

### **3. THE MAJOR GAPS AND CHALLENGES AFFECTING THE CONSERVATION AND SUSTAINABLE USE OF JAMAICA'S BIODIVERSITY**

There are many factors that contribute to the loss of biodiversity in Jamaica. These include poverty, lack of public awareness about the importance of conserving biodiversity, habitat/ecosystem destruction and degradation, habitat fragmentation, unsustainable harvesting of some species, pollution, and the spread of alien species.

#### **3.1 Socio-economic Factors**

Historically, human activities have had a negative effect on biodiversity. This view is controversial, and in the case of Jamaica, needs closer examination.

##### **3.1.1 Population Pressure**

Jamaica's population growth rate averaged just over 1% between 1993 and 1998 (1998 Economic and Social Survey of Jamaica). The population growth rate has declined slightly since this period and the annual increment to Jamaica's population is just over 20,000. An estimated two-fifths of the population is less than 20 years old and this high concentration of people in and entering their reproductive years will ensure that total births will continue to rise.

##### **3.1.2 Lack of Capacity of Local Communities**

Rural migration has affected biodiversity in different ways. Over the past 30 years, labour has become the major cost of agricultural production. Farming methods that are appropriate for short-fallow cultivation can rarely be practised because of the high labour cost required to cultivate the land where most rural poor live.

Farmers therefore have to rely on inappropriate farming methods (slash and burn) that are not suitable for their specific fallow requirements

but which were suitable for long-fallow systems. They are then forced to rely on high chemical fertiliser and pesticide inputs to reduce labour costs.

It thus can be argued that in Jamaica, it is not so much the amount of labour (excess population) that is contributing to biodiversity loss (both natural and agricultural), as it is the cost of that labour compared to other competing demands (real or imagined). This in turn leads to encroachment on forest areas and other sensitive or important biodiversity areas, as the rural poor seek ways to minimise their labour input and to survive.

##### **3.1.3 Poverty**

Poverty and over-consumption by certain sectors of the society are also contributing to the decline in biological resources. To address the problem of poverty, the Government of Jamaica in 1997 established the National Poverty Eradication Programme (NPEP). This programme outlines:

- Methods for the reduction of the poverty level;
- Human resource development;
- Social welfare;
- Environmental and natural resources protection;
- Community empowerment and community-based development; and
- The foundation for the eradication of absolute poverty.

Data for 1997 show that approximately 19.9% of Jamaica's population, or 13.6% of households, live in poverty; with 73% living in rural areas, 13.6% in the Kingston Metropolitan Area, and 13.1% in other towns.

The data revealed an increase in the percentage of poor living in rural areas.<sup>4</sup> In Jamaica, the communities closest to the most vulnerable biological resources are among the country's poorest. Not only do these communities depend on biodiversity for their own survival, they are also at risk from the same environmental problems that cause biodiversity loss, such as water pollution.

The relationship between poverty and environmental degradation requires an integrated planning approach in order to achieve economic development and environmental sustainability.

#### **Socio-economic Gaps and Challenges:**

- Developing effective mechanisms to actively engage communities in the decision-making process such as in the planning phases of development projects which may affect them and addressing existing environmental problems in their communities;
- Developing appropriate programmes and methods of communications which clearly indicate the role of biodiversity management in poverty alleviation;
- Providing alternate opportunities for income generation in rural communities which can encourage people to remain in their communities thereby decreasing urban drift;
- Identifying the social services provided by the environment and their value at the community and national level; and
- Expanding the agricultural services provided to farmers, particularly in the area of modern farming techniques.

### **3.2 Public Awareness, Education, and Community Responsibility and Empowerment**

There is an urgent need to heighten awareness and understanding among Jamaicans of the need to conserve biodiversity and to sustainably use biological resources. Environmental education is an essential tool to build support for biodiversity conservation and to change attitudes and behaviour, as well as to encourage public support for biodiversity-related policies, strategies, plans and programmes.

Despite substantial investments in this area, awareness of environmental issues in Jamaica remains at a relatively low level. However, recent increases in membership in, and the number of, environmental organisations are encouraging and indicate increased concern for environmental issues. This growing membership will also greatly assist with increasing public awareness of environmental issues and responsibilities.

A number of public awareness, education and community empowerment initiatives have already begun. These include:

- Establishment of a National Environmental Education Committee to spear-head the development of a National Environmental Education Action Plan for Sustainable Development;
- Environmental groups and communities working together to reduce the impact of development and to clean up degraded sites;
- Celebration of environmental days and occasions;
- A biennial environmental green exposition;
- Print and electronic media campaigns; and
- Publication of the State of Environment Report.

<sup>4</sup> Section 22.2, Economic and Social Survey Jamaica, 1998

**Public Awareness Gaps and Challenges:**

- Developing public education programmes to: a) explain the socio-economic benefits of protected areas, species and micro-organisms; and b) increase understanding of ways and means to reduce negative impacts on biodiversity;
- Increasing support for non-government and community environmental education and projects;
- Networking/coordination at the national level to avoid duplication thereby promoting greater efficiency the delivery of public environmental education programmes.

### 3.3 Enhancing the Legislative Framework for Biodiversity

While the current legislation creates a basic framework for the conservation of biodiversity, it does not comprehensively protect ecosystems, species, or genetic diversity.

In this regard, Jamaica is in the process of reviewing or developing several pieces of legislation that are relevant to the conservation of biodiversity and sustainable use of biological resources. These include the NRCA Act, 1991; a new Wild Life Protection Act, a new Fisheries Act; a new Watershed Act; and Regulations under the Endangered Species (Protection, Conservation and Regulation of Trade) Act, 2000.

**Legislative Gaps and Challenges:**

- Determining the mechanism to modify the Constitution to support biodiversity conservation, sustainable use of biological resources, and ownership of genetic resources;
- Determining the need to incorporate into legislation alternative regulatory instruments, such as economic incentives to promote sustainable use of biodiversity and ways and means to empower and support NGO's involved in environmental projects;
- Developing legislation concerning scientific research and collection;
- Developing appropriate legislation with regards to the commercial use of living modified organisms;
- Ensuring adequate protection through legislation for various ecosystems e.g. rivers, coastal areas, wetlands, coral reefs, cays, and caves;
- Creating memoranda of understanding between departments and agencies of Government to clarify roles and responsibilities in the management of biodiversity.
- Establishing mechanisms to ensure awareness by the judiciary of the status of Jamaica's biodiversity, especially threatened species; and
- Including mechanisms within legislation to make it easier to prove environmental crimes and recover costs for remedial action.

### 3.4 Land Use Planning and Environmental Impact Assessments

Jamaica, like other small island states, is particularly vulnerable to species extinction because island species often have smaller geographical ranges and total population sizes in comparison to mainland species. This makes them more susceptible to significant population declines due to factors including habitat loss and alteration, environmental degradation, introduced predators and competitors, and disease outbreaks. Sound land use planning

and environmental impact assessments (EIA) are essential to ensure that developments do not significantly affect Jamaica's biodiversity.

Population growth, coupled with agricultural, industrial and commercial expansion, has resulted in intense competition for land. The resultant effect is less-than-optimum land use resulting in a number of problems which negatively impacted on biodiversity.

Some recent progress has been made towards addressing land control issues. Chief among these are: the new Lands Policy drafted in 1996 and the Land Information Council of Jamaica established in 1997. The Land Information Council is mandated to harmonise Geographical Information System development to support environmental and physical planning. The Government has also been focussing on harmonising the functions of the Town Planning Department (TPD), the NRCA and the Land Development and Utilisation Commission (LDUC).

The loss of flora and fauna is not currently adequately addressed nor monitored through the present EIA process. For example, a system to identify critical habitats has not been established (this is needed to allow for the modification of development plans). There is also no requirement to identify threatened species on proposed development sites and ensure appropriate conservation measures. In addition, monitoring of the construction process and subsequent activities on the site is often not comprehensively addressed.

Although guidelines have been developed by the NRCA for the conduct of EIA's and for public presentation, there is no legal requirement to ensure public participation in the EIA process. The NRCA has tried to facilitate transparency in this process but regulations are required to govern the EIA process and the requirements for public presentation.

Improved land use planning and environmental impact assessments are critical to conserving Jamaica's biodiversity.

#### **Land Use Planning and Environmental Assessment Gaps and Challenges:**

- Preventing uncontrolled or poorly planned human settlement in areas not conducive to such development, like steep hillsides and in watersheds;
- Preventing development and expansion of farming on steep slopes and on low productivity lands;
- Preventing further deforestation and destruction of watersheds and wetlands;
- Addressing land tenure issues;
- Establishing incentives for private landowners to conserve biodiversity;
- Improving the EIA process to better protect flora, fauna and their habitats, and especially threatened species and ecosystems; to ensure monitoring of the construction and operation processes; and to ensure public participation in the EIA process; and
- Strengthening and enforcing existing laws against trespassing and illegal developments.

### **3.5 Agricultural Sustainability**

Much of the land occupied by small farmers is located on steep slopes where inappropriate farming practices result in soil erosion and loss of biodiversity. To increase income and food production, farmers often advance further up hillsides clearing forested areas which further impacts negatively on biodiversity.

Under the recently introduced Domestic Food Crop Project of the Ministry of Agriculture, efforts are being made to optimise the use of agricultural lands by determining the most suitable crops for particular soil types and other conditions.

Further research into crop zoning and implementation of other methods of land use are necessary to optimise the use of agricultural lands, achieve agricultural sustainability, and significantly reduce impacts to biodiversity by maintaining or increasing crop production without expanding the agricultural land base.

#### Agricultural Sustainability Gaps and Challenges:

- Developing and implementing improved agricultural policies and planning systems to provide a basis for sustainable use of resources and to integrate agriculture policies and programmes with conservation policies and programmes;
- Obtaining financial resources to support training and extension services in order to provide farmers with the support they need;
- Increasing technical and scientific capacity within the agricultural sector;
- Developing land use zoning and control and enforcement measures to protect sensitive landscapes and species from inappropriate agriculture use and development;
- Increasing use and development of locally adapted genetic resources; and
- Increasing control over the importation of agricultural plants and animals to prevent the introduction of harmful alien species.

### 3.6 Mining and Quarrying

Jamaica's mining industry is comprised mainly of the bauxite/alumina sector (bauxite mining and the production of alumina) and the industrial mineral sector (various forms of quarrying).

Mining and quarrying represent important areas of contemporary economic activity. Bauxite mining and the processing of bauxite ore into alumina are major sources of export earnings for Jamaica and has been for several

decades. Both mining and processing place serious and sustained burdens on the environment. On an annual basis, an average of almost 100 hectares of land are disturbed for bauxite mining while only 76 ha are restored (Table 6). The industrial minerals sector accounts for an annual average of 7.5 to 9.0 ha of land disturbed for mining.

Some of the backlog of mined areas waiting restoration dates back to the 1970s. All the bauxite/alumina companies have extensive agricultural programmes geared towards the reuse of restored mined lands. However, restored land is normally less productive than the original and although the application of fertilisers can raise yields above original levels, the yield/cost ratio is generally not economical under the present range of crops and agricultural practices. The long-term effects of bauxite mining and alumina processing have not been fully assessed.

Limestone, marl and gypsum are widely used in the construction industry and road building. Limestone and gypsum are also used extensively in the local production of cement. Limestone, in the form of burnt lime (Calcium Oxide), is one of the major raw materials in the Bayer process for the manufacture of alumina. It is also exported in the form of crushed limestone and limestone whiting. Production of gypsum for export peaked in the late 1950s when almost ~~600 kt~~ 600,000 tonnes were produced annually.

**Table 6** Disturbed lands resulting from mining

Disturbed Lands	Ha	%
Area Disturbed for Mining	4,312.82	100
Area completely mined out	3,945.40	90.7
Original pit area restored and certified	2,533.33	54.6
Fringe and marginal lands restored and certified*	1,047.20	
Total area restored and certified	3,580.53	
*44.5% more than actually disturbed		

Sand and gravel mining are important economic activities. Unfortunately, acquiring these materials is often being carried out illegally and great harm is being done to the country's rivers, beaches and coastal areas.

Clay and shale mining is conducted on a relatively small scale and its environmental impact is not as severe as the other mining activities. Clay is used mostly in the craft industry for pottery and ceramics and for roofing tiles. A large amount is also used in the production of cement. Some clay bricks are also produced, primarily for decorative purposes.

Other mineral industries such as marble are not yet developed, although Jamaica has extensive reserves of high-quality marble. Although marble has been extracted since the 1960s, output remains limited due to difficulties associated with vehicular access into the high mountainous areas where the best deposits are located. Jamaica is also known to have some gold of potential commercial value.

#### **Mining Gaps and Challenges:**

- Preventing or reducing loss of habitat for endemic and threatened species;
- Obtaining adequate detailed descriptions of geophysical, climatic, vegetative and ecological characteristics as part of planning mine site developments;
- Overcoming gaps in understanding the regenerative capacity of the various flora and fauna communities affected by mining activities;
- Overcoming gaps in understanding and ranking of areas or sites with respect to biodiversity, or their degree of threat;
- Increasing understanding of the long-term impact of pollution on species and ecosystems; and
- Including biodiversity issues in the overall planning of mining operations to prevent or prevent or minimize negative impacts.

### **3.7 Tourism**

The tourism industry, which is the largest foreign exchange earner for Jamaica, is directly dependent on the natural environment such as the white sand beaches, rivers, mountains and forests. There are six designated tourist resort areas in Jamaica. These are Montego Bay, Ocho Rios, Negril, Kingston, Port Antonio and the South Coast.

The diversity of Jamaica's geography and landscape presents unique vacation opportunities, and it is essential that the natural resources that sustain tourism are conserved. Tourism development must be well planned to ensure

that it is ecologically sustainable over the long-term.

Biodiversity is being used to market aspects of tourism in Jamaica. Several companies offer tours of natural areas including the Black River, Cockpit Country, and the Blue Mountains. A number of tourism companies use native animals in their logos and advertisements, and have made small grants to support the work of environmental NGOs.

Several initiatives that will support efforts to conserve biodiversity and reduce impacts to the environment are underway in the tourism sector. These include:

- Preparation of a draft Sustainable Tourism Master Plan;
- Environmental Audits for Sustainable Tourism (with 20 hotels and one attraction audited to date);
- The Ministry of Industry and Tourism has conducted carrying capacity assessments for three major resort areas (Montego Bay, Ocho Rios and Negril) and river-based attractions;
- A manual has been produced by the Jamaica Hotel and Tourist Association called “Environmentally Conscious Hotel Operations”;
- A programme of greening of the tourism industry was established. In 1998, four hotels in Jamaica became the first in the world to be certified by Green Globe International as Green Hotels.

#### **Sustainable Tourism Gaps and Challenges:**

- Developing a comprehensive “Green Tourism and Ecotourism Policy”;
- Developing guidelines, standards and codes of conduct to prevent negative impacts to biodiversity such as incentive measures for remedial activities and the adoption of eco-friendly standards by tourism operations;
- Improving collaboration among all sectors to reduce conflicts;
- Improving disposal and management of sewage and solid wastes in watersheds, coastal and marine areas;
- Conducting biodiversity risk assessments and determining carrying capacity for protected and sensitive areas; and
- Improving awareness among

### **3.8 Parks and Protected Areas**

Parks are defined under the NRCA Act as “any area of land to be maintained for the benefit of the public”. Protected areas are defined as “any area of land or water in which may be preserved any object (whether animate or inanimate) or unusual combination of elements of the natural environment that is of aesthetic, educational, historical or scientific interest”. A Marine Park is defined as “any

area of land lying under tidal water and adjacent to such land or any area of water”.

Regulations were passed in 1992 to govern the management of Marine Parks under the Natural Resources (Marine Parks) Regulations and in 1993 the Natural Resources (National Parks) Regulations were promulgated. These Regulations treat the following activities within the parks as offences:

- fishing without a licence;
- discharging polluting matter;
- destruction of coral and other natural formations and marine life;
- collection of specimens of flora and fauna;
- lighting of fires; and
- conducting commercial activities without a licence.

Regulations are to be prepared for five (5) types of protected areas under the NRCA Act. Jamaica plans to adopt the system used by the World Conservation Union (IUCN) to declare specific categories of protected areas. Regulations are to be developed for the categories: National Nature Reserves, Natural Landmarks/ Monuments, Habitat/Species Management Areas, Managed Resource Protected Areas and National Protected Landscapes and Seascapes.

To date, Jamaica has declared three (3) marine parks (Montego Bay, Ocho Rios and Negril); one National Park (the Blue and John Crow Mountains National Park); and three (3) protected areas (Palisadoes, Coral Springs and Portland Bight).

The entire Negril Watershed area has been declared an Environmental Protection Area under the NRCA Act to ensure the protection of the environment and natural resources in that area. This declaration was followed by the preparation of an Environmental Protection Plan, which provides a framework for sustainable development within the area. Regulations for Environmental Protection Areas have almost been completed.

Over 150 areas identified in the “Policy for Jamaica’s System of Protected Areas” as being of national significance need some type of protection. Further planning and development of Jamaica’s system of protected areas are crucial to achieving the conservation of biodiversity.

A financial mechanism to pay for the management of all types of parks and protected areas in Jamaica is still to be developed. Although there is a National Park Trust fund in place, it does not have the necessary capital to provide funding for all parks and protected areas presently declared. User Fees Regulations are currently being developed for all national parks. However, additional cost recovery schemes and financing for protection and conservation will have to be created in order to supplement the income of parks and protected areas to ensure availability of funds for research and management.

#### **Parks and Protected Areas Gaps and Challenges:**

- Continuing to build partnerships among governments, NGOs, local communities, and private sector interests to establish and maintain protected areas;
- Completing regulations for five types of protected areas including the category that offers the highest protection, the Nature Reserve;
- Obtaining the necessary financial resources to undertake assessments in order to determine the status of many of the 100 areas that are scheduled to be declared as protected areas, and putting into place interim measures to ensure their conservation;
- Working with communities to create buffer zones for Marine and National Parks;
- Determining appropriate incentives to promote conservation on private lands; and
- Ensuring a sustainable financial framework for the protection and management of

### 3.9 Conservation of Freshwater Resources

Despite the abundance of potential freshwater resources, the actual obtainable capacity, i.e. the quantity of freshwater that can actually be utilised, has been significantly reduced due to the direct and indirect effects of three main causes:

- forest degradation in watershed areas which interrupts the natural water cycling process and reduces the soil's ability to absorb and retain water;
- sand mining and damming which compromises river bed integrity as well as alter natural river courses and
- discharge of waste effluent from industrial and agricultural processes into rivers and streams influencing *in-situ* conditions.

#### **Freshwater Resources Gaps and Challenges:**

- Increasing research to ascertain the nature and extent of our freshwater resources, as well as the threats to these resources;
- Implementing and enforcing legislation with regards to the monitoring of effluent released into rivers and other inland water bodies;
- Implementing management strategies with a view to freshwater biodiversity conservation;
- Public awareness of freshwater ecosystems and their importance needs to be promoted; and
- Regulating and monitoring the harvesting of freshwater resources.

### 3.10 Conservation of Coastal and Marine Biodiversity

Coastal and marine resources are essential components of Jamaica's economy and cultural diversity. The high concentration of people living on the coastal plains has resulted in increased pressure on the coastal resources. Many marine resources are over-utilised and marine ecosystems are being degraded. Recognition of problems has resulted in improved policies and programmes.

The Fisheries Division in collaboration with the CARICOM Fisheries Resources Assignment and Management Programmes will be conducting a five-year programme aimed at developing a management plan for economic marine resources. A Council on Ocean and Coastal Zone Management was established in 1998 by the Government of Jamaica to effectively integrate the management of the coastal zone. Other conservation initiatives for coastal and marine resources include:

- Preparation of a manual for integrated coastal zone planning and management;
- Draft Fisheries Bill and Draft Beach Policy;
- An assessment of pelagic and reef species including fish catch and effort;
- Operational licensing and registration system for fishermen and vessels;
- The Coastal Water Quality Improvement Project;
- Participation in the Caribbean coral reef monitoring programme;
- Environmental audits for sustainable tourism;
- The Ridge-to-Reef Project, which began in the year 2000 and is expected to design and

- develop environmentally and economically sustainable eco-tourism related enterprises;
- Coastal Zone Atlas and draft Fisheries Atlas;
- Jamaica's Coral Reef Action Plan;
- Construction, maintenance and monitoring of underwater pipelines and cables in the Coastal Zone;
- Draft Wetlands, Coral Reef and Mariculture Policies;
- Planning and execution of coastal and estuarine dredging works and disposal of the dredged materials;
- Planning, construction and maintenance of facilities for enhancement and protection of shorelines; and
- Standards for the development and operation of nature attractions.

#### **Coastal and Marine resources Gaps and Challenges:**

- Developing legislation, monitoring and enforcement mechanisms to prevent over-fishing, poaching and accidental entanglement in gill nets;
- Improving planning and legislation to prevent the loss of threatened and sensitive species, and to prevent destruction of their habitats;
- Preparing and implementing recovery plans for threatened species;
- Increasing the understanding by resource users, tourists and developers of the need to conserve marine resources, and of their responsibilities;
- Establishing additional marine protected areas;
- Establishing mechanisms to resolve conflicts among resources users through greater community involvement and responsibility;
- Overcoming gaps in data, information and knowledge required to manage coastal and marine resources; and
- Increasing efforts to reduce sedimentation and land-based pollution from developments and illegal sand mining operations.

### **3.11.1 Conservation and Sustainable Use of Forest Biodiversity**

Conservation of forests and sustainable use of forest biological resources are essential to achieving the objectives of the CBD. Jamaica was once covered with forests but are now restricted to areas least suitable for agriculture and human settlement such as those at high altitudes on steep and rocky slopes, and in rugged limestone areas without surface water. Today, more than 30% of Jamaica has retained some form of forest cover, but only about 8% of the remaining forests can be classified as undisturbed natural forests. Estimates of the deforestation rate in Jamaica have fluctuated over the years between 0.1% to 11.3% due to a number of reasons including objectives of the study, type of forest classification used, type of study and precision of estimates. In 2000, based on a classification system derived from the interpretation of LANDSAT imagery and 1:100,000 maps, the deforestation rate was estimated at 0.1% per annum.

Forests are being utilised for a variety of uses. Although precise data is not available, fuelwood and charcoal production are probably the largest users of forest biomass in Jamaica. The decentralised nature of the sawmilling industry in Jamaica makes it difficult to collect lumber production figures. The most recent estimate indicates annual production at approximately 59,000 cubic metres of hardwoods and 3,000 cubic metres of softwoods. Annual

yam stick production has been estimated at 15 million sticks, which translates to an annual roundwood consumption of 150,000 cubic metres.

For most forest areas, the major cause of deforestation is agriculture expansion from both small-scale farming operations and larger-scale operations producing export crops. Unsustainable harvesting of trees for charcoal production is degrading lowland forests.

Terrestrial animals have responded in varying ways to conversion and degradation of their habitats. Some species have been able to survive despite the disturbances and have either maintained or increased their population in agricultural and residential areas. Other species are able to tolerate moderate levels of forest disturbance but are generally absent in highly disturbed areas. Several animal species are very sensitive to habitat alteration, including endemic species. They exhibit strong forest ecosystem dependency and become rare or disappear from forested landscapes that are intensely influenced by humans.

Sensitivity to habitat disturbance among invertebrate species is poorly understood but is thought to be significant for many species. For example, the endangered Giant Swallowtail Butterfly (*Papilio homerus*) is mainly restricted to well-developed wet forests. Recent research indicates that this species suffers high mortality due to parasitism when there are high levels of disturbance at the forest edge, their primary breeding sites.

About half the amphibian and reptile species found in Jamaica depend on relatively undisturbed habitats, including forests, rivers, wetlands and beaches. Forest ecosystem dependency is pronounced in endemic land birds. Over 60% of these species are rare or absent in open disturbed areas, and about 30% rely on well-developed forests at least during the nesting period. For non-endemic land birds, these

figures amount to about 40% and 20%, respectively.

The Jamaican Hutia or coney (*Geocapromys brownii*), Jamaica's only endemic land mammal, depends on forest cover for survival. Several bat species occur on the island and occupy forest, caves and other ecosystems. Their habitat requirements are not fully understood.

A National Forest Management and Conservation Plan for Jamaica was approved by Cabinet in 2001. The purpose of the Forest Plan is to promote and improve the conservation and sustainable use of the forest resources of Jamaica to meet local and national needs, through protecting, managing and restoring the resource for the benefit of present and future generations.

#### **Forest Biodiversity Gaps and Challenges:**

- Protecting Jamaica's remaining forest from encroachment by cultivators, livestock and timber cutters;
- Changing public attitudes to overcome indifference to: forest degradation, destruction and theft of forest resources, unsustainable land use practices, illegal occupation and livestock grazing on forest lands;
- Enforcing environmental laws, and commitment to implement plans and policies;
- Securing financial resources to overcome gaps in knowledge of the forest resource base and ensure the sound management of forest resources, especially to be able to determine sustainable harvest rates and to enforce them;
- Increasing the number of trained personnel in the public and private forest sector to ensure the sound management of forest resources;
- Increasing understanding of habitat needs for non-harvested forest species to ensure their conservation;
- Increasing the understanding of the roles and values of forest resources for biodiversity conservation, watershed protection, carbon sinks and other values; and
- Ensuring cooperation and collaboration among government

### **3.12 Conservation of Watersheds**

Landslides and slope failures are very common in the non-limestone watersheds due to the presence of steep slopes and thin or erosive soils. This is further compounded in all the watersheds by heavy and high intensity rains in the upper watershed areas, soil erosion, and susceptibility to earthquakes. These natural conditions of instability are

aggravated by the inappropriate use of steep slopes. Farming activities on the slopes have long been recognised as the single most important cause of the degradation of watersheds in Jamaica. Upwards of 170,000 farmers cultivating just less than 245,000 ha, and using unsuitable agricultural practices have contributed to massive soil loss through erosion, siltation of drains and rivers and destructive flooding downstream.

Growth in industrial and agricultural activities, population and increasing urbanisation has placed demand for and pressure on land and water resources. Water pollution has significantly increased due to the increased use of industrial and agro-chemicals, urban run-off and the improper disposal of sewage effluents.

The large-scale removal of trees for mining, quarrying, industrial and residential developments, squatter settlements, and the illegal removal of forest cover for lumber, charcoal production and yam sticks have greatly contributed to deforestation. Forest fires have been contributing more and more to deforestation due to the extended periods of drought.

These factors have resulted in heavy siltation of rivers, reservoirs, irrigation canals and water intakes, as well as harbours.

### **3.13 Conservation of Species and Their Habitats**

Conservation and sustainable use of Jamaica's wildlife species present many challenges. Habitat loss and overuse of resources have resulted in an increasing number of plants and animals that are threatened, or are extremely sensitive to further change in their numbers or habitat conditions.

Animals are hunted and collected for sport, food, research, and trade. Using traditional capturing techniques, persons opportunistically, illegally and accidentally capture turtles, manatees, crocodiles and birds to supplement food or income.

Pig hunters trap the Jamaican Hutia accidentally or deliberately. The Yellow-billed Parrot (*Amazona collaria*) and Black-billed Parrot (*Amazona agilis*) are illegally captured and sold locally in the pet trade.

Plants, especially orchids, are harvested from the forest for local sale or export. Other plants species are collected for the purpose of scientific research and private use.

The mandate for the management of species and their habitats is carried out by various agencies and organisations. These include the NRCA/NEPA, Forestry Department, Fisheries Division, BirdLife Jamaica, Institute of Jamaica, Southern Trelawny Environmental Protection Agency, Hope Zoo, Negril Area Environmental Protection Trust, Jamaica Conservation and Development Trust, Montego Bay Marine Park Trust, Caribbean Coastal Area Management Foundation and Portland Environmental Protection Association.

Committees and networks affiliated with the National Environment and Planning Agency (NEPA) are presently implementing components of recovery plans for the conservation of: sea turtles, the West Indian Manatee, several game birds, the American Crocodile, the Jamaican Iguana, the Queen Conch, the Jamaican Petrel (possibly extinct), coral reefs, forests, fisheries stock and the Giant Swallowtail Butterfly. These groups have alliances with various institutions.

Management and recovery plans seek to mitigate adverse impacts and the destruction of habitats across the country, aim to change behaviour and educate persons on aspects of biodiversity and identify the need for increased means of protection.

*Ex-situ* conservation measures have been implemented for some species, such as the establishment of captive breeding for the Jamaican Iguana at the Hope Zoo. There are four botanical gardens (Hope, Bath, Castleton,

and Cinchona) that could be developed as centres of *ex-situ* conservation for threatened plant species.

#### **Conservation and Sustainable Use of Jamaica Wild Flora and Fauna Gaps and Challenges:**

- Completing amendments to the Wild Life Protection Act to protect plants, invertebrates and micro-organisms;
- Continuing to establish protected areas to conserve species and their habitats;
- Securing financial resources and expertise to continue the development and implementation of recovery plans for threatened species and to ensure enforcement of legislation controlling the harvesting of species and habitat protection;
- Establishing incentives for the conservation and protection of wildlife to prevent species from becoming threatened;
- Overcoming gaps in knowledge to determine sustainable harvest rates;
- Overcoming gaps in knowledge of the ecology, taxonomy and systematics, and status of species, and overcoming gaps in capacity for these scientific; and
- Increasing public awareness of the need to conserve and sustainably use wild flora and fauna to gain support

### **3.14 Access to Genetic Resources and Fair and Equitable Sharing of Benefits and Traditional Knowledge**

Currently there is no legal means to protect traditional knowledge. A policy and legislation on access and benefit sharing is required to

establish the role of the Government to authorise access; state the types of activities that require prior informed consent, and from whom; and regulate *ex-situ* access to collectors. The policy and legislation should set out the requirements for access to genetic resources both for species found *in-situ* and *ex-situ*. Establishment of effective measures to share benefits arising from the use of genetic resources will provide positive incentives for conservation and sustainable use.

At present the Government regulates the access to Jamaica's biodiversity through the use of collection permits and Material Transfer Agreements.

**Access to Genetic Resources and for Benefit Sharing Gaps and Challenges to facilitating:**

- Establishing a process to identify and build consensus on national objectives and priorities in the form of a policy on access and benefit sharing; and
- Establishing a sound legal framework for governing access to Jamaica's genetic resources.

### 3.15 Harmful Alien Species

A large number of alien plant and animal species and micro-organisms have been introduced into Jamaica. Some were brought to Jamaica as domesticated animals, as exotic pets (birds and fish), as ornamental plants, and as pest control agents. Some of the most intrusive alien species are described below.

The White-tailed deer (*Odocoileus virginianus*) escaped into the hills of Portland when their enclosures were destroyed by hurricane Gilbert in 1988. The deer survived and have established populations in Portland, St Ann and St Mary.

The Indian Mongoose (*Herpestes punctata*) was brought to Jamaica in 1872 to control rats that had previously been introduced. It

became a well-established alien species. Not only did the mongoose fail to control rat populations, but it is also believed to be the factor for the decline and possible extinction of five endemic vertebrate species, a lizard (Giant Galliwasp), a snake (Black Racer), two birds (Jamaican Paruraque and Jamaican Petrel) and a mammal (Jamaican Rice Rat). In addition, it is a major threat to several rare and endangered animals including the Jamaican Iguana, other diurnal ground-dwelling lizards, and probably the Jamaican Boa.

Other alien species such as dogs, cats, and the rat (*Rattus rattus*) have very likely contributed to the decline of some of these species.

Feral populations of pigs were established in the early years of Spanish colonisation of Jamaica. They are now found in some of the natural forests, including the Hellshire Hills, Blue Mountains and John Crow Mountains. The pigs compete with native herbivores such as the Jamaican Iguana and the Jamaican Hutia. Feral pigs are hunted with dogs, which in turn attack native animals they encounter during hunting. Such attacks pose a threat to the survival of some endangered species, such as the Jamaican Iguana.

Two cultured species of shellfish have been introduced, the Freshwater prawn *Macrobrachium rosenbergii* and the Red-claw (*Cherax quadricarinatus*). The extent to which these species exist in the wild and their impact on other freshwater species have not been investigated.

There are increasing numbers of alien plant species spreading in Jamaica's forests and along riverbanks. Species of particular concern include the Mock Orange (*Pittosporum undulatum*) and the Wynne Grass (*Melinis minutifolia*) which are taking over large areas on the disturbed periphery of the Blue and John Crow Mountains National Park and spreading inwards. Wynne Grass prevents the regeneration of forests by competing with

trees seedlings for space. Its propensity to ignite and burn increases the potential for bush fires, particularly in the drier months. The Mock Orange is a small, fast growing tree whose seeds are spread by birds. Control programmes for these species are urgently needed.

#### Alien Species Gaps and Challenges:

- Obtaining adequate information on the biology, distribution, and the ecological and economic impacts of introduced alien species;
- Increasing capacity to implement alien species control programmes, including obtaining the necessary financial resources for prevention, control, and eradication programmes; and
- Overcoming gaps in legislation to control introductions of species of flora, fauna and genetic material. No legislation currently exists for the eradication of

optimising benefits that can be accrued from biotechnological developments.

#### National Biosafety Policy and Legislation Gaps and Challenges:

- Overcoming the lack of both human and technical capacities to safely handle LMOs; and
- Developing risk management and assessment capabilities.

### 3.16 Biosafety

Advancements in biotechnology are making it possible to better use and develop genetic resources resulting in the creation of many new products and services. However, there is also growing concern that living modified organisms (LMO) could pose risks to humans and to the environment.

An international framework for the use, safe transfer, and handling of living organisms resulting from biotechnology that may have an adverse impact on biodiversity and human health has been negotiated and adopted by the Parties to the Convention. This protocol is the only Protocol to be developed under the Convention on Biological Diversity since it came into force.

It is important that Jamaica establishes a domestic biosafety policy and legislation to protect biodiversity and human health, while

### 3.17 Water Pollution

At present, approximately 24% of the reliable safe yield of water resources is being used and it is projected that by the year 2015, 41% will be used. Continued deforestation, contamination of aquifers, and saline intrusion will diminish the amount of useable potable water available. Already, about 10% of available groundwater has been contaminated and is unsuitable for human consumption.

Water pollution poses a serious threat to the biodiversity of Jamaica. Pesticides, fertilisers and industrial wastes are major sources of pollution. The water quality of some rivers has deteriorated and is now not suitable for sustaining a freshwater fishery due to discharge of untreated domestic wastewater, contamination from grazing and watering of livestock, agricultural runoff, and the discharge of industrial effluents.

Current initiatives to address water pollution include: NRCA/USAID Coastal Water Quality Improvement Project, which is being executed in Negril, Westmoreland and Ocho Rios; licensing system for new domestic and industrial effluent discharges into rivers and stream; and routine

water quality monitoring throughout the island. Many challenges remain; for example, there is no policy to guide the utilisation, management and protection of rivers.

#### **Water Pollution Control Gaps and Challenges:**

- Licensing of existing facilities that discharge municipal and industrial effluents into rivers and streams;
- Developing hazardous substances regulations to control the import, transportation, manufacture use and disposal of hazardous substances;
- Establishing community based groups to address water pollution issues (potential community programmes would include, adopt-a-river or –stream programme and water pollution control plan); and
- Amending the Watershed Act to

Planning for Adaptation to Climate Change Project (CPACC), the NRCA in conjunction with the Centre for Marine Science, University of the West Indies, Mona, will be undertaking the monitoring of coral reef sites in Discovery Bay, Port Royal Cays and the Pedro Banks.

As an active participant in the Caribbean Community initiative, funding has been provided through the Global Environment Facility and the World Bank for the CPACC. This project supports preparations by Caribbean countries for the potential adverse effect of climate change, particularly sea level rise. The focus is on preparation of vulnerability assessments, adaptive planning, capacity building and institutional strengthening.

### **3.18 Climatic Change**

It is predicted that the change in global climatic conditions will result in increased temperatures, rainfall and sea level rise and more frequent hurricanes.

Jamaica's biodiversity could be adversely affected by climate change which may affect species population size, distribution, composition, geographical extent of habitats and ecosystems, and increase the rate of species extinction.

Jamaica has been proactive in responding to climate change issues. In this respect, the country has been a Party to the United Nations Framework Convention on Global Climate Change since 1995. At the regional level, as part of the Caribbean