |  |
| 13, Rio Grande                       |  |
| 14, Drivers River                    |  |
| 15, Plantain Garden River            |  |
| 16, Morant River                     |  |
| 17, Yallahs River                    |  |
|                                      | <b>Former Watershed Management Unit Boundaries</b> |

# APPENDIX 6. GEF BIODIVERSITY PROJECTS 2005-2008

(Prepared by the Environmental Management Division)

Project	Agencies involved	Funding	Duration	Objective(s)	Status
Early Action Grant	UNDP/GEF /OPM/ FD/USAID/ TNC	US\$ 150,000 with co-financing of US\$ 150,000.	June 1, 2008 to May 31, 2010	<ol style="list-style-type: none"> <li>1. Assess the value of PA's to Jamaica's economy.</li> <li>2. Initiate the incorporation of natural resource valuation into policy, and</li> <li>3. Create the capacity to consistently apply the information to relevant decision-making.</li> </ol>	<p>In the process of hiring a project Coordinator.</p> <p>Selecting representatives for Project Steering Committee (PSC) and Technical Advisory Committee (TAC).</p>
National System of Protected Areas (full size Project)	UNDP/GEF / OPM/ FD/JNHT/ TNC	J\$ 3,047,643 with co-financing of J\$ 5,320,500	July 2009- August 2015	To consolidate the operational and financial sustainability of the National System of Protected Areas	PIF submitted to UNDP. Awaiting approval
Natural Resource (Cockpit Country) Valuation	GEF/UNDP / OPM	US\$ 470,250 co-financing of US\$ 82,000	September 2008 - December 2011	To develop natural resource valuation (financial and economic) tools to be used to strengthen a holistic approach to the implementation of policies, programs, plans and development	PIF to be submitted to UNDP September 2008

Project	Agencies involved	Funding	Duration	Objective(s)	Status
				<p>projects. In particular, the project will incorporate natural resource valuation tools in the implementation of the Strategic Environmental Assessments (SEA) of programs, policies and plans</p> <p>2. The project will incorporate natural resource valuation tools into the Environmental Impact Assessment (EIA) process, allowing for a more informed decision in the permitting process of development projects.</p>	
Integrated Watersheds and Coastal Areas Management Project (IWCAM)	GEF/UNDP /UNEP /CEHI	US\$ 601,000 with co-financing of US\$ 629,340	Approximately 3 years October 2006-Sept. 2009	1. The capture of existing best practices and lessons learned through other coastal, watershed and community management initiatives within the country (e.g. CWIP, ENACT, JCDT and R2RW) to create an effective Watershed Management	Implementing activities towards the development of the Watersheds Area Management Mechanism for the Driver's River Watershed.

Project	Agencies involved	Funding	Duration	Objective(s)	Status
				<p>mechanism for Eastern Portland</p> <p>2. To develop transfer methodologies to allow for the replication of these lessons to neighbouring Watershed Management Units (WMU), and to other Caribbean SIDS</p>	
<p>Sustainable Management of the Shared Marine Resources of the Caribbean Large Marine Ecosystem (CLME) and Adjacent Regions</p> <p>Pilot project Management and Conservation of Reef Biodiversity and Reef Fisheries</p>	<p>GEF/UNDP /IOCARIBE Fisheries Division/NE PA</p>	<p>GEF: US\$ 1.3 million, Co-financing: US\$ 2.732 million.</p> <p>Jamaica – cofinancing US\$349,800</p>		<p>Management and Conservation of Reef Biodiversity and Reef Fisheries</p> <p>This demonstration project will focus on requirements to protect and maintain the ecological integrity of the reef as applied to a large and remote reef systems in Jamaica (Pedro Bank) that represent highly productive areas subjected to significant fishing pressures. They will utilize the sustainable development approach to counter act actual over-exploitation,</p>	

Project	Agencies involved	Funding	Duration	Objective(s)	Status
				<p>habitat degradation and pollution problems. Environmental authorities in these two countries will support each other by addressing how common measures and policies and participative MPA implementation, fisheries and water resources management can be fully achieved. By doing so, they will face issues related with the need for integration of local and national regulations, as well as frontier conflicts and socio-economic and cultural aspects.</p>	
<p>Assessment of Capacity Building Needs, Preparation of the Third National Report (CBD) and the Clearing House Mechanism</p>	<p>UNDP/GEF /OPM IOJ/PIOJ/E FJ</p>	<p>US\$ 218,620 with co-financing of US\$ 79,670</p>	<p>12 month period work plan, commencement date not given</p>	<p>Assessing capacity needs in the areas of preservation of indigenous knowledge, access to genetic resources and benefit sharing.</p> <ul style="list-style-type: none"> <li>- Conducting initial assessments and identifying monitoring program, including taxonomy for</li> </ul>	<p>Project Steering Committee to be established</p>

Project	Agencies involved	Funding	Duration	Objective(s)	Status
				biodiversity - Increasing the capacity of the Jamaica Clearing-House Mechanism (JA-CHM) to provide relevant data to assist in the country's development of the various sectors - Sensitizing the public to the JA-CHM and its potential to assist in economic planning and hence development - Developing the Third National Report to the CBD	
Building Capacity for effective Participation in the Biosafety Clearing-House (BCH). <sup>*12</sup>	UNEP/GEF /IOJ	UNEP-GEF \$48,000 Jamaica: \$35,000.	8 months	-To provide training for a core group of persons in all aspects of the BCH  to sensitize stakeholders on biosafety issues and the BCH	On going

<sup>12</sup> Added by author.

# APPENDIX 7. TEAM BIOGRAPHIES

## THERA EDWARDS

Thera Edwards has worked in the environment and agriculture for the past sixteen years in varying capacities. Through these professional assignments she has gained experience in agriculture, conservation, biodiversity, protected areas and watershed management. She values the use of public-private partnerships in achieving environmental transformation and sustainable development and appreciates the contextual issues surrounding land use and land degradation and recognises that interventions occur at multiple levels starting on the ground in communities and extend to institutional arrangements and policies. Her areas of professional specialisation include watershed management, vegetation ecology, biodiversity and teaching.

In the past 7 years her work has focused on environmental management and sustainable development with particular emphasis on watersheds, protected areas and biodiversity. During this period between July 2001 and August 2004 she managed the Sustainable Watersheds Branch of the National Environment and Planning Agency in Jamaica.

Thera Edwards has written and co-authored a number of technical papers for presentation at conferences and symposia. She is a current and founding member of the Jamaica Institute of Environmental Professionals and has served on the Institute's council. In addition, she has chaired a working group of the National Integrated Watershed Management Council. Miss Edwards has served as National Focal Point for the Integrating Watersheds and Coastal Areas Management in Small Island Developing States of the Caribbean Project (IWCAM).

She holds a M.Sc. in Environmental Management from the University of London and a B.Sc. in Environmental Sciences from The University of the West Indies. Currently she is pursuing a Ph.D. in Landscape History at The University of the West Indies.

## MARCIA CREARY

Marcia Creary is a marine scientist with over twenty years experience working on various aspects of the Jamaican marine and coastal environment. She holds a Bachelors of Science in Zoology and a Masters of Philosophy in Marine Sciences from the University of the West Indies.

She is presently the Environmental Data Manager of the Caribbean Coastal Data Centre of the Centre for Marine Sciences, UWI, where data from regional and local monitoring programs are archived and managed. She and her colleagues at the CMS are involved in island wide coral reef monitoring and coral beaching studies.

Since 2000 she has been involved in the regional climate initiatives change with responsibility for the assessment of the potential impacts of climate change on coral reefs and the marine environment; agriculture and food security; and water resources. She is presently in charge of the expansion of the coral reef monitoring program to seven countries in the Eastern Caribbean.

## **KARL AIKEN**

Karl Aiken, has lectured at the Life Sciences Department , UWI since 1980 and he teaches various marine and aquatic subjects, specializing in fish and fisheries matters, and for a good while now, in aquaculture (fish culture). Karl has a masters and doctorate from the UWI, Mona campus and also attended Auburn University for a year on a USAID fellowship in 1981-82. Since then Karl has worked on various aspects of Jamaican living aquatic resources.

His research interests have been many and varied, ranging from reef fishes, to lobsters, to queen conch, dolphin behaviour, and most recently fish nurseries in Kingston Harbour.

Karl Aiken was one of the five founders of the Jamaica Conservation & Development Trust (JCDT) in 1988 which has gone on to develop a good name for itself in conservation.

## **ELAINE FISHER**

Elaine Fisher has served as the Head of the Natural History Division of the Institute of Jamaica as well as the Institute's Executive Director. Her vast experience in biodiversity has led to her participating as a member of the island's delegation to the Conference of the Parties (COP) for the Convention on Biological Diversity (CBD). She was Head of Delegation for the second, third, fourth and fifth and sixth meetings of the COP. She has also represented Jamaica at various meetings of IABIN (Inter American Biodiversity Information Network) and meetings of the Subsidiary Body on Science, Technical and Technological Advice (SBSTTA) of the CBD.

In Jamaica she has served as Chairman and/or member for a number of committees on biodiversity matters including Jamaica's Scientific Authority for the Convention on Trade in Endangered Species of Wild Flora and Fauna (CITES), The National Wildlife Foundation, National Biosafety Committee, Orchid Policy Committee (responsible for drafting policy for orchids in relation to CITES).

Elaine has contributed to the preparation of the following documents; UNDP/GEF Enabling Activity to develop the National Biodiversity Strategy and Action Plan; UNEP/GEF Biosafety Frameworks Project; Draft National Biosafety Policy; Draft Orchid Policy; Dolphin Standards and Guidelines; and The Draft Dolphin Policy.

Elaine Fisher holds a Ph. D. in Marine Zoology and a Diploma in Management Studies from The University of the West Indies.

## **PETER ESPEUT**

Mr. Espeut is a sociologist and rural development specialist who has spent the past twelve years working with local communities toward improved natural resources management and sustainable community development. He is the past Executive Director of the Caribbean Coastal Area Management (CCAM) Foundation, an environment and development NGO which managed and still works in the Portland Bight Protected Area on Jamaica's south coast. As a development practitioner his efforts have led to the empowerment of local small-scale fisher groups helping them to successfully resolve internal disputes and negotiate conflicts between themselves and shipping interests.

Mr. Espeut holds Master of Philosophy, Master of Science, Bachelor of Arts, and Bachelor of Science degrees from the University of the West Indies.

## DIANE RUSSELL

Diane Russell is Biodiversity and Social Science Specialist on the Biodiversity Team within the Natural Resource Management (NRM) Office of the Economic Growth, Agriculture and Trade Bureau (EGAT) of USAID. Diane holds a PhD in anthropology and a Masters in Environmental Management and has over twenty years of experience in the fields of tropical agriculture, rural development and biodiversity conservation working both for USAID and at research institutions.

U.S. Agency for International Development

142 Old Hope Road

Kingston 6

Jamaica

Tel: (876) 702-6445

Fax: (876) 702-6385