Plan and Policy for a System of National Parks and Protected Areas

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GOVERNMENT OF GRENADA
GENERAL SECRETARIAT
ORGANIZATION OF AMERICAN STATES

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Preface

Grenada is in the process of better defining its land use policy. The national parks and protected areas program is an important step towards viewing the finite resource of land in a multiple use context. Grenada's actions in the protection of the upper watersheds and important ecosystems, promotion of cultural and natural attractions, and the development of educational and tourism programs are noteworthy in this respect.

The methodology for the establishment and management of a system of national parks and protected areas was developed by a team of national and international specialists working together under the direction of the Ministry of Agriculture. The inventory of the natural and cultural resource base relied on an interdisciplinary team made up of fisheries, forestry, land use, extension, and physical planning personnel as well as first-hand information of local hikers, naturalists and historians.

In conjunction with this report, and as part of the Government of Grenada/OAS Integrated Development Project, land policy and infrastructure development guidelines have also been defined. A zoning map has been generated to identify productive agricultural and grazing lands, especially in the southeast section of the island of Grenada where development pressures are most intense. The goal of these efforts is to protect and develop the natural resources of Grenada and Carriacou.

The studies in land policy and zoning, national parks, resource conservation, and tourism development are part of the ongoing assistance of the Department of Regional Development to integrated development planning and implementation in Grenada. The experience has provided valuable guidance for the formulation of a methodological approach for the establishment of national parks programs which hopefully can be utilized by other island states in the English-speaking Caribbean.

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Executive summary

Grenada is an island famed for its natural beauty and cultural resources. Elfin woodland dwarfed forests descend to montane rain forests, to lowland dry forests to mangrove and exquisite coral reefs. Lagoons, beaches, bays and rugged cliffs cover the coasts. Grenada has over 450 species of flowering plants and 150 species of birds, indicating great ecological diversity in a relatively small area. Likewise, the island is dotted with a diversity of cultural resources: Carib (Amerindian) archeological sites; historical sites covering over 400 years of history including forts, sugar mills, rum distilleries and estate houses; and living cultures representing unique ways of social, economic and cultural life such as nutmeg, mace, and all-spice estates, artisanal fishing and boat building facilities.

Over the past several decades ever-increasing pressures have been placed on the country's natural resource base resulting in notable increases in soil erosion; sedimentation of river systems and water supplies; hydrological regime imbalances reflected in flooding and drought periods; decreases in agricultural and fisheries productivity; and loss of habitat. Likewise, historic and archeological sites have suffered continued deterioration due to lack of clear responsibility for their management or neglect.

At the same time there is an increasing demand for recreational opportunities and education programs for Grenada's population. Likewise, there is a major need for a much greater variety of developed natural and cultural areas for both nationals and tourists.

In response, the Government of Grenada placed the establishment of a national park and protected areas program as a priority in the development plan for 1986 and requested technical assistance from the Organization of American States, Department of Regional Development. Protected areas form an integral part of the wise management of natural resources. While protecting a nation's natural and cultural heritage, protected areas play a major role in sustained production and development through their critical support of water quality and supply, forest and agricultural production, erosion and sedimentation control, watershed regime balance, recreation, tourism, fisheries production and environmental education.

A total of 27 areas for Grenada and sixteen for Carriacou are recommended for inclusion within the National Park System. Of the total, three units are recommended as National Parks, eleven as Protected Seascapes, eleven as Natural Landmarks, twelve as Cultural Landmarks, and four as Multiple-use areas. This represents approximately 11,008 acres of terrestrial area or about 13% of the total land surface of the country. In addition, several marine areas are proposed for inclusion within the System.

Of the total land area within the System (excluding Cultural landmarks) 8,505 or 77% of the land is classified as Class VI land which is unsuitable for agriculture due to slope and/or water limitations. Much of the remaining is seasonally flooded or biologically fragile habitat such as mangroves.

Full implementation of the Protected Areas Program will require significant human and financial resources. Initially a position of Manager of National Parks and Wildlife will be created, supported by

two forest rangers, but as national education and tourism programs are realized, increased staff will be necessary.

This document is flexible and is intended to adapt to changing governmental plans and policies. As national development strategies and priorities evolve, so too will the National Parks and Protected Areas Policy. Changes in land tenure and land-use, public environmental awareness, and recreational habits are all factors which will help form an effective conservation program for Grenada.

Chapter I - Introduction

The Ministry of Agriculture and Tourism/Organization of American States Project "Integrated Development in Grenada", was directed to prepare a policy and plan for national parks and protected areas for the Country. The policy provides the basis for the establishment and management of a national parks and protected areas program.

Various documents dating to the original explorers and colonizers of the Islands of Grenada and Carriacou note the majestic beauty, lush tropical forests, and varied topography. Now fondly referred to as "the Spice Island", Grenada has been coined the prettiest island in the Caribbean.

Grenada has numerous areas of outstanding natural and cultural value. Proposals for individual parks have been made by international organizations including The Caribbean Conservation Association, Eastern Caribbean Natural Areas Management Program, International Union for the Conservation of Nature and Natural Resources and the World Wildlife Fund; and the National Trust, Ministry of Agriculture and Tourism and the Grenada Hotel Association on a national level. This document attempts to present a realistic national protected areas program for Cabinet approval.

The purpose of the system plan is to identify and provide a course of action for the protection and use of the Country's outstanding natural and cultural heritage and to encourage public understanding, appreciation and use of that heritage in ways which leave it unimpaired for future generations. Of equal importance, the National Parks Programme is to promote and guarantee a continual flow of social and economic benefits to the Grenadian people.

Five management categories have been defined within the system: National Parks, Natural Landmarks, Protected Seascapes, Multiple use Management areas and Cultural Landmarks. The National Parks and Protected Areas System Plan is based on specific criteria such as ecological or geological importance, cultural significance, tourism potential, or recreational value. Units within this system are recommended for establishment by Cabinet. In the case of forest reserves, a sound policy and legislation exists and will remain in effect for the Grand Etang Forest Reserve, and Forest Reserves in Carriacou.

Marine areas are the property of the State. Some of the proposed National Park area is presently managed as a Forest Reserve or is unsurveyed State Land. Most other units within the proposed system are privately owned, therefore necessitating the development of individual management strategies in cooperation with the private owners. The policy allows for private land owners to retain limited management and development rights on parcels of their land, as approved and monitored by the responsible government agency.

Management of the Parks and Protected Areas System will be concerned with the principal function of protection of natural and cultural resources; provision of outdoor recreation, tourism and education programmes; facilities and services; provision of opportunities for research; conservation of watersheds and water production, control of sedimentation and erosion and protection of downstream investments;

production of marine products, timber, forage and wildlife on a sustained yield basis; provision of sport fishing and hunting opportunities; and in stimulating use of marginal rural areas.

Management and development plans will eventually be prepared for each unit within the system. As appropriate, specialized plans for interpretive and environmental education or research and environmental monitoring will be prepared for those units where the circumstances or objectives warrant such. Plans will be evaluated on a regular basis in order to improve both planning and execution.

The responsible management agency will develop a short and long-term funding strategy to finance the system and its activities. Components of the strategy will include funds allocated by Government; an effort to obtain financial and technical assistance from various international and bilateral sources and financial support from the national private sector; and, the establishment of special protected areas development and management funds based upon a set of fees charged to users and beneficiaries of the national system of parks and protected areas. Initially a fairly heavy reliance will be placed on international and bilateral support.

The Ministry of Agriculture and Tourism will be delegated the responsibility for the planning, management and protection of areas within the parks and protected areas system. Extensive collaboration and coordination with a number of other public and private agencies will be developed to support those efforts.

Chapter II - Government policy relevant to natural and cultural areas protection

No formal Government policy exists on the establishment and management of a system of protected areas. Various policies are, however, directed towards the objectives and goals of Government in the area of conservation and protection of natural and cultural resources.

The following national policies provided the basis for the draft policy for National Parks and Protected Areas.

Goals of tourism policy

The policy statement on the tourism sector (May, 1985) includes the following key goals:

1. To further integrate tourism with agriculture, handicrafts and fisheries.

2. To create and promote Island-wide historical and environmental attractions.

3. To diversify the industry to cater for international, regional and local clientele, as well as high, medium and low income persons.

4. To strive for an appreciation by visitors of the authentic Grenadian culture.

5. Improvement in the Quality of Life. Standards of physical and mental health require adequate recreational opportunities be created for the positive use of leisure time.

6. The Generation of Employment. Employment generation is critical and policies must

emphasize growth in activities such as tourism with employment multiplier effects. The capability for foreign exchange earnings is an added bonus.

7. Reduction of Geographic Inequity. The development of tourism attractions through the establishment of a system of parks and protected areas can assist in integrating peripheral areas into the urban centered national growth process, and improving regional/rural economic conditions.

Goals of forest, soil and water conservation policy

The state Forest Policy of Grenada (Forest, Soil and Water Conservation Ordinance/Amendment 1984) includes the following key elements:

1. To protect tree cover on such land as required for the prevention of erosion and flooding and the protection of water supplies.

2. To effect the permanent reservation as forest reserves such areas of land as may be required to ensure the continuous supply of forest products.

3. To maintain the level of forest growing stock, to ensure sound silvicultural practices are employed and to direct harvesting such that this growing stock is not reduced.

4. To protect such areas as may be required to provide a natural and undisturbed habitat for flora and fauna of Grenada.

5. To encourage and assist owners and managers of forest, woodlands and plantations whether they be on private or Crown Lands.

6. To create areas within the forest to satisfy needs for recreation within a peaceful natural environment.

7. To encourage the fullest development of the productive forests.

8. To encourage the establishment of appropriate forest industries.

9. To protect the consumer by ensuring well manufactured forest products are supplied in conformity with market demand.

10. To extend educational and training opportunities at the professional, technical and vocational level to forestry personnel.

11. To initiate and conduct forest research necessary to ensure fulfillment of this Forest Policy.

Purpose of national park and protected areas system policy

The purpose of the park policy statement is to provide a definite course of action for programmes

concerned with the protection and use of the country's natural and cultural heritage. It integrates the intent of Government policy in conservation, forestry. land-use, tourism and recreation as it relates to natural and cultural area management.

This policy provides the basis for the enactment of the legislation necessary for the Government of Grenada to manage units of the system.

General policy and principal goals

The policy of the Government of Grenada will be to protect in perpetuity those areas which represent significant examples of the country's natural and cultural heritage, to encourage public understanding, appreciation and enjoyment of that heritage in ways which leave it unimpaired for future generations, and to guarantee a continual flow of social and economic benefits for the country and its people. Management and development of the protected areas system and the consequent production of goods and services will be conducted in an appropriate manner within the cultural context of Grenada. In the context of national development policy, the goals of the national park policy are:

1. Development of a high quality living environment in a context of effective resource development which whenever possible retains the aesthetic value of the landscape.

2. Contribution to economic welfare and development through the establishment of productive sector links with protected areas, in order to maximize the availability of natural goods and services to the nation.

3. Allocation of lands to optimum use - and in particular to preserve those areas with fragile ecosystems in which fewer development alternatives exist.

4. Development of environmental awareness and appreciation in the general population.

Specific national park and protected areas system objectives

Areas will be established within the National Park and Protected Areas System to meet one or more of the following objectives:

1. Maintain in a natural or near natural state areas that constitute examples of the country's terrestrial and marine ecosystems, landscapes and geological formations, in order to guarantee the continuity of evolutionary processes and their existence for future generations.

2. Provide and protect natural resources for outdoor recreation needed by the citizens of Grenada.

3. Protect, manage and improve the natural and cultural landscape of the country in order to maintain the visual quality of the environment.

4. Stimulate national and international tourism potential and revenue for the country.

5. Preserve genetic materials as elements of natural communities, minimize the loss of any

plant or animal species and maintain biological diversity.

6. Protect and manage fish and wildlife resources in view of their important role in environmental regulation, sport and recreational activities and as producers of protein and other products.

7. Provide area for research, formal and informal education and the monitoring of environmental processes.

8. Protect and improve watersheds and water courses to maintain high standards of quality and quantity; control of erosion, sedimentation and flooding; protect downstream investments that depend on water supply, such as reservoirs and irrigation projects.

9. Produce timber, other forest products, forage and/or marine products for the benefit of the population and to decrease dependency on foreign imports.

10. Protect sites and objects of cultural, historical and archeological heritage as a basis for educational tourism.

11. Stimulate rational use of marginal areas and environmentally sound rural development.

Deforestation on steep slopes adjacent to inland bays can cause sedimentation of the marine waters which can have detrimental effects on the coral reefs.

Categories of protected areas

The Government will protect and manage natural and cultural resources in five managements categories:

National parks

Purpose

The protection of outstanding natural and scenic areas of national or international importance. The national park should provide recreational, scientific and educational activities.

Criteria for Selection

National parks are relatively large land or water areas containing a complex of ecosystems. They should include the most outstanding natural areas of the country, be under strict Government control and conform to international standards.

Management Objectives

To protect natural resources through a zoning system which will ensure the provision of strict protection in some areas and intensive recreational and educational uses in other areas without disrupting the long range objective of ensuring the area is available to future generations.

Examples

Grand Etang, Levera Pond and Archipelago, and High North National Park.

Natural landmarks

Purpose

To protect natural features of a unique character such as outstanding waterfalls, cave systems, geological features and distinctive landmarks and to ensure that these features do not lose their unique characteristics.

Criteria for Selection

Size is determined by the specific feature and the surrounding area necessary to ensure its protection. The features should be distinctive, and in a near natural state. Generally, these would be small areas rather than complete ecosystems and provide opportunities for recreational activities.

Management Objectives

To provide public access for recreational users but respecting the characteristics of the feature. These uses may be intense provided they do not destroy the basic feature protected.

Examples

Lake Antoine, Marquis Island, and Fossil Beds at Grand Bay.

Cultural landmarks

Purpose

To protect cultural features of a unique character such as old sugar and rum mills, military forts, great estate houses and their surrounding grounds, churches and Amerindian sites.

Criteria for Selection

Size will often be determined by the ownership status and by the specific features. The features should have potential for helping Grenadians and visitors understand the cultural and historical heritage of the Island.

Management Objectives

To provide public access for educational and recreational uses related to the characteristics of the feature. These sites will be developed with the collaboration of the National Trust, the Historical Society and other agencies, and if the areas are privately owned, in conjunction with the owners.

Examples

Fort Frederick, Carib's Leap, and Thiboud-Limlair Estate

Protected seascapes

Purpose

To protect outstanding littoral mangrove and island habitats, beaches and coral reefs which possess special aesthetic and ecological qualities. Life styles which have traditionally utilized marine and terrestrial resources can continue to co-exist. The boundaries of these areas will be set to include land adjacent to the shorelines and coral reef systems.

Criteria for Selection

The size of the area will depend upon special arrangements with owners, since State land only extends to the high water mark.

Management Objectives

To ensure the ecological integrity and scenic quality of seascapes is maintained for demonstrating the harmonious interactions of man with the sea, while providing opportunities for recreation, tourism, education and research.

Examples

Calivigny Harbour, the North Eastern coastline, and White/Saline Islands.

Multiple use management area

Purpose

To manage natural resources and ecological processes to contribute significantly to the economic needs of the nation. The multiple function of these lands and waters can provide sustained yields of natural products and conserve genetic diversity. Private lands needed for inclusion within the National Park System will be acquired under the provision of Land Acquisition Ordinance which allows for the acquisition of lands for public purposes.

Criteria for Selection

These will be large areas suitable for sustained production of water, wood products, wildlife, forage and/or marine products and for outdoor recreation and education. Ownership of all or most of the land should be by the Government.

Management Objectives Sustained production of water, fibre, other wood products, wildlife, forage and/or marine products and outdoor recreation and education should all be ensured. Conservation of nature will be primarily oriented to the support of economic activities but zones also may be established for nature protection.

Examples Annandale Watershed and Concord Watershed

The isolated St. Margaret or Seven Sister Falls within the Forest Reserve is an invigorating hike through banana and nutmeg plantations.

Forest reserves

One Forest Reserve, the Grand Etang, exists in Grenada and two areas in Carriacou. These areas will be utilized as is indicated in the Forest, Soil and Water Conservation Act.

The view from the Forest Centre of the Grand Etang is considered one of the most interesting and beautiful in the Caribbean.

It is conceived that certain key watersheds such as the Les Avocats will be managed with input from both forestry and national parks.

As other watersheds become important in the future, the Forestry and National Parks staff in conjunction with Land and Water Resources and The Central Water Commission will manage the areas to avoid erosion or water pollution within these watersheds. As the overall forestry and protected areas program evolves, new areas may be recommended for Cabinet approval. In the event that private ownership threatens the integrity of a critical watershed area, the Cabinet may opt to purchase the property, as has occurred in the Annandale Watershed. Recreational hunting will be permitted in the forest reserves and multiple-use management areas. The Hunter's Association understands the need for areas where hunting is prohibited to ensure the continuance of biological diversity.

Additional categories

Government may also consider the possibility of including areas in two categories which form part of international conservation programmes: Biosphere Reserves which are part of the Man and the Biosphere Program (MAB) and World Heritage Sites which are part of the World Heritage Program. UNESCO is the secretariat of both programmes and the latter would require that Grenada become a signatory to the International Convention concerning the Protection of the World Cultural and Natural Heritage. The former would require establishment of a National MAB Committee. In both cases the Country would have to nominate areas it considers appropriate for inclusion in either international program. Figure I describes those categories in more detail.

Non-state ownership

Regulation of land uses on private lands adjacent to protected areas may be necessary to ensure that actions on these lands are not detrimental to fulfilling the objectives for the units of the system.

With the development of Levera as a National Park, handicraft shops, restaurants, and taxi drivers

will receive increased business thereby contributing to their economic well-being.

Although areas of outstanding national significance, in general, should be the property of the State, areas which are important but do not warrant acquisition for inclusion within the system may be managed by individuals or by private non-profit organizations. In such instances Government may provide financial and technical assistance and share certain costs of development of the area once the manager is willing to undertake the operation and protection of the area and when the planned uses of the area are deemed appropriate. The Hotel Association is an excellent example of a qualified private group with whom relationships of this nature could be shared.

Managing the national parks and protected areas system

Functions:

The National Park System will be managed to carry out a variety of functions as indicated below. Specific policies for each management category are detailed in Appendix II.

Protection of natural resources

The protection of those natural resources which have led to the establishment of each unit within the system will be a primary consideration of management. Factors which could threaten the resource will be analyzed and appropriate protection methods implemented and, when appropriate, measures will be taken to enhance degraded resources.

Outdoor recreation

The System will be managed to provide opportunities for a wide range of recreational activities. The system is not intended to provide for all of the recreational needs of the Country but primarily those that cannot be met in areas not containing outstanding natural or cultural resources.

Information, interpretation and education

The Areas within the System will be managed to provide visitors with an understanding of the natural and cultural resources in such a way that it enhances their enjoyment and appreciation of the area.

Information relative to the programmes, activities, plans and recreational opportunities of the various areas will be given the widest distribution to ensure that the public, and in particular schools are properly informed of the opportunities available.

Facilities and services

Areas within the System will provide facilities and services necessary for public access, recreation and understanding of the area. The type and location of the facilities will reflect the resource, management category and expected use and will be undertaken in accordance with the site plan.

Certain facilities and services may be provided by the Government or by private concessionaires. The type and quality of service and maintenance standards will be set by the responsible management agency.

Research

Research concerned with understanding the natural and cultural phenomena and processes, and the protection and use of the areas within the system will be encouraged. Emphasis will be given to undertaking research essential for management purpose but basic research which will expand man's knowledge of the natural environment and cultural resources will be permitted. The nature of the research will vary with the type of area and its objectives and be regulated to ensure the protection of the resources, and safety and enjoyment of the visitors.

Interagency co-ordination and collaboration

The National Park Unit will ensure that there is proper co-ordination between the various agencies of Government and others whose activities could affect the resources, or aid in the management of the system.

The National Park unit will be responsible for providing technical information and assessing areas proposed for inclusion within the System. Once included, areas may be excluded from the system only by special law or transferred from one management category to another by direction of Cabinet.

Land ownership

State ownership

Areas established and managed as part of the National Parks and Protected Areas System shall be the property of the State or managed in coordination with the Government. When lands are formally included within the System all powers of ownership should be transferred to the National Park Unit of the Forestry Department.

A provision should be made to encourage private land owners to deed a portion of their land or the management thereof to the State for protection in perpetuity while receiving special rights to continue living on adjacent parcels, but under strictly established management regimes.

These provisions for strict State ownership or control should apply to all units classified as National Parks and Natural Landmarks and the majority of Cultural Landmarks. In Protected Seascapes and Multiple Use Management Areas most of the land and water should be under Government ownership or strict control in perpetuity. In certain specific cases Cultural Landmarks may remain under private ownership but only if specific covenants with the state establish clear management guidelines.

The National Parks Program hopes to increase environmental awareness and give students a better understanding of natural processes.

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Scope

The National Parks System Plan includes areas of national, natural, cultural and historical value. Areas which are critical to water quality and supply are also included for protection. Areas which provide important economic and natural services such as beach erosion control, protection of fishing nursery grounds, or productive ecosystems were also selected for inclusion within the system.

Methodology

The process utilized in recommending areas for inclusion into the National Park and Protected Areas System involved a systematic identification and analysis of those areas which best represent the natural and cultural heritage of the country. The inventory phase of the planning process included field trips, overflights, literature review and extensive interviews with knowledgeable individuals. A matrix was designed analyzing the full range of marine and terrestrial ecological zones, vegetative communities, wildlife, geology and geomorphology, and cultural and historical data. In addition consideration was also given to the education, tourism and scientific potential of proposed areas. Based on this analysis, a series of overlay maps were prepared to help ensure that all areas judged to be important were included within the system. Subsequently this information was correlated with national land-use priorities to minimize conflicts between critical agriculture or forestry areas and activities proposed for the park system. For example, the national land-use capability map identifies lands in classes I - IV as having potential for agriculture or agro-forestry. Combining this information with soils data, Grenada's most productive lands can be isolated. The national parks inventory was done in a similar fashion using the above mentioned criteria in order to determine those areas offering the most important examples of a particular natural or cultural phenomenon. Another area may have been selected due to its outstanding recreation or education potential. A series of these exercises leads to a completed system of national parks and protected areas providing a range of benefits to the country.

Most of the terrestrial areas proposed are in capability classes V - Vie, on poor soils and on slopes of greater than 30 percent. All mangrove areas are recommended for protection.

LAND CAPABILITY CLASSES*

* From Soil and Land-Use Surveys No. 9 Grenada.

I. Level land with deep soil and no factors limiting the use for agriculture.

II. Land suitable for cultivation with moderate limitations. The risk of erosion is the primary factor limiting development.

III. Land suitable for cultivation with strong limitations must be cultivated carefully to prevent erosion of the soil.

IV. Land marginal for cultivation due to extreme danger of erosion. Improved grassland, or tree crops should be established on this land.

V. Land not suitable for cultivation. Tree crops, food or forest trees should be established on this land.

VI. Land not suitable for cultivation. Very steeply sloping land that should never be cleared of its natural vegetation.

VII. Land not suitable for cultivation due to a combination of adverse factors.

CATEGORIES OF PROTECTED AREAS AND THEIR CORRESPONDING CONSERVATION OBJECTIVES FOR GRENADA

Primary Conservation Objectives	National Park	Natural Landmark	Cultural Landmark	Protected Landscape	Multiple Use Area	Forest Reserve	Biosphere Reserve	World Heritage Site
Maintain sample ecosystem in natural state	1	1		2	2	2	1	1
Maintain ecological diversity and environmental regulation	1	1		2	2	2	1	1
Conserve genetic resources	1	1		2	3	3	1	1
Provide education, research, and environmental monitoring	2	1	1	2	2	2	1	1
Conserve watershed condition	3	3			3	2	3	3

Control erosion, sedimentation; protect downstream investments	3	3			3	2	3	3
Produce protein and animal products from wildlife; permit sport hunting and fishing		2		3	1	1	2	
Provide recreation and tourism services	1	2	2	1	1	3	3	1
Produce timber, forage, or marine products on sustained yield basis				2	1	1	1	
Protect sites and objects of cultural, historical, and arqueological heritage	1	2	2	1	3		2	1
Protect scenic beauty and open space	1	2	2	1	3		2	1
Maintain open options; manage flexibly; permit multiple use				3	3	2	1	1

Stimulate rational, sustainable use of marginal areas and rural development	1	2	2	1	1	1	1	2

NOTE:

1 = Primary objective for management of area and resources.
2 = Not necessarily primary, but always included as an important objective.
3 = Included as an objective where applicable and whenever resources and other management objectives permit.

Participants of the first Environment Education Workshop held in the Grand Etang Forest Centre drew up an interpretive plan.

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Chapter III - Inventory and status of the natural and cultural resource base

Grenada

Geomorphology*

* Researched by Bruce Johnson, United States Peace Corps Volunteer, Land Use and Water Resources Division.

Geomorphology is the study of the characteristics and evolution of landforms. The study may involve whole physiographic regions, or be confined to individual structures within a small area, In essence, the geomorphologist attempts to answer the question, "How did the land come to be this way?"

In Grenada the answer to that question involves analysis of several variables: parent material (geology), climate, relief, and time, among others. Grenada has basically two physiographic regions: the rugged, high-relief interior, and the relatively low-relief coastal periphery.

The interior of Grenada is dominated by mountain peaks, steep ridges, and deep narrow valleys. Fast flowing streams with high gradients occur in the valley bottoms. Relief tends to be very high, with a 2000 foot drop over 1 mile horizontal distance in some areas. The volcanic geology of the interior is the dominant factor that produced this landscape. Shifting volcanic vents created a somewhat jumbled topography with several major peaks, each having numerous ridges radiating from them. The Mt. St. Catherine area is an excellent example of this phenomenon. The ridgetops, composed mostly of andesite and basalt lavas, have surprisingly retained their narrow tops and steep sides. This is possibly due to the low permeability of the clay soils to water, the principal erosive agent of the rock.

The coastal periphery of Grenada presents a landscape which is much more subdued than the interior. Again, the major factor appears to be the character of the volcanic center deposits in the area. In contrast to the volcanic centers of the interior, the coastal deposits are dominated by "reworked" volcanic rocks, including fluviatile (stream) and mudslide deposits.

Originally, the topography of the coast may have been quite rugged. But fluviatile and mass-movement processes tend to reduce relief by removing material from elevated areas and depositing that material in the lowlands. Southern Grenada's surface geology is almost entirely comprised of (lahar) mudslide deposits and fluvially-deposited (reworked) volcanics. The rocks exposed in the Southern Seascape Protected Seashore area are of this type. The entire eastern coast of Grenada is composed of reworked volcanic deposits, which accounts for the gently-rolling topography. The western coast displays a more rugged landscape, owing to the asymmetric eruption to the west, which is a pattern throughout the Windward Islands.

Climate is an important factor in the formation of topography. In Grenada, the small variation in temperature between sea level and the higher elevations is not of great geomorphological importance, but the great difference in rainfall is very significant. An analysis of rainfall indicates that annual rainfall varies directly with elevation. Since water is the principle erosive agent on the Island, the high elevations are eroding at a greater rate than the lowlands. Over time, this disparity in erosion will serve to reduce the relief between the interior and the coastal periphery.

An important manifestation of the weathering process is the formation of soils. Soils form from the same interplay of factors which influence topography, with vegetation becoming a significant variable. As indicated by Vernon (1959), climate is the single most important factor in the distribution of Grenadian soils. Therefore, in the Island's interior the soils are indicative of a high degree of chemical weathering, consistent with the high rainfall. The soils are generally kaolinitic latosols, meaning a highly leached soil with kaolinite as its principal clay component. The predominance of iron and aluminum oxides in the soil give it a distinctive bright red to orange-yellow color. The latosols have a poor nutrient-storage capacity, are fragile, easily disrupted and must be carefully managed.

Schematic Elevation - THE ISLAND OF GRENADA

		POINT SALINE	ANNANDALE FALLS	FOOTHILLS OF MT. ST. CATHERINE		LAKE ANTOINE		LEVERA POND	SUGARLOAF ISLAND	CORAL REEFS
WILDLIFE - 150 Species of Birds (Groom, 1970)		House Gecko Spinous Gecko Wall Lizard Tree Lizard Zaggada or Ground Lizard	Garman's Woodland Frog Highland Piping frog Alien's Ground Lizard African mona monkey. (Introduced)	- Manicou or large opposum - Mouse opposum - Forest Crab - Nine banded armadillo - Talon - Giant Toad - Piping Frog - 6 species of snakes		- Tilapia and other freshwater fish - Morocoy or red-legged tortoise - 11 species of bats - Agouti's extinct - Burmese Mongoose		- Rich in Aquatic Waterfowl migratory warblers, herons. Iguana, ground lizards, Ghost crab, mole crab.	- Turtle nesting 4 species Nesting seabirds	- Conch - Lobster - Real Fish
PROTECTED AREA	Molinere Reef Protected Seascape	Canoe Bay Protected Seascape Quarantine Pt, Natural Landmark	Annandale Falls Natural Landmark Annandale Multiple-Use Watershed	Grand Etang National Park Forest Reserve	Mt. St. Catherine National Park	Mt. Hope Clabony Multiple Use	Lake Antoine Natural Landmark	Levera National Park		Saline-White Island Protected Seascape

UNIQUE AMENITIES	Finest Reefs in Grenada	Scoria and Ash deposits	Oldest known rocks in Grenada - Folded and faulted sedimentary formation	Andesite Dome Basalt flows Crater Lake Endemic vegetation	Mudflows Hot Springs Highest peak in Grenada	Important water Quality & supply region for Grenville	- Explosion Crater - Herbacious Swamp	Andesite Dome. Beautiful beaches Mangrove ecosystem Salt pond	Rocky cliffs and Sandy beaches	
MANAGEMENT OBJECTIVES	- Research - Protection of over-exploited fish, lobster, and coral - Recreation	- Recreation - Tourism - Maintain aesthetic quality	- Recreation-Tourism - Watershed protection. - Reaforestation.	- Recreation - Interpretation - Environmental Education. - Watershed Protection. - Forestry Exploitation - Reaforestation		- Watershed management - Cocoa, - Coffee, - Nutmeg, - Timber - Production	- Recreation - Education - Tourism	- Recreation - Tourism - Education - Protect - Reef, littoral habitats & island ecosystems, - Maintain scenic quality.		

Joint Government of Grenada/OAS Project on the Establishment and Management of a System of National Parks and Protected Areas.

Geologic history

Reconstructing Grenada's geologic history poses a formidable task for the geologist. Most of the Island is covered by soil and dense vegetation, and rock exposures are often severely weathered. Topographic relief is great, which makes the stratigraphic correlation of rock units even more difficult. Most significantly, the geology of Grenada is complex and presents many rock types of different ages.

Several geologic studies have been conducted in Grenada, dealing with the chemical composition of particular rock types. The precise relationships between various rock units are not well understood, due to vegetative cover and the fact that volcanic centers shifted many times over millions of years. This shifting often resulted in the juxtaposition of rock units of different age, type, and volcanic source, making geologic interpretation difficult. Erosion which occurred during and between periods of active vulcanism further obscures the geologic record.

To date, the most probable chronology of events is presented in a paper by R.J. Arculus (1976), although even the author admits to gaps in the data. The following description of Grenada's geologic history is drawn primarily from the 1976 Arculus study. Table I summarizes the sequence of events, and Table II lists some geologic features by period and where they are represented within Grenada's National Parks System.

The geologic history of Grenada began approximately 38 million years ago in the upper Eocene Period. At that time, there was only a shallow sea where Grenada now exists. The sediments deposited were composed of sand, silt, mud, and calcareous mud; the rock formed from this process is now known as the Tufton Hall Formation. In between the sediments of the Tufton Hall, geologists found layers containing volcanic minerals and other deposits of volcanic origin. Volcanic activity became more frequent in the Oligocene period (37-26 million years ago). The volcanic activity during and following the deposition of the Tufton Hall formation deformed and uplifted the rock, resulting in the folding and faulting which can be seen just north of Levera Beach.

The oldest of the volcanic rock series are the andesite domes of northern Grenada, which formed in the Miocene Period (26-5 million years ago). These andesite

domes (Mt. Alexander, Mt. Rodney, Mt. William) have been estimated by radiometric dating to be 21 million years old. The middle Miocene Period is not well represented in Grenada, but the andesite domes of Levera Hill and Levera (Sugar Loaf) Island represent volcanic activity near the end of Miocene time. Thought to be concurrent with the Levera events were the eruption of the southeast mountain and Mt. Lebanon centers, which recorded the first major shift of eruptive centers to the south.

The Pliocene Period (5-2 million years ago) witnessed the advent of Grenada's most intense volcanism. In the southwest of the island, basaltic lava flows estimated at 3.5 million years old are interlayered with reworked volcanic sediments. The source of the basaltic lava was probably the Mt. Sinai Centre, but the conclusive evidence is buried beneath younger volcanics. Most of the "reworked" deposits in southern Grenada are theorized to be lahar deposits of various ages. A lahar is a massive mudslide of unconsolidated volcanic products from the sides of volcanoes. The massive, in-filling character of lahar deposits is thought to be responsible for the relatively subdued topography of southern Grenada.

In the north of central parts of the Island, major eruptions re-occurred in the Pliocene and continued into the Pleistocene Period. The Island's interior was the scene of intense activity as a series of eruptive centers shifted southward from Mt. Granby towards Mt. Qua Qua, emitting a variety of volcanic products. A source near Mt. Granby emitted pyroclastic products (many of which were later reworked) and a series of basaltic and andesitic lavas. The eruption of basaltic and andesitic lavas continued as the vents shifted southward. The chemical composition of these lavas is geologically important because it displays the cyclical nature of magma composition as eruptions occur over time; there is a repeated transition from basalt to andesite compositions. Some basaltic ash layers near Fedon's Camp indicate that a degree of explosivity characterized the eruptions. The final stages of this activity formed the andesitic dome summits of Fedon's Camp and Mt. Qua Qua, and probably ended with the extrusion of basaltic lava on the western ridges of Mt. Qua Qua.

The Mt. St. Catherine massif represents the youngest major volcanic structure on the Island. Activity at this centre likely began in the Pliocene and continued throughout the Pleistocene. Initially, a vent near the Plaisance/Malagon area extruded basaltic lavas, which were overlain by a series of andesitic and dacitic lava flows. As the vent migrated southward, andesitic and dacitic lavas were deposited to the northwest of the present summit. The Pyroclastic flows to the west of the present summit are the most voluminous deposits of their type on Grenada. The large (1½ Km diameter) crater to the South-east of Mt. St. Catherine was partially filled-in by an andesitic dome which probably concluded the eruptions in the area.

The final stage of volcanic activity involved the formation of explosion craters throughout the Island, most notably at the Lake Antoine, St. George's, and Grand Etang locations. Lake Antoine is a well-preserved crater, and has been described as the best example of a true "tufaceous ring" on the Island. The carenage of St. George's and the Queen's Park are both believed to be explosion craters, giving the Island its best harbour and best source of scoria gravel. The three closely-spaced explosion craters at Grand Etang are generally thought to be the youngest volcanic structures on the Island, having formed approximately 12,000 years ago.

In recent times, volcanic activity on the Island of Grenada has been virtually non-existent, with the minor exception of some hot springs. Most of these hot springs occur in the Mt. St. Catherine area and emit sulphurous water and vapor. Other springs such as the River Sallee and Peggy's Whim Springs are not sulphurous to any extent.

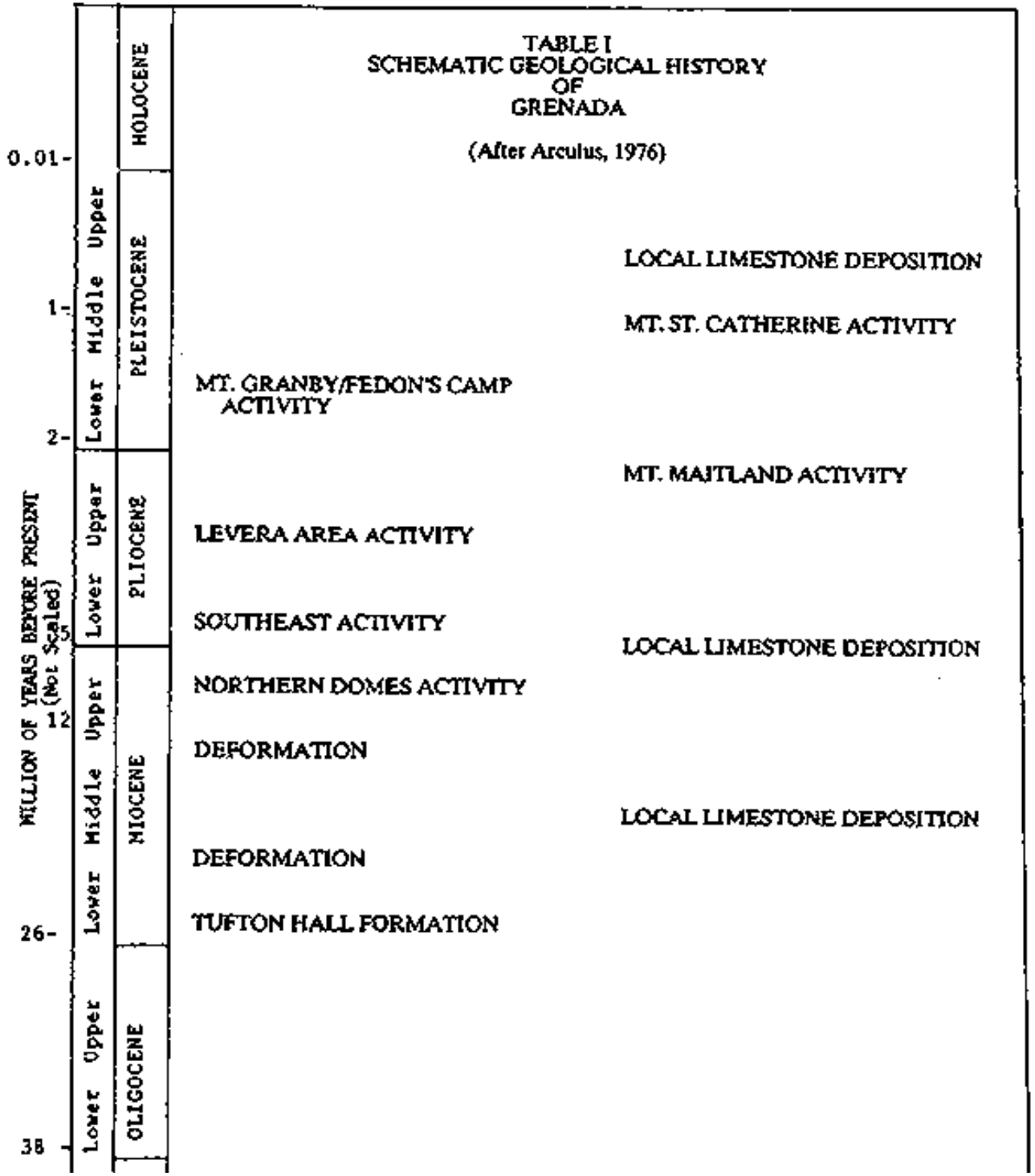
Just 8 kilometers to the north of Grenada, however, is one of the most active volcanoes in the Lesser Antilles. It is a submarine volcano, 160 meters below sea level, known as "Kick 'em Jenny" for the nearby Island of the same name. It has erupted at least half a dozen times this century, with the last eruption occurring in 1978. It is possible that the volcano may emerge during its next eruption. Scientists in Trinidad are currently monitoring this area for seismic disturbances, which might indicate renewed activity.

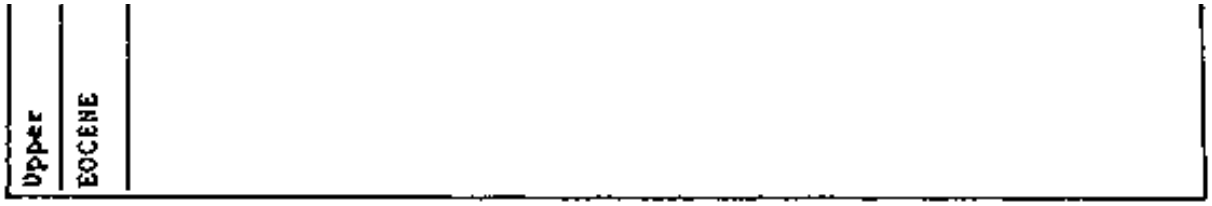
Natural vegetation*

*As adapted from (Beard, 1949)

According to Beard (1949), the existing vegetation in Grenada is a result of land-use history and differences in soil types and rainfall regimes. Grenada is intermediate in age between young St. Vincent and old St. Lucia. The principal peak. Mount St. Catherine (2,757 feet), rises in the northern half of the Island as the centre of a massif surrounded by lesser peaks and ridges. South of this massif is a low col where the Clozier road crosses the Island, and beyond it the land rises again into a long, curving ridge, or system of curving ridges, running first towards the south and then bending to

TABLE I - SCHEMATIC GEOLOGICAL HISTORY OF GRENADA





(After Arculus, 1976)

Except in the higher parts of the mountains, slopes are not excessively steep. As a result, with the small size of the Island's land mass, large areas have been cleared for agriculture including fruit, cocoa and nutmeg.

In the interior, practically all the land was originally sold out to estates, and cultivation was pushed to the highest practicable limit in most cases, though some owners reserved belts of forest on ridges for protective purposes. The Government began the consolidation of a forest reserve in 1897 and today the Grand Etang Reserve now contains over 3,800 acres. Most of this area has been protected from cutting for over eighty-five years, although Hurricane Janet of September 22, 1955 caused extensive blow-down damage. These areas were subsequently planted to Blue Mahoe, a tree noted for its value in watershed protection.

Slopes on Mount St. Catherine are extremely steep and the central massif is clad only with palm brake. Elfin woodland caps the summit and there is secondary, cut-over rain forest on the lower supporting ridges. A similar condition prevails on the steep mountains of Fedon's Camp and Qua Qua. Owing to the steep slopes and young shallow soil, landslides are very frequent. South of Qua Qua the forest growth is more diverse and includes the last remnant lower montane forests in Grenada. In the sheltered lower elevations, the forest is mature, and comparable to the type of rain forest exemplified in the other Islands. Ascending towards the main ridge forest, stature is progressively reduced, and along the crest, montane thicket predominates.

Overall, Grenada has less vegetative diversity than other Islands in the Lesser Antilles.

The main reason for this is not geographical isolation but rather that the flora was profoundly modified by felling of the valuable timber species during the nineteenth century. Most of the original species are now extinct and have been replaced by second-growth forests which grew into a mature structure by the protection afforded since the establishment of the forest reserve. Physiognomically, the forest can now be said to belong to the rain forest formation, lower montane rain forest, and montane thicket, since structure has reached climax. Floristically the communities are associes and not associations, since they are still below climax rank.

1. Rain Forest and Lower Montane Rain Forest

Beard considers these two formations together since there is very little difference in floristic composition between very tall forest with the structure of rain forest proper, and less tall forest approximating lower montane rain forest in Grenada. There is a very gradual reduction of stature and stratification with increasing exposure, and elevation and only on the ridge tops with growth reduced montane thicket is there any radical change in composition. We have therefore a *Dacryodes-Licania* associes belonging to the montane thicket. The latter is evidently sub-climax to the general *Micropholis-Richeria-Podocarpus* Association of the Islands, and the former, presumably, to both the *Dacryodes-Sloanea* and *Licania-Oxythece* Associations.

Beard illustrated a profile in the Grand Etang Reserve, at the 1400 feet level across the slope at a point where the line ran practically level. The strip is roughly at right angles to the prevailing wind. Dominant trees reach 100-110 feet in height and form a closed canopy. All of them on the strip were *Dacryodes excelsa* except for one individual *Maytenus grenadenses.* Most of the smaller trees, which fell roughly into two stories, between 40-80 and 15-30 ft, were *Licania ternatensis.* The structure agrees very well with that shown by measured profiles in rain forest of Dominica and St. Kitts. The Grenada sample is somewhat denser and shows no sign of wind damage.

The Dominants are (Beard, 1949):

Dacryodes excelsa	(Gommier)

Slonea caribaea	(Chataignier grandes feuilles)
Micropholis chrysophylloides	(Bois)
Simarouba amara	(Marouba)
Oxythece pallida	(Balata laite)
Ficus spp.	(Figuier)
Slonea truncara	(Chataignier petites feuilles)

Species almost never attaining the canopy and ranking as sub-dominants were:

Licania ternatensis	(Bois gris)
Euterpe sp.	(Mountain Cabbage Palm)
Guatteria caribaea	(Mahot)
Maytenus grenadensis	(Bois agouti)
Richeria grandis	(Bois bande)
Byrsonima martinicensis	(Mauricif)
Hex sideroxyloides	(Caca rat)

Species confined to the lowest story were:

Cassipourea elliptica	(Bois d'ail)
Myrtaceae spp.	(Goyavier)
Meliosma herbertii	(Grosse gram)
Guarea macrophylla	(Bois rouge)
Ocotea floribunda	(Laurier petites feuilles)
Euterpe globosa	(Mountain Palm)
Sapotaceae sp.	(Sapotere)
Pithecellobium jupunba	

Beard indicates that the forests of Grenada differ from those of the other Islands in two main respects - paucity of species and altered relative numbers of the species present. Grenada is at an extremity of the arc of the windwards and is 70 miles from St. Vincent; the Grenadines in between may never have stood high enough to harbour a rain forest flora and so are not associated with assisting the migration of these species.

From the point of view of relative numbers of species in composition, the most surprising thing is the complete absence of stocking resembling the *Licania-Oxythece* Association, although the forest is on Red Earth Lateritic oxisols and in its 'low phase' agrees structurally with lower montane rain forest. Both *Licania* and *Oxythece* are present in Grenada, but are never the principal dominants. Beard suggests the probability that we must blame man's exploitation of timber in the past for such floristic differences that exist. *Manilkara bidentata,* which is one of the most valuable of all the timbers, is not found in the reserve at all. *Hicronyma caribaea* and *Ormosia monosperma* are found only in secondary growth. *Meliosma herbertii, Simarouba amara, Ocotea floribunda, Oxythece pallida, Pouteria multiflora,* and *Phoebe clongata* are rare to very rare and are present usually as young specimens only. All these are the valuable timber species which were presumably cut out during the nineteenth century. Local information indicates that this was the case.

2. Montane Thicket

Montane thicket in Grenada covers the summit of the main watershed from Mount Qua Qua south towards Mount Sinai and lesser ridge tops in the area. *Micropholis chrysophylloides* is dominant and forms 40 percent of the crop. Nearly all the big trees are of this species, some of them up to 6 feet in girth. Associated species are principally 'goyavier' (group of *Myrtaceae sp.,*) 19 per cent., *Licania ternatensis* 11 per cent., *Euterpe globosa* 9 per cent., *Dacryodes excelsa* 5 per cent., and *Richeria grandis* 4 per cent. Less commonly *Euterpe,* sp., *Rapanea guianensis, Oxythece pallida,* and *Ilex sideroxyloides* are found. Composition has probably been affected by fellings in the past as is the case of the rain forest. There is virtually no shrub layer at all. Epiphytes seem to be confined to small orchids and ferns and while there are few climbers, the forest is extremely mossy. Ground vegetation is knee-high and thick beneath typical montane thicket, consisting of seedlings, ferns, and razor grass *Scleria.* In the profile lee of the ridge, the ground vegetation increases to waist high and is a tangled mass of razor grass, ferns, *Ischnosiphon arouma,* seedlings and young palms.

3. Elfin Woodland and Palm Brake

Beard (1949) considered Elfin Woodland and Palm Brake together. They exist for the most part in rather intimate relationship. The steep slopes of St. Catherine and the windward sides of Qua Qua and Fedon's Camp are covered with a patchy growth seamed with the traces of landslides, running up and down the slope. One may see the bare earth of fresh slides, or recent ones covered with moss which appears to stabilize the soil, the next stage being a thicket of small tree ferns *Cyathea* or balisier *Heliconia bihai.* Other landslides may be colonized by *Euterpe globosa,* forming a patch of palm brake. All these successional stages are set in a matrix of Elfin Woodland, a repressed growth 10 feet in height, gnarled, mossy, and containing the typical elfin species: *Charianthus purpureus var., Weigeltia antillana, Didymopanax attenuatum, Ilex sideroxyloides, Rondeletia stereocarpa, Rapanca ferruginea* and *R. guianensis, Myrcia berberis, Byrsonima martinicensis, Stylogyne lateriflora, Besleria lutea,* and a few *Euterpe globosa.* The palms are stunted and the tips of the leaves appear scorched.

Most vegetation is covered with moss, epiphytes and climbers. At the summits' of the mountains pure stands of Elfin Woodland are found. On the very top of St. Catherine and Fedon's Camp growth is reduced to waist height.

On many of the leeward slopes of the southern mountains Fedon's camp, Qua Qua, South-east Mountain, Montane Thicket is replaced by clumps or groves of *Euterpe,* sometimes 60-70 feet high and far overtopping the stunted forest. This is evidently a sub-climax type, due to storm damage.

4. Secondary Tropical Rain Forest

There is a good deal of secondary growth on land formerly cut over by shifting cultivators along the Mount Sinai ridge and in the Mount Sinai water catchment. Such growth varies from a dense crop of herbaceous *Heliconia bihai* to young forest, according to the stage of succession. The subsequent tree pioneers are, most conspicuously, *Nectandra antillana* and *Guarea macrophylla,* the latter here appearing in an unusual role. Other species include *Sapium caribaeum, Hicronyma caribaea, Euterpe globosa, Cecropia peltata, Cordia sulcata, Ocotea martinicensis, Ochroma pyramidale, Inga edulis,* and *Miconia guianensis.* In the lower part of the Mount Sinai catchment conspicuous pioneer species include *Byrsonima spicata* and *Manilkara bidentata.*

5. Dry scrub Woodlands

Beard (1949) states that the only example of fairly intact woodland of the Tropical moist forest belt seems to be that crowning Morne Delice, an isolated, high and conical hill 900 feet in height, 2 miles inland from the south coast. Tree growth has evidently been allowed to remain due to unsuitability of the terrain for cultivation, but has been subject to frequent fellings. At the bottom of the hill there are young secondary thickets of mahogany *Swietenia mahagoni,* white cedar *Tabebuia pallida, Guettarda scabra,* and other pioneers.

Most other examples of tropical moist forest consist principally of young *Swietenia mahagoni,* an invasive species, or of low bush with *Acrocomis* palms. Nearer to the coast in the dry belt only very impoverished growth remains. At best there are woodlands 30-40 feet high on rocky hill-tops, containing mostly the naked indian *Bursera simaruba,* with a few individuals of *Lonchocarpus latifolius, L. benthamianus, Albizzia caribaea, Citharexylum spinosum, Pisonia fragrans, Tabebuia pallida, Chlorophora tinctonia, Genipa americana,* and *Cordia collococca.* Undershrubs include *Bauhinia ungula, Pithecellobium unguis-cati, Tecoma stans, Amyris elemifera, Randis mitis, Jacquinia barbasco,* and *Annona squamosa.* When severly degraded by cutting on eroded slopes, the tropical moist forest may be replaced by thorn bush of *Haematoxylum campechianum.* Poor grazing land is also colonized by open thorn bush with *Acacia nilotica, A. farnesiana,*

Haematoxylum, and various native shrubs including prickly pears *Opuntia dillenii* and columnar cacti *Cephalocereus.* Most of the Point Saline peninsula is covered by alternations and mixtures of these same types (Beard 1949).

6. Littoral Woodland

Very little remains of this formation in Grenada. At Levera in the north-east the littoral hedge is formed of *Conocarpus erectus, Jacquinia barbasco, and white cedar Tabebuia pallida* (in its monophyllous form). The woodland behind contains also sea grape *Coccolobis uvifera,* mapou *Pisonia fragrans,* manchineel *Hippomane mancinella, Erithalis fruticosa, Bourreria succulenta, Pithecelloboi unguis-cati,* and *Rheedia lateriflora.* On the Point Saline peninsula some sandy raised beaches carry pure groves of *Hippomane mancinella* up to 50 feet in height.

7. Swamp

There are some small mangrove swamps, chiefly at Levera Pond in the north-east and at the head of the various deep inlets of the south coast. These contain the usual red mangrove *Rhizophora,* black mangrove *Avicennia,* white mangrove *Laguncularia,* and button mangrove *Conocarpus.* In all cases they are recommended for protection.

Wildlife*

* As adopted from "A Natural History of Grenada," J.R. Groom 1968.

Grenada is the last remaining portion of the Grenada Bank - a volcanic entity, with sheer submarine cliffs stretching from the Island of Bequia in the North to Reindeer Shoal in the south. Deep water separates Grenada from all other major Islands (St. Vincent, Barbados, Trinidad and Tobago), which gives added evidence that Grenada is a purely volcanic Island which rose from the sea never having had a land bridge between any other land mass other than the Grenadines. Grenada and the Grenadine Islands may have been an "Oceanic Island" since during the Pleistocene period (Glacial Epoch of one million years ago) when the sea level is estimated to have been between 50 and 150 fathoms lower, plants and animals may have been able to spread throughout the Grenada Bank.

The Oceanic Islands such as Grenada (Volcanic) or Barbados (uplifted coral) will present a relatively poor biological diversity compared to Trinidad and Tobago, which were at one time connected to the biologically rich South American Continent. In Grenada, animal and plant migration would have only occurred by flight, winds, or as part of a large vegetative mat which would form in the Orinoco River, and float haphazardly to Grenada. Interestingly, the majority of winged insects and birds are of North American origin indicating the Island is on the Northern Antillean migratory route.

INVERTEBRATES: Groom, 1970, indicates that no endemic invertebrates have been described in Grenada with the possible exception of the weevil *Diaprepes.* The centipede whose bite causes a swelling, is the only dangerous animal per se in Grenada. Neither the parasol ant *Acromyrmex octospinosus,* or the water snail *Australorbsis glabatrus,* the secondary host of *S. mansoni* which causes Shistosomiasis and which is prevalent in the freshwater streams and ponds of St. Lucia, occur in Grenada.

VERTEBRATES: Island isolation has given Grenada a much less spectacular flora and fauna than Trinidad and Tobago, for example, because of the difficulty the animals have in arriving to Grenada. Furthermore, almost all of the forests of Grenada below 2,000 feet have been altered for cocoa, nutmeg, or banana production. Some examples of South American fauna such as ground lizards *Ameiva* and skinks *Mabuya* are found in Grenada. Groom, indicates that Grenada appears to have no Greater Antillean types of indigenous amphibians or reptiles, but only South American stocks which arrive here on floating mats of vegetation. Myers, 1937 again supported the Oceanic Island theory by stating, "The most striking feature of the fresh water fish fauna of the West Indies is the complete absence of members of the primary division of fresh water fishes, in particular the *Ostariophysi,* which swarm in all the waters of North, Central and South America".

AMPHIBIANS: In general. Groom, 1964 states "Amphibians are absent on Oceanic Islands, for their eggs and tadpoles require fresh water and their skins are totally allergic to salt."

Present are: The giant toad *Bufo marinus,* the piping frog *Eleutherodactylus* and the highland piping frog *E. johnstonei* which is confined to the remnant forests of the Grand Etang.

Garman's woodland frog *Leptodactylus wagneri* is found which is also characteristic of the primeval forest of the Grand Etang Forests.

The giant woodland frog *Leptodactylus fallax* an edible frog, was introduced but apparently did not survive.

REPTILES: There is one island endemic, *Typhlops tasymicris,* which is known only from St. David Parish, Grenada (Schwartz and Thomas 1975); no information is available on its ecology or status.

The house gecko - *Thecadactylus rapicauda* is an object of superstition.

The spinous gecko *Hemidactylus mabouya* was introduced from Africa.

The common anole or wall lizard *Anolis aeneus,* is found from Trinidad to St. Vincent. The crested or tree lizard (Anolis richardi) is found only from Tobago to Grenada and some Grenadines.

Iguana iguana is becoming increasingly more rare due to hunting and its reputation as a culinary delicacy.

Garman's ground lizard - *Ameiva ameiva* or zaggada, a handsome blue colored lizard, (male) is now found only in Grenada and the Grenadines. It is a sun loving lizard and was almost brought to extinction by the mongoose.

Alien's Ground Lizard - *Bachia heteropus alleni,* is found throughout the Grenadines. The South Antillean slippery back lizard -*Mabuya mabouya* was thought to have been extinct, but it appears that its numbers are increasing.

OPHIDIA SNAKES

The following snakes, none of which are venomous, are found in Grenada.

The white headed worm snake *Leptotyphlops margaritae.*

The tree boa *Corallus enydris cookii.*

Boddaerts's tree snake *Mastigodryas bruesi* Cribo *Clelia clelia* a powerful constrictor, feared locally for it's strength, is also an excellent rodent exterminator.

Moon Snake *Pseudoboa neuwidii.*

CHELONIIDAE - Turtles

Sea turtles nest on the beaches on the Windward side of Grenada and Carriacou. The females crawl up the beaches and lay their eggs in the dry sand of the spray zone.

Green turtle -*Chelonia mydas* - are heavily chopped as they come to the beaches to lay up to 600 eggs in a season.

Hawksbill turtle - *Eretmochelys imbricata* is carnivorous, and like the loggerhead feeds on shellfish and rock encrusting marine animals.

Loggerhead turtle - *Caretta caretta.*

Ridley turtle - *Lepidochelys olivacea.*

DERMOCHELYIDAE

Leatherback turtle - *Dermochelys coriacea* is the largest of the sea turtles, weighing up to 500 kilograms.

Testudinidae Tortoise - The morocoy or red legged tortoise - *Geochelone carbonaria* is thought to have been indigenous to Grenada and the Grenadines but was

hunted to extinction. It has since been re-introduced.

In exercise of the powers conferred by Section 40 (r) of the Grenada Fisheries Act No. 15 of 1986, the Minister declared on the 6th May, 1987 the following closed seasons for the harvesting of Turtles, Lobsters and Oysters.

Turtles: 1st May to 30th September
Lobsters: 1st May to 30th September
Oysters: 1st May to 30th September

BIRDS

Birds - 150 species of birds have been identified in Grenada and the Grenadines. (See Groom, 1970).

The avifauna is primarily tropical North American. The avifauna, as compared to Trinidad, is remarkably different considering the islands are only 100 miles apart. The absence of a parrot (*amazonas*) in Grenada is interesting, considering Islands to the north such as St. Vincent, St. Lucia and Dominica all have their own endemic parrot.

Parrots were recorded in the 1600's by Dr. Tertre (1667-1671) and Labat (1693-1705) in FR. Devas book "The History". Groom, postulates that these may have been driven to extinction by the aggressive introduced African mona monkey. These monkeys would be largely responsible for predation of the eggs in the parrots nests.

Ornithologists attribute the peculiar distribution of birds to the hurricane frequency. Since some species are noted for the first time after a hurricane and others may never be seen again.

In the "Protection of Birds and the other Wild Life Ordinance, 1956" Chapter 56 of the revised laws of Grenada, p.347, all wild birds and their eggs are given absolute protection throughout the year, with the exception of 19 species for which there is an open season from September to February. Ducks, waders, waterfowls, pigeon and doves may be hunted, and *Buteo* and *Falco peregrinus* may be legally shot in defence if they attack chickens.

Three species of birds are listed as endangered species by the IUCN Red Data Book. These are:- *Chondrohierax uncinatus murus,* Grenada hookbilled kite; *Leptitilia wellsi,* Grenada Dove; and *Empidonax euleri johnstone,* Euler's fly catcher.

There is one endemic species, the Grenada dove *Leptotila wellsi,* which is currently treated by ICBP (1987) as conspecific with the grey-fronted dove *L. rufaxilla.* There is an account of the species in King (1978-1979), who classes it as indeterminate. The Grenada dove is thought to be very rare and its range is limited to xerophytic scrublands in the southwestern coast of Grenada.

There are no estimates available of population size. The reasons for the rarity of this species are unclear: it is possible that the population has been low throughout this century, or that it has been reduced by competition with one or more of the other species of dove that occur in the same habitat (King 1978-1979).

The following species are endemic to the Lesser Antilles (distributions from ICBP (1987): Grenada flycatcher *Myiarchus nugator* (Grenada, Grenadines and St. Vincent); scaly-breasted thrasher *Margarops fuscus* (Saba, St. Eustatius and Barbuda south to Grenada and Barbados; possibly extinct on Grenada and Barbuda); Lesser Antillean bullfinch *Loxigilla noctis* (Virgin Islands, and Lesser Antilles from Anguilla and Saba south to Grenada and Barbados); Lesser Antillean tanager *Tangara cucullata* (St. Vincent and Grenada).

Information on seabirds is poor. Halewyn and Norton (1974) list the following three species as possible breeders: Audubon's shearwater *Puffinus 1. lherminieri,* laughing gull *Lams atricilla,* and roseate tern *Sterna dougallii.*

REGION WIDE ENDANGERED SPECIES FOUND IN GRENADA

- *Chelonia mydas,* green turtle (1,2)
- *Eretmochelys imbricata,* hawksbill turtle (1,2)

- *Dennochelys coriacea,* leatherback turtle (1,2)
- *Falco peregrinus tundrius,* tundra peregrine falcon (2)
- *Pallinueus sp,* spiney lobster.
- *Strombus gigas,* queen conch.

SOURCES

1. Lazell, 1980
2. IUCN Red Book

MAMMALIA - MARSUPIALIA

Marmosa robinsoni - Chapman's murine opossum, mouse opossum or manicou is strictly a nocturnal animal which uses its prehensile tail for climbing and transporting bedding material.

Didelphis marsupialis insularis - large opossum or manicou is a common omnivorous animal which may prey upon poultry and is hunted for its meat. This species may have been introduced by Amerindians while making journeys in their perogues (Groom, 1970).

EDENTATA

Dasypus novemcinctus hoplites. Nine banded armadillo or tatou. This species is confined to forested areas, and is under heavy pressure from hunting.

CHIROPTERA - Bats

There are eleven different species of bats, with feeding habits ranging from insects and fish to nectar and fruits. The vampire bat is absent.

RODENTIA

Dasyprocta liporina - agouti - This agouti is extinct on the Island due to overhunting and the aggressive mongoose. Hurricane "Janet" in 1955 may have given the final push to extinction. Naturalists of Grenada would like to see the agouti reintroduced (Beresford Wilcox, Pers. Comm.)

CARNIVORA

Herpestes auropunctatus - The burmese mongoose was introduced from Jamaica about 1870 to control rats in the cane belt. Now it is primarily destructive to poultry, wild ground nesting birds, and lizards. The mongoose is the only proven vector of paralytic rabies in Grenada. (Groom, 1970)

PRIMATES

Cercopithecus mona - The African mona monkey was introduced from West Africa during the slave trade period. It may be seen quite readily in Grand Etang and St. Catherine Upper Montane Forests.

They are very dangerous and destructive to the local fauna. The hurricane of 1955 reduced their numbers, but their populations have reached new proportions with the limited use of firearms for hunting during recent years.

ENDEMICISM

"Grenada is such a geologically recent volcanic Island, that it is remarkable it should have some five biological items peculiar to itself: A Dove *Leptotilla wellsi* regularly recorded, but rare, a sub species of snake, a weevil, the mountain cabbage palm *Oreodoxa oleracea* and perhaps one of the Grand Etang Ferns *Danaea spp."* (Groom 1970)

On March 26, 1928 Ordinance Cap: 245 -1934 Revision No. 29 of 1956 stated, "This Ordinance establishes the Grand Etang Forest Reserve as a Sanctuary for the

Wild Animals and Birds of the Colony, and to make special temporary provision for the protection of the agouti, armadillo, and certain snakes." The short title of the Ordinance may be cited as the "Wild Animals and Birds (Sanctuary) Ordinance." It essentially establishes the Grand Etang Forest Reserve as a sanctuary for wild animals and birds.

The Schedule (section 5 (2)) protects the following snakes:

Leptotyphlops margaritae - white headed worm snake
Corallus enydris - serpent - brown tree boa.
Mastigodryas bruesi - Booddaert's tree snake
Liophis melanotus - Shaw's racer
Clelia clelia - black cribo
Pseudoboa neuwiedi - Neuweid's moon snake

This act seems to have expired at the end of 1962, as a result, no protection will exist for wildlife until Cabinet approves the National Parks and Protected Areas Program.

Brief history of Grenada

The protected areas program includes cultural landmarks, entities which are sometimes managed by the Tourist Board, National Trust or Historical Society in other countries. Significant input will be received from these groups, but it was recommended that the National Parks Division manage these resources. The following brief history mentions how the artifacts and other cultural features portray the fascinating history of Grenada.

The migration of South American Indians from their homeland brought the first inhabitants to the Islands. There were two sets of Amerindians who reached the Island - the Arawaks and Caribs. The Caribs are believed to be fierce and warlike, while the Arawaks were peaceful and loving and highly artistic. It has been written that the Arawaks were harassed by the Caribs which hastened their disappearance. It is also believed that the Caribs made concubines of the Arawak women and killed the men. These people were primarily hunters and gatherers and therefore did not affect the natural vegetation. For over 100 years after the sighting of the Island by Christopher Columbus on his third voyage, the Carib Indians were left undisturbed. In 1609 a company of London merchants attempted to establish a settlement but were compelled to withdraw as a result of the hostility of the native Indians.

Interest in the Island developed by both the English and French in the early 17th century. However, it was not until 1638, that a frenchman named Du Poincy attempted to land. This again was unsuccessful and the natives managed to secure the island from further attempts at settlement for twelve years.

The French successfully settled the Island in 1650 despite the usual native hostility. While it was discovered that the Indians called the Island Camahogne, the English named it Conception.

One year later, the Caribs realized the danger they had exposed themselves to and revolted. By then the French had already established their settlement and called for reinforcement from the French Colony of Martinique. The Caribs retreated to a precipitous hill in the north of the Island where they sought refuge. After a great search, the French discovered their refuge and took them by surprise. Most of the Carib Indians leaped into the sea below committing suicide.

Few elements of Amerindian culture survive today. These include words of Amerindian origin, some pottery and other remains found at the museum and petroglyphs in the Mt. Rich area. The Leapers Hill and town of Sauteurs got its name from the tragic event that brought the Indian occupation to an end.

The early French settlers established plantations of indigo, cotton and tobacco. At the beginning of the eighteenth Century, indigo seems to have been the main crop. It is recorded that in 1700 there were fifty-two indigo plantations on the Island. In 1702 sugar cane was introduced from South America and cane cultivation gradually took over from indigo in the early 18th century. Sugar cane cultivation necessitated the introduction of cheap labour into the country and therefore, the slave trade was developed. Africans, East Indian indentures, Portuguese, Chinese and other European bondsmen were introduced to work the plantations for the French. Until the abolition of slavery in 1834, sugar cane was by far the most important crop cultivated on almost all low lying land in the country. Cocoa was introduced to the island in 1714.

In 1763 the British secured the Island by the Treaty of Versailles of Paris. Grenada was surrendered to the British at Fort Royal (Fort George). It is important to note that every military handover in Grenada's history was done at this Fort, and every time the island changed hands, its name was changed also. Even the March 13th, 1979 Revolution saw a change of name from Fort George to Fort Rupert. This was subsequently changed back to Fort George after the intervention of American forces in October 1983.

The French temporarily regained Grenada in 1779 during the American war of independence. Four years later, the Island was handed back to the British by the eighth Article of the Treaty of Versailles.

There was always discord among the British and French Colonists on the Island. This caused a major uprising by the French planters against the British Colonist in 1795. In 1789, the French Revolution broke out under the watchwords of Liberty, Equality and Fraternity. Victor Hughes was the agent of the Revolution in the Caribbean with Headquarters in Guadaloupe.

Julien Fedon, a mulatto of French origin who owned the Belvedere estate, which was then the largest estate in Grenada, was in total support of Victor Hughes. In 1795 confusion broke out between the French planters and British colonist. On the night of March 2nd the French took to "looting, fighting and even seizing British citizens". Fedon joined by slaves and "Free Coloured" took possession of all the Island except St. George's. The rebels killed forty eight (48) of the fifty two (52) British citizens on the Island. In 1796 the British managed to reinforce their contingents with officers from Trinidad. They eventually captured the final strong hold of the French, which was the Fedon's Camp located at one of the flat topped peaks in the central mountain range.

Fedon on way to camp

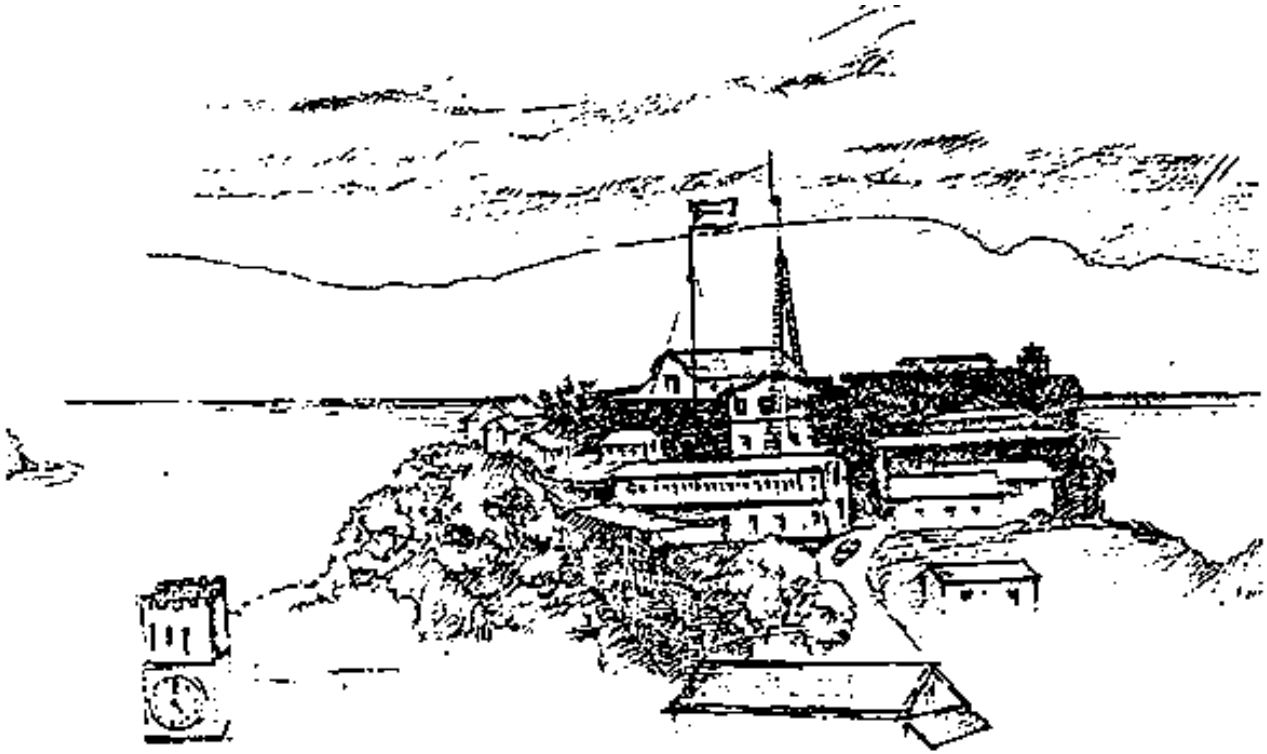
After emancipation the labourers were no longer willing to work as regularly on the estates and a severe economic depression followed. The planters also had to compete on the European market with the sugar still produced in the Spanish colonies by slave labour. An attempt was made to introduce indentured labour but that also was unsuccessful. Much of Grenada was deforested for conversion to sugar, and thereafter extensive deforestation continued in order to fuel the rum distilleries. Gradually, sugar production was replaced by cocoa which demanded less labour per acre than sugar. Cocoa at that time drew a good price on the European market. The emancipated slaves and indentured labourers took readily to these crops; a quantity of land could be easily had in the interior and the cultivation of cocoa offered an independent existence and reasonable profits for a minimum of labour. This lead to the clearing of a large part of the remaining upland natural rainforest.

Nutmeg was first introduced into Grenada in 1843, however, it took considerable time for the crop to become a significant export.

After many years of trial the crop became well established.

From the beginning of this Century, tree crops have been the predominant form of agriculture and are of considerable importance to the Island's economy. It was only after the 1955 hurricane that banana became an important crop.

Fort George built in 1706 by the French.



Fort George was built in 1706 by the French. More recently the Fort again became important in the history of Grenada when Maurice Bishop and part of his cabinet were assassinated by a split faction in the People's Revolutionary Government.

Carriacou and the Grenadines

Geologic history

The Grenadine Islands and Carriacou represent the exposed summits of peaks on a single narrow bank of submerged volcanic mountains. The Island of Grenada is separated from Carriacou by a channel 600 feet deep.

The Grenadine Islands came into existence in the late Oligocene period, sank or eroded away during the Pliocene and were completely submerged during the Pleistocene period. Since that time, a regional uplifting of the sea floor has raised the Islands above sea level (Howard, 1950).

The diversity of the geological formation of the Grenadines is fascinating. Bequia is characterized by pyroclastic rocks preponderant over massive. Some islands have red and white clays due to laterization and kaolinization of the volcanic andesites in situ. Other islands are weathered rugged volcanic rocks and agglomerates.

Carriacou, an Island of 34 square kilometers has been studied by geologists since the 19th century. The most recent studies have indicated fossiliferous limestone formation ranging in age from upper Eocene to Pleistocene.

The Island can be divided into two zones:

(i) The Fossiliferous limestone area which is mainly of the miocene age with outcroppings in the eastern part. This non-volcanic formation is characterized by continuous stratifications of calcareous, clastic and volcanic lithofacies; and

(ii) The volcanic area which covers about two thirds of the Island. This section consists of lava flows, lava domes and volcanoclastic products ranging in age from Miocene to the Pliocene (Briden *et al.*, 1979).

Climate

The climate of the Grenadines is a relatively uniform one characterized by a northeast breeze which prevails most of the year. The temperature averages about 80 degrees F. in the dry season and 74 degrees F. in the rainy season. Significantly less rain falls on the smaller Islands; from 50 - 70 inches per year. These drier conditions predominate because of their inability to cause condensation due to a lack of a high cordilliera. On Union Island for example, a high rainfall count of 62.24 inches was tabulated, and a low of 25.7 inches with a 13 year average of 37.67 inches.

Land-use history

The Islands had a deep fertile soil at the time they were settled, which was utilized first primarily for cotton, a short time for sugar cane and thereafter for cotton. Sugar cane was phased out with the abolition of slavery and with the decline of the world price of sugar.

Old windmills such as this one found near the Belair Cultural Landmark serve as monuments to the agricultural productivity of Carriacou in the 1800's and early 1900's.

Cotton is no longer an agricultural product, production having tapered over the last 40 years. As with any monoculture agriculture, insect infestation developed. The necessity of controlling the insect pests without insecticides led the farmers to rip out the annual crop and burn it thereby killing the insects and eliminating their food source. Even wild cotton was removed. The result was devastating as further soil erosion occurred at an accelerated rate.

Limes were also grown on Carriacou up until the turn of the century, but production per acre was less than the yields realized in Grenada. Lime production was

profitable until 1920 when many of the groves were abandoned.

This well, built to provide a constant source of water for livestock, can be seen in the Limlair-Thibaud Protected Seascape.

Coconuts were planted in the 1870's but were depleted in the late 1870's. Livestock were subsequently introduced on the smaller islands once soil fertility was depleted. Finally goats and black-bellied sheep were introduced and still provide improved breeding stock for Grenada. Sheep, cattle and goats are causing significant soil erosion resulting in decertification on the island. Compounding this problem is the "Let go season" where the animals are released to fend for themselves during the dry season. They promote rill and gully erosion which down cuts the subsoil and as a result water storage capability is reduced. Animals also reduce reforestation efforts and potential crop production. Although animals are very important to the economy, fencing and pasture establishment is needed. Some coconut plantations still exist which are in need of management and protection.

Natural vegetation

Beard's 1949 work, The Natural Vegetation of the Windward and Leeward Islands discusses "seasonal formations". When the evaporation from freshwater ponds and streams and the transpiration from plants exceeds the rainfall, a drought begins to occur. This is estimated to be at around 4 inches of rainfall per month (Charter, 1941). If the period of drought is short, the vegetation will be little affected, but longer droughts, as are characteristic during the dry season December through June, will adversely affect the diversity of flora. As a result, the smaller Islands are represented by a Dry Thorn Scrub - Cactus - Legume Association at its best developed stage. The plants have leaves during the rainy season, and with the exception of a few species, are leafless during the dry season, hence the plant association Dry Deciduous Seasonal Forest.

Areas deforested and left to "old field succession" generally come back in pure stands depending on adjacent seed source, relief, and soils. Vegetative tufts of Croton, *Cordia,* or *Leucaena* can be found, as can *Bauhinia ungula* and *Cuidosolus ureus* (Howard, 1950) (Beard, 1949). These forest type sub-climaxes are found primarily on the leeward side of the Islands.

On the windward side of the Islands, *Coccoloba uvifera, Hippomane manchinella* and *Cocos nucifera* are found on the beaches on the moist lowlands which descend to sea level. On the slopes which begin from the wave cut cliffs, the contorted, wind sheared and salt sprayed growth of *Randia aculeata, Tabebuia pallida, Coccoloba caribaea,* and various species of *Capparis* predominate. *Opuntia dilleiri* and *Agave caribaeicola* are found on the most extreme rocky steep cliffs. More inland the typical spiny *Acacia - Albizzia - Pithecellobium* Association may be identified.

Dominants in the open woodland are *Bursera simaruba, Brosimum alicastrum, Pisonia fragrans, Ficus lentiginosa,* in order of frequency.

Three epiphytic air plants are noted. These are *Aechmea lingulata, Tillandsia utriculata and Tillandsia flexuosa.* The latter two are in the pineapple family.

Two rare and unusual plants found on Carriacou are *Morisonia americana* or jumbie sapodilla and *Lemna perpusilla* which has been found growing on the surface of ponds.

Brief history of Carriacou*

* The following section is adapted from Howard, (1950)

Carriacou is the largest of the Grenadines in Grenada territory. It is seven miles long and three miles wide at the broadest point. The island is irregular in shape with a ridge running the length of it averaging 750 feet in height with the highest point, a hill at the northern end called High North, reaching 850 feet above sea level.

Carriacou with a population of 5,000 or more is the seat of Government for the Grenada Grenadines. The largest town on the island is Hillsborough.

Carriacou is composed mainly of subsistence agriculturalists who cultivate vegetables including sweet potatoes, pigeon peas, and corn. Tomatoes and lettuce are grown in very small quantities. Small amounts of peanuts are grown for export.

In the past century Carriacou produced limes as the principal crop. Today, sugar is no longer grown and the lime industry is intermittent. Throughout the island one finds ruins of old houses and windmill towers which were used in grinding cane. Some of these features will be protected as cultural landmarks.

Water is a chronic problem on Carriacou. According to the historic documents the land was once forested and sugar was grown at the lower levels. Irrigation channels were established in the late 1700's and used to direct rainwater from the hills for agriculture. In 1891, according to Dr. Nichols' diary, water was in such short supply that it was necessary to import water for human consumption from Grenada. In 1891 a few wells were sunk to obtain ground water. One on the grounds of the old Limlair Estate is a recommended cultural landmark. Today, most houses have their own water collection and storage system. Lack of water remains one of the chief problems limiting development on the island.

The middle of the island is a designated forest reserve under the supervision of the Forestry Department. A representative of the Forestry Department patrols the area to prevent the inhabitants of Carriacou from cutting wood and quarrying in the area.

The volcanic Mabouya Island off Carriacou has a dry thorn scrub vegetation with cactus and fragipani. It is part of a Protected Seascape.

The agriculture of a century ago covered practically all of the lands on Carriacou. Nichols reports cotton fields extending from the town of Hillsborough to the top of the ridge and continuous to the eastern coast and extending from one end of the island to the other. As a result, the intensive agricultural practices of over 200 years have left the island mostly deforested with eroded and infertile soils. Nevertheless, there are some commercial operations on Carriacou both in vegetables and fruits. The Forestry Department has initiated a Watershed Management Program.

The coast of Carriacou is largely coral or shoal formations and is wave-cut in the majority of places. Manchineel Bay and Carenage Bay near Harvey Vale have limited areas of beach, spectacular because they are of black sand formed from volcanic rock.

By contrast the beaches at Grand Anse on Hillsborough Bay are of white coral sands. While the limited black sand beaches support an *Avicennia* plant growth, those white beaches on the western side of the island are dominated by *Hippomane, Coccoloba uvifera* and *Erithallis fruticosa.* Some specimens of *Caesalpinia bonduc* scramble over the shrubs. *Crotalaria verrucosa* is a conspicuous blue-flowered herb in this beach association.


GRAND ETANG
FOREST CENTRE

Chapter IV - Analysis of the national park system

In order to determine the degree of representation of the Country's natural features, potential areas were identified and analyzed in the following ways:

- Representation of the geological formation composition and history and their significance to geomorphic and physiographic features in the area.

- Protection of native species of flora and fauna particularly those threatened with extinction.

- Representation and protection of ecosystems, through protection of watersheds and water courses. Maintain high standards of water quality and quantity,/protection of sites and objects of cultural, historical and archeological heritage.

Geologic representation in the protected areas

The antilles volcanic arc dates back to the Eocene (50M. years ago). The products of the earliest phase are mainly underwater and are technically deformed. The phase of deformation ends with the Miocene (25 M. years ago).

The vulcanism of the recent and active arc occurs after the new structural rearrangement of the area in the post Miocene times.

Grenada consists mainly of volcanic products and to a lesser degree, of sedimentary rocks. From the Miocene to Quaternary, volcanic activity has emitted a large quantity of products which vary both in chemical composition and in the way they were emitted. These result in domes, flows and a wide variety of pyroclastics related to eruptions with varying degrees of explosivity.

The Volcanic series visible on the island are underlain by a sedimentary formation, where that sedimentary "Basement" outcrops on the island is known as the Tufton Hall Formation. This is made up of sandstones, siltstones and calcareous shale in alteration. The Tufton Hall formation outcrop are mainly situated in the northwest part of the island. The only other area that is clearly visible is at the Annandale Falls, which is included within a Natural Landmark.

The Central Southern Part of the Island (Grand Etang Forest-Reserve, and National Park, South of the highway)

The main area within this zone is the Mount Sinai, Mount Lebanon axis. It has been found that volcanic activity was most intense during these periods.

(1) Middle Miocene (25M years ago) -characterized by Basic Magmas, Alkali Basalts and basic andesites. Few outcrops remain.

(2) Pliocene age - Characterized by lava flows, prismatic factoring and altered pyroclastic deposits (Morne Rouge Bay)

(3) Pleistocene age (1.7-1.4M years ago) -Activities of this period concerned the areas affected during the Middle Miocene period discussed above. This period's volcanic activity was characterized by mainly basic lava activity interspersed with major explosive activity shown by important pyroclastic deposits which are reworked.

The Volcanic Area of Mt. Granby - Grand Etang (Grand Etang National Park and northern part of Grand Etang highway) This area was affected by volcanic activity in the Pliocene and the Pleistocene. This well preserved morphology suggests that volcanic activity continued until the very recent Holocene period in the Grand Etang area. In this area is the eroded remains of Miocene vulcanite outcrops below Plio - Pleistocene products.

It is believed that Mount Granby, Mount Qua Qua and other intermediate peaks were separate centers of eruption which emitted lava at different times (Arcules 1973) and that volcanic activity began in the northern part near Mount Granby with the emission of basaltic lava which thereafter moved southward. Southward displacement would have brought the active centers close to Mount Qua Qua where both basaltic and andesite lavas are found.

The final element in this north - south migration of volcanic activity seems to be the craters located in the Grand Etang area. These are three craters one of them partially eroded all close together and a fourth at St. Margaret.

The Volcanic area of Mount St. Catherine (Mount St. Catherine National Park).

This volcanic edifice has a Pleistocene age and is characterized by a large crater, open on the southside with a diameter of about 1.2 KMS. Various domes have grown in the summit area there composition ranges from acid andesites to dacite and they constitute the main outcrops in the area.

According to Arculus (1973) the earliest activity was associated with the region in the vicinity of Plaisance and Malagon. Acidic lava flows ranging from andesite to dacites in composition were deposited on top of these early flows. Subsequently the center of activity moved southward probably near to the present crater of Mt. St. Catherine. The area to the northwest of this center is dominated by a thick sequence of andesitic and dacite lavas and pyroclastic flows forming St. Mark's mountain.

The climax of activity was probably the partial unfilling of the crater by the dome andesite.

Coastal Pleistocene Volcanic Cones (Levera and Archipelago, National Park, Lake Antoine, & Quarantine Point National Landmarks)

These recent emissions occur primarily in the Southwest and Northeast of the island and include the St. George's Harbour, Queens Park, the crater at Woodford estate and at Quarantine Point.

Lake Antoine has morphological characteristics very similar to the typical tuff-rings produced by hydromagmatic eruptions. The lava block from Lake Antoine gave an age of approximately 1.5 M years.

The two craters near the Levera Hill seem to have had very minor interaction between the magma and the sea.

This volcanic area is characterized by a large andesitic dome, which is Levera Hill 848 ft. above sea level and other smaller domes to the north west of the area. This is thought to have been formed about 7.1 M years ago during the upper Miocene period. The volcanic rocks of the Levera Hill area lie directly on the deformed Tufton Hall formation which outcrops at various points on the nearby coast.

Vegetation representation

One of the primordial concerns of a National Parks and Protected Areas program is the protection of species and assemblages of species referred to as ecosystems. Plant species have contributed significantly to medicines and remedies and it is important to protect representative areas of the different ecosystems in Grenada as they may harbour valuable economic species. Vegetative types can be analyzed with reference to both climate and edaphic (soils) conditions. Rainfall, altitude above sea level, and the actual height of mountain peaks will generally define vegetative associations. Soils will also cause differences in vegetative associations as will human influences relevant to past and present land-use.

As noted, most of the forests of Grenada and Carriacou were converted into agriculture over the last two centuries. The best representative examples of forest ecosystems which remain in an unaltered state or in a good state of recovery have been recommended for inclusion within the system. The groups, series, formations, and associations based on (Beard, 1949) are presented in Table III. Table IV indicates which areas harbour the best ecosystem of its type in the country. The High North, Grand Etang, and Levera National Parks favour positively and as a result are the first priorities for development.

Three ecological associations are poorly represented.

(1) The Rain Forest and Lower Montane Rainforest which are referred to as the *Dacryodes Licania* association. The first example of this is in the Grand Etang Forest Reserve in the vicinity of the 7 Sister falls. The inaccessibility of this area made it uneconomical to harvest the timber or convert to agriculture.

(2) The Deciduous Seasonal Formation was also largely converted to agricultural production over time. Today only small remnant forests remain, but some areas show signs of recurrence on abandoned agricultural estates.

(3) The Dry Coastal Belt is only fairly represented but is also recuperating on some of the peninsulas on the southern coast and on Levera Hill where the forests have been staging a comeback due to abandoned agricultural practices. As these forests become more mature approaching a climax state they should be revived for inclusion within the system.

The swamps, namely the mangrove and freshwater herbaceous ecosystems, are in a healthy state. Mangrove cutting for charcoal has caused a deterioration of the resource in Levera and North East Seascape but management actions to prohibit this activity have been initiated.

Wildlife representation

Wildlife is noted to play an increasing role in the economic and social development of the country. Two hunters groups consider hunting an important recreational activity as well as source of protein. Some local Creole dishes utilize wild meats which appeal to tourists and local people alike. The agouti *Dasyprocta liporina* is to be introduced into the wild. Liaison is occurring between Grenada and Trinidad and Tobago to provide a zoo and attempts will also be made to provide stock for the restoration of populations which have been depleted because of overhunting or habitat loss. An analysis has been made of the threatened and unique animal species (amphibian, reptile, bird, mammals, and fishes). The following Tables V through VIII indicate the species, status, habitat and principal units of the system where these species may be found.

Within this plan the following definition will apply to threatened species in Grenada and Carriacou:-

Endangered: taxa in danger of extinction and whose survival is unlikely if the casual factors continue operating.

Vulnerable: taxa believed likely to move into the endangered category in the near future if the causal factors continue operating.

Rare: taxa with small country populations that are not at present endangered or vulnerable, but are at risk.

Status uncertain: taxa that are suspected of belonging to one of the first three categories but for which insufficient information is currently available.

It should be noted in this section that although there has not been sufficient scientific study to determine exact ecological inter-dependencies and habitat requirements, an attempt has been made to assess habitat quality and animal species requirements. Having done this we can discern if specified wildlife species are able to find adequate habitat.

The protected areas program attempts to maintain examples of the representative habitats in a healthy state. This provides the aspiration that species can continue evolving in their environment and have a good chance of survival.

Cultural representation

The National Parks and Protected Areas system in relation to cultural landmarks should be concerned primarily with in situ conservation and interpretation of monuments, sites, and structures which are representative of the various aspects of human life during the course of country's history. Expressions of Grenada's culture including artifacts, arts, traditions and preservation of historic buildings will not be the object of systematic attention, but will naturally be introduced in relation to the specific sites and resources incorporated within the system as recommended by the Grenada National Trust.

It is also understood that, for practical reasons, the urban environments should not be included within the framework at this stage. The links between urban heritage preservation and the establishment of a national park system however are significant and should be strengthened whenever feasible.

Two broad themes will guide the definition of the framework:

"Time": The evolution of the country and the history of its people.

"Space": The relationship between people and their environment. This relates to the use and transformation of the environment to satisfy human needs and to support economic activities.

The first theme can be divided into four main periods, namely:

- The pre-colombian era.
- The pre-emancipation era (plantation system, sugar cane, slavery).
- The first emancipation era (diversification of pre-cultural production, establishment of peasantry, emancipation.)
- The contemporary period.

The second theme introduces:

- Human settlements (including architecture)
- Production systems (including land use, agricultural production, and processing techniques.) These include:
    * cane and sugar

* other export crops (coffee, nutmeg, cocoa, etc.) and
* fishing, boat building, and handicraft.

INVENTORY AND ANALYSIS OF CULTURAL LANDMARKS

Period	Culture	Landmark	Date	Reason for Protection	Other Factors
Pre-Columbian	Arawaks Caribs	Mt. Rich Amerindian Ruins*	Pre-1498	Unique Petroglyps	Beautiful River Setting
		Carib's Leap*	1651		
Colonial Period	French-British Military wars	Fort George* Fort Frederick* Fort Matthew Fort Adolphus Old Fort (Fort William Henry)	1706 1779	Outstanding Engineering accomplishment Treaty of Paris (1763) Versailles (1783)	1983 PRG Disturbance
Introduction of coffee, cocoa		Estates in general	1714		
Rum Distillery and French sugar manufacturing	British African	River Antoine Rum Distillery* Westerhall	1785	Oldest intact Rum Distillery and cane processing system in the Caribbean.	Fabulous setting
	East Indian	Rum Distillery* Belair (Carriacou)*	1800's		
Slavery	African East Indian	Hermitage Slave Pen	Early 1800's		
Emancipation	African	Fedon's Camp*	1795	Civil & Political rights for Free coloureds	
	East Indian		1832		
			1838		
			1877	Slaves freed	
				Grenada becomes a Crown Colony	
Post Sugar cane British Plantation System French (spices, coffee, African nutmeg, cocoa, banana)	East Indian	Montreuil Estate	1857	Productive Estate Cocoa replaces sugar as main crop	Beautiful setting
Estates - Sugar cane, cocoa, nutmeg, production & Caribbean Style Architecture	British French African East Indian	The Tower* Samaritan Estate House Morne Fendue House Woodford Estate House Beausejour Estate House Douglaston Estate Mount Rich Estate Hermitage Estate House Bocage Estate House Grand Bacolet Estate House Mt. Home (Paraclette) Estate House Bolonge	1916		
Contemporary Indigenous	Grenadian	Marquis Village*	19th century + 20th century	Handicraft from wild pine	
Technology representing historical methods					
	Grenadian	Soubise*	19th century + 20th century	Hand fashioned boats	
	Grenadian	Grenada Handicraft Center - Tanteen	19th & 20th century	Pottery	
		Grencraft - St. George's		Basket weaving Handicraft furniture	

* Recommended for protection within this plan.

TABLE II - GEOLOGIC FEATURES BY PERIOD AND THEIR REPRESENTATION IN THE NATIONAL PARKS SYSTEM

GEOLOGIC PERIOD	FEATURE	SIGNIFICANCE	LOCATION	REPRESENTATION WITHIN PARK SYSTEM
Eocene to Lower Miocene	folded and faulted sedimentary formation with some volcanic minerals and tufaceous horizons (Tufton Hall Formation)	Oldest known rocks in Grenada. Deposited before vulcanism and then later deformed	Levera Bay, just north of beach. Also, southern Annandale Fall	Levera and Archipelago N.P. Annandale Falls N.L.
	Andesite domes Mt. Rodney, & Mt. Alexander	Oldest known Volcanic deposits in Grenada	Grenada, West of Sauteurs	
Upper Miocene	Andesite domes of Levera Hill and Levera (Sugar Loaf) Island	Good example of dome features, also shows intrusion through Tufton Hall Formation	Levera Bay	Levera and Archipelago N.P.

	Basalt flows of Southeast Mountain	Eruptive center for much of SE Grenada; also displays intense weathering of volcanic products	Northern and Northeastern ridges of Southeast Mountain	Grand Etang F.R.
	Andesite dome of Mt. Lebanon	Eruptive center; displays a contrast in rock composition from nearby Southeast Mountain	Mt. Lebanon	Grand Etang F.R.
	Andesite dome of Fedon's Camp	Locus of several eruptive centers which display variable rock compositions	Fedon's Camp	Grand Etang N.P.
Pliocene	Scoria and ash deposits	Example of Pyroclastic fall rock type	Quarantine Point	Quarantine Point N.L.
	Mt. St. Catherine andesite lavas, mudflows, pyroclastic flows and hot springs. Also, crater morphology and crater infilling by dome andesite	Youngest major eruptive center and highest point on Island. Displays a variety of rock types and geological processes	Mt. St. Catherine	Mt. St. Catherine N.P.
Pleistocene	Mt. Alexander Limestones exposed 100 m above sea level	One of only a few limestone formations in Grenada; also evidence for geological uplift since pleistocene	Mt. Alexander	
	Scoria and ash deposits, with some volcanic bombs, High Cliff Point	Excellent example of ash and scoria deposition. Also, volcanic bombs are present	High Cliff Point	Northern Seascape P.S
	Lake Antoine explosion craters (tuff ring)	Well-preserved example of an explosion crater and associated deposits	Lake Antoine	Lake Antoine
Pleistocene	Grand Etang explosion crater	Well-preserved examples of explosion Craters in the Island's interior	Grand Etang	Grand Etang N.P.
	Hot Springs and Boiling Springs	Indicates heat flow from depth	River Salle and Mt. St. Catherine area	River Salle N.L. Mt. St. Catherine N.P.
Holocene (Recent)	Rea Coastline and associated wetlands	Indicates subsidence of the Southeast coastline	Southeast coastline	Southern Seascape P.S. La Sagesse P.S.
Various ages	Reworked (fluvially deposited) volcanic rocks	Evidence of ancient erosion and deposition of volcanic products	Marquis Island and mainland shore	Marquis Island N.L.

Note: The number of features presented for each geological period is not any indication of the amount of volcanic activity for that period. Features were chosen on the basis of significance, state of preservation, and their occurrence within the National Parks System.

TABLE III - EVALUATION OF THE VEGETATION OF GRENADA AND CARRIACOU BY REPRESENTATION IN THE NATIONAL PARK SYSTEM

A. GRENADA (Beard, 1949)

VEGETATION TYPES	ASSESSMENT	UNITS OF THE SYSTEM PROVIDING PRINCIPAL REPRESENTATION	QUANTITY	QUALITY
Climatic				
1. Rain Forest and Lower Montane Rain Forest *Dacryodes-Licania* association	Most of this faciation has been exploited, only small sectors remain in a Virgin state and are presently in the Grand Etang Forest Reserve & between Mt. Qua Qua & Fedon's Camp	Grand Etang	Not Adequate	Fair
2. Montane Thicket *Micropholis chrysophylloides* *Licania ternatensis* *Euterpe globosa* *Dacrydes excelsa* *Richeria grandis*	Well represented around all peaks over 2000 feet.	Grand Etang Mt. St. Catherine	Adequate	Excellent
3. Elfin woodland *Cyathea,* *Heliconia bihai,* *Euterpe globosa* *Charianthus purpureus* *Weigeltia antillana*	Confined to summits of peaks of Grand Etang and Mt. St. Catherine	Grand Etang Mt. St. Catherine	Adequate	Excellent
4. Deciduous Seasonal Formation (Middle Belt). White Cedar Mahogany *Swietenia mahogoni* *Tabebuia pallida* *Guettarda scabra*	Minute areas still remain, this area is poorly represented	Marquis River N.L.	Not Adequate	Fair

Dry Coastal Belt. Naked Indian - Hog Plum. Faciation *Bursera simaruba* *Albizzia caribaea* *Spondias mombin*	Very small areas remain, representation of this faciation is fair	Canoe Bay La Sagesse Lake Antoine	Not Adequate	Good
5. Dry Evergreen Formation Littoral Woodland Seaside grape Machineel association *Conocarpus erectus* *Tabebuia pallida* *Coccolobia uvifera* *Hippomane mancinella*	Relatively well represented, but most coastal areas are being exploited for charcoal or decimated by goat grazing	Northern Seascape La Sagesse Canoe Bay Levera Hog Island Calivigny Southern Seascape	Adequate	Excellent
Edaphic				
6. Herbaceous Swamp Papyrus Bog Association	Two small Caldera Lakes	Lake Antoine Grand Etang Lake	Adequate	Good
Mangrove Woodland *Rhizophora* *Avicennia* *Laguncularia* *Conocarpus*	Exploited all over for charcoal	Levera Northern Seascape Southern Seascape Hog Island	Adequate	Good

B. CARRIACOU (Howard, 1950)

VEGETATION TYPES	ASSESSMENT	UNITS OF THE SYSTEM PROVIDING PRINCIPAL REPRESENTATION	QUANTITY	QUALITY
Climatic				
1. Deciduous Seasonal Formation (Dry Woodland) *Bursera simaruba* *Brosium alicastrum* *Pisonia fragrans* *Ficus lentiginosa* *Lonchocarpus sp.* *Swietenia mohogani*	Found only in the North and the Forest Reserves. This association badly affected by overgrazing	High North Forest Reserve	Adequate	Good
Dry Thorn-Cactus Scrub *Opuntia dillenii* *Randia sp.* *Piscidia sp.*	Badly over exploited by goat grazing	High North Limlair-Thiboud Saline/White Islands Sabazan	Adequate	Good
Edaphic				
2. Mangrove Woodland	Well represented primarily because the mangroves are not cropped for charcoal	High North Lauriston-Mabouya Tyrrel Bay	Adequate	Excellent

TABLE IV - PRIORITY AREAS FOR PROTECTION OF REPRESENTATIVE SAMPLES OF GRENADA ECOSYSTEMS

*	Large Area
o	Medium to small area
x	Best in Country

Parks are listed in order from most diverse to lease diverse (excluding Cultural Landmarks & Multiple Use)	LITTORAL WOODLAND	CACTUS SCRUB	DRY WOODLAND	MOIST FOREST	RAIN FOREST	CLOUD FOREST	"ELFIN WOODLAND"	RIVERINE WOODLAND	FRESHWATER HERBACIOUS SWAMP	MANGROVE - MUDFLATS	ESTUARY	SALT POND	SEAGRASS BED	CORAL REEF	SMALL ISLAND ECOSYSTEM	OBSERVATIONS
HIGH NORTH	*	*	x			o				x	o	*	*	*		Highest Peak in Carriacou
GRAND ETANG				x	x	x	x	x	*							High Tourism/Scenic Value
LEVERA	*	x	*	*				*		*	*	*	*	*	x	High Tourism/Scenic Value
SALINE ISLAND/WHITE ISLAND	*	*	*							*		x	*	x	*	Excellent nesting habitat-birds and Iguanas

MT. ST. CATHERINE					*	*	*									Highest peak in Grenada
NORTHERN SEASCAPE	x	*	*					*		*	*	*	*	*		Finfish Production
LAURISTON-MABOUYA SANDY ISLE	*	*	o							*			o	*	*	High Tourism/Scenic Value
TYRREL BAY	o	o						o		*	*	o	o	o		Breeding & nesting habitat. Finfish production
HOG ISLAND	*	*	*							o		o	*	*	*	High Tourism/Scenic Value
LA SAGESSE	*	*	*					*		*	*	*	x	*		Best Salt Pond in Grenada
SOUTHERN SEASCAPE	*							*		*	*		*	*		Important for finfish production Product Estuary
MOLINERE REEF	*	*											o	*		Finest Reefs in Grenada
LA BAYE ROCK		o											*	*	*	Breeding & Nesting habitat
LIMLAIR-THIBOUD	*	*						o			o		*	*		High Cultural value
CALIVIGNY ISLAND	*									o		o	*	*	*	High Tourism/Scenic Value
LAKE ANTOINE			*						x							Unique Ecosystem
SABAZAN	o	o											o	o		High Cultural value
MARQUIS ISLAND	o	*											*	*	*	Area of Geologic Interest
ANNANDALE FALLS				o				*								High Recreation Potential
MARQUIS RIVER				o				*								High Recreation Potential
CONCORD FALLS				o				*								High Recreation Potential
QUARANTINE POINT	o	o														High Recreation Potential
RIVER SALLEE BOILING SPRINGS								*								Area of Geologic Interest

TABLE V - THREATENED AMPHIBIAN SPECIES AND THEIR PROTECTION IN THE NATIONAL PARK SYSTEM

SPECIES	STATUS	SOME HABITAT REQUIREMENTS	PRINCIPAL UNITS OF THE SYSTEM PROVIDING HABITAT
Giant toad (*Bufo marinus*)	Rare	Somewhat common in forest areas	Grand Etang N.P. Mt. St. Catherine N.P. Forest Reserves Multiple use areas
Piping frog (*Eleutherodactylus johnstonei*)	Status Uncertain	Forested areas	Grand Etang N.P. Mt. St. Catherine N.P. Forest Reserves Multiple use areas
Highland piping frog (*Eleutherodactylus urichi*)	Status Uncertain	Confined to virgin forests of the Grand Etang area	Grand Etang N.P.
Giant woodland frog (*Leptodactylus fallax*)	Status Uncertain	Forested Areas	Grand Etang N.P.

TABLE VI - THREATENED REPTILE SPECIES AND THEIR PROTECTION IN THE NATIONAL PARK SYSTEM

SPECIES	STATUS	SOME HABITAT REQUIREMENTS	PRINCIPAL UNITS OF THE SYSTEM PROVIDING HABITAT
SNAKES			
(Grenada has no venomous snakes)			

White headed worm snake (*Leptotypholops margaritae*)	Status Uncertain	Forested Areas	Levera N.P. High North N.P
The Tree boa or (*Corallus* (*enydris cookii*)	Status Uncertain	Forested, normally dry areas	Levera N.P. High North N.P.
Boddaert's Tree Snake (*Mastigodryas bruesi*)	Rare	Forested, normally dry areas grassland and open forest	Hog Island N.L. Levera N.P. High North N.P.
(*Clelia clelia*)	Status Uncertain	Wet forested areas	Grand Etang N.P. Mt. St. Catherine
Neuweid's moon snake (*Pseudoboa neuwiedi*)	Endangered Possibly Extinct	Forested areas	Grand Etang N.P. Mt. St. Catherine
Shaw's Racer (*Liophis melanotus*)	Endangered Possibly Extinct	Wet forested areas	Grand Etang N.P. Mt. St. Catherine
(Typhlops tasymicris)	Rare, Known only from the St. David's Parish	Moist Forested area	Levera N.P.
LIZARDS*			
Crested anole or tree lizard (*Anolis richardi*)	Status Uncertain	Forested areas	High North N.P. Levera N.P.
(*Iguana iguana*)	Threatened Possible sub-species	Dry thorn scrub	Hog Island N.L. Levera N.P. Southern Seascape P.S White Island/Saline Island P.S.
Garman ground lizard (*Ameiva tobagana*)	Status Uncertain	Forested areas	Northern Seascape Limlair - Thiboud Levera N.P.
Alien's Ground lizard (*Bachia heteropus alleni*)	Status Uncertain	Lowland dry scrub forest	Northern Seascape P.S Levera N.P. High North N.P.
South Antillean Slippery back lizard (*Mabuya mabouya*)	Status Uncertain	Lowland dry scrub forest	Northern Seascape P.S Levera N.P. High North N.P.

* Some lizards are in danger of extinction from the devastation of the mongoose. (Groom 1970)

THREATENED REPTILE SPECIES AND THEIR PROTECTION IN THE NATIONAL PARK SYSTEM

SPECIES	STATUS	SOME HABITAT REQUIREMENTS	PRINCIPAL UNITS OF THE SYSTEM PROVIDING HABITAT
SEA TURTLES* AND OTHERS			
Green turtle (*Chelonia mydas*)	Endangered	Nesting in small sheltered bays, feeds near eel grass beds	Northern Seascape P.S. Levera N.P. La Sagesse P.S High North N.P. White/Saline Islands P.S.
Hawksbill turtle (*Eretmochelys imbricata*)	Endangered	Nesting in small sheltered bays	Northern Seascape P.S. Levera N.P. La Sagesse P.S High North N.P. White/Saline Islands P.S.
Leatherback (*Dermochelys coriacea*)	Endangered	Nesting on open beaches with strong surf	Northern Seascape P.S. Levera N.P. La Sagesse P.S High North N.P. White/Saline Islands P.S.
Loggerhead turtle (*Caretta caretta*)	Endangered	Nesting in small sheltered bays	Northern Seascape P.S. Levera N.P. La Sagesse P.S High North N.P. White/Saline Islands P.S.
Ridley or Kemp's (*Lepidochelys olivacea*)	Endangered	Nesting in small sheltered bays	Northern Seascape P.S. Levera N.P. La Sagesse P.S High North N.P. White/Saline Islands P.S.

Morocoy tortoise (*Geochelone carbonaria*)	Threatened possibly extinct in the wild in Grenada (Groom, 1970)	Forested Area Small Islands	Grand Etang N.P. High North N.P. Saline/White Islands P.S.

* Most Sea Turtles are endangered because they are hunted for their meat and shells, and because their habitat for nesting, the beaches, are becoming developed. The five potential beach sites which provide suitable habitat for the sea turtles are mentioned but there is need for added research.

TABLE VII THREATENED BIRD SPECIES AND THEIR PROTECTION IN THE NATIONAL PARK SYSTEM

SPECIES	STATUS	HABITAT	PRINCIPAL UNITS OF THE SYSTEM PROVIDING HABITAT
Audubon's shearwater (*Puffinus iherminieri*)	Vulnerable	Remote area; with coastal cliffs	Saline Island/White Island Northern Seascape High North
Bat falcon (*Falco rufigularis*)	Vulnerable	Montane rain forest	Grand Etang
Black skimmer (*Rynchops nigra*)	Vulnerable	Sea Coast	Saline Island/White Island Northern Seascape
Black-crowned night-heron (*Nycticorax nycticorax*)	Vulnerable	Mangrove swamp	High North Mabouya-Sandy Isle Levera
Black tern (*Childonias niger*)	Vulnerable	Sea Coast	Northern Seascape
Blue-ground dove (*Claravis pretiosa*)	Vulnerable	Montane rain forest and tropical deciduous forest	Grand Etang
Blue-hooded euphonia (*Euphonia musica*)	Endangered	Montane rain forest	Grand Etang
Blue tailed emerald humming bird (*Chlorostilbon mellisugus*)	Endangered	Tropical forest	Levera
Bridled-tern (*Sterna anaethetus*)	Vulnerable	Remote areas with coastal cliffs	High North Marquis Island
Broad-winged hawk (*Buteo platypterus*)	Endangered	Tropical rain and lower montane forest	Mt. St. Catherine
Brown booby (*Sula leucogaster*)	Vulnerable	Remote areas with cliffs, crevices and sparse vegetation	La Baye Rock Saline Island/White Island
Brown-crested flycatcher (*Myiarchus tyrannulus*)	Vulnerable	Semi-deciduous secondary forest	La Sagesse High North
Brown noddy (*Anous stolidus*)	Vulnerable	Remote areas with steep cliffs, crevices and sparse vegetation	La Baye Rock
Brown pelican (*Pelecanus occidentalis*)	Vulnerable	Isolated areas with steep cliffs, crevices and sparse vegetation	Saline Island/White Island
Caribbean martin (*Progne dominicensis*)	Vulnerable	Remote areas with steep coastal cliffs	Northern Seascape
Common stilt (*Himantopus himantopus*)	Vulnerable	Mangrove swamp	Levera
Common snipe (Breeding) (*Gallinago gallinago*)	Endangered	Marsh and forest	Levera
Everglade kite (*Rostrhamus sociabilis*)	Endangered	Herbaceous swamp	Levera Lake Antoine
Fulvous tree-duck (*Dendrocygna bicolor*)	Endangered	Mangrove and herbaceous swamp	Levera Lake Antoine
Grenada flycatcher (*Myiarchus nugator*)	Endemic Vulnerable	Dry Thorn scrub	White/Saline Levera
Grenada dove (*Leptotilia wellsi*)	Endemic Endangered	Xerophytic scrublands	Canoe bay
Garnet throated hummingbird (*Evlampis jugularis*)	Vulnerable	Forest	Grand Etang
Gray kingbird (*Tyrannus dominicensis*)	Vulnerable	Herbaceous swamp	Grand Etang Lake Antoine
Great egret (Breeding) (*Casmerodius albus*)	Endangered	Mangrove swamp	Tyrrel Bay
Green heron (*Butorides virescens*)	Vulnerable	Sea-coast and mangrove swamp	High North
Large-billed seed-finch (*Dryzoborus crassirostris*)	Endangered	Herbaceous swamp	Lake Antoine
Laughing gull (*Larus atricilla*)	Vulnerable	Remote island with steep coastal areas and cliffs	La Baye Rock Saline Is./White Island
Least tern (*Sterna albifrons*)	Vulnerable	Sea coast	Northern Seascape
Lesser Antillean Bullfinch (*Loxigilla noctis*)	Vulnerable	Sea Coast	High North
Lesser antillean tanager (*Tangara cucullata*)	Vulnerable	Sea Coastal Mangrove swamp	White/Saline High North Levera
Lesser elaenia (*Elaenia chiriguensis*)	Endangered	Marsh and forest	Southern Seascape
Lesser seed-finch (*Oryzoborus angolensis*)	Endangered	Herbaceous swamp and marsh forest palm marsh and deciduous forest	High North Levera
Lesser swallow-tailed swift (*Panyptila cayennensis*)	Vulnerable	Montane rain forest	Grand Etang

Limpkin (*Aramus guarauna*)	Endangered	Herbaceous swamp	Lake Antoine
Little blue heron (*Florida caerulea*)	Vulnerable	Sea coast and mangrove swamp	Southern Seascape
Magnificent frigate-bird (*Fregata magnificens*)	Vulnerable	Isolated areas with steep cliffs, crevices and sparse vegetation	La Baye Rock Marquis Island
Mangrove cuckoo (*Coccyzus minor*)	Vulnerable	Mangrove swamp	Levera High North
Masked duck (*Oxyura dominical*)	Endangered	Mangrove swamp	Levera La Sagesse
Plain-breasted ground-dove (*Columbina minuta*)	Vulnerable	Marsh and forest	Northern Seascape
Red-billed tropic bird (*Phaethon aethereus*)	Vulnerable	Isolated areas with coastal cliffs	La Baye Rock
Roseate tern (*Sterna dougallii*)	Vulnerable	Remote island with coastal cliffs	Saline/White Island
Royal tern (*Sterna maxima*)	Vulnerable	Isolated area with steep cliffs, crevices and sparse vegetation	Hog Island Calivigny Island
Ruddy quail-dove (*Geotrygon montana*)	Vulnerable	Montaine rain forest	Mt. St. Catherine
Sandwich tern (*Sterna sandvicensis*)	Vulnerable	Remote areas with steep cliffs, crevices and sparse vegetation	Southern Seascape
Scaley breasted thrasher (*Margarops fuscas*)	Endangered Possibly Extinct	Dry thorn scrub	White/Saline High North
Scarlet ibis (*Eudocimus ruber*)	Endangered Possibly Extinct	Mangrove swamp	Levera
Snowy egret (*Egretta thula*)	Vulnerable	Sea coast and mangrove swamp	Southern Seascape
Sooty tern (*Sterna fuscata*)	Vulnerable	Remote areas with steep cliffs, crevices and sparse vegetation	Northern Seascape
Spotted rail (*Rallus maculatus*)	Vulnerable	Mangrove swamp	Tyrrel Bay High North Levera
Swallow-tailed Kite (*Elanoides forficatus*)	Endangered	Montane rain forest	Mt. St. Catherine
White-cheeked pintail (*Anas bahamensis*)	Vulnerable	Mangrove forest and sea-coast	High North Levera
White-necked thrush (*Turdus albicollis*)	Vulnerable	Tropical forest	High North
Yellow-billed tern (*Sterna superciliaris*)	Vulnerable	Sea coast	Northern Seascape

TABLE VIII - THREATENED MAMMAL SPECIES AND THEIR PROTECTION IN THE NATIONAL PARK SYSTEM

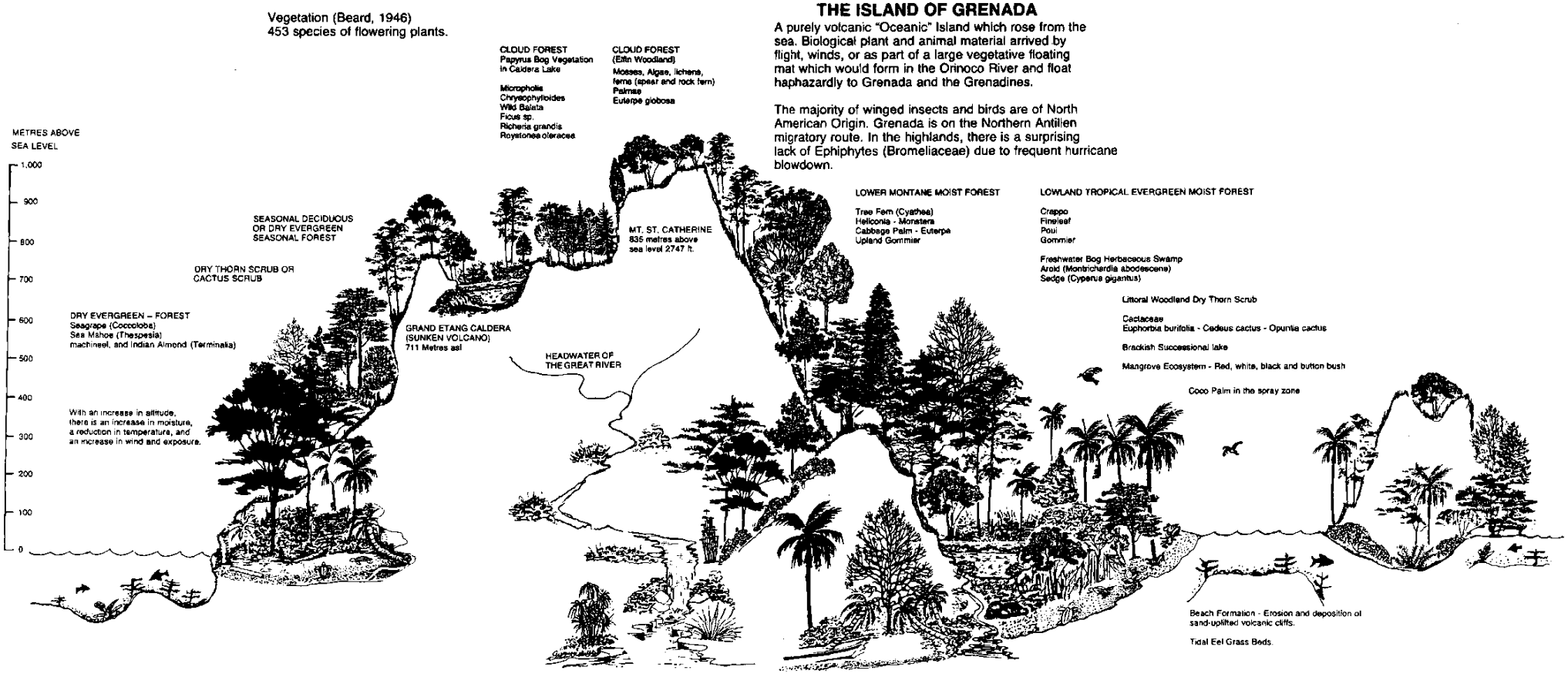
SPECIES	STATUS	HABITAT	PRINCIPAL UNITS OF THE SYSTEM PROVIDING HABITAT
Nine-banded armadillo (tatou) (*Dasypus novemcinctus novemcinctus*)	Rare	Forested as well as areas of mixed vegetation	Grand Etang N.P. Mt. St. Catherine N.P. Multiple use areas
Lesser Chapman's murine opposum (*Marmosa fuscata cam*)	Vulnerable	Forested, normally dry areas	Levera N.P.
Greater Chapman's murine opposum (*Marmosa robinsoni chapmani*)	Rare	Forested areas	Grand Etang N.P. Mt. St. Catherine N.P. Multiple use areas
Agouti (*Dasyprocta leporina*)	Endangered Possibly Extinct	Forested areas	Grand Etang N.P. Mt. St. Catherine N.P.

FISH FAUNA	DISTRIBUTION	PRINCIPAL UNITS OF THE SYSTEM PROVIDING HABITAT
Freshwater Fish		
Antillean fish fauna dominated by gobies, mountain mullets, cling fish and several sea run species	Endangered due to sedimentation and pollution in the river systems from inappropriate land-use practices on steep slopes	Grand Etang N.P. Estuaries of Northern P.S. Southern P.S.
Tete-chien (*Syn bronchus marmoratus*)	Rare	Northern P.S. Southern P.S.
Go bird fish (*Cicydium phimieri*)	Rare	Northern P.S. Southern P.S.

Schematic Elevation
THE ISLAND OF GRENADA

A purely volcanic "Oceanic" Island which rose from the sea. Biological plant and animal material arrived by flight, winds, or as part of a large vegetative floating mat which would form in the Orinoco River and float haphazardly to Grenada and the Grenadines.

The majority of winged insects and birds are of North American Origin. Grenada is on the Northern Antillen migratory route. In the highlands, there is a surprising lack of Ephiphytes (Bromeliaceae) due to frequent hurricane blowdown.



Chapter V - The units of the national park system

The National Park System's Plan envisages the creation of units in both Grenada and Carriacou. A National Parks program is necessary to carry out the Government of Grenada policy and objectives for the protection and use of the outstanding natural heritage resources of the Country.

The following section provides a summary of each area within the system, gives its significance, the principal management objectives and a synopsis of the initial management activities that will be required for the area.

Grenada

NATIONAL PARKS AND PROTECTED AREAS (Grenada) - GOVERNMENT OF GRENADA/OAS PROJECT THE ESTABLISHMENT AND MANAGEMENT OF A SYSTEM OF NATIONAL PARKS AND PROTECTED AREAS

National parks

(i) GRAND ETANG

Location: In the South-centre of Grenada North-east of the town of St. George's.

Summary Description: Located within the Central Mountain Range in the Southern half of the Island. The unit extends from the North-west to the South-east, encompassing the several mountain peaks which rise to over 2000 feet. Included are the peaks of Mount Grandby, Fedon's Camp and Mount Qua Qua.

Several of these contain old crater basins one of which is occupied by a large crater lake - Grand Etang, 1740 feet above sea level. The craters represent different centers of volcanic activities between the Miocene and Pleistocene geological periods.

The vegetation cover is characterized by Montane and Elfin forest on the steeper slopes throughout the higher region. There the trees are smaller at lower altitudes and are more thickly covered with epiphytes such as ferns and mosses. On exposed ridges and high peaks amidst the drifting clouds the densely growing trees are stunted and twisted into strange shapes, hence the name "Elfin Woodland".

This rugged isolated area provides habitat for many species of birds, mammals and reptiles that are endangered through excessive hunting, trapping, or habitat loss.

The land capability survey indicates that most of that area has greater than the 30 percent slope or falls into the "E" slope category and is therefore unsuitable for agricultural use.

The area is also of historic importance because the summit, referred to as Fedon's Camp, was the center of the Fedon's rebellion against the British after the Island was restored to Great Britain by the Treaty of Versailles in 1783.

Visitors to the Grand Etang Lake follow the self-guiding environmental education trail which indicates points of interest.

Significance of Area: The south central mountains represent one of the most outstanding natural forest areas on the Island. It provides excellent habitat for the endangered species on the Island including the nine banded armadillo, and wholly opossum. The agouti, thought to be extinct is to be re-introduced into the area in 1987. The Grand Etang mountain area is important because it is the major catchment area for the domestic water supply of the Southern part of the Island including St. George's. It is also an important scientific, educational and recreational area in close proximity to the capital and major tourist development.

Participants of the first Environment Education Workshop held in the Grand Etang Forest Centre drew up an interpretive plan for the area.

Management Objectives: To protect the natural forest ecosystem in an undisturbed condition and provide habitat for fauna particularly those threatened with extinction. Also to provide opportunities for environmental education, research and low density recreation.

Activities: Demarcation of Park's boundaries, continuation of the upgrading of Grand Etang's Interpretation Center and nature trails. Develop a management programme for the national park.

(ii) LEVERA AND ARCHIPELAGO:

Location: The North-eastern end of the Island including the Levera pond and three Islands to the North-east.

Summary Description: Included within the Levera Archipelago National Park are two conical shaped hills, one on the mainland known as Levera Hill, and the other forming an Island called "Sugar Loaf" or Levera Island. Between these two peaks is a depression occupied by twenty three (23) acres of water known as the Levera Pond. This is surrounded by red and white mangroves and has an outlet to the sea.

Also included within this unit are Green and Sandy Islands and the marine area between these and the mainland.

The flora includes one of the largest areas of mangrove swamp in the Country. This mangrove ecosystem is highly productive and probably the most important habitat for many important aquatic species as well as other species of birds including the scarlet ibis. This mangrove swamp is the northern most extension of the scarlet ibis.

Hundreds of visitors travel to Levera National Park every weekend for swimming and hiking.

Sand mining on unauthorized beaches causes accelerated erosion of the coastline and threatens the long term appropriate use of these resources.

This unit is the only representative area of the coastal type vegetation developed in areas of a marked dry season and constant saline air. Coconut palm, cactus, and woody scrub growth occupy the drier upland areas adjacent to the mangrove swamp. The area provides habitat for many species of indigenous wild life including the iguana and land crabs.

The coastal area is reputed to be the most scenic and spectacular in the Country. The many white sand beaches are important hatching ground for turtles while the marine areas are famous for their coral reefs and sea grass beds that provide food and shelter for lobsters and many beautiful reef fishes.

The land capability study indicates that the area is marginal for agricultural purposes since it has very shallow saline soil and is very dry for almost nine months of the year.

Significance of Area: The Levera pond and extensive mangrove swamp represents the most outstanding example of the mangrove swamp ecosystem on the Island of Grenada. It provides the only habitat where a large variety of birds and aquatic life can be observed. It is the only roosting area in Grenada for the scarlet ibis.

The area forms an interesting example of the land/water interface. It provides nutrients for finfish and shellfish important to the fishing industry and provides an area of floodwaters storage.

It is a relatively isolated area that will be in great demand for the development of tourism accommodations. Levera is therefore an important recreation and education area that is of aesthetic and scientific value.

Management Objectives: To protect the mangrove ecosystem and to provide opportunities for environmental education and interpretation. To protect this unique natural environment, off-shore islands and marine resources while allowing the development of appropriate recreational activities.

Activities: Acquisition of land and islands by the State for the benefit of the present and future generations. Preparation of management and development plan in conjunction with the villagers who presently use the area.

(iii) MOUNT ST. CATHERINE

Location: Northern center of the Island, east of the towns of Gouyave and Victoria and west of the old Pearls airstrip.

Summary Description: Mount Saint Catherine at 2,756 feet above sea level is the highest mountain peak in the Country. It is a large volcanic mountain formed during the pleistocene glacial epoch and has a large open crater on the south side. Many peaks and ridges surround it forming the north central mountain range, which are out cropped by acid andesites and dacites.

The vegetation within this area is virtually undisturbed by hurricanes. Elfin and Montane forest are dominated by *Micropholis chrysophylloides, Licania ternatensis, Euterpe globosa* and *Dacryodes excelsa.*

The area provides habitat for many species of indigenous wildlife. This is the only area within the country that is not dissected by roads.

Above the 1600 feet contour line which demarcates the park boundary, the land is mostly covered by natural or partially disturbed forest. The area is steep, rugged and very difficult to access for agricultural purposes although the area is used for hunting and recreation. Land capability studies recommend that with the exception of a few small patches of gentle slopes the area should remain under indigenous forest cover. Over 90% of the National Park falls into Land use category Vie, and is therefore unsuitable for cultivation.

Significance of Area: The Mount St. Catherine range represents the least disturbed ecosystem in the north of Grenada.

It is also the major water catchment area or source of domestic water for the towns and villages of the northern half of Grenada.

Management Objectives: To protect in an undisturbed condition the important natural associations and landforms within the area and to provide adventurous recreational pursuits.

Activities: Establishment of boundaries and the development of a Management Programme emphasizing enforcement of regulations geared towards the protection of the area.

Natural landmarks

(1) LAKE ANTOINE

Location: Eastern side of Grenada approximately six miles north of the town Grenville.

Summary Description: Lake Antoine occupies about 16 acres within a perfect crater in the north east of the Island. It represents an excellent example of a crater lake formed by volcanic eruptions. The crater was once a volcano which collapsed into its present crater like form. The water level of the crater lake is normally not more than twenty feet above sea level. The feature is both geomorphologically and aesthetical interesting. While the lower slopes have been used for agricultural purposes, the crest is still covered with forest.

The area recommended for protection is privately owned and forms part of the River Antoine that is of historic importance for its functional sugar mill and rum refinery.

The lake is also an important nesting ground for many species of birds and other wildlife. Although remotely located, the feature is well visited by tourist and locals.

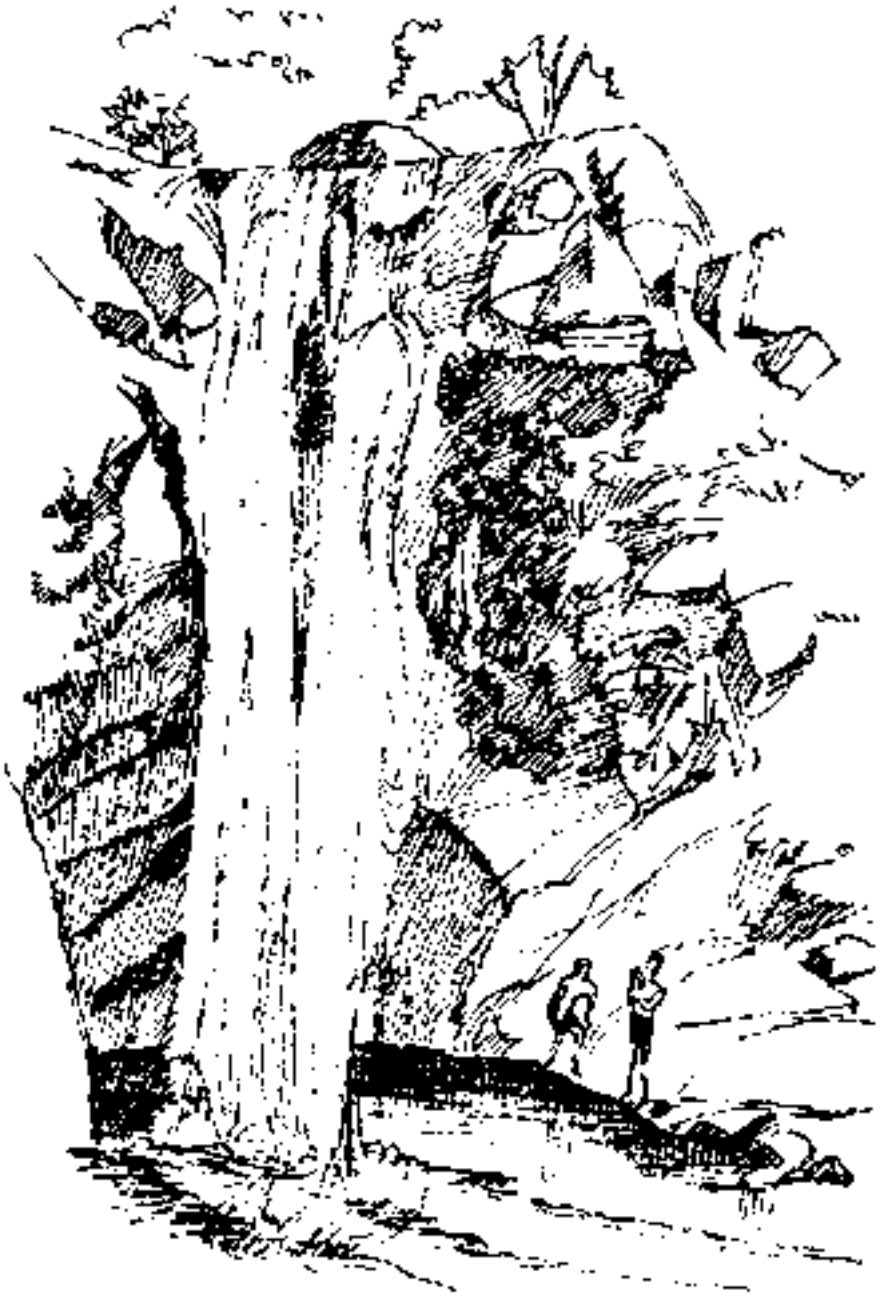
Significance of Area: The Lake Antoine crater is a geologically unique phenomenon and is reported to be one of the most scenic features throughout the Island.

Management Objectives: To maintain the crater lake as an aesthetically attractive environment and provide for interpretation of the geological, historical and natural features of the landmark.

Activities: Develop a land use and interpretation plan together with the owners emphasizing the provision of visitor facilities, maintenance of roads and infrastructure to the crater lake. An environmental education trail will be designed to indicate points of interest.

(ii) CONCORD FALLS

Location: Within the Concord Valley, along the Concord River between Mount Qua Qua and the West Coast.



Summary Description: Along the Concord River two very picturesque natural waterfalls exist apparently formed by the erosion of a band of soft rock. Located downstream, a band of hard rock was formed by the extension of lava from the eruptions. This is part of the lava flow that created the south central mountain system. The Concord (or first falls) utilized by dozens of recreationalists on a given weekend is located at the eastern end of a properly surfaced access way. The waterfall plunges approximately thirty five feet creating a pool of fresh water ideally suited for swimming.

The adjacent lands are privately owned and the owner is in the process of establishing a snack and rest-house facility. About 10 minutes hike upstream along a well constructed trail is the Fountainbleau Falls. Here the water gushes down the cliff face for about 65 feet accumulating in a very clear fresh water pool. The area has plantations of banana, nutmeg and cocoa, Grenada's main export crops.

Significance of Area: The falls are notable geographic features which need to be maintained and enhanced. The high scenic and bathing qualities of the falls and their basins have contributed to the area being a traditionally popular recreation and picnic site. Additionally they are of great educational value for students with a keen interest in the natural processes of erosion and weathering.

Management Objectives: The area will be managed to protect the aesthetic and water quality of the waterfalls and pools. Planning and Management are also very critical in providing additional facilities and maintaining the level of satisfaction achieved by the visitor. The plantations of export crops should be maintained and tied into the tourist experience.

Activities: Enhancement of scenic quality through maintenance of pool side and trails. Negotiate right of way through private property and work together with land owner on preparation of a management and development plan. Continue trail development and beautification. Develop environmental education programs which discuss geology, watershed management, multiple use and the agricultural export oriented drive of Grenada.

(iii) ANNANDALE FALLS

Location: Within the Beausejour River Valley west of Grand Etang lake.

Summary Description: Annandale waterfall was formed by the same process as explained in the case of the Concord Falls. This natural landmark however is already established as a major recreation area and is one of the most accessible in the country. Two separate waterfalls are present where the water plunges approximately 30 feet into a fresh water pool where visitors picnic and swim. The adjacent lands are State owned and are recommended in this report as a multiple use area.

Significance of Area: The area is an important geographic feature which is a classic representation of a geological out crop of the Tufton Hall Formation. This feature is to be protected and enhanced for public use both as an interpretation center and for recreational endeavours.

Activities: Once the renovation of buildings is completed, it will increase the quality of recreation attained at this landmark. It is also necessary to implement a management programme that would improve the aesthetics and provide interpretation activities to visitors. Environmental education programs should be developed to illustrate the importance of the multiple use areas surrounding the falls for agriculture, forestry, water quality, and recreation.

(iv) MARQUIS ISLAND

Location: Marquis Island is a small land mass located east of the Soubise point on the east coast of Grenada.

Summary Description: The Marquis Island and surrounding coral reef and eel grass marine ecosystems provide outstanding opportunities for recreation in a scenic environment. This area of geological interest was at one time part of the mainland. Ash layers formed by the volcanic eruptions as far away as the Grand Etang and Mount St. Catherine are visible.

Vegetation consists of the dry thorn scrub cactus environment referred to as the Deciduous Seasonal Formation. As farming once sporadically occurred on the island, there are remnants of an old foundation. In the drier, eastern section of the island (Sesuvium sp.) and other ground succulents can be identified.

Significance of the Area: This area represents an excellent example of volcanic ash stratification as well as a place of interest for an afternoon tourism experience. Boats could be rented at Soubise and utilized to visit both Marquis Island and La Baye Rock.

Management Objectives: To provide protection to the natural features in order to encourage breeding and nesting of sea birds while providing opportunities for recreation and tourism.

Activities: Development of a landing dock and trail system to encourage tourism; implementation of a zoning plan in order to protect habitat for iguana and shore birds.

(v) RIVER SALLEE BOILING SPRING

Location: The boiling springs are located in the northeast of the Island approximately 1 and 1/2 miles north of Lake Antoine and south of Levera Pond.

Summary Description: The springs are located in the River Sallee area and occupy some 594 square meters of land with a surface made of soft porous volcanic sediments. There are approximately six (6) holes scattered within the area. The largest hole is approximately two (2) meters deep and five (5) meters in circumference filled with muddy brown water. The other holes are much smaller filled with very clean highly saline water, however orange yellow sulphur deposits are present in run off channels. The water temperature reaches approximately 35°C.

Significance of Area: The boiling springs are significant not only for their unique geology but also because it is an area of spiritual importance for the local residents. Members of the Baptist faith visit the area frequently to perform spiritual rituals and baptism. Visitors also throw coins into the fountain while they make a wish. The feature is also significant because of its exceptional characteristic of highly saline acidic water more than one mile from the sea. It is possible that there is an association between the active kick-em-jenny marine volcano and the boiling spring.

Management Objectives: To protect the boiling springs of the area and provide opportunities for interpretation and further research. To provide easy access through trails and to clean up the area to improve the areas attractiveness.

Activities: Prepare a management and interpretation plan in association with the land owner. Clean up site and improve access.

(vi) HOG ISLAND

Location: Along the southern coast of the Island within the Woburn Bay.

Summary Description: Hog Island and surrounding coral reef and eel grass marine ecosystems provide outstanding representation of an island for the most part undisturbed by man. The island is thickly covered with *Acacia,* manchineel and *Leucaena* of the Deciduous Seasonal Formation. The Western coastline is covered with undisturbed mangrove forest while the eastern coastline is famous for the many shallow reefs and submerged platforms. The geology of the Island shows that it is primarily of sedimentary formation. A main fault lying in a north-west/south-east direction dissects the Island.

Significance of the Area: Hog Island is a volcanic representation of an undisturbed island ecosystem. With the exception of approximately fifteen (15) head of cattle introduced about two years ago, there is little evidence of man's activity. The Island is privately owned and trespassing strictly controlled.

The island is also significant for its aesthetic and recreational quality. A number of white sand sheltered beaches exist along the coast. Many of these are protected by shallow reefs or occur interspersed within the mangrove.

Management Objectives: To protect the natural marine and terrestrial ecosystems in their undisturbed condition and to maintain the areas high quality recreational opportunities. Actions will be initiated to remove the introduced species from the Island in order to encourage nesting birds such as the brown booby and reptiles such as the iguana.

Activities: Preparation of a management and development plan in conjunction with the owner and other interested parties. Development of an environmental education program which discusses the vulcanism, the function of a caldera, and the evolution of a marsh ecosystem.

(vii) QUARANTINE POINT

Location: Between the Grand Anse and Morne Rouge Bay. A peninsula with an apparent east/west dissection.

Summary Description: Quarantine Point is an outstanding landmark in the south of Grenada between the Grand Anse and Morne Rouge bays. The area is of geological significance since it forms the rim of the most southerly crater lake on the Island. This crater, formed in geologically recent times, is associated with the many craters on the Island's north east. The peninsula shows very interesting rock stratification and is of outstanding beauty.

The vegetation on the peninsula consists of dry thorn scrub and cactus. The rocks are important nesting grounds for the many birds common to the south coast. The area was named during the late 19th century when leprosy was a major disease and the peninsula was used as a quarantine station to ensure that carriers of the disease did not enter the mainland.

Significance of the Area: The peninsula is of prime significance for its aesthetic and recreational quality. Quarantine Point is located within the fast developing Grand Anse/Morne Rouge belt and requires urgent protection. Inappropriate development activity can lead to the loss of this scenic natural heritage resource. The point is easily accessible to the majority of the Grenadian population and would provide open space for recreation facilities as the pressures for use of the neigbouring beaches intensify. Since the point is visible from almost any point in St. George's it is critical that it is managed carefully so as not to destroy the interesting landscape.

Management Objectives: To maintain the interesting scenic and recreational qualities of the peninsula.

Activities: Designation of the peninsula as a natural landmark. Preparation of development plan outlining proposed uses. Develop facilities that would enhance scenic features and allow for increased recreational use.

(viii) LA BAYE ROCK - (Telescope Rock) Location: Off Telescope point.

Summary Description: This small Island represents one of the few totally natural environments in Grenada. As a result, large iguanas and nesting brown bobbies may be seen, as well as pristine dry thorn scrub forest. Coral reefs surround the Island.

Significance of the Area: The Island is an excellent example of animals interacting with an environment without the impacts of man. The island was formed in the Pleistocene geologic epoch.

Management Objectives: To protect the natural setting and initiate research into the fauna present on the Island and their status (nesting, breeding, roosting). To organize a boat tour which departs from Soubise and visits Marquis Island for a hike and La Baye Rock to view wildlife in an untouched state.

Activities: Development of environmental research programmes and tour visits which tie into the islandwide environmental education program to be initiated in the school systems.

(ix) THE MARQUIS RIVER WATERFALL

Location: A 1/2 hour hike up the Marquis River from the southern main road, just south of the town of Marquis in the parish of St. David's.

Summary Description: The Marquis area is rich in cultural heritage sites such as the French church and weaving from wild pine in the town of Marquis, and the ruins of the Post Royal Military Fort. The Marquis River waterfall can be tied into an eventful outing with these other attractions such as the La Sagesse Protected Seascape.

The 1/2 hour hike to the waterfall following the Marquis River is highly scenic and presents several pools and interesting geologic formations. Agricultural crops are planted along the way and a wide diversity of wild fruit trees will seasonally provide the hiker with a refreshing snack.

Very little of the original dry forest type remains as much of the area has been converted to agriculture. The vegetation surrounding the falls is quite mature because of the constant humidity generated by the mist.

Significance of the Area: The area is highly scenic and provides a recreational opportunity for the town of Grenville, and a valuable tourist resource for the Country.

Management Objectives: To maintain or encourage a natural belt of vegetation -along the river, to develop a walking trail, and provide outdoor recreational opportunities.

Activities: Determination of boundaries along the river, preparation of a management and development plan, initiation of management activities. Design and implementation of a Eastern Main Road tour which leaves daily from hotels and tours the Southern zone of the Island. Points of interest would include; The Tower C.L., the Bay Gardens, Westerhall Sugar Mill, La Sagesse Protected Seascape, Marquis Village, Marquis Island and La Baye Rock, and the Grand Etang Nature Centre.

Protected seascapes

(i) NORTH EAST SEASCAPE

Location: The North East Seascape protected area extends from the Telescope Rock to the south to the Bathway Beach to the north.

Summary Description: The North East Seascape extends for approximately six miles and is composed of magnificent cliffs, excellent wide sandy beaches, and patches of mangrove swamps.

From Telescope point northwards approximately two miles there is an excellent beach. Behind the high water mark is well developed windswept vegetation composed of coconut palms, almonds, and manchineel. Behind the Conference Bay there is approximately six acres of black and white mangroves however the outer fringe of this system has been severely damaged as a result of cropping for charcoal production. Cattle rearing has also caused a change in the vegetative association.

Between Conference Point and High Cliff point to the north is the Antoine Bay. The southern half of the coastline is occupied by a sandy beach while the northern half is strewned with rocks and boulders. Within the seascape one finds very outstanding cliff formations particularly the Bathway and High Cliffs.

The coastline is different to the others identified within this system plan since it is an open coastline exposed to the constant prevailing trade winds. As a consequence the surf is amplified resulting in heavy breakers and wide variation in water levels. Beach processes can easily be identified within the area. The magnificent beaches are also important turtle nesting sites that are being increasingly mined for construction purposes.

Significant of the area: The area represents the most natural stretch of open beach and undisturbed picturesque cliffs in the country. Within it is a critical mangrove ecosystem that is slowly being degraded through exploitation for charcoal. The area is not only important for the nesting and feeding of birds, turtles and iguanas but also for research and environmental education and interpretation.

Activities: Co-operation with the few large landowners in the area. Preparation of a management and development plan, monitor and regulate critical activities including sand mining, turtle cropping, egg collection and charcoal production.

(ii) SOUTHERN SEASCAPE

Location: The protected seascape on the south coast is comprised of a number of units made of up of different points, inlets and bays. These include from east to west the lands immediately surrounding the Westerhall Bay, Chemin Bay, Egmont Harbour, west coast of Hog Island, eastern coastline of Mount Hartman Point, Canoe and Devil's Bay. The protected seascape also includes the southern most points and associated reefs of Point Egmont (including Adam Island), Fort Jeudy Point and Mount Hartman Point.

Summary Description: The area is well known for its scenic value and outstanding fisheries and recreational resources. The areas chosen as protected seascape includes mainly well developed highly productive mangrove coastlines. These are located in well sheltered inlets that are not easily accessible by roadway. The main species is the red mangrove *Rhizophora mangle* which provides habitat for many

commercially important species such as lobster, queen conch and oysters. These also form nesting ground for many important bird species within the area are increasingly becoming scarce. Fishermen claim that the distance from shoreline to where the finfish, conch, and lobsters are harvested is increasing.

Boatbuilders of Soubise on the Windward side of Grenada stand proudly by their hand-fashioned vessel.

The southern most points of the Islands and Egmont Point have very interesting reefs and eel-grass beds that form important breakwaters and fish feeding areas. These are of both geological and scenic interest. Canoe and Devil's bays are also interesting seascapes since they form beautiful beaches and are also two of the very few areas on the south coast where iguanas are still readily seen.

Significance of Areas: The southern coast seascape represents the indented truncated coastline common to the Island of Grenada. Within the inlets are outstanding examples of mangrove ecosystems. The southern coastal waters are the most productive commercial aquatic species such as lobster and conch. The mangroves ecosystems support this marine life by producing organic matter and habitat for aquatic micro-organisms. It is therefore critical that remaining mangrove species be protected to support commercial fisheries operations.

There is an abundance of oysters within the mangrove system, which have not been exploited since it is not one of the traditional species collected by the people in the area. This gives the area increased significance since it allows the opportunity for managed harvesting and production.

The reefs to the south of peninsula are also significant as they are the habitat for many other commercial species. Presently there is extensive use of pots and traps on those reefs.

The landscapes are also important because they demonstrate geological and geomorphological processes such as volcanic activity, subsidence, uplift and wave and wind action.

It is an important recreational and educational resource that is within easy reach of 40% of the country's population.

Management Objectives: to protect the mangrove ecosystem and the important reefs within the area. To provide opportunities for environmental education, research and recreation and to manage and regulate exploitation of the traditional fishing grounds.

Activities: Development of a management plan; initiate a programme of environment education and institutionalize a monitoring system which prohibits the use of traps which are not biodegradable.

(iii) LA SAGESSE

Location: At the Estuary of the La Sagesse River within the La Sagesse Bay.

Summary Description: La Sagesse comprises a mangrove estuary, a salt pond, 3 beautiful beaches, interesting geological formations, coral reefs, and excellent examples of littoral woodland and thorn scrub cactus woodland.

Significance of the Area: The area has a diverse assemblage of ecosystems in a small area providing outstanding wildlife habitat for migratory birds and waterfowl. It is a favorite spot for weekend outings

for the local population.

Management Objectives: To protect the ecosystems in a natural state and promote programs of education and recreation.

Activities: Develop an environmental education program for the local population and tourists. Ensure protection of the salt pond, mangrove estuary, and freshwater marsh. Prohibit sandmining and any inappropriate development.

(iv) MOLINERE REEF

Location: The Molinere Reef Protected Seascape is 5 kilometers north of St. George's on the Leeward on Western side of the island.

Summary Description: The area consists of a series of coral reefs and sea fans beds. The terrestrial part is represented by seasonal deciduous forest which provides a natural backdrop to the marine ecosystem. The Molinere Reefs forms part of an extensive recreational tourist complex on the island. There is a wide diversity of life forms on this outstanding reef, considered to be the best reef off the island of Grenada.

Panoramic views can be had of the mainland from moving boats, and small private beach provides an outstanding area for nature enjoyment, relaxation, and snorkeling. The area has excellent qualities for the development of a variety of educational and recreational opportunities.

Significance of the area: The Molinere Reef represents the finest coral reefs off the mainland of Grenada. Only 20 minutes by boat from St. George's Harbour, the area is frequented by scuba and skin diving enterprises which bring visitors to the area. The area has been protected from exploitation by man by the local divers. As a result, lobsters are prevalent as are both soft and hard corals. A wreck with a steel hull is seen at 80 feet below sea level which harbours beautiful reef fishes and is beginning to be colonized by various species of coral.

Management Objectives: To protect and maintain the Molinere Bay ecosystem and its outstanding natural features and to provide opportunities for recreation interpretation research and environmental education.

Activities: Formation of a management committee with the local divers, fishermen, and Fisheries officers, protection of the marine areas by controlling visitors and enforcement of regulations.

Cultural landmarks

(i) RIVER ANTOINE RUM DISTILLERY

Location: One (1) mile to the south east of the Lake Antoine crater in the north east of the island.

Summary Description: The River Antoine Rum Distillery is located on the River Antoine estate which is owned and operated by the DeGale family. The Distillery is a working factory whose processes have changed little since the 18th Century. The cane used is produced primarily on the flat land in the immediate vicinity of the sugar factory and processed by the only operational water wheel in the country. The juice is boiled in a system of "coppers" using the bagasse produced as fuel and is transferred through the containers using a system of wooden guttering. The only modern electrical appliance is a pump that is used for transferring the juice to the fermentation tanks. The boiler is fueled by wood and, the juice is

passed through "stills" and then cooled by passing through water tanks before being transferred to the setting tanks. The fermentation process is not hastened using any chemicals or additives and the product is sold in large containers and not bottled. The physical infrastructure was established in the late 18th century and has been maintained in a fair state throughout the years. The labour force at the distillery is very skilled in their traditional method for they have been operating the factory for over twenty-five years.

The River Antoine Rum Distillery Cultural Landmark is the oldest functioning distillery in the Caribbean.

Significance of Area: River Antoine Rum Distillery is a unique historic and cultural feature not only in Grenada but throughout the English speaking Caribbean. The process is identical to that used in the late 18th century when sugar cane was the chief crop produced on the Island. The buildings and equipment are also of great significance since, they clearly represent a particular period in the history of the Island.

Management Objectives: To protect this cultural feature particularly the buildings, equipment and processes for education and interpretation. A Development and Management Plan is urgently needed and should be developed in cooperation with the owners so as to ensure a common understanding of the goals and objectives of the area.

Activities: Priority should be given to the preparation of a development plan, organization of a guided tour of the factory and the preparation of an information or interpretation leaflet.

(ii) WESTERHALL RUM DISTILLERY

Location: Along the Southern Main Road north of the Westerhall Bay on the Westerhall Estate.

Summary Description: The Westerhall Distillery has been updated, however, there are still vestiges of the old processes similar to those used at River Antoine. The water wheel used in the late 19th and early 20th century is still present and could be put back into operation. The enterprise is no longer grinding its own cane but is purchasing the molasses used in the rum distillery process. Unlike River Antoine the distillery uses chemicals and additives to hasten the process of fermentation and therefore has a higher production capacity. The produce is bottled and aggressively marketed. This represents a 20th century operation that is constantly adapting new methods and technology. This obviously changes the quality of the final product which demands aggressive marketing to increase sales volume.

Significance of Area: The process is now modernized, however the artifacts and equipment that were used in the traditional method still exist. The Westerhall Distillery represents a transformation of the process which is indicative of the changing economic and social factors that have been of significant influence.

Since this feature is only twenty minutes away from St. George's, the port of call for cruise ships, and Grand Anse, the Westerhall Distillery presents an outstanding opportunity for tourism and environmental education of the local population. This would be assisted by the many artifacts that are so well maintained.

Management Objectives: To protect the historical and cultural artifacts and equipment that exists for educational and interpretation purposes. To develop an interpretation plan so as to offer the visitor the history and evolution of the rum industry and its economic importance to Grenada and the region.

Activities: Development of an interpretation plan in cooperation with the owners and operators of the distillery.

(iii) CARIB'S LEAP/LEAPER'S HILL

Location: At the hill top and cliff-face directly north of the town of Sauteurs at the most northerly spot on the Island.

Summary Description: Leapers Hill is the promontory where St. Patrick's Roman Catholic Church, School and Cemetery are located. To the northern part of the promontory is a steep cliff face that descends vertically into the sea for more than 100 ft. This feature is recorded as the point of extermination of the original inhabitants of the Island, the Carib Indians.

It is reported that for more than 100 years after the discovery of the Island by Columbus in 1492, the Caribs were undisturbed. They settled in great numbers on Grenada because of its superior hunting and fishing grounds as compared to the other Islands. Although discovered by the Spaniards, it was not until 1626 that both the English and French became interested in this unappropriated Island. In 1609 the English landed but were forced to leave because of the Carib harassment. In 1638 a Frenchman attempted to effect a landing but was driven off by the Caribs, who thus secured further immunity from attack for twelve (12) years. A successful colony was established in 1650 by the French who apparently purchased the Island for "some knives and hatchets and a large quantity of glass beads, besides two bottles of brandy for the Chief himself".

The first colony was established in the south of the Island. Not more than one year later the Caribs reinitiated their hostility. The French reinforced their colony and were given strict orders to eliminate the aborigines.

After much struggle the Caribs were driven to the north of the Island. The last stand was at a precipice on the extreme north of the Island named by the French, "le morne de Sauteurs" or leapers hill in memory of the leap of the Caribs. The town is today called Sauteurs. It is reported "that they fought vigorously but the savages were completely defeated and those who remained, about forty (40) in number, precipitated themselves from the top of the rock rather than surrender".

Significance of Area: The feature is significant for it marks the last point of resistance of the aboriginal Indians who first occupied the Island.

Management Objectives: The area should be preserved since it is an important historic and cultural landmark where the original inhabitants chose to exterminate their race instead of surrender to the French colonists.

The landmark should be developed and maintained and a monument should be erected to mark the end of the first chapter of the Island's history.

Activities: A community group should be encouraged to undertake the clean up of the area. A programme for the development and maintenance of the features should be developed in association with the Catholic Church and the residents in the immediate vicinity.

(iv) MOUNT RICH AMERINDIAN REMAINS

Location: Along the St. Patrick's river valley in the village of Mount Rich in the parish of St. Patrick's.

Summary Description: The Amerindian remains are primarily stone carvings on rocks in the river valley. It has been established that these carvings were done by the Caribs for the work depicts their typical features and lifestyle. This is the only place on the Island where such impressive work exists. They can be most easily seen on the top and sides of a very large stone on the river bank where six carvings, headpieces, pottery, implements and tools (spears, bows and axes) used in their hunting and fishing are found. Several small stones in the vicinity have different carved features but they are not clearly discernible since they are covered by weeds and mosses.

The remains are easily accessible since they are located alongside the main road from Sauteurs close to the Mount Rich village. A community group has planted flowers along the access footpath and installed a lettered "Carib Remains-Enter".

Significance of area: The remains are significant as the only extensive area of carvings left on the Island that depicts the features and way of life of the Amerindians. It is possible that their work of art could have been done over 300 years ago since it has been established that Caribs were defeated about that time. The remains are significant for their educational value and the river valley offers recreational opportunities.

Management Objectives: To protect the Amerindian remains. Manage and improve them for the benefit of the present and future generations.

Activities: Permission should be gained from the private landowner for a public footpath through his property. A brochure should be produced, the trail improved so as to make the remains easily accessible and the surroundings maintained

(v) MARQUIS VILLAGE

Location: Approximately three (3) miles south of the town of Grenville along the Eastern Main Road.

Summary Description: Marquis village is an interesting place since it is the only village dependent in large part on the handicraft industry. Most of the handicrafts produced and sold in Grenada are made by villagers. The emphasis is on the production of straw work, these including table mats, bags, baskets, hats, bedroom slippers, etc. The village is located along the coastline and is cultivated with wild pine which is the main material used in the work produced. It exemplifies the life style of a typical villager on the Island. The men and children are primarily involved in the fishing and farming while the women are involved in the handicrafts, however, it is the man's task to cut and collect the wild pine from the field while the women and children take on the job of its preparation.

In close proximity to the village are two interesting cultural landmarks. Battle Hill to the north is a famous religious center where the Roman Catholics and Anglicans gather on special occasions for processions and worship. There is also the Royal Fort located to the immediate east of the village. This was built by the French in the late 17th century, and used as a famous outpost by the rebels during Fedon's rebellion in 1796.

Significance of Area: Marquis village is significant because of its unique culture, history and way of life. It is the only village where the straw handicraft has been continued throughout many generations. It is an interesting tourist destination since visitors can examine the handicraft process from raw materials to the finished product. The other two important historic features can be nicely tied into a day's visit.

Management Objectives: To encourage continuance of the village life style and culture while improving marketing of handicraft products and stimulating visitors to the area. To encourage the production of higher quality products. Develop a management plan for the village and surrounding landmarks.

Activities: Co-operate with the handicraft organization and the community to improve the appearance of the village. Upgrade and improve the Port Royal Fort and prepare an interpretation plan.

(vi) FORT GEORGE

Location: North of the entrance of the St. George harbour on a promontory overlooking the town of St. George's and the Grand Anse beach.

St. George's, famed to be the most scenic capital city in the Caribbean, as seen from Fort George.

Levera National Park presents fascinating geology, has productive mangrove ecosystems, and offers outstanding opportunities for recreation and nature appreciation.

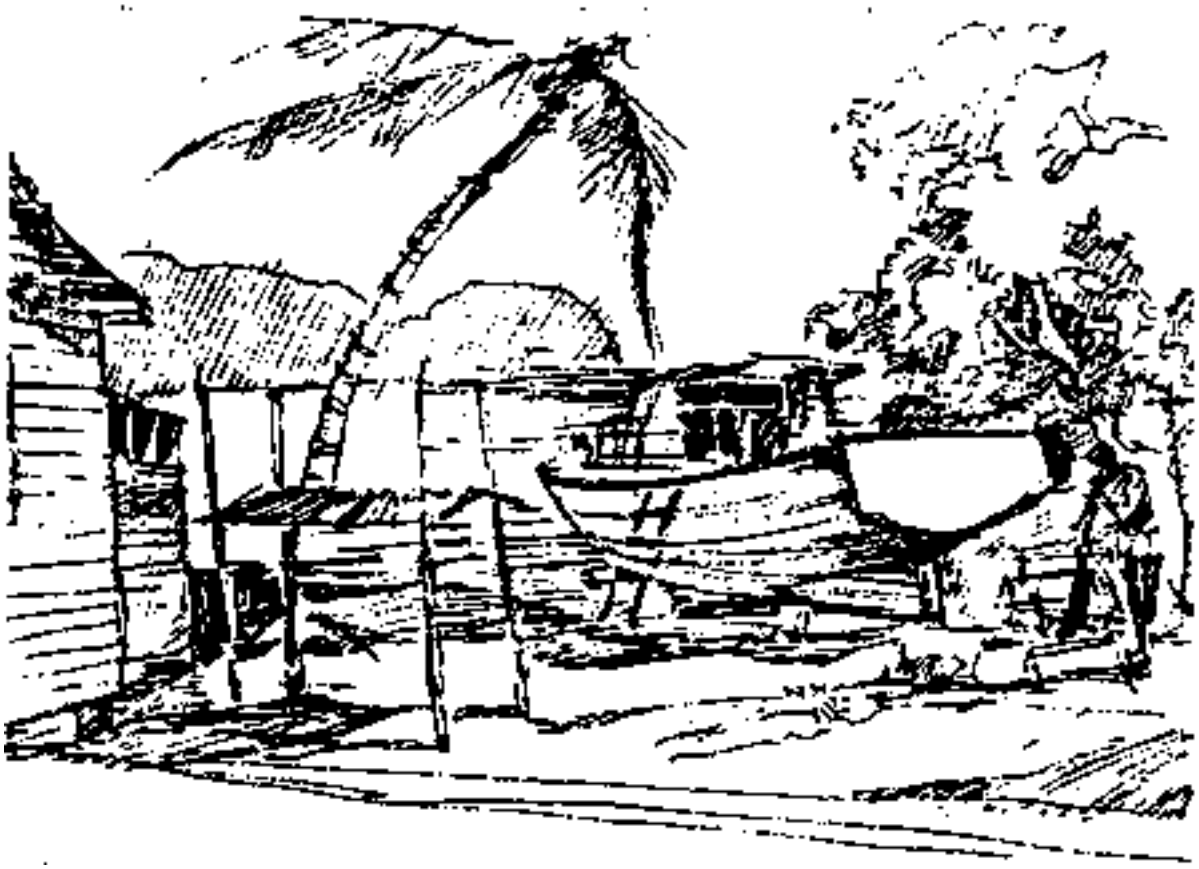
The petroglyphs seen at Mt. Rich Amerindian Remains Cultural Landmark are one of the few remainders of the indigenous people's, the Caribs and the Arawaks, that inhabited the Island up until the French colonized the Island in the 1650's.

The courtyard in Fort George where Prime Minister Maurice Bishop and his Cabinet were assassinated on October 19th, 1983.

British built cannons at Fort George set just as they were during the 1700 and 1800's when the British and French fought for the Island on numerous occasions.

Summary Description: Fort George was built in 1706 by the French after the old town known as Port Louis was relocated from the Lagoon area. The fort and capital was originally known as Fort Royal by the French. In 1756 war was declared between Great Britain and France and in 1762 a British fleet attacked Grenada, causing the French to eventually surrender. The Island was handed over to the British and the Fort and Town were then renamed after King George III.

Shipbuilding in Soubise next to the handicraft center of Marquis Village presents fascinating vistas into Grenadian country life.



The structure has not been severely altered since then, for it was built on the upper half of the promontory of walls more than four feet thick all around. It was built with two levels with all amenities including barracks, ammunition houses, and under ground tunnels. It is considered a classical structure and was undoubtedly a tremendous engineering accomplishment in its day. Fort George was the main defence post during the 18th century. When Great Britain was again at war with France in the West Indies, the Fort was a key bastion by the British when the French forces landed at Molinere Bay, north of St. George's and marched to the town. At daybreak next morning, firing was directed against Fort George, which caused the British to surrender. However, in 1783, under the 8th Article of the Treaty of Versailles, signed on September 3rd, Grenada was restored once more to the British.

The Fort is also of very recent historical importance for it is where the fall of the Peoples Revolutionary Government (1983) began with the apparent execution of the Prime Minister Maurice Bishop, leader of the New Jewel Movement, and many of his cabinet colleagues and supporters. During the reign of the PRG, the fort was renamed Fort Rupert in honour of the death of the then Prime Minister's father. The name of Fort George was restored in 1983 after the intervention of the Island by United States and Caribbean troops.

Significance of Area: The area is of historic architectural and recreational significance to the country. It has been the center of military and defence activities for the past two hundred and fifty years. It is an architecturally sound structure and provides a feature whereby the Islands history could be relived. It provides unique opportunities for educational and recreational programs.

Management Objectives: To protect this historic monument so as to preserve the nations history and architecture. To maintain and upgrade its educational and recreational potential.

Activities: Establish a visitor and interpretation center and maintain the Fort. Infrastructural development

should be closely planned and authorized. U.S AID and OAS have prepared site designs for both this fort and Fort Frederick which includes restoration and program development.

(vii) FORT FREDERICK

Location: Located at the top of the Richmond Hill east of the St. George's Harbour.

Summary Description: Fort Frederick was built in 1779 soon after the French recaptured the Island. The French realized how seriously their advance upon St. George and their occupation of the fortifications on Hospital Hill would have been encumbered if forts had been in existence on Richmond Hill. As a result, they hurried and built Fort Frederick. Fort Frederick lies between Fort Matthew to the north and Fort Adolphus to the south.

View from the Fort Frederick cultural landmark gives panorama of St. George's and the harbor. The French realised the importance of this site in defending the Island and began construction in 1779.

National Parks and Multiple-use Management Areas protect the water quality and supply in the upper watersheds thereby providing potable and irrigation water to the populated areas.

Like Fort George it is built of very thick stone walls, with amenities such as barracks, watch towers and underground tunnels. From Fort Frederick a panoramic view of the Island is afforded. This 360° view made the Fort critical to the towns defence during the 18th and 19th century.

Significance of Area: Fort Frederick is the best located fortress in the country and has been used extensively during the past three centuries to defend the city from attacks. It is also of great architectural and recreational significance. It is also significant in the recent history of the Island as it is alleged to have been used as headquarters for one of the factions during the October 19th, 1983 disturbance.

Management Objective: To protect this important historic monument in order to preserve the Nations history and architecture. To develop a management plan in co-operation with the Nations military forces who presently occupy this area.

Activities: Upgrade the facility to provide visitor interpretation and education facilities.

(viii) THE TOWER. St. Paul.

Location: Beyond the St. Paul Police Station - the Parish of St. George's.

Summary Description: The Tower represents one of the few old stone houses built of volcanic rock in a Caribbean Colonial Style of Architecture. It was built in 1917 by a prominent Grenadian Lawyer, C.F.P. Renwick. Mr. Renwick constructed the house to persuade his English wife to remain on the Island.

Today the House functions as a family home and is available for tours on an appointment basis.

Significance of Area: Sitting on an scenic eleven acre property of spice and fruit trees, the Tower presents outstanding opportunities for Tourism. Within 15 minutes of St. George's, the Tower will be tied with other attractions such as the Bay Gardens and the Westerhall Rum Distillery.

Management Objective: To preserve the integrity of the Tower structure, and develop tours.

Activities: Development of a brochure and historical documentation of the house and its furnishings.

Multiple use areas

(i) ANNANDALE WATERSHED

Location: Along the headwaters of the Beausejour River West of the Grand Etang Lake.

Summary Description: The upper watershed of the Beausejour River is occupied by the Annandale estate which was privately owned until 1984. The estate emphasized the production of the traditional crops banana, cocoa and nutmeg. This necessitated the felling of most of the natural forest so as to allow adequate sunlight for the growth of these crops. Being the water catchment area for the domestic water supply of St. George's, these activities affected the run-off, water quality, and reliability of supply.

Approximately two years ago an attempt was made to guarantee the supply of quality water by instituting a management/Development programme for the watershed. This necessitated the acquisition of the Annandale estate and the development of the Forestry Development Programme. The area is presently being extensively studied particularly by hydrologists who are examining percolation, run-off and sedimentation levels.

Significance of Area: The area is significant since it is the catchment for the domestic water supply for St. George's and has recreational and educational significance.

Management Objectives: To improve the ground cover so as to guarantee reliable and adequate water supply and at the same time make the lands in the area economically productive.

Activities: Continue the reafforestation programme and collection of valuable data on stream flow, percolation and sedimentation.

(ii) CONCORD WATERSHED

Location: East of the Concord Falls including the upper watershed area of the Concord Valley.

Summary Description: The headwaters of the Black Bay (Concord) River is presently being tapped to supply domestic pipe borne water to the villages of Concord, Marigot and Cotton Bailey in the Parish of St. John's serving approximately 3000 people. The storage tank reservoir is located near the Concord Falls. The intake is two hundred (200) yards upstream from the falls.

The lands above the Fontainbleu Falls are inaccessible and devoted to forest. However the valley area in between the two falls is privately owned and cultivated in traditional crops. The Central Water Commission states that this source is one of the only reliable water sources that remains for the parish of St. George. It is therefore critical that steps be taken early to prevent the further destruction of the vegetation above the intended source or intake.

Significance of Area: This area is significant since it is the only reliable source of domestic water remaining that can be technically and economically exploited to supply the densely populated St. George's area. It is also important as a recreation and research area since two of the nations Natural Landmarks are within the watershed.

Management Objectives: To protect the forest resources in the area for water quality and supply.

Activities: The acquisition of the upland area; the development of a forestry management plan so as to maintain an adequate water supply throughout the drier months. To develop the area as a recreation center.

(iii) MOUNT HOPE/CLABONY WATER CATCHMENT

Location: Located in the parish of St. Andrews in the uplands west of the abandoned Pearls airstrip.

Summary Description: The multiple use area around the Mount Hope, Clabony and Blaize is mostly under forest cover with some traditional crops planted on the lower slopes. It forms the headwaters of the two major rivers on the east coast of Grenada. The Simon River flows out to sea on the lower Pearls area and the Grand Bras River is a main tributary of the Great River. The upper watershed of these rivers is the source of domestic water supply for Grenville, the second largest town on the Island.

Significance of Area: Major water catchment area for the domestic water supply of Grenville and St. Andrews area.

Management Objectives: Develop a Management programme for the protection of the upper watershed area.

Carriacou

National parks

(i) HIGH NORTH

Location: Northern section of Carriacou.

NATIONAL PARKS & PROTECTED AREAS CARRIACOU - GOVERNMENT OF GRENADA/OAS PROJECT - THE ESTABLISHMENT AND MANAGEMENT OF A SYSTEM OF NATIONAL PARKS AND PROTECTED AREAS

Red mangrove proproots protect the shoreline, provide habitat for shellfish, and other wildlife.

Summary Description: High North Peak with 955 feet is the highest in Carriacou. Containing important watersheds for the northern part of the Island, this park encompasses the complete spectrum of ecological systems in Carriacou. The finest dry thorn scrub deciduous forests are found on the north west slope descending to seasonal evergreen forests on the alluvial flats leading to L'Ance La Rouche, the most scenic and private beach in Carriacou. Coral reefs and outstanding volcanic and uplifted sedimentary formations are clearly visible. The littoral vegetation of manchineel and coconut is well developed. The

entire Park is the most undisturbed area in Carriacou.

The Estate Ruins found overlooking L'Ance La Roche Bay are of significant historical importance. The estate, once comprising about 266 acres of forest and grazing lands, was advertised for sale in the St. George's Chronicle and Grenada Gazette, dated June 7, 1826. (Brinkley, F.K. 1986, Pers. Comm.) At the time it was described as a dwelling house in substantial order. A kitchen, corn house, hospital, cattle pens, and pigeon house were built of mason work. Accompanying the sale were numerous implements necessary for the cultivation of corn and cotton.

Some of the foundations are worthy of restoration and the area provides outstanding opportunities for tourism and environmental education.

The mangrove ecosystems at Petit Carenage Bay are among the most developed in the Country. Both the mangrove swamp formation and the littoral sand beach vegetation are found. Few signs of cropping for charcoal are visible, and as a result, this may be the finest mangrove and mud flat ecosystem found in the country of Grenada.

Significance of the Area: The High North National Park contains some of the most outstanding terrestrial ecosystems in the Country, and due to its importance in the Grenadines, should be recommended as a Biosphere Reserve with UNESCO. The area offers tourist and recreational resources in Carriacou and merits immediate attention. Shipbuilding in Windward presents traditional skills presented in a scenic setting. A bird sanctuary should be established at Petit Carenage where there are many rare migrants as well as resident water birds.

A tour of Carriacou should begin at the Hospital scenic overlook, where the capital Hillsborough and adjacent lands can be seen from a bird's eye view.

Now overgrown with vegetation, the cannon and foundations of the L'Ance la Rouche ruins present fascinating vistas into the past agricultural and military history of Carriacou.

Management Objectives: To provide protection for and maintain in a natural state the ecosystem and habitats of the area, to provide for recreational and educational activities in the forest area, while providing for recreational activities along the coastal areas.

Activities: Formation of a Nature Conservacy as part of the Historical Society of Carriacou to promote tours, birdwatching trips, and oversee the restoration of the area utilizing public and private sector funds.

Protected seascapes

(i) THE LIMLAIR-THIBAUD AREA

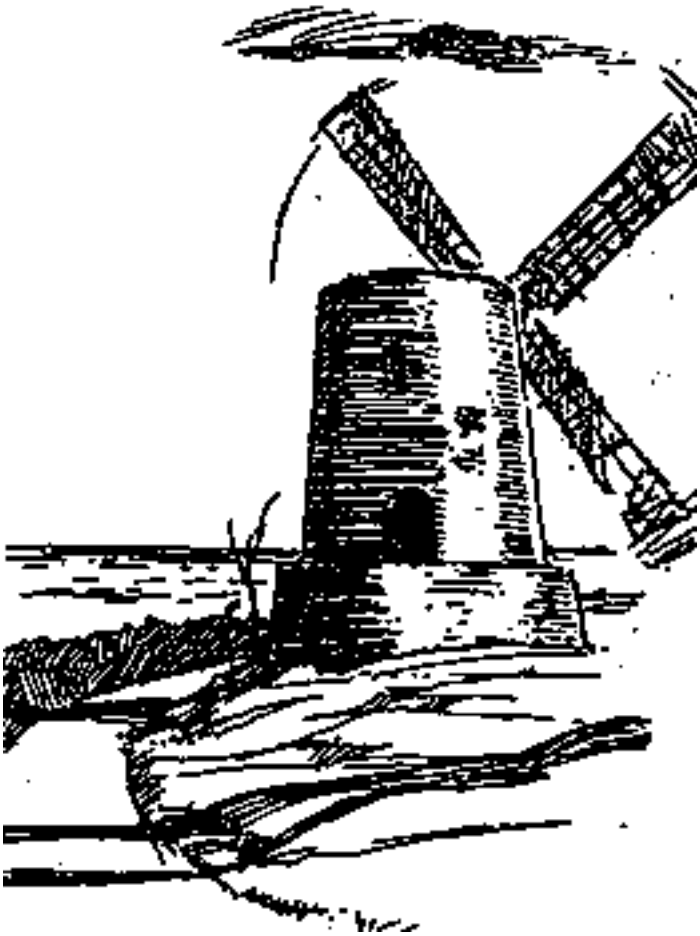
Location: South of Point Saint Hilaire in Central eastern Carriacou. Summary Description: This region is fascinating from primarily a cultural and historical vantage point. The long history of livestock development is represented by a hand dug well which is 30 by 20 by 20 feet deep and lined by a rock wall of high quality indicating the intentions of the estate owners were of permanence. The coast is lined with 3 or 4 separate cemeteries dating back to the 1700's, with a tomb and mausoleum of Hugh Monro, Esq., owner of the Limlair Estate dated 1778. On Tarltons Point a cannon can be found resting on the cliff, having been pushed out of place.

Significance of the Area: Presenting fascinating vistas into the military and agricultural history of Carriacou, the area has value for tourism, anthropological research, and education of the local population.

Management Objectives: To protect and restore these valuable cultural features and initiate programs of research, education and tourism.

Activities: Demarcation of boundaries, land tenure investigation, design of tourism and education programs.

Windmills used to dot the landscape all over Grenada and Carriacou which were previously used for investigation. Now the adventure can find foundations of these and other stone works all over the island.



(ii) TYRREL BAY Protected Seascape:

Location: South-west central area of Carriacou.

Summary Description: Carriacou has world renowned fame for the mangrove oyster which comes from the mangrove ecosystem of Tyrrel Bay. The mangrove ecosystem and adjacent salt mud flats show signs of human disturbance, and are recommended for protection because of the foreign exchange generated and employment opportunities presented.

Significance of the Areas: It is an important economic fishing area as well as nursery ground for fish and aquatic life. It has been a traditional yacht anchorage and hurricane hole.

Management Objectives: To protect the mangrove ecosystem while developing the resource for oyster

production and to accommodate regulated traditional fishing.

Activities: Demarcation of boundaries, initiation of development, protection and management programme, environmental research programme as is on going with Artisanal Fisheries Project.

(iii) LAURISTON POINT: - Sandy Island -Mabouya Island Protected Seascape.

Location: Central Western section of Carriacou.

Summary Description: Containing an excellent mangrove ecosystem, coral reefs, and island vegetation, this area is highly suitable for tourism. Close to Hillsborough, and the airport, the area provides excellent opportunities for field trips for the schools and community groups. Turtle nesting areas are found on the islands. The mangroves are untouched and are better developed than any noted in Grenada. The area is excellent for birdwatching.

Sandy Island is a favorite mooring spot for yachts.

Significance of the Area: Proximity to the capital of Carriacou and quality ecosystems.

Management Objectives: The area presents opportunities for the area to be developed for recreation, education and tourism, while protecting the valuable natural habitats, especially Sandy Island, where the reefs are reported to show stress due to spear fishing and the reported use of dynamite.

Activities: Demarcation of boundaries, preparation of management and development plan.

(iv) SALINE/WHITE ISLAND AND REEFS

Location: Fifteen miles north - north east of Grenada and one mile south of Carriacou.

Summary Description: Saline Island and White Island present fascinating geology. Saline has a brackish lagoon salt pond surrounded by a mangrove ecosystem. Pyroclastic deposits indicate major volcanic activity and two volcanic plugs are present. Shorebirds can be seen searching for crustaceans in the mud flats of the brackish lagoon and the adjacent coral reefs are unquestionably Grenada's most outstanding. Panoramic views of the reefs may be had from various look out points from both Saline and White Island. White Island is surrounded on three sides by sandy white beaches with diverse untouched littoral vegetation.

Significance of the Area: This area presents one of the most outstanding scenic and tourism resources in the country. Pristine white sandy beaches, unique geology, insights into the anthropological development of the islands, and productive mangroves and salt ponds blend together to present Grenada's finest natural setting. Both White and Saline are some of the most unusual Islands seen in the Grenadines. Both have pyroclastic volcanic plugs which rise 200 feet in height being undercut by wave action. The rock domes are fractured into tall columns. Iguanas were common until the 1960's, but now are much rarer. These Islands would be excellent areas to re-introduce the iguana and provide for their protection.

Howard, 1950 notes that the vegetation on White Island is decidedly unusual in the Lesser Antilles, and more characteristic of the Greater Antilles and Bahamas. Notably, *Tournefortia gnaphalodes, Heliotropium indicum, Heliotropium curassavicum,* and *Euphorbia buxifolia* are common.

The adjacent waters present the largest and most diverse coral reefs in Grenada as well as outstanding opportunities for recreation and tourism from Carriacou. The natural features have the potential to be

developed for day trips of diving, nature study and scenic appreciation.

Activities: Formation of White Island/Saline Island management committee of interested Carriacou residents, to design protection measures by controlling visitors, yachts, and cruise ships. Monitor the area, enforce, and design visitor tours and facilities.

(v) SABAZAN P.S.

Location: South Eastern Area of Carriacou near Dumfries.

Summary Description: Sabazan was probably the most elaborate of the large estate houses on Carriacou. Constructed in the late 1700's or early 1800's the ruins contain an old well, six foundations, a tower looking towards the sea and an elaborate cistern system. (Frances Kay Brinkley, Pers. Comm.)

Significance of the Area: The ruins reflect the history of agricultural development and the importance of water in Carriacou. It is a site of an important Amerindian settlement. Nearby, at Dumfries is an old Cotton gin, lime factory and French foundation. It is the home of some rare birds, e.g. the mangrove cuckoo.

Management Objectives: To protect the ruins, artifacts, birds; to design programs of educational research to further understand the historical development of Carriacou. To tie in Sabazan, Dumfries, and other protected areas into an around the Island tour for visitors and school groups.

Activities: New area study, protection of the ruins, artifacts, and birds, visitation by school groups.

Natural landmarks

FOSSIL BEDS OF GRAND BAY

Location: 1/2 mile south and 1/2 mile north of Grand Bay Village on the Windward Coast of Carriacou.

Summary Description: Both sites contain about 30 feet of well bedded fine grained ashy shales which are exposed along the shore. Fossils of *Gastenopoda, Pleurotoma, Alvitra, Phos, Pyrala* and *Conus* are present. When wet with seawater, the fossils look very well preserved. In some cases, the sharp edged angite crystals have imprints. *Trocolyathus* and *Flabellum* can also be seen. The *Globorotalia Fobsifobsi* (Grand Bay Beds) have been correlated with the Lower Miocene Baitoa formation of the Dominican Republic.

Significance of the Area: The fossil beds are the only known beds in Grenada which are plainly visible. The beds provide excellent opportunities for education, illustrating prehistoric shellfish, some of which are long since extinct.

Management Objectives: To design environmental education programs and protect the fossil beds from further deterioration. To initiate geological research into the importance of the area.

Activities: Review land ownership; design of environmental education program for school system.

Cultural landmarks

(i) BELAIR

Location: North Central Carriacou at 719 feet above sea level.

The Belair Cultural Landscape once served as a headquarters for the People's Revolutionary Army. Historically the property was cultivated in sugar cane and thereafter cotton.

Summary Description: In 1784, John Reid, Esq. owned Belair Estate. An old English great house was completed in 1809. Next to the great house, foundations of an older French house exist, indicative of the amount of times the island of Carriacou changed hands.

The house looks upon the old windmill tower still in excellent condition. At one time the entire area was cultivated in sugar cane to support the mill. Thereafter, at the turn of the century, cotton became the predominate crop. Just down the road is an old windmill foundation which is so intact it could be restored.

During the People's Revolutionary Government, the area was utilized as an Army Camp. At the time of the U.S. and Caribbean Forces intervention of Grenada, a large explosion occurred at the house which remains a mystery. (Frances Kay Brinkley, Pers. Comm.)

Significance of the Area: Belair has both French and English ruins, and the finest sugar mill and windmill foundations on the Island. A large cistern is also in place. The Belair Estate affords one of the most spectacular views on the island.

Management Objectives: To protect the ruins and initiate programs of education and research. Frances Kay Brinkley of the Historical Society has recommended that the Belair house be restored to a cultural and conference center. Funding agencies and private sector initiatives should be sought out to restore the house.

Activities: To promote educational programs, to protect the area with patrols. Construction of visitor facilities and design of a self-guiding cultural trail through the estate and management of the site.

(ii) LA POINTE

Location: South Western tip of Carriacou.

The Fossils Beds Natural Landmark in Carriacou expose millions of years of archeology in the sedimentary and igneous layers.

Portable cannons of this nature could be moved about freely thereby surprising the enemy during the tumultuous times when the British and French were continually fighting for dominion over the Islands.

Summary Description: La Pointe Cultural Landmark is situated in a scenic peninsular and contains the ruins of an old French estate house (Frances Kay Brinkley, Pers. Comm.)

Significance of the Area: As is true of all the old estates. La Pointe gives vistas into the history of Carriacou. Iguanas are found here.

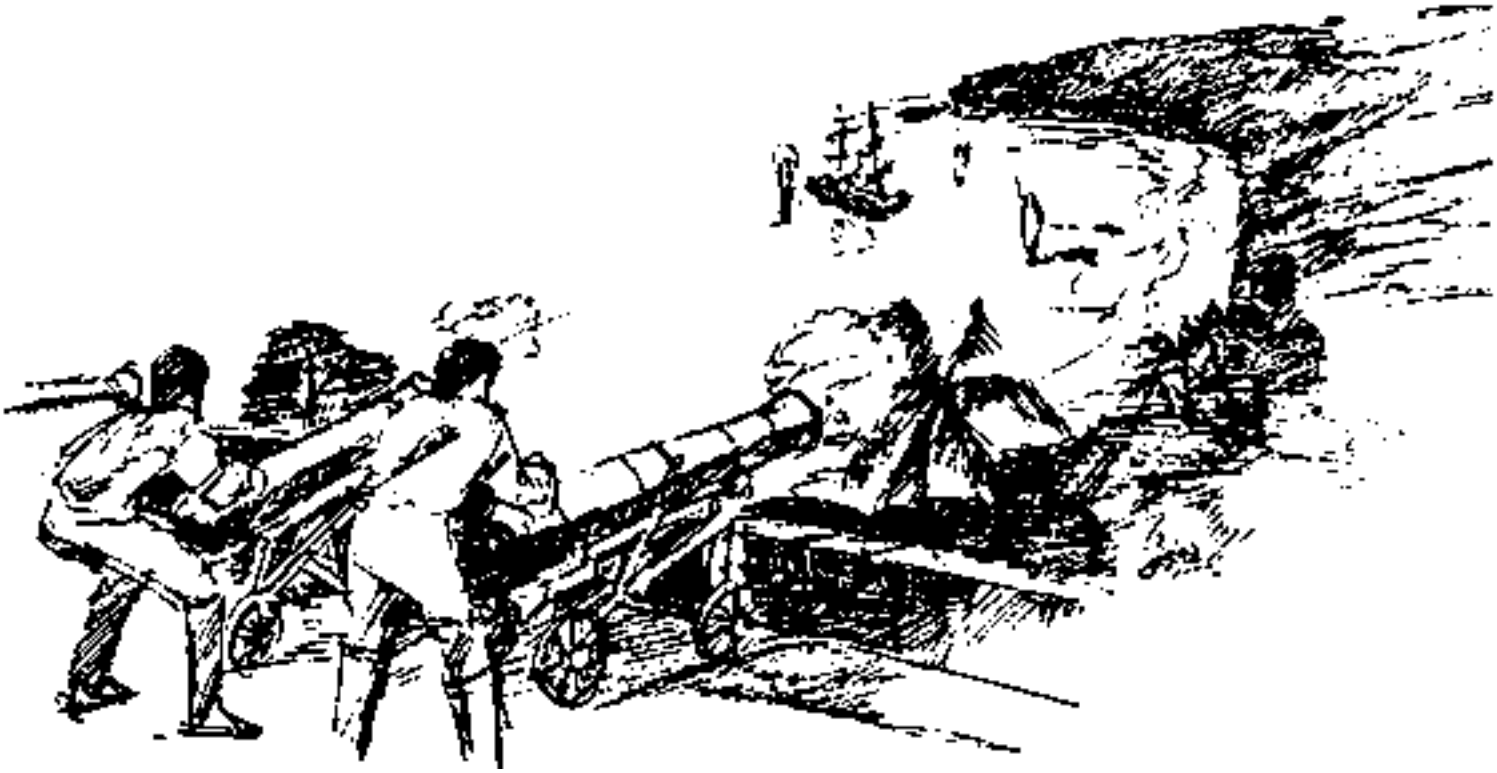
Management Objectives: To protect and continue research into the importance and value of the ruins.

Activities: The declaration of this and all cultural landmarks as areas to be inventoried and studied in more depth.

(iii) DOVER RUINS

Location: 1/4 mile inland North East Carriacou.

Summary Description: The Dover ruins are the site of the first church in Carriacou, and is where Priest Maissoneuve resided. The square cut rocks of the foundation, still in place indicate the importance of northern Carriacou to the first French settlements.



Significance of the Area: The quality of the stone foundation present fascinating opportunities for archeology. The grounds once comprised 16 acres which at one time was Catholic property in Carriacou. Next to it in 1793 was Dover Cottage, a small estate owned by the Anglican Minister, Rev. W. Nash.

Management Objectives: To protect the ruins from any further theft, to tie the area in with an around the Island Tour, and to design programs of cultural education for the local schools.

Activities: Protection of the ruins, visitation by school groups.

TABLE IX - LAND USE SUMMARY - NATIONAL PARKS AND PROTECTED AREAS

Area by Management Category	Size of Area	Existing Land Use (Acreage)	Land Cap Class	Land Use Proposal	Present Admin. and Ownership		
					Admin. Status	State	Priv.
NATIONAL PARKS							

GRAND ETANG	2370						
1. Grand Etang (including Mt. Qua Qua, Mt. Granby)		Natural Wind Swept Forest Natural Reserve Hunting	100% (2370) VIe	National Pk. Critical Conservation Area	Nature Reserve Managed by Forestry Div. Min. of Agric.	1816	554
GRAND ETANG FOREST RESERVE	2000	Lower Montane Rainforest	100% (2000) VIe	Forest Harvesting	2000 Acres managed as Forest Reserve by Forestry Department	2000	
2. Levera	548	23 Acres Mangrove Swamp Agriculture Charcoal production Fishing Hunting Cattle rearing Recreation	30% (164) IIIc Climate Low rainfall 70% (384) IIw (Wet Land)	National Critical Conservation Area	120 Acres - Farms Corporation 428 - Priv. Admin. which includes Sugarloaf, Sandy and Green Island	120	428 Kent's Agency Canadian Dev. Ltd.
3. Mt. St. Catherine	1432	Hunting Hiking Forest	100% (1432) Vie (Erosion)	National Pk. Critical Conservation Area	Crown Land Not managed	1432	-
NATURAL LANDMARKS							
1. Lake Antoine	85	60% Agric. 40% Forest	-	Area of Natural Interest	Privately Administered	-	85 DeGale families
2. Concord Falls	2 Acres	Agriculture Forest Recreation	65% (1.2) VIe 30% (.8) IVe	Natural Landscape To be Preserved	Privately Administered	-	2 acres F-Hamilton
3. Annandale Falls	3 Acres	Agriculture Recreation	70% (2) VIe 30% (1) IVe (erosion)	Natural Landscape To be Preserved	Administered by Min. of Tourism and Forestry Department	3	-

4. Marquis River Falls	2 Acres	Agriculture Recreation	N/A	Natural Landscape To be Preserved	Privately Administered	-	2
5. River Sallee Boiling Springs	1/4 Acre	Agriculture Recreation	N/A	Natural Feature to be preserved	Not Administered	-	1/4
6. Marquis Island	8 Acres	Hunting Natural Cover	50% (4) VIe 50%(4) IVe	Area of Natural and Scientific Interest	Privately Administered	-	8
7. Hog Island	70 Acres	Grazing Recreation	60% (42) VIe 40% (28) IVe	Natural Features To be Preserved	Privately Administered	-	70 Theodore family
8. Quarantine Point	8 Acres	Low Scrub Recreation Radio Transmission Towers	VIe (8)	Critical Landmark To be preserved for its Recreational and Aesthetic Value	Crown Lands Administered by Min. of Agriculture	8	-
9. La Baye Rock	5 Acres	Dry thorn scrub Cactus Forest	100% Vie	Natural Landscape to be preserved	Privately Administered	-	5
PROTECTED SEASCAPE							
1. Northeast Seascape	365	Mangrove Swamps High Cliffs Xerophytic Vegetation Littoral Vegetation	50% (183) IIw 30% (109) Vs Soil factor 20% (74) IIIc	Critical Conservation Area	Many Private Owners	-	365
2. Southern Seascape							
a. Westerhall	36	Mangroves	100% IIw	IIw Classified	Not Owned		4 Residents Assn.
b. Chemin Bay	23	Mangroves		IIw Classified	Not Owned	12	11 Fort Jeudy
c. Egmont Bay	25	Mangroves		IIw Classified	Not Owned	-	25

3. Calivigny Island	12	Grazing Littoral Vegetation	60% (7.2) IVe 40% (4.8) VIe	Not Classified	Privately Owned	-	12 Ken Milne
4. Molinere Reef	655	Scuba Diving	Open Water	Not Classified	Publicly Owned	655	
5. La Sagesse Salt Pond Natural Landmark	19	Littoral Vegetation Mangrove Cocoa Banana Pasture Secondary Forest	20% IIw 80% IVs	Area of Cultural and Historical Interest	Administered by Min. of Agriculture	8	11
CULTURAL LANDMARKS							
1. River Antoine	4	Sugar Cane Pasture Rum Production Mangrove Swamp	N/A	Area of Cultural Historical and Social Interest	Privately Administered	-	4 DeGale family
2. Westerhall Distillery	1	Rum Production	N/A	Area of Cultural and Historical Interest	Privately Administered		1 acre
3. Carib's Leap	2	Recreation	N/A	Area of Historic Importance	-	-	2 Roman Catholic Church
4. "The Tower" St. Paul	11	Residential Recreational	100% IIIe	Historical Monument	Privately Administered	-	11 Slinger family
5. Fort George	5	National Security	N/A	Area of Cultural and Historical Importance	Publicly Administered	5	-
6. Fort Frederick	4	National Security	N/A	Area of Cultural and Historical Importance	Publicly Administered	4	-
7. Marquis Village	N/A	Residential Development Agriculture	N/A	Concentration of Handicraft Development	Privately	N/A	-

8. Mt. Rich Cultural Landmark	3	Agriculture	N/A	Area of Historic & Cultural Interest	Privately Owned	-	3 Morain family
MULTIPLE-USE AREA							
1. Annandale Water	506	Forest Agriculture Water supply	100% Vs	Multi-use Area	Forestry Division Administered	506	-
2. Concord Water	240	Forest Agriculture Water Supply	100% Vs	Multi-use Area for Water Production	Publicly Administered	-	240 F. Hamilton & Others
3. Mt. Hope/Calabony Watershed	655	Forest Agriculture Water Supply	32% (209) Vie 68% (446) IVc	Multi-use Area for Water Production	Privately Owned	"	655
					Present Admin. and Ownership		
Area by Management Category	Size of Area	Existing Land Use	Land Cap Class	Land Use Proposal	Admin. States	State	Priv.
B. CARRIACOU							
NATIONAL PARKS							
1. High North National Pk	606	Forest Grazing Trapping	30% Vs 70% VIe	National Pk. Critical Forest Conservation Area	Nature Reserve State Lands	300	306 128 acres Packard 100 acre Jones, Sylvester 78 acres Mclntyre
NATURAL LANDMARKS							
1. Fossil Beds at Grand Bay		4 cliff	Windswept	N/A Geologic Interest	Area of Land	Crown	4-
PROTECTED SEASCAPES							

1. Lauriston Pt. Sandy Island Mabouya Island	584	Tourism Yachting Mangrove	100% of land surface VIe	Natural Landscape and coral reefs to be preserved	Islands are Government owned. Coral reef & Point are public	584	
2. Tyrrel Bay Mangrove	280	Oyster Harvesting Mangrove Ecosystem	N/A	Area of Natural & Scenic Interest Oyster Harvesting is compatible	Crown land not managed	280	-
3. White Island Saline Island Coral Reefs	564	Grazing on Islands Fishing Tourism	100% of land surface Vie	Area of Scenic Interest Coral reefs are among the best in Grenada	Coral reefs are Public/Privately Administered Islands	74	490
4. Sabazan	6	Grazing	100% of Land Surface Vie	Area of scenic & historic interest	Public/Private	3	1
5. THIBAUD Limlair Estate Cemetary, Tomb & Well	15	Cemetery	100% IVs	Area of Scenic Cultural & Educational Value		15	
CULTURAL LANDMARKS							
Belair Estate (and Hospital View)	6	Agriculture Hospital	N/A	Area of Cultural Historical & Educational Value	Crown lands Administered by Gov't	6	-
Dover Ruins	4	Grazing Ruins	N/A	Area of Historic & Educational Value	Private Ownership		2
La Pointe	11	Grazing	N/A	Area of Historic & Educational Value			1

MULTIPLE-USE AREA AND FOREST RESERVES							
Forest Reserve	36	Quarrying Grazing	100% Vie	Watershed Protection	Crown lands	36	
Chapeau Carre	12	Forest Reserve	100% Vie	Watershed Protection	Crown lands	12	

The view from the Estate Ruins of L'Ance la Rouche looks upon one of Carriacou's most scenic and natural beaches. The area provides outstanding opportunities for tourist and education.

Chapter VI - Development strategy for the national parks system.

The National Parks and Protected Areas Program fits in directly with the economic development of Grenada. With Agriculture, Fisheries, and Tourism making up the vast majority of Grenada's GDP and foreign exchange earnings, a protected areas program can provide a broad variety of benefits to the country because of it's vital support for and linkages to these three sectors.

Institutional analysis

Given the tight fiscal constraints and that the Government is streamlining the Civil Service, the creation of a new management agency is not feasible. Establishment and management of a protected areas system must be based on existing institutions and personnel. All relevant institutions were examined in terms of their policy and objectives, legislation, programs, projects and principal activities, staffing, training, inter-agency collaboration and coordination, control and regulation of state lands or waters, and technical, financial, and administrative constraints.

The Forestry Department was chosen as the most appropriate institution to manage the National Parks and Protected Areas System. This decision was made by a committee made up of representatives from the Forestry Department, Fisheries Division, Land-use and Water Resources, The National Trust, The Historical Society, The Ministry of Education and Culture, and The Organization of American States.

Forestry was chosen because it has the following:

(a) legislation and formal policy which charge it with protecting the nation's fauna, flora, habitats, forests, watersheds and soil and water resources in order to fulfill a series of sustained production, recreation and conservation objectives and the establishment of terrestrial reserves to accomplish those ends;

(b) a notable series of well-designed projects being executed with success, several of which deal with management of an existing forest reserve (proposed Grand Etang National Park) and a multiple use area (Annandale Watershed);

(c) a motivated, active staff with very basic training in forestry, and which is dedicated to the concept of a protected areas program and system;

(d) demonstrated ability to obtain international and national funding and technical assistance and use it effectively and efficiently;

(e) excellent collaborative relationships with many other national agencies;

(f) a basic physical plant and equipment including recently renovated offices, a visitors interpretation center in the proposed Grand Etang National Park, vehicles, field gear etc; and

(g) effective control of several areas given it by Government.

With the gradual addition of certain personnel and a well-designed and executed training program, Forestry could manage most of the system: national parks, natural landmarks, cultural landmarks and multiple use management areas.

The Fisheries Division will assist Forestry in the management of Protected Seascapes and multiple use marine areas. As they have offices in each of the Parishes and in Carriacou, Fisheries has agreed to work closely with Forestry to facilitate in every way the establishment and management of the program.

To advise the Forestry Department on the restoration and management of Cultural Landmarks, the formation of a Cultural Landmarks Steering Committee has been proposed. The Ministry of Education and Culture are to provide technical and logistical support through the UNESCO office. In conjunction, the Historical Society and National Trust will nominate a Chairman of the Cultural Landmarks Steering Committee. Utilizing the National Trust Act of 1967, this team will attract outside funding, oversee the restoration of the cultural landmarks, and design educational programs.

The Agricultural Extension Division has the responsibility to patrol the protected areas on a regular basis to ensure squatting, cropping of wood products or wildlife, hunting, sandmining or any other activity which adversely affects the resource is prohibited or regulated as indicated in the management category. The Extension Officers will report any infraction to the appropriate authorities in the Forestry and/or Fisheries Division. It is recommended that in order to give the Extension Officers the necessary power to carry out this function that they be named Auxiliary Wardens.

The Extension Officers will be trained in their new duties by annual workshops which will be held to inform them of boundaries, regulations, goals and objectives of the Protected Areas Program.

The Horticulture Division with planning and supervision from the Forestry Department, Fisheries Division, and Cultural Landmarks Steering Committee will help to maintain the grounds around the visitor centers and cultural landmarks and to maintain where needed the trail systems. It is recommended that twenty (20) full time labourers from the Ministry of Works begin work on the restoration of Fort George, Fort Frederick, Carib's Leap and other public sites.

The Land-Use and Water Resources Division will contribute to the effective analysis of the protected areas by incorporating them into the land-use capability and integrated watershed management studies presently being conducted. The Protected Areas Policy strengthens the mandate of the Division specifically in the promotion of suitable land-use practices in the multiple use areas.

The Land Division should work closely with Forestry Department to resolve issues of land tenure. People who own land within Protected Areas will be contacted and alternatives will be researched to encourage that the areas remain in a natural state.

The Tourism Department will develop promotional materials and campaigns to attract visitors and citizens to use the Protected Areas for recreation and education. They will help to train tour guides concerning the importance, objectives, resources, facilities, and

regulations of the Protected Areas.

The Education Department and Curriculum Development Unit will assist in the development of environmental and cultural resources and education curricula as integral parts of the social studies and science curricula and will promote training of teachers to utilize the curricula.

The Science and Technology Council will promote, coordinate and carry out key research needed for the planning and management of Protected Areas and promote public awareness and environmental education.

The Mirabeau Farm School is encouraged to add a course in integrated watershed planning and management which would include a solid emphasis on Protected Areas.

The Historical Society/National Trust/Cultural Landmarks Steering Committee - will be important to advise the Forestry Division on the development, management, and maintenance of Cultural Landmarks.

TABLE X INSTITUTIONAL ARRANGEMENTS FOR THE MANAGEMENT OF A PROTECTED AREAS SYSTEM IN GRENADA

TABLE XI - ESTABLISHMENT AND MANAGEMENT OF A SYSTEM OF NATIONAL PARKS AND PROTECTED AREAS

RESPONSIBILITY MATRIX

MINISTRIES, DIVISION & PRIVATE GROUPS

Primary Responsibilities*	Forestry	Fisheries	Education and Curric. Dev.	Tourism	Horticulture	Land-use	Lands and Surveys	Agricultural Extension	Farm School	Historical Society	National Trust	Cultural Landmarks Steering Committee	Min. of Works	Coast Guard	Grenada Hotel Assoc.	Science & Technology	Council
Promote, coordinate and conduct research on protected areas	*	*					*									*	
Promote and monitor education, research and environmental study opportunities	*	*										*				*	
Conserve biological diversity	*	*															
Monitor and control land use practices that can adversely affect protected areas	*	*															
Provide recreation, interpretation and tourism services	*	*		*											*		
Protect cultural sites and areas of historical and archaeologic significance	*										*	*					
Protect and conserve scenic beauty and open space	*	*															
Produce timber, forage or marine products on sustained yield basis	*	*						*									
Maintain open options, management flexibility; permit multiple use	*	*						*									
Stimulate rational, sustainable use of marginal areas and rural development	*	*						*									
Provide a cadre of trained educators to interpret the cultural and natural heritage of Grenada	*	*	*	*					*							*	
Provide a cadre of trained rangers to patrol and protect cultural and protected areas	*	*						*						*			
Identify critical areas to incorporate into a System of National Parks and Protected Areas	*	*		*		*					*	*					

Research land tenure and approach land owners to donate or sell critical conservation areas	*	*					*											
Advise Forestry and Fisheries on cultural landmark development, protection and maintenance				*				*	*	*	*							
Maintain protected areas infrastructure; maintain protected areas ground and trails	*	*			*							*						
Identify critical areas to incorporate into a System of National Parks and Protected Areas	*	*		*		*				*	*							
Research land tenure and approach land owners to donate or sell critical conservation areas	*	*					*											
Advise Forestry and Fisheries on cultural landmark development, protection and maintenance			*	*					*	*	*				*			
Maintain protected areas infrastructure; maintain protected areas grounds and trails	*	*			*							*						

TABLE XII - POTENTIAL USE OF PROTECTED AREAS (Excluding Cultural Landmarks)

4-Excellent
3-Good
2-Fair
0-Insignificant

PROTECTED AREA	Protection of Unique Resources	Endangered Species Habitat Conservation of Ecosystems	Recreation	Tourism	Education	Research	Wood	Forage	Fauna	Water		
HIGH NORTH	4	4	4	4	4	4	2	3	4	3	NATIONAL PARK	36
GRAND ETANG	4	4	4	4	4	4	2	0	3	4		33
LEVERA	4	4	4	4	4	3	2	2	3	3		33
MT. ST. CATHERINE	3	2	2	2	0	2	0	0	3	4		18
MARQUIS ISLAND	3	3	3	3	2	2	0	2	3	0	NATURAL LANDMARK	21
ANNANDALE FALLS	2	2	4	4	3	2	0	0	2	3		22
LA BAYE ROCK	3	3	3	3	2	3	0	0	4	0		21
MARQUIS FALLS	2	2	3	3	2	2	0	0	3	3		20
LAKE ANTOINE	4	3	3	3	3	3	2	3	2	3		29
CONCORD FALLS	3	2	3	3	2	2	2	2	3	4		26
RIVER SALLEE	3	0	2	3	2	2	0	0	2	2		16
HOG ISLAND	4	4	2	2	3	3	0	3	4	0		25
QUARANTINE POINT	2	2	3	3	3	2	0	0	2	0		17
NORTHERN SEASCAPE	3	3	4	4	3	3	0	2	3	3	PROTECTED SEASCAPE	28
SOUTHERN SEASCAPE	3	3	2	2	3	3	0	2	3	3		24
CALIVIGNY ISLAND	2	3	3	3	2	2	0	3	3	0		21
CANOE BAY	3	2	3	3	2	2	0	2	3	0		20
LA SAGESSE	3	4	3	4	4	4	2	3	3	3		33
TYRREL BAY	3	4	2	2	3	4	2	2	3	3		28
SALINE/WHITE ISLANDS	4	4	3	3	3	3	0	2	3	0		25
LAURISTON MABOUYA												

SANDY ISLAND	3	3	3	4	3	3	2	3	3	2		29
LIMLAIR-THIBAUD	2	2	3	3	3	1	2	3	2	3		24
SABAZAN	2	2	2	3	3	3	2	2	2	0		21
MOLINERE REEF	4	4	4	4	4	4	0	0	4	0		28
ANNANDALE	2	2	3	4	2	2	2	2	3	4	MULTIPLE USE	26
CONCORD	2	2	3	4	2	2	2	2	3	4		26
CHEMIN RIVER	2	2	2	2	2	2	2	2	3	4		23
MT. HOPE/CLABONY	2	2	2	2	2	2	2	2	3	4		23
GRAND ETANG	3	2	2	2	2	2	4	0	3	4	FOREST RESERVE	24
CENTRAL RANGE & BELLE VUE SOUTH	2	2	2	2	2	2	3	0	3	3		21

TABLE XIII - ECOSYSTEM ANALYSIS OF PROTECTED AREAS

1-Insignificant
2-Significant
3-Good
4-Very Good
5-Excellent

	NATURAL REGIONS				TERRESTRIAL ECOSYSTEMS						AQUATIC ECOSYSTEMS					GEOMORPHOLOGIC VALUES FORMATIONS		UNIQUE			TOTAL
	Caribbean Sea (Leeward)	Littoral - Beach	Cordillera	Atlantic Ocean	Tropical Dry Thorn scrub	Tropical Dry Forest	Tropical Moist	Lower Montane	Montane	Elfin Woodland	Lakes	Marshes - Bogs	Mangroves - Mudflats	Estuary	River systems	Volcanic Unique Site	Scenic Beauty	Flora/Fauna	Uniqueness	Historical/Cultural Value	
High North	5	5	5	5	5	5							5	2	2	5	5	5	5	5	67
Grand Etang				5				5	5	5	5	5			5	5	5	5	5	3	58
Levera	5		5	3	5	5	2						5	3	2	4	5	5	5	2	56
Saline/White Islands	5	5	5	2	5							3	5	2		5	5	5	5	2	54
Mt. St. Catherine				5			5	5	5							5	4	4	5		38
Northern Seascape	5		5		5	3						3	4	5	4	1	5	4	2		41
Lauriston-Mabouya		5	4		5								5	3	1	2	5	3	2		35
Tyrrel Bay		3			4								5	2			3	4	4		25
Hog Island	5		5	2	4								3			3	5	4	2	1	34
La Sagesse	5		5		5	5							4	5	5	3	5	4	4		48
Southern	5		2		3								3	5	3		3	4	3		30
Southern	5		2		3								3	5	3		3	4	3		30
Seascape																					
Molinere Reef		5			4												5	4	5		23
La Baye Rock	5				5											3	4	3	3		23
Limlair/	3		3		3								2	2			3	2	2	5	25
Thiboud																					
Calivigny	5		5	2	4								3			3	5	4	2	2	35
Island																					
Lake Antoine				2	3						5	4				5	4	2	5	3	33
Sabazan	3		2														3		3	4	15
Marquis Island	4		3		4											5	5	4	5	2	32
Annandale Falls				4						2					5	5	4	2	3	2	27
Marquis River								3							5	1	3	2	3	2	19
Concord Falls										3					5	2	4	3	4	2	23
Quarantine		4			3											5	4	2	3	2	23
Point																					
River Sallee															3		2	5	5		15
Canoe Bay	4		3		3											2	5	4	4	3	28

CULTURAL LANDMARKS																					
Fort George					3											5		3	5	5	21
Fort Frederick										3							4		5	5	17
The Tower																	4		5	4	13
Carib's Leap																	3		5	5	13
Petroglyphs																	2		5	5	12
La Pointe																	2		3	4	9
Belair																	3		3	4	10
Fossil Beds																3	3		5	4	15
Dover Ruins																	3		3	4	10
Marquis Village																	4		5	4	13
River Antoine																	4		5	4	13

CULTURAL LANDMARKS

CULTURAL LANDMARKS	TOURISM POTENTIAL	PROXIMITY TO URBAN CENTER	ECOSYSTEM ANALYSIS	TOTAL	PRIORITY FOR DEVELOPMENT
FORT GEORGE	4	4	21	29	1
FORT FREDERICK	4	4	17	25	2
FOSSIL BEDS	1	1	15	17	7
CARIB'S LEAP	3	3	13	19	4
THE TOWER	3	4	13	20	3
MARQUIS VILLAGE	3	3	13	19	5
RIVER ANTOINE	3	2	13	18	6
PETROGLYPHS	2	1	12	15	8
BELAIR	3	2	10	15	9
DOVER RUINS	2	1	10	13	10
LA POINTE	2	1	9	12	11

4-Excellent
3-Very Good
2-Good
1-Significant
0-Insignificant

TABLE XIV - SYNTHESIS - VALUE OF THE RESOURCE FOR PROTECTION AND DEVELOPMENT PRIORITIES FOR ESTABLISHMENT

MANAGEMENT CATEGORY	PROTECTED AREA	POTENTIAL USE OF PROTECTED AREAS	ECOSYSTEM ANALYSIS	TOTAL	PRIORITY FOR DEVELOPMENT
NATIONAL PARK	High North	36	67	103	1
NATIONAL PARK	Grand Etang	33	58	91	2
NATIONAL PARK	Levera	33	56	89	3
PROTECTED SEASCAPE	Saline/White Isl.	25	54	79	5
PROTECTED SEASCAPE	La Sagesse	33	48	81	4
PROTECTED SEASCAPE	Northern Seascape	28	41	69	6
NATIONAL PARK	Mt. St. Catherine	18	38	56	11
PROTECTED SEASCAPE	Lauriston-Mabouya	29	35	64	7
PROTECTED SEASCAPE	Calivigny Island	21	35	56	10
NATURAL LANDMARK	Hog Island	25	34	59	9
NATURAL LANDMARK	Lake Antoine	29	33	62	8
NATURAL LANDMARK	Marquis Island	21	32	53	13
PROTECTED SEASCAPE	Southern Seascape	24	30	54	12
PROTECTED SEASCAPE	Canoe Bay	20	28	48	18
NATURAL LANDMARK	Annandale Falls	22	27	49	16
NATURAL LANDMARK	Annandale Falls	22	27	49	16
NATURAL LANDMARK	La Baye Rock	21	27	48	19
PROTECTED SEASCAPE	Tyrrel Bay	28	25	53	14
PROTECTED SEASCAPE	Molinere Reef	28	23	51	15

NATURAL LANDMARK	Concord Falls	26	23	49	17
NATURAL LANDMARK	Quarantine Point	17	23	40	21
PROTECTED SEASCAPE	Limlair-Thiboud	24	23	47	20
NATURAL LANDMARK	Marquis River Falls	20	19	39	22
NATURAL LANDMARK	River Sallee	16	15	31	23

Procedure for targeting a development strategy

As mentioned in the Methodology section, a series of overlay maps were prepared based on unique features such as geology, vegetation, wildlife, endangered species habitat, etc. Once analyzed, these maps indicated in a general sense the most important ecosystems in the country. Thereafter, and as is indicated in the "Ecosystem Analysis of Protected Areas", the quality and size of the ecosystems were analyzed. The previous Table IV, "Priority Areas for Protection of Representative samples of Grenada Ecosystems" helped the planning team in the ecosystem analysis.

Once the team was confident that Grenada's most important resources were targeted, the team looked into the "Potential use of the Protected Areas" which is displayed in Table XII. Taking into consideration that conflicts can occur in attempting to protect the areas, such as the site may be suitable for other land-uses such as charcoal in the case of mangrove swamps, forestry in the case of slopes between 30 and 60 percent, or grazing in the case of flatter, dryer habitats, Table XII also helped the planning team decide on the appropriate management category. Potential for recreation, education, and tourism was also analyzed to assist the manager in assessing which areas should be developed first and for what purposes.

Next, the Synthesis Table, Table XIV "Value of the Resource for Protection, and Development Priorities for Establishment" pulls Tables XII and XIII together and gives the decision makers a numeric value for each protected area, and recommends the urgency for development due to potential for human services, and importance of the ecosystem. As can be noted, High North National Park, Grand Etang, and Levera present the top three areas for development, and as a result, will receive the bulk of the immediate attention for development. Nevertheless, the other areas should not be construed as low priorities and every effort must be made to protect their integrity until proper funding is allocated. Thereafter, the development of the resource into a protected area which offers the natural, social, and economic benefits to the community will occur.

In the Cultural Landmarks Category, Fort George and Fort Frederick were the top priorities for development. The National Parks Director should liaise with the Chairman of the Cultural Landmarks Steering Committee to formulate funding strategies to develop these areas for education and tourism. Tourism potential was rated based on the quality of the resource, while proximity to an urban center was an important criterion, because limited funds should be utilized to develop cultural sites which will serve the greatest amount of people.

Finally, based on all the existing tables and information, management priorities are established. In areas where private ownership occurs, the land owners will be requested to state their intentions with the land. If the deemed land-use is inappropriate with the objectives of the National Parks Program, Government purchase will be recommended, or the area will be removed from the Protected Areas list.

Important is the integration of the Extension Division into the Management of the Program by ensuring that all areas are patrolled on a regular basis. Any infractions should be reported to the Forestry and/or Fisheries Division.

Implementation requires that minimally a two year operations plan be written for the area. Construction of appropriate visitor services such as trails, brochures, and scenic overlooks can thereafter be constructed.

Administration requires the liaison with various other agencies as indicated in the responsibility matrix to assure that coordinated effort occurs. Research and environmental education programs will at this time be introduced.

Legislation

Legislation specifically relating to the protection of natural resources is analyzed in Appendix I. Legislation specifically addressing the issue of National Parks, Protected Areas, and Wildlife has not been enacted. In the interim it is recommended to rely on the National Trust Act of 1967, the Forest, Soil, and Water Conservation Act of 1984 and the Grenada Fisheries Act of 1986. The Director of National Parks and Wildlife should review the needs for additional legislation and act appropriately.

Procedure for creating units of the system

Cabinet may by proclamation declare any terrestrial or marine area to be part of the protected areas system. Subsequently the Attorney General drafts requisite legislation for approval by Parliament. The respective Ministry then assumes management of the area. The proclamation should state the management category for the area.

Of particular importance are those agencies concerned with forestry, fisheries, water resources, national physical planning, tourism, cultural resources, agriculture, reclamation, quarrying, sports and recreation, marine affairs and scientific research. When necessary, the agency responsible for the management of the System should seek expertise available in the agencies and organizations to assist in implementation of its programmes.

Administrative body

A Division of National Parks and Wildlife within the Forestry Department of the Ministry of Agriculture will be delegated the responsibility for the planning, management maintenance, and development of National Parks, National Landmarks, and Cultural Landmarks. This would be done in collaboration with Department of Tourism, Historical Society, National Trust and Grenada Hotel Association. The Terrestrial Multiple Use Management Areas will be managed by the Forestry Department. The Fisheries Division within the same Ministry will have the same responsibility for Protected Seascapes and Marine Multiple Use Management Areas.

Those divisions will be authorized to prepare, for approval by the Minister, specific regulations, policies, plans, prohibition standards and procedural rules governing the administration of the various areas designated as units of the System.

Those divisions will be provided with the personnel required to accomplish the various functions necessary to operate the areas within the System.

Management plans

A long term management and development plan will be prepared for each area within the System to establish guidelines for protection, use, management and development of areas within the System. Such a plan will detail the purpose of the area, its values as regards to resources, objectives of management and human needs that should be met. It will present a zoning scheme which will classify land and water according to their need for protection and capability to accommodate visitors and other uses. The plan will provide a framework within which subsequent management, implementation and detailed planning will take place.

The management plan should be prepared by an interdisciplinary team and opportunities will be provided for participation in the preparation of the plan by other interested Government agencies and representatives from the private sector who may be affected by the management of the area. The involvement of the public in plan development will also be encouraged. The management plan and changes thereto must be approved by the Minister responsible.

Operational plans

Operational plans for all units in the System, will be prepared each year. Those plans will give details on all management activities to be conducted, including objectives, description, requisites (equipment, materials, etc.) personnel responsible, chronology and cost for each activity, over a fixed period of 1-2 years. The result is a detailed guide to what will be done, how, who and when it will be carried out and its cost.

Specialized plans

Long-term specialized plans for specific management programs or subprograms will be prepared for those units of the System which require such. Examples of those plans are: Interpretive and environmental education plans for national parks, natural landmarks and cultural landmarks; fisheries management plans for protected seascapes; forestry management plans for multiple use management areas.

Evaluation

The agencies in charge of managing the System will develop and utilize specific methods in order to periodically evaluate the implementation of the various plans and thus determine bottle-necks to efficient and effective execution, be they administrative, technical or planning ones as well as to take into account new information or changing circumstances. This will provide feedback necessary to improve the plans in the next round of planning.

Establishment of regulations and penalties

Regulations governing the management of areas within the System and penalties for infractions will be established by the Ministry and park wardens and other government officers empowered to enforce the regulations.

Finance

The agency responsible for the management of the National Park System will develop both short and long-term funding strategies to finance the System and its activities. Those will include various components such as Government allocations, vigorous efforts to obtain funds from international and bilateral financial and technical assistance agencies and the national private sector, and the establishment of special development and management funds based on a system of special fees on the users and beneficiaries of the System's resources.

Fees may be charged for special services such as camping or brochures to reflect the need to recover a certain portion of operation and maintenance costs but will not be so high as to discourage use by any sector of the public. Government will also consider implementation of various other fees to support the system, such as small percentages of the fees (bills) collected for tourism, water services, wood production, marine products and any other resources which will flow in large part from the System.

In the initial phases the system's costs will have to be borne principally by Government allocations and funding obtained from international and bilateral agencies but Government will place strong emphasis on the gradual internalization of costs via the use of such fees and minor taxes as the System grows and continually increases to provide benefits to the users of the resources, both national and visitors.

The agency may accept gifts or donations when their use will further the work of the programme for the benefit of the people of the country.

Personnel

Personnel requirements for the effective management of the National Parks and Protected Areas Program are analyzed in this report. As the different phases of the System's plan begin to be implemented, the Director of National Parks and Wildlife can seek out increased public sector positions and request assistance for long term and short term international and bilateral organizations such as BDD, the Commonwealth Fund, OAS, World Wildlife Fund, the United States Peace Corps, and International Voluntary Services.

The Directorship of the Protected Areas Program will be housed at the Grand Etang Forest Center, and administrative support will come from Forestry. Minimally it is conceived that the program can be implemented with only the creation of this one position, but as tourism and education programs increase, two interpreters and park managers for Levera and High North Will be essential. Presently in Carriacou, there will be the need for a Parks representative.

The following Table XVI gives guidelines as to the recommended staffing levels that should be considered.

Training recommendations

A wealth of training institutions exist in the park planning and wildlife management fields. As the National Parks and Protected Areas program will utilize existing staff in the Forestry and Fisheries institutions, short training courses will be necessary for the staff.

Park Rangers optimally should have secondary school diploma plus some "0" Levels. They should receive 1-2 technical courses. These courses should be an interpretation of the environment on Park management.

Guards should have at least primary school education and receive short courses, mostly in country, geared towards basic enforcement tactics, monitoring trail conditions and visitor protection.

An annual one-week in-country National Park and Protected Area training workshop should be designed. The objectives of the workshop are to give basic techniques of park planning, management, maintenance and protection. Each workshop should have 2 days of lectures and 3 days of "hands-on" projects for the participants to organize. Topics to include doing Interpretive Plans, Management and Operations Plans, Research and Ecological Analysis, and Site Design and Development Plans.

Training courses both in-country and in other countries can be custom-designed to fit specific needs of the Parks Program.

Training programs held to date have been entitled, "Park Planning and Management Techniques", "A workshop to do an Operations Plan for the Grand Etang National Parks", and "A workshop on Interpretive Techniques". As the Parks Program evolves, training needs can be designed to fit specific objectives and goals of the program.

TABLE XV - MANAGEMENT PRIORITIES

Phase 1 - Immediately
Phase 2 - 2 Years
Phase 3 - 3-4 Years
Phase 4 - 8 Years

PROTECTED AREA	ESTABLISHMENT		MINIMUM PROTECTION	IMPLEMENTATION			ADMINISTRATION				
	Establishment as Priority Area	Land Tenure State/Private Agreement of Management and Protection	Patrol by Extension Division	Operations Plan	Management Plan	Construction of Visitor Service Trails - Brochure	Coordination with Tourism	Resource Management	Research Programs	Education Programs	Personnel
HIGH NORTH	1	1	1	1	2	1	1	1	2	2	2
GRAND ETANG	1	1	1	1	2	1	1	1	2	1	1
LEVERA	1	1	1	1	1	1	1	1	1	1	2
SALINE/WHITE ISL.	2	2	2	2	2	2	2	2	2	2	2
MT. ST. CATHERINE	2	1	1	3	3	2	3	2	2	2	2
NORTHERN SEASCAPE	1	2	1	2	2	1	1	1	2	2	2
LAURISTON/MABOUYA	1	2	2	2	2	1	1	1	2	2	2
TYRREL BAY	2	2	1	2	2	3	3	1	1	2	2
HOG ISLAND	2	2	2	2	2	2	2	1	2	2	2
LA SAGESSE	1	1	1	1	1	1	1	1	2	1	2
LA SAGESSE	1	1	1	1	1	1	1	1	2	1	2
SOUTHERN SEASCAPE	1	1	1	1	1	2	2	1	2	2	2
MOLINERE REEF	1	1	1	1	1	2	1	1	1	2	1
LA BAYE ROCK	2	2	2	2	2	2	1	1	1	2	2
LIMLAIR-THIBOUD	2	2	2	2	2	2	2	2	2	2	3
CALIVIGNY ISLAND	3	3	3	3	3	3	3	3	3	3	3
LAKE ANTOINE	3	3	3	2	2	3	3	3	3	3	2
SABAZAN	3	3	3	3	3	3	3	3	3	3	2
MARQUIS ISLAND	3	3	3	3	3	3	3	3	3	3	2
ANNANDALE FALLS	1	1	1	1	1	1	1	1	2	1	1
MARQUIS RIVER	3	3	3	3	3	3	3	3	3	3	2
CONCORD FALLS	1	1	1	1	1	1	1	1	2	1	1
QUARANTINE POINT	2	2	2	2	2	2	2	2	2	2	2
RIVER SALLEE	2	2	2	2	3	2	2	2	2	2	3
CULTURAL LANDMARKS											
L'ANSE LA ROUCHE	1	1	1	1	1	1	1	1	1	1	1
FORT GEORGE	1	State	1	1	1	1	1	1	1	1	1
FORT FREDERICK	1	State	1	1	1	1	1	1	1	1	1
THE TOWER	1	Priv.	N/A	N/A	N/A	N/A	1	1	1	N/A	N/A
CARIB'S LEAP	2	Priv.	N/A		1	1	1	1	1	1	1
PETROGLYPHS	2	Priv.	2	2	2	2	2	2	2	2	3
LA POINT	3	3	3	2	3	2	2	2	2	2	3
BELAIR	3	3	3	1	3	2	2	2	2	2	3
FOSSIL BEDS	3	3	3	2	3	2	2	2	2	2	3
DOVER RUINS	1	1	1	1	3	2	2	2	2	2	3
MARQUIS VILLAGE	1	3	N/A	1	3	2	2	2	2	2	N/A
RIVER ANTOINE	1	Priv.	N/A	1	3	1	1	2	2	2	1

TABLE XVI - PERSONNEL REQUIREMENTS - NATIONAL PARKS

	PHASE			TOTAL
	1-3 Years	3-8 Years	8-15 Years	
	1	2	3	
Director - National Parks and Wildlife	1			
Park Operations				
Deputy Director - Carriacou	1			
Interpreter/Environmental Educator		2	2	
Park Officer				

(Forester I)	2	2	2	
Secretary	1	1		
Sub-Total	5	5	4	14
Planning, Design, Construction				
Artist		1		
Park Planner		1		
Engineer Surveyor*		1		
Engineer Civil*		1		
Draughtsman I		1		
Sub-Total		5		19

* To be loaned if possible from Ministry of Works

Appendix I - Existing legislation relevant to natural and cultural areas protection

1. Ordinances for the Protection of Birds and other Wildlife:

Grenada Ordinance No. 26 of 1956
No. 26 of 1964
No. 26 of 1966

2. Protection of Forests, Soil and Water Conservation Ordinances:

Grenada Ordinance: No. 1 of 1949
No. 47 of 1954
No. 25 of 1956
No. 129 of 1958
No. 34 of 1984 (Amendment)

3. Establishment of the Grand Etang Forest Reserve:

Grenada Ordinances: Cap. 245 of 1934
No. 29 of 1956 (Revised)
Cap. 314 of 1958 (Revised)

4. Grenada Fisheries Act of 1985

5. Land Settlement Ordinance of 1933

6. The National Trust Act of 1967

None of this legislation provides adequate authority to both establish and manage national parks and protected areas. However, various of these Legislative Acts and Ordinances allow for limited protection or regulation of natural and cultural resources in such areas. Those most directly related to that end are:

An Ordinance to Establish the Grand Etang Forest

Reserve as a sanctuary for the wild animals and birds of the Colony, and to make special temporary provision for the protection of the agouti, armadillo and certain snakes.
(Ordinance Cap: 245 - 1934 Revision No. 29 of 256).

This Ordinance prohibits hunting, trapping, and carrying firearms. The protection of agouti, nine banded armadillo and the five species of snakes was authorized from 1957-1962.

Forest, Soil and Water Conservation - (Amendment) Ordinance No. 34 of 1984

This ordinance indicates that the Public Service Commission shall appoint a suitable person to be "Chief Forestry Officer" who will protect such areas as may be required to provide natural and undisturbed habitat for the flora and fauna of Grenada. The Chief Forestry Officer may create where necessary areas within the forest to satisfy man's need for recreation within a peaceful natural environment. According to the original Ordinance (Chapter 129 of August 1st, 1949), the Chief Forestry Officer may negotiate for the voluntary protection of private land. The owner of any land may request that it be supervised or managed on his behalf by the Chief Forest Officer in such a manner as may be agreed upon. According to the Act, any land (crown land included) may be declared as a "protected area" where deemed necessary for the:

(a) Protection against storms, winds, rolling stones, floods and landslides.

(b) Prevention of soil erosion and landslips, deposits of mud, stones and sand upon agricultural land.

(c) Prevention of wastage of resources of timber and for security and proper management of timber lands.

(d) Maintenance of water supplies in springs, rivers, canals, and reservoirs.

(e) Protection of roads, bridges, airstrips, and other lines of communication.

(f) Preservation of health.

It also contains provisions for controlling squatting on crown lands. Unfortunately, most existing land-use controls are not enforced due to budgetary and personnel constraints.

Grenada Fisheries Act 1986

This ordinance provides for the promotion and management of fishing and fisheries in Grenadian Seas. Part III (Section 23) Marine Reserves and Conservation Measures, indicates that the Minister may declare any area of the "fishery water and, as appropriate, any adjacent or surrounding land", to be a marine reserve where he considers that special measures are necessary to:

(a) Afford special protection to the flora and fauna of such area and to protect and preserve the natural breeding grounds and habitat of aquatic life, with particular regards to flora and fauna in danger of extinction;

(b) Allow for the natural regeneration of aquatic life in areas where such life has been depleted;

(c) Promote scientific study and research in respect of such areas; or

(d) Preserve and enhance the natural beauty of such areas.

Any person who, in any marine reserve, without permission

(a) Fishes or attempts to fish;

(b) Takes or destroys any flora and fauna other than fish;

(c) Dredges, extracts sand or gravel, discharges or deposits waste or any other polluting matter, or in any way disturbs, alters or destroys the natural environment; or

(d) Constructs or erects any buildings or other structures on or over any land or waters within such a reserve is guilty of an offence and shall be liable on summary conviction to a fine not exceeding $1000.00 dollars.

The Land Settlement Ordinance (chapter 154 page 2069 of December 30th. 1933') which authorizes the acquisition of land for public purposes on land settlement areas.

The Town and Country Planning Act 1978. Article 2. Section 1: the National Plan for physical planning should contain general objectives in respect to the use of land development (that is measured to improve the physical environment).

The National Trust Act 1967

This Ordinance established that the purposes of the National Trust, a private body, are:

(a) The listing of buildings and monuments of prehistoric, historic and architectural interest and places of natural beauty with their animal or plant life;

(b) The compilation of photographic and architectural record of the above;

(c) The preservation of chattels of prehistoric, historic or artistic interest and the establishment of museums;

(d) Making the public aware of the value and beauty of the territory's heritage as set out above;

(e) The pursuance of a policy of preservation, and acting in an advisory capacity;

(f) The acquiring of property for the benefit of the Territory;

(g) The promoting and preserving for the benefit and enjoyment of the Territory of submarine areas of beauty or natural or historic interest and for the preservation (as far as possible) of their natural aspect, features and animal, plant and marine life;

(h) The attracting of funds by means of subscriptions, donations, bequest and grants for the effective carrying out of the objects. The Ordinance also clearly establishes that the Trust may hold or own lands and aquatic areas and that such are to be inalienable:

Whenever after the passing of this ordinance any funds or tenements (including buildings) or submarine areas shall become vested in the Trust, the Council may by resolution determine that such land or tenements or marine areas or submarine areas or lakes or rivers or such portions thereof as may be specified in such resolution are proper to be held for the benefit of the Territory, and such lands or buildings or marine areas or submarine areas or lakes or rivers shall thereupon be so held by the Trust and shall be inalienable.

Analysis of Present Legislation

None of the existing legislation provides adequate authority to both establish and manage a system of national parks and protected areas, in the true sense of that terminology. Although existing and proposed legislation provides for the establishment of both forest and marine reserves, it defines the goals of such in only vague, general terms and does not specify adequately the management regimes which should be applied in them. Moreover, the central focus of that legislation is geared towards forestry and fisheries production and the law does not adequately specify that management also should ensure the protection of natural and recreational resources required for areas within a national parks and protected areas system.

Resource protection is largely ignored in present legislation. The Town and Country Planning Act provides certain tools for planning but is not for management purposes and does not cover that aspect, nor specifically mentions national parks and protected areas. In summary, existing and proposed legislation does not adequately define nor specify management of national parks, natural landmarks or cultural monuments, multiple use management areas and protected seascapes. The National Trust Ordinance gives a basis for protecting areas with both natural and cultural resources.

Appendix II - Specific policies for management categories. the national parks and protected areas system of Grenada

Definitions and Regulations

Introduction

The following section will eventually be separated from the formal policy document and system plan for use as a manual by field staff charged with managing units of the park system and enforcing establishment regulations. The reader will note that certain sections of the following document are repetitive of the policy statement. This has been done intentionally since the policy document is an overall statement for use by decision makers while the manual is for field use.

NATIONAL PARK

Introduction

The Government of Grenada has for some time recognized the desirability of setting aside outstanding natural areas representative of the diversity of the ecosystems of the country so as to guarantee their protection and use for present and future generations.

Rapid exploitation of natural resources has demonstrated that unless decisive action is taken to protect outstanding examples of the country's natural heritage, these resources may be altered beyond recuperation for park objectives. The continued trend of urbanization, more leisure time and education has increased the need to provide opportunities for outdoor recreation and tourism in a natural setting.

Criteria for Selection:

National Parks are relatively large terrestrial or marine areas which contain representative samples of the country's major natural regions, features or scenery of national or international significance where plants and animal species, geomorphological features and habitat are of special scientific, educational and recreational interest. They contain one or several ecosystems that are for the most part not materially altered by human exploitation and occupancy. Government will take steps to prevent or eliminate as soon

as possible exploitation or occupancy in the area and enforce existing policy.

The resources are managed and developed so as to sustain recreational and educational activities on a controlled basis. The area is managed in a natural or near natural state. Visitors enter under special conditions for inspirational, educational, cultural and recreational purposes.

Management Objectives:

The management objectives of National Parks call for the protection of natural and scenic areas of national or international significance for scientific, educational and recreational use. The area should perpetuate in a natural state representative samples of major ecosystems, biotic communities and genetic resources, and species in danger of extinction to provide ecosystem stability and diversity.

Management Policies:

General:

In so far as possible the resources in national parks shall be maintained in a natural undisturbed state for their inherent educational, inspirational, scientific and recreational values and as a medium for supporting the diversity and the continuation of life processes.

Natural Resources Management;

The use of the area for agriculture, forestry, grazing, mining, housing or any other commercial or exploitative purpose is prohibited. Fishing, hunting, and collection of flora and fauna, geological items or other natural phenomena, except for authorized scientific purposes is prohibited. Under certain special circumstances traditional fishing may be allowed in marine or coastal areas under regulated conditions called for in the law establishing the area.

- Exotic species of plants and animals will not be introduced into the area.

- The use of pesticides or other chemical products with residual effects is prohibited. However, under extreme circumstances, for example in an effort to fight exotic species invasion, chemicals without residual effects may be authorized by the component authorities.

- The reintroduction of species that have been scientifically proven to have existed in the area previously is permitted if it does not have negative effects on the present desired habitat of species.

- Physical developments within national parks should be limited to those that are necessary for adequate management and appropriate park use and enjoyment.

Visitor Use Policy:

- Visitor use of national parks will be controlled and regulated so as not to damage the natural features that led to the creation of the area. Since the quality of park use depends upon an understanding of the park by the visitor, an imaginative interpretive programme is essential.

- Appropriate visitor use includes both interpretation and wholesome recreation in a natural setting. This does not mean however, that national parks should accommodate all varieties or unlimited recreational use. Outdoor recreation activities such as picnics, hiking, nature observation, photography, swimming and other water oriented activities, bicycling, camping and similar activities can be accommodated.

- A broad programme of interpretation of the natural areas and features of the park will be offered to provide the visitor a clear understanding of the park values and objectives.

- Programmes to promote environmental education should also be encouraged in national parks. They will emphasize cooperation with schools, universities and other organizations for the purpose of communicating environmental principles for application in their daily lives.

- The use of the park for research activities by appropriate educational and scientific organizations should be permitted. Research programmes which aid in the management programmes will be encouraged.

NATURAL LANDMARKS

Introduction

There are many small areas in the Country such as remnant natural forests, areas containing unique species of flora or fauna, geomorphological formations, waterfalls and caves which deserve protective management. For the most part however, these areas are not of the size nor do they contain the diversity of features which would justify their classification and management as a national park. To manage these kinds of natural features, the natural landmark classification has been recommended.

Although a natural landmark may provide for recreation activities, they should be managed in such a way that they are relatively free of man's influences.

Criteria for Selection:

A natural landmark is a land or marine area which normally contains only one or a few natural features of outstanding national significance such as geological formations, unique natural sites, animal or plant species which either because of their uniqueness, natural beauty or because they are threatened with extinction either as individuals or a population, should be protected. The specific feature to be protected ideally has little or no evidence of man's activities. The area may have potential for public recreation and education.

Although generally smaller than national parks, the size of the natural landmark is not a significant factor as the area need only be as large as necessary to achieve the management objectives. For example, the protection of a unique cave formation might require only a few hectares.

Management Objectives:

Management objectives are to protect and preserve the natural features of interest and to the extent consistent with this, provide opportunities for recreation, environmental education and research.

Activities, which can endanger the perpetuation of species or cause damage to the natural phenomena of the landmark will not be permitted.

Natural Resources Management:

Management to perpetuate flora and fauna of natural phenomena which was a major objective for the establishment of the area is permitted. Normally, however, the natural processes will be allowed to evolve freely.

Fishing, hunting and collection of flora, fauna, geological items or other natural phenomena, except those utilized for authorized scientific purposes are prohibited. Traditional fishing may be allowed in marine or coastal areas under regulated conditions if provided for in the law establishing the area.

The use of the areas for agricultural, forestry, grazing, mining, or other commercial or exploitative purpose will not be permitted unless provided for in specific non critical sectors by the law establishing the area.

Exotic species of plants and animals will not be introduced and, where they exist, should be removed if practical. As natural landmarks will frequently be established within agricultural areas of private ownership, these agricultural uses may be continued.

Visitor Use Policy:

Visitors will be permitted in the area under the conditions established by management unless the feature or site is so fragile that visitor use endangers it's preservation.

Interpretation and environmental education programmes will be encouraged.

Provision of outdoor recreation facilities will be permitted although they should not unduly disturb the natural character of the area.

Visitor facilities in keeping with the character of the area may be provided.

Scientific research is encouraged.

CULTURAL LANDMARKS

Introduction:

There are many areas in the country containing cultural features which, because of their potential for education and tourism should be guaranteed protection and maintained.

In the case of Grenada, the protected areas program will tie in so closely with promoting education and tourism, it is appropriate to include Cultural Landmarks.

Cultural Landmarks will include old sugar mills, windmills, rum distilleries, areas of Amerindian importance, military forts, areas of marine history, and religious sites. Often, a cultural site will be developed in conjunction with picnic areas, scenic overlooks, and educational programs. Fort Frederick is an excellent example of an area which merits this sort of attention.

The values of these areas are such that they are capable of providing outstanding opportunities for the development of educational programs with the school system and being included on Island-wide tours for international tourists.

It should be noted that the natural or cultural landmark management category should not be confused with city parks or active recreation areas such as playing fields. The latter should be developed separately in order to have a system of parks and recreation areas.

Criteria for Selection:

A Cultural Landmark is an area of varying size which due to its importance in the historical development of Grenada is capable of supporting educational, touristic and passive recreational uses.

The area may consist of public or private lands which are run in conjunction with the responsible management entity. Private owners may utilize government or international funds to develop the resource, and pending approval of the appropriate bodies charge a modest fee for entrance.

Management Objectives:

The management objectives are to ensure that the cultural and historic features of Grenada are protected, while providing educational, passive recreational, and touristic opportunities in an aesthetically pleasing environment.

Management Policies:

General:

The management and manipulation of the cultural resource will be governed by the specific objectives of the area. Visitor use will be encouraged.

Natural Resources Management:

The use of the areas for agricultural, forestry, grazing, mining or other commercial exploitative purpose will not be permitted.

Fishing, hunting and the collection of flora, fauna, geological items or other natural phenomena, except those utilized for authorized management purposes are prohibited.

Management will be directed toward maintenance and enhancement of habitat for native wildlife.

Manipulation of the landscape may be carried out for the purpose of enhancing the cultural amenities, aesthetics of the area, maintaining a certain stage of plant succession, or improving interpretative or educational programmes.

Exotic species of plants and animals are permitted for landscaping purposes, but native species should be used if possible.

Reforestation will be carried out on eroded or otherwise deteriorated areas.

Visitor Use and Development:

Visitor use for recreation, interpretation and study is desirable to the extent that it is compatible with the carrying capacity of the resource.

Interpretation and environmental education programmes should be encouraged.

Outdoor recreational activities such as picnicking and passive reflection are permitted.

Anthropological, archaeological and historical studies and educational use should be encouraged.

PROTECTED SEASCAPES

Introduction

In Grenada and the Grenadines there are numerous rocky shores, coral reefs, mangroves, cliffs and sandy beaches that offer excellent opportunities for recreation and tourism in aesthetic environments. These distinctive coastal and island patterns are created by the integration and interaction of specific natural and cultural features that present aesthetically attractive land and water settings. These littoral, mangrove, reef, seagrass and island ecosystems are of vital importance to the nation and many local communities because of the ecological process and many economically important species which occur in them such as lobster, conch, finfish, sea turtle, black coral and mangroves. Whole communities depend upon those processes and that sustainable production, for protein, charcoal and many products for commerce. In addition coastal ecosystems are an integral part of the breeding and nesting processes of numerous species such as seabirds, wading birds and marine turtles. As coastal habitats are under extreme developmental pressure throughout the Americas, and due to their importance to migratory birds and waterfowl, significant extensions of the coastal shoreline should be protected. In Grenada and the Grenadines, inappropriate uses such as sandmining, unregulated coral gathering, over-fishing, and harvesting of marine turtles are placing pressure on the ecological and economic viability of these areas. The green turtle is recorded as nesting in only area in the Levera-Sandy Island complex area. The Scarlet Ibis has also been recorded in the mangroves of Levera, a species whose habitat is threatened throughout its range. Grenada has an excellent opportunity to be a leader in managing important coastal and marine resources for both sustained production and conservation of ecological processes and species.

The creation of Protected Seascapes implies a desire by the government for economic, aesthetic, cultural and scientific reasons to protect coastal and marine areas and species. As the government owns very little coastal lands, certain provisions will have to be made to gain the cooperation of private landowners. If possible, the most diverse and scenic areas should be purchased.

Social customs and traditional land practices such as fishing and mangrove cropping for charcoal will be respected provided they do not threaten the viability and regeneration of the ecological systems and processes.

Criteria for selection:

Protected Seascapes include coastal features which posses special aesthetic qualities due to the interaction of man and the edge of the sea and those that are primarily natural areas managed intensively by man for recreational and tourism uses. Special management may be essential to the continued existence of individual species of resident or migratory fauna. The size of the area depends upon the habitat requirements of the important species, the scenic resources and land tenure.

Management Objectives:

It is important to maintain nationally significant seascapes that show the harmonious interaction of man with island, coast, and sea while providing opportunities for public enjoyment through recreation and tourism. These areas also provide for ecological diversity and serve scientific, cultural, and educational purposes.

Management Policies:

General:

To the maximum extent possible natural resources will be maintained in a natural or semi-natural state for their educational, inspirational, recreational, touristic and scientific values. A series of general guidelines will be followed to maximize long-term ecological, economic and social benefits for local communities, the nation and visitors, through carefully established zoning:

- Conservation management over large areas while maximizing economic use, recreation, tourism, public education and research.
- Different degrees of protection and use in different zones within large areas.
- Continued harvesting, in some zones, of living resources at sustainable levels.
- Specification of the uses and activities that can proceed in each zone and the conditions applying to those uses.

Natural Resource Management;

- The area may consist of public land or may include private lands where land and marine water use practices are restricted or controlled.
- Traditional fishing and use of the beach for boat storage is allowed but under controlled management regimes. Use of nets and line is permitted, while use of pots should be strictly prohibited, the former being regulated by specific controls. Specific zoning will be established for all fisheries species such that some zones will be off-limits for all or part of the year to function as nurseries. Other zones will allow fishing for part of all of the year.
- Sandmining will be prohibited.
- Harvesting of sea turtles or their eggs will be strictly prohibited.

Visitor Use Policy:

Opportunities for interpretation and recreation within the area will be provided.

Recreational facilities such as picnicking and camping areas should be offered at suitable spots.

Interpretive facilities such as scenic overlooks, roadside exhibits and nature trails will be encouraged.

Hotels, restaurants, gas stations and similar facilities should be located only in specifically zoned areas. Measures should be taken to avoid destruction of scenic or natural resources and the area should be landscaped and planted to enhance the scenic values of the sites.

Commercial advertising is prohibited.

Road design should be such that it blends with the natural topography of the area and minimizes impacts on the natural environment.

MULTIPLE USE MANAGEMENT AREA

Introduction

A category of management is needed for terrestrial and marine areas that can protect natural resources and ecological systems and yet contribute significantly to economic, social, and material needs of the nation. The multiple function of these lands or water can provide sustained yields of natural products, preserve genetic diversity, and protect natural features and systems. Watershed protection, for example, may be of particular importance in addition to the timber, forage, or wildlife aspect of the area. In marine areas, protection of biological diversity may be important as well as sustaining the production of fish or other marine products.

Criteria for Selection:

A large area containing considerable territory suitable for production of wood products, water, pasture, wildlife, or marine products or for outdoor recreation may be settled and altered by man. The area may possess nationally unique or exceptional nature features or may have international or national significance.

Management Objectives:

Sustained production of water, timber, wildlife, pasture, or marine products and outdoor recreation should all be ensured. The conservation of nature may be primarily oriented to the support economic activities (although zones may be also designated within these areas to achieve specific conservation objectives). Within the overall area, zones may be established in which either the conservation of nature of sustainable development is the primary objective.

Management Policies:

General:

Planning programmes to ensure that the area is managed on a sustainable yield basis would be prerequisite. Land ownership will be under government control to the maximum extent possible. Through proper zoning, parts of the area could range from having the equivalent of scientific reserve status to having development consistent with the principles of environmental management. Multiple use is considered to be the management of all renewable resources, utilized in some combination to meet the needs of the country. The major premise in the management of these areas is that they will be managed to maintain the overall productivity of the area and its resources in perpetuity.

Natural Resources Management:

The area should be principally public land. Private land may be included in certain circumstances but under management regimes established by the Government.

Forestry production, agroforestry, grazing, mining, wildlife harvesting, fishing, hunting and marine products harvesting will be permitted under specific regulations and always assuring sustainable production of the resources.

The use of inputs such as fertilizers, pesticides and other agrochemicals will be permitted under strict controls.

A specific zoning scheme will be applied to maximize benefits for all uses and to avoid conflicts amongst those uses. Likewise temporal regulations throughout the year will be established to ensure sustained production of resources and minimize conflicting uses.

Under certain circumstances, exotic species may be introduced into the area in certain zones, under strict regulations.

If possible, wilderness or strict resource protection zones will be established where only scientific, educational and rustic recreational facilities and uses will be permitted.

Public Use Policy:

The establishment of outdoor recreational and educational facilities and activities will be encouraged.

Scientific research will be encouraged, especially that applied to management problems.

Residential sites, industrial developments and similar constructions will not be encouraged and when. necessary will be strictly regulated.

Road design will be such that it blends with the natural topography and minimizes impacts on the natural resources.

Commercial advertising is prohibited.

BIOSPHERE RESERVES

Introduction

One focus of the UNESCO Man and the Biosphere Programme, initiated in 1970 is to conserve representative natural areas throughout the world through the establishment of a network of biosphere reserves. In order to propose that areas be declared as such a National MAB Committee must be formed, which then sends nominations to UNESCO, for acceptance or not by the international Governing Committee of the MAB Programme.

Criteria for Selection:

Biosphere reserves should have the following characteristics:

(1) Contain representative samples of one or more ecosystems, ecological zones or biomes, which are self-sustainable to the maximum degree possible and with adequate legal and political base.

(2) Offer opportunities for basic and applied research and monitoring, particularly that directed toward and supporting management and appropriate use of resources, combining human needs and principles of ecology.

(3) Offer opportunities (and eventually facilities) for education and training, for all sectors and levels of society.

(4) Contain types of resource uses and practices, which are appropriate and which can be demonstrated, maintained, improved and promoted.

(5) Where possible allow for rehabilitative or restorative programs for environments totally or partially altered by inappropriate use of other phenomena.

(6) Should be large enough to constitute an effective conservation unit and to accommodate the different uses without conflict.

Management Objectives:

The objectives are:

(1) Conserve representative samples of ecosystems, ecological zones or biomes, which are auto-sustainable to the maximum degree possible and with adequate legal and political guarantees.

(2) Promote and facilitate basic research and monitoring in those ecosystems, their elements and processes, as well as applied research and monitoring on their appropriate use and management, via study of existing uses and experimentation.

(3) Provide opportunities and facilities for education and training of the general public (all sectors), resource managers and scientists, at all levels.

(4) Promote the use of the reserves' natural and cultural resource by appropriate practices, assuring sustained production and permanence of productivity and those practices.

(5) Promote appropriate integrated development in the biomes (ecosystem, ecological zone), via the study, conservation and promotion of resource use practices appropriate to that ecological region.

The biosphere reserve will be zoned to provide direction to management. Four zones may be delineated, the last one being optional depending upon each individual case. The first three are mandatory:

(1) Complete Protection Zone. - Baseline for the ecological region.

- Non-manipulative, baseline research and monitoring.
- Limited/controlled education and training.

(2) Multiple Function Zone (Buffer Zone)

- Basic and applied research, manipulative and non manipulative. Research and monitoring of environment, but also social, economic, cultural parameters.
- Education and training at all levels.

Appropriate uses of resources are permitted, improved, promoted, and demonstrated (fisheries, tourism, hunting, grazing, forestry production, agriculture, etc.) and may have human settlements.

(3) Stable Cultural Zone

Protection and study of ongoing culture and resource use practices which look toward minimizing the conflicts inherent in these processes.

(4) Reclamation or Restoration Zone

Managed to study restoration of damaged ' resources (human-caused or natural).

Management Policies:

Biosphere reserves will provide opportunities for ecological research, particularly baseline studies, both within natural and altered environments. These reserves have particular values as benchmarks or standards for measurement of long-term changes in the

biosphere as a whole and are consequently important sites for environmental monitoring. Biosphere reserves will provide facilities for education and training.

WORLD HERITAGE SITE NATURAL AND/OR CULTURAL

Introduction

The International Convention concerning the Protection of the World Cultural and Natural Heritage (UNESCO, 1972) provides for the designation of areas of "outstanding universal value" as World Heritage Sites". These exceptional areas must be recommended by the signatory nation responsible for the site for declaration by the World Heritage Committee.

Criteria for Selection:

Areas to be considered under the convention will be restricted to those of truly international significance. In most cases the sites will be previously designated protected areas of another management category at the national level.

Natural sites must represent one or more of the following:

- The major stages of the earth's evolutionary history.
- Significant ongoing geological processes, biological evolution, and man's interaction with his natural environment.
- Unique, rare, or superlative natural phenomena or formations, features, or areas of natural beauty.
- Habitats where populations of rare or endangered species still survive.

Cultural sites should represent one or more of the following:

Monuments: architectural works, monuments, sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of outstanding universal value from the point of view of history, art or science.

Groups of Buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity of their place in the landscape, are of outstanding universal value from the point of view of history, art or science;

Sites: works of man or the combined work of nature and/or man, and areas including archaeological sites which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological points of view.

Some sites may qualify for both the natural and cultural resources they contain.

Management Objectives:

The objectives of a World Heritage site are to protect the natural and/or cultural features for which the area was considered to be the world heritage quality; to provide information for worldwide public enlightenment; and to provide for research and environmental monitoring.

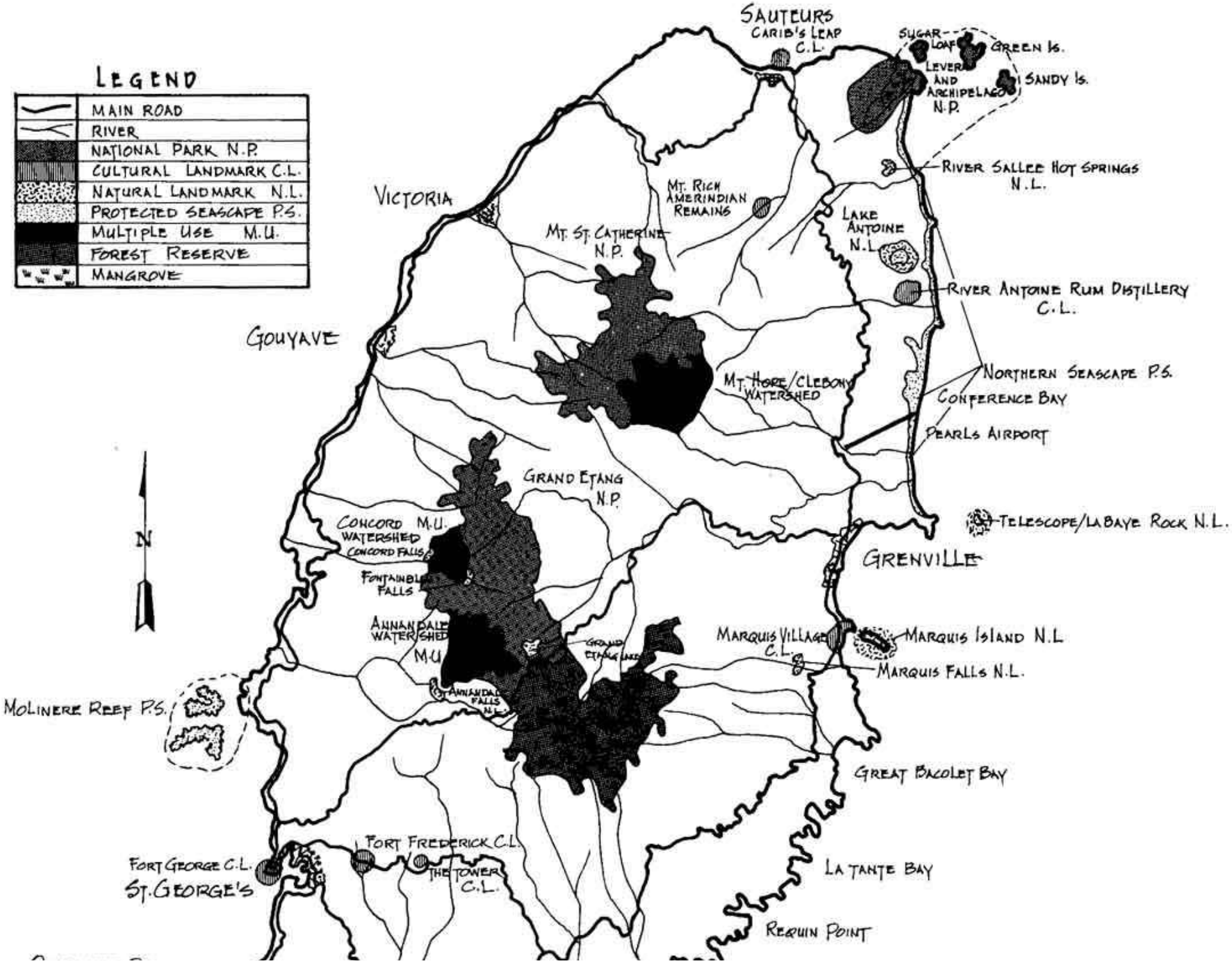
Management Policies

Natural or Cultural Heritage Sites must fulfill conditions relative to the integrity of the sites.

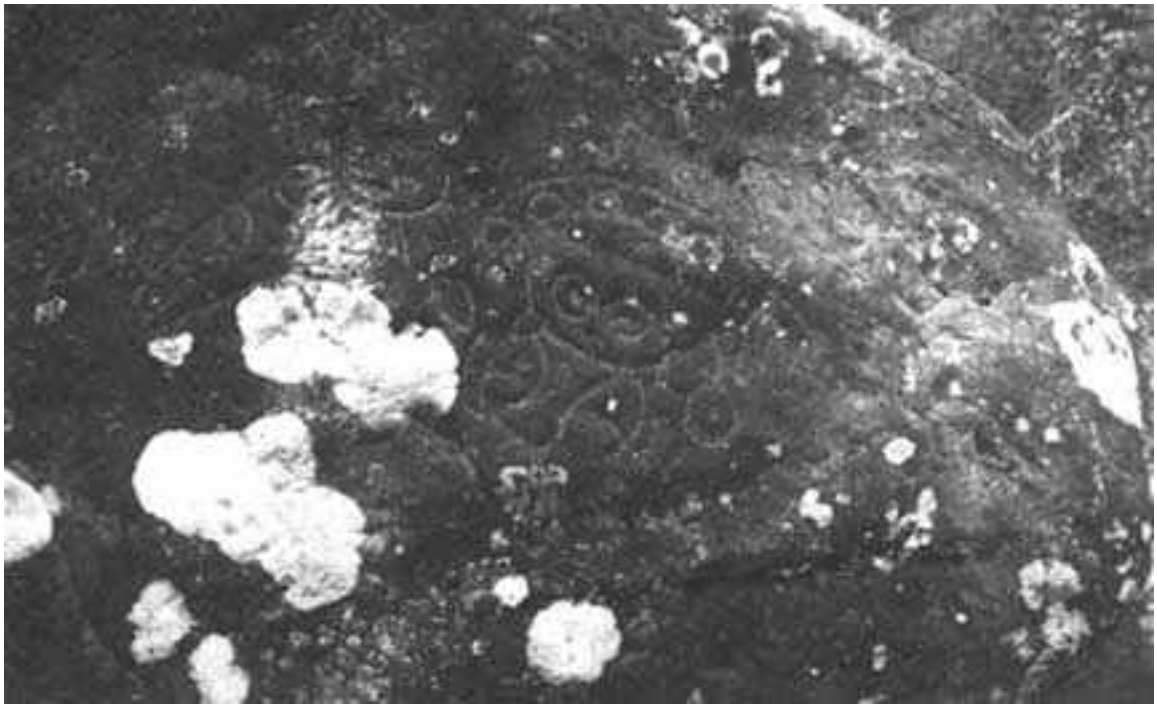
Management of these sites will stress the maintenance of heritage values, will ensure the continuation of legal protection, and will promote each site for its significance to each country, its people, and the world.

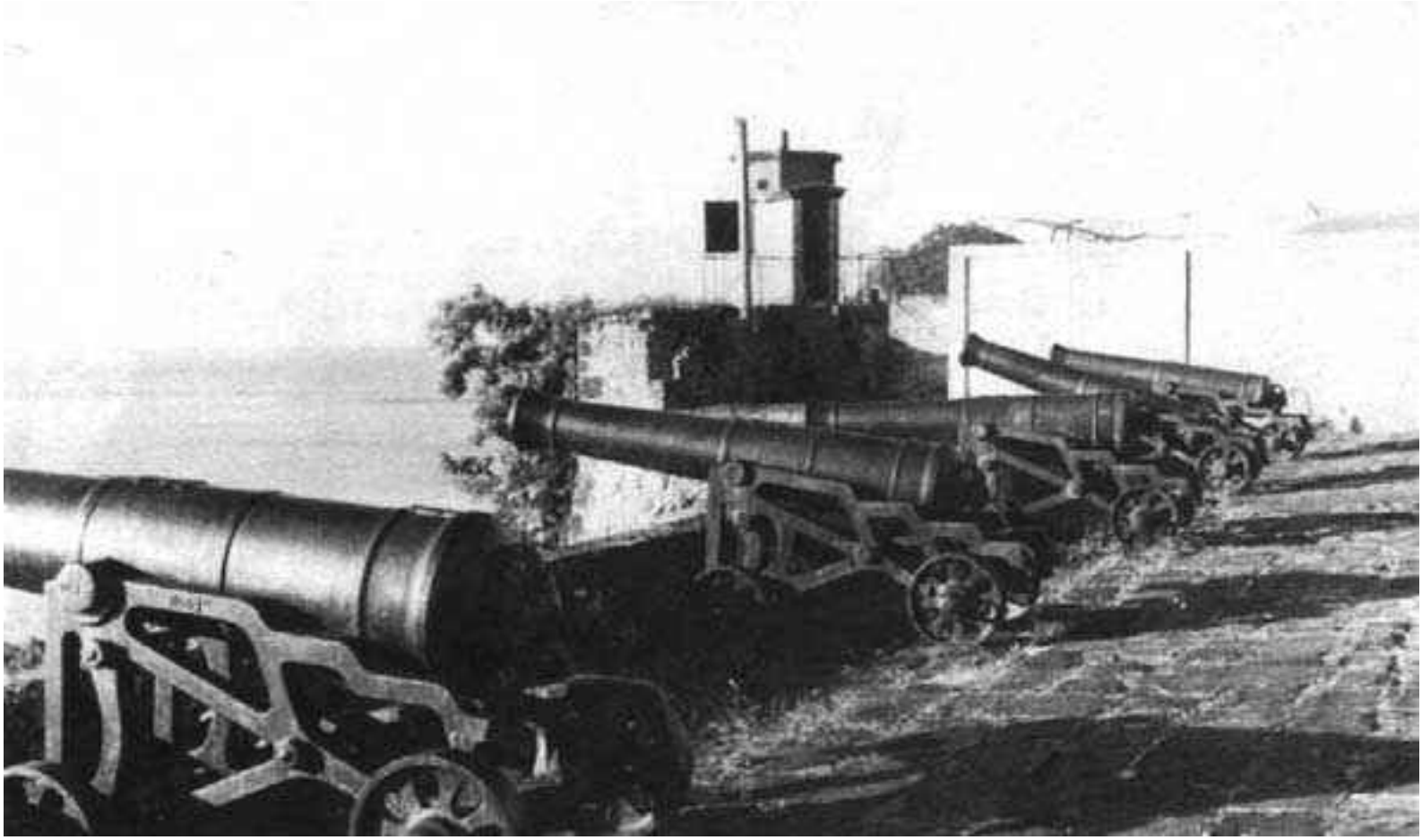
All such sites must have strict legal protection and will be owned by government

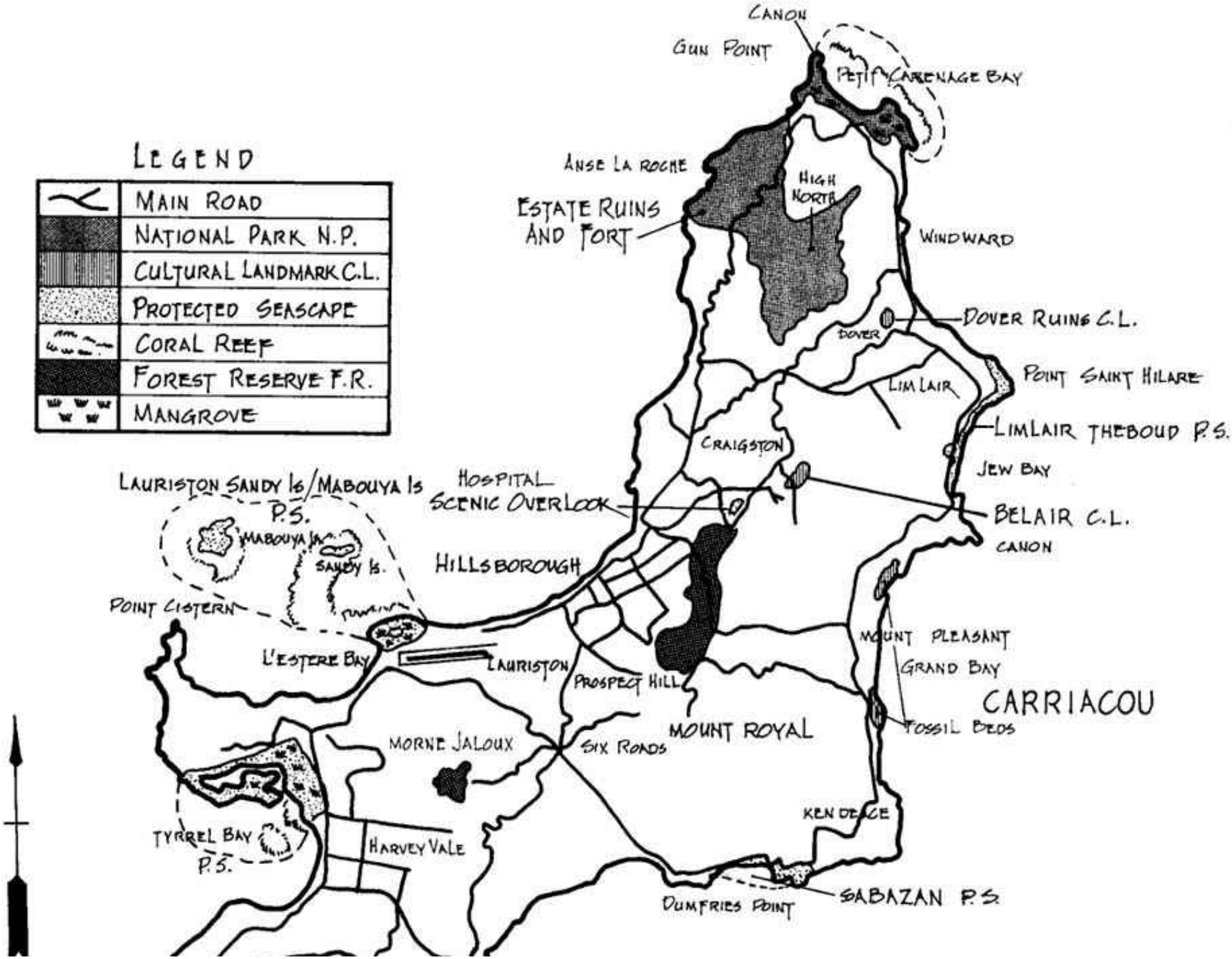
Figure

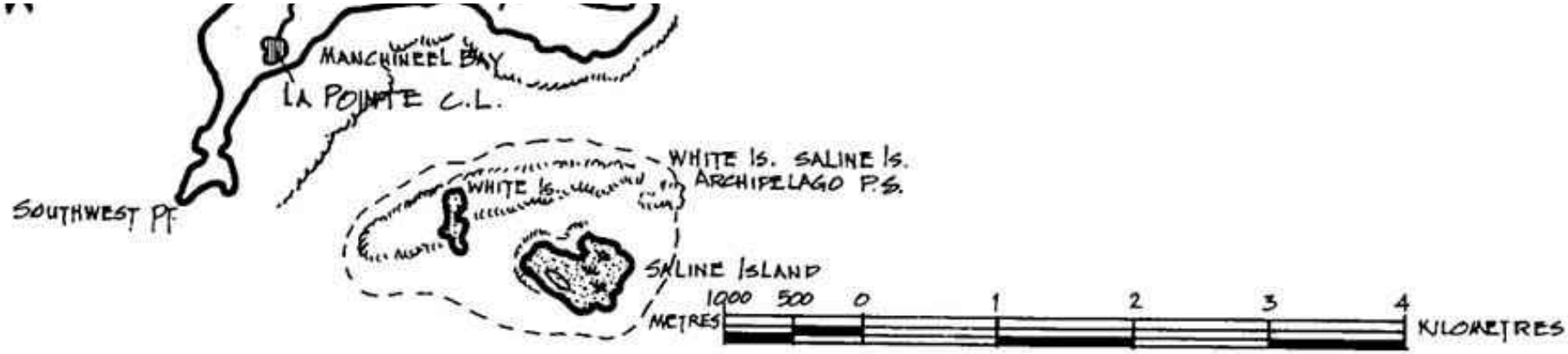

LEGEND
MAIN ROAD
RIVER
NATIONAL PARK N.P.
CULTURAL LANDMARK C.L.
NATURAL LANDMARK N.L.
PROTECTED SEASCAPE P.S.
MULTIPLE USE M.U.
FOREST RESERVE
MANGROVE
SAUTEURS
CARIB'S LEAP C.L.
SUGAR LOAF
GREEN Is.
LEVERA AND ARCHIPELAGO N.P.
SANDY Is.
RIVER SALLEE HOT SPRINGS N.L.
VICTORIA
MT. RICH AMERINDIAN REMAINS
MT. ST. CATHERINE N.P.
LAKE ANTOINE N.L.
RIVER ANTOINE RUM DISTILLERY C.L.
GOUYAVE
MT. HORE/CLEBONY WATERSHED
NORTHERN SEASCAPE P.S.
CONFERENCE BAY
PEARLS AIRPORT
GRAND ETANG N.P.
N
CONCORD M.U. WATERSHED
CONCORD FALLS
TELESCOPE/LA BAYE ROCK N.L.
GRENVILLE
FONTAINEBLEAU FALLS
ANNANDALE WATERSHED M.U.
MARQUIS VILLAGE C.L.
MARQUIS ISLAND N.L
MARQUIS FALLS N.L.
MOLINERE REEF P.S.
ANNANDALE FALLS N.L.
GREAT BACOLET BAY
FORT FREDERICK C.L.
FORT GEORGE C.L.
ST. GEORGE'S
THE TOWER C.L.
LA TANTE BAY
REQUIN POINT


QUARANTINE PT.
N.L.
LA SAGESSE P.S.
POINT SALINES INTERNATIONAL AIRPORT
WESTERN HALL BAY
SOUTHERN SEASCAPE P.S.
CANOE BAY P.S.
FORT JEUDY
LANCE AUX EPINES
HOG ISLAND
N.L.
CALIVIGNY ISLAND P.S.
1 3/4 1/2 1/4 0 1 2 3
Miles






LEGEND
MAIN ROAD
NATIONAL PARK N.P.
CULTURAL LANDMARK C.L.
PROTECTED SEASCAPE
CORAL REEF
FOREST RESERVE F.R.
MANGROVE
CANON
GUN POINT
PETIT CARENAGE BAY
ANSE LA ROCHE
HIGH NORTH
ESTATE RUINS AND FORT
WINDWARD
DOVER RUINS C.L.
DOVER
POINT SAINT HILARE
LIMLAIR
LIMLAIR THEBOUD P.S.
CRAIGSTON
JEW BAY
LAURISTON SANDY Is/MABOUYA Is P.S.
HOSPITAL
SCENIC OVERLOOK
BELAIR C.L.
MABOUYA Is.
SANDY Is.
CANON
HILLSBOROUGH
POINT CISTERN
MOUNT PLEASANT
L'ESTERE BAY
LAURISTON
GRAND BAY
PROSPECT HILL
CARRIACOU
MOUNT ROYAL
FOSSIL BEDS
MORNE JALOUX
SIX ROADS
KEN DEACE
TYRREL BAY P.S.
HARVEY VALE
SABAZAN P.S.
DUMFRIES POINT


MANCHINEEL BAY
LA POINTE C.L.
SOUTHWEST PT.
WHITE Is. SALINE Is.
ARCHIPELAGO P.S.
WHITE Is.
SALINE ISLAND
1000 500 0 1 2 3 4
METRES
KILOMETRES


PRA RETURN #4 SALUTE
THE 2ND PERIOD OF CONSTRUCTION.

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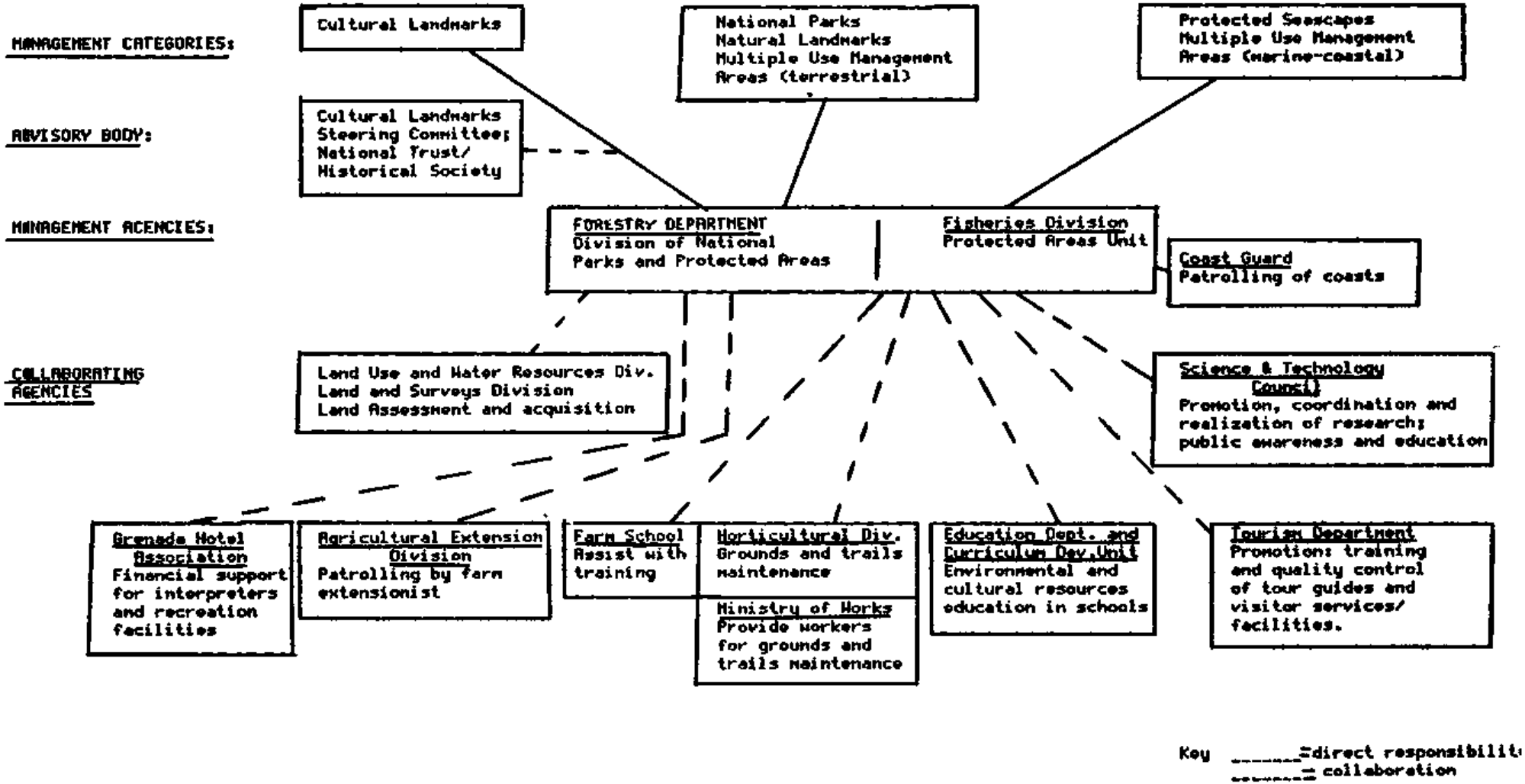
MANAGEMENT CATEGORIES:
Cultural Landmarks
National Parks
Natural Landmarks
Multiple Use Management
Areas (terrestrial)
Protected Seascapes
Multiple Use Management
Areas (marine-coastal)
ADVISORY BODY:
Cultural Landmarks
Steering Committee;
National Trust/
Historical Society
MANAGEMENT AGENCIES:
FORESTRY DEPARTMENT
Division of National
Parks and Protected Areas
Fisheries Division
Protected Areas Unit
Coast Guard
Patrolling of coasts
COLLABORATING AGENCIES
Land Use and Water Resources Div.
Land and Surveys Division
Land Assessment and acquisition
Science & Technology Council
Promotion, coordination and
realization of research;
public awareness and education
Grenada Hotel Association
Financial support
for interpreters
and recreation
facilities
Agricultural Extension Division
Patrolling by farm
extensionist
Farm School
Assist with
training
Horticultural Div.
Grounds and trails
maintenance
Ministry of Works
Provide workers
for grounds and
trails maintenance
Education Dept. and Curriculum Dev.Unit
Environmental and
cultural resources
education in schools
Tourism Department
Promotion: training
and quality control
of tour guides and
visitor services/
facilities.
Key _____=direct responsibilit
_____= collaboration


CARRIACOU
CANNON
GUN POINT
PETIT CARENAGE BAY
ANSE LA ROCHE
ESTATE RUINS AND FORT
WINDWARD
RUINS C.L
POINT ST. HILAIRE
LIALAIR
LIALAIR THIBAUD P.S.
JEW BAY
BELAIR C.L.
HOSPITAL
SCENIC OVERLOOK
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MABOUYA IS.
SANDY IS.
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CORNE JALOUX
TYRREL BAY P.S.
HARVEYVALE
DUMFRIES PT.
SABAZAN P.S.
LA POINTE C.L.
MANCHINEEL BAY
SOUTHWEST PT.
WHITE IS.
WHITE ISLAND, SALINE ISLAND ARCHIPELAGO P.S
SALINE IS.

The Organization of American States

The purposes of the Organization of American States (OAS) are to strengthen the peace and security of the Hemisphere; to prevent possible causes of difficulties and to ensure the pacific settlement of disputes that may arise among the member states; to provide for common action on the part of those states in the event of aggression; to seek the solution of political, juridical, and economic problems that may arise among them; and to promote, by cooperative action, their economic, social, and cultural development.

To achieve these objectives, the OAS acts through the General Assembly; the Meeting of Consultation of Ministers of Foreign Affairs; the three Councils (the Permanent Council, the Inter-American Economic and Social Council, and the Inter-American Council for Education, Science, and Culture); the Inter-American Juridical Committee; the Inter-American Commission on Human Rights; the General Secretariat; the Specialized Conferences; and the Specialized Organizations.

The General Assembly holds regular sessions once a year and special sessions when circumstances warrant. The Meeting of Consultation is convened to consider urgent matters of common interest and to serve as Organ of Consultation in the application of the Inter-American Treaty of Reciprocal Assistance (known as the Rio Treaty), which is the main instrument for joint action in the event of aggression. The Permanent Council takes cognizance of matters referred to it by the General Assembly or the Meeting of Consultation and carries out the decisions of both when their implementation has not been assigned to any other body; monitors the maintenance of friendly relations among the member states and the observance of the standards governing General Secretariat operations; and, in certain instances specified in the Charter of the Organization, acts provisionally as Organ of Consultation under the Rio Treaty. The other two Councils, each of which has a Permanent Executive Committee, organize inter-American action in their areas and hold regular meetings once a year. The General Secretariat is the central, permanent organ of the OAS. The headquarters of both the Permanent Council and the General Secretariat is in Washington, D.C.

The Organization of American States is the oldest regional society of nations in the world, dating back to the First International Conference of American States, held in Washington, D.C., which on April 14, 1890, established the International Union of American Republics. When the United Nations was established, the OAS joined it as a regional organization. The Charter governing the OAS was signed in Bogota in 1948 and amended by the Protocol of Buenos Aires, which entered into force in February 1970. Today the OAS is made up of thirty-two member states.

MEMBER STATES: Antigua and Barbuda, Argentina, The Bahamas, (*Commonwealth of***), Barbados, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, (***Commonwealth of***), Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, United States, Uruguay, Venezuela.**