ACKNOWLEDGMENTS

This report was the product of a cooperative effort, led by the Environmental Unit of the Ministry of Health & Environment, St. Vincent & the Grenadines (SVG), and facilitated by Simmons & Associates in the capacity of International Consultant. We would like to take the opportunity to acknowledge the contribution of the team of National Consultants on the project: Mr. Morrison Baisden, Mr. Colin Campbell, Dr. Winston McCalla, Mr. Fitzgerald Providence, and Ms. Rowena Kirby, as well as the efforts and cooperation of the Environmental Unit, in particular the Project Coordinator Dr. Reynold Murray. We would also like to thank the persons who participated in the National Consultation Process on the conservation of biodiversity in SVG for their invaluable contribution to the development of the Biodiversity Strategy and Action Plan. A complete list of these contributors and participants can be found in Appendix 1., 1.(a) and 1.(b). The document also owes much to those individuals who commented on the technical content and structure of the draft documents, and to them, we wish to express our sincere gratitude.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS

ACP	African Caribbean Pacific
CARDI	Caribbean Agricultural Research and Development Institute
CBD	Convention on Biological Diversity
CCA	Caribbean Conservation Association
CEP	Country Environmental Profile
CFRAMP	Caricom Fisheries Research and Management Programme
CIDA	Canadian International Development Agency
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
COP	Conference of Parties
CPU	Central Planning Unit
CPD	Central Planning Division
CWSA	Central Water and Sewerage Authority
DDT	*D*ichloro*d*iphenyl*t*richloroethane
EC	Eastern Caribbean
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FCCC	Framework Convention on Climate Change
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIS	Geographical Information System
GPS	Global Positioning System
GSVG	Government of St. Vincent and the Grenadines
HACCP	Hazard Analysis Critical Control Point
IUCN	International Union for the Conservation of Nature and Natural Resources
IWC	International Whaling Commission
MAL	Ministry of Agriculture Industry and Labour
MARPOL	International Convention for the Prevention of Pollution from Ships
NBSAP	National Biodiversity Strategy and Action Plan
NEAB	National Environmental Advisory Board
NEAP	National Environmental Action Plan
NFAP	National Forestry Action Plan for St. Vincent and the Grenadines
NGO	Non-government Organisation
NRMU	Natural Resources Management Unit
OECS	Organisation of Eastern Caribbean States
PBU	Plant Breeders Rights
PPU	Physical Planning Unit
PPC	Planning and Priorities Committee
SIDS	Small Island Developing States
SPAW	Protocol (to the 1983 Cartagena Convention) Concerning Specially Protected Areas and Wildlife in the Wider Caribbean
SVG	St. Vincent & the Grenadines
SWCUT	Soil and Water Conservation Unit
TCPA	Town & Country Planning Act
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Scientific and Cultural Organisation
UPOV	International Convention for the Protection of New Varieties of Plants (1961)
WECAFC	Western Central Atlantic Fishery Commission
WIBDECO	Winward Island Banana Development Company
WIDECAST	Wider Caribbean Sea Turtles
WIPO	World Intellectual Property Organization
WRI	World Resources Institute

DEFINITION OF TERMS USED IN THE DOCUMENT

Biodiversity. The totality of genes, species and ecosystems in a region.

Biological Resources. Those components of biodiversity of direct, indirect or potential use to humanity.

Biosafety. The precautionary measures implemented to ensure that Living Modified Organisms (LMOs) and their products are transferred, handled used and disposed of safely. LMOs are generated through biotechnology processes including the transfer of genes between cells of related or unrelated organisms.

Biotechnology. Any technology that is applied to living organisms to make them more valuable to people.

Conservation. The management of human use of the biosphere so that it may yield the greatest sustainable benefit to current generations while maintaining its potential to meet the needs and aspirations of future generations.

Ecology. The scientific study of the interactions of living things and their environment.

Ecosystem. A dynamic complex of plant, animal, fungal, and microorganism communities and their associated non-living environment interacting as an ecological unit.

Ecotourism. Travel undertaken to witness sites or regions of unique natural or ecologic quality, or the provision of services to facilitate such travel.

Endemic. Restricted to a specified region or locality.

Environmental Impact Assessment. Process by which the potential benefits and negative impacts of proposed projects are evaluated as an integral part of planning the project, alternatives are analysed, mitigation measures identified and the general public is given opportunity to comment.

Ex situ Conservation. Keeping components of biodiversity alive outside of their original habitat or natural environment.

Extant. Still surviving; opposite of extinct.

Fauna. All of the animals found in a given area.

Flora. All of the plants found in a given area.

Gene. The unit of life found within every living cell, responsible for conferring on an organism its specific characteristics.

Genetic Diversity. Variation in the genetic composition of individuals within or among species, the heritable genetic variation within and among populations.

Geographic Information Systems (GIS). Are computer-based databases that include spatial references for different variables stored, so that maps of each of such variables can be displayed, combined and analyzed with relative ease.

Habitat. The environment in which an organism lives. Habitat can also refer to organisms and physical environment in a particular place.

Indigenous/Native Species. Plants, animals, fungi, and micro-organisms that occur naturally in a given area or region.

In situ Conservation. The conservation of biodiversity within the evolutionary dynamic ecosystem of the original habitat or natural environment.

Intellectual Property Right. A right enabling an inventor to exclude imitators from the market for a limited time.

Introduced species. A species occurring in an areas outside of its historically known range as a result of intentional or accidental dispersal of human activities (also known as exotic or alien species)

Non-governmental organisation. A non-profit group or association organised outside of institutionalised political structures to realise particular social objectives (such as environmental protection) or serve particular constituencies (such as indigenous people). NGO activities range from research, information distribution, training, local organisation and community service to legal advocacy, lobbying for legislative change, and civil disobedience. NGOs range in size from small groups within a particular community to huge membership groups with a national or international scope.

Protected Area. A legally established land or water area under either public or private ownership that is regulated and managed to achieve specific conservation objectives.

Species. A group of organisms capable of interbreeding freely with each other but not with members of other species.

Sustainable development. Development that meets the needs and aspirations of the current generation without compromising the ability to meet those of future generations.

Variety. A variety is a quasi-species, a work of evolution, and of interest in terms of biodiversity, evolution and classification.

Wetlands. Any ecosystem in which there is surface water or the substratum is waterlogged for at least part of the year. Freshwater wetlands include *open water* streams, water courses, ponds, swamps, etc. and *semi-terrestrial wetlands* eg marshes, and *brackish saline wetlands* including, estuaries, and maritime salt marshes.

ES 1. EXECUTIVE SUMMARY

ES 1.1 Background & Rational for the SVG National Biodiversity Strategy & Action Plan (NBSAP)

The Eastern Caribbean nation of St. Vincent and the Grenadines (SVG) consists of the main island of St. Vincent (345 km^2), and the northern Grenadines (44 km^2) which includes the islands of Bequia, Mustique, Canouan, Mayreau, Union Island, Palm Island, Petit St. Vincent, and 28 uninhabited islets. The combined population of SVG is approximately 110,000 people. SVG's annual per capita income of US $1,730 places it in the ranks of the least developed countries within the United Nations system.

SVG boasts a diverse collection of biological resources. St. Vincent is mountainous and fertile, and has significant tropical rainforest which provides the natural habitat for the St. Vincent parrot and other wildlife. The Grenadines, in contrast, consists of low dry islands surrounded by extensive coral reefs. In total, more than 1,150 species of flowering plants, 163 species of ferns, 4 species of amphibians, 16 species of reptiles, 111 species of birds, and 15 species of mammals have been identified on SVG. The relatively small and confined nature of the islands eco-system creates a special need for the protection of their natural, and in particular, biological resources.

The Government of SVG places top priority on the conservation and sustenance of its biodiversity. To date, the government has established three Crown Lands Forest Reserves and 24 wildlife reserves. Also, in recent years SVG's marine biodiversity has received even more attention since the establishment of the Tobago Cays Marine Reserve.

In addition, SVG has developed a solid legal base for managing its natural resources. The Forest Resources Conservation Act (1992) created, for the first time, a specialized forest management agency to manage the nation's forests and watersheds. The Wildlife Protection Act (1987) provides for the protection and management of the nation's wildlife and authorizes the establishment of wildlife reserves for that purpose, and it is under this Act that SVG's 24 wildlife reserves, have been established. The Fisheries Act (1986) provides for the management and development of fisheries as well as the protection of special areas designated as marine reserves.

Since the development of SVG's *National Environmental Action Plan* (NEAP) in 1994, a stronger emphasis has been placed on the implementation of SVG's environmentally related legislation. Though the NEAP dealt with broader issues of sustainable development, such as urban planning, pollution, and some issues relating to renewable natural resources, tourism, and biodiversity conservation, the analysis of environmental issues undertaken by the NEAP process greatly facilitated the biodiversity planning process by identifying gaps and opportunities for specific biodiversity conservation interventions.

Despite the urgency placed upon conservation and sustainable development, the biodiversity of SVG is under threat from the needs of a developing economy. Tourism, construction, agriculture and other sectors are making heavy demands on the limited resources of the country, especially on certain biologically sensitive areas.

ES 1.2 The Importance of Biodiversity

Biodiversity is the totality and variety of genes, species and ecosystems occurring in a region. The biodiversity in any such region is the result of millions of years of evolutionary history. Biodiversity has also been shaped over time by human intervention through the domestication and breeding of local varieties of crops and livestock. The various components of biodiversity have enormous importance to all aspects of human life especially food, medicines, industrial and agricultural products, and they also provide the basis for recreation and tourism. Over time, the greatest value of biodiversity may be found in the opportunities that it provides to humanity for adapting to local and global change.

Ironically, the destruction and degradation of genes, species and ecosystems has predominantly occurred as a result of the ways in which human beings have used and misused the environment in the course of development of their societies. This misuse or overuse of biological resources does not just disrupt ecosystem functions but it also imposes a cost on society. Losing diversity means losing the resilience of the ecosystem, loss of genetic resources, deterioration in quantity and quality of the water supply, a decline in agricultural productivity and loss of economically important species and ecosystems; all of which lead to adverse effects on human lives.

The situation that exists in practically all countries of the world, is that of a double-sided coin. On one side, the conservation of biodiversity is increasingly recognised as an essential component of sustainable development. On the flip side, we are forced to adjust our patterns of living in order to find ways to make our societies sustainable, so that biodiversity can be conserved. Biodiversity conservation is concerned not only with the protection of wild species, but also with the safeguarding of the genetic diversity of cultivated and domesticated species on which we depend. Essentially, it involves the maintenance of the human life support system provided by nature and the living resources essential for development.

The present worldwide movement to conserve biodiversity is enshrined in the Convention on Biological Diversity (CBD), which was initially signed by 154 nations at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June, 1992. Since UNCED, additional nations have also signed the Convention. As the Convention is ratified, individual governments accept the responsibility to assess and protect the profusion of species, genetic materials, habitats and ecosystems that make up the natural world. Governments also agree to foster development that uses biological resources sustainably. In this regard, the Convention recognizes each nation's sovereignty over the biodiversity found in its territory and confers on each the responsibility to conserve that biodiversity.

Ratification of the CBD commits governments to correcting the imbalance between who benefits from biodiversity protection and who pays; i.e. To find equitable ways to share biodiversity's monetary and non-monetary values, to spur technological cooperation and to establish mechanisms to finance investments in maintaining the diversity of life on earth.

ES 1.3 Goals and Objectives of the SVG NBSAP Project

St. Vincent and the Grenadines ratified the CBD and therefore became responsible for implementing the provisions of that Convention. This project is an enabling activity to formulate a strategy for the protection and sustainable use of SVG's biodiversity in accordance with Article 6 of the CBD.

Article 6 of the CBD "General Measures for Conservation and Sustainable Use" calls for governments to:

- Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the contracting party concerned; and

- Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

The project also aims to prepare a plan of action for the implementation of the Strategy. Therefore the primary output of this project will be the National Biodiversity Strategy and Action Plan (NBSAP). The principal objectives are to:

i. Conduct a comprehensive assessment of the existing information on SVG's biodiversity;
ii. Implement a participatory, strategic planning process and develop priorities for action in protecting SVG's biodiversity culminating in the preparation of the NBSAP;
iii. Conduct a public information campaign to encourage participation in the strategic planning exercises;
iv. Prepare the first national report for submission to the Conference of Parties (COP)

An international consultant was retained in order to carry out the following tasks under the SVG NBSAP project:

- Prepare the project document and a detailed work plan;

- establish the necessary institutional arrangements;

- familiarize the appropriate institutions and individuals with the participatory planning processes, including the design of participatory workshops;

- provide training in biodiversity analysis, planning and participatory methodologies;

- facilitate the participation of relevant stakeholders;

- Analyze framing and formulating biodiversity planning issues;

- develop strategies for biodiversity conservation;

- draft the NBSAP and the St. Vincent and the Grenadines National Report to the COP.

- as well as to identify and analyze all of the legal and regulatory regimes for biodiversity conservation.

This report was compiled by the international consultant (*Simmons & Associates, inc.*) And reflects the findings as presented in the various country study reports prepared by the national consultants. These reports included the following assessments:

- An Assessment of Marine & Fresh Water Species
- Forestry, Terrestrial Flora & Fauna
- Agriculture Resources
- Land Use Development & the Establishment of a GIS
- and a Legal Assessment

(See Appendix 1. for the SVG NBSAP Team Biographies)

ES 1.4 Challenges Identified in Biodiversity Conservation in SVG

Since it ratified the CBD in 1992 SVG has sent notice of its intention to honour its commitment by acceding to several conventions which have a direct bearing on issues of biodiversity protection. Both legislative and administrative measures are being pursued to ensure sound implementation, however, in some instances the administrative procedures are more advanced than the legal arrangements that have been put in place to date. Government should consider the adoption of comprehensive environmental legislation that would provide an adequate legislative basis for implementation of CDB and the Protocol (to the 1983 Cartagena Convention) Concerning Specially Protected Areas and Wildlife in the Wider Caribbean (SPAW).

In the compilation of the legal assessment section of this report, difficulties with the retrieval of information surfaced at virtually every stage of the exercise. Outstanding gaps in the information include:

(a) satisfying reporting requirements under the Conventions;
(b) identification of specific implementing government agencies/institutions;
(c) fulfillment of any financial commitment under the Conventions;
(d) description of administrative measures taken and planned;
(e) details of attendance at relevant meetings and positions taken.

The information required tends to be excessively dependent upon personal recollection and availability. The mobility of public officers between departments compounds problems of obtaining information when that information resides with one or two individuals. A method of streamlining information flows and the channeling of information pertinent to particular tasks (e.g., meeting reporting obligations under the Conventions) appears desirable.

Government has not ratified a number of other Conventions that protect various biodiversity elements and may wish to consider the relevance of these Conventions to St. Vincent and the Grenadines.

Management of protected areas in St. Vincent and the Grenadines would benefit from an integrated approach. For example, the Fort Charlotte historical site could be combined with a marine component to form a larger and more meaningful protected area which would protect both the leading historical monument in the country and one of its most outstanding dive sites. Any project to upgrade the municipal sewerage system in Kingstown would be required to minimise impacts on this site by extending the outfall further offshore. The wildlife reserves at Milligan Cay, La Paz Rock, Sail Rock and some other offshore islets could each be combined with a marine component; the proposed Soufriere National Park could be combined with the existing Parrot Reserve into a single management unit which would also protect many important catchment areas.

Factors Affecting the Implementation of Environmental Legislation in SVG

The role of environmental legislation in promoting sustainable development in St Vincent and The Grenadines has been found to be affected by a number of factors including:

1. A lack of political commitment to environmental programmes

2. A lack of financial resources with which to support environmental programmes

3. Organisational weaknesses in the implementation of programmes and their co-ordination at both the national and local levels

4. A lack of awareness, technical expertise and experience at national and local levels

5. The influence of the policies of the International agencies currently providing financial assistance to the country

6. A Lack of integration of environmental costs into economic policies

ES 1.5 Major Threats to Biodiversity in SVG

St. Vincent and the Grenadines has a diversity of flora and fauna some of which are island and regional endemics. However, this diversity needs to be managed to ensure the protection of this valuable resource. Presently the major threats to biological diversity in SVG are:

(i) Deforestation The rate of estimated deforestation has greatly increased due to an increase in the amount of areas cleared for the illegal cultivation of marijuana.

(ii) Species

	Introductions	The unregulated introduction of exotic species continues to be a problem. A noted recent introduction, the armadillo, is suspected to cause the destabilisation of slopes due to their rooting activities.
(iii)	**Emigrants**	Recent arrivals on the island such as the cattle egret and glossy cow bird can affect other bird populations. e.g The egret raiding low-lying bird nests and the cowbird pirating the nests of the Carib Grackle.
(iv)	**Exotic Pests/Diseases**	Exotic pests and diseases like the "Pink Mealy Bug" can severely affect the flora of SVG.
(v)	**Limited Knowledge**	Little or no knowledge of the type, distribution and value of the flora and fauna can lead to misuse and careless destruction.
(vi)	**Agrochemical Use**	Poor monitoring or regulation of the use and disposal of agrochemicals can affect faunal species, e.g aquatic species and animals that use agricultural fields for foraging.
(vii)	**Hunting Activities**	Although there is an open and closed season which partially protects terrestrial species, there is no control on quantities, sex, or age of animals caught for the hunting of terrestrial species. Also the hunting season is not determined by any study of the behaviour of the animals to protect them from the harvesting of pregnant females.
(viii)	**Inadequate Enforcement**	There is also an inherent lack of enforcement of existing regulations which provide for the protection of biological resources in SVG.
(ix)	**Urban Development**	Development expansion in coastal and lowland areas in order to supply the increasing housing demand has resulted in the fragmentation and destruction of coastal woodlands and other such habitats.

1. BASELINE INFORMATION ON ST. VINCENT & THE GRENADINES

1.1 Location and Land Area

St. Vincent and the Grenadines is a multiple island nation consisting of approximately 32 Islands and Cays. Eight of these islands are inhabited, they are: St. Vincent, Bequia, Mustique, Union, Canouan, Prune (Palm), Mayreau and Petit St. Vincent. The total land area is approximately 389 Km^2 or 38,694 Ha (the figure represents only the inhabited islands), with St. Vincent being the largest island with a size of 344 Km^2 or 34,462Ha. The islands form part of the Windward Islands, and are located between St. Lucia to the north and Grenada to the south, 100 miles west of Barbados. (See Figures 1 & 2)

1.2 Topography

St. Vincent is roughly oval in shape with a central spine of mountains running from north to south with steep ridges radiating towards the east and west. The highest mountains are in the north, (the Soufriere mountains) and in one of the peaks lies the Soufriere volcano which last erupted in 1979.

The main island of St. Vincent is very rugged with 50% of the slopes 30 degrees or more and 20% less than 20 degrees (Barker, 1981 cited in Caribbean Conservation Association (CCA), 1991). The islands topography is due to the volcanic origin of the island, resulting in a central north-south mountain chain with La Soufriere volcano (1180M) dominating the northern end of the island.

St. Vincent has a very mountainous and deeply divided interior. The Soufriere mountains are the most northerly, the Morne Garou mountains lie to their south and farther south Grand Bonhomme, Petit Bonhomme and Mt. St. Andrew. A large number of very steep lateral ridges emanate from the central massif culminating in high, almost vertical cliffs on the Leeward coast while the Windward coast has wider, flatter valleys and truncated spurs which are lower and more rounded than those of the leeward coast.

The Grenadines are geologically older than St. Vincent and have a much gentler relief. The islands also have a much lower annual rainfall, thus there are no perennial streams, except for a spring on Bequia. The Grenadines are surrounded by fringing reefs and white sandy beaches.

The topography and population dynamics of the islands result in most towns and villages being established on the flat coastal regions. Agriculture is mainly concentrated in the middle basin where land is not too steep in grade allowing for productive farming.

Figure 1. Map of St. Vincent

Figure 2. Map of The Grenadines

1.3 Climate

The mountainous island creates a range of microclimates that vary greatly with height, location and orientation of the island. The central mountains cause moisture laden air to rise. The rising air cools and expands resulting in orographic cloud formation and often heavy rainfall. Approximate annual rainfall on the island ranges from 1700mm on the dry coast to 7000mm in the wet central mountains (CCA, 1991). It has been estimated by Birdsey, et. al. (1986) that the island receives 1035 million m^3 (838,500 acre feet) of rain water on its surface per year. The island has two major seasons in a year, a wet and dry season. The length of these seasons varies with location but the dry season occurs between January and May.

In stark contrast to the forested mountains of St. Vincent which may have as much as 5100 mm of rain per year, the Grenadines may have as little as 460 mm. The average annual rainfall recorded on Bequia and Canouan is 1,412 mm and 955mm, respectively (Gumbs, 1992).

1.4 Population & Demographic Characteristics

St. Vincent's population is estimated at 120,519 (1999 est.), concentrated mostly in towns and villages along the East, West and the South coasts and in the southern interior of the mainland (see figure 3.). The average annual rate of natural increase is 1.31%; birth rate 18.3/1000, the infant mortality rate: 15.2/1000, and population density is 803 persons per sq. mi.

Figure 3. Built-up Areas of St. Vincent

2. STATUS OF BIODIVERSITY CONSERVATION IN ST. VINCENT & THE GRENADINES

Biological diversity is defined as the variability among living organisms from all sources including: terrestrial, marine and aquatic ecosystems, and the ecological complexes of which they are a part. This includes diversity within species, between species and of ecosystems according to the CBD.

Therefore it is very important to know the types (species), quantities and distribution of species of flora and fauna within a country to develop and plan any actions to manage biological diversity. It is very significant in a multiple island state where species can evolve separately, thus resulting in island endemics and varieties due to the separation of these islands that are isolated from each other by water. This report presents the preliminary findings of an assessment of the status of knowledge as it relates to forestry, species and habitat diversity, protected areas and threats to the biological diversity of SVG.

2.1 TERRESTRIAL FLORA DIVERSITY

2.1.1 Natural Vegetation

The natural vegetation of SVG is defined by climax vegetation formation based on environmental gradients. The concentric variations of rainfall with elevation would theoretically give rise to a concentric variation in vegetation, Watson et. al. in 1958 developed a map of the island giving the theoretical distribution of vegetation. The regeneration on the slopes of the volcano was due to the frequent disturbance of the vegetation by volcanic eruptions. However, factors of topography and geology modify this concentric variation in vegetation in the Grenadines, which have lower relief, and a more semi-arid climate than St. Vincent, there is also a uniform vegetation distribution of scrub and cacti vegetation.

The most widely used vegetation description model was developed by J.S. Beard in 1945 and Howard (1952), and is used to describe the vegetation of the Grenadines. There has been very little work on the flora of SVG since Anon (1893) and Beard (1949). However, Howards recent work (1974 - 1989) which produced a series of books on the flora of the lesser Antilles has indicated some anomalies with this past work (Chow, 1993). These anomalies includes Howard, giving Proctor's list of ferns as 163 with 12 being regional endemics, whereas in the Country Environmental Profile (CEP) (CCA,1991), Anon is cited as listing 163 ferns with four, being regional endemics (see Appendix 4.). Also, 54 species of orchids were recorded, five being regional endemics. Barbara A. Chow in her report on wildlife and Biodiversity stated that further work is needed to prepare a proper check list and field guide based on the work of Howard and the various contributors to that work. While a comprehensive re-evaluation of these works would refine the floral checklist for SVG, the number of single island endemics would be expected to remain small. Further, given the common volcanic origin of the Lesser Antillean islands, the frequency of regional endemics is high,

superseding single island endemics. Protection should therefore always be afforded to the endemic flora with special consideration for the regional endemics. Considering the absence of real time botanical surveys, it is therefore recommended, that such work be carried out to protect the distribution and status of these species. Until such time, the representation and status of such species within declared or intended protected areas remains uncertain. Due to the inherent sensitivity of small island endemics to habitat losses, this should be given more priority. Therefore, conservation of wild flora, in contrast to the more popular emphasis on forests, should be the immediate focus. Floral studies and the development of proper herbaria should be pursued.

2.1.2 Forest Ecosystems

The physical and environmental changes on these small islands give a remarkable diversity of ecosystems. These changes are elevation, terrain, soils, rainfall and relative exposure to the trade winds, which gives rise to different forest types. Beard (1949) gave general classifications for the forest types of SVG. This classification is still used today although other classifications such as Holdridge's Life Zones, are also used. In describing forest ecosystems there are two broad categories which are climax communities and secondary communities. (See Figure 4.)

2.1.3 Climax Communities

Examples of Climax Communities include the following vegetation types:

Rainforests which are described by the forest occurring in areas of high rainfall, experiencing over 100mm of rainfall per month with very short dry periods. They occupy small areas between 300 m and 500m in elevation, mainly in the middle to upper watershed basins of the Colonarie, Cumberland and Buccament valleys. The canopy dominants include Prestoea montana (on the windward side only), Dacryodes excelsa, Lauraceae species, Meliosina herbertii, Micropholis chrysophylloides and Sloanea caribaea;

Elfin Woodlands which occupy summits above 500m on both windward and leeward sides on the central mountain. The trees, due to the conditions of wind and moisture are 4m or less in height, gnarled and covered in moss and epiphytes. The main tree species are Charianthus cocconeus, Didymopanax attennatum, Freziera hirsuta, Prestoea montana, Inga laurina, Weinmannia pinnata, Ficus and Clusia species;

Littoral Woodlands which occupy limited areas adjacent to the sea. The trees seldom exceed 8m in height. Common dominants are Coccoloba unifera, Rheedia species and Tabebuia pallida; and

Mangrove Forests which cover approximately 42 Ha in SVG, mainly on Union and Mustique Islands, along with a very small area in the south of St. Vincent. The forests consist of four distinct

species of mangroves known loosely as red, black, white and button, (Rhizophora mangle L., Avicennia germinans L. Laguncularia racemosa (L) Gaertn.f., and Cococarpus erecta). Interestingly all four species are found together in an area of less than 6Ha at Richmond Beach on Union Island.

Figure 4. St Vincent Natural Vegetation (Circa, 1949)

2.1.4 Secondary Communities

Secondary Communities consist of the following vegetation types:

Palm Brakes which occupy the area between rainforest and elfin woodland (sometimes referred to as cloud forest) on both sides of the mountains. The formations consist of mainly palms with 70% reaching a height of 12m;

Secondary Rain Forests which are forest lands that have had some major intervention (natural or man-made). They occupy areas between permanent cultivation and rainforest (primary). These forests contain secondary tree species such as Chimarrhis cymossa, Sapium caribeum, Inga ignoides, Cecropia peltata, Freziera hirsuta, Ochroma pyramidale, Cordia sulcata and Lauraceae species. These forests are normally denser than primary forest, with smaller tree diameters. However, the more advance succession stage has a higher number of rainforest species;

Dry Scrub Woodlands which occur in the drier coastal regions of SVG. They occupy uncultivated lands on steep rocky slopes, where lush forest never existed. The vegetation of this forest is most times felled for timber and fuel wood. Dominant tree species include Bursera simaruba, Pisonia fragrans, Acrocima species. Other tree species found in these forest types include: Tabebuia pallida, Swietenia mahogani, Hymenaea courbaril, Pouteria multiflora, Inga laurina, Mastichodendron feutidissimum, Brosimum alicastrum and the Lauraceae species. The Kings Hill Forest reserve has this forest type and has remained virtually undisturbed since its creation in 1791, with trees reaching to 20m in height; and

Disturbed Lands (Regeneration) which include the area of La Soufriere which is disturbed by periodic volcanic eruptions resulting in states of succession ranging from bare soil to secondary forest.

2.1.5 Forestry Resources

The historical change in the extent of forest coverage in SVG is not clearly known. In 1949 J.S. Beard of the Colonial Forest Service produced a map of the vegetation of St. Vincent. However, there is a history of deforestation in SVG due to squatting and agricultural encroachment. The advent of the banana industry has contributed to this deforestation in many areas. Estimates of deforestation in some watershed areas were estimated to approach 60 - 70 acres/year (CCA, 1991).

2.1.5.1 Forests of St. Vincent

In 1984 Birdsey et. al. did an inventory of the forest on St. Vincent which was based on photo interpretation, however, a forest cover map was not compiled at the time. The map they produced was an adaptation of Beard's 1949 study. The most recent inventory was done in 1993 where a National Inventory Report was produced. This inventory was based on the re-interpretation of the 1982 photographs and strip sampling points. (See the findings of this inventory in the following Tables 2.1.1 & 2.1.2)

Table 2.1.1 Forest Land Classification and Areas by inventory Year

Forest Types	Area in ha		
	1949	1984	1993
Rainforest	8218	9208	7759
Dry Scrub Woodland	1491	1326	2179
Elfin Woodland	207	952	457
Palm Brake	4122	1734	518
Regeneration			1776
Total Forest Area	14038	13220	12689

Table 2.1.2 Areas of Rainforest Types (1993)

Forest Type	Area (ha)
Primary Rainforest	4308
Secondary Rainforest	3451
Total Forest Area	7759

2.1.5.2 Forests of The Grenadines

According to the 1993 National Inventory Report, a formal inventory has never been carried out for the Grenadines, however visits were made for the GOSVG/CIDA forestry development project to ground-truth existing map information. An account of the flora of the Grenadines can be found in Howard's "Vegetation of the Grenadines" published in 1952 and cited in the CEP.

Bequia supports a significant forested area. The predominant species is White Cedar (Tabebuia pallida) with Naked Indian (Bursera simaruba) as emergents as well as several species of (Acacia) and cactus. There is also a small area of black mangrove at Spring Beach.

Canouan has a small stand of dry woodland on the lee side of Mount Royal which is threatened by a tourist development scheme.

Union Island supports large areas of dry scrub forest, 4 to 5 meters in height, with emergents of naked Indian, Albizia (*Albizia caribeae*), *Guapira fragrans, Bouvreria succulenta*, and *Tamarindus* species. The ground cover includes *Aloe vera*, which was probably cultivated at some time. Most of the other islands still support individual trees and scattered patches of forest. Union island supports the major mangrove areas in the nation, with those of Ashton Harbour and Richmond Beach being the most significant.

Mustique supports about 10 ha of mainly black mangroves in two areas inland. The Mustique Company is enjoined to protect and improve the natural environment, including the mangroves in Lagoon Bay, by the Mustique Company Limited Act of 1989. The company also works to protect the natural vegetation of the island, which has a relatively good vegetative cover.

2.1.5.3 Mangrove Forest

In her report on wildlife and biodiversity, Chow made the following observation about the status of Mangroves based on the reports of Metz (1989), Weekes & Metz (1991) and Bacon (1991): "The conservation policy inferred from these reports is that of zero loss, given the small size and resource base in SVG. Tree harvesting for charcoal needs to be addressed and methods for sustainable harvesting determined. It is suggested that a mangrove assessment exercise be undertaken that goes beyond the descriptive work in order to determine relative importance nationally and to each other as habitat for marine life and feeding, roosting and breeding grounds for shore and sea birds. Mangroves are important to the coastal ecology; this has been stressed in the Forestry Division's public education outreach Programmes and needs to be continued particularly in the Grenadines." (The distribution and composition of Mangrove Forest in SVG is given in the following table 2.1.3)

Table 2.1.3 Distribution and Composition of Mangrove Forests in SVG

Location	Size (Ha)	Composition
St. Vincent	0.16	White mangrove
Mustique (Lagoon Bay)	8.09	7.69 ha Black mangrove (Black mangrove 65%, red mangrove 25%, Manchineel (*Hippomane mancinella* L.), Kashee-*Acacia spp.*, Mimosaceae spp 10% 0.4 ha of Red mangrove belt.
Mustique (northwest corner of airport)	4.05	Black mangrove with small clumps of button mangrove
Union (Ashton Harbour)	20.24	.81 ha red mangrove belt, 19.43 ha black mangrove (tree & shrub form)
Union (Richmond beach)	5.67	Red, black, white and button mangrove.
Union (Clifton Bay Reserve)	1.25	red and black mangrove

Source: Weekes and Metz 1992.

2.1.5.4 Forest Plantations

The reforestation efforts in SVG have been carried out mainly to reforest upper and middle watershed areas, this effort was started over 30 years ago. The main thrust was to reclaim abandoned agricultural lands for the purpose of soil conservation and water conservation (quality and quantity). The production of timber, poles, post, fuel wood and charcoal have been of secondary importance. Initial reforestation efforts were done with exotic species which were fast growing and could easily be propagated in a nursery. Three main species were initially used, they were Blue Mahoe (Hibiscus elatus), Mahogany (Swietenia macrophylla and S. mahagoni) and Caribbean Pine (Pinus caribaea). These species originated in the region from areas like Jamaica, Belize (Honduras) and Cuba. Of the 110.3 Ha of forest plantation established before 1989 (the beginning of the GOSVG/CIDA forestry development project) 90% of the species planted was Blue Mahoe, the mahoganies and Caribbean Pine. The remaining 10% was a mixture of Galba (Calophyllum antillanum), Red Cedar (Cedrela ordorata), Cype (Cordia alliodora) Leucaena (Leucaena leucocephala), Teak (Tectona grandis), Chinaberry (Melia azadarach), Shoemaker's Bark (Brysonima spicata), and White Cedar (Tabebuia pallida). The initial plantation had little or no silvicultural treatments i.e thinning and tending.

Prior to 1989 and during the Forestry Development Project up to July 1993, 64.6 Ha of plantations were established (14 ha in 1993), primarily in Rabacca and Montreal (61 Ha was established on Crown lands which were under illegal agricultural cultivation). The species that were planted were mahoganies 23.4 ha, blue mahoe- 19.2 ha, red cedar - 2.7 ha, galba - 2.4 ha, and other local species - 4.7 ha. In addition, leucaena, white cedar, cype, fruit trees, and exotics such as Eucalyptus torelliana and E. deglupta, mangium (Acacia mangium), neem (Azadirachta indica), and Paraserianthes falcataria (fastest growing tree species in the country) were planted.

The Silvicultural Plan 1993-2002 proposed to establish 24 hectares annually between 1994 and 2003 on public lands. The priority areas were Rabacca Farms - 83 ha, the Colonarie Watershed - 48.5 ha, Montreal Watershed 16 - ha and the remainder in other areas. The species to be planted annually were Blue Mahoe - 10 ha, Mahoganies -8 ha, and other species - 6 ha. However, the plan was not fully implemented and due to limited exact measurements, no compiled data records of the plantations established since 1994 are available. The Forestry department has planned over these years to establish 60 acres of plantation annually, however there needs to be a proper compilation and measurement of the plantations established to give accurate figures of establishment in terms of hectares and species planted.

2.1.5.5 Impact of Forestry on Biodiversity

According to the Silvicultural Plan, the establishment of plantations of exotic species such as Swietenia and the Hibiscus does not represent a threat to biodiversity at the proposed scale of use. The problem lies with the herbaceous species principally the banana (Musa sp.). The Silvicultural plan proposed an increase in the area of the island under plantation to 1.2%. This would only form 2% of the estimated 60% of the island under some form of agriculture, the 1.2% is also only 3% of

the estimated area under some form of natural forest.

The establishment of forest plantation protects biodiversity and the natural forest by restoring illegally cleared agricultural lands within the boundaries of the natural forest to forest cover and creating "buffer" areas between agriculture and natural forest.

The establishment of monoculture plantation forest does however, have some effects on biodiversity which include the following;

- Limited species diversity
- Limited habitat diversity
- Allelopathtic and other properties of exotics preventing under story growth

The slow and/or non-implementation of Silvicultural treatments can also affect diversity. e.g By encouraging rapid crown closure thus limiting undergrowth in plantations. Silvicultural treatments reduces weeds which also reduces diversity in these plantations.

The Silvicultural Plan referred to a comprehensive study in Puerto Rico (Lugo 1992) that compared plantations of Caribbean Pine and Honduras Mahogany with secondary forest of similar age growing adjacent to each other. The study found, that beneath the canopy of the older plantation trees developed higher species with a richness similar to that of the paired secondary forest. This observation was also made in the older plantations in Cumberland and Vermont in St. Vincent.

2.2 TERRESTRIAL FAUNA DIVERSITY

SVG has a diversity of fauna species, some of which were introduced to the island by humans. Both local island and regional endemics occur within the islands, however there are enormous gaps in existing information that need to be filled.

2.2.1 Terrestrial & Other Invertebrates

The decapod crustacean fauna of SVG includes several species of fresh water shrimp, and both terrestrial and freshwater crabs, however the documented list is incomplete (CEP, 1991). There are also snails of which little is known (Chow 1993). Very little information is available on the terrestrial invertebrates existing in St. Vincent and the Grenadines. Very limited studies have been conducted on the Insecta families existing on the SVG islands.

2.2.2 Butterflies

In Schwartz and Henderson Lesser Antillean Butterflies, a total of 43 species were listed to be found on St. Vincent and 35 in the Grenadines. The recordings for the Grenadines included Carriacou which is an isle of Grenada. Overall, there was an increase in the number of species listed when compared to Goodman and Salvins 1896 record. Schwartz and Henderson in their report noted that a lack of interest in collecting data was the cause of the lack of information available, and expressed the need for additional work to be carried out which would reveal even more species of butterflies. The existence of endemic species and their status is also not well known (Miller & Miller 1989 in Chow,1993).

2.2.3 Fresh Water Fish

A lack of in-depth studies of the fresh water fish has restricted the quality and quantity of information available on this topic. However, evidence suggests that various species of Gobies, Mountain Mullets, Tri-Tri and Clingfish exist. The Mountain Mullet and Tri-Tri are the most popular for domestic consumption.

In the National Resource Conservation Plan it is noted that fresh water fish are being threatened by over-fishing, and the use of inappropriate nets and explosives. Chemical runoff from the cleaning of agricultural equipment is also attributed to the poisoning of fish in the rivers.

2.2.4 Amphibians and Reptiles

The CEP lists four species of amphibians which include the marine toad (Bufo marinus), two tree frogs (Eleutherodactylus johnstonei and E. urichi) and the pond frog (Leptodactylus wagneri). In later literature the frog E. urichi shrevei which was thought to be an endemic subspecies was confirmed to be an endemic species Eleutherodactylus shrevei (Kaiser and Henderson 1994)

The CEP cites Maclean et. al. as documenting 12 species of reptiles on St. Vincent, they included three gecko lizards, two anole lizards, two ground lizards, an iguana, a skink and three snakes. The Grenadines was found to be the home of four additional species, three lizards and a tortoise. The literature has revealed a new gecko of the genus Sphaerodactylus found in Bequia which has since been given the name Sphaerodactylus kirbyi (Lazell, 1994).

With regard to the reptile species there are two lizards and a snake which are endemic to St. Vincent, Anolis griseus and A. trinitatus and the snake (Chironius vincenti). A gecko in Bequia Sphaerodactylus kirbyi is also endemic. The CEP lists two other lizards (Gymnophthalmus underwoodi and Sphaerodactylus vincenti) and the snake (Mastigodryas bruesi) as regional endemics.

The distribution of various species of amphibians and reptiles found in SVG is presented in Appendix 3. It should be noted that the snake Corallus enydris has been renamed as Corallus hortulanus. (Henderson et. Al., 1996)

2.2.5 Birds

A list of birds compiled from the book "A Guide to Birds of the West Indies" lists a total of 153 birds in SVG, including migrants. The CEP reported 95 species breeding in SVG and Evans (1990) registered 124 species on St. Vincent, but the number present in the Grenadines could not be determined from that report.

There are two endemic birds on St. Vincent, the St. Vincent Parrot (Amazona guildingii) and the Whistling Warbler (Catharopezea bishopi). In addition Chow gives two endemic subspecies, the St Vincent (Rufous throated) Solitaire (Myadestes genibaris) and the House Wren (Troglodytes aedon). There are also seven existing regional endemic bird species.

Out of an original seven species the St. Vincent Parrot is one of the four remaining species of Lesser Antillean Parrots in the genus Amazona. (CCA 1991). The parrot is listed as an endangered species with coverage under appendix one of the CITES international laws. The Forestry Department has had a programme of monitoring the wild populations, as well as a captive breeding programme. The breeding programme has been successfully producing on average about one new bird per year since its inception in 1990. The most recent census conducted in 1999, estimated the wild population of birds is estimated to be about 600 birds. The parrot is found in the relatively undisturbed rain forest and its range includes the upper watershed areas of Buccament, Colonaire and Cumberland. The 1987 Wildlife Protection Act includes provision for a Parrot reserve, which is intended to protect the habitat of the parrot and other wildlife. However, there is still concern about the removal of birds or eggs from the wild to be traded internationally.

The Warbler is stated as being common in the primary, elfin and palm brake forests, however eruptions of La Soufriere volcano can seriously affect their habitat on the slopes of the volcano. One major concern for bird life, was noted by Chow as being the use of agrochemical pesticides such as Furidan in the banana plantations. This was evident from observed kills of different species of birds after the application of this chemical.

2.2.6 Mammals

A few terrestrial mammals are found in SVG, the number is dominated by bats and only six non-flying mammals. Of the six non-flying mammals five were introduced to the island, and the only endemic species is the rice rat (Oryzomys victu), which is extinct. The other five include: Agouti (Dasyprocta agouti), Mongoose (Herpestes auropunctatus), Rats (Rattus rattus and Rattus norvegicus), Mice (Mus musculus), Opossum or Manicou (Didelphis marsupialis) and the Armadillo or Tatto (Dasypus novemcinctus).

These non-flying mammals, except for the rats, mice and the mongoose are partially protected by the Wildlife Protection Act. Thus, they can be hunted during the hunting season along with the Iguana.

Species of Bats

The biggest group of mammals is the bats. Records list nine species present in St. Vincent and another four are limited to the Grenadines. In recent studies on St. Vincent, seven of the nine species were caught and an additional three species previously unrecorded were found. (See Appendix 3(a).

In her report, Chow noted that Jones (1989) did not believe that one of the bats previously listed (Natalus stramineaus) occurred in SVG. The origin and occurrence of some of these bats were given by Chow as follows: "Recent invaders from South America include; Glossophaga longirostris (only in SVG and Grenada), and the endemic subspecies of Sturnira lilium paulsoni, and Artibeus lituratus (Grenada and St. Vincent only). The regional endemics found in SVG include; Monophyllus plethodon, Ardops nichollsi luciae (not collected in recent times), and Brachyphylla cavernarum cavernarum. Little is known on the status of these species, and their unfortunate description of vermin needs to be rectified through public education."

Vaughan and Hill in their report on the new records of bats for St. Vincent gave the following account: “P. parnellii and M megalotis problably invaded the Lesser Antilles from the South and T. brasiliensis from the North or West. Those bats not caught in their research were due to Artibeus lituratus being quite rare, B. cavernarum roosts in sea caves and M. molossus does not fly under the canopy.” (Vaughan and Hill, 1996)

In the study by Vaughan and Hill on bat diversity and their abundance in banana plantations and rain forest; they found species to be significantly higher in the forest, however, they caught a higher number of bats under the canopy of banana plantations. They noted that at certain times of the year banana plantations and other cultivated areas may be an important foraging habitat for G. longirostris and A. jamaicensis. Bats however, seem to be able to exploit agricultural habitats and roost in man-made structures. Vaughan and Hill also noted the importance of conserving the diversity of bat species by protecting the remaining rain forest on the island. The fact that bats are still categorised

as vermin in the Wildlife Protection Act is of serious concern for bat conservation, given their definitive ecological importance.

2.2.7 Endemic Species

Although small, St. Vincent and the Grenadines is rich and diverse in flora and fauna species as in other tropical islands. Within this diversity of species are island endemics, regional endemics and endemics limited to a small number of islands including SVG. A list of all identified endemic species are given in Appendix 4.

2.2.8 Protected Areas

In 1998, the first National Marine Park, Tobago Cays National Marine Park was opened. This area had previously come under the protection of the Forest Resource Conservation Act of 1992 as a Forest Reserve. There are also other areas in SVG of biological interest with environmental indicators which have been designated as protected areas. (NAFP report 1993) However, there is no systematic approach to the conservation of these areas. Thus attempts at protection of these areas have lacked both geographical and ecological logic, resulting in areas of concurrent jurisdiction and potential administrative confusion. (NAFP report 1993)

Forest Reserves

The first Forest Reserve established in SVG was the Kings Hill Forest Reserve, established by the enactment of the Kings Hill Enclosure Ordinance No. 5 of 1791. The reserve is a 21.2 ha (55 acres) dry woodland climax forest situated on a 220 m high hill on the East coast on St. Vincent. The area in which this reserve is located experiences some of the lowest annual rainfall (approx. 2000mm). The reserve was established "for the purpose of attracting the clouds and rain to the benefit and advantage of owners and possessors of land in the neighbourhood thereof." The reserve is still intact today, due to the easy access for monitoring, and the community interest in this reserve. The reserve is an ideal site for further study and it is essential that the reserve be afforded the highest level of legal protection available.

The reserve is presently scheduled as a forest reserve under the Forest Resource Conservation Act and as a wildlife reserve in the Wildlife Protection Act. The National Forestry Action Plan (NFAP) report also stated: "Given the local, regional and international scientific significance of the reserve, it is recommended that the entire reserve be declared a protected area under Section 12 of the Forest Resource Conservation Act, 1992. Furthermore, if provision is made for the designation of Scientific Reserve, it is recommended that this higher level of protection be extended to the Kings Hill Forest Reserve."

On August 22, 1912, there was a proclamation which read "all such Crown Land as are situated 100ft above sea level" were reserved from "any administration or disposal thereof that would be prejudicial to the forest growing or to grow thereon." Estimates of this reserve size was 13,600 Ha, approximately 40% of the island's total land area. However, no survey maps were prepared to identify these lands, thus the area limits intended for protection could not be determined.

In 1948 the Crown Lands Forest Reserve Order established the Soufriere, Mesopotamia and Central, Colonarie Forest Reserves. However, the procedure to have them established, including maps, was not followed so that they were never legally established.

During the Forestry Development Project several new reserve boundaries were surveyed. They included; The Kingstown Reserve, Campden Park Reserve, Colonarie, Soufriere, Mt. Pleasant, Dalaway, Richmond Reserves and a new National Forest Boundary. However, these are awaiting gazetting and enactment by law. The major obstacle in this procedure is problems in the descriptions given by the surveyor for these reserves and boundaries. (pers communication with D. Jackson).

Wildlife Reserves

The following information is taken from the National Forestry Action Plan (NFAP) for St. Vincent and the Grenadines (Main Report):

The Wildlife Protection Act, No. 16 of 1987, establishes a system of Wildlife Reserves as well as machinery for the creation of further reserves. By Section 9 (1) the areas defined in the first schedule to the Act are declared as Wildlife Reserves. The schedule includes eight areas in St. Vincent and 16 areas in the Grenadines. The largest and most important of these is the 7,596 acres (3075 ha) St. Vincent Parrot Reserve, straddling the central mountain range in St. Vincent, which is intended to protect the endangered St. Vincent Parrot (Amazona guildingii).

Apart from the St. Vincent Parrot Reserve, the protected areas in St. Vincent include the King's Hill Forest Reserve, an undefined area in the vicinity of the Falls of Baleine, the Botanical Gardens, the adjacent grounds of Government House and four offshore islands, the largest of which are Chateaubelair Islet and Young Island, off the Northwestern and Southern coast respectively. Young Island, which is also part of a marine conservation area protected under the Fisheries Act, 1986, is an exclusive tourist resort.

Apart from an undefined area at the Northeastern extremity of Bequia, all the Wildlife Reserves in the Grenadines extend protection over the entire area of 17 small islands, island groups and rocks. Two of these; Petit St. Vincent and Prune (Palm) Island are exclusive tourist resorts. The islands of the Tobago Cays, which are part of a Marine Conservation Area protected under the Fisheries Act, and protected as Forest Reserves under the Forest Resource Conservation Act 1992, are also designated Wildlife Reserves under this legislation.

However, to date, the system of Wildlife Reserves exist largely on paper. The boundaries of designated areas have not been demarcated on the ground and in some cases have not yet been defined. Moreover, the administrative machinery contemplated by the Act has not yet been put in place. Although, in the absence of these arrangements, provision is made for Forest Officers to function as Wildlife Protection Officers. However, the Forest Officers capacity to effectively function as Wildlife Protection Officers is quite limited. And so, the declaration of these areas as Wildlife Reserves does not necessarily afford them effective protection.

It is the obligation of the Chief Wildlife Protection Officer to define, demarcate and maintain the boundaries of all Wildlife Reserves. In the cases of the St. Vincent Parrot Reserve, the Falls of Baleine and Northwestern Bequia it is essential that these steps be taken expeditiously to ensure the legal protection of these areas as Wildlife Reserves. The exclusive tourist resorts of Young Island, Palm Island and Petit St. Vincent may not be appropriately designated as wildlife reserves.

The only provision for habitat protection, is for those habitats existing within the confines of the nations forests. The prohibition of hunting is weakened by legislative deficiencies. There is also provision for a 'conservation fund' into which visitor fees can be allocated.

Botanical Gardens

The Botanical Gardens situated in Kingstown is the oldest in the western hemisphere. Established in 1765, it has a large number of exotic plants from South America and the East Indies including the famous breadfruit tree. The Gardens and the contiguous grounds to the Government House have been designated a wildlife reserve under the Wildlife Protection Act.

Recreation Sites

The Forestry Department is responsible for the maintenance of several recreation sites which they developed during the period 1985 – 1991. These sites include the Vermont Nature Trails, Trinity Falls, Falls of Belaine, La Soufriere Trails, Black Point Tunnel Recreation Site, Richmond Beach and Owia Salt Pond. Except for the Vermont Nature Trails which fall within the St. Vincent Parrot Reserve all the other sites are not protected under any of the laws of St. Vincent. The use of these sites are not well regulated because of the lack of user fees and the lack of a presence of tour guides at all times, thus there is very limited control of visitor use and activity.

Mustique Island

The entire island and its marine environment is a protected area. Two areas on Mustique, an area of wetland adjacent to the airport and an area of dry forest in the south of the island, were identified

for conservation (OAS,1986). However, a legitimate question can be raised as to the merit of the special treatment accorded to Mustique as a conservation area. Presumably, the designation of this area as a protected area was actuated by the island's status as a privately controlled luxury resort. Hence, its classification as such, has limited implications for the public management of a system of protected areas in St. Vincent and the Grenadines.

2.2.9 Constraints for Existing Protected Areas

The major omissions in protected area regulations appear to be in respect of coastal resources. With respect to the Grenadines, it would appear that there is a need to upgrade the protected status of the island of Baliceaux, the northern half of Canouan Island and the western and northern portions of Union Island.

There is concurrent jurisdiction over specific areas and a potential for conflict. This potential can only be successfully countered by the effective liaison between the responsible organizations and development of a coherent strategy for the management of these areas which realize their diverse goals.

The Fisheries Act, contains no requirement that management plans be prepared for Marine Reserves. Given that the designated marine conservation areas contain both Forest and Wildlife Reserves, which are under the legal control of the Forestry Division, and beaches, which are under the administrative control of the same organization, a greater potential for conflict exists in this area. Since both the Forestry and Fisheries Divisions fall under the aegis of Ministry of Agriculture Industry and Labour (MAL) the coordinated approach to the management of Marine Reserves ought to be facilitated. However, currently there appears to be no institutional machinery for co-operation between the Forestry and Fisheries Divisions of MAL, in fact, the level of communication between these agencies can be described as inadequate. Intervention at the level of the umbrella organization appears to be necessary if a coherent management strategy for these protected areas is to evolve.

The ability of relevant organizations to manage the areas is in question. They appear to be grossly understaffed, particularly with qualified personnel, a situation which is aggravated by critical personnel frequently being on leave of absence.

Both the personnel and logistical problems cast doubt upon the ability of these organizations to demarcate and control the areas under their jurisdiction. However, even with their existing capabilities substantial improvement could be effected by closer collaboration between the relevant agencies. For example, the Forestry Division has no capability to patrol the designated Forest and Wildlife Reserves in the Grenadines, but this problem could be effectively addressed by the development of a system of joint patrols with the Fisheries Division.

However, the key issue is one of adequate funding. The legal framework has been laid for the improvement of this situation by provision for the collection of fees for example for entry into Wildlife Reserves and the utilization of beach materials, as well as the creation of special funds. However, no action has been taken on the basis of these powers to date, a situation which needs to be addressed urgently. Consideration should also be given to exploring the existing opportunities for "debt-for-nature-swaps", such as that offered under the Enterprise of the American Initiative, the use of which has been pioneered in the region by Jamaica. In countries where development projects constitute the highest priorities for the appropriation of government revenue, this may offer the only viable solution to address the need to fund environmental management initiatives.

2.2.10 Biological diversity and its management

The Present Management of Biological Diversity

The management of the natural floral and faunal resources is directly the responsibility of the Forestry Department. Legislation which guide the management of biological resources are predominately the Forest Resource Conservation Act and the Wildlife Protection Act. The National Forest Resource Conservation Plan also guides the resource management and conservation process in this regard.

The National Development Plan of SVG should also make allowance for the development and proper use of the natural resources for the benefit of the country.

There is presently no direct intention for the management of biological diversity, however, the protection of forested areas, reserves and the reforestation of deforested areas all play a role in the maintenance of floral and faunal diversity. The enforcement of wildlife laws by restricting hunting and the monitoring of the wild parrot population is also done by the Forestry Department.

2.3 MARINE AND FRESHWATER DIVERSITY

Currently, just over 100 species of fish are landed at the New Kingstown Fish Market, St. Vincent's central fish market. From January to August, the main species landed are offshore and inshore Pelagics. The offshore pelagics are highly commercial, with relatively high consumer demand and prices. The large tunas caught by the longliners have even greater economic value, fetching high prices in local and foreign markets.

Shallow-shelf reef fish and deep slope demersal species are mainly targeted from September to December, the "low" season for offshore Pelagics and are usually valued higher than the offshore Pelagics. Lobster, caught during the open-season September 1 to April 30 has by far, the highest

economic value and is heavily demanded by hotels/restaurants and foreign markets, particularly in Martinique.

The residents of Barrouallie and Paget Farm in Bequia, two of the main fishing villages in the country, traditionally practice whaling. In Barrouallie, the main species targeted is the Pilot Whale (*Globicephala macrorhynchus*), and in Bequia, the humpback whale *(Megaptera novaengliae)* for which the country has an International Whaling Commission (IWC) quota of two per year.

Even with the recent developments in the fishing industry, there still remains numerous under and unutilized species, including various deepwater species, such as, Gastropods and Algae for instance enjoy great economic potential. On the other hand, there are various species which have been over-exploited and others which are being destroyed before realizing their full economic potential. While there are natural threats to the marine environment, human activities such as inappropriate fishing methods, pollution and coastal degradation threaten the conservation of the country's biodiversity. (See Appendix 5(a) - 5(g) National Fisheries & Marine Biodiversity Listing, and Appendix 5(h) - 5(i) for Management Objectives/Threats to Main the Fisheries, and Uses/Benefits/Threats to the Main Fishery respectively)

All citizens of St. Vincent and the Grenadines are either direct or indirect stakeholders in the fishing industry and must therefore be concerned with the sustainable use and conservation of marine biodiversity. The marine resources provide food, employment, income, foreign exchange, recreation, aesthetic beauty, cultural traditions and numerous ecological services. In light of the recent uncertainty about the future of the country's traditional mainstay, the banana industry, the marine/fisheries biological resource stock opens numerous economic possibilities to enable the adaptation to the changing needs and economical circumstances occurring locally and globally.

2.3.1 Current Status of Marine and Freshwater Species

Freshwater Biodiversity of St. Vincent and the Grenadines

Very little information is readily available about freshwater biodiversity. The Forestry Division is responsible for rivers, but not much has been done in terms of conducting an inventory. (See Appendix 6. Fresh Water Biodiversity Species List)

Fishing Grounds and Habitats

The collection of data on fishing grounds and habitats is ongoing. There are maps from as early as 1970, showing the approximate location of fishing grounds. The current data collection initiative, known as the Trip Interview Programme (TIP) contains fields which capture the location of fishing grounds. Additional information is obtained through informal discussions with fishermen, and reports from the Fisheries Division training vessel, "Black Jack", a multipurpose fishing platform equipped with a Global Positioning System (GPS), and fish locator equipment. (See Figure 5. Map of SVG fishing and Whaling Grounds)

The OECS-NRMU is spearheading a project to map coastal habitats. Work has already begun in the digitizing of fisheries conservation areas, with the aid of satellite imagery and aerial photographs, using the GIS software Arc View. Plans are underway to incorporate information from historical, traditional, anecdotal, current knowledge, and previously mentioned sources on fishing grounds and habitats into the national GIS.

2.3.2 Marine Protected Areas

The Tobago Cays National Marine Park

The Tobago Cays comprise four small Grenadine islands, Petit Rameau, Petit Bateau, Baradal and Jamesby. The Cays are renowned in the tourism industry for their extensive coral reefs ideal for snorkelling and scuba diving, and clear, shallow waters esteemed in the yachting world. (See Figure 6. Tobago Cays National Marine Park Zones)

The first step toward the protection of these islands and surrounding waters occurred in 1987, when the Government of St. Vincent and the Grenadines designated the area as one of ten marine conservation areas in the country. Since then, the area was designated a marine park and is now managed by a Board, as mandated by the Marine Parks (Tobago Cays) Regulations of 1998.
Project proposals for the management of the Cays were prepared by the Organisation of American States (OAS) and the French Cooperation. The latter signed an agreement with the government to implement an action plan, and has effected among other ventures, a monitoring programme and the placement of yacht moorings.

The Tobago Cays were recently officially handed over to the government of SVG by the private owner. "The Mission of the Tobago Cays Marine Park is to protect, conserve and improve the natural resources of the Tobago Cays."[1]

Many of the activities in the Tobago Cays have negative impacts on the marine environment and contribute to the loss of the biodiversity of the Cays. As a result, plans are in place for better control of these activities. Therefore, commercial activities in the park will be prohibited.

[1] Taken from the "Tobago Cays Marine Park Management Plan, August, 1998"

Figure 5. Map of SVG fishing and Whaling Grounds

Figure 6. Map of The Tobago Cays National Marine Park Zones

Marine Protected Area Management

One of the objectives of the Tobago Cays Marine Park is to protect the natural resources critical to the maintenance of biodiversity, especially the coral reefs and their inhabitants. Consequently, various efforts have been made, and more have been planned, to ensure that this goal is achieved. Some of these efforts are as follows:

Moorings: Mooring anchors have already been placed in the area to help prevent yachts and dinghies from anchoring on the fragile Horseshoe Reef. Park management has also implemented measures to ensure regular maintenance of these moorings.

Controlled Scuba Diving: Plans to limit scuba diving in the area include the requirement that divers be customers of local dive operators. This would ensure that the divers are supervised by qualified dive masters, who in turn would be registered with the park. Such an effort would minimize physical impact on the reef. Foreign dive masters would need to apply for permission to dive in the area.

Garbage Control: A definite system to prevent yachts from dumping their waste in the waters of the Cays has not yet been decided upon. Park management is still toying with two ideas, (1) A "No Tolerance" garbage rule which would demand that boats keep waste onboard under all circumstances, and (2) A Vendor Collection System, under which waste collectors would be paid to take garbage from the yachts and ensure that it reaches a proper waste disposal site in Union Island. However, there is much concern regarding the handling of garbage by collectors.

Cruise Ship Control: A recommendation for a system to limit the environmental destruction caused by cruise ships has been made to the Tobago Cays Board. This system will forbid cruise ships anchoring in the recreational zone of the park. It is advised that no more than one cruise ship be allowed to enter the park on any given day, and that no more than three cruise ships be allowed per week.

Zoning: Buoys will be used to demarcate zones in the area. Recreational and Scientific zones would be clearly indicated. The buoys would have different colours depending on the zone and the colours would also differentiate moorings for boats of specified sizes.

Fees and Licensing: Park users would be subject to fees and licenses as a means of distributing some financial responsibility for the management of the park among the users. Per head entrance fees, diving fees, permits and fines for environmental degradation would be implemented in this regard.

Coastal Mapping: The OECS-NRMU has proposed a national coastal mapping project to include aerial photographs of the Tobago Cays. Participants in this project are from the Fisheries and Planning Divisions. Unfortunately, there seems to be some difficulty getting the aerial photography done.

Research: A study of the currents in the area was proposed by an organisation called Seascape. The organisation also submitted a proposal for a mapping study to the French Mission, and is receiving support, particularly from an international academic institution to implement this study.

A 1986 study of tourism development in the Grenadines included an inventory of the coral reefs in the Cays, as well as current flow in Horseshoe Reef (Berwick, 1986). Recommendations have been made for the park to seek linkages with international environmental research groups.

Law Enforcement: This is of critical concern to the park's management, which does not want to be perceived as a law enforcement group. While management would be concerned with environmental management and ensuring that specific park rules are met, the park needs to have a proper enforcement system. The Marine Parks (Tobago Cays) Regulations, 1998, prohibit the fishing and destruction of flora or fauna, among other activities

Public Education: School programmes, slide shows and community consultations have already been carried out in Union Island and would hopefully continue. Brochures and guide books would be provided to users of the park. Park management hopes to promote the formation of a "Friends of the Tobago Cays" group which will strengthen the community link and provide monitoring assistance.

Monitoring: Present coral reef monitoring efforts include sediment traps from which data are collected and processed twice per month, temperature loggers, Secchi disk[2] measurements, dive logs and photoquadrats.

2.3.3 Marine Conservation Areas

There are nine other Marine Conservation Areas besides the Tobago Cays as legislated in the Fisheries Regulations, 1987. Of these, only one is on mainland St. Vincent. The others are scattered throughout the Grenadines, with two in Bequia and two in Mustique. These areas were earmarked for special protection of their habitats and resources, as well as for research purposes and the maintenance of aesthetic beauty. (See Figure 7. Marine Conservation Areas)

In recent years, the environmental degradation of many of these areas has greatly accelerated due to coastal development. No documented information about the status of these areas is readily available. In fact, it is not certain whether any such documentation was ever done.

Indian Bay/Villa/Calliaqua/Blue Lagoon

Together, these sites make up the lone marine conservation area on mainland St. Vincent which encompasses over 30% of all hotels/guest houses in St. Vincent and the Grenadines. Restaurants, tour companies, marinas and other tourist oriented businesses are also found in the area. The activities of all of these businesses have impacted greatly on the marine environment and pose a severe threat to the biodiversity of the area. The effects of these activities are seen through coral reef degradation caused by sedimentation, nutrient overload and sewage discharge, physical damage by anchors grounding and diving, as well as widespread beach erosion and deteriorating water quality.

Figure 7. Marine Conservation Areas

[2] A white disk attached to a measuring line and lowered into the water until it disappears. This measures water clarity (turbidity).

The Park Bay Marine Conservation Area

Park Bay is part of the marine conservation found on the North Eastern Coast of Bequia. The other bays making up this protected area are Industry Bay and Spring Bay. In recent times, Park Bay has been given positive attention by the Interact Club, an arm of the Bequia Rotary Club, made up of students of the Bequia Anglican High School. The club is one of the few school groups in St. Vincent and the Grenadines participating in the UNESCO Sea Project.

Park Bay has very little beach and as in the Villa/Indian Bay area, rocks now appear in areas totally covered by sand a few years ago. A turtle hatchery has been operating close to the beach for the past four years. The coral reefs in the area have suffered severe sedimentation and algal overgrowth. This, and the concern that the turtles may not find any beach at all when they return to nest, led the Interact group, under the supervision of teacher Mr. Belmar, to implement the following projects:

a. Replacement of juvenile whelks to counteract the algal overgrowth
b. Cultivation of plants
c. Assisting Mr. Orton King with the release of juvenile turtles[3]
d. Erection of conservation signs in conjunction with the Fisheries Division

2.3.4 Aquaculture

Present Cultivation

No large scale aquaculture is currently being practised in SVG. Five farms currently culture *Tilapia nilotica* along with varying sub-species as a result of inter-breeding. The farms range from 120 sq. ft. to 2800 sq. ft. with an average size of 980 sq. ft. Data on overall yield is unavailable, however one farmer reports that his first harvest yielded species up to 30 cm in length. There is no mono-sex production resulting in inbreeding of black and red species (Ryan, 1998).

Two farmers currently produce shrimp, *Macrobrachium rosenbergi* on subsistence levels, but information about their operations are unavailable. In past years, the Taiwanese Technical Agricultural Mission cultured *Macrobrachium spp.* in relatively large ponds. Unfortunately, that project ended with little transfer of technology or documentation to the appropriate Government agencies and local producers.

[3] Mr. King operates the only turtle hatchery in St. Vincent and the Grenadines. He only breeds Hawksbill Turtles. His reasons were because of their significant value to man and their endangered status.

There is one known turtle hatchery in the country. It is located in Park Bay, Bequia, and is operated by Mr Orton King, as an environmental service. Only Hawksbill Turtles are cultured and they are released when they are about two years old.

Potential Cultivation

Matthes, 1984, and Kawaguchi, 1990, made recommendations for the mariculture of various species. Both were particularly concerned about diminishing stocks of Conch, Lobsters and Turtles and believed that mariculture of these species for the purpose of replenishing stocks was just as important as culturing them for marketing purposes. Matthes strongly recommended culture of seamoss, *Gracilaria spp.* in Ashton Bay, but Kawaguchi advised reconsideration of such a project as large amounts of green algae in the area would hamper seamoss growth.

Matthes was of the opinion that aquaculture is of critical importance as a resource development activity, which would help to meet the growing demands for seafood and compensate for lowered productivity of degraded marine habitats. He proposed the following four projects in his document, "St. Vincent and the Grenadines - Formulation of a Fisheries Development Programme:"

a. A Seamoss Culture Pilot Project
b. Conch Hatchery
c. Fresh Water Aquaculture Development
d. Survey of Turtle , Lobster and Fish Mariculture Prospects

2.3.5 Economic Importance and Potential Use of Marine & Fresh Water Biodiversity

About 1.6% of the national workforce is made up of full-time employees in the Fisheries sector (Morris, 1996). Recent estimates show that there are approximately 2500 fishermen/women and at least an equal number employed in supporting businesses, such as marketing and boat building/repair.

Although fishing contributes only about 2 % to the total GDP, it accounts for an important sector in the agriculture industry. In 1997, it contributed more to the GDP than bananas and forestry and is comparable with the hotel and restaurant sector which contributed 2.5 %.

The Quality Control/ Product Development Unit in the Fisheries Division is currently conducting market research and developing various seafood products including:

- Smoked *Robin*, *Balahoo*, *Tuna*, *Blackfish*, *Marlin*
- *Whale* bacon
- *Blackfish* bacon

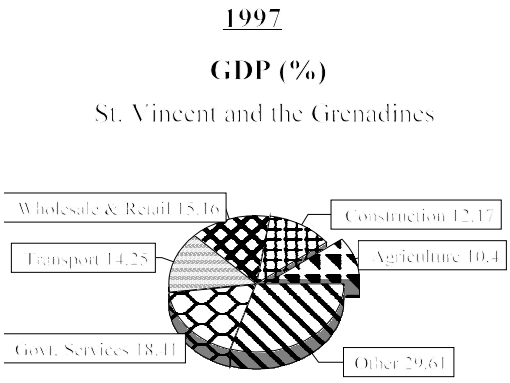
- Marinated *Balahoo*, *Spratt*
- Filleted *Robin*, *Flyingfish*, *Balahoo*
- Smoked and seasoned *Tuna* chunks

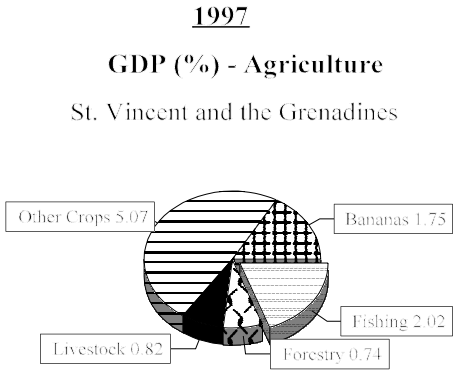
The Division plans to continue its experiments which will include fish paste and canned products. Knowledge and skills necessary for the development of these products will then be transferred to locals through training workshops and exhibitions.

Sharks and cetaceans also present various possibilities for product development. Cetacean oils are regarded as having high medicinal value and can open economic doors for the country as health-food markets continue to grow regionally and internationally. Sharks are prized globally for their hides, fins and oils, and in this regard offer a myriad of economic possibilities.

Marine invertebrates are highly utilized internationally for food and in the production of various products. A number of those found in our waters are edible and others can be used in the manufacture of soup bases, pharmaceutical and cosmetic products and animal feed (Morris, 1996).

The following pie charts illustrate the contribution of the fisheries sector to the GDP of SVG.





2.3.5.1 Value of Recent Exports

In 1998, exports from the Grenadines accounted for about 50% of total exports. In the Grenadines, lobster is particularly valuable as an export product, with Martinique being its main market. During the lobster season which ran from September 1998 to April, 1999, approximately 72,000 lbs of lobster was legally exported with a value of about EC $ 700,000. In recent years, on mainland St. Vincent, the export of large tunas from the longline vessels has contributed significantly to total exports.

Trends toward more stringent quality control measures, such as HACCP[4], are making it difficult for international trade of fish, since it is highly perishable. At an OECS Fisheries symposium held March, 1999, regional fisheries managers admitted that it would be very difficult for the islands to perform the required tests because of a severe lack of accredited testing labs. Fisheries representatives were also of the opinion that the establishment of such a lab, even a regional one, would be a great challenge.

With international market rules becoming increasingly tougher, there is need to reduce imports and utilize local fish products. It seems unfair that export of local products poses such a challenge, when numerous types of foreign fish products enter the country with relative ease. Obtaining optimum returns from the country's marine biodiversity through sustainable use should be the goal.

[4] HACCP - Hazard Analysis Critical Control Point, a food safety management system which is becoming increasingly important in international trade.

2.3.5.2 Benefits and Threats to Marine & Fresh Water Biodiversity

While natural phenomena may cause destruction to biodiversity, human activities are by far the most consistent and damaging in the long-run. Increased population, fuels the demand for more land space, leading to inland degradation and waste build up. Increasing environmental degradation inland leads to the same in the coasts, and the seas become the garbage bin for the waste from inland activities. Degradation of the oceans result in loss of biodiversity and unfortunately many seem not to realize that reduced biodiversity leads to reduced chances for man's survival.

Fisheries Resources

The benefits of fisheries are wide ranging, from nutrition and medicine, to employment, income and national revenue. In St. Vincent and the Grenadines, most coastal villages depend on fisheries resources as their main protein source. Various species, especially shellfish, are regarded as delicacies by locals as well as tourists. The Fisheries Division is working to encourage expansion of fishing activities into the harvesting and marketing of large tunas and deep-slope species, previously under-exploited by locals because of inappropriate boats and gear.

Marine & Fresh Water Habitats

Besides the open sea, the main fisheries habitats are coral reefs, mangrove swamps and seagrass beds. Loss of biodiversity is largely attributed to habitat degradation mainly as a result of inland activities. At the same time, threats originating at sea, such as oil spills, direct garbage disposal and physical damage to coral reefs also help to degrade habitats. In St. Vincent and the Grenadines, poor planning of coastal construction is a major cause of the destruction of habitats. Mere observation by diving/snorkelling around the bays of the country shows widespread sedimentation of coral reefs and a few struggling coral and fish species in areas where biodiversity was once greater.

Marine Protected Areas

There are ten legislated marine protected areas in St. Vincent and the Grenadines, but none are systematically monitored by the Fisheries Division. These areas were designated to protect fisheries habitats, especially coral reefs. None of these areas occur in the Grenadines where tourism and other activities are in direct conflict with habitat conservation. Fortunately, the Tobago Cays, consisting of the most extensive coral reefs in the country has in recent years been given added protection as a National Marine Park.

2.3.6 Support Systems for the Management of Biodiversity

2.3.6.1 Legal Framework

Various international conventions/commissions support the proper management of Biodiversity through sustainable use. On the other hand, there are some which emphasize preservation (non-use of the resource) rather than conservation (wise use of the resource). St. Vincent and the Grenadines has signed various environmentally related conventions, and is a member of a few organisations which support both the conservation of biodiversity.

For the conventions which have been ratified, the country is required to fulfill certain requirements. For example, this country report has been prepared in partial fulfilment of one such requirement of the Biodiversity Convention signed in Rio de Janeiro, June 5, 1992. Other international commitments such as CITES affect the trade of fisheries resources.

There are a few regional initiatives which relate to biodiversity management, some relate specifically to fisheries biodiversity while others incorporate it. Various local legislation exists particularly to support conservation efforts. In many cases, local legislation does not support international conventions, making it difficult to ensure that international requirements are met.

2.3.6.2 Regional Initiatives for Biodiversity Management

Few regional initiatives specific to fisheries biodiversity management exist. However, others such as the Caribbean Conservation Association (CCA) incorporate the sustainable use of fisheries resources. One of the major regional initiatives which supports the management of fisheries biodiversity is the Caricom Fisheries Resource Assessment and Management programme (CFRAMP). The programme was formed in 1991 and is funded jointly by the Canadian International Development Agency (CIDA) and participating member states. Part of the programme's mandate is to assess major fisheries resources in the region and strengthen the capabilities of fisheries divisions of member countries to manage their biodiversity.

2.3.6.3 National Policy

No local legislation has been approved to specifically address the Biodiversity Convention, however various existing environmental regulations support sustainable use of fisheries biodiversity. Fisheries regulations prohibit the use of destructive fishing methods, thereby protecting habitats and juvenile fish. There are closed seasons and minimum sizes for lobsters and turtles, and a minimum size for conch.

2.3.6.4 Institutional Capacity

Apart from the supporting agencies mentioned in the preceding paragraph, there is a general lack of human resources to facilitate efficient management of the country's biodiversity. As previously mentioned, the problem lies mainly with the absence of a fisheries department presence in the Grenadine islands where much of the fisheries resources exist, and where a large percentage of the population depends on fisheries for their livelihoods. Nevertheless, the Fisheries Division has been one of the fastest growing units in the Ministry of Agriculture, in terms of human resources as well as technological advances.

Ambitious vision of management, along with commitment to the proper management and development of the fishing industry has resulted in a staff where more than half of the technical staff has been trained at least to a first degree level. In addition, junior staff members are also well trained and opportunities continue to open for further training for staff members at all levels. Still there are numerous openings for additional staff, and advanced technology to facilitate efficient management and sustainable use of fisheries biodiversity.

3. OTHER ACTIVITIES IMPACTING ON BIODIVERSITY IN SVG

3.1 AGRICULTURE & BIODIVERSITY CONSERVATION

Agriculture is the mainstay of the economy, accounting for about 19% of GDP and absorbing some 66% of the labour force. Bananas are the principal crop, accounting for 50% of agricultural exports. However, several other agricultural commodities are produced , including coconuts, sweet potatoes, plantains, eddoes, tannias, and yams.

Because of SVGs dependence on agriculture, the economy is highly vulnerable to the weather, especially hurricanes, and the external developments affecting commodity prices, especially in the preferential market for bananas. (NEAP, 1992)

3.1.1 Vegetative Cover

The earliest reports on vegetation were recorded by T. S Beard in 1949, based on observation made at that time. The existing vegetation was attributed primarily from man's use of the land for plantation agriculture during the colonial period, and also due to the physical impacts of periodic volcano eruptions. These conditions although recorded in 1949 still hold true today. The forms of vegetative cover include the following:

Rain Forest: Confined to areas in the upper Colonarie, Cumberland and Buccament Valleys between 1,000 to 1,600 feet.

Lower Mountain Forest: This forest type did not exist in the 1940's the forests having been felled for construction purposes and the land cultivated in the early colonial period. Estate boundaries and remnants of sugar factories and buildings bear out this observation.

Secondary Rain Forest: This refers to the forests which were disturbed by volcanic eruptions, hurricanes and human activity. The largest areas lie in and around the Soufriere mountainous. The vegetation ranges from almost bare soil on the upper slopes of the volcano to significant stands of new forest at lower elevations.

Palm Brake: This refers to a sub-climax type apparently arising after such disturbances as land slides. The land is covered initially by mosses, then by small tree ferns and heliconias and by Mountain-Cabbage Palms in mountainous regions above 1,640 feet.

Elfin Woodland: Found on exposed summits above 1640 feet on both sides of the central mountains. They consist of pure stands of dwarfed trees about ten feet in height covered with Epiphytes. As may be observed by the similarity in elevation, they are sometimes associated with the Palm Brake.

Deciduous Seasonal Forest/Cactus Scrub: On the very dry southern and south western coast of St. Vincent and in the Grenadines where soils are extremely thin the land is covered by rough, dry, scrub species with spiny columnar cacti interspersed in it.

Littoral Woodland: This type of vegetation characterised by manchineel, button mangrove, sea-grape and similar species exist in small narrow strips along the eastern coastline on St. Vincent and on a number of the islets and cays of the Grenadines. This type of vegetation is fast disappearing as development takes place along the coast.

Swamps: Only small areas of swamp occur in St. Vincent and the Grenadines. These exist in the southern section of the main land on the sea coast and on a few of the Grenadine islets. The typical species are Red Mangrove, Black Mangrove, White Mangrove and Button Mangrove.

3.1.2 The Soil Types of St. Vincent

St. Vincent is made up of volcano ash soils in the north of the island. These are young, coarse textured sandy soils which are free draining and have the propensity to release their mineral nutrients when cultivated. (See Figure 8. Soil Type Map of St. Vincent)

Above the 600 ft foot level are so called zonal or high level yellow earth soils which are deeply weathered, poorly drained, leached and acidic due to their location in high rainfall areas.

Below the 600 ft level are the low-level yellow earth/brown earth soils. These are less leached and drain more freely. These are usually more fertile and occur on gentler slopes.

Alluvial soils: These soils occupy about 1800 acres of valley floors mostly in the south west. These are the island's most fertile soils.

Shoal clay soils: These occur in the southern and western coastal belt. They are sticky when wet, and hard and cracked when dry. These soils are of medium fertility and are difficult to cultivate.

Central mountain soils: Shallow soils occurring in high rainfall areas, most of them are under forest; they have high organic matter near the surface, are acidic and leached. They have the highest potential for serious erosion and should not be disturbed.

Figure 8. Soil Type Map of St. Vincent

3.1.3 The Impact of Crops on Bio-diversity

The early inhabitants of St. Vincent and the Grenadines, created little disturbance in the bio-diversity of the island. The Oriental and African people encountered here by early Europeans, had lifestyles and cultivation practices which had little negative impact on the flora and fauna. This soon changed, since extensive land area was later burned and cleared for sugar plantations. With the forced labor of enslaved Africans they cleared every cultivable acre and covered the island with Sugar Cane.

The crop chosen may have saved some of the natural bio-diversity; sugarcane did not do well in the wet foothills of the rain forested mountains. Sugarcane covered most of the coastal lands except where the soils were extremely thin and rocky surfaces presented themselves.

Cotton succeeded sugarcane and despite the severe soil erosion brought about by its cultivation, that crop persisted in SVG up to the 1960s.

It may reasonably be assumed, that the period of cotton production was one when the nation's bio-diversity would have been significantly reduced in the areas where it was cropped. D. D. T. was introduced to the ecosystem at this time. When the cotton crop ceased, several food and vegetable crops were cultivated. Arrowroot persisted as a crop in the recent volcanic ash soils and Lead Arsenate was used to control pests. Coconut cultivation followed the devastating eruptions of the Soufriere volcano in 1902, this crop saw no fertilizer or pesticide use.

It was bananas, however, that was to become the next king of mono-crops. It became the first intensively cultivated crop in the islands history to utilize modern chemical pest and weed control systems and a definite fertiliser regime. There is, at this time, no evidence that species were lost in the process of banana production, but it is clear that birds, frogs, lizards, opossum and agouti have been killed by chemicals used in the fields. The soil fauna has also been affected but the extent is unknown. Stream life has also been affected, but as in the other cases no studies have been done to ascertain the extent of the loss.

The cultivation of vegetables continues with little obvious effect on the bio-diversity. This is probably due to the fact that large commercial quantities are not grown.

It is very likely that while the numbers within species have been reduced by crop production, the actual number of species have not been affected. It must be observed that because the land surface is so fragmented, there very seldom exists an area of five or more acres which does not have one or more breaks in cultivation due to rock out crops, ravines or other areas which cannot be cultivated successfully. It may be in these areas that species find sanctuary and from them that the lands are repopulated.

There are crops that have been de-emphasized, as cultural patterns change, but these are seldom if ever completely lost. This applies to several marginal crops which exist in small quantities in some locations.

3.1.4 The Impact of Livestock on Bio-diversity

St. Vincent and the Grenadines has not had a history of intensive livestock production. The last herd of cattle now runs at Mount Wynne Estate on the Leeward side of the island in an area designated for hotel development. On that same coast, but in a more southerly direction cattle roam unattended on the Pembroke estate or what remains of it.

At present livestock - Sheep, Goats, Cattle, Pigs and Poultry are raised throughout the nation in small numbers most owned by landless farmers. Chickens are the exception to that rule with several small farmers raising fewer than five thousand birds at any one time.

Given the low level of livestock breeding, it is very doubtful the raising of livestock on mainland St. Vincent has contributed to any loss of bio-diversity . In the Grenadines however, and on the island of Balliceaux in particular, cattle, goats and sheep are grazed intensely on this dry islet which has lead to approximately 50 % of the soil cover being completely lost.

Other Grenadine islands, Mayreau, Canouan, and Union have a practice called "Let go Season" when in the usually severe dry season, animals are released to fend for themselves. This has in the past led to the decimation of all edible species of plants including those cultivated by residents.

It is very likely that in these situations bio-diversity has suffered tremendously. However, there are no studies which support or refute this hypothesis with empirical evidence.

3.1.5 Disease Control Measures

The most prevalent disease conditions in livestock arises from an overburden of helminths in all types and of ecto-parasites in the major species; viz-a-viz cattle, goats and sheep. The animal health division of the Department of Agriculture conducts regular de-worming clinics in areas of high animal population. In addition, anthelmintics may be bought in the city. Ecto-parasites, the most common pests are mainly ticks in the case of cattle and mites in goats and sheep. Animal health technicians are positioned around the nation to carry out the treatment of pests and diseases which occur regularly and to summon the veterinarian when cases are new or complex.

3.1.6 Agricultural Research: Its Impact on Bio- diversity

St. Vincent and the Grenadines has for the last ten years not been involved in any meaningful agricultural research programs. The nation has however benefitted from research done in the banana crop by the Windward Island Banana Research Unit (now WIBDECO RESEARCH). Several new varieties of bananas have been introduced and a number of new fertilizers and pest management systems have been introduced and adopted.

In what may be regarded as applied research, the ministry has imported new stud animals (goats and sheep) from breeders in the United Kingdom. These breeds have been locally evaluated in terms of their performance, and stud breeding services have been offered in several agricultural districts in the islands.

3.1.7 Direct Use of Agricultural Bio-diversity

There are no game ranching operations in St. Vincent and the Grenadines. It is however, possible that if there is an increase in demand for "Wild Meat" that Iguana farms might be started in the drier areas of St. Vincent or in the Grenadines. Agouti have been successfully raised in some Caribbean territories and it is quite possible that such an exercise may be considered.

No new types of agricultural crops have been developed here using species from the wild. In recent times (1998-1999) some consideration is being given to cultivating Morinda Citrifolia (Jumbie Soursop) since it has become popular as a "cure for all illnesses in the Western world".

There has been no breeding of new varieties of livestock or of agricultural crops using genetic materials from wild species on the island.

3.2 PHYSICAL DEVELOPMENT PLANNING & BIODIVERSITY MANAGEMENT

3.2.1 Background

Since the introduction of the Town and Country Planning act in 1976 physical planning has played a significant role in development of this country. It has encouraged better development standards and promoted the need to conserve, preserve and reserve vital natural resources. Human development activity in the state is increasing as the population size increases and as a result, physical planning legislation and regulations are employed to regulate the process. Natural hazards are unavoidable in this region, however, physical planning techniques are also employed to minimise the impacts. Similarly, environmental laws were enacted to protect very sensitive ecological systems

that are vital to the survival of the country's natural resources and sustain the biological diversity mix.

Many of the natural resources of St. Vincent and The Grenadines are still in good condition. Maps of the built environment and the existing land use of SVG show evidence of the large extent of the forest resources that still exist. There are many areas that have not yet been invaded by human elements and activities, which offer planners and environmentalists opportunities for future sustainability of the environment.

The development of the built environment over the last two decades has continued the initial landuse pattern, mainly along coastal strips (See Figure 9. Existing Land Use Patterns in St Vincent). The expansion stems from the introduction of a mortgage scheme by the National Commercial Bank (NCB) during the 1980's. This mortgage scheme allowed both middle-income and low-income earners to qualify for loans to build homes and establish other small-scale commercial enterprises. From an environmental stand point, that meant more lands had to be committed to construction, more infrastructure had to be implemented, which consequently resulted in more displacement of fauna and the increased removal of vegetation.

3.2.2 The Impacts of Physical Development

The increase in construction has resulted in higher density of the built environment, and greater amount of paved surfaces, and hence run-off. In areas where this obtains on sloping lands, especially in rural villages, there have been numerous occurrences of landslides. These occurrences have resulted from adverse conditions; such as the extensive removal of flora from their natural environment, where their rooting systems could have controlled the movement of soil during heavy rains and run-off. This scenario may be further compounded in instances where development takes place outside the formal planning system, e.g. squatting.

Figure 9. Existing Land Use Patterns in St Vincent

Squatter settlements are fast spreading in environmentally sensitive areas, e.g. water catchment areas, beside riverbanks, within dry riverbeds, and on forest reserves; and to a large extent on valuable crown lands. It has posed some serious health hazards, and environmental degradation in many areas. As a Caribbean island this country's social, and economical development is directly related to its natural resources, which are rapidly being depleted and destroyed. The rapid rate of squatting has given the planning authorities little or no opportunity to intervene or to assist in the establishment of development that satisfy planning regulations. Therefore, planners had little or no chance to regulate or to influence the manner and rate at which development took place in these areas where squatting has occurred (see Figure 10. Squatter Areas in St. Vincent)

Although the planning authorities encounter most problems with the informal sector, the formal sector does not go without demerits. Many developers have to a large extent contributed to the degradation of the country's environment and its resources. In many cases, formal developers receive planning permission, but in practice totally ignore the planning regulations and conditions of approval that are required to achieve an acceptable standard of development.

Villages, which are located close to streams, often cause pollution to these water courses. Pollution occurs as a result of human activities as many persons use the streams for several domestic purposes: Washing, cooking, backyard gardening, bathing, the dumping of garbage and the discharge of sewage. Thus, villagers upstream can pollute the water for downstream users. Where these activities take place close to the source of streams and/or water catchment areas the problem assumes quite serious proportions. The real impact of these activities will not only have a negative effect on other villages that use the streams for the same purposes, but may even affect the domestic water supply to the island.

Farming practices, which are currently employed, are heavily dependent on the utilisation of chemical fertilisers, which may have negative impact on the environmental quality. These chemical compounds which eventually percolate into underground water systems, can pollute and damage vital water resources. Land use conflicts exist , such as in the case between forestry and agriculture, where farming may be competing for forest areas, often occurs within forest reserves. The chemical compounds used by farmers leach into the soil and may destroy vital indigenous flora and fauna within the forest. A forest is an important resource, it contributes to the regulation of climatic conditions in any region.

Marine resources are sometimes threatened by pollution that occurred on land and upstream of rivers. Other pollutants are introduced into the sea by boats and large ships, which have resulted in large scale poisoning of marine species. Out of season hunting and fishing can potentially threaten the viability of certain rare or endangered species that play critical roles in marine ecosystems.

Figure 10. Squatter Areas in St. Vincent

3.2.3 Legislation as a Planning Instrument

It may be argued that there already is adequate legislation on the books to protect the environment and the various species and so maintain a healthy biodiversity mix. However, there is a tendency for weak enforcement of such legislation. Often, while the various legislation may be adequate in their provisions the institutions charged with the day to day administration may be lacking in commitment, or inadequately staffed to be effective. Generally, responses to complaints on environmental breaches tend to be tardy, and this results in failure to arrest the problem quite often. In addition, the lack of effectiveness can be attributed to overlap of legislation and responsibilities and as such it may not always be clear who is responsible for what.

3.2.4 The Value of Establishing a Biodiversity Database

National environmental stocktaking, is the main objective of the data gathering process. This effort is a necessary first step in augmenting the initiative of planners and environmentalists, who are charged with the management of the islands' natural resources. It is hoped that with improved public awareness, sustainable development would be better understood by the national population.

Public education on national biological resources and the importance of biodiversity in particular is expected to promote a better quality of physical development in the future. A national biodiversity database is required to form the foundation upon which future empirical and statistical data collection can be built. The ultimate aim should culminate with the setting up of a Geographic Information System (GIS) comprising the data collected in order to make it readily accessible to national decision-makers, professionals and the public. This system should ensure that data dissemination is encouraged at a national level, as well as, to facilitate the process of data updating on a continuous basis.

3.2.5 GIS System Design Guidelines

GIS systems are computer based databases that includes spatial references for different variables stored, so that maps of each of such variables can be displayed combined and analyzed with relative ease, requires good equipment, committed skilled personnel and current and reliable data.

The preparation of a development plan to guide the establishment of a National Biodiversity GIS database would include the following tasks:

I. Establishing a set of broad goals and objectives that are desirable to be achieved from the establishment of the Biodiversity GIS database over time.

II. Outlining a system of guidelines that can assist various users and contributors of the system.

III. Establishing a national biodiversity database inclusive of data formats and standards for accuracy and detail of all data to be incorporated in any national GIS System.

IV. Establishing a committee to guide national GIS Development Policy. The committee would be comprised of senior technical and administrative personnel within government and the private sector. These persons should posses an appreciation of computer technology, and the application of GIS and database management hardware and software.

V. Establishing a lower level technical committee of users from various units to function at the 'operations' level (hands-on workers, users, data providers' etc.).

VI. Setting out a programme of meetings to ensure that committees meet often enough to be effective at their respective levels.

VII. Establishing a Technical Support Unit of technicians competent in the security and maintenance of computer hardware and software and related systems, to be the official backup support.

VIII. Establishing a basis for publishing various outputs, data in several forms, maps, charts, studies, atlases etc. for sale to the public at large in order to earn revenue to maintain the system.

IX. Endeavoring to widen the user base of the system over time to strengthen the overall national awareness. And to facilitate the future growth and development of the national biodiversity GIS database

X. Ensuring that all that is technically required to facilitate data transfer between ministries is provided inclusive of internet links to allow for on-line services and electronic mail facilities on a broad basis.

4. INSTITUTIONS & LEGAL MECHANISMS FOR BIODIVERSITY CONSERVATION

4.1 GOVERNMENT INSTITUTIONS RESPONSIBLE FOR THE MANAGEMENT & CONSERVATION OF BIODIVERSITY RESOURCES

Responsibility for biodiversity management and conservation in St. Vincent is dispersed among a number of departments of Government. No single agency of Government is charged with responsibility for the environment, although the Ministry of Health and the Environment does largely assume a leading role in this regard.

Despite the lack of a strong centralized agency for environmental management, St. Vincent has over time, strengthened the national planing and development control process and attempted to structure several forms of inter-agency coordination which have the potential to improve overall environmental accountability within the Government and to lessen fragmentation of environmental responsibilities.

4.1.1 The Ministry of Health and the Environment

The Ministry of Health and the Environment was formed in 1989. The Ministry comprises the public health services transferred from the former Ministry of Health. The responsibilities of this ministry are not clearly defined. However, within the Ministry's Public Health Department, public health responsibilities are carried out under two broad divisions: Environmental Health and Community Health. A Central Board of Health was established under the Public Health Act (No. 9, 1977), but it has not been functional since 1979. The Department coordinates some of its responsibilities with the Central Water and Sewerage Authority (CWSA) which monitors drinking water supplies and notifies the Public Health Department when levels of bacterial contamination are excessively high.

The Environmental Unit of this ministry has subsequently been established in order advise the Minister on environmental management and conservation matters. The unit is currently headed by an Environmental Officer, and also employs a Resource Analyst, and a Secretary.

The Unit was envisaged from its inception to have expanded into the role of a environmental monitoring/regulatory agency in addition to facilitating public education and awareness on environmental issues and initiatives, as well as enhancing its project execution capacity. Proposed staffing in order for the unit to effectively carry out these additional functions include: an Environmental Chemist, Environmental Engineer/Planner, legal Specialist, and a Sociologist trained in Education/Public Relations. However, these additional appointments are pending approval by the SVG Cabinet.

The *National Environmental Advisory Board (NEAB)* falls under the Environmental Unit of the Ministry of Health and Environment. The primary mandate of the NEAB is to advise the government on the implementation of the SVG NEAP. The NEAB is chaired by the Chief Environmental Officer of the Environmental Unit, and also seeks to provide advice to the minister on all environmentally related matters, which also include biodiversity conservation/management concerns. The Board consists of eleven members who serve on a voluntary bases, and represent the following sectors:

- The Environmental Unit (Chairman)
- Ministry of Communications & Works
- Community Development
- Legal Department
- Planning Division
- Forestry
- Fisheries
- Agriculture
- Environmental Health Department
- National Trust
- National Youth Council
- and NGO representation

4.1.2 Central Planning Unit

Development control activities in the country are the responsibility of the Physical Planning Unit (PPU) and Development Board. Its membership is comprised of the Director of Planning, Manager of the Development Corporation, Chief Engineer, Chief Agricultural Officer, Chief Surveyor, Public Health Superintendent, General Manager of the Housing and Land Development Corporation, Manager of the Central Water and Sewerage Authority, and three other appointed persons not in public service. At present, there is no representation on the Board from the *environmental* component of the Ministry of Health and the Environment. Because of its broad inter-ministerial base, Lausche (1986) points out that the Board functions as a coordinating body for planning and development control decision-making in the country.

The Physical Planning Unit within the Central Planning Divisions (CPD) serves as the Secretariat to the Board and provides the Board with technical staff. Additionally, the PPU is charged with the preparation of physical development plans and with the administration of development control regulations. In effect, the PPU fulfills the dual function of development planning and development control. The office also maintains that one of its responsibilities is to advise Government on environmental matters and to assist in environmental management.

4.1.3 Ministry of Agriculture & Labour

A Soil and Water Conservation Unit (SWCUT) was set up within the Ministry of Agriculture in 1988 in response to growing concern about soil erosion and the need to improve soil conservation techniques among small farmers. The agricultural officer who heads the Unit prepares soil conservation programs to include public education, demonstration farms, data collection, and soil erosion surveys.

The Ministry's Extension and Advisory Services Division, in addition to providing customary field services for farmers, operates the Botanic Gardens and supports a small Tree Crop Development Program. The Ministry also supports a small Research Unit which lends services to the Extension Division, works in collaboration with CARDI's St. Vincent office, and monitors rainfall in the country's eight agricultural districts.

The Ministry of Agriculture has responsibility for administration of the Beach Protection Act (No. 10, 1981) which provides for the protection of beaches and the regulation of sand removal. Applications for permission to remove sand from beaches are required, but the law has never been fully enforced.

Another piece of legislation which falls under the authority of the Ministry of Agriculture but which has not been substantially enforced is the Pesticides Control Act (No. 23, 1973), which legislates control procedures for the importation, sale, storage, and use of pesticides. However, until regulations are enacted, the Board has little or no control over the import, distribution or use of pesticides in St. Vincent and the Grenadines.

4.1.4 The Forestry Department

The work of Forestry in St Vincent and the Grenadines began in the 1950s under the Superintendent of Agriculture. The early work was mainly protection of forest and water catchments and the sale of charcoal license with very small scale planting.

The department currently has annual Programmes which include the following;

- Reforestation
- Plantation maintenance
- Utilization
- Recreation Site Management
- Education
- Watershed management
- Wildlife management (focussed around the St. Vincent Parrot)

The country is divided into four (4) physical regions called ranges, they are the north windward, south windward, leeward and central which includes the Grenadines.

Forestry Development

With the passage of the Forest Resource Conservation Act of 1992, the Forestry Division was given the mandate to become a department with the Director of Forestry as the head. During the years 1989 to 1994 a forestry development project was carried out funded by CIDA and the Government of St. Vincent and the Grenadines.

The forestry development project had the goal of "developing the institutional capacity of the St. Vincent and the Grenadines Forestry Division to manage and protect the country's forest resources and to create an awareness among Vincentians that they can reverse the trend of environmental degradation while providing for their forest needs."

The outputs of the project included:

- the training of staff at both technical and management levels
- the construction of a Forestry Headquarters building
- the purchase of additional vehicles and a radio communication system
- the development of a reforestation programme
- the development of legislation and a forest policy

One of the major outputs of the project was the development of a National Forest Resource Conservation Plan for the 10 year period 1994-2003 which is to guide the Forestry Division in the implementation of the forest policy, legislation and regulations that were developed in the earlier stages of the project.

The Forest Policy seeks to facilitate, conservation management, development, production and the enhancement of the country's resources in harmony with national Programmes and development plans. The objectives of the policy are:

- *Increasing the contribution of the forestry sector to the country's social welfare and forest economy;*
- *Establishing, measuring and maintaining the Crown Forest Estate;*
- *Managing the Crown Forest Estate;*
- *Developing forest industries;*
- *Providing areas and facilities for outdoor recreation, tourism, natural resource education and investigation, the conservation of genetic resources and environmental protection;*
- *Protecting, managing and utilizing wild flora and fauna which occur naturally on Crown and private lands and have economic, scientific, aesthetic or cultural value or have a site protection value;*
- *Establishing and utilizing facilities for educating and training personnel to serve at different levels in the Forestry Division, in other Government agencies and in the private sector for the management, development and use of the natural resources within the forest estate; and*

- *Executing and promoting research to provide information and technology development which will permit better management and utilization of natural resources on Crown and private land.*

4.1.5 The Fisheries Division

The management of fisheries, including enhancement of catch productivity, research and stock assessment, and maintenance of marine reserves, is the responsibility of the Fisheries Division within the Ministry of Agriculture, Industry and Labor.

Relevant legislation, the Fisheries Act (No. 8, 1986), provides for the management and development of fishing and fisheries in the state. Additionally, it gives the Minister the authority to identify and declare as marine reserves those fishery waters and adjacent land requiring special protective status. The Act also authorizes the Minister to make regulations for the taking of coral, shells, and aquarium fish, for the protection of turtles, lobsters and conchs, and for controlling the importation and exportation of fish. Regulations were passed in 1987.

4.1.6 The St. Vincent National Trust

The St. Vincent National Trust Ordinance (No. 32, 1969) established the St. Vincent National Trust as a statutory body to conserve and protect the historical and natural heritage of the country. The Trust is administered by a Board of Trustees consisting of not less than eight members.

The potential role of the Trust in resource conservation is substantial under the authorizing legislation. The Trust is empowered to raise funds, to acquire property, and to make regulations governing the use of property it holds

4.1.7 Central Water and Sewerage Authority

CWSA was established by legislation of the same title in 1978 (Central Water and Sewerage Authority Act, No. 6, 1978) and is governed by an inter-ministerial Board. The Authority was given broad powers to provide for the conservation, control, apportionment, and use of water resources. A laboratory for the monitoring of drinking water quality at public production facilities is maintained by CWSA.

Lausche (1986) had pointed out earlier that while the 1978 Act gave the Authority power to make regulations in such areas as water pollution control, soil conservation, and water quality regulation, such regulations had never been enacted.

Proposed legislation would expand the powers of the CWSA and mandate that the Authority prepare a national water resources development plan; construct and operate sewerage works; regulate private sewers, septic tanks and latrines; regulate commercial and industrial treatment of effluents; establish "protected zones" around water supplies; and impose substantial penalties for violations of anti-pollution laws.

The following table 3.2 summarizes the key responsibilities related to biodiversity conservation and management by the various government agencies in SVG:

Table 3.2 Key Institutions responsible for the Environment & Biodiversity Conservation

GOVERNMENT AGENCY	KEY RESPONSIBILITIES IN ENVIRONMENTAL MANAGEMENT & BIODIVERSITY CONSERVATION
MINISTRY OF HEALTH AND THE ENVIRONMENT	-Maintenance of environmental health -Policy advisory board to Government regarding directions and focus for the Ministry
MINISTRY OF FINANCE, PLANNING, AND DEVELOPMENT	-Preparation of physical development plans; -administration of development control; -advise on environmental matters; -Secretariat to Physical Planning -Decision-making authority for development activities -Review and make recommendations regarding development plans, projects and programs; -Central Planning Division also serves as Secretariat to the Planning and Priorities Committee (PPC)

GOVERNMENT AGENCY	KEY RESPONSIBILITIES IN ENVIRONMENTAL MANAGEMENT & BIODIVERSITY CONSERVATION
MINISTRY OF AGRICULTURE	-Extension services, research, agronomy and soil conservation -Undertake surveys for various government departments -Control of the importation, distribution and use of pesticides **Forestry Division** -Designated as lead agency to coordinate the protection and management of the nation's forests and wildlife **Fisheries Division** -Management and development of the fisheries sector and the use of marine resources within the country's EEZ.
MINISTRY OF COMMUNICATIONS AND WORKS	-Responsible for management of quarries and mining operations Central Water and Sewerage Authority -Conservation, apportionment and use of water resources

(Adapted from CCA, 1991.)

4.2 A REVIEW OF EXISTING LEGISLATION

With a growing demand for the provision of goods and services, there is an ever increasing pressure on the natural habitats, freshwater resources and energy supplies, which in turn give rise to such problems as destruction of natural vegetation and coastal ecosystems and problems of solid waste disposal. Negative impacts on the natural environment, including biodiversity, from development activities have far-reaching social and economic implications. These impacts demand that the country have a strong policy on conservation that emphasises the protection of remaining natural resources, habitats and species.

The GSVG has not enacted any specific legislation on the protection of biodiversity in response to the country's ratification of the 1992 Convention on Biological Diversity. Environmental legislation currently in force in St. Vincent and the Grenadines provides imprecise tools for the management and protection of the Islands' biological resources. The legislation lacks a broad environmental and institutional focus. Legislation is fragmented and dispersed over several statutes charging different and uncoordinated government bodies, departments and entities with environmental administration. This traditional ad hoc approach to resolving environmental problems has also led to gaps in the substantive regime of protection of biological diversity.

4.2.1 Land Resource Use and Planning

The *Town and Country Planning Act (TCPA)* (45 of 1992) enacted in 1992, makes provisions to ensure the orderly and progressive development of land and the proper planning of town and country areas and also for the control of development. The Act establishes the Physical Planning and Development Board and authorizes it to prepare national regional and local plans for submission to the Minister and approval by Cabinet. In regard to the preparation of national plans, the Board shall consider the foreseeable need and availability of land for natural agricultural and forestry reserves, national parks and, public and open spaces. The Board shall also have regard to the provisions of any coastal zone management plan. The Minister is empowered to zone any area to be reserved for a public purpose.

Under section 30 of the TCPA the Minister where he is satisfied that it is in the public's interest to do so, may by order direct the Board to take such steps as are necessary to remove, mitigate or prevent any condition that poses or is likely to pose a threat to the environment.

The Board may also make tree preservation orders where it is necessary: (a) in order to provide any public amenity, (b) the purpose of soil conservation, tree preservation, water conservation or for any other public purpose. The tree preservation order may prohibit the destruction of any tree, forest or woodland.

4.2.1.1 Protected Areas

St. Vincent and the Grenadines does not possess comprehensive Protected Areas legislation. Preservation and conservation of areas of biological diversity is undertaken in a piecemeal fashion. A number of existing laws contain provisions which provide for the establishment of a protected area. These laws are *The Forest Act*, The *Central Water and Sewerage Authority Act*, The *Town Country Planning Act*, the *Marine Parks Act* and the *Fisheries Act*. Each of these laws focuses on protection for particular purposes or under specific conditions. I n general supporting provisions (either in law or regulations) to guide the management of these areas does not exist.

The *Forest Resource Conservation Act* authorises the Minister to declare any Crown land to be a forest reserve. This can be for any of four purposes: (1) the sustained production of timber and water; (2) the conservation of soils; (3) public recreation; or (4) the preservation of flora and fauna. Within two years after the declaration of a forest reserve the Director of Forestry is required to produce a Forest Management Plan to guide development and other activities in that forest reserve. In addition, under *Section 12* the Minister may declare any area in a forest reserve to be a protected area where there shall be no (a) harvesting of timber or other forest produce or (b) development or exploration except for trails. By the schedule to the Act, the following were declared to be forest reserves: King's Hill Forest Reserve, Cumberland Forest Reserve and Tobago Cays National Park.

The Forest Resource Conservation Act also permits the Minister to enter into agreements with the owners of private land to declare such land a cooperative forest for any of four purposes: (1) managing forest plantation or natural forest for the production of timber; (2) soil and water conservation; (3) plant and wildlife conservation; and (4) public recreation.

The Act also allows the Minister (after consultation with the Planning Board) to declare any area of land, whether private, Crown or both to be a conservation area. This can be done for a variety of reasons including: (1) that the area requires the implementation of conservation practice and management controls; (2) that the water resources of the area are in a polluted condition; (3) the area is in a dangerous or unstable state above roadsides or along river and stream banks.

Mustique Company Limited Act, 1989 declares Mustique to be a conservation area and directs that appropriate action be taken to conserve and enhance the natural beauty and environment of the Mustique Conservation Area.

Wildlife Protection Act, (section 16) provides authority to establish bird sanctuaries; by proclamation Young's Island, King's Hill, Government House Grounds including the Botanical Gardens, Milligan Cay, Pigeon (Ramier) Island, and Isle de Quatre have been declared bird sanctuaries. Other wildlife are not covered and no provisions exist to define the management needs of such areas.

Section 16 of the Act also establishes a system of Wildlife Reserves as well as machinery for the creation of further Reserves. By Section 9 (1), the areas defined in the first schedule to the Act are declared as Wildlife Reserves. The schedule includes eight areas in St. Vincent and sixteen areas in the Grenadines. The largest and most important of these is the 7,596 acres (3075 ha) St. Vincent

Parrot Reserve, straddles the central mountain range in St. Vincent, and is intended to afford protection to the endangered St. Vincent Parrot (Amazona guildingii).

Apart from the St. Vincent Parrot Reserve, the protected areas in St. Vincent include the King's Hill Forest Reserve, an undefined area in the vicinity of the Falls of Baleine, the Botanical Garden and adjacent grounds of Government House and four shore islands, the largest of which are Chateaubelair Islet and Young Island, off the northwestern and southern coast respectively. Young Island, which is also part of a marine conservation areas protected under the Fisheries Act, 1986, is an exclusive tourist resort.

With the exception of an undefined area at the northeastern extremity of Bequia, all the Wildlife Reserves in the Grenadines extend protection over the entire area of seventeen small islands, island groups and rocks. Two of these, Petit St. Vincent and Prune (Palm) Island are exclusive tourist resorts. The islands of the Tobago Cays, which are part of a Marine Conservation Area, is protected under the Fisheries Act, and protected as Forest Reserves under the Forest Resource Conservation Act 1992, are also designated Wildlife Reserves under this legislation.

The *Central Water and Sewerage Authority Act, 1992 (section 21)* authorises the Minister to set aside protected areas for the protection of water resources related to water supply needs. The Minister may where he considers it necessary regulate activities within such an area.

4.2.1.2 Land Tenure and Property Rights

The Constitution of St. Vincent and the Grenadines provides for the protection from deprivation of private property. No property can be compulsorily acquired, except by or under the authority of a written law prescribing the principles on which and the manner in which compensation is to be determined, and giving to the landowner a right of access to the High Court for determination of the amount of compensation.

The constitutional provisions are of importance to protection of biodiversity because it confirms the exclusivity of private ownership and management of land. The Privy Council decision in Societe United Docks v. Government of Mauritius [1985] 1 All E.R. 864, in effect suggests that the constitutional protection of property provision extends to government action, which results in the destruction of the value of property. Or also the imposition of planning restrictions that deprives the land user of its full value, and could therefore attract legitimate claims for compensation. The risk of exposure to compensatory payments could inhibit the enforcement of government environmental policy.

4.2.1.3 Natural Vegetation

Under the *Town and Country Planning Act (TCPA)* natural vegetation is subject to piecemeal protection in several different statutes, the Act also makes provision for tree preservation orders.

4.2.1.4 Habitat Protection

There is no protected habitat legislation as such but incidental protection of the habitat of rare or endangered species is provided in several statutes.

The TCPA makes provision for a study of town and country development, preparation development and approval of national, regional and local plans. These plans must take into consideration, among other things, the foreseeable need and availability of land for natural agricultural and forestry reserves, national parks, public open spaces and other areas which appear to the Board to be in the national interest to retain or provide. Tree preservation orders may be made under the TCPA.

4.2.2 Forestry Preservation

The Forest Resource Conservation Act was passed in 1992. This Act creates a specialised forest management agency and authorises it to manage the nations' forest. The Act requires that the Director of Forestry shall prepare and submit to the Minister, a Forest Resource Conservation Plan.

The National Forest Resource Conservation Plan has been prepared for the period 1994-2003 in accordance with the provisions outlined in Section 6 of the Forest Resource Conservation Act. In the Plan, the nations' forest resources which consist of (1) timber and other forest produce; (2) water resources; (3) soils, wildlife, recreation, and other natural resources, were assessed in terms of current amounts, condition and status and compared to the national demand for each resource. The Plan also addresses the threats to the sustainability of the forest resources and attempts to reverse the trend of resources loss occurring in the sensitive upper river basins on Crown lands.

The Plan also deals with the establishment of other forest reserves with accompanying management plans. Watershed Management plans are also to be developed for the 13 watersheds on St. Vincent and those in the Grenadines.

4.2.3 Agriculture

There is no legislation which explicitly makes the connection between the agricultural and livestock segments and the promotion and protection of biodiversity. Instead relevant provisions are found in a multiplicity of statutes.

A number of laws exist which might be used to control and manage agriculture for conservation. These laws do not appear to be actively used at the present time.

The Crown Lands (Rent) Regulations (no. 25) (1983), made under the Crown Lands Act (cap. 77) contain several conditions which restrict the tenant. For purposes of watershed protection, the tenant must agree to cultivate the tenancy in a proper and husband-like manner as approved and directed by the Chief Surveyor or his duly authorised agent or agents. He shall take steps to control pests and disease, to carry out soil and water conservation measures and to maintain all types of contour bands and/or barriers which occur within the area, and perform any agricultural measures which the Chief Surveyor or his duly authorised Agent or Agents may deem fit. Enforcement of this provision on rented Crown Lands may provide some relief from the growing erosion problems being experienced with agricultural activities.

The Crown Lands (Sale) Regulations (1983) made under the Crown Lands Act (cap. 77), specify the conditions and procedures whereby Crown Lands may be sold or granted by licence. The form of the purchase agreement is contained in the second schedule to the regulations. That form already contains two provisions reserving rights over existing roads and minerals. If determined to be in the public interest, other conditions could be added to specific sale agreements to accommodate the particular natural resource characteristics (e.g., steep slopes, riverbanks) of the site.

Private agricultural lands near catchments might be regulated by the *Central Water and Sewerage Authority Act (1992)* under its power to ensure that activities near water supplies are undertaken in a manner that will not harm water supplies. Such authority might be exercised either by declaring an area a protected area (Section 20) or through the general power to advise the Minister to preserve and conserve water resources in the country (Section 8).

The *Central Water and Sewerage Authority Act (1992)* could be more specifically used to protect forest areas that are critical as catchments for maintaining water supplies. Powers include the power to investigate water resources of St. Vincent and to advise and make recommendations to the Minister relating to the improvement, preservation, conservation, utilization, and apportionment of those resources and the provision of additional water supplies . This section could be interpreted to include the necessary measures to protect land that is providing those water supplies, as well as the source or course of any body of water used for water supplies. The Authority's power is not restricted to public lands.

4.2.4 Marine & Fishery Resources

4.2.4.1 Coastal and Marine Ecosystems

The Fisheries Act of 1986, modeled after the OECS/FAO legislation drafted for the region, provides for the management and development of fisheries as well as the protection of special fishery areas designated as marine reserves. Regulations have been promulgated for implementing and enforcing the provisions of this Act. A number of marine reserves have been designated under this Act, the most famous being the Tobago Cays Marine Park. Although the Beach Protection Act of 1981 provides authority for protection of the nations beach resources and, in particular, control of beach

sand mining, the lack of implementing regulations and confusion over enforcement authority have resulted in effective enforcement of the law.

The principal legislation in this area is the Beach Protection Act of 1981. The Act prohibits the taking of any material on a beach or seabed except pursuant to permission from the Minister (Minister of Agriculture). The Minister may permit removal of materials for a public purpose or when not for a public purpose, subject to such conditions or limitations as he may deem fit. Persons having property bordering the sea are authorised to take a reasonable quantity of sand or gravel, reasonable being defined to mean no more than one truck load in any calendar year. The Minister is authorised to charge fees for the removal of materials from the beach. This legislation has considerable potential for increased use to protect beaches, especially those areas that are particularly sensitive and environmentally unstable. One important step could be enacting regulations to provide guidance on the kinds of activities that should be controlled with respect to removal of beach materials.

4.2.4.2 Marine Parks Act

The *Marine Parks Act* empowers the declaration of marine parks. In accordance with this Act Tobago Cays were declared to be marine parks. The Act also establishes a Board for the effective management of the Marine Park. The Board is empowered to issue permits, preserve and enhance the beauty of marine parks, regulate the use of parks and have responsibility for zoning within the parks.

The Act prohibits (1) fishing in the sea forming part of the Marine Park; (2) removing any object from the Marine Park; (3) damaging or impairing the growth of any flora or fauna; (4) damaging the substrata or causing pollution of the air or sea; (5) carrying out any commercial activities except in an area designated for that purpose.

The Marine Parks (Tobago Cays) Regulations, 1998 regulates anchorage and diving within the Tobago Cays, and also makes provision for designated areas within Tobago Cays. The regulation specifies certain prohibited activities within the designated areas. These include: fishing in the Marine Park; damaging or destroying flora and fauna; carrying out activities that endanger the health or safety of members of the public. These Regulations also provide for the appointment of a Park Manager, a Park Warden and other officers to be responsible for the management of the Marine Park and the enforcement of the Regulations.

4.2.4.3 Fishery Resource Management

The Fisheries Act

The Fisheries Act (No. 8 of 1986), established for the first time a legal framework for fisheries management in St. Vincent and the Grenadines. The Act covers fisheries access agreements, foreign fishing licenses, fish processing establishments, fisheries research and the registration of fishing vessels. The Act also prohibits the use of any explosive, poison or other noxious substance for the purpose of killing, stunning, disabling or catching fish. It empowers the Minister to set up marine reserves for the conservation of the environment and the enhancement of fisheries and to promulgate regulations for prohibiting harmful fishing methods. The Minister may declare any area of the fishery waters (i.e., the waters of the Exclusive Economic Zone EEZ, territorial sea, archipelagic waters, and internal waters as defined in the Maritime Areas Act), and any adjacent or surrounding land, to be a marine reserve.

The Fisheries Regulations (SRO No. 1 of 1987), pertain to the establishment of a Fisheries Advisory Committee and include provisions for foreign fishing vessels, local fishing licences and fish aggregating devices. The regulations also set out fishery conservation measures, such as closed seasons and gear restrictions, and specify coordinates for the boundaries of ten marine conservation areas. Enforcement of the law regarding fisheries and marine conservation areas is the responsibility of any authorised officer (i.e., any fisheries officer, any customs officer or police officer, or any other person designated by the Minister).

4.2.4.4 Fresh Water Resources

Central Water and Sewerage Authority Act (1992)

The Central Water and Sewerage Authority Act establishes a legal framework for the conservation, control, apportionment and use of water resources in St. Vincent and the Grenadines. The Act establishes the Central Water and Sewerage Authority whose duty includes investigating the water resources, formulating proposals for meeting existing and future water supply.

4.2.5 General Species Protection and Management

St. Vincent and the Grenadines has no legislation for the general protection of wild fauna and flora. There is no broad regulation of the international trade in endangered species as required in international conventions such as the Convention on International Trade in endangered Species of Flora and Fauna (CITES). Legislation protecting special areas and wildlife is in evidence, however there is a need for comprehensive regulation which incorporates suitable provisions for management plans and protection of intellectual property rights. Thus protection of the biological diversity of St. Vincent and the Grenadines requires further legislative attention.

4.2.6 Avian Species

Wildlife Protection Act

The Act provides for the appointment of a Chief Wildlife Protection Officer who will be responsible for the management of wildlife and the administration and the enforcement of the Act. The Act provides for the establishment of wildlife reserves (see Appendix 3) in which wildlife is protected all year round.

The Act also sets aside as a Parrot Reserve an area of 7,596 acres in a single contiguous parcel including the Upper Buccament Valley, the Upper Cumberland River Valley, and the Upper Colonarie River Valley; a separate, isolated parcel of some 3,690 acres lying to the north and bounded by the peak of La Soufriere was also included in the Reserve.

The Act provides absolute year-round protection for four species of reptiles; all seabirds; all wading birds except yellow legs, snipe, sandpipers, plovers and ducks; and all land birds except doves, pigeons, chachalaca and quail. The exempted species as well as the opossum, agouti, armadillo, and iguana may be hunted except during a closed season. The closed season for the birds is from 1 March to 30 September; and for the armadillo, opposum, agouti and iguana it is from 1 February to 30 September. Bats, rats, mice and mongoose are defined as "vermin" and may be hunted at any time.

The Act provides for fines and jail sentences for offenders, the issuance of licences and import and export permits, and special provisions for the management of the St. Vincent Parrot.

Consideration should be given to granting the chachalaca, quail and iguana absolute protection under the Act because of the increasing disturbance of their habitat and their apparently reduced populations.

Utilization of Indigenous Species

Specific legislation on utilization of indigenous species, as such, is not known to exist; however the following related information is relevant in this regard.

4.2.7 Cultural Resources

Limited legislative provisions exist in relation to cultural resources that are relevant to biodiversity. Some provisions in planning law protect areas of historical and cultural importance; a local non-government organisation dedicated to the preservation of historical sites has received statutory recognition and there is provision on the protection of aspects of intellectual property. Recent government initiatives to alleviate poverty may also be relevant. However these measures have not yet been discussed from an environmental focus.

Under the TCPA the Minister may, upon the recommendation of the Board, make provision for the preservation of any building of special architectural or historic interest, make an order restricting the

demolition, alteration or extension of the building. The Minister is also authorised to approve lists of buildings of special architectural or historic interest.

The St. Vincent National Trust Ordinance outlined that body's purpose as the conservation of the historical and natural heritage of St. Vincent and the Grenadines, defined in an early publication on the Trust to include historic buildings, pre-historic sites and stone age relics, areas of special beauty and interest with their associated flora and fauna, the reefs, shorelines and small islets of the country. The enabling legislation empowers the Trust to identify, document and preserve buildings, monuments and places of historic and architectural interest, including the acquisition of property and the raising of funds for the management of such property. Executive authority for the administration of the Trust is vested in a Board of Trustees which is elected at an annual general meeting.

4.2.8 Antiquities

Antiquities now receive very limited protection. Under the statutory regime, the Minister responsible for planning may issue orders for the preservation of any building of special architectural or historic interest in the Island. Such an order may restrict the demolition, alteration or extension of the building.

4.2.9 Intellectual Property Rights

The CBD requires that access to and transfer of technology shall be provided on terms which recognise and are consistent with the adequate and effective protection of intellectual property rights (Article 16 (2)). Three types of intellectual property rights are particularly relevant to the Convention. Patents protect any process, machine or composition of nature that is novel, useful and embodies an inventive or non-obvious step. The Paris Convention provides for the international treatment of patents for the protection of Industrial Property and is administered by the World Intellectual Property Organization (WIPO). Given that the Paris Convention does not create an internationally enforceable patent right, national law regulates. Trade Secrets are used to protect subject matter which is either unpatentable or because the holder does not want to publicly publish the subject matter for fear that a commercial competitor will use the information to the holder's disadvantage. Trade Secrets may be applied to a wide range of information, including scientific information or traditional knowledge. Plant Breeders' Rights (PBRs) are recognised internationally through the 1961 International Convention for the Protection of New Varieties of Plants as amended in 1978 (UPOV). Member states are expected to grant and protect breeders' rights at the national level for plant varieties that are new, distinct, uniform and stable. St. Vincent and the Grenadines lack specific legislation on the protection of intellectual property in relation to biodiversity and biotechnology.

4.2.10 Factors Affecting the Implementation of Environmental Legislation in SVG

The role of environmental legislation in promoting sustainable development in St Vincent and The Grenadines is affected by a number of factors including:

1. A lack of political commitment to environmental programmes

2. A lack of financial resources with which to support environmental programmes

3. Organisational weaknesses in the implementation of programmes and their co-ordination at both the national and local levels

4. A lack of environmental awareness, technical expertise and experience at national and local levels among regulatory enforcement agencies such the judiciary, police, and the immigration officers.

5. The influence of the policies of the International agencies currently providing financial assistance to the country

6. A Lack of integration of environmental costs into economic policies

4.3 INTERNATIONAL OBLIGATIONS FOR BIODIVERSITY CONSERVATION

As previously mentioned SVG has accepted several international conventions that make provision for the conservation and protection of biological diversity. In accordance with the provisions of these conventions St. Vincent and the Grenadines has obligations to faithfully implement rules for the preservation of biological resources. From a legal perspective, implementation is by way of the passage and enforcement of legislation and regulations. Administrative procedures and mechanisms may also be employed.

The United Nations Convention on Biological Diversity was adopted on 5 June 1992, at the Rio de Janeiro, at the end of the United Nations Conference on the Human Environment. The CBD entered into force on 29 December 1993. St. Vincent and the Grenadines is a party to this Convention.

Whereas no ministry has assumed sole responsibility for the implementation of the COB a number of ministries are responsible for matters falling under this Convention, they include:

- The Ministry of Health and the Environment;
- The Ministry responsible for Planning; and
- The Ministry of Agriculture.

There is no legislation that comprehensively implements the CBD. Existing legislation used to protect elements of biological diversity include:

I. Town and Country Planning Act
II. Forest Resource Conservation Act
III. Wildlife Protection Act
IV. Fisheries Act
V. Marine Parks Act
VI. St. Vincent National Trust Act
VII. Maritime Areas Act

4.3.1 Related Biodiversity Conventions Adopted by SVG

International conventions for the protection of biological diversity which are ratified by the GSVG are not automatically part of the law of the land. These agreements must be incorporated by legislation before becoming effective national law. Government sometimes secures the enabling legislation before becoming a party to the Convention but at other times does not. A particular convention may not expressly require enactment of legislation but may require some other governmental action at the national level. In such circumstances Government may decide, in its discretion, whether adoption of legislation and regulation is desirable. To date, Government is a party to several conventions which create certain obligations with respect to biodiversity conservation.

The *Protocol (to the 1983 Cartagena Convention), Concerning Specially Protected Areas and Wildlife in the Wider Caribbean (SPAW)* was adopted in Kingston on 18 January 1990. It has not yet entered into force. St. Vincent and the Grenadines has not taken legal steps to implement the SPAW Protocol.

The *United Nations Framework Convention on Climate Change* (FCCC), was adopted on 9 May 1992 in New York, and entered into force on 21 March 1994. St. Vincent and the Grenadines became a party to this Convention on 26th March, 1999. The Convention and Protocol are relevant

to the protection of biodiversity because they control the emission of greenhouse gases; however, neither imposes any substantive obligations on St. Vincent and the Grenadines at this time to phase-out the importation or use of such gases.

There is no existing legislation that comprehensively incorporates provisions in the FCCC. The GSVG and the private sector have taken measures to reduce consumption of greenhouse gases. Both leaded and unleaded gasoline are currently available at petrol stations on St. Vincent and the Grenadines.

The *International Convention for the Protection of Plants and Plant Products* was adopted on 6 December 1951 at Rome, Italy. It entered into force on 3 April 1952. The Ministry of Agriculture is the department of government responsible for implementing the Convention. As a contracting state St. Vincent and the Grenadines is under an obligation to take all suitable measures to achieve the objective of this Convention which is to prevent the introduction and spread of pests and diseases of plants. Appropriate action is taken under the Plant Protection Act. These measures assist in the retention and protection of biodiversity.

The *Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal,* adopted at Basel, on 22 March 1989, entered into force on 24 May 1992. The Basel Convention applies the precautionary principle to biodiversity by restricting the importation of hazardous wastes. This restriction is important because St. Vincent and the Grenadines lacks the capacity to use or dispose of highly toxic material in an environmentally sound manner. Responsibility for the enforcement of the provisions of the Convention rests primarily with the Ministry of Health and the Environment.

There is no legislation that implements this Convention. Instead, the central objective is achieved through Government policy not accepting hazardous waste from developed countries. This policy is reinforced by the waste ban imposed under LOME IV. Under the latter, St. Vincent and the Grenadines is obligated to prohibit the importation of hazardous wastes (including nuclear and radioactive wastes) from the countries of the European Union and from anywhere else.

The *Vienna Convention for the Protection of the Ozone Layer* was concluded on 22 March 1985 in Vienna and entered into force on 22 September 1988. It is supplemented by the Protocol on Substances that Deplete the Ozone Layer, completed on 16 September 1987 in Montreal, and which entered into force on 1 July 1989. The Ozone Layer Convention is important for biodiversity because one of the best known effects of ozone depletion is damage to crops and plants. The Ministry of Health and the Environment is responsible for taking the measures necessary to fulfill obligations of St. Vincent and the Grenadines under the Convention.

In the absence of specific enabling legislation, heavy reliance is placed upon the Health Services Act which seeks to protect human health and the environment against pollutants and nuisances.

Further to the above, policy and legislative measures to phase out Ozone Depleting Substances (ODSs) were proposed for tabling in Cabinet in June 1998. Additionally, efforts to assist the hotel sector in the phase out of the use of ODSs are currently being explored. Environmental educational activities have also been a substantial part of the work at the national level.

The *United Nations Convention on the Law of the Sea (UNCLOS)* was adopted on 10 December 1982, at Montego Bay, and entered into force on 16 November 1994. The Convention is relevant to biodiversity because it prescribes jurisdictional rules for the protection of the marine environment and by extension marine biodiversity.

The UNCLOS, of which St. Vincent and the Grenadines is a signatory, obligates coastal member states to protect and preserve the marine environment and provides a legal framework for doing so utilizing the concept of the EEZ. Following a seminar on the EEZ of small island states held in St. Vincent under the sponsorship of the Dalhousie Ocean Studies Program in 1981, GSVG declared an EEZ by passage of the Maritime Areas Act (No. 15 of 1983).

The EEZ extends seaward for 200 nautical miles and encompasses a total area of about 11,000 square miles (Matthes, 1984). Within this zone the nation claims exclusive control, through the Minister of Foreign Affairs, of: (1) fishing and other economic activities; (2) conservation and management of living and non-living resources; and (3) the protection and preservation of the marine environment. The Act also gives the Minister broad powers to set up sea lanes and vessel traffic separation schemes for the purpose of, among others, preventing pollution. The Act states that the Minister shall publish charts and lists of coordinates delineating the limits of the various special zones set up by the Act, but this has not yet been done.

There is no legislation for the implementation of this Convention. There is still a need to develop more comprehensive legislation for the protection of rare or fragile ecosystems, as well as the habitat of depleted, threatened or endangered species in accordance with the SPAW Protocol.

The *Convention on Trade in Endangered Species*, was adopted on 3 March 1973 in Washington and entered into force on 1 July 1975. St.Vincent and the Grenadines became a party in 1989.

The Convention attempts to regulate wildlife trade through a worldwide system of import and export controls for species which are listed in three appendices. Appendix I of the Convention lists species which are threatened with extinction and for which commercial trade is prohibited; Appendix II lists species which may become extinct unless trade is strictly regulated; and Appendix III reports those species protected in their country of origin and for which the cooperation of other nations is required in order to enforce export restrictions. Species occurring in St. Vincent and the Grenadines which are covered by the Convention include the St. Vincent Parrot, the Green Turtle, the Hawksbill Turtle, and all large species of whale.

CITES offers very imperfect protection to endangered species since a member country is obligated only to ensure that products from such species do not enter international trade. Moreover, any

country is allowed to enter reservations at the time of ratifying the Convention which allow it to continue its international trade in certain species which it so designates (e.g. GSVG has entered reservations for the Leatherback Turtle and Humpback Whale).

St. Vincent and the Grenadines makes annual reports to the CITES Secretariat regarding measures taken to implement the Convention. Responsibility for the enforcement of this Convention rests primarily with the Ministry of Agriculture.

Relevant legislative provisions are scattered throughout a number of statutes including the Fisheries Act and the Wildlife Protection Act. Legislation to fully implement the provisions of the CITES Convention still appears necessary.

The *International Convention for the Prevention of Pollution from Ships (MARPOL) 1973* was adopted in London on 2 November 1973 and entered into force on 2 October 1983. MARPOL 73 is supplemented by the Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships 1973, which was concluded at London on 17 February 1978. The Protocol entered into force on 2 October 1978. Together the agreements are known as MARPOL 73/78.

Implementation of this regime will protect those aspects of coastal elements of biodiversity against pollution by oil. Implementation will also assist the global effort since St. Vincent and the Grenadines has developed a register of foreign vessels.

The *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter,* was adopted at London on 29 December 1972 and entered into force on 30 August 1975. There is no documentary evidence that St. Vincent and the Grenadines is a party to the Convention and its Protocol. However, these agreements probably embody customary rules binding upon the Islands. In any event the agreements confer rights (of intervention in relation to foreign shipping) rather than impose obligations.

Successful implementation of this regime will help to improve the protection of biodiversity from oil spills. Intervention powers are available whenever an accident has occurred to or on a ship and will or may cause pollution on a large scale in the territorial waters of St. Vincent and the Grenadines.

St. Vincent and the Grenadines is a party to the 1946 Washington International Convention for the Regulation of Whaling (in force 4 May, 1959).

The *International Convention on Civil Liability for Oil Pollution Damage* was adopted at Brussels, on 29 November 1969 and entered into force on 19 June 1975. This Agreement is to be read with the *International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage* 1971, which was adopted at Brussels on 18 December 1971 and entered into force on 16 October 1978. The 1969 and 1971 Conventions were amended by separate Protocols of 1976 (*Protocol to the 1969 International Convention on Civil Liability For Oil Pollution*

Damage, adopted in London on 19 November 1976 and entered into force on 8 April 1981; and *Protocol to the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage* adopted in at London on 19 November 1976). The Conventions were also amended by Protocols of 1984 (*Protocol to Amend the 1969 International Convention on Civil Liability For Oil Pollution Damage*, adopted in London on 25 May 1984 and the *Protocol to the 1971 International Convention on the Establishment of An International Fund For Compensation For Oil Pollution Damage* adopted in London on 25 May 1984). The latter Protocols never entered into force and were replaced by Protocols of 1992 (*Protocol to Amend the 1969 International Convention on Civil Liability For Oil Pollution Damage*, adopted in London in 1992; and *Protocol to the 1971 International Convention on the Establishment of An International Fund For Compensation For Oil Pollution Damage* adopted in London in 1992). These agreements are important to biodiversity in that they facilitate payment of compensation for injury to biodiversity elements; monies that could be used in rehabilitation and restoration. There is no conclusive evidence to suggest wheather or not SVG is a party to this Convention.

The *International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties* was adopted in Brussels on 29 November 1969 and entered into force on 6 May 1975. It is supplemented by the Protocol Relating to Intervention on the High Seas in Cases of Pollution by Substances Other than Oil, done at London on 2 November 1973 and entered into force on 30 March 1983.

4.3.2 Biodiversity Conventions to Which SVG Is Not A Party

St. Vincent and the Grenadines is not a party to several conventions which protect aspects of biodiversity or which are otherwise related to the use of biodiversity. These include the following: the 1993 Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and Their Destruction. The 1990 London International Convention on Oil Pollution, Response and Cooperation (in force 13 May 1995). The 1997 Bonn Convention on the Conservation of Migratory Species of Wild Animals (in force 1 November 1983). The UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage (in force 17 December 1975). The 1971 Ramsar Convention on Wetlands of International Importance (in force 1986). The 1950 Paris International Convention for the Protection of Birds (in force 17 January 1963), and the 1940 Washington Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere (in force 1 May 1942).

5. THE SVG BIODIVERSITY STRATEGY & ACTION PLAN

As part of the efforts to implement the CBD a call was issued to the countries of the world to initiate a strategy and action programme to conserve the world's biodiversity. As a signatory to CBD, SVG is likewise challenged to prepare a national strategy and action plan to conserve biodiversity in the multi-island nation state for the benefit of present and future generations. This Strategy, which mirrors the strategies being developed and implemented around the world in fulfilment of CBD, is of particular importance to SVG in that it recognises the fragility of the limited genetic pool, and the extent to which the goals of this concept poses challenges for many persons who depend on the use of these resources for their daily lives.

One overarching principle of biodiversity conservation is the need to build conservation into decision making. Quite often, the decision to conserve is hampered by fears that those measures might retard development, particularly in environments where development almost invariably involve some manipulation of the natural resource base (tourism, agriculture, housing development). Many of those fears are groundless and are sparked out of ignorance and or lack of knowledge or awareness of alternatives. Notwithstanding these drawbacks, biodiversity conservation is recognised as an integral aspect of environmental planning and management and a strategy and action plan which seeks to enhance the capacity for management and sustainable use of scarce resources should form an integral part of planning and decision making in SVG.

The National Biodiversity Strategy for SVG is guided by a set of ten (10) basic principles. These principles have been generally identified as a key component of most strategy documents since they help to establish the parameters which help to shape the thinking in respect of the goals to be pursued. These Principles are as follows:

1. Every form of life is unique, and warrants respect from humanity.

2. All Vincentians depend on local biodiversity and therefore have a responsibility to contribute to the conservation and sustainable use of biological resources.

3. Policy, and institutional strengthening is required in order to create conditions under which national biodiversity conservation can become an integral part of the decision making process, through effective implementation.

4. All Vincentians should be educated about local biodiversity and be given an opportunity to participate in decision-making that affects biodiversity.

5. Biodiversity is best conserved in the wild *(in situ)*.

6. An ecological approach to resource management is central to achieving biodiversity conservation and the sustainable use of biological resources.
7. Management of biodiversity must be ecologically and economically sustainable.

8. Conservation of biodiversity should proceed on the basis of the best knowledge available, using approaches that can be refined as new information is gained.

9. Biodiversity conservation requires the cooperation of government and non-government organizations, resource users and the community in general.

10. Regional and international cooperative action and sharing of knowledge, cost, and benefits are essential to biodiversity conservation.

These principles are essential to the successful conservation of biodiversity, and underpin the strategies and actions which have been developed in this plan.

5.1 Major Areas to be addressed by the Biodiversity Strategy

The preparation of the Strategy and Action Plan was developed on the basis of issues identified during the preparation of the Technical Report. This report was based on the analysis of four sectors comprising: Agriculture, Forestry, Fisheries, and Land Resource Use. In addition, an analysis was conducted of the legal and institutional regime for biodiversity conservation in SVG.

These Technical Reports, which were prepared by local personnel, reviewed the status of biodiversity conservation and made recommendations for action in order to arrest the loss of biodiversity. In the following sections the major physical mechanisms are identified, which are primarily responsible for the loss of biodiversity in SVG. Based on these seven priority areas a set of priority areas for intervention are identified and a strategy outlined for addressing conservation of biodiversity for the next five years.

A Habitat Loss and Fragmentation

Habitat loss and fragmentation is an on-going process in SVG. During colonial times substantial vegetation was cleared for mono-culture agricultural purposes, and as a source of building materials, charcoal and fuel wood. More recently large scale vegetation loss has resulted primarily from clearing to facilitate the largely *ad-hoc* urbanization process, the illegal Marijuana trade, and unchecked land squatting activities. Over grazing has also contributed to the decimation of vegetative cover particularly on the grenadine islands of Balliceaux, Mayreau, Canouan, and Union where uncontrolled livestock grazing is practiced.

Another major contributor of habitat loss and fragmentation is the rapid expansion of squatting communities in environmentally sensitive areas. The inability of Planning Authorities as well as other relevant government agencies to keep abreast with many of these informal sector activities, needs to be addressed. In addition development activities which falls under formal planning authority

needs to be more effectively monitored and regulated to ensure that the conditions as stipulated in planning approvals are observed.

Land use conflicts do exist in some forested areas between residential and agricultural development pressures, and the need to preserve forest reserve areas. Natural linkages must be maintained between land resource features such as gully systems, forested areas, coastal zone areas, non-arable lands undergoing regeneration, as well as other contiguous areas which may support various ecosystems. There is a need to evaluate all proposed development activities which may occur within close proximity of these potentially significant habitats.

B Over-exploitation of Plant and Animal Species

The economic exploitation of plant and animal species in SVG must be effectively monitored and regulated. The island's marine resources are particularly vulnerable to over-exploitation. Notwithstanding natural threats to the marine environment, human activities such as inappropriate fishing methods, pollution and coastal degradation threaten the conservation of the country's biodiversity.

Despite significant improvements in the human resource and technological capacity of the Fisheries Division, there still remains a general lack of human resources to facilitate the efficient management of the fishing industry and marine biological resources. The greatest challenges are in the Grenadines, where much of the fisheries resources exist and where a large percentage of the population depend on fisheries for their livelihoods.

There is an open and closed season for partially protected terrestrial species which are hunted. However, there are essentially no controls on quantities, sex, or the age of these terrestrial animals which are allowed to be hunted. In addition the hunting season has not been designed to correspond to the various species natural behavior patterns, and reproductive cycles in order to promote population regeneration and preservation.

C Introduction of Species and Emigrant Species

The introduction of species is thought to have contributed significantly to the modification of local endemic species populations. As is characteristic of many small tropical islands, SVG possesses several isolated ecosystems, and the introduction of a new predator, competitor, or pathogen can rapidly imperil species that did not evolve with the new comer, and can seriously threaten native biodiversity.(WRI, IUCN, and UNEP 1992).

A notable recent introduction is the Armadillo which is suspected to have contributed to the destabilization of slopes due to their rooting activities. Other relatively recent arrivals such as the Cattle Egret and the Glossy Cow Bird, have been respectively blamed for raiding low lying birds nests, and pirating the Carib Grackle nests. Exotic diseases such as the "Pink Mealy Bug" can potentially, severely impact on SVG's flora diversity due to the lack of appropriate regulation and monitoring.

Appropriate levels of precaution should be exercised with respect to the illegal importation of flora and fauna species among custom and immigration departments and other relevant authorities. The level of awareness of the adverse impacts of the introduction of species needs to be raised among government departments and the general public.

D Pollution of Soil, Water and the Atmosphere

Due to agricultural development there has been an intensive use of fertilizers, pesticides and herbicides in SVG. The unregulated and inappropriate use of these toxic and agrochemicals, particularly in villages along the east coast where bananas are cultivated on steep slopes in the upper water sheds has adversely impacted on many terrestrial habitats. These activities pose a direct threat to the sources of drinking water. The reduced landings of inshore pelagic fish in some coastal areas has also been attributed to the runoff from areas which are heavily cultivated and where there is an intensive use of agricultural chemicals (NEAP, 1992).

Human activities within villages and illegal squatter settlements have impacted adversely on the physical environment and biodiversity throughout SVG. Domestic activities in these unregulated human settlements include, washing, cooking, backyard gardening, bathing the dumping of refuse and the discharge of sewage into rivers and streams. These activities effect, fresh water, marine and terrestrial biota, in addition, to having serious human health implications for other down stream villages and the domestic water supply.

The pollution of soil, water and the atmosphere can significantly compromise the conservation of biodiversity in SVG. Pollutants may reduce or eliminate populations of sensitive species. Contamination reverberates along food chains and places strain on ecosystems. Sensitive habitats such as the island's forest areas, gullies, rivers, wetlands and coastal zone must be particularly protected from the effects of pollutants.

E Intensive Mono-culture Agricultural System

The cumulative effects of the intensive mono-culture agricultural system on SVG's biodiversity has not been studied in detail to date. However, the significant effects such as decreases in the area of natural habitats over time, increased soil loss from erosion and landslides, as well as the increased eutrophication of marine habitats and the pollution of marine environments by agro-chemicals are factors which have, no doubt, adversely effected the island's biological resources.

SVG has a long history of intensive mono-culture agriculture which includes; cotton, sugarcane, arrowroot, and more recently being dominated by banana cultivation. Intensive agriculture has contributed to the erosion of topsoil, and also significant inputs of agrochemicals into the environment. These agrochemicals mainly consist of pesticides and chemical fertilizers are transported and discharged by runoff into surface water bodies, rivers and the marine environment. Agrochemical contamination of underground water supplies, near-shore waters and biota is not well

documented for SVG but no doubt presents a serious risk to human health, flora and fauna. Various bird species, frogs, lizards, opossum, and Agouti as well as several fresh water species populations are speculated to have been effected over time. However, little documented empirical evidence has been collected to substantiate these claims.

F Global Climatic Change

The global climatic change as the result of air pollution caused by the proliferation of green house gasses and global warming will become a factor of increasing significance in the coming decades. This is essentially a universal problem with several varied local implications. Projected temperature rises are between 1^0 and 3^0 C during the next century with an associated rise in sea level of 1 to 2 meters (WRI, IUCN, and UNEP 1992). These rises in temperature are anticipated to result in the displacement of the limits of tolerance of animal and plant species towards the cooler poles. Many species will be unable to redistribute themselves fast enough to keep up with the projected changes.

In SVG, where terrestrial species mobility will be constrained as a result of the closed nature of the islands ecosystem, their inability to adapt will very possibly lead to their extinction. On the other hand, the more mobile marine and migrant avian species would likely migrate towards cooler areas. Many islands' coastal areas could plausibly be wiped out due to sea level rises, the effects of which will result in catastrophic loss of fauna and flora species.

5.2 Addressing Biodiversity Conservation Priority Issues

The National Strategy for Biodiversity Conservation for SVG seeks to respond to these outlined priority areas. Conservation can be generally regarded as the management of human use of the biological resources, in a manner that it may yield the greatest sustainable benefit to current and future generations. Moreover, sustainable development implies the utilization of natural and biological resources, in a manner which meets the needs and aspirations of the current generation, without compromising the ability to meet those of future generations.

Biodiversity and natural resources are fundamental to SVG's development process. Though a separate biodiversity conservation planning process is valuable in identifying what exists and what conservation priorities for biological resources should be, it is important that the biodiversity conservation planning process be integrated with wider sustainable development initiatives in the country. The integration of biodiversity conservation as far as possible into other sectoral planning initiatives is in fact required under *Article 6 section b* of the CBD.

The Strategy which seeks to respond to those issues which have been identified as providing the vehicle through which biodiversity loss is occurring has been laid out in a manner which will facilitate the identification of generic tools. Habitat loss and fragmentation is the main focus of the Land Diversity Section, and is addressed through strategies such as the regulation of land resources, establishment of protected areas, legislation and incentives. Issues pertaining to the over-

exploitation of plant and animal species, the introduction of species, and the intensive mono-culture agriculture system are discussed in the Sections on Natural Vegetation and Agricultural Diversity and Terrestrial Fauna Diversity. The pollution of soil, water and the atmosphere and global climatic change affect all ecosystems and as such are themes which run throughout all of the Sections.

5.2.1 Development and Articulation of Policy and Plans for Biodiversity Conservation

A strategy for biodiversity conservation is predicated on the articulation of clear policy and a set of supporting activities which addresses those areas where loss of biodiversity is greatest. It is also predicated on the development of appropriate legislative and institutional mechanisms which provides both positive mechanisms for conservation of biodiversity and deterrents in order to discourage those activities which are deemed most harmful to the resource base. This policy should have as its underlying thesis, adherence to the principles of sustainable development and the adherence by all public agencies and institutions to these policies. Based on the threats to biodiversity identified in the Technical Reports and the ten Guiding Principles established in the NBSAP for SVG. In addition, to realizing the ultimate goal of the conservation and sustainable utilisation of biological diversity in SVG. Eight (8) areas were identified which will facilitate the articulation of the strategy for biodiversity conservation as follows:

I Revision, Updating and Harmonization of Environmental Legislation

II Institutional Strengthening for St. Vincent and the Grenadines

III Resource (Biodiversity) Inventory (Terrestrial and Marine)

IV Development of GIS Database

V Educational Awareness

VI Human Resource Development

VII Incentives and Disincentives

VIII Mechanism for monitoring the implementation of biodiversity conservation

GOAL: ***The Conservation and sustainable utilisation of all biological diversity throughout St. Vincent & the Grenadines.***

The conservation and sustainable utilisation of all biological diversity throughout SVG presents a challenge which requires the use of the resources in a manner which will ensure that its last indefinitely and for the good of all Vincentians. "Use" when used in this context does not imply

consumption as it is generally understood, but rather consumption in a sustainable manner. It may even require maintenance in its natural state for its ecological or cultural values. Moreover, it requires the adoption of policies and development of plans which are enshrined in national laws. It also requires a commitment across government ministries and the development of partnerships between resource managers in these ministries and the users of the resource, as well as among community groups and individuals.

OBJECTIVES:

- Develop and articulate a National Biodiversity Policy which fosters the sustainable use of biological resources and the maintenance of biodiversity.
- Integrate biodiversity conservation into national planning processes.
- Encourage integrated natural resource management techniques with emphasis given to developing practical and cost effective measures for the preservation of natural habitats.
- Rationalize land use allocation and encourage sectoral and regional planning for human settlements.
- Create conditions and incentives for effective conservation at both the national and local level.
- Strengthen the human capacity for conserving and using biodiversity sustainably.

I Revision, Updating and Harmonization of Environmental Legislation

STRATEGY: ***Revise and enact national legislation which provides for the Conservation of Biodiversity.***

The GSVG has not enacted any specific legislation on the protection of biodiversity in response to the country's ratification of the 1992 Convention on Biological Diversity. Environmental legislation currently in force in St. Vincent and the Grenadines provides imprecise tools for the management and protection of the Islands' biological resources. The legislation lacks a broad environmental and institutional focus. Legislation is fragmented and dispersed over several statutes charging different and uncoordinated government bodies, departments and entities with environmental administration.

This traditional *ad hoc* approach to resolving environmental problems has also led to gaps in the substantive regime of protection of biological diversity.

The objective of this component is to undertake a review of all environmental legislation and develop a comprehensive environmental legal framework which would provide the legislative and regulatory mechanism for the conservation and sustainable management of all biological resources.

Under this initiative, biodiversity conservation policy, legislation and regulations will be drafted within the context of national Environmental Protection Act . This Act could provide the umbrella coverage to include legislation for the establishment of special protection regimes (protected areas, conservation of wildlife, etc.), procedures for environmental impact assessment and regulations to control the activities of users of the resource as well as to regulate the release of pollutants into the environment which threatens or contaminates biological resources.

A legal regime must be developed to give a comprehensive response to the requirements for the protection of biological diversity. In addition to the development of strategies in order to enhance the effective enforcement of current environmental legislation. Existing legislation that needs to be fine tuned includes:

The output of this exercise will be an Environmental Protection Act which clearly supports the policy of biodiversity conservation through its legal and regulatory instruments, and appropriate enforcement measures.

ACTIVITIES:

- Amending the Wildlife Protection Act to expand the category of protected species.
- Update the Marine Parks Act.
- National Park legislation is required to ensure the protection and preservation of distinctive fauna and flora.
- The documentation of a criteria for designating marine conservation areas so that amendments can be made to the regulations to include other areas to which the criteria apply.
- Write and enact regulations for both the Forest Resource Conservation Act and The Wildlife Protection Act. Make provision for proper descriptions for all proposed reserves for scheduling under the Forest Resource Conservation act.
- Strengthen the capacity to implement the Wildlife Act, by the appointment of a Chief Wildlife Officer, an Advisory Committee and the establishment of a Conservation Fund.
- Establish the Conservation Committee as provided for in the Forest Resource Conservation Act.

II Institutional Strengthening for St. Vincent and the Grenadines

STRATEGY: ***To strengthen the institutions responsible for environmental matters across the numerous different agencies, and promote consolidation of authority on environmental issues under a centralized body.***

The Government of St. Vincent and the Grenadines has initiated a number of activities and programs aimed at seeking to reduce environmental degradation and promote sustainable development in St. Vincent and the Grenadines. The Ministry of Health and the Environment was established in 1989 to deal with issues affecting the natural environment. However, that ministry has not yet assumed full control over environmental matters, therefore responsibility for environmental management is still shared among a number of ministries and statutory bodies.

The major problem with this present arrangement for environmental management is that there is a lack of coordination of activities among the various ministries. This means that there tends to be a very piecemeal and ad hoc approach to environmental management and environmental issues are dealt with as they arise rather than in a systematic fashion. These plans and activities have not resulted in any significant improvement in sustainable management of natural resources because of several factors including the lack of any comprehensive management plan, the inadequacy or outdated status of several pieces of legislation and more importantly, the inadequate institutional capacity.

St. Vincent and the Grenadines, like most of the other Commonwealth Caribbean Countries, has an extensive collection of legislation which address various aspects of environmental management. A regional review[5] noted that the legislative framework for environmental management is, for the most part, outdated and inadequate to cope with current problems, especially those associated with conflicting demands for resource use and development. Additionally, there are several areas where legislation is inadequate to cope with current environmental and natural resource management problems. In other instances, overlapping jurisdiction, the lack of monitoring to ensure compliance, and the lack of enforcement have hindered the effective application of existing laws.

On the positive side, commendable efforts have been made to protect and preserve national biodiversity by acceding to relevant international conventions and implementing their provisions by domestic legislation.

Despite these recent efforts to address environmental problems in St. Vincent and the Grenadines, the list of issues of concern (ranging from the management of development activities, the protection and conservation of natural resources, to the reduction of green house gas emissions and pollution) continues to grow, thereby pressing the Government of St. Vincent and the Grenadines to enhance and upgrade institutional co-ordination for environmental and natural resource management, and hasten the development of an appropriate policy, regulatory, institutional and enforcement regime. Additionally, public and commercial acceptance of the role of environmental stewardship in all

5 *Environmental Laws of the Commonwealth Caribbean*. Caribbean Law Institute (CLI). 1991.

aspects of development planing and execution is being seen as a powerful force to assist Government in the successful implementation of its sustainable development policy.

It is apparent that one of the first issues that needs to be addressed if sound environmental management and sustainable development is to become a reality in St. Vincent and the Grenadines, is the establishment of a comprehensive, coordinated and integrated institutional structure for sound environmental and resource management, supported and enforced by a comprehensive and holistic policy and legal framework.

ACTIVITIES:

- Review the existing institutional structure concerning environmental and natural resources management, focusing on the Environmental Unit, and defining distinct mandates for the relevant institutions with respect to biodiversity conservation.

- Establish clear policies, guidelines and programmes for biodiversity conservation and the sustainable use of natural resources.

- Devise a regulatory and administrative framework for environmental management that would ensure effective enforcement of and compliance with the guidelines, regulations and procedures developed to eliminate and/or mitigate the negative environmental impacts of development projects and programmes.

- Make specific recommendations for the institutional strengthening required, to enable the Environmental Unit within the Ministry of Health and Environment to effectively carry out its designated functions including the revision and implementation of the national environmental education and training programme and emphasizing the staffing requirements and training needs of the Unit.

- Make recommendations for institutional strengthening of the institutions involved in national resource management, and improve the capacity of these government agencies to effectively manage the components of biodiversity for which they have responsibility.

- Enhance the Fisheries Department's presence throughout the Grenadines, by appointing increasing fisheries staff for Bequia and Union/Canouan

- Improved communication and integrated management among agencies responsible for biological resources management and conservation.

In developing and implementing such a comprehensive strategic plan, St. Vincent and the Grenadines will not only ensure that all development activities will meet the needs of both present and future generations, but in so doing will establish a precedent that could serve as a model for

other small island developing States. Additionally, such an approach would result in the establishment of a comprehensive policy, legal and institutional framework for environmental management and sustainable development that meets the requirements of *AGENDA 21* (the Program of Action concluded at the United Nations Conference on Environment and Development) and the *Program of Action* concluded at the United Nations Conference on the Sustainable Development of Small Island Developing States.

III Resource (Biodiversity) Inventory (Terrestrial and Marine)

STRATEGY: ***Expand Revise and enhance biodiversity research and inventorying initiatives. Establish a national programme of on-going monitoring to document the status and patterns of change in terrestrial flora, and fauna species, and their habitats.***

The establishment of a national biodiversity database inventory and monitoring program is essential to enhancing our understanding and our appreciation of the biological diversity. Moreover, in order to achieve an improved local understanding of the types of changes occurring in terrestrial, marine and aquatic ecosystems, and of the causes of those changes, in order to facilitate the development of appropriate conservation techniques and mechanisms.

There are substantial gaps in the current knowledge of biodiversity with respect to flora and fauna species classification, location and extent, pattern of distribution, and quantity. These gaps must be filled by the appropriately trained biologists and ecologists working in these fields. Data collection must be undertaken by these respective experts, in order for the information output of the compilation process to be of relevance to the various stake holders.

ACTIVITIES:

- Undertake detailed inventory in order to determine the quantities, locations, habitats etc. of the existing marine and terrestrial biodiversity. In addition, ensure that regular field surveys are conducted to capture biodiversity data, and ensure that the database remains current.

- Research and scientific techniques should be utilized to help determine the carrying capacity of various terrestrial conservation areas and marine parks. This would allow for a scientifically sound method of determining the potential use of such areas.

- Undertake a comprehensive study of the Egret population which are recent migrates to the islands, and their effect on indigenous ecosystems including; reptiles, insects and flora species.

- A detailed examination of the impacts of nematicides, insecticides, fungicides and fertilisers over time is required. In addition to a detailed study of the effects of banana cultivation on the biodiversity of the lands on which the crop is grown.

- Research on potential uses of un-utilized and under-utilized species, including product development possibilities of species which are already economically important.

- The establishment of a national herbaria facility.

- Limitations for closed and open hunting and fishing season should be established based on the biological research for protected species, and employ restrictions on the size and numbers of species that may be caught.

- Complete demarcations of the forest boundary should be carried out, and buffer zone management areas should be established.

IV Development of GIS Database

In keeping with the UNEP Guidelines, the issues related to the creation of a Biodiversity Database were identified and evaluated. The role of a Biodiversity Database is to manage and maintain the Biodiversity-related data that exists, presently or may exist in the future, in a digital database with the attendant data usage and update procedures defined. It is also used to assign responsibilities for data collection and update and to ensure that all data is encompassed within a coordinated technical and institutional environment where the maximum value may be made of the data through structured professional analyses.

The future application of the Biodiversity GIS model should initially focus on the continuation of the process of data collection, input, conversion, analysis, and output. It is important to establish and maintain strong links with agencies and individuals involved in the management of the environment. This will provide the opportunity for the system to be constantly updated and facilitate those individuals with data on a regular basis.

Data held in the GIS should influence decision-makers at the national and local levels, and so inform development policy on matters relating to the environment especially. Among the general areas that can benefit immediately are the following;

- Preparation of a national environmental atlas of SVG
- Local area Planning
- Development control
- Remote sensing and vegetative Mapping
- Hazard mapping and monitoring.
- Project specific assistance to all ministries and departments.
- Training of users in critical agencies and or ministries so as to facilitate data conversion and the expansion of the database.

STRATEGY: ***Establish a GIS database for biodiversity information which should be updated periodically.***

A GIS system requires good equipment, committed skilled personnel, current and reliable data, a clear structure for the management and operation of the system and also technical and other support mechanisms to ensure adequate maintenance of equipment to minimise operational down time. These can be all considered prerequisites to ensuring the overall sustainability of the system.

ACTIVITIES:

- Establish a committee to guide general GIS Development Policy within the state, comprised of Senior and Technical personnel within Government and the private sector.

- Establish a set of broad Goals and Objectives that are desirable to be achieved from the establishment of the Biodiversity GIS database over time.

- Establish a national Biodiversity database inclusive of data formats and standards for accuracy and detail of all data to be incorporated in any national GIS System.

- Facilitate data transfer between the various institutions responsible for biodiversity and natural resource management.

V Educational Awareness

STRATEGY: ***(i) Improved public awareness and education on biodiversity issues.***

(ii) To ensure broad based support for and involvement in biodiversity conservation initiatives through widespread public awareness.

ACTIVITIES:

- Undertake media productions aimed at educating the public, thereby promoting community assistance in enforcement.

- Training of government agencies, department staff, as well as local private organizations, and other grassroots groups.

- Educate and sensitize regulatory and law enforcement agencies with regard to biodiversity management and conservation issues.

- Special provisions should be made for improved extension services, e.g. room for public education seminars/workshops, library with appropriate database of available information.

- Co-management with businesses and NGOs operating in marine and terrestrial conservation areas to encourage more responsibility for the protection of these areas. Activities which can be encouraged include, beach clean-ups, sign placements and maintenance, simple beach monitoring, sea turtle watches and closed season patrols.

VI Human Resource Development

STRATEGY: ***To enhance the local capacity to conserve biodiversity through increasing and improving the local expertise in relevant fields & institutional Strengthening.***

Improve the local knowledge base in terrestrial ecology at the genetic, species and habitat levels that is essential for the effective conservation and management of SVG's terrestrial fauna diversity.

ACTIVITIES:

- The institutional capacity of the Forestry Department should be strengthened, with specific training in the areas of ecology research, wildlife management and resource economics.

- Undertake a GIS user training programme in order to enhance the level of technical competence among relevant government and non-government institutions.

VII Incentives and Disincentives

STRATEGY: ***To provide economic and financial incentives which promote and encourage sustainable utilization of SVG's biological and natural resources.***

In order to develop a meaningful and workable policy for the conservation of biodiversity, it is important not only to have descriptive information on the causes of biodiversity loss, but it is also important to have an understanding of the underlying economic forces which are causing these losses. There are three major, interrelated forces driving biodiversity loss and which must be addressed through a broad range of policy mechanisms:

Unsustainable patterns of consumption and production are a major cause of biodiversity loss. The removal of economic incentives which encourage unsustainable production, in addition to education about the impacts of excessive consumption is crucial to rectifying these effects.

Population growth and distribution are major factors in determining how the country's land resources and biological resources are used. An increasing population density, in combination with improving socio-economic conditions leads to pressure on land and marine resources for food production, roads, housing, commercial and tourism developments.

Economic failure means that the interplay of market forces does not ensure the economically correct balance of habitat conversion and conservation. This is because those who convert the land do not have to compensate those who suffer the consequences of that conversion, locally or globally, e.g the loss of biodiversity values. As a result, the private cost of engaging in activities that adversely impact on biodiversity is artificially low. The cost of losing habitat and wildlife is shifted to society rather than being internalised by the private actor. This pattern encourages the overuse of components of biodiversity (OECD, 1996).

Economic valuation methods must be adopted which place environment conservation on the same footing as the other traditional sectors of the economy such as health, education, transportation, agriculture and industry. In addition, it is possible to include the value of natural capital in national accounting systems. This is known as the "greening of national accounts." Several developed and developing countries have used economic valuation methods to value important environmental resources, such as forestry, fisheries, and mines, for national accounting purposes. Valuation of biodiversity is the next logical step in this process, where values are placed on the physical inventory of different categories of biodiversity.

ACTIVITIES:

- Correct imbalances in the control of land resources that contributes to the loss of biodiversity e.g. enhanced regulatory controls of development activity on private as well as public lands.

- Research on potential uses of unutilized and under-utilized terrestrial and marine species, including product development possibilities of species which are economically important or of potential scientific and/or medicinal value.

- Reduce the pressures of urban expansion by the encouragement of higher density housing, in-filling of existing residential and commercial areas, and the enforcement of appropriate zoning control.

- The enactment and enforcement of more effective fines and penalties in order to act as a deterrent of unsustainable physical development and resource exploitation practices.

- Reduce the impacts of agricultural expansion into environmentally sensitive areas by providing incentives to increase the productivity of lands currently under cultivation.

- Provide incentives to reduce the use of toxic chemical pesticides, herbicides, and fertilisers.

VIII Mechanism for Monitoring the Implementation of Biodiversity Conservation

STRATEGY: ***To enhance the capacity for SVG to monitor and assess the progress of its biodiversity conservation programmes and initiatives, and to effectively coordinate the implementation of biodiversity policy.***

The conservation of biodiversity in SVG will rely on the effectiveness of the GSVG to streamline the operations of the various ministries and agencies which are involved in environmental management. The formulation and delegation of clear biodiversity protection mandates among these institutions, enhanced levels of communication and documentation of biodiversity related information, in addition to the optimal utilization of resources at hand is essential if they are to carry out their respective functions.

ACTIVITIES:

The Ministry of Health & Environment needs to fully embrace its role as the lead agency for biodiversity, and protected area management, and also seek to establish specialized sub-committees to effectively administer and monitor the implementation of biodiversity management and conservation programmes and activities. In this regard the following functions should be considered:

- Policy formulation
- international agreements and protocols
- legislation and regulations
- compliance
- assessment, licencing and approvals
- guidelines and standards
- pollution prevention
- monitoring
- education and development, and
- environmental reporting

6. PROPOSED PROJECTS FOR BIOLOGICAL DIVERSITY CONSERVATION

Essential to the success of the Biodiversity Strategy and Action Plan is the identification of priorities and time frames for their achievement. Not all of the strategies and actions identified in the previous section will contribute equally to ensuring the protection of SVG's biodiversity, neither do they have the same degree of urgency.

This section attempts to identify projects that support and embrace the implementation of those strategies and actions as recommended to enhance the biodiversity conservation/management capacity of the GSVG. These projects were identified on the basis of recommended activities coming out of the Country Study technical reports and the Strategy Action Plan, existing project priorities as identified by relevant government departments and agencies in SVG, as well as in consultation with the participants of the Review Workshop held on the 19th of May, 2000 in Kingstown St. Vincent. (See Appendix 1. (b) for a list of participants).

These conservation priorities will form the foundation for the establishment of a biodiversity conservation ethic in the planning processes of SVG and for the further implementation of the various initiatives identified in section 5 of this document.

PROJECT NO: 1.

Project Title: Development of a Biodiversity Awareness Programme

Executing Agency: **Ministry of Health & Environment, Environmental Unit**

Priority Area: Education Awareness

Justification: The level of awareness on biodiversity conservation issues needs to be raised at a national level throughout all sectors of society in St. Vincent and the grenadines. The lack of awareness at an individual level can be said to be a major factor influencing the unsustainable patterns of use and management of biological resources currently existing in SVG. The inclusion of the general public, public servants and the private sector will eventually encourage the citizens, law enforcement agencies, and the judiciary to assume greater levels of responsibility for the protection of these valuable natural resources.

Goal: To heighten awareness of various initiatives aimed at conservation of biodiversity in St. Vincent and the Grenadines.

Objectives: To ensure broad based support, and compliance with biodiversity initiatives aimed at preserving sensitive habitats and conserving species which they support.

Activities:

- Dissemination of information on biodiversity to primary and secondary schools through essay competitions, poster competitions, etc. and the incorporation of biodiversity issues into the school curriculum.
- Production of educational materials i.e information brochures, publications etc. for the general public, visitors and school children.
- Present seminars and public discussions to increase the public awareness to the challenges of biodiversity conservation and management, and the part they can play in ensuring that these resources are used sustainably.
- Target public service announcements, media programmes to selected sectors of the population, such as community groups, visitors to the island, the business community etc.
- Create awareness among the judiciary, law enforcement officers, and immigration officers, via workshops, with regard to the importance of the enforcement of penalties for offences related to biodiversity protection.
- Special provisions should be made for setting up extension services, e.g. a library with appropriate database of available information on SVG biological resources.

PROJECT NO: 2.

Project Title: Development of a Wildlife Unit (Adapted from Chow 1993)

Executing Agency: **Forestry Division**

Priority Area: Wildlife Conservation; Institutional Strengthening, Human Resource Development.

Justification: Presently there is no clearly established Wildlife unit in the Forestry Department capable of proper terrestrial wildlife assessment, due to the lack of a wildlife biologist and research and monitoring equipment and personnel.

Goal: To enhance the institutional capacity to assess and manage the terrestrial wildlife/forestry resources of SVG.

Objective: To establish an appropriate legal and institutional framework to enable the Forestry Department to develop the capacity for management of biodiversity.

Activities:

- Develop 5 yr action plan and develop a comprehensive geo-referenced biodiversity database
- Conduct flora and fauna inventories of the watershed areas and in other reserves and conservation areas throughout SVG, in order to determine the status of these species and their habitats
- Amend the Wildlife Protection Act and develop further regulations,
- Conduct in-depth surveys of the *Amazona guildingii* including nesting sites.
- Undertake a study of the *Egret* population and their effects on indigenous ecosystems.
- Supervise the monitoring and enforcement activities for the conservation and management of terrestrial biodiversity.
- To ensure that personnel recruited are adequately trained in areas of ecological research, wildlife management and resource economics.

PROJECT NO: 3

Project Title: Establish Plant Inventory and Herbarium

Executing Agency: **Forestry Division**

Priority Area: Flora Conservation/Biodiversity Data Cataloging & Storage

Justification: There has never been a complete survey (study) of the flora of SVG in terms of plant distribution and status. Therefore, to aid in the conservation of the floral resources, periodic inventories should be carried out. Also there is no local collection of all plants found in SVG and a herbarium collection should be priority in the conservation of Biological diversity

Goal: To determine what plants are present in SVG, their distribution and status.

Objectives:

- To develop the capacity to undertake regular plant inventories.
- The provision of a comprehensive flora database for SVG.

Activities:

- Establish an inventory unit
- Conduct an inventory of plants throughout SVG's protected/conservation areas, and water catchments
- Collect herbarium specimens of all plants
- Establish and house a local herbarium collection.

PROJECT NO: 4

Project Title: Environmental Monitoring of Coral Reefs

Executing Agency: Fisheries Division

Priority Area: Marine Resource Conservation

Justification: St. Vincent & the Grenadines is heavily dependent on its marine/fisheries biological resources. There are indications that these biological resources are under threat from deteriorating water quality, as a result of the increase of pollutants and sedimentation, which are effecting changes in chemical composition and temperature. Physical damage and overexploitation caused by destructive commercial use and recreational practices have also attributed to the degradation and destruction of marine biodiversity among others. These adverse impacts have the potential to cause major disasters in the fisheries sector such as fish kills, in addition to the continued and accelerated loss of marine habitats/diversity and so they require more detailed empirical studies.

Goal: To improve local understanding of the types of changes occurring in the marine environment as a result of anthropogenic activities, and assist in the development and adoption of appropriate conservation techniques and mechanisms to preserve these biological resources.

Objective a: To develop a Marine Resource and Environmental Monitoring Program, by initiating biological and chemical monitoring of fisheries - specific marine habitats.

Objective b: To acquire baseline data on the chemical and physical structure of the water column in the designated marine conservation areas, in order to assess the viability of these areas and to determine the origin of negative impacts.

Activities:

- Establish standards for coastal water quality with input from the Environmental Unit.
- Monitoring of water quality and assessing the long term impacts of changing coastal water quality on the health of marine ecosystems and habitats.

PROJECT NO: 5

Project Title: Cataloging of Fisheries Documents

Executing Agency: Fisheries Division/ Education/Research Unit

Priority Area: Marine Resource Inventorying/Educational Awareness

Justification: Fisheries and other marine biological resources in SVG tends to be well recorded due to their relatively high economic significance to the economy. Notwithstanding this fact, there is an apparent need to improve the access to this information among resource managers and other counterpart agencies. In addition to effectively documenting the current state of knowledge in order to ensure the maximum return from these efforts.

Goal: To improve the state of knowledge with regard to use, conservation and management of SVG's marine biological diversity.

Objective a: To organize all the documents in the Fisheries Division into a database, searchable by different fields including title, author, subject, and also by keywords.

Phase 1: To catalogue all documents specific to fisheries in St. Vincent and the Grenadines

Objective: To obtain information on the status of fisheries resources in past years, including a list of all species ever documented.

Phase 2: To catalogue all other fisheries related information

Objective: To improve and increase research capabilities.

Objective b: To heighten the awareness of the general public about marine conservation issues

Activities:

- Compile a reference list of work done on the various species and habitats and collect abstracts where available
- Set up, or acquire a searchable database to hold information on biodiversity; Fishbase and reef Base.
- Special provisions should be made for setting up extension services, e.g. a library with appropriate database of available information related to marine biodiversity.
- Coordinate marine and fresh water biodiversity related education awareness programme activities in collaboration with the Environmental Unit.
- Undertake media productions and other educational programmes, and public education seminars aimed at enhancing public awareness with regard to marine conservation issues.

PROJECT NO: 6

Project Title: Turtle Nesting Beach Surveys

Executing Agency: Fisheries Division Biology/ Research Unit

Priority Area: Marine Resource Conservation

Justification: The Critically Endangered (IUCN, 1996) Hawksbill turtle, *Eretmochelys imbricata*, and the Endangered (IUCN, 1996) leatherback turtle, *Dermochelys coriacea*, are two species known to exist in the region. No comprehensive studies have been known to be undertaken to date which seek to investigate the status and distribution of the various species of turtles known to nest throughout the islands of SVG. There is clearly a need to fill the gap in information with regard to the locations of turtle nesting habitats and the impacts of coastal zone development on these species in the country.

Goal: To improve the level of protection afforded to marine turtles and there habitats throughout SVG.

Objective: To monitor turtle nesting activities on beaches in St. Vincent and the Grenadines

Activities:

- Undertake mapping of all identified turtle nesting areas and incorporate this information in a "national GIS database".
- Develop future policies for sea turtle protection, and the preservation of turtle nesting habitats.
- Undertake monitoring of coastal zone development activities and assessments of their potential to adversely impact upon marine environments.

PROJECT NO: 7

Project Title: Formulation of a Comprehensive Land Use Development Plan

Executing Agency: Central Planning Division

Priority Area: Biodiversity Resource Conservation

Justification: A major contributor to the loss and fragmentation of habitats and the disruption of ecosystems in SVG, is related to the largely ad-hoc urbanization process and virtually unregulated land resource use. These adverse impacts on biodiversity can be said to be a direct result of the lack of clearly defined land use policies, zoning plans, and development control laws and regulations, coupled with the inability of the planning authorities to monitor and enforce existing planning regulations due to the lack of manpower and other resources.

Goal: The efficient management of development activity so that it occurs in an orderly fashion ensuring the preservation and sustainable use of biological diversity throughout SVG.

Objective:

- Rationalization of land use allocation and encourage sectoral and regional planning for human settlements

- Integrate biodiversity conservation into the planning process, and enhance the level of consultation with the various agencies charged with biodiversity conservation/management responsibilities.

- Develop and articulate a national planning policy which fosters the conservation and sustainable use of biodiversity

- Strengthen the capacity to monitor and control physical development activities

Activities:

- The formulation and establishment of a comprehensive set of land use policies, zoning plans, and development control laws and regulations.

- Establishment of formalized triggering mechanism for Environmental Impact Assessment Studies as a requirement for proposed developments.

- The rationalization of land use planning, management and control responsibilities, among relevant government agencies, and the establishment of integrated land use policy and sectoral plans for biodiversity management/conservation.

- Coordinate data collection and update initiatives for the "national biodiversity GIS database". In addition to collating data collected by the key agencies with biodiversity conservation/management responsibilities, i.e the Forestry Division, Fisheries Division and the Environmental Unit.

- Provision of adequate training for GIS operators.

Table 6.1 presents the priority actions, the time frames for their implementation, the costs for undertaking implementation over a three year period and the key implementing institutions and agencies. The key below provides explanation of terms used in the table.

KEY

Priority actions : Those actions or activities identified in the Strategy and Action Plan which will form the basis of biodiversity conservation efforts in SVG. These actions need to be addressed and reviewed within a three year period prior (using available technical and financial resources) prior to the implementation of further initiatives.

Level of priority : The degree of urgency with which actions must be implemented to ensure the conservation and sustainable use of biodiversity.

- **H :** Very urgent. Essential to the prevention of further loss of biodiversity.
- **M :** Moderately urgent. Necessary to the conservation of species and habitats over the short term.
- **L :** Slightly urgent. Needs to be implemented to ensure sustainable use of biodiversity over the long term.

Time frame for implementation: Period of time within which action should be implemented and specific targets achieved.

Table 6.1 Proposed Projects for the Implementation of Biodiversity Conservation Initiatives

BIODIVERSITY CONSERVATION PRIORITY		Priority H, M, L	Time Frame for Implementation	Cost/Budget US $	Key Implementing Institutions and Agencies
Proposed Projects	**Project Activities**				
PROJECT No.1. **Public Relations/Education**	Dissemination of information on biodiversity to primary and secondary schools through essay competitions, poster competitions, etc. and the incorporation of biodiversity issues into the school curriculum.	H	Within 2 years	US$25,000 (running over a three year period)	Ministry of Health & Environment - Environmental Unit. (*Lead Agency*) *In collaboration with the following agencies:*
	Undertake media productions and other educational programmes, Production of educational materials i.e information brochures, publications etc. for the general public, visitors and school children.	H	within 1 year	US$85,000 (running over a three year period)	Fisheries Division Forestry Division Ministry of Communications & Works
	Present seminars to increase the public awareness of the challenges of biodiversity conservation and management, and the part they can play in ensuring that these resources are used sustainably.	H	Within 1 year	(In-Kind contribution)	
	Create awareness among the judiciary, law enforcement officers, and immigration officers, via workshops, with regard to the importance of the enforcement of penalties for offences related to biodiversity protection.	H	Within 1 year	(In-Kind contribution)	

BIODIVERSITY CONSERVATION PRIORITY		Priority H, M, L	Time Frame for Implementation	Cost/Budget US $	Key Implementing Institutions and Agencies
Proposed Projects	**Project Activities**				
PROJECT NO. 2 **Development of a Wildlife Unit**	Conducting flora and fauna inventories of the watershed areas of SV. Determine status of wildlife species and their habitats	H	Within 2 years	US$60,000	Forestry Division
	Conduct in-depth surveys of the *Amazona guildingii* including nesting sites.	M	Within 3 years	US$10,000	
	Undertake a study of the *Egret* population and their effects on indigenous ecosystems.	M	Within 3 years	US$10,000	
PROJECT NO: 3 **In-depth Plant Inventory and Herbarium Establishment**	Establish an inventory unit	H	Within 2 years	US$50,000	Forestry Division
	Collect herbarium specimens of all plants	H	Within 2 years	(In-Kind contribution)	
	Establish and house a local herbarium collection.	H	Within 3 years	(In-Kind contribution)	
PROJECT NO: 4 **Environmental Monitoring of Coral Reefs**	Establish standards for coastal water quality with input from the Environmental Unit.	H	Within 1 year	(In-Kind contribution)	Fisheries Division
	Monitoring of water quality and assessing the long term impacts of changing coastal water quality on the health of marine ecosystems and habitats.	H	Within 2 years	US$60,000	

BIODIVERSITY CONSERVATION PRIORITY		Priority H, M, L	Time Frame for Implementation	Cost/Budget US $	Key Implementing Institutions and Agencies
Proposed Projects	**Project Activities**				
PROJECT NO: 5 **Cataloguing of Fisheries Documents**	Compile a reference list of work done on the various species and habitats and collect abstracts where available	H	Within 1 year	(In-Kind contribution)	Fisheries Division Environmental Unit
	Set up, or acquire a searchable database to hold information on biodiversity; Fishbase and reef Base.	H	Within 1 year	US$5,000	
	Special provisions should be made for setting up extension services, e.g. a library with appropriate database of available information related to marine biodiversity.	M	Within 3 years	(In-Kind contribution)	
	Coordinate marine and fresh water biodiversity related education awareness programme activities in collaboration with the Environmental Unit.	H	Within 1 year	(In-Kind contribution)	
	Undertake media productions and other educational programmes, and public education seminars aimed at enhancing public awareness with regard to marine conservation issues.	H	Within 1 years	US$60,000 (running over a three year period)	

BIODIVERSITY CONSERVATION PRIORITY		Priority H, M, L	Time Frame for Implementation	Cost/Budget US $	Key Implementing Institutions and Agencies
Proposed Projects	**Project Activities**				
PROJECT NO: 6 **Turtle Nesting Beach Surveys**	Undertake mapping of all identified turtle nesting areas and incorporate this information in a "national GIS database".	H	Within 2 years	(In-Kind contribution)	Fisheries Division (*Lead Agency)* With input from the following agency:
	Develop future policies for sea turtle protection, and the preservation of turtle nesting habitats.	H	Within 2 years	(In-Kind contribution)	Central Planning Division
	Undertake monitoring of coastal zone development activities and assessments of their potential to adversely impact upon marine environments.	H	Within 1 years	(In-Kind contribution)	

BIODIVERSITY CONSERVATION PRIORITY		Priority H, M, L	Time Frame for Implementation	Cost/Budget US $	Key Implementing Institutions and Agencies
Proposed Projects	**Project Activities**				
PROJECT NO: 7 **Formulation of a Comprehensive Land Use Development Plan**	The formulation and establishment of a comprehensive set of land use policies, zoning plans, and development control laws and regulations.	H	Within 1 year	US$120,000 (Consultancy fees)	Central Planning Division (*lead Agency*) *Input from the following agencies:*
	Establishment of formalized triggering mechanism for Environmental Impact Assessment Studies as a requirement for proposed developments.	H	Within 1-2 years	US$50,000 (Consultancy fees)	Ministry of Health & Environment - Environmental Unit. Minstry of Agriculture -
	The rationalization of land use planning, management and control responsibilities, among relevant government agencies, and the establishment of integrated land use policy and sectoral plans for biodiversity management/conservation.	H	Within 1 year	(In-Kind contribution)	Fisheries Division Forestry Division Ministry of Communications & Works
	Coordinate data collection and update initiatives for the "national biodiversity GIS database". In addition to collating data collected by the key agencies with biodiversity conservation/management responsibilities, i.e the Forestry Division, Fisheries Division and the Environmental Unit.	H	Within 1-2 years	(In-Kind contribution)	
	Provision of adequate training for GIS operators	H	Within 1 year	US$30,000	

BIBLIOGRAPHY

Terrestrial Flora & Fauna Assessment

Caribbean Conservation Association, (C.C.A.) (*Editor*). 1991. St. Vincent and the Grenadines, country environmental profile (CEP). C.C.A. Bridgetown, Barbados.

Chow Barbara. A., 1993. Report on Wildlife and Biodiversity., Tropical Forests Action Programme country mission team to St. Vincent and the Grenadines CARICOM / FAO / ODA.

Biodiversity and Conservation Profile St. Vincent, 1988. *ICBP Monograph No.1.*

Dardoin 1993. National Forestry Action Plan Main Report. Tropical Forests Action Programme CARICOM / FAO / ODA.

Forestry Department, 1998. Report on the ninth Caribbean Foresters meeting held in Santa Domingo, Dominican Republic, theme Biodiversity.

Forestry Department,1999. Report on the 1999 ST. Vincent Parrot census

Henderson, R.W., and G. T. Haas. 1993. Status of the West Indian snake *Chironius vincenti*. *Oryx*, 27 (3) p 181-184.

Henderson, R.W., R. A. Winstel, and J. Friesch 1996. *Corallus hortulanus* (Serpentes: Boidae) in the post-columbian West Indies. new habitats, new prey species, and new predators, p. 417-423. *In* R. Powell and R.W. Henderson (eds), Contributions to West Indian Herpetology: A Tribute to Albert Schwartz. Society for the Study of Amphibians and Reptiles, Ithaca (New York). Contributions to Herpetology, volume 12.

Kaiser H, and R. W. Henderson, 1994. The Consrevation status of Lesser Antillean Frogs, p 41-56 Herpetological Natural History, 2 (2). The International Herpetological Symposium, Inc.

Lazell James, 1994. A new *Sphaerodactylus* (Sauria; Gekkonidae) fro Bequia, Grenada bank, Lesser Antilles. Breviora No. 496. Museum of Comparative Zoology Cambridge Mass.

Lausche, B., 1987. Natural resources conservation act 1987. Draft No 1. based on country visit No. 3: June 15 - 21, 1987. Government of St. Vincent and the Grenadines.

McHenry, T. and Gane, M., 1988. Report to the Government of St. Vincent and the Grenadines on forestry, wildlife and national parks policy and legislation. FAO, Rome.

Providence L.F., 1996. Protecting our protected areas (St. Vincent), p. 86-92. *In* Proceedings of the Eight Meeting of Caribbean Foresters at Grenada (Protected Areas Management) 1997. Puerto Rico Conservation Foundation & International Institute of Tropical Forestry, USDA Forest Service Rio Piedras, Puerto Rico

Raffaele H., W. James, O. Garrido, A. Keith and J. Raffaele. 1998. A guide to the birds of the West Indies. Princeton University Press, Princeton New Jersey.

Schwartz ,A. and R. M. Henderson.. 1985. A guide to the identification of Amphibians and Reptiles of the West Indies exclusive of Hispaniola. Milwaukee Public Museum.

Schwartz, A. and R. M. Henderson. The Butterflies of St. Vincent and the Grenadines. West Indies (*Reference incomplete*)

Vaughan Nancy, 1995., New records of bats on St. Vincent. The Bulletin., British Ecological Society Vol. XXVI.

Vaughan N. and J.E. Hill, 1996., Bat (Chiroptera) diversity and abundance in banana plantations and rainforest and three new records for St. Vincent, Lesser Antilles. *Mammalia, t. 60, n˚3*: p 441-447.

Marine & Freshwater Species Assessment

Acker, Susan. Leaflet on Mangrove Ecology. pp. 19.

Adams, J.E. 1978. Offshore Bank fishing in the West Indies. East Texas University; USA. Ecumene. Vol. 10, pp. 20-26.

Adams, J.E. 1980. Seafaring Grenadines: An Historical geography of Traditional Fisheries in the Caribbean. University of Minnesota, Duluth, Minnesota, USA. pp. 105.

Adams, J.E. 1990. Conch Fishing Industry of Union Island, Grenadines, West Indies. Department of Geography, University of Minnesota, Duluth, Minnesota, USA.

Bailey, M. (1992).Case Study on Management of the Tobago Cays National Park. Fisheries Division. Kingstown, St. Vincent and the Grenadines. pp. 10.

Beardsley, G.L. Marine recreational Fishing Statistics - A Caribbean Basin Initiative. U.S. Department of Commerce, National Marine Fisheries Service, NOAA, Miami, Florida.

Beebe, W. and G. Hollister. (1935) The Fishes of Union Island, Grenadines, British West Indies, with the Description of a New Species of Star-gazer. Zoologica. Vol 19, no.6 pp. 209-224.

Berwick, Nora L. 1986. Tourism and the Near Shore Marine Environment in St. Vincent and the Grenadines. OAS, Washington D.C.

Caribbean Conservation Association on behalf of the Government of St. Vincent and the Grenadines. (1991). Country Environmental Profile.

Caldwell, D.K., and M.C. Caldwell. 1971. Porpoise Fisheries in the Southern Caribbean - Present Utilizations and Future Potentials. University of Florida, Gainesville, Florida.

Caldwell, D.K. and D.S. Erdman. 1963. Journal of Mammalogy - Pilot Whale. Vol. 44. No.1. pp. 114-115.

Caldwell, D.K., Caldwell, M.C and Griffith Arindell. 1973. Dwarf Sperm whales, Kogiasimus, from the Lesser Antillean Island of St. Vincent. University of Florida, Gainesville, Florida.

Caldwell, D.K., Caldwell, M.C., Rathjen, W.F, and John. R. Sullivan. 1971. Cetaceans from the Lesser Antillean Island of St. Vincent. Fishery Bulletin: Vol. 69. No. 2.

FAO Paper, 1984. Unintentional Entanglements in Fishing Nets and Debris. Fishery Resources and Environment Division , Rome.

FAO Paper. 1985. Western Central Atlantic Fishery Commission. Committee for the Management and Development of Fisheries in the Lesser Antilles Second Seminar. Review of the Fisheries Situation in the Area. Castries.

FishBase. 1998. FishBase CD-ROM. Frose, R. and D. Pauly, Editors. ICLARM, Manila.
Fisheries Act, 1986. Saint Vincent and the Grenadines Act No. 8 of 1986.

Fisheries Corporate Plan 2000. Present and Proposed Organisational Charts.

Fisheries Regulations, 1987. Statutory Rules and Orders, 1987 No. 1.

Findlay, James. 1998. Conflict Resolution in the Seine Net Fishery of St. Vincent and the Grenadines. pp. 31 - 39.

Glynn, Shermine. 1999. Fisheries Fata Collector. Personal Commentary.

Gourmain, Philippe. 1993. Action Plan for the Tobago Cays National Marine Park. French Cooperation/Fisheries Division.

Heyman, A.M., Smith, A., Shallow, T. and J. R. Clarke. 1987 project Proposal - Development of the Tobago Cays National Park. GOSVG-OAS.

Jones, A and N. Sefton. 1978. Marine Life of the Caribbean. "The Middle World of the Mangroves". pp 11 - 20.

Kawaguchi, Masonori. 1990. Report on a Baseline Study for Aquaculture Development in St. Vincent and the Grenadines.

Mahon, R. 1990. Fishery Managment Options fro Lesser Antilles Countries - FAO Fisheries Technical Paper 313.

Matthes, H. (1984). Saint Vincent and the Grenadines Formulation of a Fisheries Development Programme. United Nations Food and Agricultural Organisation (FAO). Rome. 147 - 149.

Ministry of Foreign Affairs and Tourism - French Mission for Cooperation. 1995. Survey on the Yachting Activity in the Tobago Cays and the Grenadines.

Morris K. (1996). An Overview of the Status of the Fisheries Sector of St. Vincent and the Grenadines and the Potential for Further Development. Ministry of Agriculture and Labour, Kingstown, St. Vincent and the Grenadines.

Morris, K. (1991). Fisheries Country Profile. Fisheries Division, Ministry of Agriculture and Labour, Kingstown, St. Vincent and the Grenadines.

Morris. 1999. Personal Commentary. OECS-NRMU/CDB Symposium, Kingstown, St. Vincent and the Grenadines.

Nurse, L.A. and Robert Bascom. 1997. Technical reconnaissance Survey of Selected Beaches and Coastal Areas in St. Vincent and the Grenadines.

Nybakken, J.W. 1993. Marine Bioolgy - An Ecological Approach. Sea Grass Communities. pp 196 - 204. 3rd Ed. Harper Collins College Publishers. N.Y.

Ryan, R. 1999. St. Vincent and the Greandines Fisheries Status Report. 1997. Fisheries Division, Ministry of Agriculture and Labour. pp 9 - 17.

Scott, Nigel M. and Julia Horrocks. 1993. Sea Turtle Recovery Action Plan for St. Vincent and the Grenadines. WIDECAST. CEP Technical Report No. 27. pp 66 - 71.

Sea Grant Newsletter. 1999. Sea Grant in the Caribbean. "Mangrove managed by Local Community in St. Lucia." Jan - Mar. issue. Pp 1- 4.

Straker, L. (1997). Commercial Marine Species Field Manual. Fisheries Division, Ministry of Agriculture and Labour, Kingstown, St. Vincent and the Grenadines.

Vink, D.L.N. and Rudo Von Cosel. 1985. Revue Suisse de Zoologie. "The Conus Cedonulli Complex. "Historical review, taxonomy and Biological Observations." Geneve. Imprimierie Kundig. pp. 539 - 546.

Walker, S.H., Newton, R.A. and A. Ortiz. USEPA. Coral Reefs: An English Compilation of Activities for Middle School Students. "The Importance of the Coral Reef." pp. 84 - 85.

Agricultural Biodiversity Assessment

Guilding Landown. 1825. An Account of the Botanic Garden in the island of St. Vincent From its First Establishment to the Present.

Honychurch N. Penelope. Caribbean Wild Plants and their Uses.

Caribbean Conservation Association, (C.C.A.) (*Editor*). 1991. St. Vincent and the Grenadines, country environmental profile (CEP). C.C.A. Bridgetown, Barbados.

Kirby I.A Earl. The Sugar Hills of St. Vincent and their Sites

Carringhton Sean. Wild Plants of the Eastern Caribbean.

Physical Development Planning Assessment

UNDP Caribbean Environmental Program (CEP), "Bruntland Commission on *'Our Common Future'* ", Rio de Janeiro, Brazil, 1992.

C.A.S.T., "Proceedings of the Seminar on Man versus the Environment", Ministry of Science, Technology and Environment, NRCD, PAHO, June 1984.

Girvan, Norman P., "Caribbean Ecology and Economics," Institute of Social Economic and Economic Research, UWI, Mona, Kingston Jamaica, 1991.

The Institution for Research on Public Policy, " Sustainable Development in the Caribbean", Kingston, Printed in Canada, May 1990.

Geoghegan, Tighe, Wagner, Kathryn and Turner, Katherine, " Proceedings of The Caribbean Seminar on Environmental Impact Assessment ", Centre for Resource Management and Environmental Studies, University of the West Indies, Barbados, 1985.

McNeely, Jeffrey A., Miller, Kenton R., Reid, Walter V., Mittermeier, Russell A., Werner, Timothy B., " Conserving the World's Biological Diversity ", published by International Union for Conservation of Nature and Natural Resources, World Resources Institute, Conservation International, World Wildlife Funds-US and the World Bank, Gland, Switzerland, and Washington, D.C., 1990.

TYDAC, "International Spans Workshop (Technical Demonstrations Notes)", Ottawa, Ontario, Canada, August 30 – September 1, 1995.

APPENDIX 1.
SVG NBSAP PROJECT TEAM BIOGRAPHIES

EDWARD MORRISON BAISDEN holds a Diploma in Agriculture from the East Caribbean Institute of Agriculture and Forestry, Trinidad & Tobago (1971 –73). He has also completed extensive training in agricultural studies including: Certificate Tropical Weed Control, Certificate National Park Planning – Caribbean Wildlands Programme and a Certificate Mass Communication – Frederich Ebert Stiftung and the University of the West Indies.

Mr. Baisden also completed a Certificate Project Management – Caribbean Development Bank and Project Monitoring and Evaluation from the International Fund for Agricultural Development and the Caribbean Development Bank.

Mr. Baisden served as the consultant for the Agricultural Assessment component of this project.

COLIN CAMPBELL is a Planning Officer at the Central Planning Unit of the Ministry of Finance & Planning of SVG. Mr. Campbell undertook the Physical Development Planning and GIS Assessment of the NBSAP country study.

ROWENA KIRBY has been working with the SVG Fisheries Division since 1991 as an Extension Assistant. In 1998, she was appointed Fisheries Officer and is now responsible for Public Education/Relations. One of her responsibilities under this Post is the creation of informational material to keep the public up to date on fisheries matters.

Ms. Kirby holds a Bachelor of Science Degree in Environmental Management from Lake Erie College, Ohio, USA and is also involved with various environmental projects which have an impact on marine resources. Ms. Kirby also represents the Fisheries Division on the National Environmental and Advisory Board.

Ms. Kirby served as the consultant for the Marine & Freshwater Species Assessment component of this project.

FITZGERALD PROVIDENCE is a graduate of the University of New Brunswick, Fredericton New Brunswick Canada in 1994 with a Bachelor of Science in Forest Management and a minor in Wildlife Biology, He also holds a Diploma in Forestry from the Eastern Caribbean Institute of Agriculture and Forestry (E.C.I.A.F.) in Trinidad and Tobago. Mr. Providence has also undertaken training in Project Development and Appraisal, in addition to Public Service Financial Management.

Since 1994 Mr. Providence has held the position of Forest Supervisor responsible for Conservation, in the Forestry Department of the Ministry Of Agriculture, St. Vincent and the Grenadines. His present responsibilities are the supervision of the Watershed management, Wildlife management and Recreation Site management programmes (activities) in the Forestry Department.

FitzGerald's interests include, forest ecology and plant identification and conservation. Some of his relevant projects include; a study of the vegetation change along the slopes of La Soufriere Volcano, the development and implementation of a tour guide-training programme for the Vermont Nature Trails and an investigation of plants used as herbal medicines in the Buccament Valley St. Vincent.

Mr. Providence served as the consultant for Terrestrial Flora and Fauna Assessment component of this project.

DAVID A. SIMMONS is the Principal Partner of SIMMONS & ASSOCIATES. He has more than 17 years experience working in the Caribbean in a number of areas related to Environmental Impact Assessment, and Environmental Policy, Planning and Management. The Consulting firm was established in 1992 with the aim of providing consulting services to regional and international clients in all aspects of environmental management.

Before forming the consulting group Mr. Simmons worked with the Caribbean Conservation Association where, as Project manager for the Natural Resource Management Programme, he advised and assisted several governments of the region on various aspects of Environmental Policy, Planning and Management.

Since the formation of the firm in 1992, Mr. Simmons has undertaken extensive work in the areas Environmental Impact Assessments (EIA) related to tourism development, Conservation Strategies in several countries of the Caribbean and the management of environmental resources within the context of protected areas concept. Mr. Simmons is extremely knowledgeable of the environment in the wider Caribbean having worked on several regional projects including the development of the Caribbean Marine Parks and Protected Areas Management Network implemented by the Caribbean Conservation Association (CCA); the preparation of National Environmental Policy documents for Dominica, Grenada, St, Kitts and Nevis, St. Lucia and St. Vincent & the Grenadines and the preparation of National Environmental Action Plan (NEAP) for St. Lucia and assisted in the preparation of NEAP for Grenada. The firm also recently concluded the National Biodiversity Strategy and Action Plan for Barbados.

Mr. Simmons served as the International Consultant/Team Leader on this project.

DR. WINSTON MCCALLA is an Environmental and Institutional legal specialist with over twenty years experience. He has served as an expert on environmental law and planning law to a number of regional and international agencies and governments. Dr. McCalla has extensive experience in the area of drafting legislation, having served as a consultant to several regional and international agencies in the preparation of model legislation in several areas. Some of these assignments included work on the preparation of legislation for the restoration of a historic town in Antigua and also in the preparation of legal documents for the establishment of trust for the management of Historic Sites in St. Kitts-Nevis and other parts of the Eastern Caribbean.

Dr. McCalla has also worked as a Consultant, NARMAP Project, in Belize (WWF/USAID), and in this regard prepared guidelines for environment impact assessment as well as environmental impact assessment regulations and effluent limitation regulations for the Government of Belize. He also assisted the Government of Belize in the preparation of the Belize National Environmental Plan.

As a Consultant to ODA/Forest Planning and Management Project in Belize, Dr. McCalla prepared a review of forest and forest-related legislation as well as a new Forest Act and amendments to the Wildlife Protection Act, the National Parks Systems Act and the Land Utilization Act for the Government of Belize.

Dr. McCalla is very familiar with St. Vincent and the Grenadines having prepared the model Physical Planning Legislation for St. Vincent and the Grenadines. Mr. McCalla has served as the consultant for the Legal Assessment component of this project.

KEVIN SEALE is an in-house staff member at Simmons & Associates. His area of specialization is in Environmental Planning and Geographic Information Systems.

Since graduating from Carleton University in Ottawa, Canada (1997), Mr. Seale worked in the environmental management consulting field. He has extensive training and experience in undertaking Environmental Impact Assessments and Environmental Auditing.

Kevin Seale has participated in a number of local and regional environmental consulting projects which include: Environmental Impact Assessments, Natural Resource Assessment, Tourism Development Planning and Conservation Strategies.

Some of his relevant experience includes: Participation on the recently concluded National Biodiversity Strategy and Action Plan for Barbados, coordinated by the Ministry of Environment, Energy, & Natural Resources. Mr. Seale drafted the *Land Resources Assessment Technical Report*. In addition to coordinating project activities and producing final documents for submission.

APPENDIX 1.(a)
SVG BIODIVESITY NATIONAL CONSULTATION
LIST OF PARTICIPANTS
April 14th, 2000
Camelot Hotel

	NAMES OF PARTICIPANTS	ORGANIZATIONS
1.	Rowena Kirby	Fisheries Division
2.	Michael Nelson	Central Planning Division
3.	Maxwell Porter	Ministry of Agriculture
4.	Alex Barnwell	Chamber of Industry and Commerce
5.	Alwyn Cupid	Ministry of Housing
6.	Antonio Joyette	Meteorological Office
7.	Carl Browne	Ministry of Communications and Works
8.	Juanita Francios	N.B.C Radio 705
9.	St. Clair Charles	WE F.M.
10.	Jerry George	First F.M / The Vincentian
I 1.	Benson Chieverton	Public Health Dept. - Ministry of Health
12.	E. Morrison Baisden	Consultant / National Trust
13.	Alston Stoddard	Ministry Of Trade. Industry and Commerce
14.	Roger Young	Community Development Division
15.	St. Clair Jimmy Prince	Government Information Service
16.	Leroy Rose	Chamber of Industry and Commerce
17.	Nina Maloney	N.B.C. Radio 705
18.	Mitra Malcolm	VINLEC
19.	Dr. Earl Kirby	National Trust
20.	Edmund Jackson	Resource Analyst
21.	Nigel Weekes	Forestry Division
22.	Avis Collis	PESCO
23.	Jenny Miller	PESCO
24.	Edson Boyea	National Youth Council
25.	Asram Soleyn	National Youth Council
26.	Howie Prince	Tourism
27.	Glenroy Browne	Integrated Development Solutions
28.	Bentley Browne	CWSA
29.	O'Reilly Lewis	CWSA
30.	Clarence	Coast Guard Service
31.	Daniel Rawlins	Ministry Of Education
32.	Hon. Joseph Bonadie	Minster Of Health and the Environment
33.	Brenton Bailey	P/S Ministry of Health/Environment
34.	Dr. Reynold Murray	Environmental Services Coordinator

APPENDIX 1.(b)
REVIEW WORKSHOP
May 19th, 2000
LIST OF PARTICIPANTS

Baisden, Morrison	Consultant, Integrated Development Solutions
Browne, Glenroy	Consultant, Integrated Development Solutions
Kirby, Rowena	Consultant, Fisheries Division
Marshall, Dawn	Consultant Facilitator, Simmons and Associates
Murray, Reynold	Coordinator, Ministry of Health and Environment
Providence, Fitzgerald	Consultant, Forestry Department
Seale, Kevin	Research Officer, Simmons and Associates
Snagg, Rosita	Director (Ag.), Community Services, Ministry of Housing

APPENDIX 2.
Checklist of ferns in St. Vincent and the Grenadines
(Proctor, 1977 In Howard 1977)

Psilotum nudum
Lycopodium sieberanum
L. reflexum var. reflexum
L. wilsonii
L. funiforme
L. dichotomum
L. taxifolium
L. aqualupianum (doubtful from St. Vincent)
L. cernuum (probably regional endemic)
Selaginella flabellata
S. substipitata
S. tenella
S. rotundifolia (regional endemic)
Danae nodosa
D. elliptica
D. alata
Dicranopteris pectinata
Gleichenia furcata
G. bifida
Hymenophyllum fucoides
H. lineare
H. elegans
H. hirsutum
H. hirtellum var. gratum (regional endemic)
H. hirtellum var. vincentinum (regional endemic)
H. latifrons (regional endemic)
H. lanatum
H. macrothecum
H. polyanthos var. polyanthus
Trichomanes hymenophylloides
T. membranaceum
T. lineolatum
T. punctatum
T. hymenoides
T. angustifrons
T. kapplerianum
T. krausii
T. angustifrons
T. kapplerianum
T. krausii
T. pedicellatum
T. robustum
T. trigodon var. trigodon
T. polypodioides
T. holopterum
T. alatum
T. crispum
T. crinitum
T. osmundoides
Cyathea imrayana
C. muricata (regional endemic)
C. tenera
Cnemidaria grandiflora var. obtusa
Dennstaedtia obtusifolia
Saccoloma domingense
Lindsaea guadrangularis
L. guianenesis
Odontosoria flexuosa (regional endemic)
Anisosorus hirstus
Pteris arborea
P. altissima
Neurocallis praestantissima
Blechnum occidentale
B. divergens
B. ryanii
Pityrogramma calomelanos
P. chrysophylla
Hermionitis palmata
Cheilanthes microphylla
Adiantopsis radiata
Adiantum villosum
A. concinnum
A. capillus-veneris
A. tenerum
Oleandra nodosa
Elaphoglossum herminieri
E. petiolatum
E. martinicense
E. plumieri
E. smithii (regional endemic)
E. apodum
Hymenodium crinitum
Lomariopsis sorbifolia
Polybotrya cervina
Nephrolepsis rivularis
N. multiflora
Cyclopeltis semicordata
Tectana plantaginea
T. trifolia
T. incisa
Ctenitis subincisa
C. sloanei
Lastreopsis effusa var. effusa
L. effusa subsp. divergens
Stigmatopteris rotunda
Diplazium godmani (regional endemic)
D. limbatum
D. cristatum
D. caracasanum
D. expansum
Macrothelypteris touresiana
Thelypteris opposita
T. cooleyi (regional endemic)
T. Balbisii
T. pachyrhachis
T. hydrophila (regional endemic)
T. rustica
T. decussata
T. glandulosa
T. extensa
T. quadrangularis var. grandularis
T. quadrangularis var. inconstans
T. dentata
T. abrupta
T. tetragona var. tetragona
T. tetragona var. guadalupensis
T. nephrodioides
T. pennata
T. poiteana
T. reticulata

T. serrata
Asplenium serratum
A. serra
A. Laetum
A. obtusifolium
A. alatum
A. pteropus
A. abscissum
A. salicifolium var. salicifolium
A. cristatum

A. cunneatum
Polypodium pectinatum
P. dissimile
P. loriceum
P. chnoodes
P. aureum var. aureum
P. piloselloides
P. lycopodioides
P. astrolepsis
P. repens
P. phyllitidis
P. latum
P. crassifolium
Neurodium lanceolatum
Dicranoglossum desvauxii
Grammitis limbata
G. serrulata
G. hartii
G. natata
G. taenifolia
G. trinifolia
G. trifurcata
G. phlegmaria
G. suspensa
G. taxifolia
G. asplenifolia
G. eggersii (regional endemic)
G. mollisima
Cochlidium seminudum
Anetium citrifolium
Polytaenium feci
Vittaria lineata
Ananthacorus angustifolius

Checklist of ferns in St. Vincent and the Grenadines (Proctor, 1977 In Howard 1977)

APPENDIX 3.
Distribution of amphibian and reptile species in SVG

St. Vincent
Bufo marinus
Eleutherodactylus johnstonei
E. shrevei
E. martinicensis
Leptodactylus wagneri
Ameiva ameiva
Anolis griseus
A. trinitatus
Gymnophthaimus underwoodi
Hemidactylus mabouia
Iguanaiguana
Mabuya mabouya
Sphaerodactylus vincenti
Thecadactylus rapicauda
Chironius vincenti
Corallus hortulanuss
Mastigodryas bruesi

Petit St. Vincent
lguana iguana

Prune Island
Anolis aeneus

Union Island
Anolis aeneus
Ameiva ameiva
Iguanaiguana
Corallus enydris
Mastigodryas bruesi

Tobago Cays
Anolis aeneus
Iguanaiguana

Mayero (Mayreau, Mayeau)
Ameiva ameiva
Anolisaoneus
Hemidactylus mabouia
Mabuya mabouya

Catholic Island
Anolis aeneus

Canouan
Geochelone carbonaria
Ameiva ameiva
lguana iguana
Bachia heteropus
Mabuya mabouya

Petit Canouan
Anolis aeneus

Savan Island
Anolis aeneus
lguanaiguana

Petit Mustique
Anolis aeneus
Iguanaiguana

Mustique
Ameiva ameiva
Anolis aeneus
Iguana iguana
Corallus enydris
Mastigodryas bruesi

Baliceaux
Anolis aeneus

Battowia
Anolis aeneus
lguanaiguana
Corallus enydris
Mastigodryas bruesi

Beguia
Leptodactylus wagneri
Mastigodryas bruesi
Amelva ameiva
Anolis aeneus
Anolis richardi
Bachia heteropus
Hemidactylus mabouia
lguanaiguana
Mabuya mabouya
Thecadactylus rapicauda
Corallus onydris
Sphaerodactylus kirbyi

Petit Bateau
Ameiva ameiva
Mabuya mabouya

Cabret
Anolis aeneus

Source: Maclean, et-al., 1977; pers. comm., Dr. David Corke, Senior Ecologist, Northeast London Polytechnic, 1990.

APPENDIX 3.(a)

List of Bats Recorded in St. Vincent And The Grenadines

NAME	STATUS
Noctilio leporinus mastivus	
Pteronotus parnellii	
Allicronycteris megalotis	
Glossophaga longirostris rostrata	
Monophyllusplethodon luciae	Antillean endemic
Sturnira lilium paulsoni	
Artibeusjamaicensis schwartzi	
Artibeus lituratuspalmarum	Probably quite rare
Ardops nichollsi luciae	Antillean endemic
Brachyphylla cavemarum cavemarum	Antillean endemic
Molossus molossus	
Tadarida brasiliensis antillularum	

APPENDIX 4.
List of All Endemic Species in SVG

FLORA	HABITAT AND OR STATUS
Flowering Plants	
Trigynaea antillana	
Meliosoma herbertii	
Calliandra guildingii	
Psidium guildingianum	
Tibouchina cistoides	High elevations
Begonia pensilis	
Hoffmannia tubiflora	
Malouetia retroflexa	
Columnea speciosa	
Peperromia cuneata	
Peperomia vincentiana	
Croton guildingii	
Epidendrum vincentinum	
Tillandsia megastachya	
Spachea perforata	
FERNS	
Diplazium godmani	Endemic to Lesser Antilles / woodland at high elevations plant rare
Elaphoglossum smithii	Endemic to Lesser Antilles; St. Vincent & Grenada / High elevations very rare.
MAMMALS	
Oryzomys victus (Rice rat)	Extinct
Note: 3 other mammals are listed as regional endemics.	
REPTILES	
Sphaerodactylus kirdyi	Bequia / apparently rare
Anolis griseus	forested areas / status unknow
Anolis trinitatus	forested areas / status unknow
Chironius vincenti	forested areas / status unknow but not rare
Gymnophathalmus underwoodi	Regional endemic
Sphaerodactylus vincenti	Regional endemic
Mastigodryas bruesi	Regional endemic
AMPHIBIANS	
Eleutherodactylus shrevei	forested interior, most common at altitudes > 300m / status unknown

APPENDIX 5(a) SVG National Fisheries Biodiversity List - Finfish Species

Family	Species		Synonyms
	Common Name	Scientific Name	
Acanthuridae	Blue tang surgeonfish	Acanthurus coeruleus	Hepatus caeruleus, Teuthis coeruleus
	Doctorfish	Acanthurus chirurgus	Chaetodon chirurgus
	Ocean surgeon	Acanthurus bahianus	Teuthis bahianus, Hepatus bahianus
	Palette surgeonfish	Paracanthurus hepatus	Teuthis hepatus
Albulidae	Bonefish	Albula vulpes	Esox vulpes
Alopiidae	Thresher shark	Alopias vulpinus	
Antennariidae	Longlure frogfish	Antennarius multiocellatus	Antennarius tenebrosus
	Striated frogfish	Antennarius striatus	Antennarius scaber
Apogonidae	Flamefish	Apogon maculatus	Monoprion maculatus
Ariommatidae	Silver-rag driftfish	Ariomma bondi	
	Spotted driftfish	Ariomma regulus	Psenes regulus
Atherinidae	Hardhead silverside	Atherinomorus stipes	Atherina stipes
Aulostomidae	Trumpetfish	Aulostomus maculatus	Aulostomus maculatum
Balistidae (Triggerfishes)	Black triggerfish (pigfish)	Melichthys niger	Balistes niger (Original)
	Grey triggerfish	Balistes carolinensis	Balistes capriscus
	Queen triggerfish *(V)*	Balistes vetula	
Belonidae (Needlefishes)	Agujon needlefish	Tylosurus acus acus	Sphyraena acus, Tylosurus acuc
	Flat needlefish	Ablennes hians	Belone hians, Tylosurus hians

Family	Species		Synonyms
	Common Name	Scientific Name	
	Hound needlefish	Tylosurus crocodilus crocodilus	Belone crocodila, Strongylura crocodila
	Keeltail needlefish	Platybelone argalus argalus	Belona argalus
	Timicu	Strongylura timucu	Esox belone timucu
Blenniidae		Ophioblennius atlanticus atlanticus	Scartichthys atlanticus, Rupiscartes atlanticus, Salarias atlanticus, Cynoscartes atlanticus, Blennius atlanticus
	Molly miller	Scartella cristata	Blenius cristatus, Adonis cristatus
	Redlip blenny	Ophioblennius atlanticus macclurei	Ruphioblennius atlanticus atlanticus
	Textile blenny	Entomacrodus textilis	Salarias textilis, Salarichthys textilis Alticus textilis
Bothidae	Eyed flounder	Bothus ocellatus	Rhombus ocellatus
	Peacock flounder	Bothus lunatus	Pleuronectes lunatus Romboidichthys lunatus Platophrys lunatus
Carangidae (Jacks and Pompanos)	African pompano (Jackfish driver)	Alectis ciliaris	Zeus ciliaris, Blepharis ciliaris
	Almaco jack		
	Atlantic bumper	Chloroscombrus chrysurus	Scomber chrysurus, Mycropteryx chrysurus, Mycropterus chrysurus
	Atlantic moonfish	Selene setapinnis	Zeus setapinnis, Vomer setapinnis
	Bar jack	Caranx ruber	Scomber ruber, Carangoides ruber
	Bigeye scad (Jacks)	Selar crumenophthalmus	Scomber crumenophthalmus Caranx crumenophthalmus

Family	Species		Synonyms
	Common Name	Scientific Name	
			Trachurops crumenophthalmus
	Black jack	Caranx lugubris	
	Blue runner (Greenback cavalli)	Caranx crysos	Scomber crysos, Paratractus crysos Carangoides crysos
	Bluntnose jack	Hemicaranx amblyrhynchus	Caranx amblyrhnchus
	Dodger (Round scad)	Decapterus punctatus	Caranx punctatus
	Greater amberjack	Seriola dumerili	Caranx dumerili
	Horse-eye jack	Caranx latus	Xurel lata
	Leatherjack	Oligoplites saurus	Scomber saurus
	Palometa (Pompamo)	Trachinotus goodei	
	Permit	Trachinotus falcatus	
	Pilotfish	Naucrates ductor	Gasterosteus ductor (O)
	Rainbow runner (Salmon)	Elagatis bipinnulata	Seriola bipinnulata Micropterux bipinnulatus
	Robin (Mackerel scad)	Decapterus macarellus	Caranx jacobeus
	Yellow jack	Caranx batholomaei	Carangoides bartholomaei
Carcharinidae (Ground sharks)	Blacknose shark *(V)*	Carcharhinus acronotus	
	Blacktip shark	Carcharhinus limbatus	
	Blue shark	Prionace glauca	
	Bull shark	Carcharhinus leucas	Carcharias leucas

Family	Species		Synonyms
	Common Name	Scientific Name	
	Caribbean reef shark	Carcharhinus perezi	Carcharhinus perezii Carcharhinus springeri
	Caribbean sharpnose shark	Rhizoprionodon porosus	
	Lemon shark	Negaprion brevirostris	
	Oceanic whitetip shark	Carcharhinus longimanus	Carcharhinus maou
	Silky shark	Carcharhinus falciformis	Carcharias falciformis
	Tiger shark	Galeocerdo cuvier	Galeocerdo cuvieri
Centropomidae (Snooks)	Common snook (Broache)	Centropomus undecimalis	Sciaena undecimalis
	Fat snook	Centropomus parallelus	
	Swordspine snook	Centropomus ensiferus	
	Tarpon snook	Centropomus pectinatus	
Chaetodontidae	Banded butterflyfih	Chaetodon striatus	
	Spotfin butterflyfish	Chaetodon ocellatus	
Chlorophthalmidae	Shortnose greeneye	Chlorophthalmus agassizi	
Clupeidae	Atlantic thread herring	Opisthonema oglinum	Megalops oglina
	Brazilian sardinella	Sardinella brasiliensis	Clupea brasiliensis
	Dogtooth herring	Chirocentrodon bleekerianus	Pellona bleekeriana
	Dwarf round herring	Jenkinsia lamprotaenia	Clupea lamprotaenia
	False herring	Harengula clupeola	Clupea clupeola
	Redear herring	Harengula humeralis	Clupea humeralis

Family	Species		Synonyms
	Common Name	Scientific Name	
	Round sardinella (Windward sprat)	Sardinella aurita	Sardinella aurita mediterranea Sardinella aurita terrasae
	Scaled herring	Harengula jaguana	
Congridae	Conger (Manytooth)	Conger triporiceps	
	Sea bass (Bank sea bass)	Centropristis ocyurus	Serranus ocyurus
Coryphaenidae (Dolphinfishes)	Common dolphinfish	Coryphaena hippurus	
	Pompano dolphinfish	Coryphaena equiselis	
Cynoglossidae	Duskycheek tonguefish	Symphurus plagusia	
Dactylopteridae	Flying gurnard	Dactylopterus volitans	Trigla volitans, Cephalacanthus volitans
Dactyloscopidae	Saddle stargazer	Platygillellus rubrocinctus	Gillellus rubrocinctus
	Sand stargazer	Dactyloscopus tridigitatus	
Dasyatidae (Stingrays)	Chupare stingray	Himantura schmardae	Trygon schmardae
	Longnose stingray	Dasyatis guttata	Raja guttata
	Southern stingray	Dasyatis americana	
Diodontidae	Spotfin procupinefish (Hedge (H) Hog)	Diodon hystrix	Diodon holocanthus
Elopidae	Ladyfish	Elops saurus	
Engraulidae (Anchovies)	Atlantic anchoveta	Cetengraulis edentulus	Engraulis endentulus
	Big-eye anchovy	Anchoa lamprotaenia	

Family	Species		Synonyms
	Common Name	Scientific Name	
	Broad-striped anchovy	Anchoa hepsetus	
	Cuban anchovy	Anchoa cubana	Engraulis cubanus, Anchoviella cubana
	Key anchovy	Anchoa cayorum	Anchovia choerostoma cayorum Anchovia cayorum
	Little anchovy	Anchoa parva	Anchovia parva
	Longfinger anchovy	Anchoa filifera	Anchovia filifera, Anchoviella filifera
	Narrow-striped anchovy	Anchoa colonensis	Anchoa hepsetus colonesis
	Poey's anchovy	Anchoviella perfasciata	Engraulis perfasciatus Anchovia perfasciata Stolephorus perfasciatus
	Shortfinger anchovy	Anchoa lyolepis	Anchoviella lyolepis, Stolephorus lyolepis
	Zabaleta anchoveta	Anchovia clupeoides	Engraulis clupeoides Stolephorus clupeoides
Ephippidae	Atlantic spadefish (Power)	Chaetodipterus faber	Chaetodon faber
Exocoetidae (Flyingfishes)	Atlantic flyingfish	Cheilopogan melanurus	Exocoetus melanurus Cypselurus melanurus
	Bluntnose flyingfish	Prognichthys gibbifrons	Exocoetus gibbifrons
	Bandwing flyingfish	Cypselurus exsiliens	Exocoetus exsiliens Cheilopogon exsiliens
	Clearwing flyingfish	Cypselurus comatus	Exocoetus comatus
	Fourwing flyingfish	Hirundichthys affinis	Exonautes affinis, Hirundichthys affinis
	Margined flyingfish	Cheilopogon cyanopterus	Cypselurus cyanopterus

Family	Species		Synonyms
	Common Name	Scientific Name	
			Exocoetus cyanopterus
	Mirrorwing flyingfish	Hirundichthys speculiger	Cypselurus speculiger Exocoetus speculiger
	Oceanic two-wing flyingfish	Exocoetus obtusirostris	
	Sailfin flyingfish	Parexocoetus brachypterus	Exocoetus brachypterus
	Spotfin flyingfish	Cheilopogon furcatus	Exocoetus furcatus, Cypselurus furcatus
	Tropical two-wing flying fish	Exocoetus volitans	
Fistularia tabacaria	Bluespotted cornetfish	Fistularia tabacaria	
Gempylidae	Black snake mackerel	Nealotus tripes	
	Escolar	Lepidocybium flavobrunneum	Cybium flavobrunneum
	Oilfish	Ruvettus pretiosus	
	Snake mackerel	Gempylus serpens	
	Striped escolar	Diplospinnus multistriatus	
Gerreidae (Mojarras)	Bigeye mojarra	Eucinostomus havana	Xystaema havana, Lepidochir havana
	Caitipa mojarra	Diapterus rhombeus	Gerres rhombeus
	Flagfin mojarra	Eucinostomus melanopterus	Gerres melanopterus
	Graceful mojarra	Eucinostomus gracilis	Diapterus gracilis
	Irish mojarra	Diapterus auratus	
	Jenny mojarra	Eucinostomus gula	Gerres gula
	Mottled mojarra	Eucinostomus lefroyi	Diapterus lefroyi, Ulaema lefroyi

Family	Species		Synonyms
	Common Name	Scientific Name	
	Silver mojarra	Eucinostomus argenteus	
	Yellowfin mojarra	Gerres cinereus	Mugil cinereus
Ginglymostomatidae	Nurse shark	Ginglymostoma cirratum	Squalus cirratus
Gobiidae	Frillfin goby	Bathygobius soporator	Gobius soporator, Mapo soporator
	Tri Tri	Sicydium plumieri	Gobius plumieri
	Yellownose goby	Gobiosoma randalli	Elacatinus randalli
Haemulidae (Grunts)	Barred grunt	Conodon nobilis	Perca nobilis
	Black grunt	Haemulon bonariense	
	Black margate	Anisotremus surinamensis	Lutjanus surinamensis
	Bluestriped grunt	Haemulon sciurus	Sparus sciurrus
	Burro grunt	Pomadasys crocro	Pristipoma crocro
	Caesar grunt	Haemulon carbonarium	
	Cottonwick grunt	Haemulon melanurum	Perca melanura
	French grunt	Haemulon flavolineatum	Diabasis flavolineatum
	Porkfish	Anisotremus virginicus	Sparus virginicus
	Roughneck grunt	Pomadasys corvinaeformis	Haemulon corvinaeforme
	Sailor’s grunt	Haemulon parra	Diabasis parra, Haemulon parra
	Smallmouth grunt	Haemulon chrysargyreum	Brachygenys chrysargyreus
	Spanish grunt	Haemulon macrostoma	

Family	Species		Synonyms
	Common Name	Scientific Name	
	Striped grunt	Haemulon striatum	Perca striata
	Tomtate grunt	Haemulon aurolineatum	Bathystoma aurolineatum
	White grunt	Haemulon plumieri	Labrus plumierii
	White margate (Porgate margy)	Haemulon album	
Hemiramphidae (Halfbeaks)	Balao halfbeak	Hemiramphus balao	Hemirhamphus balao
	Ballyhoo	Hemiramphus brasiliensis	Esox brasiliensis
	Common halfbeak	Hyporhamphus unifasciatus	Hemirhamhus unifasciatus
	Flying halfbeak	Euleptorhamphus velox	
Holocentridae	Squirrelfish (Kiti; Jack Spaniard fish)	Holocentrus ascensionis	Perca adscensionis
	Longspine squirrelfish	Holocentrus rufus	Perca rufa
	Blackbar soldierfish (Red Kiti)	Myripristis jacobus	
Istiophoridae (Billfishes)	Atlantic sailfish	Istiophorus albicans	Makaira albicans, Histiophorus albicans
	Blue marlin	Makaira nigricans	Makaira nigricans nigricans
	White marlin	Tetrapturus albidus	Lamontella albida
	Indo-Pacific Sailfish	Istiophorus platypterus	Xiphas platypterus
	Longbill spearfish	Tetrapturus pfluegeri	
Kyphosidae (sea chubs)	Bermuda sea chub	Kyphosus sectatrix	Kyphosus sectator, perca sectatrix
	Yellow sea chub	Kyphosus incisor	Pimelepterus incisor
Labridae			

Family	Species		Synonyms
	Common Name	Scientific Name	
(Wrasses)	Bluehead	Thalassoma bifasciatum	Labrus bifasciatum
	Green razorfish	Xyrichtys splendens	Xyrichthys splendens Hemipteronotus splendens
	Hogfish *(V)*	Lachnolaimus maximus	Labrus maximus
	Pearly razorfish	Xyrichtys novacula	Coryphaena novacula, Novacula novacula Hemipteronotus novacula
	Puddingwife wrasse	Halichoeres radiatus	Labrus radiatus
	Rosy razorfish	Xyrichtys martinicensis	Xyrichthys martinicensis Hemipteronotus martinicensis
	Slippery dick	Halichoeres bivittatus	Labrus bivittatus
	Spanish hogfish	Bodianus rufus	Labrus rufus
	Spotfin hogfish	Bodianus pulchellus	Crossyphus pulchellus
	Yellowhead wrasse	Halichoeres garnoti	Julius garnoti
Labrisomidae	Hairy blenny	Labrisomus nuchipinnis	Clinus nuchipinnis
Lamnidae	Mako shark	Isurus oxyrinchus	
Lampridae	Opah	Lampris guttatus	Zeus guttatus
Lobotidae	Atlantic tripetail	Lobotes surinamensis	Holocentrus suriamensis
Lutjanidae (Snappers)	Black snapper	Apsilus dentatus	Tropidinius dentatus
	Blackfin snapper	Lutjanus buccanella	Mesoprion buccanella
	Cubera snapper	Lutjanus cyanopterus	Mesoprion cyanopterus
	Dog snapper	Lutjanus jocu	Anthias jocu

Family	Species		Synonyms
	Common Name	**Scientific Name**	
	Grey snapper	Lutjanus griseus	Labrus griseus
	Lane snapper	Lutjanus synagris	Sparus synagris
	Mahogany snapper	Lutjanus mahogoni	Mesoprion mahogoni
	Mutton snapper *(V)*	Lutjanus analis	Mesoprion analis
	Queen snapper	Etelis oculatus	Serranus oculatis
	Schoolmaster snapper	Lutjanus apodus	Perca apoda, Neomaneis apodus
	Silk snapper	Lutjanus vivanus	Mesoprion vivanus
	Southern red snapper	Lutjanus purpureus	
	Vermilion snapper	Rhomboplites aurorubens	Centropristis aurorubens
	Wenchman	Pristipomoides aquilonaris	Anthias aquilonaris
	Yellowtail snapper	Ocyurus chrysurus	Sparus chrysurus Mesoprion chrysurus Lutjanus chrysurus
Macrouridae	Common Atlantic grenadier	Nezumia aequlais	Coryphaenoides aequalis Macrurus aequalis
	Firebelly grenadier	Caelorinchus ventrilux	Coeloehynchus ventrilux
	Glasshead grenadier	Hymenocephalus italicus	Macrurus italicus
	Softhead grenadier	Malacocephalus laevis	Macrourus laevis
	Western softhead grenadier	Malacocephalus occidentalis	Ventrifossa occidentalis Lionurus occidentalis Chalinura occidentalis

Family	Species		Synonyms
	Common Name	Scientific Name	
Malacanthidae	Blackline tilefish	Caulolatilus cyanops	
	Sand tilefish	Malacanthus plumieri	Coryphaena plumieri
Megalopidae	Tarpon	Tarpon atlanticus	Megalops atlanticus, Megalops atlantica
Microstomatidae			
Monacanthidae (Filefishes)	Fringed filefish	Monachanthus ciliatus	Balistes ciliatus
	Orange filefish	Aluterus schoepfii	Balistes schoepfii
	Orangespotted filefish	Cantherhines pullus	Monacanthus pullus
	Planehead filefish	Stephanolepis hispidus	Balistes hispidus, Stephanolepis hispida Monacanthus hispidus
	Pygmy filefish	Monacanthus setifer	Stephanolepis setifer
	Slender filefish	Monacanthus tuckeri	
Mugilidae (Mullets)	Dwarf mullet	Mugil curvidens	Myxus curvidens
	Fantail mullet	Mugil trichodon	
	Flathead mullet	Mugil cephalus	Mugil cephalus cephalus
	Hospe mullet	Mugil hospes	
	Liza	Mugil liza	
	White mullet	Mugil curema	
Mullidae (Goatfishes)	Dwarf goatfish	Upeneus parvus	
	Red goatfish	Mullus auratus	Mullus barbatus auratus
	Spotted goatfish	Pseudupeneus maculatus	Upeneus maculatus, Mullus maculatus

Family	Species		Synonyms
	Common Name	Scientific Name	
	Yellow goatfish	Mulloidichthys martinicus	Upeneus martinicus Mulloides martinicus
Muraenidae (Moray eels)	Blackedge moray	Gymnothorax ocellatus	Muraena ocellata
	Broadbanded moray	Channomuraena vittata	Ichthyophis vittatus Gymnomuraena vittata Nettastoma vittata
	Goldentail moray	Gymnothprax miliaris	Thrysoidea miliaris, Sidera miliaris Lycodontis miliaris
	Green moray	Gymnothorax funebris	Lycodontis funebris
	Purplemouth moray	Gymnothorax vicinus	Lycodontis vicinus, Murenophis vicina
	Spotted moray	Gymnothorax moringa	Lycodontis moringa, Muraena moringa Sidera moringa
	Viper moray	Enchelycore nigricans	Muraena nigricans
Myliobatidae	Spotted eagle ray	Aetobatus narinari	Raja narinari, Stoasodon narinari
	Giant manta	Manta birostris	Raja birostris
Ogcocephalidae	Shortnose batfish	Ogocephalus nasutus	Malthe nasuta
Ophichthidae	Spotted snake eel	Ophichthus ophis	Muraena ophis
Ostraciidae (Boxfishes)	Buffalo trunkfish	Lactophrys trigonus	Octracion trigonus
	Scrawled cowfish	Acanthostracion quadricornis	Ostracion quadricornis Lactophrys quadricornis
	Smooth trunkfish	Lactophrys triqueter	Ostracion triquetor, Rhinesomus triquetor
	Spotted trunkfish	Lactophrys bicaudalis	Ostracion bicaudalis

Family	Species		Synonyms
	Common Name	Scientific Name	
			Rhinesomus bicaudalis
Paralichthyidae	Smallmouth flounder	Etropus microstomus	Citharichthys microstomus
Pempheridae	Glassy sweeper	Pempheris schomburgki	
Polynemidae	Barbu threadfin	Polydactylus viginicus	Virginicus polynemus virginicus
Pomacanthidae (Angelfishes)	Cherubfish	Centropyge argi	
	French angelfish	Pomacanthus paru	Chaetodon paru
	Gray angelfish	Pomacanthus arcuatus	Chaetodon arcualus
	Queen angelfish	Holacanthus ciliaris	Chaetodon ciliaris
	Rock beauty	Holacanthus tricolor	Chaetodon tricolor
Pomacentridae (Damselfishes)	Beaugregory	Stegastes leucostictus	Pomacentrus leucostictus Eupomacentrus leucostictus
	Blue chromis	Chromis cyanea	Furcaria cyanea, Heliastes cyaneus
	Brown chromis	Chromis multilineata	Heliases multilineatus
	Dusky damselfish	Stegastes dorsopunicans	Pomacentrus dorsopunicans
	Night sergeant	Abudefduf taurus	Glyphidodon taurus, Nexilarius taurus
	Sergeant major	Abudefduf saxatilis	Chaetodon saxatilis
	Whitetail damsel	Pomacentrus chrysurus	
	Yellowtail damselfish	Microspathodon chrysurus	Glyphisodon chrysurus
Priacanthidae (Bigeyes)	Atlantic bigeye	Priancanthus arenatus	
	Glasseye	Heteopriacanthus cruentatus	

Family	Species		Synonyms
	Common Name	Scientific Name	
Rhincodontidae	Whale shark	Rhincodon typus	Rhiniodon lypus
Rachycentridae	Cobia	Rachycentridae	
Scaridae (Parrotfishes)	Blue parrotfish	Scarus coeruleus	Coryphaena coerulea
	Bucktooth parrotfish	Sparisoma radians	Scarus radians
	Midnight parrotfih	Scarus coelestinus	
	Princess parrotfish	Scarus taeniopterus	
	Queen parrotfish	Scarus vetula	
	Rainbow parrotfish *(V)*	Scarus guacamaia	
	Redband parrotfish	Sparisoma aurofrenatum	Scarus aurofrenatus
	Redfin parrotfish	Sparisoma rubripinne	Scarus rubripinnis Sparisoma rubripinnis
	Redtail parotfish	Sparisoma chrysopterum	Scarus chrysopterum
	Stoplight parrotfish	Sparisoma viride	Scarus viridis
	Striped parrotfish	Scarus inserti	Callyodon iseri
Sciaenidae (Drums or Croakers)	Acoupa weakfish	Cynoscion acoupa	Cheilodipterus acoupa, Cestrus acoupa
	Barbel drum	Ctenosciaena gracilicirrhus	Umbrina gracilicirrhus
	Ground croaker	Bairdiella ronchus	Corvina ronchus
	High hat	Equetus acuminatus	Grammistes acuminatus Pareques acuminatus
	Jamaica weakfish	Cynoscion jamaicensis	Otolithus jamaicensis

Family	Species		Synonyms
	Common Name	**Scientific Name**	
	Longtail croaker	Lonchurus lanceolatus	Perca lanceolata
	Sand drum	Umbrina coroides	
	Shorthead rum	Larimus breviceps	
	Smalleye stardrum	Stellifer microps	Corvina microps, Ophioscion microps
	Smooth weakfish	Cynoscion leiarchus	Othilithus leiarchus
	Striped croaker	Bairdiella sanctaeluciae	Corvula sanctaeluciae
	Tonkin weakfish	Cynoscion similis	
	Whitemouth croaker	Micropogonias furnieri	Micropogon furnieiri, Umbrina furnieri Micropogon furnieri
Scombridae (Mackerels, Tunas, Bonitos)	Albacore *(V)*	Thunnus alalunga	Scomber alalunga, Thynnus alalunga Germo alalunga
	Bigeye tuna *(V)*	Thunnus obesus	Thynnus obesus, Parathunnus obesus Neothunnus obesus
	Bonito (Blackfin tuna)	Thunnus atlanticus	Thynnus atlanticus Parathunnus atlanticus
	Bullet tuna	Auxis rochei	Scomber rochei
	Cero mackerel	Scomberomorus regalis	Scomber regalis
	Frigate tuna	Auxis thazard	Scomber thazard
	Kingfish (Wahoo)	Acanthocybium solandri	Cybium solandri
	King mackerel (Mulatto kingfish)	Scomberomorus cavalla	Cybium cavalla
	Little tunny	Euthynnus alletteratus	Scomber alletteratus , Pelamys alleterata

Family	Species		Synonyms
	Common Name	Scientific Name	
			Gymnosarda alletterata
	Northern bluefin tuna *(CE)*	Thunnus thynnus thynnus	Scomber thynnus, Orcynus thynnus Thunnus thynnus, Thynnus thynnus Albercora thynnus
	Skipjack tuna	Katsuwonus pelamis	Scomber pelamis, Thynnus pelamis Thinnus pelamis, Orcynus pelamis, Gymnosarda pelamis
	Spanish mackerel	Scomberomorus maculatus	Scomber maculatus
	Yellowfin tuna	Thunnus albacares	Scomber albacares
Scorpaenidae	Longsnout scorpionfish	Pontinus castor	Scorpaena castor
	Spotted scorpionfish	Scorpaena plumieri plumieri	Scorpaena plumieri
Scyliorhinidae (Catsharks)	Boa catshark	Scyliorhinus boa	Scyliorhinus retifer boa
	Roughtail catshark	Galeus arae	Aristiurus arae
Serranidae (Groupers and Fairy basslets)	Barred hamlet	Hypoplectrus puella	Plectropoma puella
	Black grouper	Mycteroperca bonaci	Serranus bonaci
	Butter hamlet	Hypoplectrus unicolor	Perca unicolor
	Coney (Coney Seabass; Butterfish. Red butterfish;Rock butterfish	Cephalopholis fulva	Labrus fulvus (Original) Epinephelus fulva Epinephelus fulvus
	Creole fish	Paranthias furcifer	Serranus furcifer
	Esonue grouper (Jewfish) *(CE)*	Epinephelus itajara	Serranus itajara
	Graysby	Cephalopholis cruentata	Sparus cruentatus, Epinephelus cruentatas

Family	Species		Synonyms
	Common Name	Scientific Name	
			Petrometopon cruentatus
	Greater soapfish	Rypticus saponaceus	Anthias saponaceus
	Indigo hamlet	Hypoplectrus indigo	Plectropoma indigo
	Marbled grouper *(V)*	Dermatolepis inermis	Serranus inermis, Epinephelus inermis
	Misty grouper	Epinephelus mystacinus	Serranus mystacinus
	Mutton hamlet	Alphestes afer	Epinephelus afer
	Nassau grouper *(E)*	Epinephelus striatus	Anthias striatus, Serranus striatus
	Red hind	Epinephelus guttatus	Perca guttata
	Red grouper	Epinephelus morio	Serranus morio
	Rock hind	Epinephelus adscensionis	Trachinus adscensionis Cerna adscensionis
	Shy hamlet	Hypoplectrus indigo	
	Spanish flag	Gonioplectrus guttavarius	
	Tiger grouper	Mycteroperca tigris	Serranus tigris
	Warsaw grouper		
	Yellowedge grouper	Epinephelus flavolimbatus	
	Yellowfin grouper	Mycteroperca venensosa	Perca venenosa
	Yellowmouth grouper	Mycteroperca interstitialis	Serranus interstitialis
	Yellowtail hamlet	Hypoplectrus chlorurus	
Sparidae	Jolthead porgy	Calamus bajonado	Plectropoma chlorurum

Family	Species		Synonyms
	Common Name	Scientific Name	
(Porgies)	Longspine porgy	Stenotomus caprinus	Sparus bajonada
	Saucereye porgy	Calamus calamus	Pagellus calamus
	Sheepshead porgy	Calamus penna	Pagellus penna
	Silver porgy	Diplodus argenteus caudimacula	Sargus caudimacula Diplodus caudimacula
	Pluma porgy	Clamus pennatula	
	Western Atlantic seabream	Archosargus rhomboidalis	Perca rhomboidalis
Sphyraenidae (Barracudas)	Great barracuda	Sphyraena barracuda	Esox barracuda
	Guachanche barracuda	Sphyraena guachanche	
	Snook (Southern sennet)	Sphyraena picudilla	
Sphyrnidae	Great hammerhead	Sphyrna mokarran	Zygaena mokarran
	Scalloped hammerhead	Sphyrna lewini	Zygaena lewini
Stomiidae		Bathophilus digitatus	
Syngnathidae	Shortfin pipefish	Cosmocampus elucens	Syngnathus elucens
Synodontidae	Sand diver	Synodus intermedius	Saurus intermedius
	Snakefish	Trachinocephalus myops	Salmo myops, Sarus myops Synodus myops
Tetraodontidae (Puffers)	Bandtail puffer	Sphoeroides spengleri	Tetrodon spengleri
	Checkered puffer	Sphoeroides testudineus	Tetraodon testudineus
	Sharpnose puffer	Canthigasta rostrata	Tetrodon rostratus, Canthigaster rostratus

Family	Species		Synonyms
	Common Name	**Scientific Name**	
	Smooth puffer	Lagocephalus laevigatus	Tetrodon laevigatus Tetraodon laevigatus
	Southern puffer	Sphoeroides nephelus	Tetrodon nephelus
Triakidae	Dusky smooth-hound shark	Mustelus canis	Squalus canis
Trichiuridae	Largehead hairtail	Trichiurus lepturus	
Xiphiidae	Swordfish *(E)*	Xiphas gladius	

Source: Fisheries Data Unit, FishBase '98

IUCN Red List: *(V)* - Vulnerable *(E)* - Endangered *(CE)* - Critically Endangered

APPENDIX 5(b) SVG National Fisheries Biodiversity List - Whales and Dolphins

Family	Species	
	Common Name	Scientific Name
Balaenopteridae	Humpback whale	Megaptera novaengliae
Delphinidae	Porpoise (Bottlenose dolphin)	Tursiops truncatus
	Blackfish (Pilot whale)	Globicephala macrorynchus
	Killer whale	Orcinus orca
	Spinner dolphin	Stenella longirostris

Source: Fisheries Data Unit

APPENDIX 5(c) SVG National Fisheries Biodiversity List - Turtles

Family	**Species**	
	Common Name	**Scientific Name**
Chelonidae	Loggerhead turtle	Caretta caretta
	Green turtle	Chelonia mydas
	Hawksbill turtle	Eretmochelys imbricata
Dermochelidae	Leatherback turtle	Dermochelys coriacea

Source: Fisheries Data Unit

APPENDIX 5(d) SVG National Fisheries Biodiversity List - Crustaceans

Family	Common Name	Genus	Species
Nephropidae			
Palinuridae	Lobster (Spiny)	Panulirus	argus

Source: Fisheries Data Unit

APPENDIX 5(e) SVG National Fisheries Biodiversity List - Gastropods

Family	Common Name	Genus	Species
Cassidae			
		Conus	cedonulli
Connidae		Conus	cedonulli cedonulli[1]
		Conus	cedonullie dominicanus
		Conus	pseudaurantius[2]
Fissurellidae	Barbados keyhole limpet	Fissurella	barbadensis
	Rayed keyhole limpet	Fissurella	nimbosa
Muricidae			
Neritidae	Bleeding tooth	Nerita	peloronta
Strombidae	Conch (pink)	Strombus	gigas
Trochidae	Whelks	Cittarium	pica

Source: Matthes Report, 1984., Vink et al, 1985.

[1]This species is endemic to the west coast of St. Lucia and to St. Vincent and the Grenadines (Vink et al, 1985)

[2]Specimens found in the Muséum d'Histoire Naturelle, Geneva (Vink et al, 1985)

APPENDIX 5(f) SVG National Fisheries Biodiversity List - Seaweeds

Family	Common Name	Genus	Species
Chlorophyta		Byropsis	
		Caulerpa	
		Codium	
		Enteromorpha	
		Ulva	
Phaeophyta		Sargassum	
		Turbinaria	
Rhodophyta		Gracilaria	debilis
		Gracilaria	domingensis
		Halymenia	
		Porphyra	

Source: Matthes Report, 1984.

APPENDIX 5(g) SVG National Fisheries Biodiversity List - Invertebrates (Tobago Cays)

Phylum	Class	Species		Location	Comments
		Common Name	Scientific Name		
Annelida	Polychaeta	Giant feather duster	Sabellastarte magnifica	Horse Shoe Reef (back reef)	
			Spirobranchus giganteus	Horse Shoe Reef (back reef)	Smaller "boring polychaete"
Anthophyta (Division)		Sea grass	Thalassia testudinum	Between back reef and Cays and around Cays	Turtle grass
			Syringodium filiforme	Between back reef and Cays	
Chlorophyta (Division)		Green algae	Udotea sp.	Horse Shoe Reef (fore reef)	
Coelenterata	Anthozoa	Branching coral	Madracis mirabilis		personal observation by Bailey, 1994
		Brain coral (tan)	Meandrina meandrites	Horse Shoe Reef (back reef)	
		Brain	Colpophyllia natans	Horse Shoe Reef (fore reef)	
			Diploria clivosa	Horse Shoe Reef (back reef)	
			Diploria labyrinthiformis	Horse Shoe Reef (back reef)	
			Diploria strigosa	Horse Shoe Reef (back reef and around cays)	

Phylum	Class	Species		Location	Comments
		Common Name	Scientific Name		
		Cactus coral (large)	Mycetophyllia lamarckiana	Horse Show Reef (fore reef)	
		Colonial anemone	Palythoa caribaeorum	Horse Shoe Reef	
		Deadman's fingers	Briareum asbestinum	Horse shoe reef (back)	Also known as "encrusting gorgonian"
		Elkhorn coral	Acropora palmata	Horse Shoe Reef	
		Finger (thick)	Porites porites	Horse Shoe Reef (back and fore reef and around cays)	
		Finger (thin)	Porites furcata	Horse Shoe Reef (fore reef)	
		Flat braided fire coral			
		Knobby candelabra	Eunicia sp.	Horse Shoe Reef (back)	
		Knobby coral	Madracis decactis		personal observation by Bailey,1994
		Large			
		Lettuce leaf coral	Argacia agaricites	Horse Shoe Reef (back)	tan
			Argaricia fragalis	Horse Shoe Reef (fore reef)	

Phylum	Class	Species		Location	Comments
		Common Name	Scientific Name		
			Argarica lamarchi	Horse Shoe Reef (fore reef)	
		Pillar	Dendogyra cylindrus	Horse Shoe Reef (fore reef)	
		Porous coral (yellow)	Porites astreoides	Horse Shoe Reef (back and fore reef and around cays)	
		Sea blade	Pterogorgia acerosa	Horse Shoe Reef (back reef)	
		Sea fan	Rhipidogoria sp.	Horse Shoe Reef (back reef)	
			Gorgonia sp.	Horse Shoe Reef (fore reef and arond Cays)	
		Sea feathers (sea plumes)	Pseudopterogorgia sp.	Horse Shoe Reef (fore reef)	Soft coral
		Sea rods (sea whips)	Plexaurella sp.	Horse Shoe Reef (back and fore reef)	
		Soft coral (tan bushy)	Muriceopsis flavida	Horse Shoe Reef (back reef)	
			Plexaura flexuosa	Horse Shoe Reef (fore reef and around Cays)	
			Plexaura homomalla	Horse Shoe Reef (fore reef)	bushy

Phylum	Class	Species		Location	Comments
		Common Name	Scientific Name		
		Staghorn	Acropora cervicornis	Around Cays	Also called dotted line coral
		Star coral	Favia Fragum	Horse Shoe Reef (back)	
			Montastrea annularis	Horse Shoe Reef (back and fore reef and around Cays)	referred to as boulder coral by Berwick, 1986
			Montastrea cavernosa		personal observation, Bailey, 1994
		Star coral (rough)	Isophyllastra rigida	Horse Shoe Reef (back and fore reef)	
		Starlet coral	Siderastrea radians	Horse shoe Reef	Also called pitted coral
		Starlet (round)	Siderastrea sidera	Horse Shoe reef (back)	
	Hydrozoa	Fire coral (plate)	Millepora complanata		personal observation, Bailey, 1994
		Fire coral (branching)	Millepora alcicornis		personal observation. Bailey, 1994
		Fire coral (flat braided)	Millepora sp.	Horse Shoe Reef	
Phaeophyta (Division)		Dictyota sp.			

Source: Berwick Report, 1986, Personal Observation - Michael Bailey 1994

APPENDIX 5.(h) Management Objectives/Threats to Main Fisheries

Fishery Type	Management Objectives	Threats	Recommendations
Shallow-Shelf and Reef	· Promotion of stock recovery - reduction in fishing pressure by controlling effort.	· Deteriorating health of coral reefs and mangroves · Destructive fishing methods eg. use if dynamite, tangle nets, pots and nets with illegal mesh sizes, spearfishing · Ghost traps	· Amend regulations to include restrictions on trap mesh size · Amend regulations to establish conservation areas as marine reserves. · Strict enforcement of marine reserves regulations. · Enforce spearfishing licenses. · Enforce regulations meant to curtail habitat destruction from inland sources · Biodegradeable panels for traps. · Co-management within communities and also between SVG and Grenada which share shelf. · Strict enforcement of gear and methods regulations. · Establish licensing programme as a means of reducing effort. · Resource assessment, including the determination of potential yield, size at maturity and trap/mesh selectivity · Research and experiment with artificial reefs for areas with severe habitat destruction · Public education · Utilize species which are under-utilized, eg. marketing of ornamental fishes
Deep Slope/Bank	· Development of the fishery - improve gear technology to encourage fleet expansion into non-traditional fishing areas · Maximize catches while managing	· Overfishing of snappers and groupers · Destruction of habitats of juveniles - coral reefs and mangroves	· Enforce regulations which protect habitats of juveniles · Resource assessment to determine potential yields

Fishery Type	Management Objectives	Threats	Recommendations
	resource on a sustainable basis		
Coastal Pelagics	· Development of fishery in terms of fish processing · Control of fishing effort	· Use of inappropriate gear and illegal mesh sizes · Deteriorating health of habitats of juveniles	· Strict enforcement of mesh sizes regulations · Conservation of juvenile habitats · Catch and effort monitoring · Resource assessment including the determination of potential yields · Develop value added products
Offshore Pelagics	· Development of fishery through: ➢ Application of improved technology ➢ Expansion into non-traditional fishing areas, ➢ Promotion of recreational fisheries · Maximize catches which managing resource on a sustainable basis · Co-management and transfer of technology	· Overfishing by foreign fleets, especially swordfish · Oil spills	· Proper surveillance programme · Oil spill contingency plan · Proper data collection system for tuna longliners, hotels/restaurants and trading vessels · Revision of estimates for potential yield · Determine how catches by SVG foreign flagged vessels might affect ICCAT[3] quotas and institute appropriate measures to safe guard local interests
Lobster	· Rebuild stocks in depleted areas by reducing fishing pressure · Control fishing effort	· Destructive fishing practices, including spearfishing, harvesting of undersize lobsters and lobsters with eggs, and scraping of eggs · Destruction and degradation of habitats	· Habitat conservation and restoration (eg. artificial reefs) · Strict enforcement of regulations · Amend existing regulations to include stiffer penalties · Proper monitoring and control system · Rigorous surveillance in both close and open seasons

[3] International Commission for the Conservation of Atlantic Tunas.

Fishery Type	Management Objectives	Threats	Recommendations
			· Stock assessment to include the determination of potential yields and impact of scuba gear · Licensing of divers as a means of controlling effort · Regional harmonisation with Grenada in stock assessment, data collection, surveillance and enforcement of regulations · Proper system for catch and effort data · Co-Management · Public education
Conch	· Rebuild stocks in depleted areas by reducing fishing pressure · Manage resource on sustainable basis by controlling fishing effort	· Destructive fishing practices, including harvesting of undersize conch · Destruction and degradation of habitats	· Enforce existing regulations · Resource assessment, including the determination of potential yield, more precise size limits · Assessment of benefits of limited entry strategy, gear restrictions and a closed season · Habitat conservation and restoration · Improved system for catch and effort data · Co-management · Public education

Source: St. Vincent and the Grenadines Fisheries Status Report, 1997

APPENDIX 5.(i) Uses/Benefits/Threats to Main Habitats

Habitat	Uses	Benefits	Threats	Recommendations
Coral reef	*Present:* · Tourism activities, eg. diving, snorkeling · Food · Recreation · Creation of jewelry and ornaments *Potential:* · Use of un-utilized and under-utilized species as food · Use of some species for aquariums · Agricultural, industrial and medicinal products	*Socio-economic:* · Revenue from tourism activities eg. diving/snorkeling · Recreation eg. diving/snorkeling, fishing · Income from the sale of reef fish · Food *Ecological Services:* · Fragmentation of coral creates white sand beaches · Provide food and habitats for a large percentage of bottom dwelling fish landed for human consumption · Protects mangroves, seagrass beds, beaches and land from storm waves · Indicators that other environmental problems exist · Spawning and nursery grounds · Shelter sea life from big waves and strong currents	*Human-induced:* · Land-based pollution · Sand mining · Beach erosion · Sediments · Run-off from land, including that from fertilizers · Sewage discharge · Anchoring · Grounding of vessels · Accidental breaking and hand-picking of coral · Spear-fishing · Damage from fish traps · Physical damage from boats, fish traps and divers · Algal overgrowth · Development too close to shore · Poor placement of coastal structures *Natural:* · Hurricanes and tropical storms · Sea level rise · Climate changes · Natural predators eg. parrotfish, sponges, sea · Diseases eg. White Band · Bleaching, possibly due to global warming	Treatment of sewage · Measures which control inland and beach erosion · Environmental Impact Assessments for all coastal development projects · Amendment of fisheries regulations for better protection · Enforcement of other related laws, eg. sand mining · Encourage use of traps made with biodegradable material · Public education · Boat moorings · Community management · Beach and reef monitoring · Studies of beach system functions before protection attempts, such as patterns of shoreline change, wave action, offshore substrate · Better placement of coastal structures · Integrated coastal planning

Habitat	Uses	Benefits	Threats	Recommendations
			· Lowered populations · Land subsidence (sinking)	
Mangrove Swamps	*Present:* · Charcoal production · Subsistence harvesting of crabs for food *Potential:* · Ecotours · Use of tanin from bark and leaves to tan hides and dye cloth · Flowers as a source of fine honey · Dried leaves as substitutes for tea and tobacco · Red mangrove seedlings can be cooked for food or smoked as cigars when dried and trimmed	*Socio-Economic:* · Subsistence in charcoal production · Subsistence harvesting of crabs *Ecological Services:* · Act as nurseries · Filter chemicals, sediments and land run off · Critical feeding and resting habitats for birds (including migratory) · Protect coral reefs by filtering land-based sediment · Vital source of oxygen · Buffer zone protecting shoreline and inland from eroding wave action and hurricane flooding · Contribute to cooler coastal temperatures · Roots trap sediment and encourage land building · provide shelter and food to numerous species of organisms, including oysters	*Human-induced:* · Development · Cutting · Filling · Drainage · Reclamation · Dredging · Dumping of refuse · Over-harvesting *Natural:* · Hurricanes · Floods	· Pruning of trees as a means of sustainable use · Use for ecotours · Public education · Community management · Establish conservation areas in locations of remaining mangroves and enforce appropriate legislation · Proper Environmental Impact Assessment of projects which will affect mangroves · Monitoring

Habitat	Uses	Benefits	Threats	Recommendations
Seagrass Beds	*Present:* *Potential:* · Pharmaceutical use as antibiotics	*Socio-economic:* *Ecological Services:* · Feeding grounds for adult reef fish · Major source of primary productivity in shallow waters · Stabilize soft bottoms · Nursery grounds · Trap sediments and build up sea bottoms and beaches · Protect marine organisms from effects of strong sunlight	*Human-induced:* *Natural:* · Uncontrolled populations of predators such as the tropical sea urchin diadema · Diseases	· Research on benefits, threats and potential uses

Source: St. Vincent and the Grenadines Country Profile, 1991

APPENDIX 5.(j) Uses/Benefits/Threats to Marine Conservation Areas

Name of Area	Uses	Benefits	Threats	Recommendations
Tobago Cays National Marine Park	*Present:* · Fishing · Snorkeling and scuba diving · Yachting · Commercial activities eg. sale of T-shirts, barbecue · Beach recreation · Cruise-ship visitation and bareboat charters *Potential*: · Scientific study and research · Medicinal purposes · Ecotoursim land based and underwater tours · Mariculture of lobster and conch · Sanctuaries for threatened and endangered species · One of the best marine reserves in the Caribbean	*Socio-Economic:* · Revenue for charter companies, water taxi operators, dive operators, vendors · Aesthetic beauty and recreational centre for tourists and locals · Provide anchorage for numerous yachts *Ecological Services:* · Reefs protect Mayreau and Union Is. Shorelines from storms, currents and waves · Reefs provides nurseries for fish and lobsters · Provide homes for hundreds of species	*Human-induced:* · Fishing · Over-fishing · Pollution from sewage and garbage dumped by boats · Sedimentation · Anchoring · Physical damage from breakage by divers, dingy anchors etc. · Trap, spearfishing and ghost-fishing by lost traps · Algal-overgrowth of coral reefs · Over-crowding of boats *Natural:* · Hurricanes · Diseases affecting corals · Sea level rise · Climate change	· User fees to help with park operations and conservation activities · Zoning · Public education, including visitors centre · Registration and licensing and strict monitoring of all commercial activities · Installation and repair of dinghy and yacht moorings · Biological and environmental monitoring · Strict enforcement of the Marine Parks (Tobago Cays) Regulations · Natural resources inventories · Proper waste management system · Strict control of no. of yachts, cruiseships and people and anchorage · Proper data collection system on usage · Development and ongoing update of accurate map with use of GIS

				· Friends of Tobago Cays group and monitoring assistants

	‘79	‘80	
	‘81	‘82	
	‘83	‘84	
	‘85	‘86	
	‘87	‘88	
	‘89	‘90	
	‘91	‘92	
	‘93	‘94	
	‘95	‘96	
	‘97	‘98	
Dolphin	22.3	32.1	
	13.9	21.8	
	35.4	13.7	30
Kingfish	0.8	1.9	
	0.5	3.7	
	5.6	8.1	
	2.2	4.9	
	8.7	4.4	
	3.7	28.1	
	32.7	18.1	
	24.6	33.3	
	15.7	19.2	
	9.2	34.2	
Skipjack	12.2	13.3	

		35.4 14.3 21.9 25.4 10.8 16.9 20.5 16.5 28.2 29.0 27.7 13.2 21.0 28.5 13.4 16.5 12.6 29.3 Bonito 11.5 10.1 10.3 29.9 6.0 32.5 11.8 18.7 13.0 18.5 15.3 38.1 10.4 6.8 10.5 14.3 6.7 8.2 6.3 14.7 Source: Data Unit, Fisheries Division Ministry of Agriculture and Labour, St. Vincent and the Grenadines		

		Reefs protect Mayreau and Union Is. shorelines from storms, currents and waves · Reefs provide nurseries for fish and lobsters · Provide homes for hundreds of species		
Indian Bay/Villa Young Island/Canash Conservation Area	*Present:* · Main centre for tourism activities on mainland St. Vincent with more than 30% of the hotels/guest houses in St. Vincent and the Grenadines · Tourism activities, including, anchoring, diving/swimming, boating · Recreation for tourists as well as locals · Fishing · Cultural activities eg. picnics, dances, barbeques, wedding receptions	*Socio-Economic:* · Revenue for hotels/restaurants, dive shop · Tourism related jobs and income for many locals · Revenue for Government · Revenue for tourism related businesses eg. airlines, tour companies, dive shops, restaurants, hotels/guesthouses *Ecological Services:* · All ecological services	*Human-induced:* · Coral reef degradation · Beach erosion · Sewage and wastewater disposal · Deteriorating water quality · Coastal developments · Poor placement of shoreline structures *Natural:* · Hurricanes and storms · Sea level rise · All threats to coral	· Strict enforcement of fisheries conservation laws · Legislative amendments for further protection · Beach and coral reef monitoring · Mandatory sewage treatment system · Studies before beach renourishment and coral reef restoration attempts · Public education · Better environmental management efforts and responsibility by

	Potential: · Scientific research · Reefs for medicinal purposes	provided by coral reefs (see coral reefs table)	reefs (see coral reef table)	businesses and other users

Source: Action Plan for the Tobago Cays National Marine Park, 1993, Nurse Report, 1997

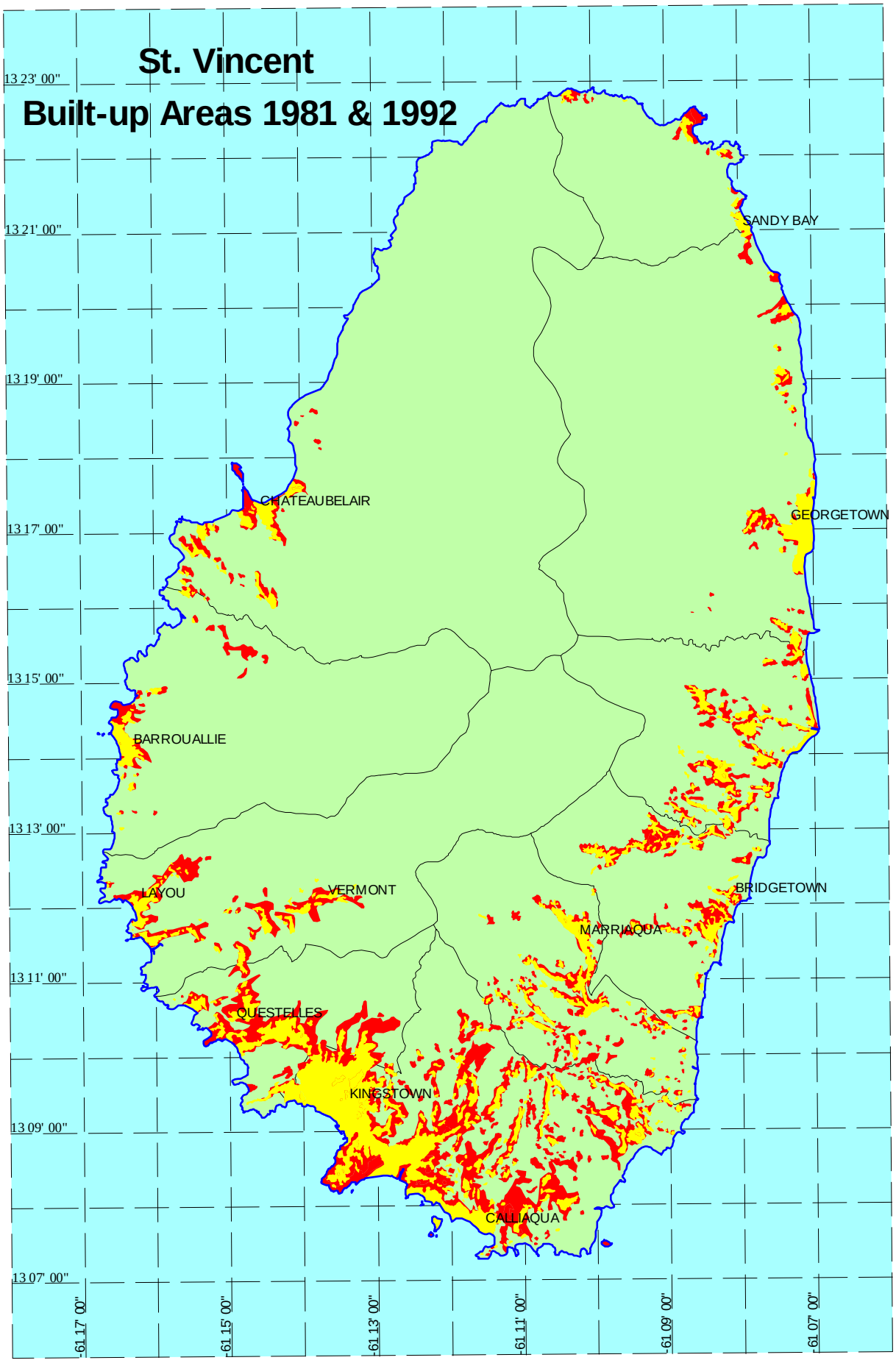
APPENDIX 6. List of Freshwater Species

Category	Common Name	Scientific Name	Status
Crustaceans	Crayfish	Macrobrachuim faustinum	Common
	Crayfish	Macrobrachuim heterchinus	Common
	River lobster	Macrobrachium carcinus	Common
Fishes	Goby	Gobisox spp.	Common
	Mountain mullet	Agonostomus monitcloa	Common
	Flathead mullet	Mugil cephalus	Common
	Nile Tilapia *	Oreochromis niloticus niloticus	
	Tilapia *	Tilapia aurea	
	Tilapia *	Tilapia nilotica	
	Shrimp *	Macrobrachium rosenbergi	
	Tri Tri	Sicydium plumeri	Abundant

Source: Buccament Valley Inventory, FishBase ‘98, St. Vincent and the Grenadines Fisheries Status Report 1997

* Aquaculture species

St. Vincent
Built-up Areas 1981 & 1992



Legend

Built-up areas '92

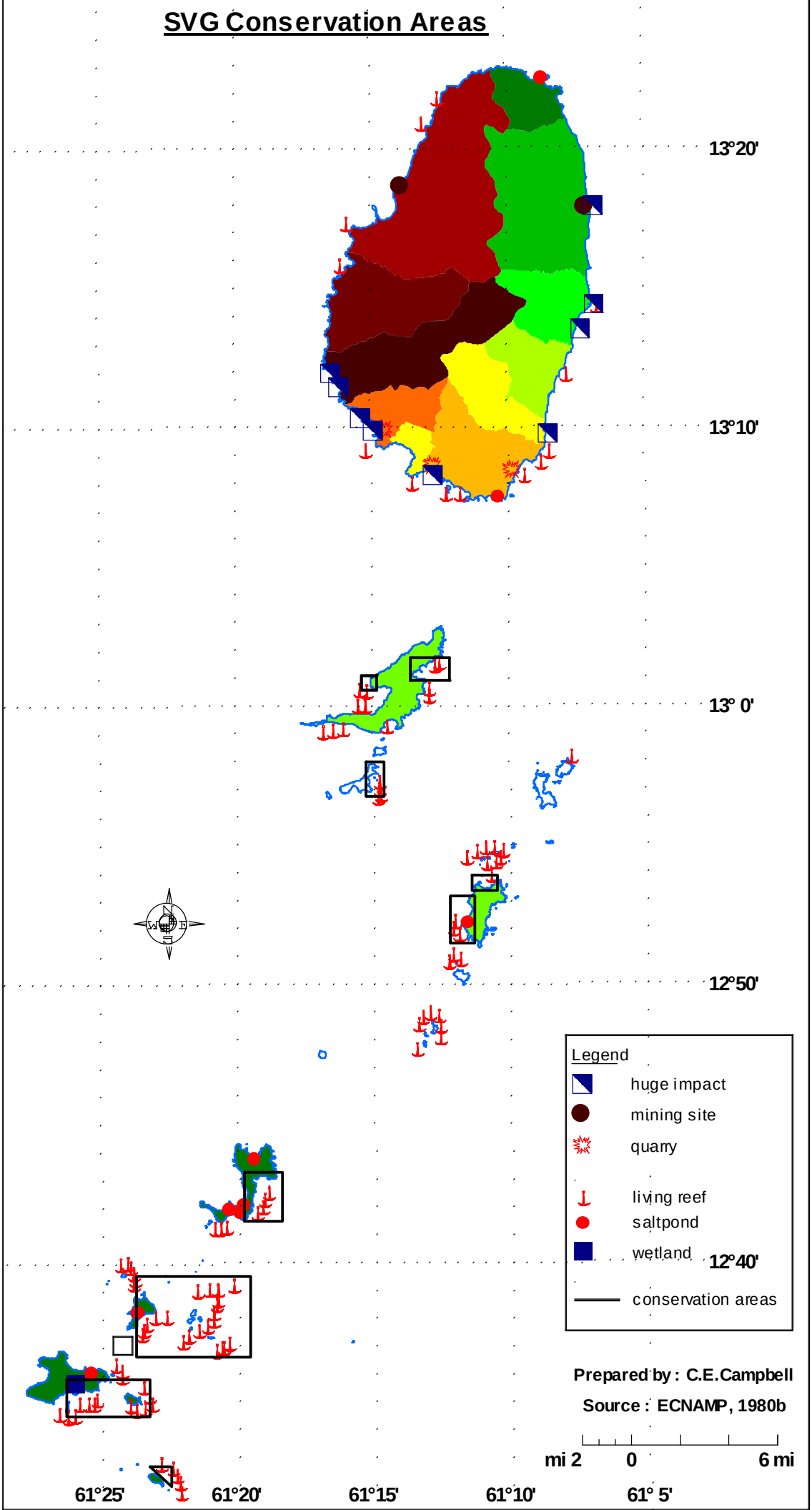
Built-up areas '81

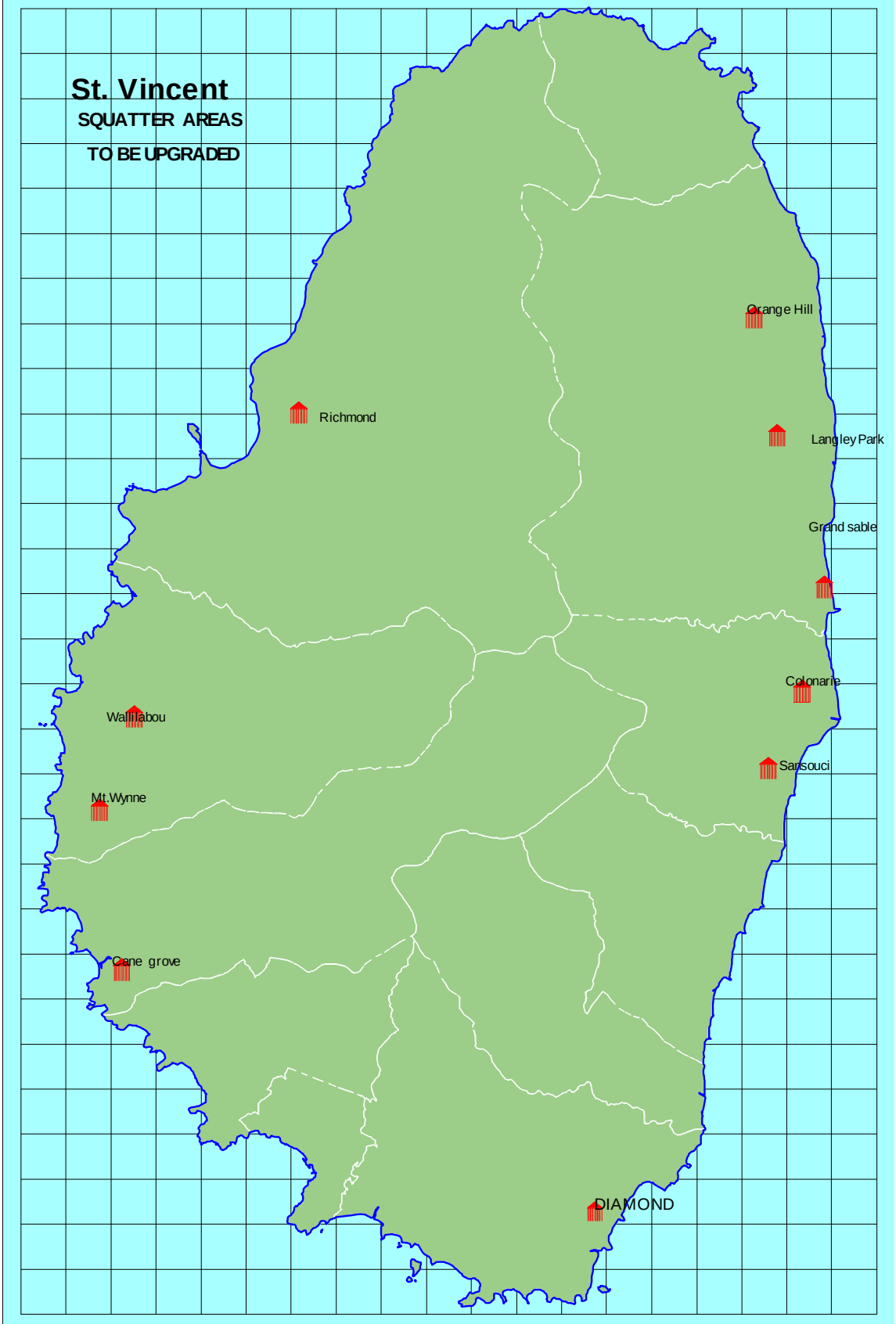
Source:- Aerial Photos '81&'92
Min.of Finance & Planning
Dec. 1996

Central Planning Unit
Ministry of Finance & Planning
St.Vincent & the Grenadines
in co-operation with:
UNDP /UNCHS
and CIDA

mi 1 0 2 mi

SVG Conservation Areas





Scale 1:50,000

km 2 0 10 km

mi 1 0 5 mi

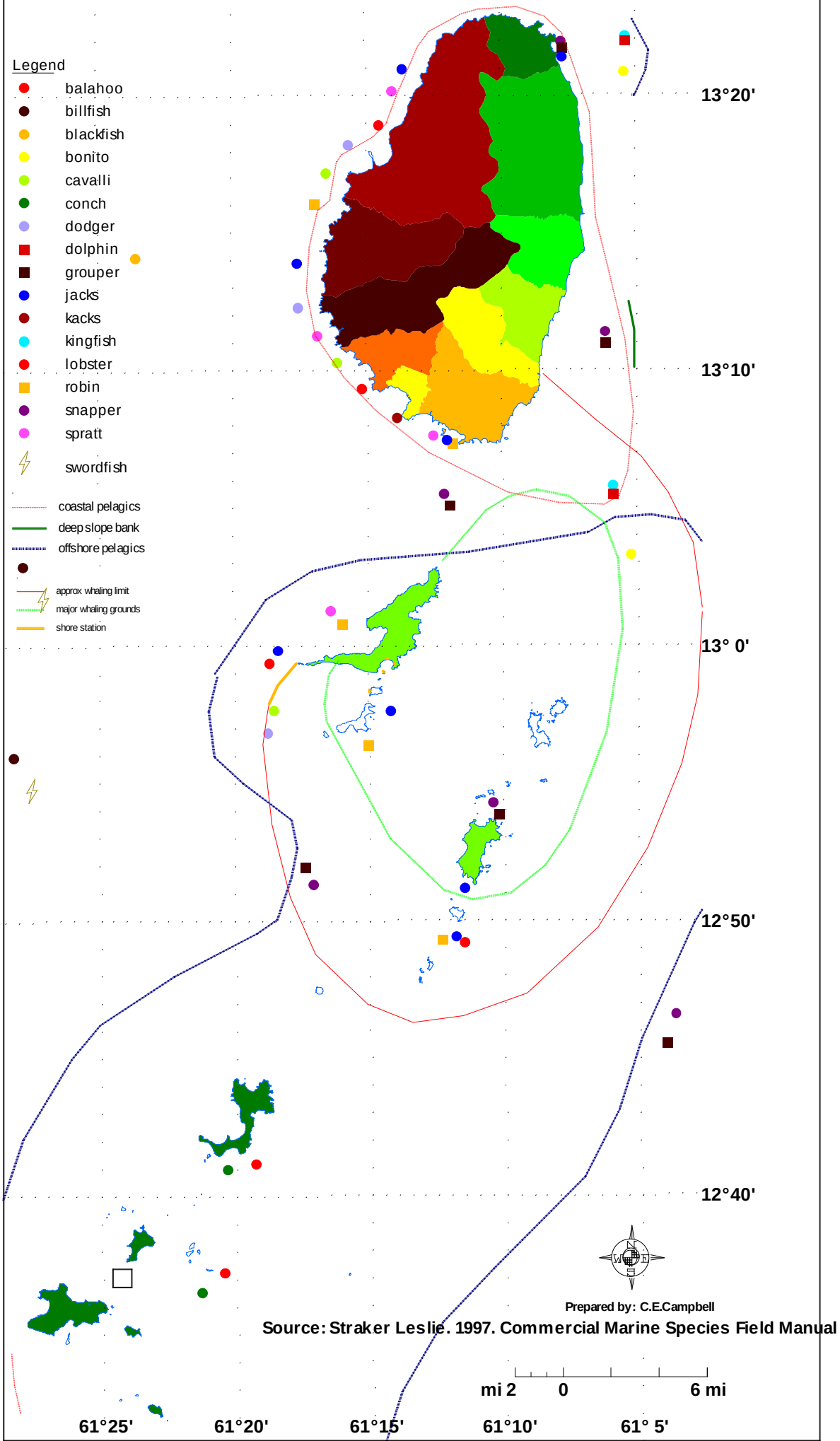
SQUATTER AREAS

Central Planning Unit
Ministry of Finance & Planning
St. Vincent & the Grenadines
in co-operation with:
UNDP /UNCHS
and CIDA

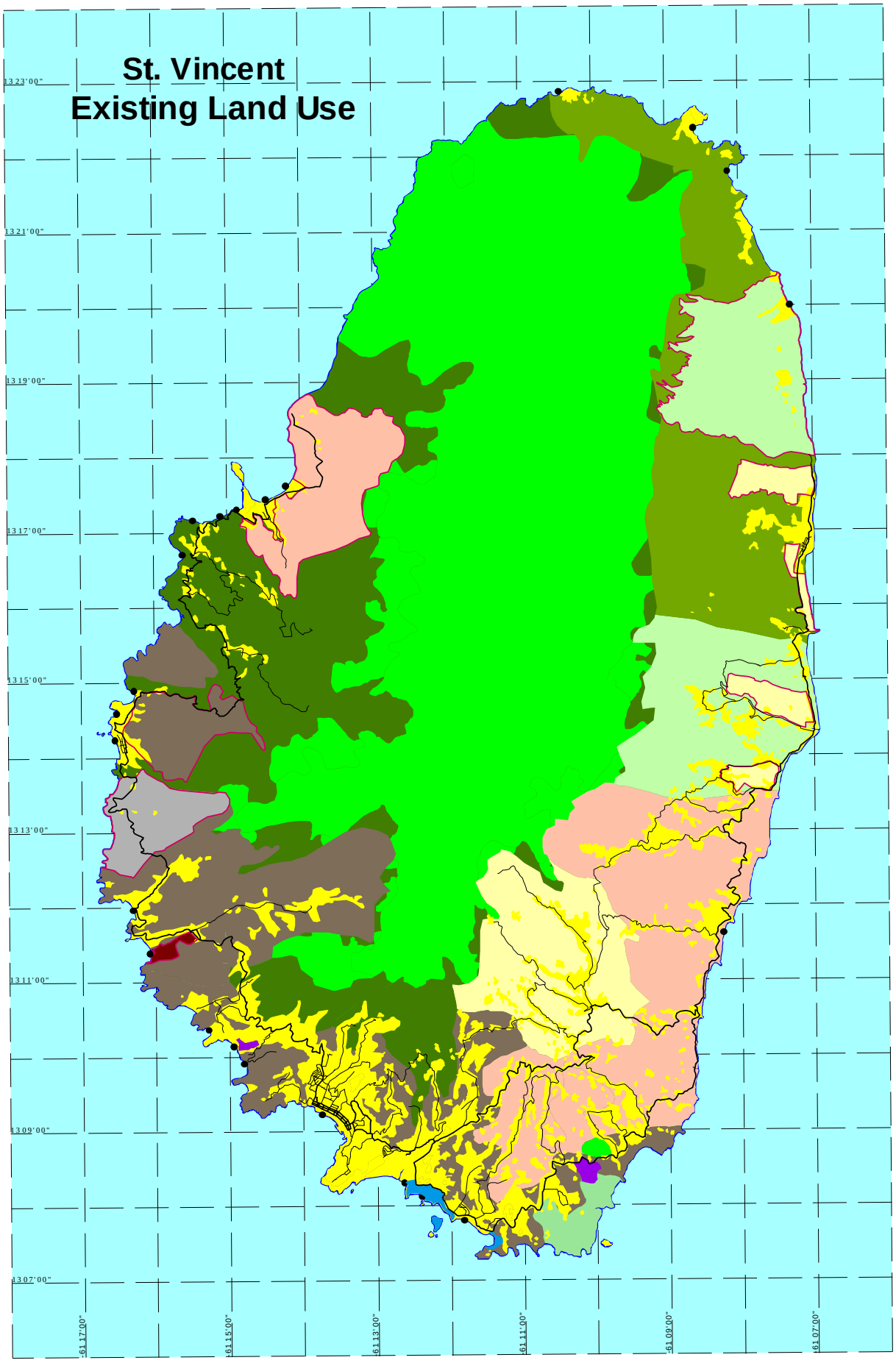
PROJECTION DATA

Universal Transverse Mercator
ZONE 20
Projection: Transverse Mercator
Spheroid: Clarke 1866
Unit of Measurement: Metre
Meridian of Origin: 63 W. of Greenwich
Latitude of Origin: Equator
Scale Factor at Origin: 0.9996
False Co-ords of Origin: 500,000M E
Datum 1927 North American

SVG Fishing / Whaling grounds



St. Vincent
Existing Land Use



Legend

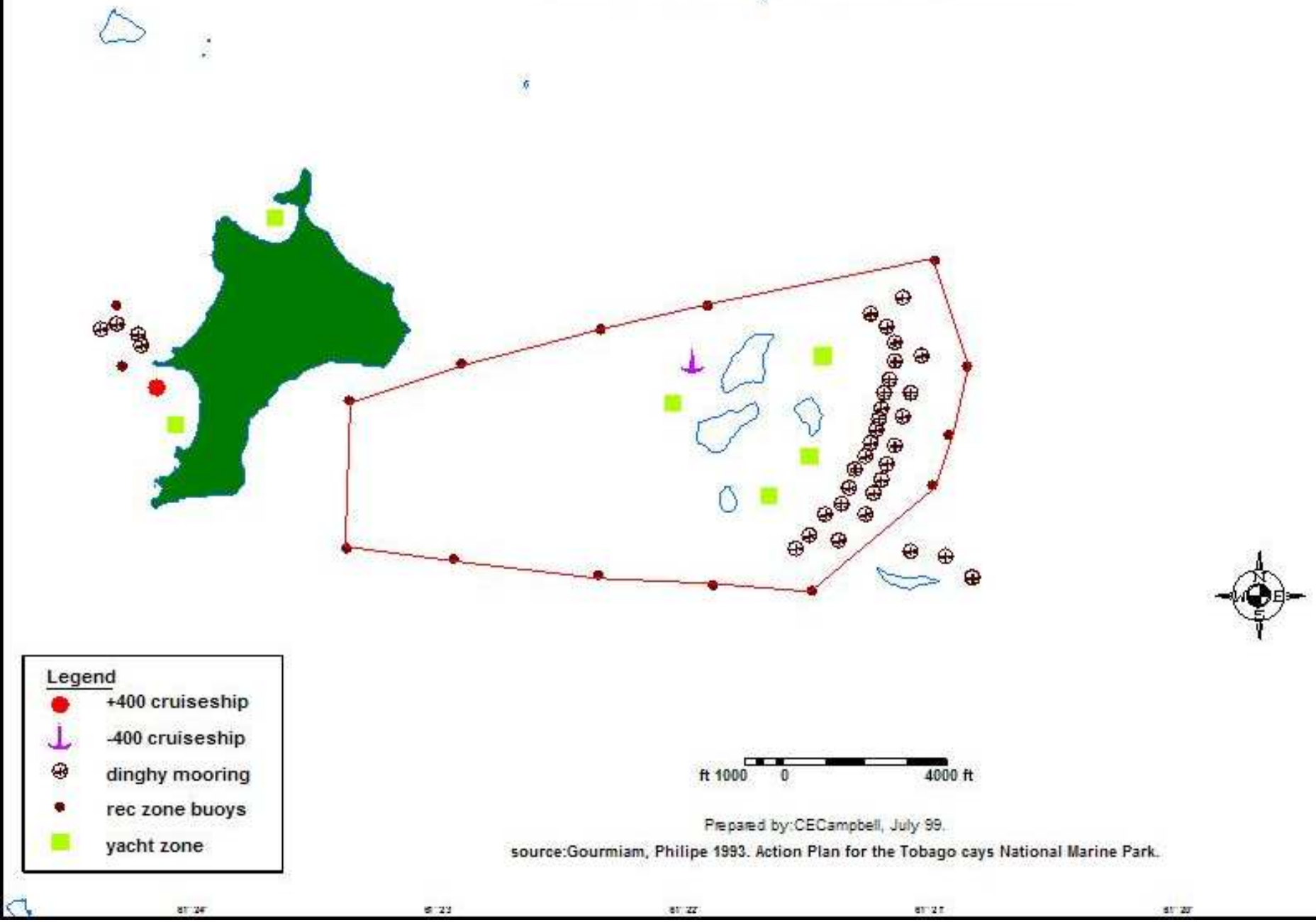
- Banana
- Banana/Arrowroot
- Banana/Coconut
- Banana/Rootcrop
- Forest
- Natural Vegetation
- Pasture
- Rootcrop
- Vegetable/Rootcrop
- Vegetable
- UBuilt-up areas
- Industrial Site
- Resort Areas
- ARDP Estates
- Main Roads
- Secondary Roads
- Landing sites

Source:-
Min.of Agriculture
Dec. 1996

Central Planning Unit
Ministry of Finance & Planning
St.Vincent & the Grenadines
in co-operation with:
UNDP /UNCHS
and CIDA

mi 1 0 2 mi

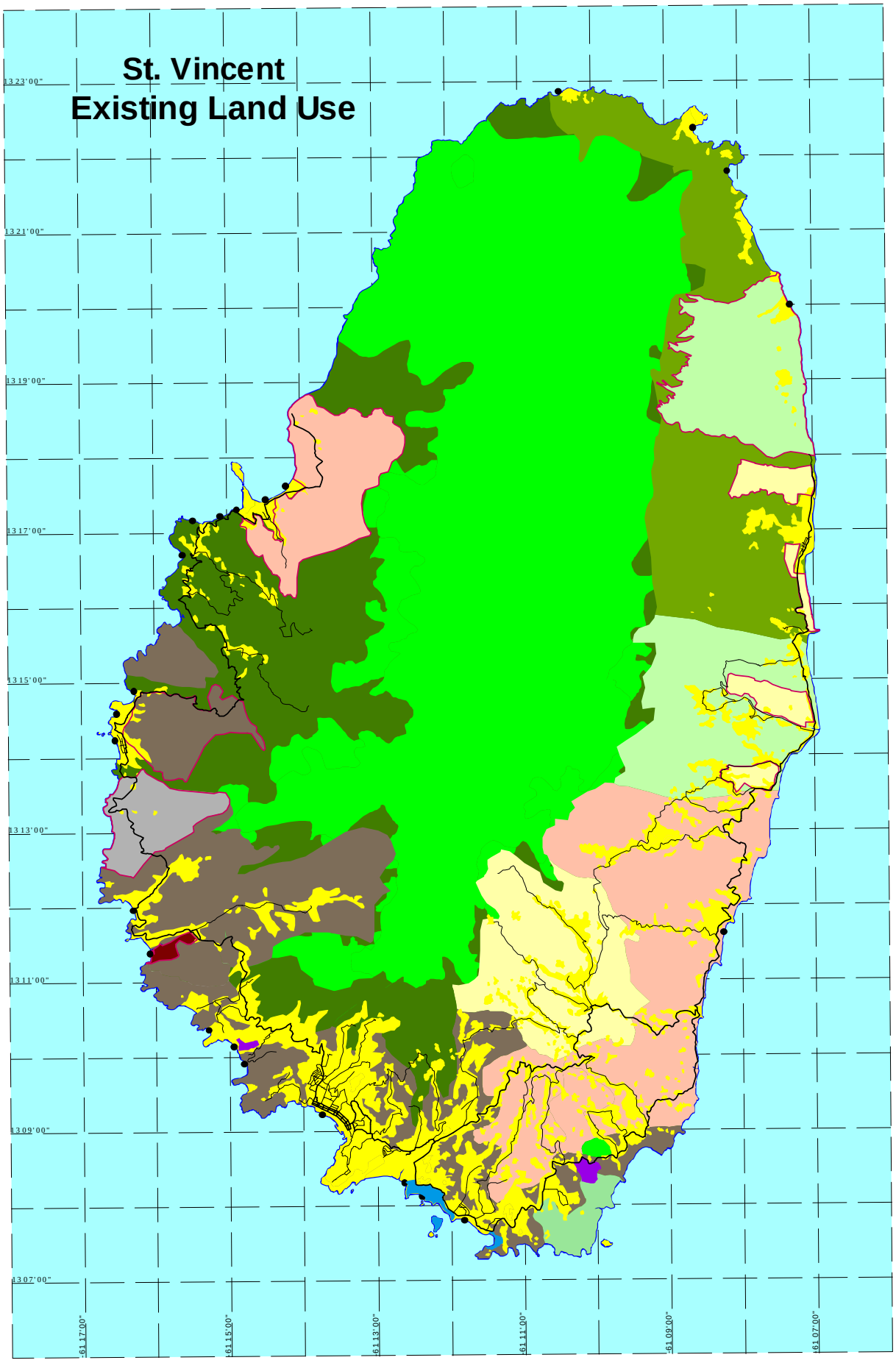
Tobago Cays National Marine Park zones



Prepared by:CECampbell, July 99.

source:Gourmiam, Philipe 1993. Action Plan for the Tobago cays National Marine Park.

St. Vincent
Existing Land Use



Legend

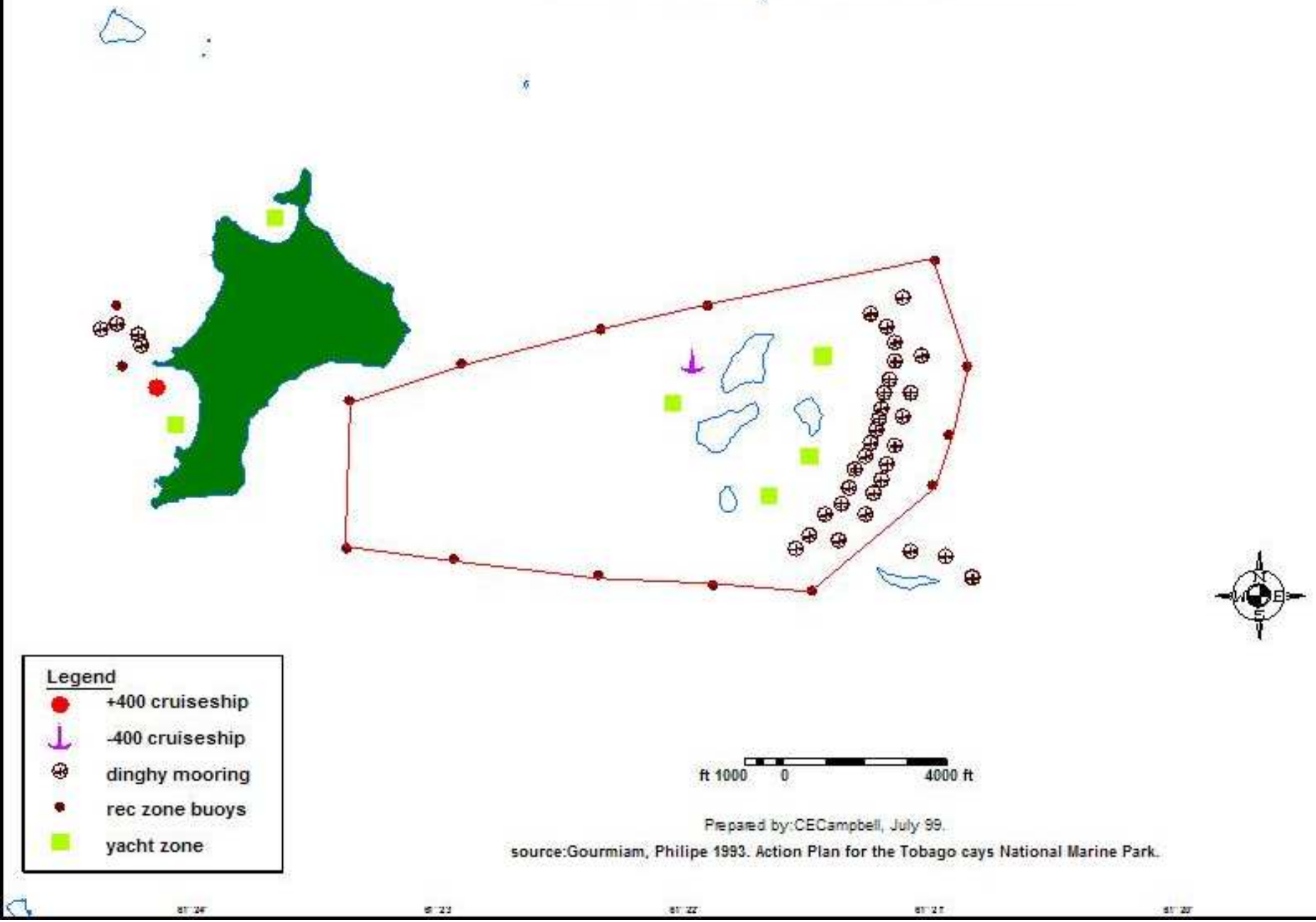
- Banana
- Banana/Arrowroot
- Banana/Coconut
- Banana/Rootcrop
- Forest
- Natural Vegetation
- Pasture
- Rootcrop
- Vegetable/Rootcrop
- Vegetable
- UBuilt-up areas
- Industrial Site
- Resort Areas
- ARDP Estates
- Main Roads
- Secondary Roads
- Landing sites

Source:-
Min.of Agriculture
Dec. 1996

Central Planning Unit
Ministry of Finance & Planning
St.Vincent & the Grenadines
in co-operation with:
UNDP /UNCHS
and CIDA

mi 1 0 2 mi

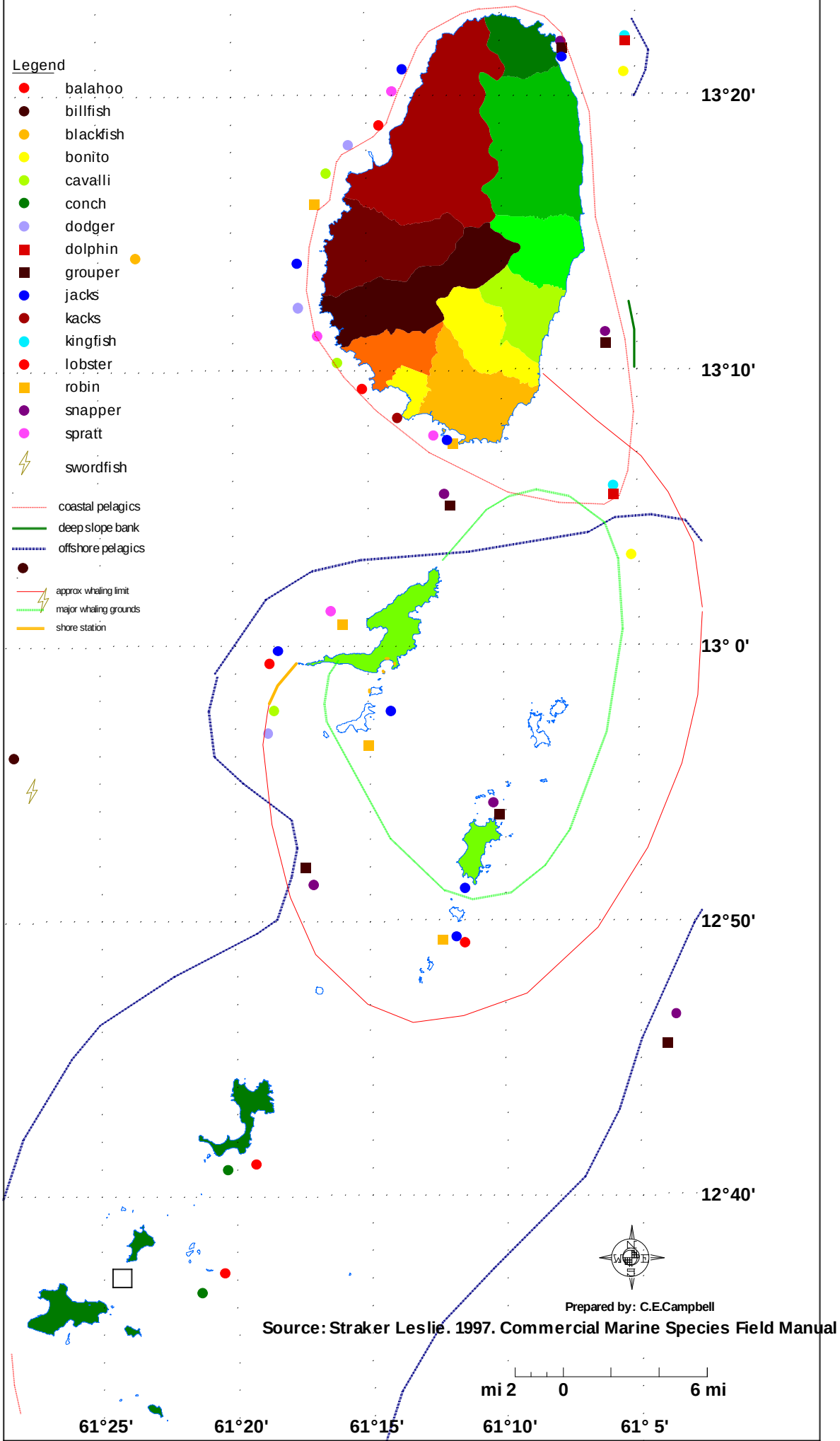
Tobago Cays National Marine Park zones



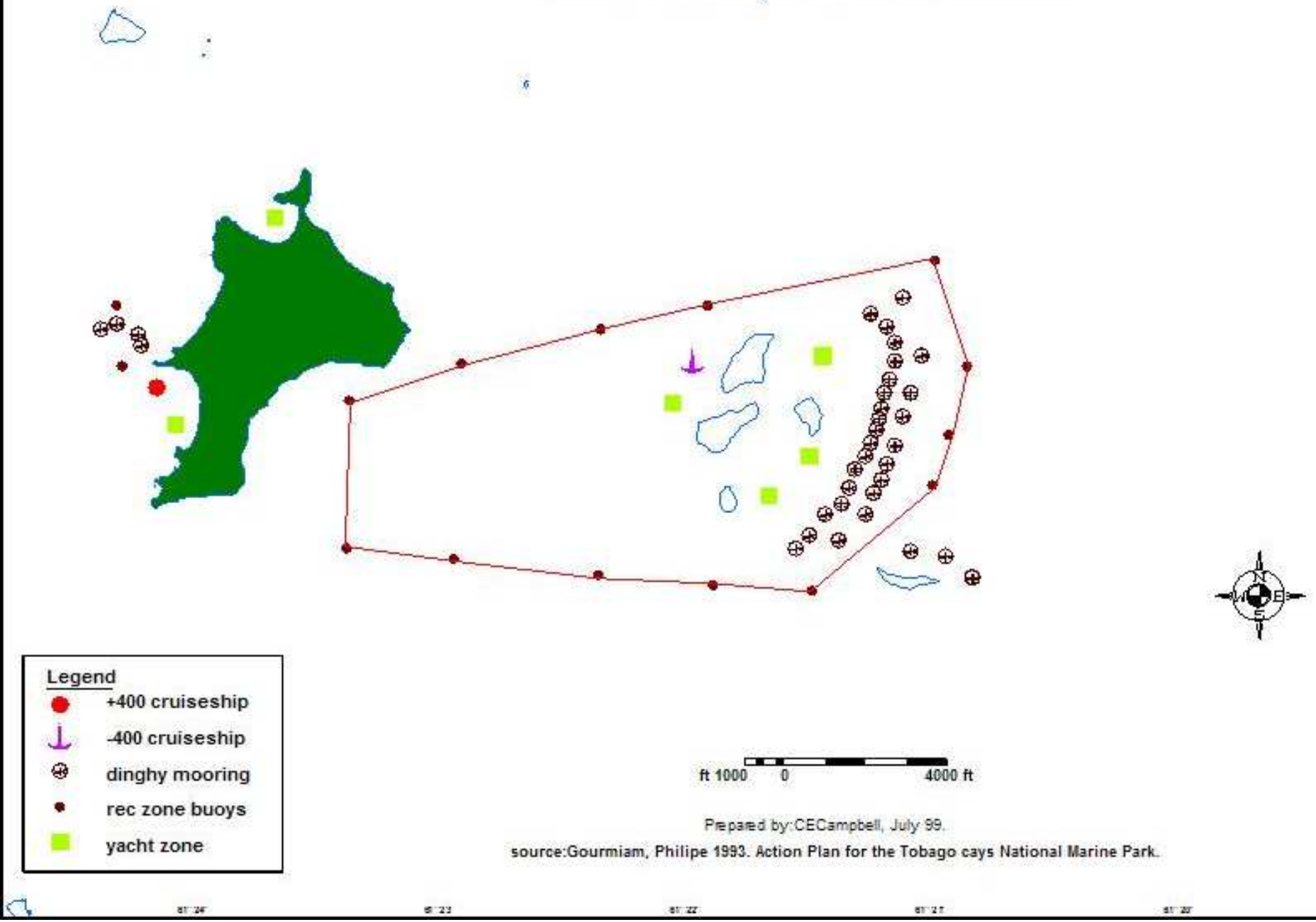
Prepared by:CECampbell, July 99.

source:Gourmiam, Philipe 1993. Action Plan for the Tobago cays National Marine Park.

SVG Fishing / Whaling grounds



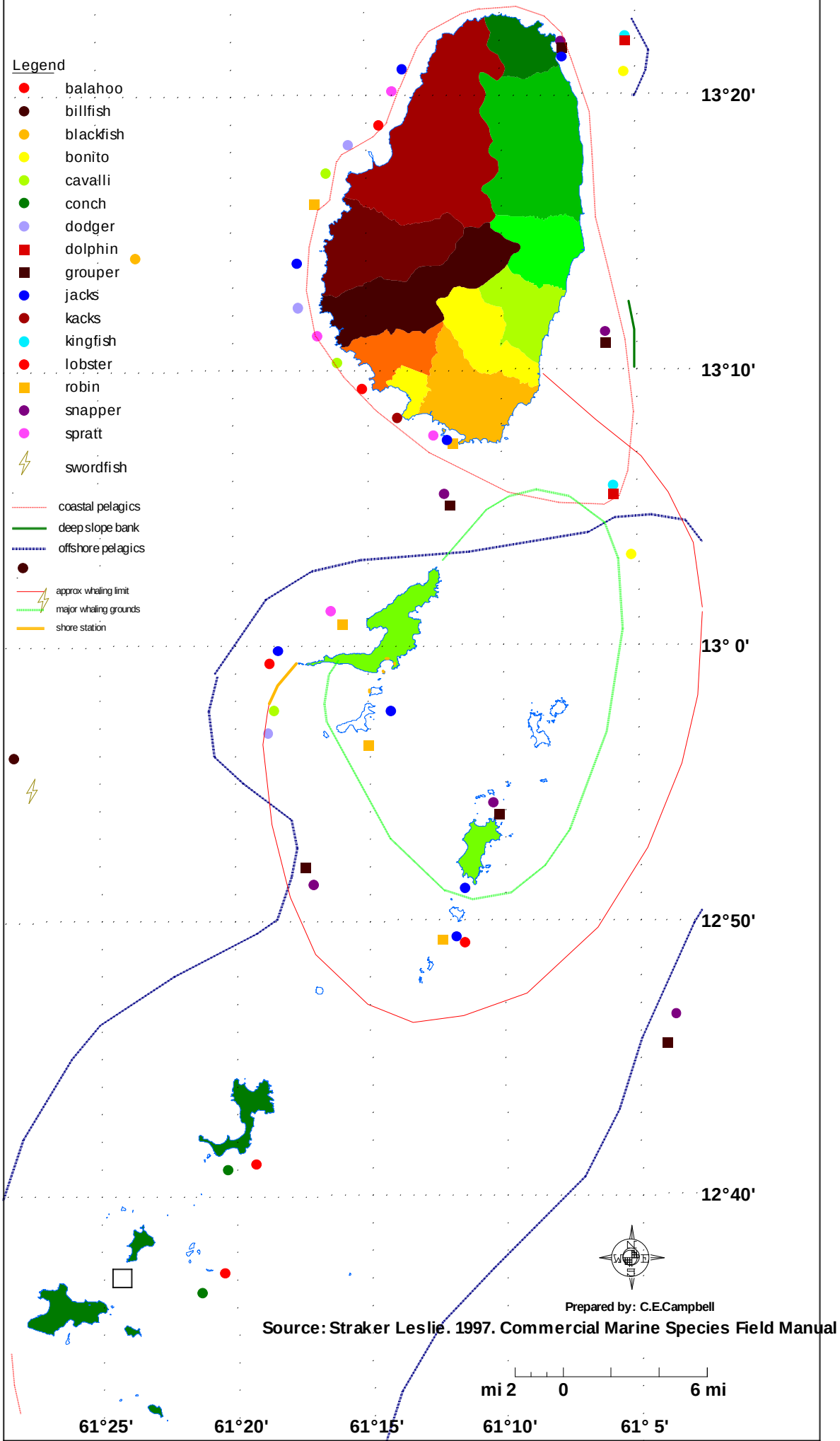
Tobago Cays National Marine Park zones



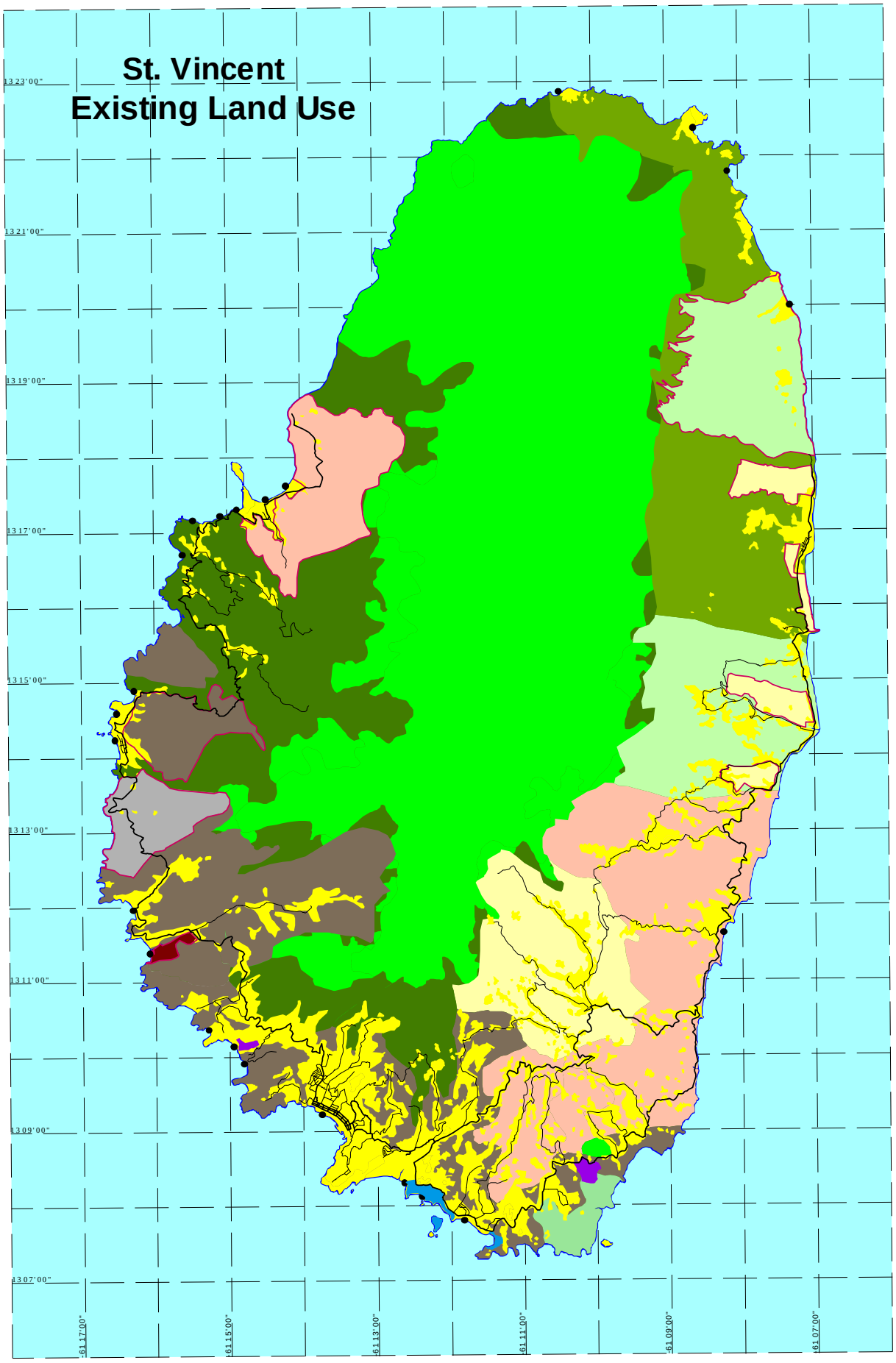
Prepared by:CECampbell, July 99.

source:Gourmiam, Philipe 1993. Action Plan for the Tobago cays National Marine Park.

SVG Fishing / Whaling grounds



St. Vincent
Existing Land Use



Legend

- Banana
- Banana/Arrowroot
- Banana/Coconut
- Banana/Rootcrop
- Forest
- Natural Vegetation
- Pasture
- Rootcrop
- Vegetable/Rootcrop
- Vegetable
- UBuilt-up areas
- Industrial Site
- Resort Areas
- ARDP Estates
- Main Roads
- Secondary Roads
- Landing sites

Source:-
Min.of Agriculture
Dec. 1996

Central Planning Unit
Ministry of Finance & Planning
St.Vincent & the Grenadines
in co-operation with:
UNDP /UNCHS
and CIDA

mi 1 0 2 mi