

## **Appendix 1: TRENDS AFFECTING ST. LUCIA'S BIODIVERSITY AND CAUSES OF THESE TRENDS**

<b>Ecosystems</b>	<b>Threats</b>	<b>Causes</b>
<p><b>Forest and terrestrial Wildlife</b></p> <p>There are five forest types (rainforest, lower montane rainforest, montane elfin woodland, secondary forest, and dry scrub woodland) covering approximately 35% of the land area. 1/3 of the forest area is in government forest reserves, including one protected area (the Parrot Sanctuary). There are at least 1,310 plant, cycads and gymnosperms belonging to 143 families, plus 119 fern species; 150 bird species; 14 reptiles; 9 mammals and 4 amphibians.</p>	<p>22.5% loss of forest between 1977 and 1989 - losses high in both rainforest and scrub forest</p> <p>27 endangered plant species, 4 endangered bird species</p> <p>2 endemic species, the St. Lucia muskrat (mammal) and the mountain chicken (amphibian), thought to be extinct</p>	<p>agricultural conversion, especially for bananas</p> <p>deforestation for charcoal production</p> <p>removal of vegetation cover for housing and infrastructural development</p> <p>loss of habitats critical to endangered species</p>

Ecosystems	Threats	Causes
<p><b>Coastal and Marine Ecosystems</b> Coastal and marine ecosystems are diverse, including coral reefs, seagrass beds and mangroves, which provide home to a wide array of species of fish, invertebrates, birds and sea mammals. Most coastal and all marine natural areas are under public ownership.</p>	<p>patch and narrow fringing reefs seriously affected by sedimentation and land-based pollutants</p> <p>approximately 12.5% of beach length currently mined for sand</p> <p>approximately 40% of mangroves lost, remainder under stress</p> <p>stocks of most commercially important benthic species diminishing and potentially threatened</p>	<p>possible excessive harvesting of commercially important species, particularly some groupers and shallow reef snappers, the conch and the white sea urchin</p> <p>inadequate disposal and treatment of liquid waste</p> <p>unregulated construction and dredging in coastal areas</p> <p>soil erosion from poor agricultural practices on steep slopes</p> <p>mining of sand for construction purposes</p> <p>conversion and reclamations of mangroves, and illegal use of these areas for waste disposal</p> <p>illegal trade in coral and other protected species</p> <p>illegal exploitation such as unauthorized foreign fishing and fishing in marine reserves</p> <p>illegal and destructive fishing methods</p>

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<p><b>Freshwater Ecosystems</b>  Freshwater habitats include 37 rivers and water catchments, and a small number of marshes, swamps, underground springs, flood plains and inland mangroves. There are also constructed systems such as the Rodney Bay sewage treatments ponds, the Roseau dam and aquaculture ponds. All these systems provide habitats for the maintenance of flora and fauna. Relatively little is known about the species present, but recent studies have identified at least 13 species of shrimp, many micro-invertebrate families, a few fish and several bird species.</p>	<p>50% of the wetlands already lost, and decline still continuing</p> <p>increase in the incidence of water poisoning with undetermined effects on freshwater and possibly marine biota</p> <p>increases in siltation and pollution above water intakes</p> <p>increases in human demands for freshwater (for drinking, irrigation, washing, bathing, industry, recreation) with demand exceeding supply in some catchments, particularly during the dry season</p> <p>transformation of water courses and systems to facilitate urban development and flood control</p>	<p>conversion and reclamation of mangroves, and illegal use of these areas for waste disposal</p> <p>increased use of toxins for fishing, and absence of control</p> <p>deliberate and indiscriminate disposal of agro-chemicals and industrial wastes</p> <p>continuing expansion of banana cultivation and other crop production on steep slopes in catchments above water intakes</p> <p>rapidly growing population, particularly in Castries and Gros Islet</p> <p>rapidly growing tourism industry</p> <p>changing patterns of consumption and recreation</p> <p>expansion of settlements into water catchment areas</p> <p>inappropriate river management schemes and techniques</p> <p>river sand mining, river bank cultivation and deforestation</p>

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<p><b>Agro-ecosystems</b> A wide variety of fruit, vegetable and other crops are grown in St. Lucia. Banana cultivation is usually conducted in a monoculture system and is considered the largest and most significant agricultural production activity on the island. Land races, old crop varieties and wild relatives of crops are an important, although poorly documented, component of the nation's biodiversity. There are approximately 24 varieties of <i>Musa</i> species. Livestock production has been increasing and new genetic material is being introduced. Agro-ecosystems contain a number of other useful species, including medicinal plants.</p>	<p>although the status of many local varieties is not well documented, some are likely to be threatened by the introduction of new hybrids and by the clearing of agricultural lands</p> <p>non-propagation of important genetic material, resulting in loss of varieties and cultivars which could play a role in future crop improvements</p>	<p>conversion of agricultural lands for other uses</p> <p>abandonment and displacement of local varieties</p> <p>reduction in demand for local species, varieties, hybrids and breeds</p>

## Appendix 2: RELATIONSHIP BETWEEN BIODIVERSITY AND THE MAIN SOCIAL AND ECONOMIC SECTORS

Sector	Contribution of biodiversity to the sector	Impact of the sector on biodiversity	Measures to improve linkages
<b>Tourism</b> Tourism is the country's largest economic sector, and it is growing rapidly (from 212,000 visitors in 1988 to 564,000 visitors in 1997). Tourism infrastructure is concentrated on the north west coast of the island. Nature and heritage attractions currently constitute a relatively small part of the tourism product, but there are efforts currently underway to develop these resources and to involve communities in their management.	nature trails and bird watching in forest areas  snorkeling and diving on coral reefs  bathing, yachting, recreational fishing and other water sports  wild seafood in local cuisine  wild materials for handicraft and souvenirs  attractiveness of landscapes	<u>Positive impacts:</u> source of revenue and employment  source of revenue for conservation and environmental management  provision of incentives and creation of demand for conservation and environmental management  <u>Negative impacts:</u> generation of solid and liquid waste, with impact on ecosystems and species  demand for seafood which often exceeds productive capacity  potentially negative impact on plants used for handicraft and souvenirs  illegal trade in corals and other protected marine species  physical damages to reefs  conversion of sensitive areas for construction of tourism facilities	adoption of policy to channel revenue from tourism uses of biodiversity for conservation and management  determination of the carrying capacity of the island as a whole, and of specific sites and communities  increase in the revenue generated from tourism uses of biodiversity  adoption and enforcement of measures to control the impact of tourism uses on biodiversity  research and monitor the economic, social and environmental impacts of tourism  improvement of water quality monitoring near tourism plants

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<p><b>Agriculture</b> Agriculture has long been the mainstay of St. Lucia's economy. Banana remains the single most important crop, but markets and production have declined in the past five years. Approximately 34% of the lands are currently under agricultural production.</p>	<p>formation and retaining of soils, absorption and filtering of water, provision of natural pollinators, and control of pests</p> <p>increase in the genetic resistance of crops and livestock species</p> <p>wild resources with potential for commercial uses</p> <p>value of genetic material for future crop improvements</p> <p>provision of food and feed for livestock</p>	<p><u>Positive impacts:</u></p> <p>source of revenue and employment</p> <p>provision of incentives and creation of demand for the maintenance and use of important breeds, varieties, hybrids and species</p> <p><u>Negative impacts:</u></p> <p>destruction and conversion of natural habitats for agriculture</p> <p>damages to ecosystems from erosion and sedimentation caused by agricultural activities</p> <p>contamination of ecosystems by run-off and leaching of fertilizers, pesticides and herbicides</p> <p>impacts of pesticides on beneficial, non-target organisms</p>	<p>establishment and improvement of monitoring systems (soil erosion, cropping patterns, water quality and land use)</p> <p>provision of training on the use of pesticides and on integrated pest management</p> <p>review and reform of land use and land tenure policies to encourage sustainable practices</p> <p>tourism plants</p>

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<p><b>Fisheries</b> The fisheries sector is important, for economic, social and cultural reasons. Fish provides a reliable source of protein for many inhabitants, and fishing supports economic activities in a number of coastal communities.</p>	<p>commercially important species of reef fishes, conch, lobster and sea urchin</p> <p>supply of food and reduction of food imports</p>	<p><u>Positive impacts:</u></p> <p>source of revenue and employment</p> <p>provision of justification and incentives for conservation and natural resource management</p> <p><u>Negative impacts:</u></p> <p>unsustainable harvesting of certain species</p> <p>impacts of harvesting on the ecosystems and on other species</p>	<p>development of a national education and public awareness programme on environmental issues affecting fisheries and coastal and marine ecosystems</p> <p>establishment and improvement of systems for monitoring of fish stocks and environmental conditions</p> <p>enforcement of fisheries laws and regulations</p>

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<p><b>Forestry</b> Forest products make significant contributions to the lives of St. Lucians, with the provision of raw material for construction, furniture-making, canoe-building, handicraft and a number of other uses.</p>	<p>timber production, in small volumes, from the natural forest</p> <p>important source of timber provided by plantations (exotic species) and dry scrub forest, utilized locally for furniture-making, building and interior decoration</p> <p>charcoal and firewood</p> <p>raw materials for handicraft production provided by commercially valuable native palm and grass species</p>	<p><u>Positive impacts:</u> source of revenue and employment</p> <p>reduction in the rate of harvesting of valuable rainforest timber species</p> <p><u>Negative impacts:</u> over-exploitation of timber plantation and commercially important local species</p> <p>over-exploitation of the mangrove ecosystem</p> <p>risk of habitat destruction from charcoal production</p> <p>threats to important species such as the <i>Latannyé</i></p>	<p>development of a silviculture prescription for all timber plantations</p> <p>development of a management regime for valuable dry land timber species and other commercially valuable species</p>



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<p><b>Construction and Manufacturing</b> Construction has grown rapidly due to population increases, tourism development, and slow but steady economic growth. Manufacturing remains a small but important part of the economy. Much of this activity is concentrated in the north west of the island.</p>	<p>availability of raw products, particularly timber, for construction</p>	<p><u>Positive impacts:</u> provision of alternatives to forms of resource use which can be detrimental to biological diversity</p> <p><u>Negative impacts:</u> conversion of sensitive coastal and terrestrial habitats for commercial, residential and infrastructural uses</p> <p>sand mining for construction</p> <p>sedimentation of rivers, wetlands and nearshore marine environments from construction activity and road cuts</p> <p>pollution from manufacturing activities</p>	<p>formulation and adoption of a land use policy and of zoning procedures and guidelines</p> <p>revision of planning legislation and inclusion of requirements for EIAs</p> <p>use of bioengineering technologies for erosion control</p> <p>demarcation and effective management of existing protected areas</p> <p>development of alternative sources of construction aggregates</p> <p>identification of sensitive terrestrial and coastal habitats, and zoning for protection or compatible uses</p> <p>improvement of water quality systems and programmes near manufacturing facilities</p> <p>enforcement of legislation against industrial dumping</p>

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<p><b>Education</b> Education is a very critical sector. In the formal education systems, there are currently 88 primary schools, 21 secondary schools and one tertiary education institution. Environmental education is part of the formal system, and is also provided by natural resource management agencies through a variety of media and programmes.</p>	<p>availability of a wide range of ecosystems which can be used for educational purposes in a number of disciplines</p>	<p><u>Positive impacts:</u> increased awareness and commitment, as a result of better education</p>	<p>continuation and expansion of formal and non-formal education and awareness programmes on biodiversity, for the benefits of all sectors</p>

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<p><b>Health</b> Physical and mental health care is an essential requirement for the well-being of a nation and its citizens. Formal health care delivery is provided in community health centres, public hospitals (5 in all), one private hospital, and the private practice a large number of medical doctors. Informal and traditional health services remain important sources of health care, particularly in rural communities.</p> <p>Environmental health is an essential component of the sector. It forms the basis of any Primary Health Care (PHC) strategy, providing services of a primarily preventative nature to communities and institutions.</p>	<p>species which are or can be used for medicinal purposes</p> <p>production of clean air and water</p> <p>provision of useful organisms for biological control</p> <p>improved food safety and reduction in food-borne illnesses</p> <p>reduction in vector proliferation and infestation</p>	<p><u>Positive impacts:</u> provision of incentives and rationale for research on the medicinal properties of local flora</p> <p><u>Negative impacts:</u> destruction of beneficial, non-target species</p> <p>contamination from bio-medical wastes</p>	<p>continuation and improvement of monitoring of environmental quality (e.g. water and air)</p> <p>dissemination of relevant information to all concerned</p> <p>conduct of research on biological control of mosquitoes, especially <i>Aedes aegypti</i></p> <p>continued joint action and consultation</p> <p>inclusion of environmental health studies within school curricula</p> <p>inclusion of environmental health issues in popular media and educational programmes</p> <p>increased collaboration between public and private sector agencies concerned with environmental health</p>

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<p><b>Recreation</b>  Recreational activities, whether active or passive, are often based on the natural environment: bathing and swimming, hiking, relaxing and meditating, observing wildlife and landscapes, visiting sites and attractions, diving and snorkeling are all important sources of recreation. In recent years, the country has witnessed a growth in the demand for such outdoor and nature-based recreational activities</p>	<p>provision of resources, sites and attractions for various forms of recreation</p>	<p><u>Positive impacts:</u>  increased awareness of the benefits of biodiversity, and of the need to conserve and manage</p> <p><u>Negative impacts:</u>  pollution and physical damage caused by recreational uses of sensitive areas</p>	<p>adequate planning of recreational sites to control and minimize negative impacts on biodiversity</p> <p>monitoring of impacts of activities</p>

### Appendix 3: PARTICIPANTS IN CONSULTATIVE MEETINGS

#### Ministries of government

##### Ministry of Agriculture, Forestry and Fisheries

Hon. Cassius Elias, Minister  
Dr. James Fletcher, Permanent Secretary  
Brian James, Chief Forestry Officer  
Horace Walters, Chief Fisheries Officer  
Rhikki Alexander, Department of Forestry  
Michael Andrew, Department of Forestry  
Donald Anthony, Department of Forestry  
Vaughn Charles, Department of Fisheries  
Christopher Cox, Department of Forestry  
Marie-Louise Felix, Department of Fisheries  
Cornelius Fevrier, Department of the Environment  
Paul Francis, Agriculture Extension Division  
Alicia George, Agriculture Research Division  
Cornelius Isaac, Department of Forestry  
Williana Joseph, Department of Fisheries  
Joan Norville, Agriculture Research Division  
Dawn Pierre-Nathaniel, Department of Fisheries  
Alfred Prospere, Department of Forestry  
Susanna Scott, Department of Fisheries  
Laverne Walker, Department of Fisheries

##### Ministry of Planning, Development, Environment and Housing

Marcathian Alexander  
Crispin d'Auvergne  
Elizabeth Charles-Soomer  
Christopher Corbin  
Donovan Williams

##### Customs and Excise Department

Anthony Louis

##### Ministry of Community Development, Culture, Local Government and Cooperatives

Norma Herman  
Urania Joseph  
Jahto Mahal  
Brenda Wilson

##### Ministry of Tourism, Civil Aviation and International Financial Services

Jacqueline Alexander  
Sharmon Jules

##### St. Lucia Heritage Tourism Programme

Sylvester Clauzel

##### Ministry of Legal Affairs, Home Affairs and Labour

Lenita Joseph

##### Attorney General's Chambers

George Charlemagne

##### Ministry of Health, Human Services, Family Affairs and Gender Relations

Harold Andrew  
Joseph Medard  
Ricardo Nelson

##### Ministry of Education, Human Resource Development, Youth and Sports

June Sifflet

##### National Commission for UNESCO

Sherry Alexander Heinis

##### Sir Arthur Lewis Community College

Julia Bird  
Hilary Charlemagne

##### Ministry of Commerce, Industry and Consumer Affairs

Francis Raphael

##### Ministry of Communications, Works, Transport and Public Utilities

Lester Arnold  
Cornelius Daniel

Rural Economic Diversification Incentives  
Project

Jerome Jules

Mabouya Valley Development Project  
Evestus Augustin

Office of Disaster Preparedness  
Dawn French

Royal St. Lucia Police Force  
Isidore Brisefer  
Cyrus Fauckner  
Anthony Lubin  
Adon Marcion  
George Modeste  
Michael Smith  
Frederick Stanio

Fire Service  
Olson Peter

*Statutory boards and corporations*

Bureau of Standards  
Thomas Edmund

Housing and Urban Development Corporation  
Karlene Ellis-Vitalis

National Development Corporation  
Dainea Augier  
Trissa Charles

Parks and Beaches Commission  
Ed Leopold

Solid Waste Management Authority  
Carleen Jules  
Alison King-Joseph

St. Lucia Air and Sea Ports Authority  
Adrian Milaine  
Solace Myers

St. Lucia Livestock Development Company  
Leton Lawrence

St. Lucia Electricity Services  
Cuthbert Duncan

St. Lucia Water and Sewerage Authority  
Amatus Hamilton

*Town and Village Councils*

Atrinson Alcide, Castries  
Egbert Lucien, Gros Islet  
George Regis, Anse la Raye

*Community and non-governmental organisations*

Anse la Raye Fishermen's Co-operative  
Christopher Evans

Association of Professional Engineers  
Cornelius Edmund

Dennery Watershed Management Action Force  
Alfred Prospere

Derniere Riviere Water Catchment Group  
Millines Herman

Folk Research Centre  
Leslie Charles

Gros Islet Fishermen's Cooperative  
Finbar Delicette

Laborie Conservation Group ECHO-LAB  
Augustine Dominique

Micoud Water Catchment Group  
Justina Toussaint

National Council for the Advancement of  
Rastafari

Fred Alcindor  
Paul Francis  
Edwin Joseph

National Council for Transportation  
Guy Joseph

National Farmers Association  
Patrick Ernest

National Research and Development  
Foundation  
Bryan Walcott

National Youth Council  
Rhikki Alexander

St. Lucia National Trust  
Maria Grech  
Charmaine Nathaniel

Soufriere Fishermen's Cooperative  
Julian Alexis  
Edwin Mongroo

St. Lucia Naturalists Society  
Lenita Joseph

Soufriere Marine Management Area  
Angela Lamontagne  
Kai Wulf

St. Lucia Teachers' Union  
Virginia Albert  
Lucius Prescott

Soufriere Regional Development Foundation  
Ervin Alexis

St. Lucia Whale and Dolphin Watching  
Association  
Jane Tipson

Soufriere Water Taxi Association  
Caroline Aimable

Talvan Water Catchment Group  
Morrison Lucien  
Claudina Robert  
Innocent Roserie

Southern Taxi Association  
Albert Pierre

St. Lucia Agriculturists Association  
Marylane La Corbiniere

Vieux Fort Heritage and Conservation Group  
Sylvester Clauzel  
Myrtle Isaac

St. Lucia Animal Protection Society  
Maria Grech  
Jane Tipson

*Private sector*

St. Lucia Arts and Crafts Association  
Sabinus Thomas

ACME Consultancy  
Agnes Francis

St. Lucia Chamber of Commerce, Industry and  
Agriculture  
William Yarde

Cable and Wireless Telecommunications Ltd.  
Roderick Cherry

St. Lucia Day Boat Charters Association  
Ricardo Theobalds

Cox and Company  
Gilda De Veer-Spencer

St. Lucia Dive Association (Anbaglo)  
Anthony Leonce  
Thomas de Nobrega  
Kai Wulf

Minvielle and Chastanet  
Ian Herman

St. Lucia Game Fishing Association  
Francis Compton

Petroleum Dealers Association  
Clinton Charlery

St. Lucia Horticulturists Society  
Gloria Greenwood

Rodney Bay Marina  
Ian Cowan

St. Lucia Hotel Vendors Association  
Evans Stanislaus

Sandals St. Lucia  
Anthony Leonce

Shoppers Paradise Pet Store  
Fitzroy Pollard

St. Lucia Banana Corporation  
Frank Polius

St. Lucia Distillers Ltd.  
Allan Lang  
Marie-Celine Lawrence

Tropical Quality Fruits Company  
Cuthbert Joseph  
Andre Lansiquot

Windward Islands Banana Development  
Corporation  
Luvette Thomas-Louisy

*Regional and international organisations*

Caribbean Agriculture Research and  
Development Institute  
Lennox Daisely

Caribbean Environmental Health Institute  
Herold Gopaul

Caribbean Natural Resources Institute  
Mathias Burt  
Yves Renard  
Allan Smith

CARICOM Secretariat  
David Brown

Inter-American Institute for Cooperation in  
Agriculture  
L. Barbara Graham

Organisation of Eastern Caribbean States/  
Natural Resources Management Unit  
Keith Nichols

RARE Centre  
Paul Butler  
Alleyne Regis

University of the West Indies  
Dunstan Campbell