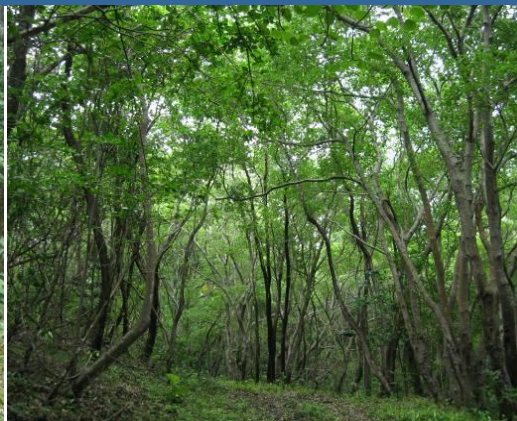


Presented to the European Commission and  
Banana Industry Trust



**NATIONAL FOREST DEMARCATION AND BIO-PHYSICAL  
RESOURCE INVENTORY PROJECT  
CARIBBEAN – SAINT LUCIA  
SFA 2003/SLU/BIT-04/0711/EMF/LC**

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By  
ROBERT B. TENNENT  
Project Leader

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# Table of Contents

Introduction.....	1
Saint Lucia Background.....	2
Project Background.....	3
Major Project Activities .....	5
Timber inventory data analysis.....	5
Biodiversity survey.....	7
Forest Management System and Planning.....	10
GIS and Data Management.....	11
Forest reserves boundary survey.....	13
Other Project activities.....	16
Meetings .....	16
Visits to support the project.....	16
Annexes .....	17
Annex 1. Forest mammals report executive summary .....	18
Annex 2. Forest timber inventory report executive summary .....	21
Annex 3. Draft executive summary of wildlife use survey report.....	22
Annex 4. Draft executive summary of species critical for conservation management report .....	23
Annex 5. Draft executive summary of forest birds of Saint Lucia report .....	24
Annex 6. Draft executive summary of reptiles and amphibians report .....	25
Annex 7. Draft executive summary of vegetative classification report.....	28
Annex 8. Draft report on upgrading of herbarium .....	29

## Introduction

The National Forest Demarcation and Bio-Physical Resource Inventory Project entered its data analysis and reporting phase during the period July 1<sup>st</sup> to October 31<sup>st</sup> covered in this third Interim Report.

A major field work focus during the third period was continuation of the boundary survey component of the project. The Forest Demarcation component started field operations in May 2009, when the first field survey team commenced survey work. They were joined by a second survey field team in June. Survey field work will continue until mid-November, with the Forest Demarcation component finishing at the end of November. The report includes details of progress in the survey component.

This interim report describes the project activities from July to the end of October 2009. The report focuses on providing a summary of activities. Background detail is provided in associated project Technical Reports and Annexes to this report.

The draft Final Project Report will be release November 30<sup>th</sup>, with the Final Report due for release December 15<sup>th</sup>.

## Saint Lucia Background

Saint Lucia is located within the Windward Islands of the Lesser Antilles in the West Indies. Its closest neighbouring islands are Martinique, 32 km to the north and Saint Vincent, 40 km to the south. Saint Lucia is the second largest island of the Lesser Antilles with an area of 616km<sup>2</sup>, with the maximum length and width of 43km and 21km, respectively. The human population is close to 166,838 residents, giving a mean density of approximately 1,036/km<sup>2</sup>, but much of the island's interior is uninhabited.

Volcanic in origin, Saint Lucia has a mountainous topography dominated by a central ridge running almost the full length of the island from north to south. Numerous steep offshoot ridges extend to both sides of the coasts. Some valleys are broad and occupied by large banana plantations, including Cul-de-suc, Roseau and Mabouya. These valleys, together with the area around the town of Vieux-Fort in the South, account for most of the flat lands of the country. The central southern part of the country has high mountains (Mount Gimie being the highest at 958m). The coastlines, particularly the east coast, are deeply indented by near-vertical cliffs with some narrow sandy beaches.

The island's tropical marine climate is characterized by relatively uniform high temperature throughout the year. The dry season is roughly from January to April and the rainy season from May to August, with usually sunny, warm weather from September to October. Tropical storms and hurricanes are infrequent, with the majority of West Indian tropical cyclones passing to the north of Saint Lucia. The hottest period is May to October, and the coolest, December to March, giving a mean annual temperature of approximately 26°C at sea level. Annual rainfall varies from 1,524 - 1,778mm in the north to 2,540 - 3,683 mm in the mountainous interior of the south.

There are approximately 21,692 hectares of natural vegetation types in Saint Lucia, of which 9,186 hectares are within the expanded Government Forest Reserve (protected forests).

Approximately 30% of Saint Lucia's land area is pastoral and arable land. Originally the mainstay of the economy, agriculture has been in decline in recent years, contributing only 3.4% of Gross Domestic Product (GDP) in 2005, with bananas the principal export crop. The economy of Saint Lucia has shifted to a service economy, with tourism the largest economic sector, accounting for 13.6% of GDP in 2005.

## Project Background

The Ministry of Agriculture, Lands, Fisheries and Forestry of Saint Lucia promotes and supports the conservation of the country's natural resource base for the benefit of the entire population. The Forestry Department, in collaboration with the Crown Lands Division of the Ministry of Physical Development and National Mobilization, has identified all the lands adjacent to the Forest Reserves and has made recommendations for their vesting/acquisition and eventual incorporation into the existing Forest Reserve Management System. However, before reaching that point, these lands have to be surveyed, demarcated on the ground with standard physical markers, vested in the Crown, or acquired, and declared legal Forest Reserves. In addition, the existing forest reserve boundaries need to be re-demarcated.

The Forestry Department is the principle agency responsible for managing forest and wildlife resources on the island of Saint Lucia. The Forestry Division of Saint Lucia was established in 1946, upgraded to the status of Forestry Department in 1984 and is supervised by the Chief Forest Officer

This project is funded by the European Community under the Saint Lucia SFA2003 Programme Economic and Agriculture Diversification and Poverty Reduction Through Integrated National Resources Management. The Banana Industry Trust is the Grant Beneficiary and Manager of a component of the Programme "Environmental Management Fund".

The overall objective of the project is:

"To survey and demarcate the physical parameters of the public forest reserve and conduct a comprehensive biophysical inventory/assessment and management system of forest resources to produce, inter alia, a forest resource monitoring system, obtained through ground survey, remote sensing, assessment and review of existing data that will serve as the basis for strategic sustainable planning and management of forest resources".

The purposes of the service contract are:

- i. To survey and demarcate and realign the Forests Reserves boundaries, inter alia incorporating the newly acquired crown lands, in order to facilitate better protection and management;
- ii. To create an updated data base of Forest Reserve boundary line (digital and hard copy data, to reside at Forestry Department and Lands and Surveys Department) and measure the quality, quantity and distribution - inclusive of yield and volume - of timber and non-timber resources, and to compile statistics of their availability at the range, watershed and national level.
- iii. To assess the status of the forest ecosystem, assessment of biodiversity (species richness and diversity) and all existing vegetation type at the watershed, range, and national level.
- iv. To advise on the most optimal means/measures for the sustainable management (utilization and conservation) of forest resources
- v. To recommend relevant silvicultural and utilization prescriptions necessary for planning and management of forest resources
- vi. To assess all existing forestry related database, and to create an updated monitoring system for producing forest resource state and change estimates;
- vii. To provide spatial and statistical data for estimating the nature, magnitude, geographical scope, in relation to Timber and NTFP yield and volume, biodiversity, carbon storage, and processes

- viii. To conduct a training programme to develop the capacity of a cadre of persons in forests resource assessment and inventory method and forests management system using, scientific and modern technology
- ix. To recommend and implement an effective, efficient and appropriate forest management system for Saint Lucia.

Information dissemination for the public awareness and support is crucial for the successful implementation of this project. Organising consultations with and briefing sessions for key stakeholders for the presentation of the forest demarcation and biodiversity assessment work plan, and conducting meeting with major communities that are directly or indirectly linked to the forest reserves and other important forest ecosystems that will require conservation interventions, are essential for getting the community support and acceptance for the work of the project. Past experience shows that support is best generated by close involvement through a consultative and participatory management approach.

The project commenced in July 2008 and is now in the Final Phase, with intensive data analysis and report preparation being carried out. Boundary survey work will be ongoing until the end of November 2009.

## Major Project Activities

The main project activities carried out during the period under report from July 1<sup>st</sup> to October 31<sup>st</sup> were data analysis and report preparation. These activities are described further, cross referenced to the project documentation to show how the activities contribute to the required project outputs.

### Timber inventory data analysis

A major project achievement was the implementation and completion of the timber inventory. The field work started ahead of schedule on January 12<sup>th</sup>, and finished ahead of schedule on May 29<sup>th</sup>. Over twenty people took part in the inventory, consisting of staff hired by the project supplemented by Forestry Department staff. This ensured that at the end of the 5 month period Saint Lucia had a high number of individuals skilled and experienced in modern natural forest timber inventory procedures. The field work supplemented the training activities carried out in 2008, and strengthened the outputs achieved in 2008 contributing to the training purpose, result, and specific activities as shown below.

The timber inventory ultimately resulted in the measurement of 416 sample plots, distributed through the forest as shown in the following table. Measurements were collected on 12,636 trees.

The inventory results show the land under Forestry Department control has an average of 540 trees per hectare, with an average of 305 cubic metres of timber per hectare, totalling approximately 2.8 million cubic metres of timber. The average timber volume per hectare in 1982 was approximately 187 cubic metres, showing the forest timber volume has increased by over 60% in the past 27 years, an average increase of over 2% per year.

Detailed analysis of the timber inventory field data and preparation of reports was carried out during the reporting period, and the Timber Inventory Report was released, titled as shown below.

Tennent, R.B. (2009) *Timber Inventory of Saint Lucia's Forests*. Technical Report No. 5 to the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd, Helsinki, Finland.

For full details on the timber inventory see project Technical Report No. 5. Annex 2 includes the Executive Summary from the timber inventory report.

The timber inventory contributed to the following aspects of the project Terms of Reference and work plan.

#### 2.2 Purpose

- iii. To assess the status of the forest ecosystem, assessment of biodiversity (species richness and diversity) and all existing vegetation type at the watershed, range, and national level.
- vii. To provide spatial and statistical data for estimating the nature, magnitude, geographical scope, in relation to Timber and NTFP yield and volume, biodiversity, carbon storage, and processes
- viii. To conduct a training programme to develop the capacity of a cadre of persons in forests resource assessment and inventory method and forests management system using, scientific and modern technology

#### 2.3 Results to be achieved by the Consultant

- v. A comprehensive report on the current state of forest resources (Timber, NonTimber, biodiversity, wild fauna etc), with recommendations for sustainable management practices. The report should include, but should not be limited to, the following key considerations:

- c. Inventory Design;
  - d. Inventory results, including area, volume, species composition;
  - e. Accuracy of inventory results;
  - f. Vegetation classification and composition;
  - g. Species list;
  - h. Summary of statistical calculations;
- x. A cadre of locally trained individuals with sufficient capacity and skills to function in a forest inventory/assessment environment and at least 2 local persons who can manage a forest management system.

#### **4.2 Specific Activities**

- i. The inventory framework should be universally applicable irrespective of the forests type and geographical location and the design of the framework should be cost effective and flexible enough to permit adaptability to changing trends.
- ii. The inventory must be scientifically defensible, be based on internationally acceptable methodology and presented in a form that demonstrates a logical progression in the conduct of the assignment.
- iii. The inventory process must be replicable.
- iv. The forest inventory must employ standard terminology and quantifiable field sampling and data analysis methods, so levels of confidence can be documented.
- v. The inventory methods employed should be widely accepted both nationally and internationally.
- vi. The inventory design should take advantage of the information available from previous inventories,
- vii. The inventory must classify existing biological associations that repeat across the landscape.
- viii. The inventory units must be ecologically meaningful (relating to watershed boundaries wherever possible).
- ix. The inventory units must be mappable from polygons that are discernable on imagery.
- x. The system of assessment must be hierarchically organized such that it can be applied at different spatial scales.
- xi. This system must identify units at an appropriate scale to meet the objectives for resource management and biodiversity conservation,
- xii. The system must be flexible and open ended such that it will allow for additions, modifications, and continuous refinement.
- xx. Conduct training workshops for a cadre of local persons, including forestry officers, which will form part of the biophysical inventory and forest boundary line surveying team.

#### **Work Plan Milestones due during period**

**Forest resource inventory results collated - achieved**



## Biodiversity survey

This period was one of intensive data analysis and reporting by the project's extensive team of more than 20 biologists under the direction of the Conservation Biologist. The main activities, with some key preliminary findings, are as follows below. A number of specific reports are being prepared, the first of which, a report on the mammals of Saint Lucia, has been released. The following list shows reports due to be presented.

- The mammals of Saint Lucia
- The status and management of Saint Lucia's forest reptiles and amphibians
- The Classification of the Vegetation of Saint Lucia
- Important Plants of Saint Lucia: Botanical Descriptions and Species Checklist
- Insects of Saint Lucia: Title to be announced
- Wildlife use in Saint Lucia : (Title to be confirmed)
- Herbarium and Training Report
- Critical Species report: (Title to be confirmed)
- Summary of biodiversity values and recommendations

Dr. Daltry held a one-day workshop at the Forestry Department on October 15<sup>th</sup> in which she sought feedback to all aspects of the biodiversity survey. At the meeting feedback was sought into such aspects as critically endangered species and areas which should be included in the forest reserve.

### ***Mammal survey***

Project Mammalogist Dr Frank Clarke and forestry staff conducted a successful mammal survey in Saint Lucia for 12 weeks from 16 January to 8 April 2009. A draft report was release on August 16<sup>th</sup>, and the final report was released on October 16<sup>th</sup>. For full details on the mammal survey work see project Technical Report No. 1:

Clarke, F. M. (2009) *The Mammals of Saint Lucia: Species Accounts, Distribution, Abundance, Ecology, Conservation and Management of Saint Lucia's Native and Introduced Wild Mammals*. Technical Report No. 1 to the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd, Helsinki, Finland

Annex 1 contains the Executive Summary from the mammals report.

### ***Herpetological survey***

The project Conservation Biologist, Dr Jenny Daltry completed standardized assessments of the diversity and relative abundance of reptiles and amphibians in 33 sites, representing the major forest types from sea level to more than 800 metres. The preliminary findings show that many of the endemic species appear to be abnormally scarce, probably mainly due to the spread of alien invasive species. Their conservation management needs will be integrated into the forthcoming forest management system.

The draft Executive Summary of the reptiles and amphibians report can be seen in Annex 6.

### ***Entomological survey***

The project Entomologist, Prof. Mike Ivie spent three months working in Saint Lucia with a rotating team of more than 20 entomologists from the USA. The team collected over 70 families of insects, comprising several

hundred species, most of which are new records for Saint Lucia. A large number of species may be new to science and preliminary findings indicate the team has discovered four new genera of beetles. Prof Ivie is completing his work in his laboratory.

Unfortunately Prof. Ivie suffered a health setback in September, which has delayed the production of his report. His report is still anticipated to be available for release prior to the closure of the project.

### ***Botanical survey***

Project Botanist Roger Graveson, assisted by Melvin Smith and others, conducted more than 179 standardized plots between 12 January and 20 June, recording all tree and understory species and relevant physiological variables within a fixed radius. These detailed plot data formed the basis for a new forest classification system, which was developed multivariate ordination.

Mr. Graveson made a presentation of his findings to a meeting in the Forestry Department meeting room on October 14<sup>th</sup>, in which he described the development of the new forest classification system, and described the work done with the GIS specialist on the vegetative map.

Annex 7 includes the draft Executive Summary of the vegetative classification report

### ***Wildlife Use Survey***

Critical Habitats Specialist Matthew Morton began coordinating the wildlife use survey in April, devising and testing questionnaires for forestry department staff, hunters/ collectors and traders, and the general public. The questionnaires were delivered by forestry department staff and volunteers to over 200 people. Annex 3 contains a draft summary of the wildlife use survey report.

Mr. Morton is also preparing a further technical report on species critical for conservation management. The draft executive summary of this report is included in Annex 4.

More than a dozen Forestry Department staff participated in the design or execution of the surveys above, gaining new skills and knowledge and thereby supplementing the biological survey training activities carried out by the Conservation Biologist in 2008.

### ***Forest birds survey***

Project Counterpart Adams Toussaint, Critical Habitats Specialist Matthew Morton, and Assistant Chief Forest Officer Lyndon John conducted a survey of forest birds of Saint Lucia, and are preparing a report on the status and conservation of such birds. Annex 5 contains a summary of the details to be produced in this report.

### ***Herbarium upgrade***

Project Botanist Roger Graveson has worked with Forestry Department staff to upgrade the herbarium, and has prepared a draft report on the upgrade, which is included as Annex 8.

The biodiversity survey work contributed to the following aspects of the project Terms of Reference and work plan.

## **2.2 Purpose**

The purposes of this contract are as follows:

- iii. To assess the status of the forest ecosystem, assessment of biodiversity (species richness and diversity) and all existing vegetation type at the watershed, range, and national level.

## **2.3 Results to be achieved by the Consultant**

The key output (s) of the Inventory/Assessment of Forest Resources shall include inter alia:

- v. A comprehensive report on the current state of forest resources (Timber, NonTimber, biodiversity, wild fauna etc), with recommendations for sustainable management practices. The report should include, but should not be limited to, the following key considerations:
- vi. An updated and functional forest resource monitoring system which should include:
  - c. An upgraded and integrated data base, with biodiversity, wildlife, forest, botanical inventory data;
  - e. Standard maps at a scale of 1:25,000 for the whole country using GIS data, indicating different forest zones, forest boundaries, forest cover classes, wildlife sanctuaries and important habitats for rare and endangers wild animals and other critical biodiversity conservation considerations.
- vii. A botanical description of forest plants including an island wide specimen collection and identification. An upgraded and improved National Herbarium.
- viii. An assessment of wildlife use attributes identifying critical habitats and recommendation for sustaining habitats of important, rare or endangered animal species,

### **Work Plan Milestones due during period**

#### **A botanical description of forest plants (due March 09)**

The original date of this milestone did not take into account two factors: (i) the 6-month botanical field survey did not commence until January 2009. (ii) The botanical description is intrinsically linked to the vegetation classification system, which is pending the completion of the botanical field surveys in July 2009. The Botanist has almost completed it during the next reporting phase.

#### **Assessment report on wildlife use attributes (due May 09)**

The original date of this milestone did not consider two factors: (i) The Forestry Department staff required for the questionnaire survey work were occupied with a survey of parrots from January to April 2009. The questionnaire survey therefore could not commence until May. (ii) In addition to interviewing wildlife traders and regulators, the wildlife use assessment must also draw on empirical data from the mammal, plant and herpetological surveys. The report will now be released in November.

## Forest Management System and Planning

The project silviculturist Ms. Karla van Eynde spent one month in Saint Lucia collecting information for the preparation of draft forest management plans. She conducted field visits and interviews throughout Saint Lucia, and collected data from forest range officers and senior members of the Forestry Department. Her report will be presented in November.

A prototype FMIS was prepared in January 2009, which included an inventory data processing component, prototype inventory analysis reports, a prototype PSP module, as well as prototype forest harvesting and forest growth modules. During the period covered in this report work was completed out on the development of the Saint Lucia FMIS. Two program modules were released, a standalone PSP system, and a FMIS including inventory data processing, inventory analysis and reporting, forest harvesting simulation and forest growth simulation. Training in the use of these systems commenced during October, with user guides prepared and released titled as below.

Tennent, R.B. (2009) *The Saint Lucia Permanent Sample Plot System: User Guide*. Technical Report No. 6 to the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd, Helsinki, Finland.

Tennent, R.B. (2009) *The Saint Lucia Forest Management Information System – User Guides*. Technical Report No. 11 to the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd, Helsinki, Finland.

The development of the FMIS contributes to the following aspects of the project Terms of Reference and work plan.

### 2.2 Purpose

- vi. To assess all existing forestry related database, and to create an updated monitoring system for producing forest resource state and change estimates;
- vii. To provide spatial and statistical data for estimating the nature, magnitude, geographical scope, in relation to Timber and NTFP yield and volume, biodiversity, carbon storage, and processes

### 2.3 Results to be achieved by the Consultant

- vi. An updated and functional forest resource monitoring system which should include:
  - a. Permanent sample plots;
  - b. Yield tables and other tools for measurements of changing variables;
  - c. An upgraded and integrated data base, with biodiversity, wildlife, forest, botanical inventory data;
- ix. A forest management system in place and functioning;

### 4.2 Specific Activities

- xiii. The results should be analyzed, maintained and presented in the form of a GIS and geo-reference database linked specifically to other inventories,

### Work Plan Milestones due during period

FMIS released for training - achieved

## GIS and Data Management

The project GIS and Data Management Specialist, Mr Vijay Datadin, made two visits to Saint Lucia to provide input during the period reported. During his missions he continued the development of the project GIS system on the computer purchased for the system, with an emphasis on training of FD staff in data collection from aerial photographs purchased during the period.

Mr. Datadin also spent a considerable amount of time in assisting with the analysis of field data collected by members of the Biophysical survey field work. Mr. Datadin also liaised with the survey team to ensure that the survey team's outputs were compatible with the project GIS. Mr. Datadin also spent a considerable amount of time on the development of a vegetative map of Saint Lucia.

Mr. Datadin made a presentation of his work to a meeting at the Forestry Department on October 22<sup>nd</sup>, detailing work carried out in his missions to Saint Lucia. His final report on the activities of the GIS and Data Management Specialist will be included in the project Final report.

The establishment of the project GIS system contributed to the following aspects of the project Terms of Reference and work plan.

### 2.2 Purpose

- ii. To create an updated data base of Forest Reserve boundary line (digital and hard copy data, to reside at Forestry Department and Lands and Surveys Department) and measure the quality, quantity and distribution - inclusive of yield and volume - of timber and non-timber resources, and to compile statistics of their availability at the range, watershed and national level.
- vii. To provide spatial and statistical data for estimating the nature, magnitude, geographical scope, in relation to Timber and NTFP yield and volume, biodiversity, carbon storage, and processes

### 2.3 Results to be achieved by the Consultant

- iii. Digital and physical plans/maps, reports, data and other information on land of all forests reserves produced from surveying and demarcation of the forests reserves boundary line survey;
- vi. An updated and functional forest resource monitoring system which should include:
  - c. An upgraded and integrated data base, with biodiversity, wildlife, forest, botanical inventory data;
  - d. Capacity for effective and efficient maintenance of monitoring system, including computers, GPS, GIS, other relevant tools and human resources;
  - e. Standard maps at a scale of 1:25,000 for the whole country using GIS data, indicating different forest zones, forest boundaries, forest cover classes, wildlife sanctuaries and important habitats for rare and endangers wild animals and other critical biodiversity conservation considerations.

## **4.2 Specific Activities**

- ix. The inventory units must be mappable from polygons that are discernable oil imagery
- xiii. The results should be analyzed, maintained and presented in the form of a GIS and geo-reference database linked specifically to other inventories,

### **Work Plan Milestones due during period**

## Forest reserves boundary survey

Survey field work commenced in May, with two field teams being fielded instead of the one team initially proposed. The boundary survey team initially consisted of the Principal Surveyor, Mr. Johnson Volney, assisted by two Survey Technicians, Mr. Alphaeus Fadlien and Mr. Baxter Bushell, the latter two each leading a field team composed of an additional three chainmen assisted by a cutlass man. This totals 11 people devoted to the boundary survey, assisted by one permanent Forestry Department officer and additional forest officers as required. In July Mr. Baxter Bushell was replaced due to the Project Leader being concerned at his team's low rate of progress, and reports of a lack of attention to the field work. Mr. Bushell was replaced by Mr. Theo Walcott, who commenced work in August.

Table 1 shows the progress of the survey teams up to the end of October. Team A, led by Mr. Fadlien, was working in typical forest land, while Team B, lead by Mr. Walcott, were working in an extremely steep area in the Des Bottes region, which accounts for the difference in output.

Week	A team (m.)	B team (m.)	Total (m.)	Cumulative Total (m.)
1	2,635		2,635	2,635
2	1,205		1,205	3,840
3	785		785	4,625
4	538		538	5,163
5	642	256	898	6,061
6	1,170	260	1,430	7,491
7	1,821		1,821	9,312
8	1,105		1,105	10,417
9	272		272	10,689
10	759		759	11,448
11	405	382	787	12,235
12	475	512	987	13,223
13	620	393	1,013	14,236
14		427	427	14,663
15	922	75	997	15,660
16	1,573	309	1,882	17,541
17	907	343	1,250	18,791
18	859	315	1,174	19,965
19	1,308	74	1,382	21,348
20	489	81	570	21,918
21	502	90	592	22,510
22	686	49	735	23,245
23	711	119	830	24,075
<b>Average</b>	<b>927</b>	<b>246</b>	<b>1047</b>	

Table 1 Boundary survey progress

Figure 1 shows the progress graphically.

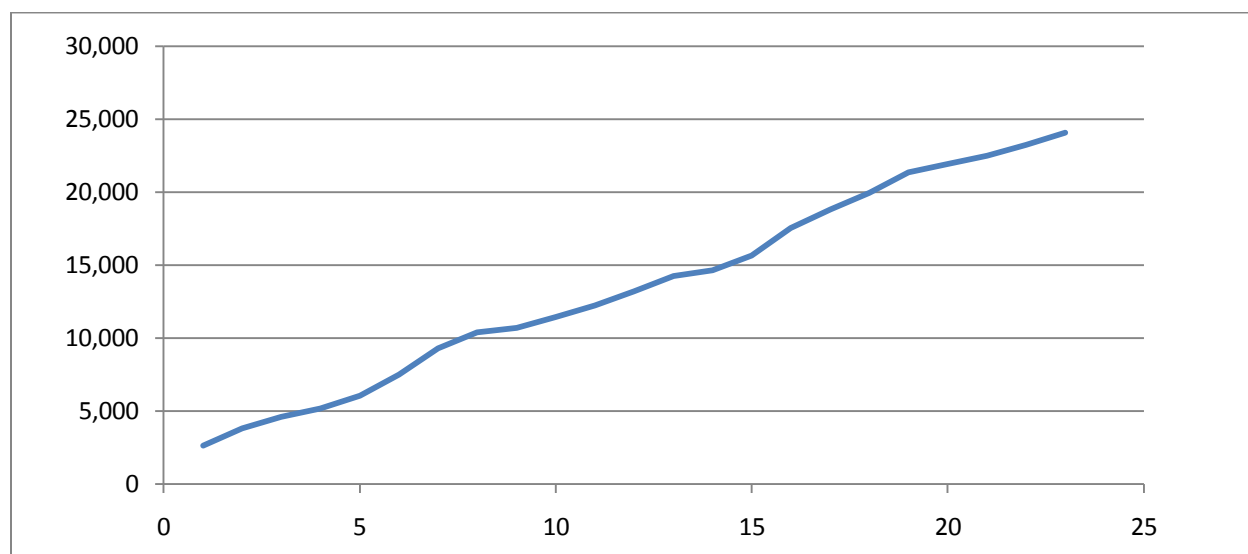


Figure 1 Survey progress over time

The GIS consultant calculated the combined length of the old forest reserve boundaries, together with the additions to the forest reserve. From these lengths the time taken to conduct a full boundary survey of based on the current rate of progress can be estimated, as shown in Table 2 below.

Land classification	Area (ha.)	Perimeter (km.)	Survey team weeks	Survey team years*
Forest Reserve	7295	151.3	289	6.4
Additions	1901	132.8	254	5.6
<b>Total</b>	<b>9196</b>	<b>284.1</b>	<b>543</b>	<b>12.1</b>

\* Based on 45 weeks field work per year

Table 2 Estimated time to conduct full boundary survey

The estimated time to complete the remaining area is approximately a further 520 team weeks.

The forest reserves boundary survey contributes to the following aspects of the project Terms of Reference and work plan.

## 2.2 Purpose

The purposes of this contract are as follows:

- To survey and demarcate and realign the Forests Reserves boundaries, inter alia incorporating the newly acquired crown lands, in order to facilitate better protection and management;
- To create an updated data base of Forest Reserve boundary line (digital and hard copy data, to reside at Forestry Department and Lands and Surveys Department) and measure the quality, quantity and distribution - inclusive of yield and volume - of timber and non-



timber resources, and to compile statistics of their availability at the range, watershed and national level.

### **2.3 Results to be achieved by the Consultant**

The key output (s) of the Inventory/Assessment of Forest Resources shall include inter alia:

- ii. Realigned, demarcated and updated forest reserve boundaries incorporating the 117 critical forested Crown parcels (approx. 2015 acres) and the 20+ parcels of private lands acquired for the purpose of amalgamating into the official Forest Reserves;
- iii. Digital and physical plans/maps, reports, data and other information on land of all forests reserves produced from surveying and demarcation of the forests reserves boundary line survey;
- iv. A national forest reserve boundary maintenance plan;

### **Work Plan Milestones due during period**

## Other Project activities

### Meetings

The Project Leader attended numerous informal meetings with the BIT, Forestry Department, and other stakeholders to coordinate project activities. The Project Leader also attended all Project Implementation Unit and Project Technical Committee meetings held during the period. In early October the Project Leader travelled to Finland to attend discussions with FCG over the finalisation of the project, and the structure of reports to be produced.

### Visits to support the project

Over the last four months there have been six visits to Saint Lucia by Key Experts. Two visits were made by the project Conservation Biologist, Dr. Jenny Daltry, to plan and conduct field data collection and to hold workshops. A one month visit was made by the Project Silviculturist, Ms. Karla van Eynde. Two visits were made by the project GIS and Data Management Specialist, Mr. Vijay Datadin, to develop the GIS system and to prepare of maps. The Project Entomologist, Dr. Mike Ivie arrived in May for a three month mission, and left on July 18<sup>th</sup>. The two local experts, Mr. Roger Graveson and Mr. Matthew Morton, made ongoing contributions to the project during the period under report.

## Annexes

Annex 1.	Forest mammals report executive summary.....	18
Annex 2.	Forest timber inventory report executive summary .....	21
Annex 3.	Draft executive summary of wildlife use survey report .....	22
Annex 4.	Draft executive summary of species critical for conservation management report .....	23
Annex 5.	Draft executive summary of forest birds of Saint Lucia report.....	24
Annex 6.	Draft executive summary of reptiles and amphibians report .....	25
Annex 7.	Draft executive summary of vegetative classification report .....	28
Annex 8.	Draft report on upgrading of herbarium.....	29

## Annex 1. Forest mammals report executive summary

Saint Lucia's mammals are an important part of the biological diversity of the island's forests. As part of the EU-funded project to survey and demarcate the public forest reserve and conduct a comprehensive biophysical inventory and assessment of forest resources, the following objectives were completed. Assessments of the diversity and relative abundance of native and introduced mammals were undertaken from 16<sup>th</sup> January to 7<sup>th</sup> April 2009 in five key forest types and mammal species distributions were mapped. This technical report presents the survey findings and discusses information on the status, ecology, and known management needs of Saint Lucia's mammals. During the survey, eight Forestry Department (FD) staff were trained and mentored in mammal identification and assessment techniques. This component aimed to build capacity for biological assessment within the department and provide conservation and management recommendations for Saint Lucia's mammals.

Saint Lucia's native mammalian fauna consist of at least nine bat species: the frugivorous Jamaican Fruit Bat *Artibeus jamaicensis jamaicensis* (39% of captures), the nectarivorous Insular Long-tongued bat *Monophyllus plethodon luciae* (38%), the frugivorous Little Yellow-shouldered Bat *Sturnira lilium luciae*, (10%), the frugivorous Tree Bat (4%), the insectivorous Davy's Naked-backed Bat *Pteronotus davyi davyi* (4%), the insectivorous Common Free-tailed Bat *Molossus molossus molossus* (2%), the insectivorous Brazilian Free-tailed Bat *Tadarida brasiliensis antillarum* (2%) and the piscivorous Greater Fishing Bat *Noctilio leporinus mastivus* (1%). A roost of a ninth species, the omnivorous Antillean Fruit Bat *Brachyphylla cavernarum cavernarum*, was located. The species diversity, composition and trophic structure of Saint Lucia's bat community is comparable to that of other islands of similar size in the Lesser Antilles that also have a high floral diversity and significant tracts of wet forest. Bat species diversity and abundance were greater in wet and mesic forest than dry forest types, probably due to their greater habitat complexity, abundance of fruiting plants, and greater insect diversity and abundance.

Conserving Saint Lucia's bats is important to preserve the island's natural heritage and because bats have key ecological roles and are economically important, notably in pollinating fruit crops. The Antillean Fruit Bat, Insular Long-tongued Bat and Tree Bat are regional endemics; that is they are not found anywhere else outside of the Antilles. Furthermore, the Tree Bat subspecies *luciae* only occurs on Saint Lucia and Saint Vincent, and the Little Yellow-shouldered Bat subspecies *luciae* is *only* found on Saint Lucia, giving Saint Lucia a global responsibility for their stewardship. None of Saint Lucia's bat species are listed as protected under the Wildlife Protection Act 1980 or the revised Wildlife Protection Act 2001, and it is proposed that all bats be added to Schedule 1 (fully protected wildlife), or at least Schedule 2, as part of the current review and amendment of this Act. Conservation actions for bats should focus largely on habitat protection because their continued survival may largely depend on conserving a full representative range of forest types, including existing forest reserves. Critical to several bat species is the protection of important cave roosts, especially those of the regional endemic Antillean Fruit Bat and Insular Long-tongued Bats. Roost protection should include routine monitoring of bat numbers and of threats to these roost sites. Research on the Tree Bat, Antillean Fruit Bat and the Insular Long-tongued Bat should be particularly encouraged as these bats are regional endemics and are not well known. Research should focus on habitat and roost requirements, diet (food preferences, pollination and seed dispersal studies), and movements of bats. Education programmes on the importance of bats would be beneficial and may prevent some instances of deliberate persecution of bats.

Our attempts to find the other native mammal - the Saint Lucian Giant Rice Rat *Megalomys luciae* – were unsuccessful. This mammal was last reported in the wild before the year 1881 and is probably extinct, though more extensive surveys are required to confirm this.

The distribution and abundance of the following introduced (alien) mammals were also determined: the Southern Opossum *Didelphis marsupialis marsupialis*, Small Asian Mongoose *Herpestes javanicus*, Brazilian Agouti *Dasyprocta leporina fulvus*, the rats *Rattus rattus* and *Rattus norvegicus*, and feral pigs *Sus scrofa*. The Southern Opossum was found to commonly occur in most habitats in Saint Lucia, from around sea level to at least 550m, but was more abundant in dry forests than wet and mesic forests. As a non-threatened, introduced species the Southern Opossum is a low conservation priority for Saint Lucia. Currently, the Southern Opossum is protected by law, but from a conservation standpoint, is not necessary to sustain the hunting ban on the opossum *unless* the FD perceives that opossum hunting practices could inadvertently and seriously endanger people or native wildlife. It is not clear what impact this abundant introduced mammal has on Saint Lucia's endemic birds, reptiles, invertebrates and plants. Further research is needed to address this question, including dietary studies and experimental enclosure studies to measure the ecological impact of removing the opossum from selected areas. Reducing their numbers near key nesting iguana and marine turtles nesting sites could benefit Saint Lucia's reptiles without endangering the overall opossum population. Neither subsistence hunting nor local eradication of opossums is likely to threaten this adaptable and fecund mammal.

The Brazilian Agouti appears to be uncommon and largely restricted to wet and mesic forest in the interior of the island. Though listed as fully protected under Schedule 1 of the Wildlife Protection Act 1980, the agouti is not native and like the opossum, it is not necessary to sustain the hunting ban on the agouti from a conservation standpoint, *unless* the FD perceives that agouti hunting practices could inadvertently and seriously endanger people or native wildlife. It is recognised that some people regard the agouti as naturalised, and do not wish to risk losing the species entirely. There is potential to use this population sustainably, however, either by hunting wild agouti or farming them for human consumption ("minilivestock farming"). A trade-off between protection and exploitation would be to down-list agouti to Schedule 2 of the Wildlife Protection Act ('partially protected'), and prohibit hunting on all protected and state-owned forest lands, but allow agouti to be legally killed or captured for breeding stock on private land. Such measures would protect the 'core' agouti population that resides within state-owned wet forest lands and allow exploitation of agouti that are damaging crops. However, any new strategies for sustainable harvesting of agoutis and other wildlife using dogs or guns need to be considered in the context of FD's policy on hunting since the 1980s, and should take into account the FD's current capacity and resources to effectively regulate hunting. This report recommends specific hunting regulations and farming options.

The Small Asian Mongoose was found to commonly occur in most habitats on Saint Lucia, from around sea level to at least 550m, but is more abundant in wet and mesic forests than dry forests. The Small Asian Mongoose is not native to Saint Lucia. As one of the world's worst invasive species, the mongoose needs to be managed to mitigate its threat to native wildlife. Saint Lucia is too large and current control technologies too limited or labour intensive to attempt a total, permanent eradication of this widespread introduced species, but mongooses could be efficiently controlled in small, sensitive areas of high conservation value (e.g., sites where they present a critical threat to endangered birds, reptiles or other wildlife) using trapping, perhaps in combination with poisoning. Specific management recommendations for mongoose control are described in this report.

Untended domestic animals, many of which have gone wild (feral), are exotics and may pose a significant threat to native wildlife. In Saint Lucia, pigs have escaped or been deliberately released, and have become

feral. Our surveys showed that feral pigs are largely restricted to wet forest on Saint Lucia and have become locally abundant. They are damaging large tracts of wet forest: rooting up the vegetation, destroying seedlings, contaminating watering holes, and destroying the eggs and young of native (ground nesting) birds and reptiles. No panacea for feral pig control currently exists, and it would probably be too expensive and difficult to eradicate feral pigs from Saint Lucia. A broad-based strategy, deploying multiple techniques is likely to be necessary to manage the pig numbers. Management recommendations for the control of feral pigs are discussed in this report.

Rats were found to be common in most habitats and occur from around sea level to at least 550m on Saint Lucia. The Norway Rat *Rattus norvegicus* and the Roof Rat *R. rattus* can have devastating effects on the flora and fauna of islands; suppressing some forest plants, and being associated with extinctions or declines of flightless invertebrates, ground-dwelling reptiles, land birds, and burrowing seabirds. Eradication of rats from mainland Saint Lucia would be virtually impossible and prohibitively expensive with current technology, and unlikely to last. However, rat eradications from small islands have proved highly successful. Saint Lucia's small offshore islands have been cleared or are clear of rats, and these restored islands have an incredibly important role to play in the conservation of Saint Lucia's threatened endemic reptiles. The use of rodenticides and other measures to control rats are discussed.

## Annex 2. Forest timber inventory report executive summary

The 2009 Saint Lucia forest timber inventory was carried out as part of the National Forest Demarcation and Bio-Physical Resource Inventory Project, funded by the European Community.

The inventory field work was carried out from January 2009 to May 2009, based on a design prepared after examination of past inventories of Saint Lucia. During the inventory a total of 12,636 trees were measured in 416 sample plots. Following the field work, the field data were analysed and results collated.

The inventory results found the land under Forestry Department control has an average of 540 trees per hectare, with an average of 305 cubic metres of timber per hectare, totalling approximately 2.8 million cubic metres of timber in the forest reserve. The average timber volume per hectare in 1982 was approximately 187 cubic metres, with an estimated 1.3 million cubic metres total volume in the then forest reserve.

Assuming an approximate average volume in 1982 of 200 cubic metres, versus an approximate average volume of 300 cubic metres in 2009, the forest can be seen to have increased by at least 50% in volume over the past 27 years.

The current inventory estimated an average stocking in the forest of approximately 542 stems per hectare, ranging from a low of approximately 480 to a high of approximately 600. The 1982 inventory reported a mean stocking of 289 stems per hectare, ranging from 275 to 344 by forest management class. The 2009 inventory results show an average increase in stocking of approximately 85%.

The increase in stocking and volume between the 1982 and 2009 inventories indicates Saint Lucia's forests have recovered strongly from the effects of Hurricane Allen in 1980. This strong recovery shows that the forests of Saint Lucia are capable of relatively rapid recovery from disturbance, indicating that selective logging could be considered a viable forest management alternative.

Inventory results show that 60% of the timber volume is contained in 10 species, with 17% contained in *Sterculia caribaea*, mainly in smaller size classes, and an additional 10% contained in *Dacryodes excelsa*, mainly in large size classes. Fully 4% of the timber volume in the forests of Saint Lucia is contained in large *Dacryodes excelsa* trees. This amounts to a total resource of approximately 120,000 cubic metres of large size *Dacryodes excelsa*.

The information collected in the inventory is stored in a modern forest management information system, and can be extracted for detailed analysis in alternative software. All data are available for future growth and yield analysis. All data have been entered into electronic form, and, provided secure backups are made at regular intervals, will be available for future inventory planning.

The timber inventory carried out in 2009 has successfully updated information previously only available from inventories over twenty years ago. The Saint Lucia Forestry Department has access to stratified estimates of tree volume by species by size class for the entire forest reserve, capable of being broken down by range or to lower forest management levels.

Saint Lucia's Forestry Department now has a modern forest inventory system set in place, with a cadre of staff and other individuals trained and experienced in conducting a modern forest inventory. This provides a secure basis for the implementation of future forest timber inventories, which should be undertaken at more regular intervals, perhaps every five years.

### Annex 3. Draft executive summary of wildlife use survey report

The purpose of this survey was to assess current levels of exploitation of eleven target wildlife species, plants and animals, identified by the Saint Lucia Forestry Department (SLFD) as currently in use on Saint Lucia. The scope was an island-wide questionnaire survey of the general public on Saint Lucia, supplemented by a more detailed questionnaire to expert respondents within SLFD.

A randomly selected sample of communities, stratified by SLFD administrative Ranges and community population size was selected and a total of 213 persons interviewed. Selection of respondents was not random, but contained roughly equal numbers of male and female, and younger (< 40 years) and older (> 40 years) adults.

Reported use of wildlife was higher for most plant species and invertebrates (crabs) than for most vertebrate animal species (mammals and reptiles). However respondents reporting of other people's use of wildlife was higher for vertebrates. This combined with the fact that only the vertebrates amongst the target species have any statutory protection (under the 1980 Wildlife Protection Act) suggests respondents may have under-reported their own use of vertebrate wildlife.

Public confidence in their knowledge of trends in target species populations appeared to be low, with most expressing ignorance. In other words, knowledge of the impact of wildlife use on that resource appeared to be a gap in the public's awareness.

A large number of respondents did not use wildlife of various target species. Reasons given were primarily the availability of better alternatives (cited as a reason primarily for non-use of plant species), lack of availability of wildlife species (both plants and animals) and disgust at the idea of using it or dislike of the taste (cited as a reason primarily for non-use of animal species).

There was slightly higher reported usage of some target animal species in the eastern ranges of Dennery and Quillesse compared with the other three Ranges. There was also slightly higher usage reported for the target plant and invertebrate in the more populous Northern Range. But sample sizes are small when the data is examined Range by Range and these apparent patterns need to be treated with caution.

Expert respondents were asked to rate the abundance of target species as "abundant", "common" or "rare". Most responses indicated that most target species were common. Two were notably considered very abundant: kochon mawon and mannikou, whilst léza and ponm dilyenn were mostly considered rare. Expert respondents also offered opinions and information of levels of take, frequency of take, numbers of harvesters per range and extraction methods used.

Some management priorities for the use of wildlife in Saint Lucia are suggested. These include:

- Develop and implement kochon mawon population control programme.
- Enforce legislation to minimize hunting of the Saint Lucia iguana.
- Develop farming of agouti as a sustainable livelihood.
- Develop community-based initiatives for the sustainable harvest of lansan.



#### Annex 4. Draft executive summary of species critical for conservation management report

This short report selects a small number of critical species for which more focussed, species-specific conservation actions are recommended, although it is clear that there are many overlaps with recommended conservation actions for the broader base of biodiversity on Saint Lucia.

Species selections are restricted primarily to the vertebrate groups showing the most endemism on Saint Lucia: the birds and reptiles. Other groups such as invertebrates and plants are probably better managed as part of broader ecosystem-based initiatives, covered in other reports under this project, though a few examples of the latter are included. The only native mammals extant on Saint Lucia are bats. These animals provide critical ecosystem services, but given their wide foraging ranges are more amenable to habitat conservation. Nevertheless, two bat species are included here to highlight some of concerns peculiar to this taxon.

The final set of critical species is currently being developed; however, it is likely to be restricted to all or most of the following:

- Birds:
- the Saint Lucia nightjar
  - the Saint Lucia Amazon
  - the white breasted thrasher
  - the Saint Lucia black finch
  - the Saint Lucia wren
- Reptiles:
- the Saint Lucia racer
  - the Saint Lucia iguana
  - the Saint Lucia whiptail lizard
  - the Saint Lucia pygmy gecko
  - the Saint Lucia fer de lance
- Bats:
- the Lesser Antillean long-tongued bat
  - the greater fishing bat
- Plants:
- to be confirmed

For each species, a profile is presented collating what is known the following:

- species status (IUCN red list; 1980 Wildlife act ; level of endemism);
- population status and trends;
- illustrated description, with identification guide;
- map of known distribution;
- breeding biology;
- diet;
- habitat use;
- threats.

For each species a series of recommendations for conservation action are presented

## Annex 5. Draft executive summary of forest birds of Saint Lucia report

The purpose of this report is to derive management recommendations for the conservation of forest bird biodiversity on Saint Lucia. Its scope consists of a sample of 33 counts of bird species conducted in 2009 at points allocated within the major forest types on Saint Lucia. This data is augmented with more intensively sampled data on a smaller number of target species from four other auxiliary surveys devoted to or including birds that were conducted the Saint Lucia Forestry Department (SLFD) and the Durrell Wildlife Conservation Trust (Durrell) over the period 2006-2009. Finally, a collation of records of migrant bird sightings from the period 1990-2004 was also examined.

Although all bird species detected were counted on every point count, a suite of 16 'priority species' were selected, for the production of individual species distribution maps, as being of high priority for conservation management on Saint Lucia. This selection was a subset Saint Lucia's Important Bird Area (IBA) species. Selection of the 16 priority species for this survey was based primarily on endemism, at a specific and subspecific level. Similar criteria were used to select target species for the auxiliary surveys.

Bird species resident in Saint Lucia are well represented in the inventory survey data, with 64% (49 species) of all residents having been recorded. A lot of the variation in the relative abundance of different species within the inventory counts seems attributable either to habitat specificities not adequately sampled using the survey's forest-biased methodology, or variations in the detectability of different species. Only 5% of all migrant species recorded from Saint Lucia were found during this survey and none of the vagrants recorded. High proportions of endemic species and subspecies were recorded. The survey was successful at detecting the priority species with 75% being detected.

The montane rain forests largely included in Saint Lucia's Forest Reserve have clearly been very important in conserving priority species that are largely or entirely restricted to them. Most priority species however occur predominantly or exclusively *outside* the Forest Reserve. Some use both deciduous seasonal and semi evergreen seasonal forest, although it should be remembered that the latter is now a rare type on Saint Lucia. Deciduous seasonal (dry) forest stands out as the most critical habitat for the conservation of bird biodiversity on Saint Lucia.

The two dry forest IBAs, the North East Corridor and Mandelé represent 81% and 63% respectively of all the priority species, more than any other IBAs on Saint Lucia. It is of concern that these two IBAs capturing most bird biodiversity, and most priority bird diversity, are without any statutory protection on Saint Lucia.

A number of criteria were used to rank priority species in terms of those most in need of immediate conservation action. The Saint Lucia nightjar, Saint Lucia Amazon, White-breasted thrasher, Saint Lucia black finch and Saint Lucia wren emerge as the most important priority species.

A number of management recommendations are made; these include:

- Secure the management and restoration of critical deciduous seasonal and semi-evergreen forest areas on Saint Lucia
- Control the introduction and spread of alien invasive species that endanger forest avifauna.
- Develop and implement plans to improve conservation management
- Conduct research in the context of adaptively managing – specifically through habitat restoration or modification and alien invasive species control – Saint Lucia's avifauna.
- Further efforts in education and awareness.

## Annex 6. Draft executive summary of reptiles and amphibians report

A study of Saint Lucia's forest herpetofauna was carried out as part of the National Forest Demarcation and Bio-Physical Resource Inventory Project. This entailed a literature review, interviews, and nationwide field surveys.

Nineteen native species of reptiles and amphibians (three extinct), and nine alien species (three extinct) have been recorded in Saint Lucia, all of which are illustrated and described in this report. Endemicity is remarkably high among the native forest community, with seven nationally endemic species, and five endemic subspecies. All but one of the extant species were seen during this survey.

To assess and compare the diversity and relative abundance of reptiles and amphibians in different forest types, 55 sites were intensively surveyed for an hour apiece using a variety of visual search techniques. The forest class with by far the greatest diversity and abundance of species was mature Deciduous Seasonal Forest (seven species confirmed, and a mean encounter rate of 36.8 individuals per hour), followed by mature Freshwater Swamp Forest and Semi-Evergreen Seasonal Forest. Forests that naturally had significantly lower species diversity and abundance were Elfin Shrubland (only one species), Lower Montane Rainforest, Fumarole Vegetation and Mangrove. Human degradation of all forest classes was significantly associated with an increased number of alien invasive species. These findings were corroborated with additional, opportunistic surveys, interviews with local experts, and the literature.

These findings tell us that the existing forest reserve system on Saint Lucia is woefully inadequate in representing and protecting the nation's herpetofauna. Ironically, the forest classes that are *best* represented in the protected area system have the *lowest* diversity and abundance. The species-rich Deciduous Seasonal Forests and Freshwater Swamp Forests are largely outside of the protected zone and thus at risk. An important exception to this rule are the xeric Maria Islands (12ha), which supports seven native species, many of which are scarce or absent from the 'mainland'. This survey also found encouraging signs that the rare and important Semi-Evergreen Seasonal Forest – a mesic forest type that was largely cleared for agriculture – is regenerating where farms have been abandoned for economic or other reasons.

As well as assessing and comparing the conservation significance of major forest classes, the conservation status of every native forest species was examined. Drawing on historical records and comparisons with other West Indian islands, this study found most of Saint Lucia's native forest species have declined significantly in distribution range and population size; some to critically low levels. By applying the IUCN categories of threat, at least six endemics now qualify as globally threatened with extinction, i.e. *Critically Endangered*: Saint Lucia racer; *Endangered*: Saint Lucia whiptail; or *Vulnerable*: Saint Lucia pygmy gecko (both subspecies), Saint Lucia thread snake, and, perhaps surprisingly, Saint Lucia fer-de-lance. If it is taxonomically distinct, the Saint Lucia iguana, also qualifies as Critically Endangered. When these findings are pooled with additional considerations of economic use, cultural values and ecological importance, the reptiles that emerge as the nation's highest conservation priorities are the iguana, racer and whiptail lizard.

The greatest threats to Saint Lucia's native forest herpetofauna, and the root cause of most of their declines, are alien invasive animals. These include predatory mammals, e.g. the opossum, rats, dogs, cats and feral pigs and, most importantly, the mongoose. Alien invasive reptiles and amphibians also pose a great danger to native species through predation, competition and hybridization. The introduced green iguanas near Soufriere present a clear hazard to the native iguana through competition and hybridization. This field survey also discovered that the alien Watts' anole has dispersed widely and is apparently displacing the endemic Saint Lucia anole in

disturbed habitats. There is an extremely high risk of more alien species invading the near future, assisted by human transport. There are a number of other threats to the forest herpetofauna which are also important and are discussed in this report, including habitat loss, hunting and agrochemical pollution. Loss of genetic diversity, stochastic effects and climate change are serious impending threats to the species and subspecies that are scarce and/or confined to the offshore islands.

In addition to identifying gaps in the protected area system, this study highlighted some disturbing weaknesses in the Wildlife Protection Act 1980 (revised 2001). While this important piece of legislation has been very successful in combating over-exploitation, it was not designed to – and thus largely fails to – address the other, greater threats to Saint Lucia’s herpetofauna. Furthermore, the legal status of only five of the 12 extant native forest species, and none of the six extant alien species, is explicitly defined in the act, thus leaving many species in a legal grey area.

Taking into account the legislative limitations and other known constraints to the management of Saint Lucia’s herpetofauna (public attitudes, human and financial resources, information, technological limitations), a series of practical management recommendations are proposed. The objective of these is to conserve Saint Lucia’s unique and important forest herpetofauna, including enabling the most threatened species to recover:

### ***Management Recommendations***

Objective: Control the introduction and spread of alien invasive species that endanger forest herpetofauna

- Keep the offshore islands free of alien invasive species [TOP PRIORITY]
- Eradicate the introduced green iguanas to conserve the Saint Lucia iguana [TOP PRIORITY]
- Control harmful alien invasive mammals from priority sites on the main island
- Minimise the probability of non-native species invading Saint Lucia [TOP PRIORITY]
- Minimise the probability of species from Saint Lucia invading other countries

Objective: Revise the national legislation to reflect the current needs of Saint Lucia’s herpetofauna

- Revise the next edition of the Wildlife Protection Act [TOP PRIORITY]

Objective: Secure the protection and regeneration of important dry and mesic forest sites on Saint Lucia

- Establish at least one new nature reserve to protect dry forest wildlife communities on the main island of Saint Lucia [TOP PRIORITY]
- Formulate local agreements to preserve important wildlife habitats and forest corridors

Objective: Update and use the Red List system to guide and support improved management

- Enable IUCN to list all native Saint Lucia reptiles with appropriate categories of threat on the international Red List [TOP PRIORITY]
- Develop a National Red List
- Prepare and implement species conservation action plans for Saint Lucia’s most threatened herpetofauna

Objective: Conduct applied research to inform and monitor the management of Saint Lucia’s herpetofauna

- Assess the status and ecological needs of, and threats to, the least-known species [TOP PRIORITY]
- Elucidate the impacts of different alien invasive animals on native reptiles and amphibians

- Monitor selected populations and forest habitats to evaluate and guide management decisions
- Conduct applied research on improved medical treatment for snakebites

Objective: Strengthen local and national understanding and support for conservation

- Increase public interest in and awareness of Saint Lucia's reptiles and amphibians
- Heighten public understanding of the impact of alien invasive species

## Annex 7. Draft executive summary of vegetative classification report

The aim of this report was to present a vegetation classification system of Saint Lucia, based on field studies and satellite image analysis.

A simple starter map was produced dividing Saint Lucia into 24 cells and showing approximate elevation zones and special areas on interest. 200 plot surveys were made, ensuring that all the variety of Saint Lucia, geographic and elevation, was covered. Floristic and biophysical data was recorded.

This data was then analyzed by two methods, a manual floristic analysis and a Twin Span Software analysis.

An evaluation was made of prior vegetation classification systems of the Lesser Antilles. This was used, along with the results of the data analysis, to propose a new vegetation classification system for Saint Lucia.

Each vegetation class was then described and illustrated in some detail.

### Findings

The following vegetation classes were proposed;

#### **Natural Forest**

Littoral Evergreen Forest and Shrubland	Semi-evergreen Seasonal Forest
Mangrove	Lower Montane Rainforest
Freshwater Swamp Forest	Montane Rainforest
Deciduous Seasonal Forest	Cloud Montane Rainforest

#### **Non-natural Forest**

Tree Plantations

#### **Non-Forest**

Elfin Shrublands	Littoral Unconsolidated Sand Vegetation
Herbaceous Swamp (seasonal or permanent)	Littoral Scrub, including Cacti
Aquatic Herbaceous Vegetation	Fumarole Vegetation
Littoral Rock and Cliff Vegetation	Grassland, with or without a few trees or shrubs

### Recommendations

The TWINSpan data analysis revealed an apparently striking division in the Lower Montane Rainforest class into two subclasses. This should be investigated further.

Additional plot data should be collected to help fine-tune the vegetation map. Future changes in Saint Lucia's vegetation should be monitored either at a very fine scale, by replicating the same plots, or on a large scale, by analyzing new Landsat images.

Plantation trees in the forest reserve should be culled over a period time to allow the indigenous forest to further regenerate.

Attempts should be made to preserve the rare Semi-evergreen Seasonal Forest by protecting Mount Souf and Mount Parasol.

An attempt should be made to create a 'dry forest reserve' in the north-east of Saint Lucia.

No alien species should be planted in any protected areas and importation of ornamentals should be strictly controlled.

## Annex 8. Draft report on upgrading of herbarium

Dr. Daltry and I identified two national personnel who I would train and mentor in plant identification and assessment techniques during this project. Both had already shown great promise and interest in this difficult specialist area and this training was part of an ongoing process. Chris Sealys had shown great determination and skill in herbarium curating and Melvin Smith was very capable in the field, both in practical and botanical skills. The aim of further training was to encourage the development of both of them in their weaker areas, Chris in his field skills and Melvin in taxonomy, as well as to continue their overall progress.

### Chris Sealys

Chris Sealys has been working in the herbarium for over 2 years, after having shown great promise during a school-leavers' project in which students were taught the basics of field collection and herbarium management.

*Insert image Chris at desk*

Chris Sealys accompanied Melvin and me once a week on our field trips. He contributed to the collection of technical information in the plot surveys (GPS co-ordinates, slope, direction and angle, canopy height). More importantly, he learnt to recognize many of the main forest trees from Melvin and myself. He made plant collections under my guidance: these were usually rare species or species not represented in the herbarium collection.

He completed his field note book on site, with details of the habit and phenology of the species, its habitat and location.

Back at the herbarium he prepared the specimens in the normal way, in presses between blotting paper and newspaper labeled with the collection number date, and collectors' initials, and put in the dryer. Once dry he mounted the specimens on herbarium paper, writing in pencil the collection number, date and collectors initials in the lower right corner.

He then entered into the Microsoft Access herbarium database the information from the field note book plus the species name and family. He also added the specimen details into the accessions database and gave the specimen an accession number. He printed out a label from the herbarium database and glued it onto the herbarium sheet, covering the penciled information, along with a small accessions number label.

*appendix Excel file. Chris-database*

*Insert image specimen*

At this point, I checked the label and identification and then after keeping the specimen in the freezer for 3 days, Chris filed the specimen in the appropriate folder in the herbarium cabinets.

He was able to perform all the steps in this procedure by the end of the project with minimum supervision. He understood the stress I placed on the quick processing of specimens; I have noticed that specimens not dealt with quickly in herbaria tend to remain in newspaper forever! All his specimens (110 specimens of 67 species) are already in the collection. They included 10 very rare species of orchids, and 2 new finds, *Rhynchospora globularis*, a sedge, and *Physalis pubescens*, and recollection of the historical collection of *Lobelia cliffortiana*.

Some specimens collected by myself, Melvin or Chris were of such special interest that they were handled separately and are still being processed.

The most important were the addition of 2 forest trees to our flora: Melvin and I had been targeting them for some time but we managed finally to collect fertile specimens on project field trips. Both were what we thought they might be;

A very tall tree of very steep slopes in the northern range was *Guarea kunthiana*, a South American species, related to acajou *gwan bwa* and *bwa di wos*. The shape of the fruit was decisive.

*Insert image Guarea kunthiana*

A second species found occasionally in the Edmond forest bears a distinct similarity to the sugar apple family. It turned out to *Oxandra laurifolia*, in that family (Annonaceae).

*Insert image Oxandra.*

We also experienced great success with the epiphytic parasitic *anho bwa* (mistletoe) family *Santalaceae*. Melvin discovered *Phoradendron chrysocladon* in the Edmond Forest. This species is recorded for Saint Lucia, probably from the last century. As it is a Lesser Antillean endemic, it was an exciting find. Melvin and I also found a new mistletoe in the Millet range; to our astonishment it had 2 different sorts of fruit. This of course is impossible and I eventually realized that we had parasitic mistletoe growing on a tree and parasitic mistletoe growing on the mistletoe, a hyperparasite. Both were new records for Saint Lucia, *Phoradendron quadrangulare* and *Phoradendron tterapterum* (There is a herbarium specimen identified as *P. tetrapterum* but it is in fact the common *Phoradendron trinervium*).

*Insert image hyperparasite*

In all there were first Saint Lucian records discovered during this project and will be added to our flora once voucher specimens have been made. Two were grasses which have not yet been identified to species level. Both Chris Sealys and Melvin Smith were involved in these exciting discoveries.

### **Melvin Smith**

*Insert image Melvin*

Melvin Smith has been accompanying me on field trips for 10 years. His field skills are exceptional and he needs no training in that area; he should in fact be training others. We have notched up over 600 full day field trips to all part of the island. Dr Mike Ivie's team recently used Melvin seven times to lead field trips up Piton Troumassé, using a route Melvin and I discovered a few years earlier. He has made multiple off track ascents on all part of the Mount Gimie range and all major mountains in Saint Lucia.

*Insert image mike\_ivie\_team\_troumasse*

His botanical field expertise is also remarkable; he has constantly shown the ability to observe minor differences in the appearance of plants to spot new species new to Saint Lucia,

However while he had a rough idea of plant families, it was clear to me and him that he needed to tackle taxonomy. As a first step I encouraged him to use botanical names on some of the common tree species when we recording plant plot data. A longer term approach was to provide Melvin with my personal illustrated flora database.

He is now using these to get a feel of taxonomic structure; using email, I have been able to guide him through several families. While it is a daunting task, he may well succeed because he already knows the plants. In my



view, it is impossible to train anyone in plant identification unless they already have good field knowledge. This training will continue: the next stage will be for Melvin to produce species lists from field notes.

### ***The Herbarium***

Over the last two years, there has been a tremendous improvement in the herbarium collection. This process has continued during the nine months I have been working on this project. Over the last few years I had built up a large collection of specimens which were stored unmounted in freezers along with specimens from the school-leavers' project Chris Sealys had been part of. In addition new cabinets had been bought but were not in use. And there was no proper database of the original collection, let alone new additions.

At this stage, I can now say that an important part of the transformation of the herbarium has been almost completed; what remains is the labeling of cabinets and the preparation of a species list sheet for each folder.

In addition systems are now in place for continued additions to the collection. These will probably continue at a gentler pace than over the hectic last two years.

In summary, these improvements have taken place, before and during the project;

1. An accessions database has been set-up and now contains details of all specimens, each with an accession number. The herbarium now has 2 computers.
2. The herbarium has been allowed to use a labeling database provided by F. Axelrod, of the University of Puerto Rico Rio Pedras. Labels are now printed out onto acid-free paper using a laser printer inside the herbarium.
2. The backlog of specimens has been mounted, and labels produced; these specimens have been accessed, checked, and added to the collection. This resulted in a doubling of the size of the herbarium collection, to well over 5000 specimens.
3. Many specimens had been labeled with acid blue paper. New labels on acid-free paper were added to all these specimens
4. I have checked all specimens for name changes, using the latest taxonomic nomenclature from the major US herbaria. This includes some major family changes. All specimens with changed names had annotation labels added, alongside the original labels.
5. I had spotted what seem to be quite a few identification errors. Annotation labels have been placed alongside the original labels.
6. The whole collection has been re-organized with no division between monocotyledons and dicotyledons. This acceptable modern practice makes it easier for non-specialists to locate a family. The collection has been evenly spread through the old and new cabinets, leaving plenty of room for future expansion.

### ***Recommendations***

#### **Personnel**

It is important that Chris Sealys continue to play a role in the herbarium. Even if he gains experience in other areas of forestry work, he should continue to spend a portion of each month at the herbarium in order not to lose the skills and knowledge that he has but also continue to build on them. Attending a herbarium course in Trinidad or Kew Gardens, London would be very useful. It has to be understood that although detailed

knowledge of the local flora takes many years to acquire, it is important that someone on the island has that knowledge – otherwise we become dependent on foreign ‘experts’.

Melvin Smith’s unique combination of field and botanical skill already should be used by the Department of Forestry to the full; his ability to safely lead groups (including forestry officers, Durrell Institute personnel, visiting botanists and so on) to any part of Saint Lucia, including previously unvisited spots, is already well-known to many people in the Department of Forestry but need to be formalized in some way, probably through some connection with the herbarium

It is dangerous to rely on just two persons and efforts should be made to identify people already showing an active interest in this field (not just professing an interest) and use the herbarium as a centre for these people to train and arrange field trips. For example, the field guide at the Aerial Tram who I know as ‘Vision’ is a very knowledgeable and very serious young botanist who keeps detailed notes on what he finds and makes an effort to identify what he does not know. There are I am sure others who I do not know.

### **Herbarium**

As I mentioned above it is important for the herbarium to become a centre for people with a real interest in plants. It is here they can look at specimens and databases and also meet each other; this is very important as there are so few of us in Saint Lucia and we can feel very isolated – Martinique and Trinidad have very active botanical groups and we should encourage such a group to develop here. Visiting botanists could also give talks.

The plant collection is now in reasonably well-organized. However in order to become an internationally recognized herbarium, the physical structure of the room has to be greatly modified. See appendix 1 for a rough idea of what needs to be done.

School students and others often want to make use of the herbarium but frequent handling of specimens is not a good idea. A much better approach is to scan the best of our specimens and put them on line either in an academic web site such as the Oxford University Brahms project, or simply in our own herbarium web site. Ideally a fully illustrated flora of Saint Lucia should be put on line so that students, tourists and forestry personnel can gain a real understanding of our flora.