**ORGANISATION OF EASTERN CARIBBEAN STATES**
**ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT**

# ENVIRONMENTAL AND SOCIO-ECONOMIC STUDIES FOR OPAAL DEMONSTRATION SITES

# CABRITS NATIONAL PARK (MARINE COMPONENT) SITE REPORT, DOMINICA

ECO REPORT No. 11/2007

July 31, 2007

PREPARED BY

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# EXECUTIVE SUMMARY

## OVERVIEW

Ecoengineering Caribbean Limited was authorised by the Environment and Sustainable Development Unit (ESDU) of the Organization of Eastern Caribbean States (OECS) to undertake Environmental and Socio-Economic studies under the OECS Protected Areas Associated Livelihoods (OPAAL) Project. The OPAAL project has as its global objective, "to contribute to the conservation of biodiversity of global importance in the Participating Member States by removing barriers to the effective management of protected areas (PAs), and increasing the involvement of civil society and the private sector in the planning, management and sustainable use of these areas."

As part of the establishment of PAs under the OPAAL Project, two types of environmental and socio-economic studies were commissioned. Baseline environmental and socio-economic studies were used to determine the status of the resource base, its use and the nature of communities associated with the site, and, detailed site preparation studies were used to identify adverse environmental or socio-economic impacts associated with the development, identifying safeguards and / or mitigation measures.

This site report documents findings of a site visit to the marine component of the Cabrits National Park in Dominica during the period March 7$^{th}$ to 16$^{th}$, 2007.

## PHYSICAL CHARACTERISTICS

The Cabrits Peninsula is located along the north-western coast of Dominica approximately 2 kilometres from the town of Portsmouth. The peninsular is comprised of twin peaks of extinct volcanoes - the east Cabrits rising to a height of 485 feet (140m) and the west Cabrits rising to 560 feet (171m). An extensive swamp, 35 ha (89 acres) is located just east of the Cabrits. The marine component of the Cabrits National Park (MC/CNP) is the equivalent of 1,053 acres (421 hectares) of sea between Prince Rupert's Bay and Toucarie Bay and extends from the Lamothe River mouth at Cottage, north of Toucarie Bay, to the southern side of the Cabrits peninsular.

The rainfall pattern in the Cabrits area is very seasonal (1500 mm to 1800 mm per year) with a marked dry season and wetter rainy season. There are approximately 21 rivers in the study area. The Indian River to the south is a well established tourist attraction. Beaches composed of sand from marine and

terrestrial sediments line the inner portions of the two bays in the study area: Prince Rupert and Douglas Bays. Beaches in both bays have been severely eroded due to the high wave activity caused by tropical storm and hurricane systems. Water depths in the study area can be 200 feet very close to the shoreline. Water quality testing for microbial contamination from two separate studies show that Indian River, Glanvillia and Toucari Bay are most contaminated.

## METHODOLOGY

Significant baseline information was collected for the Cabrits National Park from studies provided by the ESDU. To build a more robust data base for the Cabrits National Park, Ecoengineering expanded on available information from these previous studies and published sources by conducting field reconnaissance and having interviews with key stakeholders within and around the study areas.

Diver roving surveys and snorkelling surveys were conducted at selected sites within the MC/CNP. The Reef Check method was also used to gather data on substrate composition, target and indicator species of fish and invertebrates, coral condition (including bleaching and signs of disease) and obvious signs of human impact such as garbage, anchor damage, and abandoned fishing lines, etc.

During a site visit to the Cabrits wetland, vegetation types were identified. For each vegetative type and a list of dominant species was generated. Avifauna was also identified opportunistically while walking along the trails within the wetland. Bird identifications were conducted during the morning period by visual and auditory means. The abundance of each species was also noted. Other fauna observed on site were noted. Any areas of obvious damage were identified.

To gather socio-economic data as well as other information in the park, several key governmental agencies were interviewed. Discussions were held with the Environmental Health Department, the Ministry of Tourism, the Statistics Department, the Physical, Planning Department, the Fisheries Department, the Dominica Port Authority, the Coast Guard, and the Forestry, Wildlife & Parks Division. Additionally, questionnaire surveys were used to gather information from other key stakeholders such as Area Residents, Fishermen, Tourists / Yachters, Tour Boat Operators and Divers.

## FINDINGS

### *Marine Environment*

Coral reefs were generally in good condition. The most pristine coral formations were observed at Cabrits South. Corals observed were a mix of hard and soft corals. Areas of damage as a result of the passage of hurricanes were observed at Toucarie, Douglas Point South, Cabrits North and Pinnard Reef. Evidence of algal over-growth was observed at Toucarie, Douglas Point South and Cabrits North. Although bleaching and black-band disease were observed on some of the reefs during the earlier 1996 study, no evidence of this was observed during this study.

Seagrass beds were observed at three locations. Those two at Douglas Bay and Toucarie Bay were within the boundaries of the MC/CNP and the seagrass at Prince Rupert Bay was just east and south of the park. Seagrass beds were dominated with Syringodium sp. at all three sites. Scarring of the seagrass beds and patchy growth were observed at Douglas and Prince Rupert Bays. In Prince Rupert Bay this is due to the anchor damage from yachts. In Douglas Bay this may be due to storm damage during the passage of hurricanes. The seagrasses in Toucarie Bay were degraded by the deposition of solid wastes from anthropogenic sources.

Marine Mammals in the form of whales and dolphins are observed within the waters of the west coast of Dominica and discussions with fishermen indicate that these animals may venture into the park from time to time. Hawksbill turtles are known to nest on the beaches of the west coast. Within the study area nesting occurs at Douglas and Toucarie Bays. However, these beaches have experienced severe erosion due to the passage of hurricanes.

### *Wetlands*

There are three main ecotypes within the Cabrits wetland system: mangroves, swamp forest and marshlands. The wetland supports all the major faunal groups on Dominica including birds, reptiles, amphibians, fish, mammals, crustaceans and insects.

### *Socio-Economic*

Fishing is the primary source of income for most of the families in the areas studied. A small number also worked at the Ross University and fished part time. The majority of the respondents agreed that the quality of the reef has changed over the years mainly due to the hurricane and increase in construction on the

roads. Also, respondents were in general agreement that the reef should become a marine protected area. The all agreed that it would have a positive impact on the reef. The majority of the respondents indicated that the Marine Protected Area (MPA) would not affect their livelihood. The few that felt their livelihood would be affected were fishermen, divers and yachters who feared that their activities on the reef would be restricted. There are few Hotels / Restaurants within the Cabrits / Portsmouth area. Only one indicated organising tours for guests. Fish bought was usually from deep sea fishermen. Most of the respondents valued the reef, even if they do not use the reef often.

## DRAFT MANAGEMENT PLAN

The main goal of the 2007 – 2010 Draft Management Plan for the Cabrits National Park – Marine Area is "to manage the cultural, recreational and economic values of the marine park in such a manner as to maintain its biological diversity and value for future generations."

Zonation was identified as one of the key management tools for the MC/CNP. It will include a "No-take" or Nursery Zone, a Recreation Zone a Fishing Priority Zone and a Turtle Preservation Zone. The Draft Management Plan proposes that funding for the operations of the park may be derived from several sources including subvention from Government, funding from international institutions, development of a Marine Park Fund, user fees, and sale of park paraphernalia. The user fees suggested are those currently in place at the existing Soufriere Scotts Head Marine Reserve. The Draft Management Plan outlines several programmes to be implemented during the life of the plan, focusing on Conservation, Education and Sustainable Use, Administration and Finance, and Monitoring and Evaluation. In addition, the draft management Plan proposes the implementation of a Disaster Management Plan, the objective of being to put in place an effective disaster plan to ensure the safety and security of staff, equipment and other resources.

## ANALYSIS OF IMPACTS

A SWOT (Strengths, Weaknesses, Opportunities and Threats) Analysis was used as a means of focussing the analysis of potential impacts, specifically in relating pre-existing factors to the approaches in the Management Plan. By identifying Strengths, Weaknesses, Opportunities and Threats associated with the Cabrits National Park, it was easier to identify appropriate measures for protecting the environment and specifically for addressing potential adverse impacts.

The Table below provides a summary of the classification of potential adverse environment impacts with the establishment of the MC/CNP, with and without mitigation measures, based the use of environmental resources by the various stakeholders.

## SUMMARY OF CLASSIFICATION OF POTENTIAL ADVERSE IMPACTS

| CLASSIFICATION OF POTENTIAL ADVERSE IMPACTS | | | | | |
|---|---|---|---|---|---|
| ENVIRONMENTAL COMPONENT / STAKEHOLDER | WITH MITIGATION | | | | WITHOUT MITIGATION |
| | EXTENT | INTENSITY | NATURE | CLASSIFICATION | CLASSIFICATION |
| Climate | localised | minor | reversible | low | moderate |
| Upland development | localised | minor | reversible | low | moderate |
| Water quality | localised | very small | reversible | low | moderate |
| Coral reefs | on-site | very small | reversible | low | moderate |
| Sea grass beds | on-site | very small | reversible | low* | low |
| Fisheries | on-site | very small | reversible | low* | low |
| Mangrove | on-site | very small | reversible | low | moderate |
| Beaches | on-site | very small | reversible | low* | low |
| Fishermen | localised | medium | irreversible | moderate | high |
| Yachters / Tourists | localised | very small | reversible | low* | low |

## RECCOMENDATIONS

Out of the SWOT Analysis and the findings of the analysis of impacts, recommendations were made including:

- Coordination / Collaboration between Agencies
- The development of a Wetland Policy
- Control of Future Development
- Marketing of the CNP, Management Regulations
- The use of the Monitoring & Evaluation Tool
- Disposal of wastes from Yachts and Cruise ships
- Training
- Monitoring of Natural Assets, and
- Livelihoods Assessment

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## GLOSSARY OF TERMS

| TERM | APPLICABLE DEFINITION |
|---|---|
| Bathymetry | measurement of water depth |
| Bilges | lowest internal portion of the hull |
| Bilge Water | dirty water that collects inside the bilges |
| Fish (Fisheries Act) | any aquatic animal (including coral), its young and its eggs. |
| Gorgonian | coral species of the order Gorgonacea |
| Groyne | low wall or barrier built into the sea to prevent erosion as well as drifting of sand |
| Indigenous | found only/ located only in one place |
| Pelagic | relating to the open seas |
| Pleistocene | time referring to the first epoch of the Quarternary period which involves the first appearance of the ice ages and humans |
| Substratum | underlying area of rock or soils beneath the earth's surface |
| Sustained-yield | reaping a harvest while leaving sufficient for replenishment and without threatening the ability for future natural growth of population |
| Topography | arrangement of features on the earth's surface/ representation of such features on a map |
| Vulnerable/fragile/sensitive | easily affected by and adverse effects |
| Zero Tolerance | total restriction |

## LIST OF ACRONYMS

| ACRONYM | MEANING |
|---|---|
| AGRRA | The Atlantic and Gulf Rapid Reef Assessment |
| CEZ | Conservation Exclusive Zone |
| CITES | Convention on the International Trade in Endangered Species of Flora and Fauna |
| CNP | Cabrits National Park |
| EEZ | Economic Exclusive Zone |
| EIA | Environmental Impact Assessment |
| ESDU | Environmental and Sustainable Development Unit |
| FDD | Fisheries Development Division |
| LMA | Local Management Authority |
| MC | Marine Component |
| MPA | Marine Protected Area |
| NGO | Non-Governmental Organization |
| OECS | Organization of Eastern Caribbean States |
| OPAAL | OECS Protected Areas Associated Livelihoods |
| PA | protected area |
| SWOT | Strengths, Weaknesses, Opportunities, Threats |
| ZOI | Zone of Influence |

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# ENVIRONMENTAL AND SOCIO-ECONOMIC STUDIES FOR OPAAL DEMONSTRATION PROJECTS

# CABRITS NATIONAL PARK (MARINE COMPONENT) SITE REPORT DOMINICA

## 1 INTRODUCTION

### 1.1 Authorisation and Report Layout

This report, prepared by Ecoengineering Caribbean Limited, is the first of three site reports being prepared for the Environment and Sustainable Development Unit (ESDU) of the Organization of Eastern Caribbean States (OECS). It was conducted in accordance with our revised proposal dated December 15, 2006. This site report documents findings of a site visit to the marine component of the Cabrits National Park in Dominica (see Figure 1) during the period March 7th to 16th, 2007.

This report contains nine chapters and 5 appendices. The remainder of this chapter provides a brief background of the proposed project and specifically the Cabrits National Park site visit; indicates the scope of work; introduces the project team and lists acknowledgements. Chapter 2 establishes the regulatory and legal framework for the marine park while Chapter 3 describes the methods used to collect baseline data. Chapter 4 describes the environmental assets/characteristics within the marine park. Chapter 5 describes the socio-economic context in which the marine park exists as well as presents the results of stakeholder consultation. Chapter 6 provides a summary of the draft Management Plan while Chapter 7 details the process used to analyse the

proposals documented in the draft management plan. Chapter 8 describes potential impacts which may result from proposals for the protected area and presents mitigation measures for minimizing these impacts. Finally, Chapter 9 highlights the recommendations proposed.

In order to keep the text of this report to a manageable length, detailed information is presented in the following Appendices:

Appendix A: STRUCTURED QUESTIONNAIRE TEMPLATES
Appendix B: CLASSIFICATION OF IMPACTS
Appendix C: SPECIES LISTS AND NOTES OF AQUATIC FLORA AND FAUNA
Appendix D: CABRITS TERRESTRIAL FLORA AND FAUNA
Appendix E : MONITORING AND EVALUATION SCORECARD
Appendix F: EXCERPT FROM USER NOTES FOR CIDA'S ENVIRONMENTAL ASSESSMENT FORMS

## 1.2 Background

This project which is termed the OECS Protected Areas Associated Livelihoods Project (OPAAL) has as its global objective "to contribute to the conservation of biodiversity of global importance in the Participating Member States by removing barriers to the effective management of protected areas (PAs), and increasing the involvement of civil society and the private sector in the planning, management and sustainable use of these areas".

As part of the establishment of PAs under the OPAAL Project, two types of environmental and socio-economic studies were commissioned:

- baseline environmental and socio-economic studies to determine the status of the resource base, its use and the nature of communities associated with the site; and

- detailed site preparation studies to identify adverse environmental or socio-economic impacts associated with the development, and identify safeguards and / or mitigation measures.


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| Ecoengineering Caribbean Ltd. | Eco Report No. 11/2007 | CLIENT: OECS -ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT | FIGURE NUMBER 1 |
| | Date: 31/07/07 | PROJECT: CABRITS NATIONAL PARK (MARINE COMPONENT) SITE REPORT | |
| | | DWG. NAME: PROJECT I OCATION | |

This study comprises a combination of two elements of work. Firstly, it sought to update an early environmental assessment undertaken at the time of project design to identify any possible adverse impacts associated with likely project intervention through a review of project sub-components. Both environmental and socio-economic assessments were designed to incorporate relevant mitigation measures which can be taken on board in the finalization and implementation of the site management plan and specific project activities including the development of relevant infrastructure and livelihood sub-projects. Secondly, the study was undertaken to describe and assess the health and value of biodiversity within the site, levels of use and threats to inform area management and assist in the establishment of monitoring and evaluation system for the site.

Ideally, this study should have preceded and therefore guided the preparation of the site management plan for the OPAAL demonstration site. This has not been the case due to procurement challenges which affected the timely contracting of services and hence the drafting of a management plan for the site was well advanced at the time of conducting the environmental and socio-economic site assessments. Therefore, it will be important that the information, recommendations and conclusions emanating out of this study be used to further inform and strengthen the management planning process.

This site report documents information gathered on a visit to the Cabrits National Park during the period March 7$^{th}$ to 16$^{th}$, 2007.

## 1.3 Scope of Work

The scope of work for this assignment is as follows:

- Review of Relevant Documents,
- Understanding the Proposals for the PA,
- Review of Regulatory Framework,
- Field Collection of Data,
- Assessment of Potential Impacts, and
- Recommendation of Mitigation Measures.

## 1.4 Study Team

The following are the key professional staff who worked on this assignment:

Ecoengineering Caribbean Limited

Dr. George K. Sammy, Study Director/Environmental Engineer,
Ms. Debbie Reyes, Study Manager/Environmental Scientist,
Ms. Lisa Ramlalsingh, Environmental Scientist,
Mr. Darshanjit Singh Narang, Ecologist, and
Mr. Imran Khan, Ecologist/Certified Diver.

## 1.5 Acknowledgements

Ecoengineering Caribbean Limited acknowledges, with thanks, the contributions of the following in completing this assignment:

| | |
|---|---|
| **Forestry, Wildlife & Parks Division** | Ms. Jacqueline Andre, Assistant Forestry Officer<br>Mr. Arlington James, Forestry Officer |
| **Statistical Department** | Mrs. Caret |
| **Environmental Health** | Mr. Scotland<br>Mr. Raphael Joseph |
| **Ministry of Tourism** | Mrs. Esther Thomas |
| **Physical Planning** | Ms. Annie Edwards |
| **Dominica Port Authority** | Mr. Benoit Badouille |
| **Coast Guard** | ASP Frederick |

# 2 REGULATORY FRAMEWORK

This chapter provides a brief synopsis of the laws, regulations and policies which govern the management of the marine component of the Cabrits National Park. A detailed assessment of these laws, regulations and policies was conducted for the OECS as a separate document by another consultant (Environmental Support Services, 2007). What follows is a brief summary of what is contained in that document

## 2.1 Policy Framework

The "Dominica Forest and Park System Plan" (Shanks and Putney, 1979) rated land for conservation purposes according to their forestry and agricultural capability, as habitat for endangered wildlife, domestic water catchments, and unique natural features. The document articulated the land management objectives for the forest and park system, proposed the categories of units to be included in the system, and described the thirteen (13) sites proposed for inclusion in the system.

The objectives listed in the 1979 Forest and Park System Plan were:

- Maintain sample ecosystems in a natural state.
- Maintain ecological diversity and environmental regulation.
- Provide education, research, and environmental monitoring.
- Preserve genetic resources.
- Regulate stream flow, prevent flooding.
- Control erosion and water pollution.
- Produce protein from wildlife, sport hunting and fishing.
- Provide timber and forage on a sustained-yield basis.
- Provide recreation and tourism opportunities.
- Protect cultural or historical sites.
- Retain scenic beauty and green areas.

This Plan does not address protected areas and needs to undergo significant revision before it can be seriously considered as an appropriate policy and plan for development of protected areas.

The Tourism 2010 policy and the Biodiversity Strategy and Action Plan also articulate objectives for protected areas as:

- Protection of heritage and cultural resources throughout Dominica with particular attention on community-based resources;
- Enhanced interpretive programs at nature sites;
- Development of scenic viewscape protection policies for Dominica's coastline routes; and
- Land use policies that protect Dominica's environment, important viewscapes, scenic corridors and the intimate feel of the destination as "the Caribbean as it used to be".

There is also a Biodiversity Strategy and Action Plan which has the following objectives:

- Identification and protection of sensitive / fragile / threatened ecosystems with priority given to the Indian River wetland among others, and Dry Scrub Woodland, and the identification and protection of buffer areas required to protect and conserve threatened flora/fauna and ecosystems.

- Review/amend existing legislation, and as appropriate develop new legislation with respect to:

    - Conservation and management of coastal and marine biodiversity;
    - Protection of vulnerable/fragile/indigenous marine species and ecosystems;
    - Coastal zone management;
    - Coastal and marine parks and protected areas;
    - The implementation and enforcement of the Convention on the International Trade in Endangered Species of Flora and Fauna (CITES);
    - Local and community participation in coastal and marine conservation/management;
    - Management of solid and liquid waste (industrial, agriculture, urban); and
    - Enforcement of existing and proposed legislation through empowerment and strengthening of all relevant agencies and community groups.

- Identification and protection of sensitive/fragile/threatened coastal and marine ecosystems and establishment of coastal and marine protected areas and restocking of endangered species where necessary.

## 2.2 Legal Framework

There are several pieces of legislation applicable to the management of protected areas and environmental resources in Dominica. Those relevant to the marine component of the Cabrits National Park are highlighted below:

- National Parks and Protected Areas Act, 1975;
- Salvage of Artifacts and Treasure Board Act, 1980
- Beach Control Act , 1986
- Fisheries Act, 1987;
- Forestry and Wildlife Act, 1976;
- Environmental Health Services Act, 1997
- Tourism (Regulations and Standards) Act, 2001
- Physical Planning Act, 2002.

### 2.2.1 National Parks and Protected Areas Act, 1975

This Act provides for the declaration of protected areas, leasing of land to add to parks, and the organization of all parks and protected areas into a system of protected areas (Section 3(1)). Protected areas may be declared for the following purposes (Section 5):

- preserving the natural beauty of such area, including flora and fauna;
- creating a recreational area;
- commemorating a historic event of national importance; or
- preserving any historic landmark or any object of historic, pre-historic, archaeological or scientific importance.

The Act makes provision for the creation of a National Parks Service to manage the system of protected areas, and a National Parks Advisory Council to advise the Minister on maters relevant to the National Parks Service (Sections 7-10).

Management plans are required for areas within the system of protected areas (Section 11), and the public has to be notified of the Government's intention to adopt a management plan. The Minister is also authorized to make regulations for the management of the protected areas system.

### 2.2.2 Salvage of Artefacts and Treasure Board Act (1980)

"An Act to provide for the appointment of a Board for the purpose of supervising salvage operations in the territorial waters of Dominica; the division, storage and sale of artefacts and treasure; the establishment and control of a museum and other related matters".

This Act sets the duties of the Board including, "to be responsible for the maintenance of the regulation and control over underwater shipwrecks wherever located for tourist purposes" (Section 4(1)).

The provision for control over shipwrecks for tourist purposes (Section 4(1)) can be in conflict with Section 5(d) of the National Parks and Protected Areas Act (1975) if the wreck is of historical value.

### 2.2.3 Beach Control Act, 1986

"An Act for the control and protection of beaches in Dominica". Under this Act, the placement of docks, groynes, and other structures along the foreshore or on the floor of the sea requires a permit from the Department/Ministry of Works.

Coastal areas are included in a number of the protected areas, and sand mining is a problem in Dominica. As such, the demand for sand could result in sources within protected areas being targeted. The Act does not currently make special provisions for approval of mining proposals to be handled by the National Parks Service or other relevant protected areas agency.

### 2.2.4 Fisheries Act, 1987

This Act provides the legal basis for the promotion and regulation of fishing. The Act defines fish to mean any aquatic animal (including corals), its young, and its eggs (Section 2), a definition that technically gives the Fisheries Division a measure of legal oversight of all activities focused on marine faunal species. As such, unless new protected areas legislation or regulations stipulate otherwise, research on fish and coral within marine protected areas require a licence from the Fisheries Division.

Marine reserves can be declared where special measures are considered necessary. This includes protection, preservation, regeneration, scientific study and research. Marine reserves can therefore be designated to meet conservation objectives other than fisheries management, as well as for recreational purposes.

### 2.2.5 Forestry and Wildlife Act, 1976

"An Act to provide for the protection, conservation and management of wild mammals, freshwater fishes, amphibians, crustaceans and reptiles, and for purposes connected therewith".

This act seems more concerned with hunting than with species management. It however implies control over wildlife in other types of protected areas, as well as the possibility of having multiple designations for portions of other types of protected areas.

### 2.2.6 Environmental Health Services Act, 1997

The Environmental Health Department provides permitting for the design and placement of sewage treatment and disposal facilities at the sites. They also deal with the issues of solid waste management and food handling for the sites.

The Department conducts water quality monitoring, and is generally concerned about public places where there is overcrowding. The Department can therefore set limits to the number of persons using a particular site at the same time. However, there is no indication that such an action is being contemplated for protected areas at this time.

### 2.2.7 Tourism (Regulations and Standards) Act, 2001

The protected areas of Dominica form the base of the ecotourism product, and as such, all services offered at such sites will focus primarily on tourists. The provisions of this Act therefore apply to all national parks and marine management areas.

### 2.2.8 Physical Planning Act, 2002

The Act provides for the orderly development of land through the preparation of development plans and regulation of construction activities. The Act also established the Physical Planning and Development Control Authority to implement the provisions of the Act (Section 4).

Although no mention of marine resources is made in this act, natural and heritage resources protection is also integrated into the development control process through the use of an environmental impact assessment (EIA) process. However, the EIA process treats protected areas no differently from any other area in the country, in that, the process uses the same standards.

# 3 METHOD STATEMENT

This chapter is a summary of the methods used on this assignment. It begins with a statement of the context of the study, and then describes each of the tasks which were undertaken, as follows:

- Review of Relevant Documents,
- Understanding the Proposals for the PA,
- Review of Regulatory Framework,
- Field Collection of Data,
- SWOT Analysis, and
- Potential Impacts and Mitigation Measures.

The final section of this chapter introduces two other evaluation tools which were used on this assignment. In describing the various tasks, reference will be made to the original Terms of Reference and Technical Proposal for this assignment; to note any changes and explain the reason for those changes.

## 3.1 Context

This statement of the context of the study includes four elements:

- Biodiversity in the OECS,
- Challenges in Protected Area Management,
- The OPAAL Project, and
- Environmental and Socio-Economic Studies.

These descriptions are based largely on information provided in the Terms of Reference which formed part of the OECS' Request for Proposals, as well as generalized information (such as is available on the internet). It is in the context stated in this section that the methods for the individual tasks were designed.

### 3.1.1 Biodiversity in the OECS

The Eastern Caribbean region is endowed with a rich biodiversity, which, partly due to its isolation within the Caribbean Sea, has resulted in relatively high rates of national and regional endemism. One survey of the world's biodiversity hotspots identified the Caribbean as the fifth ranking "hotspot" and one of the highest priorities in any global strategy for biodiversity conservation and sustainable management. A second study based on faunal distributions classified the Eastern Caribbean region as a unique marine eco-region of the tropical north-western Atlantic province and as the most threatened given the highest priority ranking for conservation purposes.

Despite the significance of the region's biodiversity endowment, there have been reductions in both its quantity and quality over time. Many of the region's highly productive offshore ecosystems have come under increasing pressure in recent times from a variety of anthropogenic and natural sources. Efforts aimed at protecting the critical ecosystems in the islands of the Eastern Caribbean have not been very successful. The lack of congruence between nation building and the sustainable use of natural resources remains the biggest hurdle to attaining the goals of sustainable development. The nexus between poverty and the loss of natural capital (through over or indiscriminate resource extraction) is still not clearly understood. For now the establishment of protected areas (PAs) remains the primary tool for resource conservation in the Eastern Caribbean but that itself is characterized by a checkered history of implementation.

### 3.1.2 Challenges in Protected Area Management

The establishment of an effective framework to create and manage PAs is constrained by significant impediments in the OECS. Existing institutional arrangements are weakened by:

- gaps in policy framework, including limited incorporation of environmental and social costs (direct or indirect) in decision-making; and

- inadequate systems to support integrated planning, information sharing and collaboration.

This has led to adverse impacts on PAs (for example, sedimentation from upstream development or unsustainable exploitation of resource).

### 3.1.3 The OPAAL Project

The overall objective of the OPAAL project is described in Section 1.2. The project intends to achieve this objective firstly by strengthening national and regional capacities in the sound management of PAs.

OPAAL is geared towards providing global benefits through the conservation of globally significant biodiversity. Most importantly these global benefits will be closely linked to demonstrable benefits for local populations. Perhaps the most important benefit will be the newly developed constituencies for biodiversity conservation who will act to promote conservation and sustainable development due to the tangible economic benefits and improved economic opportunities.

The project is also geared to providing benefits to those target groups associated with project-supported PAs. Where the nature of that dependency is not compliant with the goals of protection for the area, the project will provide for the identification of alternative sources of livelihoods that will ensure equal or greater socio-economic benefits than previously obtained. The empowerment of target groups/persons will be effected through appropriate capacity building initiatives undertaken by the project.

### 3.1.4 Environmental and Socio-Economic Studies

Component 2 of the OPAAL Project deals with Protected Areas Management and Associated, Alternative and New Livelihoods. This component seeks to promote biodiversity management and conservation through the establishment of new protected areas and the strengthening existing PAs. This thrust is complemented by support for alternative and/or new livelihoods in areas in proximity to PAs.

As part of the establishment of PAs under the OPAAL Project, two types of environmental and socio-economic studies are required:

- baseline environmental and socio-economic studies to determine the status of the resource base, its use and the nature of communities associated with the site; and

- detailed site preparation studies to identify adverse environmental or socio-economic impacts associated with the development, and identify safeguards and / or mitigation measures.

As part of this assignment, significant baseline information must be collected for the Cabrits National Park.

## 3.2 Review of Relevant Documents

As the first task on this assignment, Ecoengineering collected and reviewed the following documents provided by ESDU or available from other sources:

- OECS Protected Areas and Associated Livelihoods Project Capacity Building for Protected Areas Planning and Management and Associated Livelihoods. Protected Areas Training Needs Assessment, Dominica Country Report. Prepared by Kemraj Parsram, 2007.

- OECS Protected Areas and Associated Livelihoods Project. Review of The Policy, Legal And Institutional Frameworks For Protected Areas Management In Dominica. Prepared by Mr. Lloyd Gardner of Environmental Support Services, LLC., 2006.

- Opportunities for Sustainable Livelihoods in One Protected Area in Each of the Six Independent OECS Territories, for the OECS Protected Areas and Sustainable Livelihoods (OPAAL) Project. Prepared by Peter Espeut 2006.

- Tourism Master Plan 2005 – 2015 (Final Report) Prepared for The Commonwealth of Dominica, Ministry of Tourism, Industry and Private Sector Relations, 2006.

- Draft Management Plan 2007-2012. Cabrits National Park Marine Section. Prepared by Marie-Jose Edwards, November 2006.

- Encore Environment & Coastal Resources Project Management Plan for the Marine Section Cabrits National Park, Dominica. Prepared By Tom Van't Hof And Jiselle Allport, 1998.

This review allowed the field work to be focussed on areas where data was less-readily available.

## 3.3 Understanding the Proposals for the PA

Ecoengineering's understanding of the Proposals for the MC/CNP was based on a review of the Management Plan prepared by Ms. Marie Jose Edwards; provided by ESDU. Our initial work was based on a review of the draft Plan (November, 2006). A copy of the Final Draft Plan (April, 2007) was provided on June 21, 2007, and this report on the Environmental and Socio-Economic Studies was reviewed and amended as required to ensure conformity with the Final Draft Management Plan.

As noted in Section 1.2, the present study paralleled the preparation of the Management Plan for the MC/CNP. The benefit of this approach is that it allowed a more focussed assessment of the environmental impacts associated with the Management Plan. In addition, the timing of the two assignments allowed some harmonization of the data collection exercises. Both teams were present in Dominica in March, 2007, and the two efforts were co-ordinated to ensure that key stakeholders were not asked repetitive questions. In addition, the Management Plan consultant indicated some areas of interest in the natural environment for which Ecoengineering was collecting baseline information.

## 3.4 Review of Regulatory Framework

Ecoengineering's review of the laws, regulations and standards which govern the operation of the MC/CNP focussed on the following:

Policy Framework

- Dominica Forest and Park System Plan (1979)
- Tourism 2010 Policy
- Biodiversity Strategy and Action Plan

Existing Legal Framework

- National Parks and Protected Areas Act, 1975
- Salvage of Artifacts and Treasure Board Act, 1980
- Beach Control Act, 1986
- Fisheries Act, 1976
- Environmental Health Services Act, 1997
- Tourism (Regulations and Standards) Act, 2001
- Physical Planning Act, 2002

## 3.5 Field Collection of Data

To build a more robust data base for the Cabrits National Park, Ecoengineering expanded on available information from previous studies and published sources (see Section 3.2, above) by field reconnaissance and interviews with key stakeholders.

### 3.5.1 Marine Biological Field Work

Diver roving surveys and snorkelling were conducted at selected sites within the MC/CNP during March 2007. These roving dive surveys involved the diver swimming freely throughout a dive site and recording the presence of all fish species, substrate changes and other invertebrate species that are encountered and that can be positively identified. The search for fishes and/or invertebrates begins as soon as the diver enters the water. The goal is to find as many species as possible. At the conclusion of each survey, each recorded fish species is assigned one of four abundance categories based on about how many were seen throughout the dive [single (1); few (2-10), many (11-100), and abundant (>100)]. The invertebrates are assigned either the abundance codes (Single, Few, Many, Abundant) or Present, depending on the species.

In addition, the Reef Check method was also used to gather data on substrate composition, target and indicator species of fish and invertebrates, coral condition (including bleaching and signs of disease) and obvious signs of human impact (garbage, anchor damage, abandoned fishing line, etc.). This monitoring provided a quantitative view of the extent of human impacts on reefs considered to be in the “best” condition.

In order to describe the Cabrits National Park in greater detail, the Park was divided into the following areas:

- Toucarie Bay (A),
- Douglas Point South (B),
- Douglas Bay (C),
- Cabrits North and South (D & E),
- Pinard Reef (proposed addition to the Marine Park) (F), and
- Purple Turtle / Big Papa’s (proposed addition to the Marine Park) (G).

The following sections provide a brief description of the diver roving surveys that were conducted in each of the six areas.

#### 3.5.1.1 Toucarie

Starting at the northern point of the bay, south of Anse Crainte (see Figure 2), the survey proceeded in a northwest direction for approximately 46 m. The survey then headed south, across the outer perimeter of the bay towards the northern end of Douglas Point and back again in a north-northeast direction to the point of origin.

N

LEGEND

- 2007 SNORKEL SURVEY
- 2007 DIVE SURVEY
- NATIONAL PARK BOUNDARY
- ECOENGINEERING DIVE LOCATIONS
- HISTORICAL DIVE LOCATIONS

0 3km

SCALE

Ecoengineering Caribbean Ltd.

| | | |
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| Eco Report No. 11/2007 | CLIENT: OECS – ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT | FIGURE NUMBER 2 |
| Date: 31/07/07 | PROJECT: CABRITS NATIONAL PARK (MARINE COMPONENT) SITE REPORT | |
| | DWG. NAME: SKETCH OF CURRENT DIVE SURVEY LOCATIONS AND LOCATIONS OF HISTORICAL SAMPLING POINTS | |

#### 3.5.1.2 Douglas Point South

This survey started to the east of Douglas Point South (see Figure 2), just inside of the point. The survey proceeded about 61 m in a southwest direction into deeper waters (18-30 m) before heading due north to the cliff wall between Douglas Point South and North. It then proceeded along the edge of the coast, passing the canyons and caves back to the point of origin. The density of coral decreases as one follows the shoreline south towards the area of Manicou River. This also marks the start of the sea grass beds in Douglas Bay.

#### 3.5.1.3 Douglas Bay

Diver roving and snorkelling surveys were conducted in Douglas Bay to assess the ecology and environment in that area (see Figure 2). These surveys were conducted randomly and generally spanned the area of the seagrass beds starting in the north of Douglas Bay and heading south.

#### 3.5.1.4 Cabrits North

This survey commenced just east of the point at Cabrits North (see Figure 2), descending to depths between 18-27 m. It then proceeded west of the point and then south, rising to depths between 9-18 m. At this depth the survey headed northeast back to its point of origin, passing the 'five fingers' formation along the way.

#### 3.5.1.5 Cabrits South

Starting just east of the Southern Point of Cabrits (see Figure 2), the survey proceeded in a south-western direction across the reef to a depth of between 18-27 m. The survey continued in these deeper waters, heading further east of the point of origin of the dive before turning and heading northwest toward the origin of the dive.

#### 3.5.1.6 Pinnard Reef

The survey commenced approximately 6-7 m north of Lamothe River (the Parks northern boundary - see Figure 2), in 12 m of water. It proceeded south, sweeping east and west, reaching 9 m in the western areas, and then returning north to the point of origin.

#### 3.5.1.7 Purple Turtle / Big Papa

The survey commenced in 2 m of water about 9 m west of Purple Turtle and headed south to the vicinity of Big Papa's. It then proceeded west before heading northeast to the point of origin.

### 3.5.2 Mangrove Field Work

During the site visit vegetation within the Cabrits wetland were identified for each ecotype with the dominant species being noted. Avifauna was also identified opportunistically while walking along the trails within the wetland. Bird identifications were conducted during the morning period by visual and auditory means. The abundance of each species was also noted. Other fauna observed while on site were noted. However small animal trapping and netting of insects were not conducted as it was considered unnecessary. As with the reconnaissance in the marine parks, areas of obvious damage were identified.

### 3.5.3 Socio-Economic Field Work

#### 3.5.3.1 Interviews with Key Stakeholders

As part of this assignment, the study team met with the following government agencies to discuss the operations of the Marine Component of the Cabrits National Park:

- Environmental Health Department – Mr. Scotland or Rafael Joseph
- Ministry of Tourism – Mrs. Esther Thomas
- Statistics Department - Mrs Caret
- Physical Planning Department – Mrs. Annie Edwards
- Fisheries Department - Mr. Harold Guiste
- Dominica Port Authority – Mr. Benoit Badouille
- Coast Guard – ASP Frederick
- Forestry, Wildlife & Parks Division - Mr. Arlington James

In addition, 103 interviews of other key stakeholders were conducted using a structured questionnaire (see Appendix A). The actual numbers interviewed in each group were as follows:

- 48 Area Residents,
- 19 Fishermen,
- 19 Tourists / Yachters,
- 11 Tour Boat Operators, and
- 6 Divers.

In general interviews were conducted between 9:00 am to 5:00 pm. However, there were several groups, such as the fishermen and the water taxi operators who were interviewed after 5:00 pm because they spent their days out on the water.

#### 3.5.3.2 Challenges and Constraints

As noted above in Section 3.5.3.1, a total of one hundred and three interviews were conducted. Individual interviews were conducted for fishermen, residents, divers and tourists/yachters. There was only one group meeting with the tour boat operators / water taxis because it was easier to collect information collectively from them.

During the field data collection, the following challenges were experienced:

- During discussions with residents and fishermen concerns were expressed regarding spear fishing in the area and the need for the practice to be stopped. It was noted that the fishermen who engaged in spear fishing live on the other side of the island and we were therefore unable to interview this segment of the fishermen who fish within the Cabrits area. The Fisheries Division also indicated that they had no information concerning this fishing group.

- There was some difficulty accessing the fishermen, as they had very irregular hours and spent significant time at sea. Meetings were arranged at two locations Bioche and Portsmouth on two separate days but only a few attended. Only three fishermen attended the meeting at Bioche while only four attended at Portsmouth. The fishermen that were interviewed were interviewed between 5:00 pm to 7:00 pm. Finally, a number of interviews were conducted while the fishermen were sorting their fish after their catch.

- No interviews were conducted with vendors as they were associated with the Cruise Ship Dock at Cabrits and were only present for one day when a cruise ship docked for a short time.

- Residents indicated that they rarely visited the reef and were not aware of the activities that took place on the reef. Therefore some of the residents were reluctant to be interviewed.

### 3.5.4 Application of Results

The results of field data collection were used to prepare a description of baseline conditions on which potential impacts can be evaluated. In addition, the field work also disclosed adverse impacts which are already taking place at the CNP.

## 3.6 SWOT Analysis

The SWOT (Strengths, Weaknesses, Opportunities and Threats) Analysis was not part of the original scope of this assignment, but was added by Ecoengineering as a means of focussing the analysis of potential impacts (and specifically in relating pre-existing factors to the approaches in the Management Plan). SWOT Analysis is an extremely useful tool with which data is subjectively assessed and organized into a logical order. By identifying Strengths, Weaknesses, Opportunities and Threats associated with the Cabrits National Park, it will be easier to identify appropriate measures for protecting the environment and specifically for addressing potential adverse impacts. In any SWOT Analysis, it is important to note that the categories are not mutually exclusive. It is quite possible for a single aspect to be associated with a strength and also with a threat.

## 3.7 Potential Impacts and Mitigation Measures

The assessment of potential impacts consisted of three steps:

- Impact Identification,
- Classification of Impacts, and
- Recommendation of Mitigation Measures.

### 3.7.1 Impact Identification

Based on the proposals for the PA and the baseline description (see Section 3.3 and Chapters 4 and 5), Ecoengineering identified potential adverse impacts to the natural and human environments, of two general kinds:

- new impacts which may arise from the PA Proposal, and
- intensification (or diminution) of existing impacts.

This identification of potential impacts was based, in large measure, on the study team's considerable experience in environmental studies (and in particular Environmental Impact Assessments) in the OECS and in the wider Caricom Region.

### 3.7.2 Classification of Impacts

The impacts which were identified were also classified on a systematic basis (both assuming that now mitigation measures were applied and also assuming the successful implementation of mitigation measures). The classification method was based on three criteria: extent, intensity, and nature. Based on this, impacts (both with and without mitigation) were classified as low, moderate or high. Where adverse impacts were considered to be insignificant, no classification was applied. Further details on the classification system are provided in Appendix B.

### 3.7.3 Recommendation of Mitigation Measures

Ecoengineering also identified measures which can be used to effectively reduce environmental impacts of the PA Proposals, both on the Natural Environment and on the Human Environment (that is, on the physical, biological and social environments). Again, we relied largely on our experience on earlier projects of this kind. The mitigation measures were physical measures (fixed anchorages, appropriate trash collection, appropriate sewage treatment) as well as administrative measures (limiting visits during nesting seasons, limiting numbers of visitors at one time).

## 3.8 Other Evaluation Tools

Two other evaluation tools are discussed in this report:

- A Monitoring and Evaluation (M&E) Checklist, and
- An Evaluation Matrix

The M & E Checklist was adpated for use in Protected Areas in the OECS. This is introduced in Section 5.8, and discussed further in Section 9.6.

The Evaluation Matrix was adpated from a Canadian model. It is introduced in Section 9.12, and used in that same section to summarize environmental, social and livelihood aspects of the actions envisaged in the Management Plan and the Livelihoods Study.

# 4 ENVIRONMENTAL CHARACTERISTICS

This chapter describes the key environmental characteristics of the Cabrits National Park, Dominica. It begins with a definition of the area and continues with brief baseline descriptions of the following components:

- Climate,
- Topography,
- Drainage,
- Geology,
- Bathymetry,
- Physical Oceanography,
- Water Quality,
- Marine Environment

A brief description of the methods used to capture this information is included at the beginning of each section. The photographs referred to in this chapter are contained in the annex at the end of the chapter.

## 4.1 Location and Boundaries

The Cabrits Peninsula is located along the north-western coast of Dominica (see Figure 3), approximately 2 kilometres from the town of Portsmouth. The peninsular is comprised of twin peaks of extinct volcanoes - the east Cabrits rising to a height of 485 feet (140m) and the west Cabrits rising to 560 feet (171). An extensive swamp, 35 ha (89 acres) is located just east of the Cabrits (see Figure 3). The Cabrits is better known for its historical value as a site of an 18$^{th}$ Century fort with extensive historical fortifications a few of which have been restored (see Figure 4).

The marine component of the Cabrits National park is the equivalent of 1,053 acres (421 hectares) of sea between Prince Rupert's Bay and Toucarie Bay and extends from the Lamothe River mouth at Cottage, north of Toucarie Bay, to the southern side of the Cabrits peninsular (see Figure 3).

## 4.2 Physical Environment

### 4.2.1 Climate

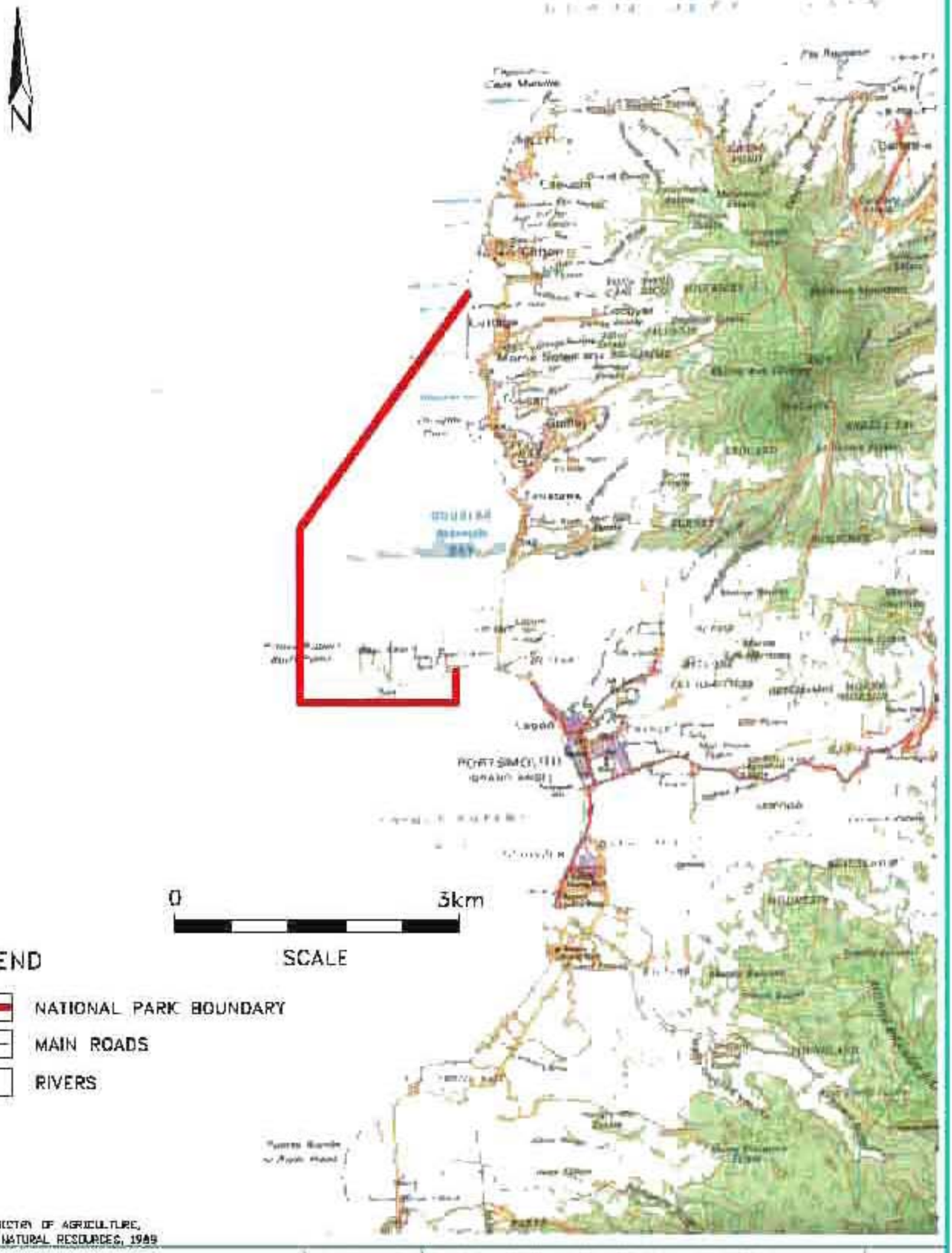
The climate of Dominica is classified as "humid tropical marine", with average temperatures of 27$^{o}$C (80$^{o}$F). Because of the island's rugged topography, micro-climatic variability can exist within very short distances, influenced by the high moisture content of the air masses that enter the region from the Atlantic Ocean. This makes Dominica a very high rainfall country, with an average rainfall of 4,500 mm per year during the wet season. Rainfall increases from the leeward side eastward towards the central parts of the island where it reaches approximately 10,200 mm annually.

The Cabrits wetland is located at about sea level on the leeward side of the island and these factors have an influence on the prevailing climatic conditions such as rainfall, temperatures and winds. The rainfall pattern in the Cabrits wetland is very seasonal, having a marked Dry Season extending from February to May/June, following a wetter Rainy Season. The annual rainfall for the Cabrits area averages between 1500 mm and 1800 mm per year, which is relatively low as compared to the rainfall experienced by other parts of the island. Table 1 displays the rainfall data for the Cabrits National Park between 1999 and 2003.

**TABLE 1 - RAINFALL AT THE CABRITS NATIONAL PARK (1999-2003)**

| YEAR | TOTAL RAINFALL (mm) | WETTEST MONTH (mm) | DRIEST MONTH (mm) |
|---|---|---|---|
| 1999 | 1,925.0 | August (246.4) | February (34.4) |
| 2000 | 1,454.6 | January (202.6) | March (35.4) |
| 2001 | 1,583.2 | December (384.2) | May (7.6) |
| 2002 | 1,644.0 | March (239.2) | November (43.6) |
| 2003 | 1,565.6 | November (259.0) | March (9.8) |

The humidity and evapo-transpiration rates in the Cabrits wetland are very high due to the presence of the swamp, open water and marsh lands. The expected mean annual temperatures of the area would be between 27°C and 28°C. Highest temperatures usually occur during the middle of the year (June and July) when temperature may reach 33°C, and the coldest months are from December to March when daytime temperatures may reach a maximum of approximately 30°C.




SOURCE: MINISTRY OF AGRICULTURE, TRADE AND NATURAL RESOURCES, 1989

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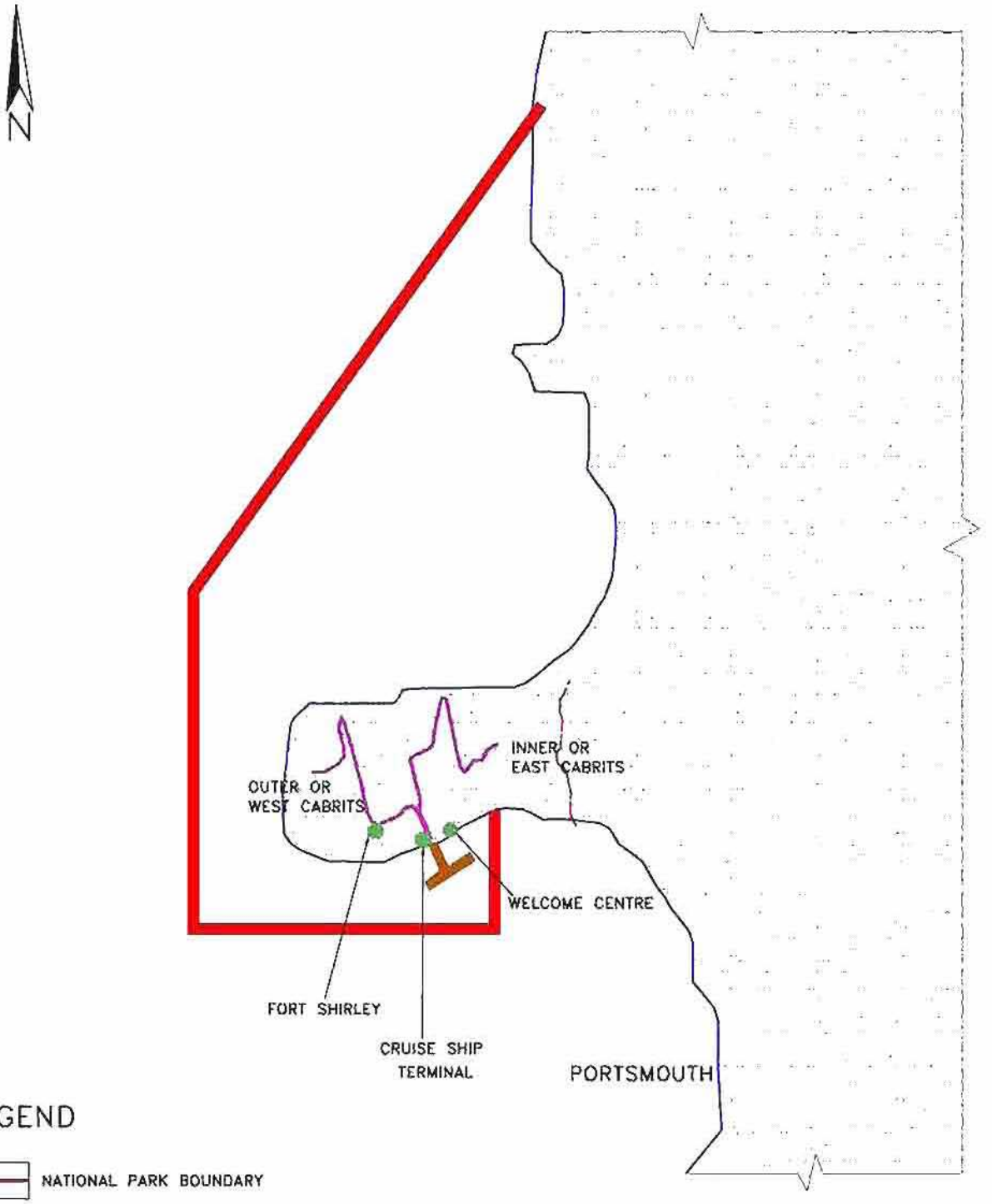



LEGEND

- NATIONAL PARK BOUNDARY
- TRAILS
- SITES IN CABRITS NATIONAL PARK

0 5km

SCALE

SOURCE: PHYSICAL PLANNING DEPT, 2007

| | | | |
|---|---|---|---|
| Proengineering Caribbean Ltd. | Eco Report No. 11/2007 | CLIENT: OECS – ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT | FIGURE NUMBER 4 |
| | Date: 31/07/07 | PROJECT: CABRITS NATIONAL PARK (MARINE COMPONENT) SITE REPORT | |
| | | DWG. NAME: CABRITS NATIONAL PARK (TERRESTRIAL COMPONENT) | |

The prevailing winds in the area originate from the north-east, with generally low wind speeds. However, tropical storms and hurricanes occasionally impact the island resulting in strong winds and high rainfall. The high rainfall makes the country susceptible to landslides, particularly in the more mountainous regions. Dominica is also vulnerable to hurricanes. Within the last decade the social and economic infrastructure of the country has been severely affected by a number of hurricanes. While the plants in the marsh areas may not be too severely affected by the strong winds, the taller trees within the mangroves and swamp forests may yield to these storms through broken crowns and branches.

### 4.2.2 Topography

The terrain of Dominica can be described as very rugged and steep, with some areas reaching to heights of more than 4,500 feet. The highest peak, Mt. Diablotin reaches a height of 4,747 feet. Most of the flat land is located near the coast. The land within the study area ranges from 1,250 feet to sea level. In the Cabrits area, the highest elevation is 458 feet.

### 4.2.3 Drainage

Dominica receives up to 175 inches of rainfall and up to 300 inches at higher elevations per year. There are also approximately 365 watercourses throughout the island. Freshwater is exported to St. Maarten and occasionally to other Caribbean Islands.

There are approximately twenty-one rivers are located within the study area. The Indian River watershed is located to the south of Cabrits while the Lamothe River forms the landward northern boundary of the marine component of the Cabrits National Park.

### 4.2.4 Geology

The Cabrits are of volcanic origin of the Pleistocene age. Dominica was formed in 15 stages with the Cabrits being formed in the tenth stage as a result of eruptions centred on Morne Aux Diables, which piled up the northern headland of Dominica less than a million years ago. The hills were originally separated from the main island, but through the action of tides and ocean currents an isthmus of sand and coral has built up. Subsequent alluvial deposits from the land have formed a wetland with fresh and

brackish waters draining into Prince Rupert's Bay. The Cabrits peninsula can thus be described as a narrow continental shelf around the headland that is typically a continuation of the mountain formation descending to a depth of over 100 feet uninterrupted. This formation continues toward the north-western tip of the peninsula where the slopes become less steep. The substratum consists of boulders with encrusting epi-biota.

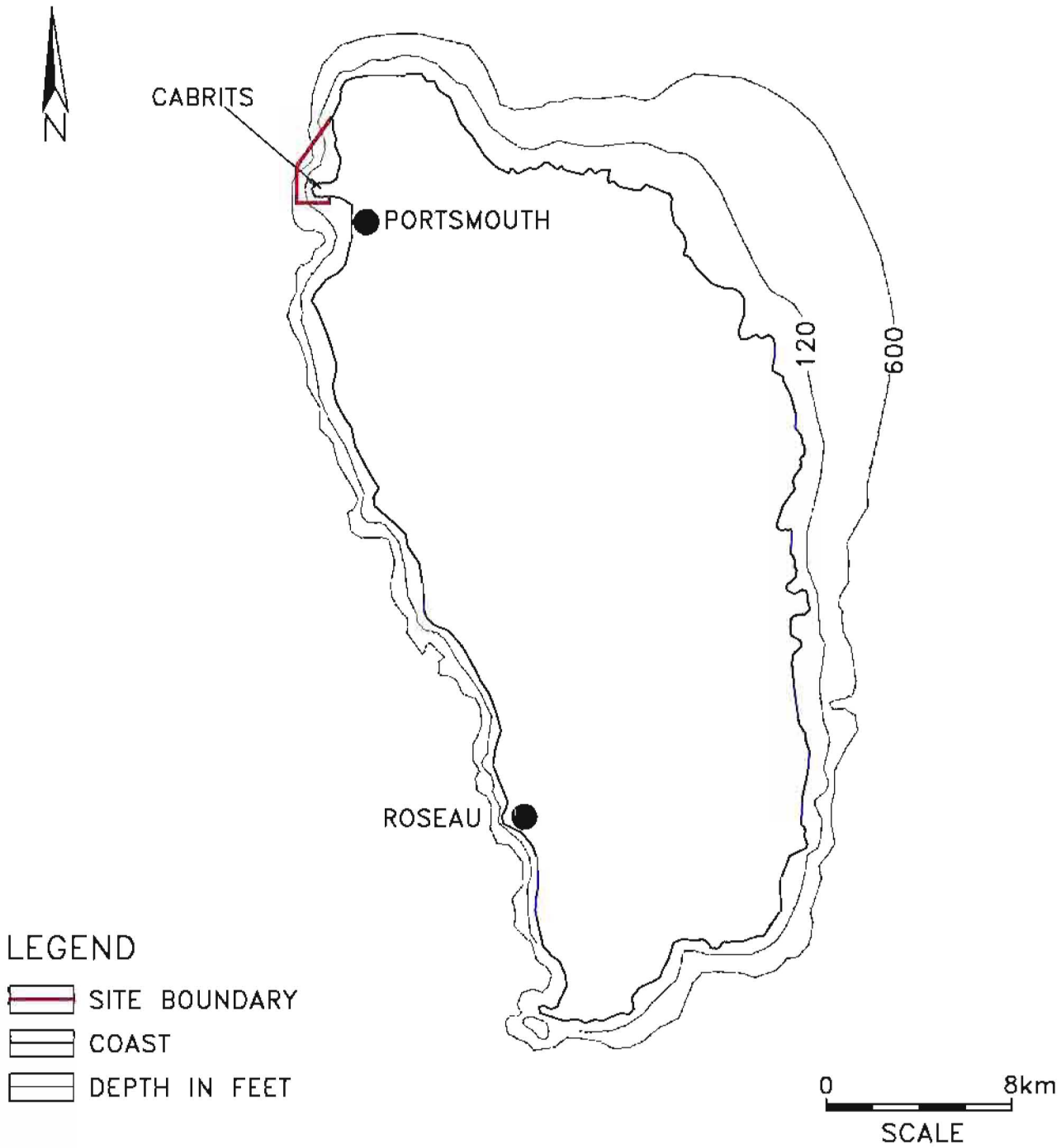
Beaches composed of sand from both marine and terrestrial sediments line the inner portions of Prince Rupert's and Douglas Bays. To the north of Douglas Bay is a formation of cliffs characteristics of the northern portion of the island.

Immediately north of the Cabrits peninsula is Douglas Bay. The bay's substratum is exclusively of a sandy nature with patches of sea grass beds making up 35% of the cover. The coral reef cover is pronounced from depths of 40 feet with boulders and coral heads interspersed with sand patches making up 30-40% of the substrate. The once fairly extensive sandy beach is now a narrow fringe that is generally of a sandy nature and occasionally transformed to a rocky interface by high wave energy due to freak turbulent swells and seasonal storms. Replenishment of the beach frequently occurs as a gradual, natural process over time.

### 4.2.5 Bathymetry

Dominica has a 153 km coastline that adjoins a 715 km coastal shelf. Most of the western portion of the shelf is less than one km wide but it broadens to approximately 5 km along the east coast in the vicinity of Marigot (see Figure 5) The coastal plain is similarly narrow except around Portsmouth on the west coast.

The sub-marine topography is similar to that of the land, rugged and mountainous with very deep valleys. The continental shelf around the island is narrow and as a result the water plummets to depths in excess of 120 ft very close to shore.




SOURCE ECNAMP, 1980

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| | DWG. NAME: BATHYMETRY | |

### 4.2.6 Physical Oceanography

The temperature of the water remains fairly constant and ranges from 25-29 degrees Celsius (Singh & Lewis, 1997)

Coastal currents generally flow along the western coast of Dominica in a north-south direction. The tidal range, except during storms, rarely exceeds 30 c.m. and there is no well developed inter-tidal area.

However, when wind driven the normal direction is towards the northwest, which is evident in the area of the CNP. Open water current patterns are not usually the same in the near-shore areas. During the winter months (January to April), up-welling currents, which bring nutrients from the depth to the surface, are more abundant. There is the everyday lateral wave movement resulting in long-shore sediment movement that maintains the integrity of the beach by moving sand along the shoreline. However, vertical sediment displacement is increased drastically during the hurricane season thereby removing sand from the beach, and exposing the rocks along the foreshore. Toucarie Bay and Belle Hall (Douglas Bay) beaches are areas where sand drifting and accretion over the last two years is evident. This regeneration of the beach is usually a fairly rapid process.

### 4.2.7 Water Quality

An assessment was conducted by the Environmental Health Department in 1996 at Indian River, Scott's Head-Champagne Area, Soufriere, Purple Turtle Beach and Coconut Beach. Additionally, sampling was conducted at Cabrits, Indian River, Purple Turtle, Glanvillia, Douglas Bay and Toucarie Bay as part of an ENCORE project in 1997. The results of both sampling events are shown in Table 2. All sites sampled showed evidence of microbiological contamination with Indian River, Glanvillia and Toucarie Bay being the most contaminated.

**TABLE 2: RANGE OF MICROBIOLOGICAL CONTAMINATION AT SELECTED BATHING WATERS 1996 AND 1997**

| Site | Environmental Health, 1996 | | ENCORE, 1997 | |
|---|---|---|---|---|
| | Range | | Range | |
| | Minimum FC CFU/100ml | Maximum FC CFU/100ml | Minimum FC CFU/100ml | Maximum FC CFU/100ml |
| Cabrits | N/M | N/M | 40 | 23,000 |
| Indian River | 520 | TNTC | 600 | 108,000 |
| Scott Head | 10 | 4400 | N/M | N/M |
| Soufriere | 6 | 1636 | N/M | N/M |
| Purple Turtle | 16 | 363 | 20 | >8,000 |
| Coconut Beach | 26 | 272 | N/M | N/M |
| Glanvillia | N/M | N/M | >1 | >80,000 |
| Douglas Bay | N/M | N/M | >1 | 47,000 |
| Toucarie Bay | N/M | N/M | 10 | 80,000 |

**NB: samples were collected from multiple located at each site.**
**NM: Not Monitored**

### 4.2.8 Summary of Physical Characteristics

The following are the salient factors of the physical environment:

- The rainfall pattern in the Cabrits area is very seasonal (1500mm to 1800 mm per year) with a marked dry season and wetter rainy season.
- Topography within the study area ranges from sea level to 1,250 feet.
- There are approximately 21 rivers in the study area. The two significant ones are the Lamothe River to the north which forms the northern boundary of the park, and the Indian River to the south which is a well established tourist attraction.
- Beaches composed of sand from marine and terrestrial sediments line the inner portions of the two bays in the study area: Prince Rupert and Douglas Bays. Beaches in both bays have been severely eroded due to the high wave activity caused by tropical storm and hurricane systems.
- Water depths in the study are can be 200 feet very close to the shoreline.
- Water quality testing for microbial contamination from two separate studies show that Indian River, Glanvillia and Toucari Bay are most contaminated.

## 4.3 Biological Characteristics

The marine assets within the Cabrits National Park (CNP) will be discussed under the following headings:

- Coral Reefs,
- Sea Grass Beds,
- Mangroves, and
- Beaches.

Discussions of the fauna associated with these assets will be included in the relevant sections. The description of the historical status of the different areas of the CNP was sourced from Edwards, 2006 and Weyerman *et al*, 1996. Figure 6 shows the location of the coastal resources of the project vicinity as provided by the Physical Planning Division.

### 4.3.1 Methodology

Field surveys (see Figure 2) via diver roving surveys and snorkelling were conducted at selected sites within the CNP during March 2007. These surveys focused on areas of high marine diversity, areas of high human activity ("popular areas") and areas of damage or scarring. In addition, local knowledge on marine changes within areas of the Park was obtained through consultation and diving with Ignatius Mitchell, a local resident of the area who has been diving in the waters off Cabrits for almost 25 years.

### 4.3.2 Coral Reefs

#### 4.3.2.1 Toucarie Bay

##### *4.3.2.1.1 Status of Toucarie Bay (1996)*

Toucarie Bay has been described by the dive community as the best area for diving in the park. There is a large variety of hard coral, sponges and fishes with fewer soft corals. In some areas there is algal growth over the corals and sponges. Mariska *et al*, 1996 observed four instances of black band disease on boulder brain coral (*Colpophyllia natans)* in a shallow area near the wreck. Pelagic fish species were abundant as well as shoals of Brown Chromis (*Chromis multilineata*) in deep reef areas. Commercially valuable fish species were not abundant in this bay. A low abundance of Surgeon Fish (*Acanthurus chirurgus* and *A. coeruleus*) was observed. Reef fish species found in abundance were parrotfish (*Sparisoma sp.* and *Scarus sp.*), snappers (*Lutjanus sp.*) and groupers (*Epinephelus guttatus* and *Cephalopholis cruentata*) all of very small sizes (less that 30 cm in length). The small size of the fish and the low numbers of commercially valuable species indicate that the reef is over fished.

#### *4.3.2.1.2 Status of Toucarie (2007)*

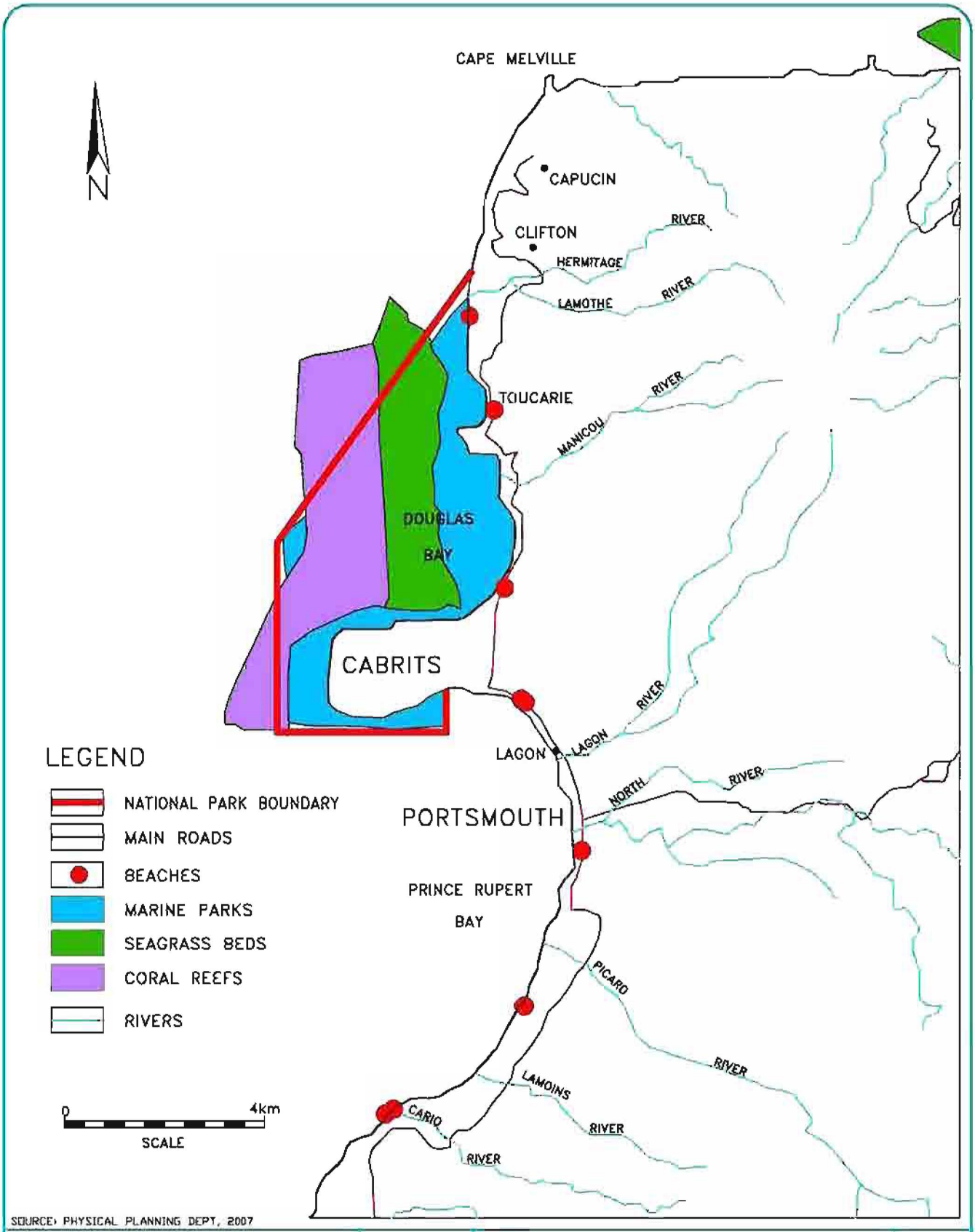
Toucarie Bay can be described as having coral outcroppings on both its northern and southern points. Toward the centre of the bay lies an area of sea grass beds which is dominated by *Syringodium sp.* This sea grass community is separated form the coral growth by sand channels. There was a diverse mix of dominant stony corals; lettuce / plate coral (*Agaricia sp.*), brain coral (*Colpophyllia sp.*), finger coral (*Porities sp.*) and gorgonians comprising sea feathers (*Pseudopterogorgia sp.*). Although fewer species of sponges were observed during this survey, the distribution of organisms is the same as was recorded in 1996.

In the shallower canyon and cave areas (<20 m) {see Figure 7} a few immature lobsters (*Panulirus sp.*) were observed sheltering alongside schools of Black-bar Soldierfish (*Myripristis jacobus*). A large Dog Tooth Snapper (*Lutjanus joco*) was also observed in this cave. Medium sized schools (40-60 individuals) of Brown Chromis (*Chromis multilineata*) were observed and there were occasional sightings of parrotfish, grouper, surgeons as well as black sea urchins *(Diadema antillarum)*. The reef fish composition and average fish size has not changed significantly since the 1996 survey and the area is therefore still not conducive to demersal fishing. Typical reef fish were also found at this site (see Appendix C).

The surveyed area had a high density of live coral growth with few un-colonised boulders. As in 1996 there was algal growth over both the soft and stony corals. Photograph 1 shows algae smothering a sea feather and Photograph 2 shows red algae, Y-branching algae (*Dictyota sp.*) and *Halimedia sp.* overgrowing live and dead boulder star coral (*Montastrea sp.*). However discussions with Mr. Mitchell have indicated that the algal cover in this area has been on the decline in recent times.

There were localised areas to the north of the bay where dead finger coral was abundant (see Photograph 3 and Figure 7)) which are possible remnants of reef destruction from past hurricanes and storms. These areas are now showing signs of re-growth (see Photograph 4).

Solid waste comprising of coconuts shells, plastics, pieces of wood and leaves was observed in the vicinity of the start of the dive (see Section 3.5.1.1). Mr. Mitchell indicated that this area is usually a depository for wastes from the nearby rivers, due to the physical landscape and currents. This debris is only removed during storm activity or from the work of divers during cleanup dives.

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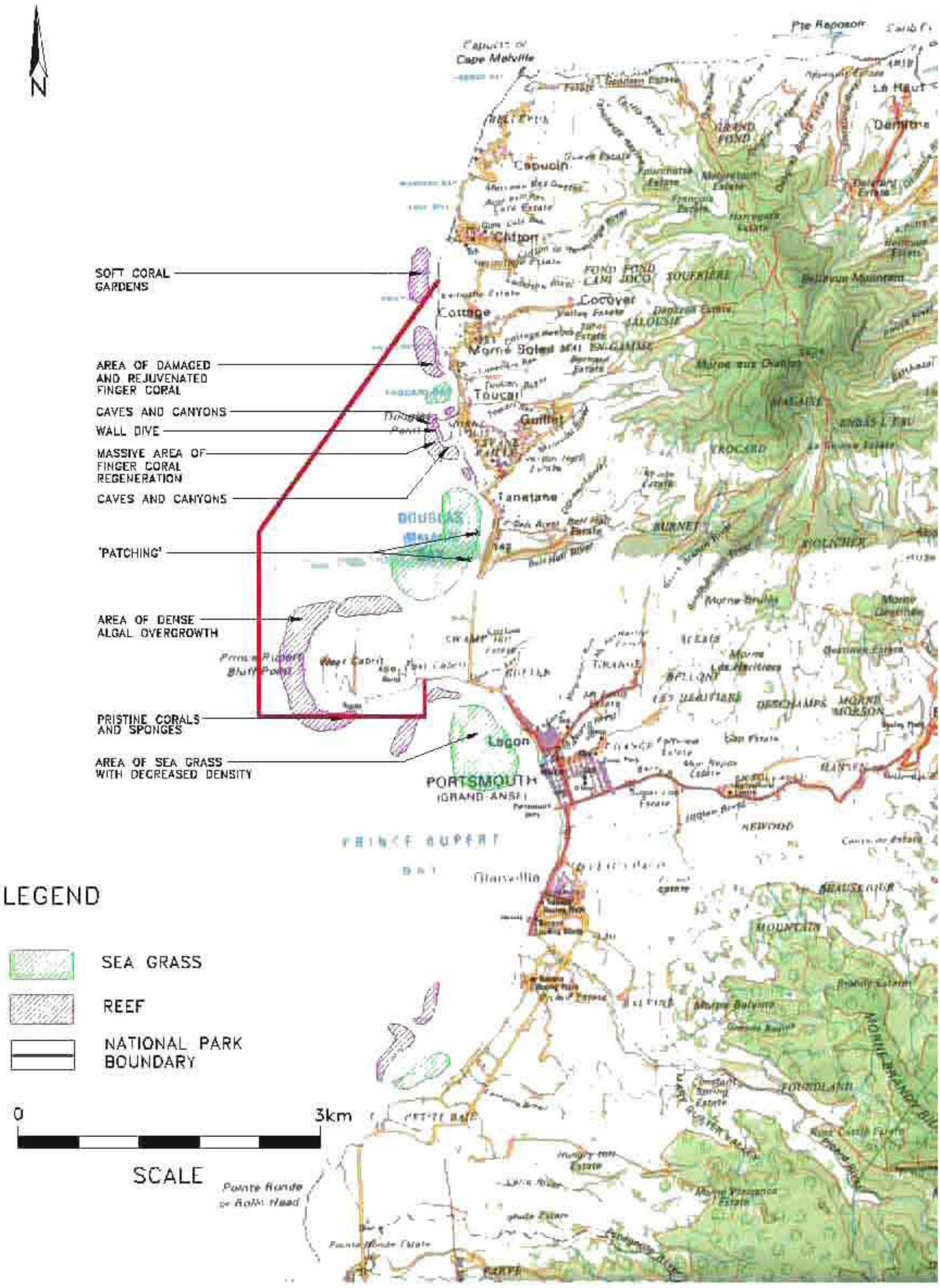
| | Date: 31/07/07 | PROJECT: CABRITS NATIONAL PARK (MARINE COMPONENT) SITE REPORT | |
| | | DWG. NAME: COASTAL RESOURCES IN STUDY AREA | |

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| | DWG. NAME: LOCATION OF CORAL REEFS AND SEA GRASS BEDS | |

In 1996, Mariska *et al* described an area of brain coral showing signs of black band disease near a wreck. Neither the wreck nor the area of diseased coral was observed during the roving survey. No instances of black band or any other coral disease were observed during the survey at this site.

#### 4.3.2.2 Douglas Point South

##### *4.3.2.2.1 Status of Douglas Point South (1996)*

Douglas Point South is characterized by narrow gullies and swim-throughs which provide an interesting site for divers. Between depths of 4-6 m there are extensive shallow reefs with limited coral cover (5% to 10%) interspersed with sandy patches. This area had a high urchin density with a significant amount of visible substrate with little to no algal cover. This trend changed as the dive neared Douglas Point North which was characterised by substantial algal growth consisting mainly of miscellaneous brown and red, Y-branch and thicket algae (*Galaxaura sp.)* among the pinnacles, indicating that there was coral destruction in this area.

The reef becomes deeper towards the south and east, with a substrate consisting mainly of rock with patches of sand that slopes gently down to 18 m giving way to sand. Live coral cover was between 25% and 50% and was dominated by patches of boulder star coral (*Montastrea complex*) and plate corals (*Agaricia sp*.). Species of encrusting fan leaf (*Lobophora variegata*) and the red filamentous algae were abundant in this area. Also common in this area was a variety of sponges including the brown tube sponge (*Agelas conifera*) which account for between 5% and 10% of sponge cover. Sea feathers were also common here.

The Bay has a healthy fish community consisting of free-swimming reef fish and benthic dwellers including Goat fish (*Mulloidichthys martinicus*) and Lizardfish (*Synodus sp*.). The following fish species were abundant:

- Sergeant Majors (*Abudefduf saxatilis*),
- Blue Chromis (*Chromis cyanea*),
- Creole fish (*Paranthias furcifer*),
- Creole wrasse (*Clepticus parrae*),
- Parrotfish (abundant in deep and shallow reef areas),
- Glass eye snappers, snapper (*Lutjanus spp*.), juvenile grouper, and parrotfish are common at depths exceeding 30ft.

Siirila, 1996 reported more than 95% of fish less than 15 cm in total length. There were no commercially valuable species observed except for parrot fishes and the abundant algal growth suggests that there was limited grazing by fish or sea urchins.

#### *4.3.2.2.2 Status of Douglas Point South (2007)*

The survey area is characterised by a mixture of both stony and gorgonian corals. The dominant stony coral included boulder star coral, lettuce/plate coral and finger coral. Finger coral was not dominant in 1996. As in 1996, there is still a high density of sponges and gorgonians.

In the deeper areas of the reef at about 25 – 30 ft, there were several large black margate (*Anisotremus surinamensis*) and dog tooth snapper. Small schools of smaller grunts (*Haemilidae spp.*) and mahogany snapper (*Lutjanus mahogoni*) were also observed around these larger fish. It was observed that there was an increase in the numbers of commercially important fish species (see Appendix C). This is in contrast to the surveys conducted a decade ago where the only notable commercially important fish was parrotfish. In the shallower areas and in the canyons, typical reef fish were encountered (see Appendix C) such as the red hind grouper (*Epinephelus guttatus*) exceeding 15 cm in total length (see Photograph 5). The canyon areas typically had lower abundances of fish but are still popular dive sites.

In 1996 Douglas Point South had little algal growth (except towards Douglas Point North) and a high urchin density. However in 2007, this particular reef had significantly more algae. Turf and Y branching algae were prominent in many areas of the reef (see Photographs 6 and 7). The urchin population here was relatively low and the absence of other herbivores in the shallower areas may be attributing to the high algal density. According to Mitchell (personal comm.) this area, like Toucarie, is also experiencing algal decline.

Also in 1996 areas toward Douglas Point North there were broken pinnacles of coral which remained after the passage of hurricanes and storms. In 2007 there were new colonies of finger corals re-establishing themselves (see Photograph 8). This area, like Toucarie Bay, is also experiencing coral rejuvenation.

There were no signs of coral disease and bleaching in this area and there was a notable absence of solid waste on the seafloor. The waters may be described as being more turbid than at other sites; the visibility in shallow, near shore areas (< 60 ft) being lower than was normally encountered at other sites within the National Park.

### 4.3.2.3 Cabrits North

#### *4.3.2.3.1 Status of Cabrits North (1996)*

This area consists of a sloping reef wall 2 m from shore which drops down to 6-9 m. The reef ceases abruptly and gives way to a flat sandy area and large rock formation called 'five fingers' which is located to the north and west of the Cabrits peninsula. Coral cover was diverse but low in both deep and shallow water. There is also evidence of destruction of coral colonies in the entire area. A variety of corals, sponges and algae were also present in the area. Generally in the deeper waters, algae and sponges are dominant.

#### *4.3.2.3.2 Status of Cabrits North (2007)*

The majority of the corals in this area have grown on boulder substrate. Gorgonians (sea feathers) are dominant in this reef, particularly so in the deeper regions (20-30 m) (see Photograph 9). Also abundant and diverse were the sponges. There were sandy patches separating areas of coral growth.

The fish observed were mainly reef dwelling species such as blue and brown chromis, wrasses, gobies (*Coryphopterus sp.*), trumpetfish (*Aulostomus maculates*), small parrotfish, small groupers and damselfish (*Stegastes sp.*), all of which are of no importance to commercial fisheries. Appendix C gives a listing of other typical reef dwelling fish found in this area. There were also many sea urchins and several sea cucumbers (*Holothuria mexicana*) observed throughout the site.

In terms of algal growth, much has not changed since 1996. Turf, Y-branched (*Dictyota sp.*) and encrusting fan leaf alga (*Lobophora variegate*) were present throughout all depths of the reef but more so in the deeper areas (20-30 m). Photographs 10 to 13 show the extent of algal growth on the sea floor and on the corals themselves. This site is generally characterised by higher algal growth according to Mitchell (personal comm.). Factors which may cause this phenomenon are damage from storms and hurricanes and a gentler current from the Cabrits South which favours the settling of nutrients.

Many of the communities in the Cabrits north area show evidence of storm and hurricane damage such as over turned sea feathers, broken and dead finger coral (see Photograph 14) and bleaching of plate and brain corals.

#### 4.3.2.4 Cabrits South

##### *4.3.2.4.1 Status of Cabrits South (1996)*

Cabrits South is characterized by a shelf 2 m from shore with slopes dropping to 13 m on the south and 9 m on the west side. There is a large area with boulders in the shallows around the corner of the Cabrits peninsula. The substrate is comprised of a mixture of rock and sand. Live cover in this area was approximately 30% and was evenly spread between corals, sponges and algae plant species which covered less than 10% of the area. The dominant species in this area were encrusting maze (*Meandrina meandrites*), finger coral (*Porites porites*) and red filamentous algae. In 1996, Siirila noted that sponge cover {dominated by barrel sponges (*Xestospongia muta*)} was 10%-25%. Some areas were dominated by red filamentous cover. The visibility in this area was 6 m.

##### *4.3.2.4.2 Status of Cabrits South (2007)*

Gorgonians and sponges were prevalent over the hard coral as compared to the dominant hard *Meandrina sp.* and *Porites porites* in 1996. Mostly finger and boulder coral were observed between the array of gorgonians and sponges. Photographs 15 – 18 show the variety of corals encountered at this site.

The presence of red filamentous red algae in 1996 was not observed during the 2007 survey, or any other significant amounts of any algal types. Mitchell (personal comm.) attributes this lack of algae and sediments and excellent visibility to the strong dual action currents in this area. Also of note at Cabrits South is the high urchin density which was the highest of all the areas surveyed within the CNP.

Some dead finger coral and a few broken large barrel sponges were observed in the deeper areas (20-30 m) but there is also a high density and diversity of coral and sponge in these areas. The areas between 10-20 m in depth once exhibited hurricane damage but regeneration is noticeable. The Cabrits South reef is possibly the healthiest within the National Park. As with Cabrits North, the dominant reef species were small reef dwelling fish (see Appendix C).

### 4.3.2.5 Pinnard Reef

#### *4.3.2.5.1 Status of Pinnard Reef (1996)*

Located in the north-western end of Toucarie Bay, there is a popular dive site around two large rocks. In areas between 20 m to 30 m of water the rocks are almost completely covered with sponges particularly brown tube sponge (*Agelas conifera*) and some encrusting varieties. Between the rocks are small coral boulders scattered over a sandy bed. The coral communities were quite diverse with sparse volumes of maze (*Meandrina meandrites*) and mustard hill (*Porites astreoides*) corals that are normally very common in other areas**.** Algal cover is significant and is dominated by Y-branch forms. It has been stated that in some areas algae overgrow coral and sponges.

In deeper waters, algal cover was very high and was dominated by *Dictyota sp.* Barrel sponges and sea feathers were abundant as well as sparse amounts of Giant Split Pore sea rods (*Plexaurella nutans)* that are considered rare in Dominica. The abundance of algal cover may be as a result of nutrient run-off from the land. The fish community was rich in the deeper section (6 m) and was dominated by grunt species (*Haemulon spp.*) interspersed with glass eye snapper, goat fish, squirrel fish, creole wrasse, drums (*Equetus punctatus*) and mahogany snappers. Some larger pelagics were also identified in this area. These included margates, mackerel scad (*Scomberomorus sp.*), large groupers and parrotfish.

#### *4.3.2.5.2 Status of Pinnard Reef (2007)*

The surveyed areas contained an even distribution of sea whips, feathers, sponges as well as brain and encrusting corals (see Photograph 19). Larger sandy areas were observed between the coral areas. Small boulders in these sandy areas were colonised by sea feathers. Mitchell (personal comm.) stated that this area is usually inhabited by schools of several fish species as well as stingrays and turtles. No stingrays and turtles were observed but medium sized schools (40-60 individuals) of grunts, goatfish, glass-eyed and mahogany snappers. Several large parrotfish, spiny lobster and a very large dogtooth snapper were also observed. A similar observation was made in 1996 and by the number of fish pots (see Photograph 20) observed in the area during the survey; the reef remains favourable for fishing.

During construction of the nearby Guillette - Pennvelle Road the reef area suffered from sedimentation. However, the visibility during this dive was similar to that of other sites within the Park. Testing the bottom sediment in several areas revealed a layer of sludge atop the sand which is evidence of past siltation (see Photograph 21). Photograph 22 shows sediment smothering a sponge and this was commonly observed on low lying corals as well. Y branching and filamentous algae were observed but they were at times also smothered by sediment. They were not as dominant as in 1996, perhaps now limited by recent sedimentation.

There were many instances of sea feathers falling over, probably due to currents, fish potting or even divers. This area, despite the relatively lower coral density, had possibly the highest fish density and diversity than surveyed areas within the MC/CNP.

### 4.3.3 Sea Grass Beds

#### 4.3.3.1 Status of Douglas Bay (2007)

The central regions of Douglas Bay present a pristine stretch of sea grass. Previous reports have stated that *Thalassia sp.* was the dominant species of seagrass. At present the dominant seagrass is the *syringodium sp.* (see Photograph 23) with little *Caulerpa sp.* or *Thalassia sp.* observed. In the north of the bay there are few coral outcroppings which continue south and ends at the mouth of the Manicou River (see Figure 7). The seagrass extends from the middle of the bay to the south where it meets the coral reef at Bell Hall. The seagrass in Douglas Bay extended 3-5 m from the shoreline west until depths unsuitable for seagrass growth. Figure 7 shows the extent of sea grass beds in Prince Rupert Bay. Of the fauna observed, there were several immature queen conchs *(Strombus gigas)*, sea cucumbers (*Holothuria mexicana)*, many juvenile fish and a few barracuda (*Sphyraena sp.*). There was also evidence of turtles in the area.

Within the inner areas of sea grass there were several instances of scarring (Photograph 24 and 25). These may have been as a result of storm action as they were not comparable to the effects of anchors and their chains observed in Prince Rupert Bay. The scars generally ranged from 1-2 m in diameter and it is unlikely that this could be caused by the smaller anchors that fishermen use. Leaf debris and solid waste were usually seen accumulating in these depressions within the sea grass. However, there was not much solid waste observed within the bay. As in Toucarie, ‘patching’ was observed (see Photograph 26). Towards the shoreline, where the sea grass met the sand, there were areas that appeared to be dying. This is natural and only occurs in the transition between sand and grass.

#### 4.3.3.2 Status of Purple Turtle / Big Papa's (2007)

This area is used by yachts as a mooring area. During the survey there were between 40 – 50 moored yachts observed. *Syringodium spp.* was the dominant seagrass in the bay and there was also evidence of *Caulerpa sp*. There were also few coral outcroppings between Purple Turtle and Big Papa's. Queen Conch and many juvenile fish were observed amongst the sea grasses and other solid structures encountered.

The sea grass in this area is being damaged by anchors and their chains which are used by mooring yachts (see Photographs 27 and 28). In some areas, chain damage is evident on the little hard substrate which would have supported coral growth in the past (see Photograph 29). Young fish still aggregate around such structures though. Other areas of hard substrate (see Photograph 30) have more algae than coral growth and are covered in sediment. There is an area of a few feet in diameter just outside Big Papa's with dead finger coral (see Photograph 31). Mitchell (personal comm.) has stated that these were not deposited there by currents but was previously a colony of finger coral. Towards the deeper areas of the bay, a fish pot was noticed and within it a few medium to large sized parrot fish. In moving through the sea grass bed, it was often observed that there were clearings, scars and areas of sea grass that appeared to be 'thinning' (see Photograph 32). This was unlike the 'patching' that was observed at Toucarie and Douglas Bay. Being closer to main terrestrial areas of activity, Prince Rupert Bay had the highest collection of solid waste including paper and plastic items, an old boat engine, buckets, cans and bottles.

#### 4.3.3.3 Status of Toucarie Bay (2007)

Toucarie Bay can be described as having coral outcroppings on both its northern and southern points. In the centre of this lies an area of *Syringodium* sea grass beds (see Figure 7) separated form the coral growth by sand channels.

A colony of garden eels (*Heteroconger halis*) was observed in the northern sand channel. Within the sea grass beds a single species of sea cucumber was observed. There were also several intermediate queen conchs, a high presence of juvenile yellow goatfish *(Mulloidichthys martinicus)* and many smaller schools of fish which were too small to be identified on-site.

During snorkelling across the bay, there was an area about 30 ft out from the shore, in the centre of the shoreline in which tiny bubbles were rising up from the sea floor. Its origin is in the volcanic activity that created the island. At Douglas Point North heading eastwards, lies a shallow / exposed reef which is a popular snorkelling site.

Snorkelling in the inner parts of the bay revealed that the sandy areas, approximately 15-30 ft in a seaward direction from the shoreline, was also scattered with litter. It was also observed on the adjacent front of sea grass. This too comes from the rivers as well as the abutting Toucarie Village and beach visitors. A 'patching' event was observed within the sea grass. In areas along the perimeter of the grass there were areas where the grass seemed to be decreasing in density and dying. This can be attributed to a natural cycle, where the grasses sometimes thrive and sometimes not. In shallower areas there was damage to the sea grass beds from fishing with nets that sometimes drag on the sea floor. This may be considered as minimal though as the sea beds in this area can be considered a healthy ecosystem.

### 4.3.4 Marine Mammals

According to Anon 2001, whales are not hunted in Dominica either commercially or for local use, but pilot whales (*Globicephala macrorhynchus*) are reportedly sometimes landed as incidental catch. Weidner et al 2001 report that the Fisheries Division does not report marine mammal interactions with local fisheries other than a few fishermen that target pilot whales with harpoons. Also, humpback whales are occasionally reported as taken and the meat is sold in local markets. The Biodiversity Strategy and Action Plan (Anon, 2001) reports a list of marine mammals species that have been observed in the coastal waters of Dominica. These include:

- Sperm Whale (*Physter catodon*)
- Bryde's Whale (*Balaenoptera edeni*)
- Short-fined Pilot Whale (*Globicephala macrorhynchus*)
- Cuvier's Beaked Whale (*Ziphius cavirostis*)
- Pygmy Sperm Whale (*Kogia breviceps*)
- Humpback Whale (*Megaptera novaenglia*)
- Whale Shark (*Rhincodon typus*)
- Spotted Dolphin (*Stenella sp*)
- Spinner Dolphin (*Stenella clymene*)
- Frasers Dolphin (*Lagenodelphis hosei*)
- Bottlenose Dolphin (*Tursiops truncates*).

Dominica is a breeding ground for the sperm whale, and there is a resident population observed year-round off the west coast (Anon, 2001).

### 4.3.5 Sea Turtles

The hawksbill is the most common turtle in Dominica, and nests on the island. The second most commonly observed species is the leatherback, which nests on beaches along the east coast. Within the Cabrits area, nesting of turtles is reported to occur in Douglas Bay. No information on the numbers or trends over recent times was available. In addition, the beaches in this bay have experienced severe erosion due to the passage of recent hurricanes.

### 4.3.6 Mangroves

This study of the wetland on the Cabrits Isthmus is based on a review of relevant reports and publications as well as from a site visit conducted on March 14, 2007. This study examines the current status of the marshes, mangrove and swamp forests within the Cabrits National Park. The health of these ecosystems was observed as well as the present uses and potential threats identified.

#### 4.3.6.1 Methodology

During the site visit vegetation within the Cabrits wetland were identified for each ecotype with the dominant species being noted. Avifauna was also identified opportunistically while walking along the trails within the wetland (see Section 3.5.2). As with the reconnaissance in the marine parks, areas of obvious damage were identified.

#### 4.3.6.2 History and Legal Status

The Cabrits Peninsula is located in the northwest of Dominica, about one mile northwest of the town of Portsmouth. The Peninsula is dominated by two hills - the East or Inner Cabrit (139.6 m) and the West or Outer Cabrit (179.6 m). An isthmus separates the peninsula from the mainland and it supports the island's most extensive wetland. The peninsula, its surrounding marine area and much of the isthmus were included in the Cabrits National Park when the latter was legally established in December 1986, through an amendment to the National Parks and Protected Areas Act (Ch. 42:02) in the form of an S.R. & O. The current park boundaries are described in Schedule II of the said Act. The park is 1,313 acres in extent, but the terrestrial portion is only 260 acres, with a substantial portion being occupied by the wetland (89 acres).

Prior to the establishment of the Cabrits National Park, approximately 13 acres comprising the southern portion of the wetland and the fringing coastal strip were sold to a developer for the development of a marina, and work on that project began in the early 1980's. However, these lands were subsequently repossessed by the State and are currently designated as “Unallocated State Lands”. A cruise ship dock and reception facility was constructed at the southern side of the Cabrits in 1990, near the site of the original historic wharf. This allows cruise ship passengers to disembark directly into the Cabrits National Park.

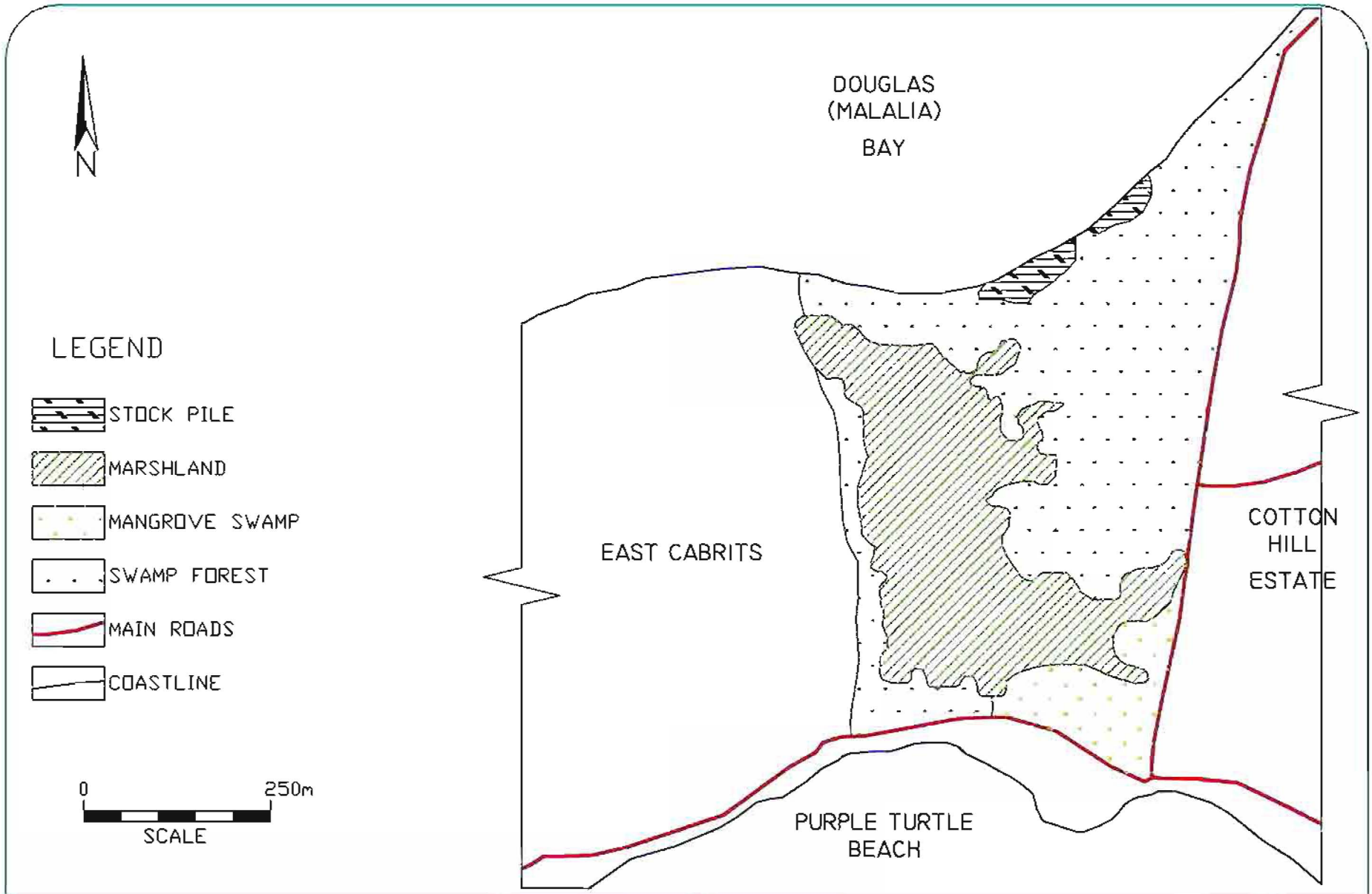
#### 4.3.6.3 Ecotypes within the Cabrits Wetlands

The wetland of the Cabrits National Park is an area influenced by the seasonal supply of fresh water and poor drainage. This wetland support the only true stands of true mangrove trees on Dominica, stands of freshwater swamp forest and extensive marshlands (see Figure 8). This wetland is about 35 hectares (85 acres) and is one of the two large wetlands in the greater Portsmouth area; the other is located at Glanvilla and is associated with the Indian River. The Cabrits wetland receives part of its supply of fresh water from the rain falling directly over the area. It also receives water from the runoff coming from the eastern face of the East Cabrit and from the lands to the immediate east of the isthmus, as well as from a temporary stream that flows into the northeast corner of the isthmus.

During the rainy season (July to January), excess water accumulates in the marsh and during the dry season (February to June) much of the marsh and swamp becomes very dry. The flora that are able to survive under these conditions usually have special adaptations to tolerate their usually waterlogged environment.

#### 4.3.6.4 Surrounding Vegetation

The vegetation of the eastern slopes (see Photograph 33) of the East Cabrit is comprised of dry forest (see Figure 9). Dominant species in this ecotype include White Cedar (*Tabebuia heterophylla*), Wezinye (*Cocoloba pubescens*), Savonnet (*Lonchocarpus benthamianus*), Naked Indian (*Bursera simaruba*), Kanpech (*Haematoxylum campechium*) and Bay Leaf (*Pimenta racemosa*). The change from the wetland to the dry forest is rapid and a few Kachimon Mawon (*Annona glabra*) trees that are usually associated with the wetland are found in the narrow transition area between the wetland and the dry forest.

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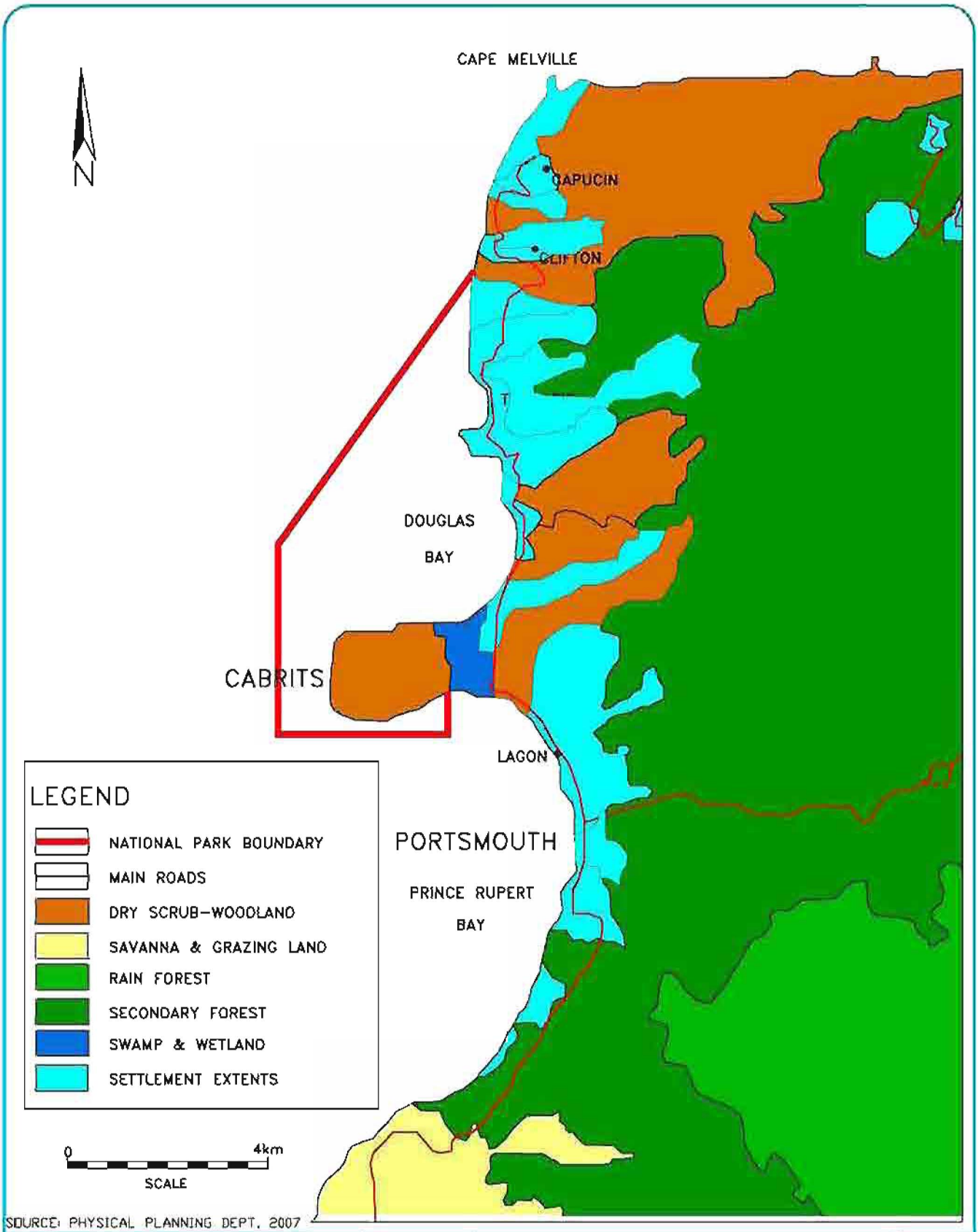
| | DWG. NAME: CABRITS WETLAND SYSTEMS | |

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| | DWG. NAME: VEGETATION IN THE STUDY AREA | |

The area to the east of the wetland, i.e. to the east of the Portsmouth-Tantane Road, is partly under cultivation, but also contains a few typical wetland species such as Hoopwood (*Dalbergia ecastaphyllum*), White Mangrove (*Laguncularia racemosa*), Roseau Reed or Wild Cane (*Gyerium sagitata*). Appendix D contains a listing of the dominant floral and faunal species associated with the wetlands.

#### 4.3.6.5 Flora of Cabrits Wetlands

##### *4.3.6.5.1 Mangrove Swamp*

Due to the waterlogged conditions the swamp area of the Cabrits wetland the species composition is not very diverse. There are two small stands of mangrove in the wetland and they are dominated by mature trees of White Mangrove (*Laguncularia racemosa*) which is the only typical swamp tree in that area that is able to withstand brackish soil conditions (see Photograph 34). The Cabrits Isthmus is the site that contains the largest number of White Mangrove trees on Dominica. White Mangrove trees can grow up to 50 ft tall and they usually produce dense mats of pneumatophores near their base. Some of the White Mangrove trees growing near the edge of the Portsmouth-Tanetane Road also produce prop roots as a special adaptation.

The only other true swamp trees in the wetlands are a few "Maho dou" trees (*Hibiscus pernambucensis*) which belong to the Malvaceae or Hibiscus family.

##### *4.3.6.5.2 Marshland*

Sawgrass (*Cladium jamaicens*), a sedge with a thick 7-8 feet tall stem, covers a major area of the Cabrits marshlands. The other dominant plants in the marsh are two sedges (*Eleocharis mutata* and *E. interstincta*) that are known locally as “Jon”. The marshlands contain dense patches of the giant Swamp Fern (*Achrosticum danaefolium*) which grow in large, thick tussocks (see Photograph 35). This species is one of the few ferns that are adapted to survive in flooded soil conditions; it can also tolerate brackish water. Several other sedges may also be found along the edges of the wetlands, or on sites that are not regularly flooded. Other plants growing in or on the edges of the marsh at the Cabrits include Gwenn Job (*Coix lacryma-jobi*), Hoopwood (*Dalbergia ecastaphyllum*) and the small white-flowered water lily (*Typhae sp.*) which occurs in the south-east corner of the wetland.

#### *4.3.6.5.3 Swamp Forest*

The freshwater swamp forest of the Cabrits wetlands includes a pure stand of "Kachiman mawon" or Pond Apple (*Annona glabra*) {see Photograph 36}. In some other areas of the swamp this species may grow quite distinctly from or in a mix with stands of "Bwa Mang" or Swamp Bloodwood (*Pterocarpus officinalis*). The Pond Apple is a small tree that branches from near its base and produces an open crown of shiny leaves. Several short, thick, tightly packed buttresses are produced by this tree as well as pneumatophores by older trees.

The Swamp Bloodwood (see Photograph 37) is the largest and tallest of the swamp trees at Cabrits reaching a height of 75 ft and a diameter of over 2 ft. It occurs in a small patch of freshwater swamp located on the northern portion of the wetland. Some trees also line a temporary watercourse that leads into the main portion of the wetland. Swamp Bloodwood produces characteristic plank buttresses with a number of pneumatophores. This tree produces a fruit which is an important food source for Red-necked (Jaco) Parrots (*Amazona arausiaca*) in lowland areas in the northern half of Dominica.

There are examples of Strangler Figs or "Fidjé" (*Ficus citrifolia*) strangling the Swamp Bloodwood and Kachiman Mawon (*Annona glabra*) trees in the Cabrits swamp. The Cabrits swamp forest also contains a number of White Cedar (*Tabebuia heterophyla*) and Kanpech (*Haematoxylum campechium*) trees (typical dry forest species) which can be found growing with the Swamp Bloodwood and the Kachiman Mawon trees.

### 4.3.6.6 Fauna

The Cabrits wetland is inhabited by all the major terrestrial faunal groups on Dominica and these include birds, reptiles, amphibians, fish, mammals, crustaceans and insects.

#### *4.3.6.6.1 Avifauna*

Several species of resident birds such as the Scaly-naped Pigeon (*Columba squamosa*), the Green Heron (*Butorides striatus*) and the Smooth-billed Ani (*Crotophaga ani*), among many others, are associated with the Cabrits swamp. The birds of the Cabrits wetlands also include ducks (e.g. teals (*Anas sp.*), herons and egrets (e.g. Little Blue Heron (*Egretta caerulea*), Cattle Egret {*Bubulcus ibis*}), dowitchers (*Limnodromus sp.*), warblers (*Dendroica sp.*), various species of sandpipers

(*Calidris sp.*) and yellowlegs (*Tringa sp.*). The Green Heron (*Butorides striatus*) is known to nest in the White Mangrove trees in the swamp, and ducks with young chicks have been observed on several occasions swimming in the open water in the marsh. It is possible that the Common Moorhen may also be nesting in the marsh.

The swamp and marsh of the Cabrits wetland have been cited as important sites for migratory birds on the island, particularly for waterfowl and wading birds, and these sites have been recommended as major bird watching areas in Dominica. The wetlands are used by several species of neotropical birds migrating from North America to South America and back, and at least thirty-five species of migratory birds have been documented at the Cabrits wetlands.

#### *4.3.6.6.2 Reptiles*

Two species of lizard are directly associated with the Cabrits wetlands, i.e. the Dominican tree lizard or 'Zandoli' (*Anolis oculatus*) which occurs regularly in the swamp, and the Dominican Ground Lizard or 'Abolo' (*Ameiva fuscata*). Both of these species of lizard are endemic to Dominica. The second smallest, and one of the rarest species of lizard found on the island, the Fantastic Gecko (*Sphaerodaclylus fantasticus*), has been observed on the edge of the swamp overlooking Douglas Bay. The adult of this species is only approximately 1.5 inches long.

#### *4.3.6.6.3 Crustaceans*

The Cabrits swamp is an important area for crabs on Dominica, and at least six species may be found here. This includes the island's largest species of terrestrial crab - the White Crab or 'Kobo' (*Cardisoma guanhumi*) and one of the two smallest species of crab on the island - the Fiddler Crab (*Uca sp*.). The other crustaceans associated with the wetlands are freshwater shrimp, and at two species (*Macrobrachium spp.*) have been identified in the area.

#### *4.3.6.6.4 Amphibians*

Only one species of amphibian has been identified in the wetlands - the West Indian Tree Frog (*Eleutherodactylus martinicensis*). This small frog bypasses the tadpole stage in its breeding cycle.

#### *4.3.6.6.5 Fish*

Two species of freshwater fish, known locally as 'Casey' (unidentified sp.) and 'Dome' (*Eleotris pisonis*), were traditionally collected from the pools in the marsh by residents. Guppies (*Gambizi affinis* and *Poecilia reticulata*) may also be found in the pools of water in the marsh, but these were introduced by the Environmental health Department to control mosquito breeding in the wetlands.

#### *4.3.6.6.6 Mammals*

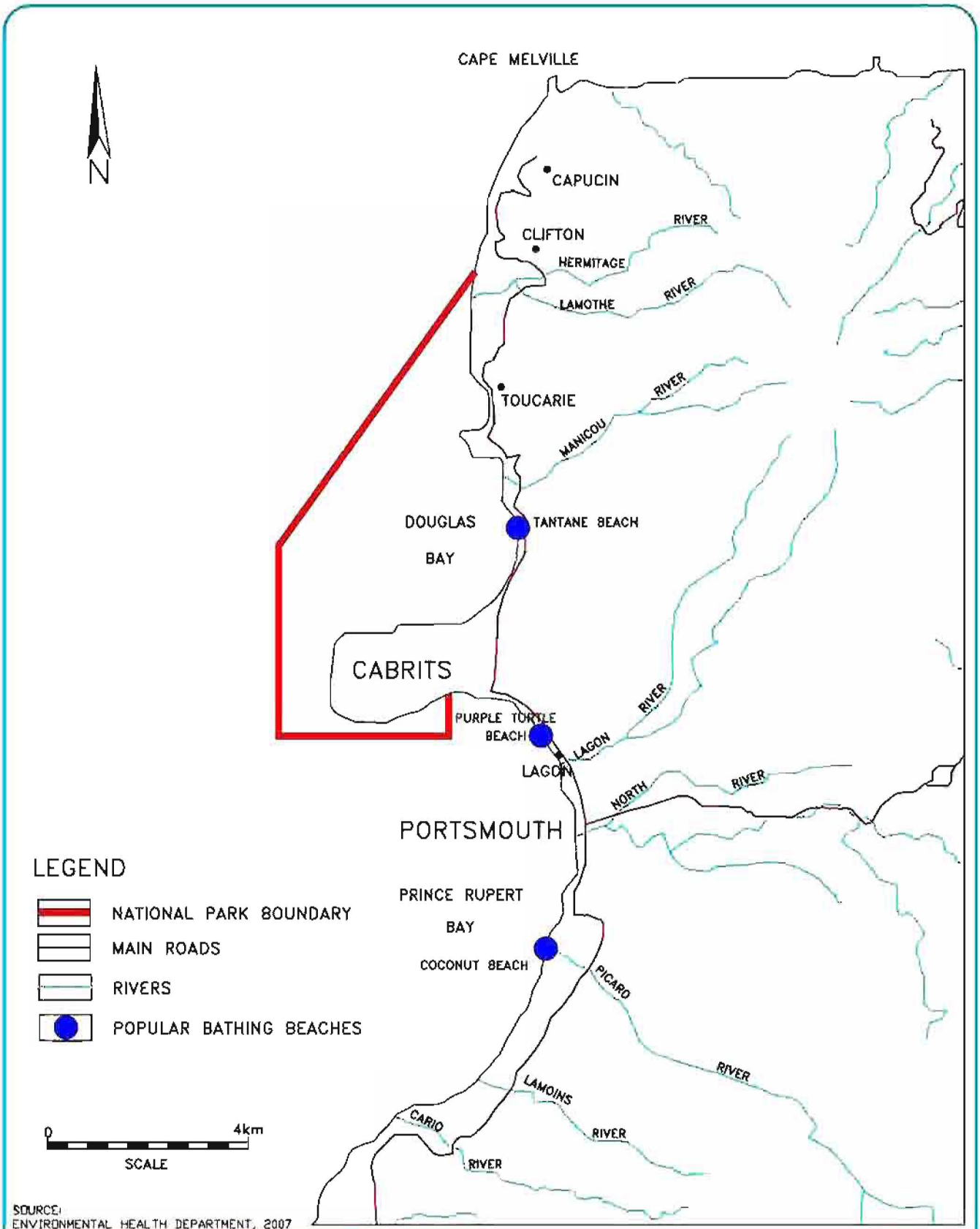
The mammals associated with the Cabrits wetlands include the frugivorous (fruit-eating) bats, insectivorous bats and possibly nectarvorous bats. Eight species of bats have been recorded for the wider Cabrits National Park. Although the opossum has occasionally been sighted in the dry forest of the Cabrits this mammal has not been reported for the wetlands.

### 4.3.7 Beaches

There are three beaches within the study area which are used for recreation: Tanetane Beach, Purple Turtle Beach and Coconut Beach (see Figure 10). Of the three, Tanetane beach is located within the Cabrits marine component while Purple Turtle and Coconut Beaches are located to the south of the Cabrits marine component. Information from the residents, fishermen and other stakeholders in the study area indicated that the beaches in the study area have been seriously affected by the passage of hurricanes in recent years. Photographs 38 and 39 show the beaches which have been eroded by hurricanes while Photographs 40 and 41 show the few recreational beaches still in existence in the study area.

### 4.3.8 Summary of Biological Characteristics

Coral reefs were generally in good condition. The most pristine coral formations were observed at Cabrits South. Corals observed were a mix of hard and soft corals. Areas of damage as a result of the passage of hurricanes were observed at Toucarie, Douglas Point South, Cabrits North and Pinnard Reef.

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| | | DWG. NAME: POPULAR BATHING BEACHES IN THE STUDY AREA | |

Evidence of algal over-growth was observed at Toucarie, Douglas Point South and Cabrits North. Although bleaching and black-band disease were observed on some of the reefs during the earlier 1996 study, no evidence of this was observed during this study.

Seagrass beds were observed at three locations. Two at Douglas Bay and Toucarie Bay which are within the boundaries of the MC/CNP and at Prince Rupert Bay just east and south of the park.

Seagrass beds were dominated with Syringodium sp. at all three sites. Scarring of the seagrass beds and patchy growth were observed at Douglas and Prince Rupert Bays. In Prince Rupert Bay this is due to the anchor damage from yachts. In Douglas Bay this may be due to storm damage during the passage of hurricanes. The seagrasses in Toucarie Bay were degraded by the deposition of solid wastes from anthropogenic sources.

Marine Mammals in the form of whales and dolphins are observed within the waters of the west coast of Dominica and discussions with fishermen indicate that these animals may venture into the park from time to time.

Hawksbill turtles are known to nest on the beaches of the west coast. Within the study area nesting occurs at Douglas and Toucarie Bays. However, these beaches have experienced sever erosion due to the passage of hurricanes.

There are three main ecotypes within the Cabrits wetland system: mangroves, swamp forest and marshlands. The wetland supports all the major faunal groups on Dominica including birds, reptiles, amphibians, fish, mammals, crustaceans and insects.

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PHOTOGRAPH 1: ALGAE SMOTHERING A SEA FEATHER IN TOUCARIE BAY


PHOTOGRAPH 2: DICTYOTA Sp., HALIMEDIA Sp. AND RED ALGAE SMOTHERING MONTASTREA CORAL

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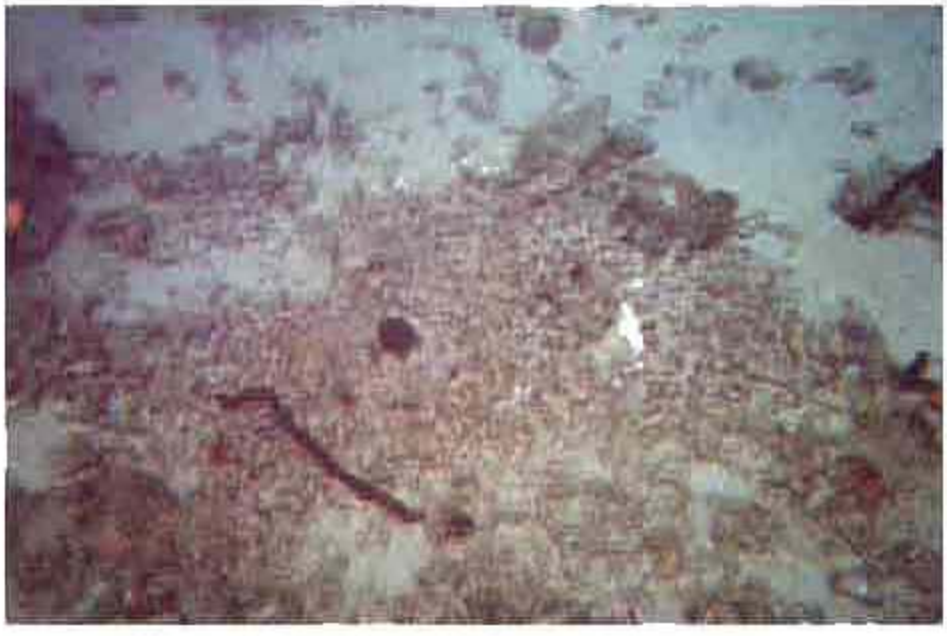

PHOTOGRAPH 3: DEAD PORITES Sp. IN TOUCARIE BAY

PHOTOGRAPH 4: GROWTH OF PORITES Sp. IN TOUCARIE BAY

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PHOTOGRAPH 5: RED HIND GROUPER (730cm IN LENGTH) AT DOUGLAS PT. SOUTH

PHOTOGRAPH 6: SOME DICTYOTA Sp. AND TURF ALGAE
ON DEAD CORAL SUBSTRATE AT DOUGLAS PT. SOUTH

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PHOTOGRAPH 7: TURF ALGAE BETWEEN PATCHES OF RE-GENERATING PORITES Sp.

PHOTOGRAPH 8: RE-ESTABLISHMENT OF PORITES Sp.
WITH DEAD PORITES Sp. IN THE BACKGROUND

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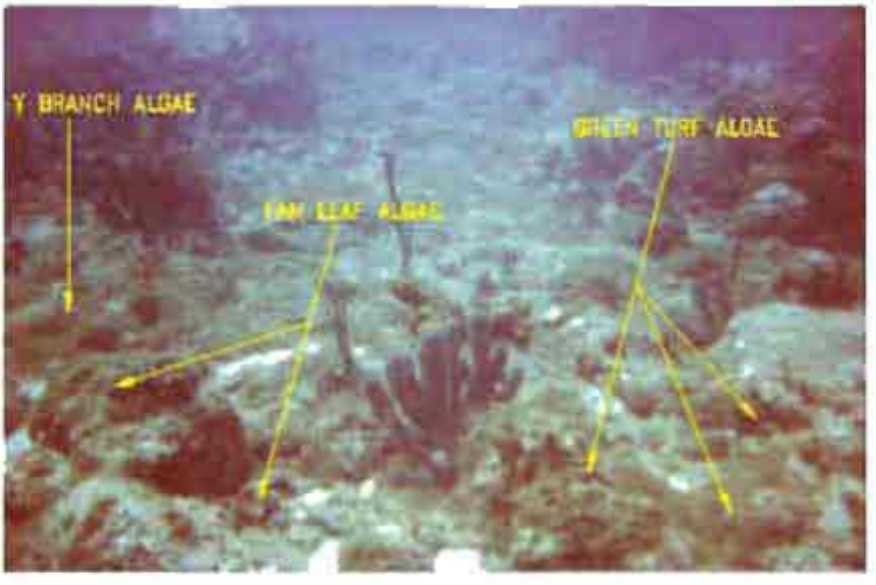
| | DWG. NAME: | PHOTOGRAPHS 7 & 8 |

PHOTOGRAPH 9: A SECTION OF SEA FEATHERS IN CABRITS NORTH




PHOTOGRAPH 10: GREEN TURF ALGAE, Y BRANCH ALGAE AND ENCRUSTING FAN LEAF ALGAE ON THE SEA FLOOR IN CABRITS NORTH

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| | DWG NAME | PHOTOGRAPHS 9 & 10 |

PHOTOGRAPH 11: Y BRANCH ALGAE OVERGROWING SOFT CORAL AT CABRITS NORTH

PHOTOGRAPH 12: Y BRANCH ALGAE OVERGROWING SOFT CORAL

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| Date: 31/07/07 | DWG. NAME: PHOTOGRAPHS 11 & 12 |

PHOTOGRAPH 13: Y BRANCH AND ENCRUSTING FAN LEAF ALGAE OVERGROWING BOULDER STAR CORAL

PHOTOGRAPH 14: AN EXPANSE OF DEAD FINGER CORAL IN CABRITS NORTH

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| Date: 31/07/07 | DWG. NAME: | PHOTOGRAPHS 13 & 14 |


PHOTOGRAPH 15: A VARIETY OF SPONGES AND SOFT CORAL FOUND AT CABRITS SOUTH

PHOTOGRAPH 16: FEATHER STAR IN AN AZURE VASE SPONGE

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| | DWG NAME: | PHOTOGRAPHS 15 & 16 |

PHOTOGRAPH 17: A PAIR OF BARREL SPONGES IN CABRITS SOUTH


PHOTOGRAPH 18: AN AGGREGATION OF ORANGE ENCRUSTING SPONGES

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PHOTOGRAPH 19: A COLLECTION OF SPONGES, HARD AND SOFT CORALS AT PINNARD

PHOTOGRAPH 20: A SET FISH POT AT PINNARD

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PHOTOGRAPH 21: SILT ON THE SEA FLOOR AT PINNARD

PHOTOGRAPH 22: SEDIMENT SMOTHERING A SPONGE

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PHOTOGRAPH 23: PRISTINE SEA GRASS BEDS OF SYRINGODIUM Sp. AT DOUGLAS BAY

PHOTOGRAPH 24: A LARGE SCAR FILLED WITH DEAD LEAVES IN THE SEA GRASS BED AT DOUGLAS BAY

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| | DWG. NAME: | PHOTOGRAPHS 23 & 24 |

PHOTOGRAPH 25: A SCAR IN THE SEA GRASS AT DOUGLAS BAY

PHOTOGRAPH 26: "PATCHING" NEAR THE SHORELINE PERIMETER IN DOUGLAS BAY

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| | DWG. NAME | PHOTOGRAPHS 25 & 26 |

PHOTOGRAPH 27: AN ANCHOR PLOWING THROUGH SEA GRASS AT PRINC RUPERT BAY

PHOTOGRAPH 28: AN ANCHOR CHAIN SCARRING THE SEA GRASS AT PRINCE RUPERT BAY

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| Date: 31/07/07 | DWG. NAME: | PHOTOGRAPHS 27 & 28 |


PHOTOGRAPH 29: ANCHOR CHAIN DAMAGE TO HARD SUBSTRATE WHICH WOULD HAVE OTHERWISE SUPPORTED CORAL GROWTH

PHOTOGRAPH 30: HARD SUBSTRATE SMOTHERED IN ALGAL GROWTH

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PHOTOGRAPH 31: AN AREA OF DEAD FINGER CORAL IN PRINCE RUPERT BAY

PHOTOGRAPH 32: AN AREA OF LOW DENSITY SEA GRASS, TYPICAL IN PRINCE RUPERT BAY

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| | DWG. NAME: | PHOTOGRAPHS 31 & 32 |

PHOTOGRAPH 33: VEGETATION OF EAST CABRITS

PHOTOGRAPH 34: MANGROVE SWAMP

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| Date: 31/07/07 | DWG. NAME: | PHOTOGRAPHS 33 & 34 |

PHOTOGRAPH 35: SWAMP FERN (ACROSTICHUM DANAEFOLIUM) IN MARSHLAND

PHOTOGRAPH 36: KACHIMAN MAWON (ANNONA GLEBRA) ON MARSH EDGE

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| | DWG NAME | PHOTOGRAPHS 35 & 36 |

PHOTOGRAPH 37: SWAMP BLOODWOOD (PTEROCARPUS OCCICINALIS)

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| | PROJECT: | CABRITS NATIONAL PARK (MARINE COMPONENT) SITE REPORT |
| Date: 31/07/07 | DWG. NAME: | PHOTOGRAPH 37 |

PHOTOGRAPH 38: BEACH EROSION AT CABRITS

PHOTOGRAPH 39: BEACH EROSION AT CABRITS

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| | PROJECT | CABRITS NATIONAL PARK (MARINE COMPONENT) SITE REPORT |
| Date: 31/07/07 | DWG. NAME | PHOTOGRAPHS 38 & 39 |

PHOTOGRAPH 40: RECREATION ON BEACH AT DOUGLAS BAY

PHOTOGRAPH 41: RECREATION ON BEACH AT DOUGLAS BAY

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| Date: 31/07/07 | DWG. NAME | PHOTOGRAPHS 40 & 41 |

# 5 SOCIO-ECONOMIC CHARACTERISTICS

This discussion of socio-economic characteristics is derived from several sources including:

- Meetings with government agencies and other organisations.
- The Dominica Population and Housing Census Report 2001.
- Opportunities for Sustainable Livelihoods in One Protected Area in Each of the Six Independent OECS Territories, for the OECS Protected Areas and Sustainable Livelihoods (OPAAL) Project. Espeut 2006.
- Capacity Building for Protected Areas Planning and Management and Associated Livelihoods. Parsram 2007.
- Draft Management Plan, Cabrits National Park Marine Section. Marie – Jose' Edwards. December, 2006

## 5.1 Demographic Data

The data provided in this section are discussed under the following headings:

- Population,
- Number of Households,
- Employment / Unemployment, and
- Commercial Activity.

This information is provided as a context for the results of stakeholder consultations.

### 5.1.1 Population

Table 3 below shows that there is a general decrease in the total country population over the 20 year period. For the parish of St. John, there was a decrease in population from the 1981 population census to the 1991 census. This population increased by 6.3% from 1981 to 2001. In 2006, Espeut notes that the parish of St. John has the highest mean population growth rate (in the census period 1991 to 2001) of all the parishes in Dominica.

**TABLE 3: POPULATION AND PERCENTAGE CHANGE**

| CENSUS DIVISION | POPULATION | | | % CHANGE | |
|---|---|---|---|---|---|
| | 1981 | 1991 | 2001 | 1981-1991 | 1991-2001 |
| Country Total | 73795 | 71183 | 69625 | -3.7 | -2.2 |
| St. John | 5412 | 4990 | 5327 | -8.5 | 6.3 |

**TABLE 4: POPULATION BY GEOGRAPHIC AREA AND SEX (2001)**

| LOCATION | TOTAL | MALE | FEMALE |
|---|---|---|---|
| Lagon, Derriere, La Rosine | 572 | 285 | 287 |
| Cabrits, Bell Hall, Tantane, etc. | 377 | 203 | 174 |
| Toucarie, Morne Cabrit, etc. | 57 | 28 | 29 |
| Picard, Glanvillia, D'Leau Chaud | 1,385 | 713 | 672 |
| Rest of Portsmouth | 1,804 | 880 | 924 |
| TOTAL | 4,195 | 2,109 | 2,089 |

The Cabrits National Park including the marine component is surrounded by the villages of Cottage, Toucarie, Tanetane, Savanne Paille, Guillet, Morne A-Louis, Lagon, Glanvillia and Picard and the town of Portsmouth (see Figure 11). The population of the communities in the vicinity of the Cabrits National Park represents just 6% of the total population of the island of Dominica and 78.7% of the population of the Parish of St. John (see Table 4).


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| | | DWG. NAME: POPULATION CENTRES IN THE PROJECT VICINITY | |

### 5.1.2 Number of Households

In contrast to the decrease in population in the country as a whole, the number of households increased steadily over the 30 year period (see Table 5). The greatest increase (13.4%) occurred during the 1991 – 2001 census period.

**TABLE 5: NUMBER OF HOUSEHOLDS BY CENSUS DIVISION**

| CENSUS DIVISION | 1970 | 1981 | 1991 | 2001 | PERCENTAGE CHANGE | | |
|---|---|---|---|---|---|---|---|
| | | | | | 1970-1981 | 1980-1991 | 1991-2001 |
| Country Total | 15149 | 17310 | 19374 | 22359 | 12.5 | 10.7 | 13.4 |
| St. John | N/A | N/A | N/A | 1578 | N/A | N/A | N/A |

**TABLE 6: NUMBER OF HOUSEHOLDS OF SELECTED COMMUNITIES (2001)**

| LOCATION | TOTAL |
|---|---|
| Lagon, Derriere, La Rosine | 185 |
| Cabrits, Bell Hall, Tantane, Etc. | 133 |
| Toucarie, Morne Cabrit, etc. | 21 |
| Picard, Glanvillia, D'Leau Chaud | 608 |
| Rest of Portsmouth | 631 |
| Total | 1578 |

The number of households in the surrounding villages is 1578 just 7% of the number of households in Dominica (see Table 6).

### 5.1.3 Employment / Unemployment

Employment in Dominica has increased over the period 1981 to 2001 with the greatest increase (15%) occurring during the period 1981 to 1991 with a smaller increase (4%) over the period 1991 to 2001 (see Table 7).

**TABLE 7: EMPLOYMENT, UNEMPLOYMENT AND PARTICIPATION RATES BY GENDER AND CENSUS DIVISION**

| CENSUS DIVISION | EMPLOYED | UNEMPLOYED | LABOUR FORCE PARTICIPATION RATE / % |
|---|---|---|---|
| **2001** | | | |
| Country Total | 24811 | 3054 | 89.0 |
| **1991** | | | |
| Country Total | 23823 | 2541 | 90.4 |
| **1981** | | | |
| Country Total | 20706 | 4627 | 81.7 |

The majority of employed persons in Dominica were employed in the skilled agricultural and fishery workers sector (17.8%) followed closely by the craft and related trade workers sector (16.8%) (see Table 8). This differs slightly in the Cabrits area where the majority of employed persons are in the service workers and shop / market sales workers sector (17.9%) followed by the elementary occupations sector (16.7%). This (as noted by Espeut 2006) is as a direct result of the presence of the Ross Medical School.

**TABLE 8: EMPLOYED PERSONS IN THE CABRITS CATCHMENT AREA (1991)**

| OCCUPATIONAL GROUP | TOTAL DOMINICA | | CABRITS CATCHMENT AREA | |
|---|---|---|---|---|
| | TOTAL | PERCENT | TOTAL | PERCENT |
| Legislators / Senior Officials / Managers | 1679 | 6.8 | 169 | 9.6 |
| Professionals | 915 | 3.7 | 53 | 3.0 |
| Technicians and Associate Professionals | 2609 | 10.5 | 183 | 10.4 |
| Clerks | 2379 | 9.6 | 160 | 9.0 |
| Service Workers and Shop / Market Sales Workers | 3395 | 13.7 | 316 | 17.9 |
| Skilled Agricultural and Fishery Workers | 4426 | 17.8 | 193 | 10.9 |
| Craft and Related Trade Workers | 4159 | 16.8 | 291 | 16.6 |
| Plant and Machine Operators Assemblers | 1312 | 5.3 | 107 | 6.1 |
| Elementary Occupations | 3922 | 15.8 | 295 | 16.7 |
| Not Stated | 15 | 0.1 | 1 | 0.1 |
| **Total** | **24,811** | **100** | **1,768** | **100** |

Unemployment fluctuated over the last three census periods (see Table 7). During the period 1981 to 1991, unemployment in Dominica decreased by approximately 45% while there was an increase of 20% during the period 1991 to 2001.

## 5.2 Commercial Activity

Commercial Activity specifically associated with the Cabrits area includes:

- Fishing
- Cruise Tourism
- Diving and Snorkelling
- Yachting
- Boat Tours

### 5.2.1 Fishing

Most of the major landing sites are located on the west coast of Dominica due to the nature of its beach front. The island is divided into five zones each under the supervision of a Fisheries Officer. Landing sites have been divided into three categories: primary, secondary and tertiary depending on the level of fishing activity and the infrastructure development they possess (primary being the leas and tertiary the most developed). There are 4 landings sites within and in the vicinity of the MC/CNP. Of these 4, only the one at Portsmouth is classed as a tertiary site while 2 (Capuchin and Bioche) are primary sites and Dublanc is a secondary site.

As noted in Section 5.1.2 above, skilled agricultural and fishery workers account for 17.8% of the total employment of Dominica and for 10.9% of employment in the Cabrits catchment area.

#### 5.2.1.1 Number of Fishermen

There are 78 registered fishers in the Portsmouth area (see Table 9) and a total of 193 in the region from Batalie to Capuchin. However, the present surveys only included the area from Bioche to Toucarie. This area was considered (after consultation with the Fisheries Division) as the area where the majority of fishers who fish in the Cabrits area live. There are approximately 184 registered fishers in this area. However, information from both the Fisheries Division and the fishermen themselves indicate that many of these fishermen do not fish in the Cabrits area but further offshore.

The total number of fishers across all landing sites has increased in the 10 year period. This increase was more pronounced at Portsmouth where the increase was 612% from 1994 to 1999 and 22% between 1999 and 2004. Espeut speculates that the reason for this significant increase in fishers in the Portsmouth area is the few options for employment in the Portsmouth area and therefore an increase in recruits into the fishing sector. Another reason proposed in an undetermined number of fishers landing in Portsmouth but originating from elsewhere in Dominica.

**TABLE 9: NUMBER OF REGISTERED FISHERS**

| AREA | NUMBER OF FISHERS |
|---|---|
| Portsmouth | 78 |
| Coulibistrie | 39 |
| Batalie | 2 |
| Bioche | 38 |
| Dublanc | 28 |
| Toucarie | 40 |
| Capuchin | 2 |
| Clifton | 7 |
| Anse de Mai | 41 |
| Delaford | 18 |
| Vieille Case | 20 |
| Thibaud | 20 |
| **TOTAL** | **193** |

Source: Fisheries Development Division, 2006

Espeut also provides data from the Fisheries Division on the change in the number of fishers over the period 1994 to 2004 (see Table 10).

**TABLE 10: NUMBER OF FISHERS REGISTERED AT SELECTED LANDING SITES**

| LANDING SITE | 1994 | 1999 | 2004 |
|---|---|---|---|
| Bioche | 19 | 27 | 28 |
| Capuchin | 12 | 13 | 13 |
| Colihaut | 34 | 36 | 36 |
| Dublanc | 7 | 23 | 24 |
| Portsmouth | 8 | 57 | 70 |
| Toucarie | 10 | 16 | 16 |
| TOTAL | 90 | 172 | 187 |

Source: Espeut, 2006

#### 5.2.1.2 Fishing Gear

The major types of fishing gear used on the reefs consist of the following (see Table 11):

- Large Antillean fish pots set for a period of several days.
- Small basket traps woven from bamboo set for a period of a few hours.
- Longline, hook and line.
- Spear fishing which is undertaken within the marine section from Cabrits to Toucarie.
- Fish pots (mesh sizes are regulated by the fisheries Division and is typically 1 1/2 inch).
- Seine fishing/ beach net.
- Net fishing- generally undertaken by retired fishermen.
- Bottom fishing/ sink and line and gill net fishing.

**TABLE 11: DATA ON FISHING ACTIVITIES OF FISHERMEN FROM PORTSMOUTH TO CAPUCHIN**

| LANDING SITE | NO. OF FISHERMEN | FISHERY TYPE | AREAS FISHED |
|---|---|---|---|
| Portsmouth / Glanvilla / Lagon | 78 | Fish pots<br>Beach Seine<br>Trolling, Tuna Long Line | Pointe Ronde<br>Pointe Crabbier<br>Prince Rupert Bay<br>Toucarie<br>Guadeloupe Channel |
| Toucarie / Clifton / Tanetane | 47 | Beach Seine | Toucarie<br>Tanetane<br>Guadeloupe Channel |
| Capuchin, Cottage, Savanne Paille, Guillet | 40 | Fish pots,<br>Trolling,<br>Hook / Line,<br>Tuna Long Line,<br>Beach Seine | Capuchin Point<br>Guadeloupe Channel<br>Capuchin Point |

Source: Fisheries Development Division 2006

### 5.2.1.3 Fishing Fleet

Table 12 below provides data on the number of registered fishing boats in the various landing sites within the Portsmouth / Cabrits area. The number of fishermen is included as a comparison.

**TABLE 12: NO. OF REGISTERED BOATS BY SELECTED LANDING SITES (2004)**

| LANDING SITE | NO. OF FISHERS | NO. OF BOATS |
|---|---|---|
| Bioche | 28 | 16 |
| Capuchin | 13 | 14 |
| Colihaut | 36 | 16 |
| Dublanc | 24 | 15 |
| Portsmouth | 70 | 63 |
| Toucarie | 16 | 11 |
| Total | 187 | 135 |

There are a total of 135 boats registered in the Portsmouth / Cabrits area. As expected, the majority of fishing boats are registered to Portsmouth which corresponds to the highest number of fishers. It must be noted however, that this number does not reflect the total number of boats existing in the area since many of the fishermen interviewed were not registered as the process is described as long and drawn-out.

### 5.2.1.4 Fish Landings

Fish landings in Portsmouth generally increased from 2001 to 2005 (see Table 13). There was a slight decline from 2001 to 2002, and no data was collected in 2003. Landings at Batalie, Colihaut, Bioche and Dublanc fluctuated significantly over the same period. After Portsmouth, the most fish was landed at Dublanc but this landing site experienced a dramatic decrease in fish landed from 2004 (160,997) to 2005 (46,207). No reasons were provided to account for these fluctuations.

**TABLE 13: ESTIMATED LANDINGS IN THE PORTSMOUTH CATCHMENT AREA (IN LBS)**

| | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|
| Portsmouth | 115 245 | 109 325 | 0 | 172 265 | 282 319 |
| Batalie / Coulibistrie | 33 582 | 66 861 | 45 255 | 37 457 | 39 646 |
| Colihaut | 68 333 | 157 821 | 50 195 | 50 946 | 62 980 |
| Bioche | 43 872 | 77 222 | 26 474 | 34 419 | 25 296 |
| Dublanc | 117 800 | 135 882 | 143 684 | 160 997 | 46 207 |

Note: 1. Where there is 0 there was no data collected

Espeut also provides catch data for the Cabrits / Portsmouth area but prefaces his discussion by making the assumption that landings of demersal species at the landing sites from Bioche to Portsmouth would be a close representation of fish catch in the Cabrits area which is fairly shallow as opposed to landings of pelagics which are usually fished in deeper waters. Using this assumption the data suggests that catch of reef demersals declined by approximately 20% over the 1999 to 2004 period (when data was available). Espeut postulates that this may indicate that the demersal fishery in the Cabrits marine area may be unsustainable given the decrease in fish catch but the increase in fishers.

### 5.2.2 Cruise Ships Operators

There is a cruise ship terminal within the boundary of the marine components of the Cabrits National Park. Information obtained from Espeut indicates that there is at least one cruise ship visit to the park every week. Our discussions with various stakeholders indicate that cruise ship visits may be more irregular than this. Table 14 below shows the number of cruise ship visits to Cabrits as compared to the entire island. Cruise ship calls to Cabrits represent 22.5% of the total cruise ship calls to the entire islan

**TABLE 14: CRUISE SHIP SCHEDULE FOR CABRITS AND DOMINICA 2005/2006**

| SCHEDULE | VALUE |
|---|---|
| Calls in Dominica | 240 |
| Calls at Cabrits | 54 |
| Hours at Cabrits | 243 (mean + 4.5) |
| Vessel Capacity | 13,402 |

### 5.2.3 Diving

Information gathered during the field visit suggests that there is one operational dive shop in the Portsmouth area. Visits to other dive shops in Roseau revealed that tours to Cabrits from these shops are very rare. Apart from this there are a few local divers who dive the reefs in Cabrits. The other diving group is students at the nearby Ross Medical School. Two small cruise lines also provide diving and snorkelling tours on a monthly basis from October to April.

### 5.2.4 Yachting

While yachting is not as popular in Dominica as it is elsewhere in the eastern Caribbean, Prince Rupert Bay just south of Cabrits is considered to be the only anchorage suitable for yachts on the coastline of Dominica. In the past, some moorings were provided in the Bay for yachts; however, these moorings were never maintained. There are also proposals for a marina to be constructed in the area for yachts (see Figure 12). Table 15 shows that yachts arrivals have been on the decline since 1999.

**TABLE 15: YACHT ARRIVALS TO DOMINICA**

| YEAR | NO. OF CALLS | NO. OF PAX |
|---|---|---|
| 1999 | 1,769 | 606 |
| 2000 | 1,470 | 630 |
| 2001 | 1,619 | 468 |
| 2002 | 1,359 | 405 |
| 2003 | 1,366 | 357 |

### 5.2.5 Boat Tours / water taxis

While there are no water taxis dedicated to catering to yachts at Cabrits, several of the boats that conduct tours on Indian River (located south of the Cabrits National Park) also service the yachts when needed. However, since this arrangement is not formal and is dependent on the irregular yachting visits, no definite numbers of water taxis are available.

### 5.2.6 Vendors

Vending is associated with the visits of cruise ships. As noted in Section 5.2.2, cruise ships visit at least once per week. No information on the numbers of vendors selling within the Cabrits National Park was available.

## 5.3 Results of Stakeholder Consultations

A review of the existing literature on the marine component of the Cabrits National Park, revealed that there are several stakeholders whose livelihoods are directly or indirectly associated with the area. These stakeholders were separated into primary and secondary stakeholders based on guidelines outlined in the Socio-Economic Manual for Coral Reef Management. Based on these guidelines the following are the definitions used for identification of primary and secondary stakeholders:

**Primary stakeholders** – people who directly depend on the reef for a living and who make direct use of the reef and its resources (e.g. fishermen, dive operators).

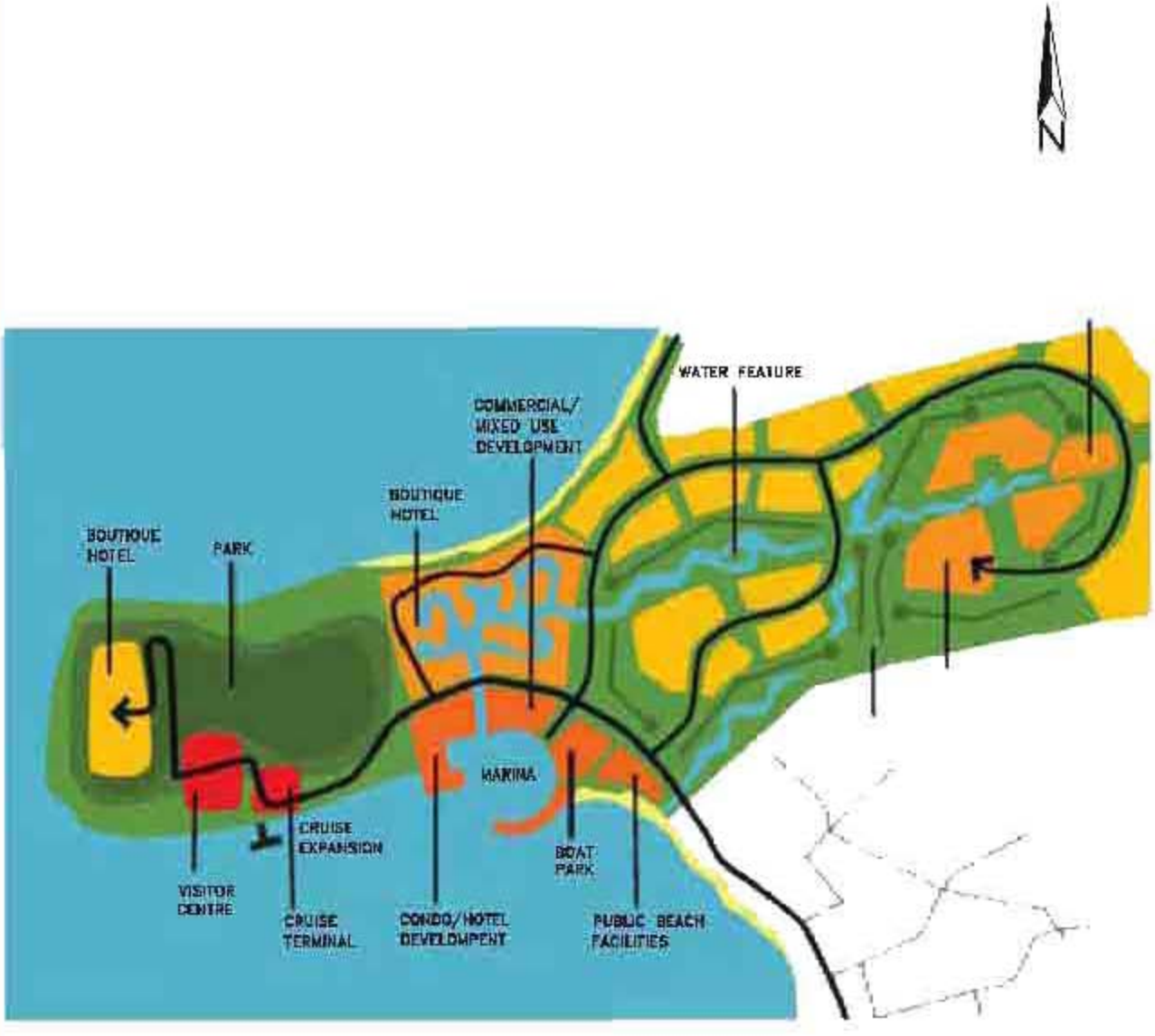
**Secondary stakeholders** – people who do not use the reef and its resources directly, but make use of products or services from the reef (e.g. fish traders) or whose actions may affect the reef (e.g. upstream farmers);

### 5.3.1 Method

The method used to collect information from the various stakeholders was a structured questionnaire (see Appendix A). Table 16 provides the numbers of each stakeholder group interviewed.

**TABLE 16: NUMBERS OF INTERVIEWS THAT WERE CONDUCTED**

| GROUP | NUMBER INTERVIEWED |
|---|---|
| Divers including Dive Shop | 6 |
| Tour boat operators | 11 |
| Fishermen | 19 |
| Tourists /Yachters | 19 |
| Residents | 48 |
| **TOTAL** | **103** |




SOURCE: MINISTRY OF TOURISM, 2007
STILL IN DRAFT FORM

| | | | |
|---|---|---|---|
| Eco Consulting Caribbean Ltd. | Eco Report No. 11/2007 | CLIENT: OECS – ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT | FIGURE NUMBER 12 |
| | Date: 31/07/07 | PROJECT: CABRITS NATIONAL PARK (MARINE COMPONENT) SITE REPORT | |
| | | DWG. NAME: PROPOSED DEVELOPMENT AT CABRITS WATERFRONT | |

Finally, information from the secondary stakeholders was obtained through meetings which were arranged prior to the interview or walk in interviews.

### 5.3.2 Primary Stakeholders

#### 5.3.2.1 Tour Boat Operators / Water Taxi Operators

##### *5.3.2.1.1 Respondent Information*

A total of eleven tour boat operators were interviewed collectively at the mouth of the Indian River. They were all male. They relayed information that was known to them concerning all the tour boat operators in the area. The tour boat operators include operators for the Indian River as well as for the reef. Only motorised boats (about twelve) go onto the reef while row boats are used to carry out tours on the Indian River.

The owners of the motorised boats also offer services to the yachters such as sale of fruits, transportation of garbage from the boats or transporting them to the island to get fuel and other supplies.

None of the boats were registered since they thought it was too costly and involved a lot of paper work.

Most, if not all of the respondents indicated that they had other skills. The most popular skill was crafts. There were a few that also did construction work part time.

##### *5.3.2.1.2 Use of Reef*

A few of the tour boat operators were in this occupation for more than 30 years while others were in the business for about 10 to 20 years.

The majority of the operators own their own boats. There is one operator who owned six boats and employed other operators. However not all of his boats go out to the reef. The trip that they decide to make daily depended on the amount of money being offered.

The number of persons on each boat trip varied. If the boat was going out to the reef the maximum number of people on the trip would be 4. On the river the number of people going on the boats ranged from 4 to 8. The majority of the operators indicated that they made more than three trips per day.

The length of the trips ranged from one hour and thirty minutes to an hour. Trips on the motorised boats are also made to Secret Beach, Douglas Bay, Toucarie Bay and several points off the Cabrits Area. The months of the year with the most visitors were October to April.

#### *5.3.2.1.3 Quality of the Reef*

When asked about the activities that have negatively impacted on the quality of the reef they pointed out that people were throwing plastics in the water and polluting the water. They indicated that most of the change in quality was from hurricanes. However, there has also been recent reef breakage from the dropping of anchors by the yachts.

When asked how the tour boat business has changed in the time that they have been in the business, all of the respondents said that business has decreased. They indicated that the reef is less attractive presently due to sediments in the water caused by construction on the coastal areas. They also indicated that there were more snorkellers ten years ago than there were presently.

The only constraint that the operators face when they go out in open waters is not getting near to the cruise ships. They indicated that they must stay one hundred yards away from the ships.

#### *5.3.2.1.4 Management*

The tour boat operators want to contribute to the management of the reef since they are very familiar with the surrounding. They made a few suggestions that could contribute to the management of the reef. These include:

- Making the tour boat operators into marine wardens to patrol the reef at intervals. They are very familiar with the area and could help in restricting negative activities on the reef while at the same time creating employment.

- Placing buoys and mooring stations for yachts so that they would not have to anchor on the reef and damage the corals.

- Placing restrictions on divers since a number of the divers shoot the fish when they go out on dives.

#### *5.3.2.1.5 Summary of Concerns*

The main concerns of tour boat operators were:

- Water Pollution from garbage (such as plastics) and sediments from construction in coastal areas,
- Hurricane damage to reefs, and
- Reef breakage from the dropping of anchors by the yachts.

### 5.3.2.2 Fishermen

Fishing contributed a significant source of financial support to the families in the Portsmouth area and environs such as Toucarie, Tanetane, Guillette and Savanne Paille (Table 17).

**TABLE 17: NUMBERS OF REGISTERED FISHERS IN THE TOWNS NEAR THE CABRITS AREA**

| TOWN | NUMBER OF FISHERMEN |
|---|---|
| Portsmouth | 78 |
| Bioche | 38 |
| Toucarie | 40 |
| Capuchin | 2 |

#### *5.3.2.2.1 Respondent Information*

Seventeen fishermen were interviewed, eight from Toucarie, three from Bioche, four from Portsmouth, one from Glanvillia and one from Lagon. They were all male. The majority of respondents (55%) indicated that Toucarie Bay was their primary fishing ground, while others (44%) indicated that they fished in or off the Cabrits area. One person fished in Tanetane and Portsmouth while another did mainly deep water fishing.

The majority of the respondents (50%) were between the ages of 46-55, while the minority (8%) were between the 26-35 age groups.

**TABLE 18: AGE CATEGORIES OF FISHERMEN**

| AGE CATEGORY | PERCENTAGE (%) |
|---|---|
| 18 – 25 | 0 |
| 26 – 35 | 8 |
| 36 – 45 | 25 |
| 46 – 55 | 50 |
| 56 – 65 | 17 |
| > 66 | 0 |
| No response | 0 |

Only ten respondents indicated the level of education received. The majority (73%) pointed out that their highest level of education was primary school and the minority (9%) reached secondary and technical school.

**TABLE 19: FISHERMEN'S LEVEL OF EDUCATION**

| LEVEL OF EDUCATION | PERCENTAGE (%) |
|---|---|
| Primary | 73 |
| Secondary | 9 |
| Technical / Vocational | 9 |
| Tertiary | 0 |
| No response | 9 |

Eleven of the fishermen (91%) indicated that they had skills other than fishing. This included construction, carpentry, joinery, maintenance and farming. A number of the fishermen also earned their income from part time fishing. One of the fishermen in particular was a town constable; there were others that did maintenance work at the Ross University and did fishing part time.

#### *5.3.2.2.2 Household Information*

Eighty five percent (85%) of the respondents indicated that they were the main income earner in their households. The dependents were both male and female ranging from 12 to 29 years of age. In each of the households surveyed there were either one or two employed adults. There were students in forty percent (40%) of the households interviewed.

#### *5.3.2.2.3 Use of Reef*

When asked how long they had been fishing, sixty four percent (64%) indicated more than twenty years. They pointed out that they have grown up fishing and this tradition was passed onto them from generations. 71% have been fishing for more than ten years with the majority 64% being in the occupation for over 20 years.

**TABLE 20: DURATION IN OCCUPATION**

| DURATION IN OCCUPATION | PERCENTAGE (%) |
|---|---|
| < 1 | 0 |
| 1 – 5 | 14 |
| 6 – 10 | 14 |
| 11 – 15 | 7 |
| 16 – 20 | 0 |
| > 20 | 64 |
| No response | 0 |

Just over one third of the fishermen (35%) fished many times each week usually three or four times, 14% fished every morning, 14% fished many times a day while 21% fished once a week. There was only one person interviewed that fished only a couple times a month.

**TABLE 21: FREQUENCY WHICH FISHERMEN WENT OUT TO FISH**

| Times went out to fish | PERCENTAGE (%) |
|---|---|
| Once a day | 35 |
| Many times a day | 12 |
| Once a week | 18 |
| Many times a week | 29 |
| Once a month | 0 |
| Many times a month | 6 |
| No response | 0 |

Seventy eight percent (74%) of the fishermen owned their own boat; eleven percent (11%) did not own their boat while another eleven percent (11%) gave no response. Sixty five percent (65%) of these boats were made of wood, eighteen percent (18%) of fibre glass and twelve percent (12%) of both.

The fishermen indicated that their primary fishing grounds were Toucarie Bay, Cabrits, Portsmouth, Capuchin, Lamothe and Douglas Bay.

**TABLE 22: PRIMARY FISHING GROUND FOR THE FISHERMEN**

| Primary fishing ground | PERCENTAGE |
|---|---|
| Toucarie Bay | 40 |
| Cabrits | 35 |
| Douglas Bay | 5 |
| Portsmouth | 5 |
| Tanetane | 5 |
| Capuchin | 5 |
| Lamouth | 5 |

The most popular fishing grounds were Toucarie Bay and Cabrits. The least popular ones include Douglas Bay, Portsmouth, Tanetane, Capuchin and Lamouth.

The types of fish caught were: snapper, redfish, dolphin, tuna, gar fish and ballyhoo. The most popular fishing method used was fish pots but fishermen also used lines and nets. The catch size ranged from 50 – 80 pounds per day to 500-1000 pounds per

week. When asked if the catch size had changed since they started fishing, fifty eight percent (58%) indicated it had decreased, five percent (5%) indicated that it had increased; four percent (4%) said that it remained the same while the rest did not respond. They indicated that the decrease was a result of too many small fishes being caught. This is because the mesh wire in the nets is too small and the smaller fishes are being caught.

#### *5.3.2.2.4 Quality of the Reef*

Fifty six percent (56%) of the fishermen interviewed indicated that the quality of the reef has not changed since they started fishing while twenty eight percent (28%) said there was some form of change over the years. The change indicated by the fishermen included decrease in the number and size of fishes. They pointed out that the change has been caused by fishermen dragging their nets and killing some of the fishes. This activity has also led to reef breakage.

#### *5.3.2.2.5 Management*

Eighty three percent (83%) of the fishermen agreed that the reef should become a marine protected area while the remaining seventeen percent (17%) gave no response. The major concern that the fishermen face is the restrictions that would be placed on fishing on the reef since fishing is the primary source of income for their families.

Some fishermen had no problem with the reef becoming a protected area as long as there was some other means that they can make their income. These fishermen indicated that they would require some form of compensation if their fishing would be restricted or some form of monetary value that could assist them in changing their profession.

#### *5.3.2.2.6 Summary of Concerns*

The major concerns of fishermen were:

- Predominance of small fish being caught at present,
- The practice by some fishermen of dragging of nets on the reef, and
- Potential reduction of income if fishing restrictions are implemented in the protected area.

### 5.3.2.3 Divers

#### *5.3.2.3.1 Respondent Information*

Six divers were interviewed five individuals and one associated with the Cabrits Dive centre. Four of the individuals were foreigners from America, Canada and the United Kingdom; only one local diver was interviewed. The Cabrits Dive Centre offers services to clients who dive in the Cabrits area and environs. Two of the five divers were female and three male between the ages 18 to 55. The majority of divers were within the age group of 18 to 25. The highest level of education attained by the majority of respondents (80%) was tertiary and one respondent attained technical education.

**TABLE 23: AGE CATEGORIES OF DIVERS**

| AGE CATEGORY | PERCENTAGE |
|---|---|
| 18 – 25 | 60 |
| 26 – 35 | 0 |
| 36 – 45 | 0 |
| 46 – 55 | 40 |
| 56 – 65 | 0 |
| > 66 | 0 |
| No response | 0 |

**TABLE 24: DIVERS' LEVEL OF EDUCATION**

| LEVEL OF EDUCATION | PERCENTAGE |
|---|---|
| Primary | 0 |
| Secondary | 0 |
| Technical / Vocational | 20 |
| Tertiary | 80 |
| No response | 0 |

Information from the Dive Centre indicated that the popular dive sites in the Cabrits area includes Toucarie Cave, Five Finger Rock, Douglas Bay, Tunnel Vision, Capuchin, Point Break, Coco Reef and Anse Grande. The popular snorkelling sites include Secret Bay and Futsatola Reef. The co-ordinator indicated that there are roughly six hundred tourist divers yearly. There are also students who dive in those areas as well.

#### *5.3.2.3.2 Use of Reef*

Eighty percent (80%) of the people that dive near the Cabrits area dive for pleasure while the remaining twenty percent (20%) dive commercially. The owner of the Cabrits center indicated that the majority of the divers dive for pleasure. The Cabrits area is the primary diving ground for eighty percent (80%) of the divers while the remaining twenty percent (20%) gave no answer.

#### *5.3.2.3.3 Quality of the Reef*

From the divers interviewed seventeen percent (17%) said that there was a change in the quality of the reef, forty nine percent (49%) said that there was no change, while the remaining thirty four percent (34%) gave no response or didn't know the situation at the reef before. The majority of the divers interviewed had only visited the reef once so they were not able to say if the quality has changed. The divers who had visited the reefs more than once indicated the only difference they saw was an increase in reef breakage.

#### *5.3.2.3.4 Management*

All of the divers interviewed agreed that the reef should become a marine protected area. When asked if it would affect their livelihoods only a few indicated that it would have some form of impact. Their major concern was whether their recreational diving would be restricted. The respondents were all foreign and mainly come to the island to dive in certain parts of Dominica, with the Cabrits Reef being one of the popular diving spots.

#### *5.3.2.3.5 Summary of Concerns*

The major concerns of divers were:

- Observed increase in reef breakage, and
- Potential restrictions on recreational diving in the protected area.

### 5.3.2.4 Yachters / tourists

#### *5.3.2.4.1 Respondent Information*

There were approximately 40-50 yachts anchored in the Portsmouth area off Prince Rupert's Bay, Toucarie Bay and Douglas Bay at the time of the surveys.

Twenty yachters were interviewed, twelve male and eight female respondents, ranging in ages from twenty-six to sixty-five. Their countries of origin were: United States, Belgium, France, Brazil, Canada, Czech Republic and United Kingdom.

Forty four percent (44%) visit the country yearly or several times for the year while for the remaining fifty six percent (56%) it was their first visit.

#### *5.3.2.4.2 Use of Reef*

The activities that tourists/yachters engage in while on the reef included: diving, snorkelling and swimming. The majority (40%) of the respondents indicated that they are more interested in land based activities such as touring the Indian River, hiking in the rainforest and visiting the waterfalls. A number of the tourists/ yachters interviewed stated that they have not been on the reef since they anchored on the island but are planning on visiting the area before they leave the island.

#### *5.3.2.4.3 Quality of the Reef*

When asked if the quality of the reef has changed over the past few years none of the respondents were able to give this information. This was because they had not visited the reef as yet, or it was their first visit to the reef and they were not able to differentiate the changes.

#### *5.3.2.4.4 Management*

Ninety percent (90%) of the yachters/tourists agreed that there would be no major impact on whether they visited if the reef became a Marine Protected Area; ten percent disagreed and said that it would have an impact on them. Their main fear was the restrictions that would be placed on their usage of the reef mainly anchoring on or near the reef, diving and snorkelling. Some also indicated that they would not visit the island again if they cannot dive or snorkel in the area, or if there is a heavy fine placed on their usage of the reef.

However one hundred percent (100%) of the respondents agreed that the reef should become a protected area because it will assist in maintaining the sustainability of the island. A few respondents also made reference to educating the people who use the reef so that they would be aware of the importance and not destroy the reef.

Finally, one local yachter who also runs a business employing some of the locals in repairing boats expressed dissatisfaction with the proposal to manage the MC/CNP as an MPA. He indicated that if there were restrictions he will close down his business which will leave locals out of work.

#### *5.3.2.4.5 Summary of Concerns*

Tourists/yachters' main concerns were:

- Potential restrictions on continued use of the protected area for anchoring, diving and snorkelling, and
- User fees to be implemented being too heavy.

### 5.3.2.5 Residents

#### *5.3.2.5.1 Household Information*

Forty eight people were interviewed from the areas of Portsmouth, Guillette, Toucarie, Savanne Paille and Morne Alouis of which sixty-two percent (62%) was male and thirty eight percent (38%) was female.

The majority (23%) of the people interviewed were between the ages of fifty six to sixty five, twenty one percent (21%) were between the ages thirty six to forty five, while the remainder were either within the age group of eighteen to twenty five or over sixty six years old.

The highest level of education attained by thirty one percent (31%) of the people interviewed was primary level, seventeen percent (17%) attained secondary level, six percent (6%) attained tertiary and two percent (2%) attained technical level. The remaining forty four (44%) gave no response to this question.
The majority (52%) of the respondents lived in their current address for over thirty years, while forty two percent (42%) lived there for less than thirty years; the remaining two percent (2%) gave to response.

Household sizes ranged from two to eleven people, with males comprising twenty seven percent and females the remaining seventy three percent (73%). The households comprised mostly of children attending primary and secondary school. There were either one or two employed adults outside the households interviewed while in other households there were no employed adults outside the household. Occupation of employed adults outside of the household include: cashiers, hair dressers, teacher, taxi driver, labourer and plumber.

#### *5.3.2.5.2 Use of Reef*

The majority of the respondents (25%) visit the reef weekly, twenty one percent (21%) visit yearly, seventeen percent (17%) visit monthly and six percent (6%) visit daily. Nineteen percent (19%) of the respondents never go onto the reef while the remaining thirteen percent (13%) gave no response.

**TABLE 25: FREQUENCY AT WHICH RESIDENTS VISIT THE REEF**

| TIME WHEN REEF IS VISITED | PERCENTAGE (%) |
|---|---|
| Daily | 6 |
| Weekly | 25 |
| Monthly | 17 |
| Yearly | 21 |
| Never | 19 |
| No response | 13 |

The majority of people that use the reef swim out to get to the reef rather than using a water taxi. Twenty percent (20%) access the reef via their private boats.

The majority of the residents agreed that the reef was an ideal location for relaxation. The activities that they engaged in when they visit the reef include: swimming, sea bathing, diving, snorkelling, picnicking, recreational fishing, and site seeing. Some of the residents also indicated that they spear fished on the reef.

#### *5.3.2.5.3 Quality of the Reef*

When asked if the reef quality had changed, the majority (44%) of residents indicated that it had, due to damage from hurricanes and road construction near the shoreline. The changes in the reef observed were decrease in water quality and decrease in water clarity. Some also indicated that the fishes were smaller and there were fewer fishes now than there were a few years ago.

Forty percent (40%) of the respondents indicated that the quality of the reef has not changed. The remaining percentage did not know if the quality has changed because they do not visit the reef.

#### *5.3.2.5.4 Management*

When asked if there were any activities that should be controlled or prohibited in the Cabrits area forty two percent (42%) said yes and listed activities such as spear fishing, anchoring on the reef, and catching of small fishes. Thirty three percent (33%) said there were no activities that should be controlled or prohibited.

When asked if establishing the marine component of the Cabrits National Park as a protected area would impact the reef forty two percent (42%) indicated that it would have a positive impact on the reef by allowing the corals to grow. The remaining percentage was not sure of the impacts that it would have and had no response.

Ten percent (10%) of the respondents indicated that a marine protected area would affect their livelihood. They feared that their main source of survival which is fishing might be restricted. The remaining percentage indicated that it would not affect their

livelihood and it would have a positive impact on the reef including increase in employment, increase in tourism and sustainability of the reef. However ninety two percent (92%) stated that the reef should become protected while the remaining eight percent (8%) did not respond.

#### *5.3.2.5.5 Summary of Concerns*

Residents were mainly concerned about:

- Reef damage due to hurricanes and road construction near the shoreline,
- Decrease in water quality and clarity,
- The practices of spear fishing, anchoring, and catching of small fishes on the reef, and
- Fear that fishing as a livelihood might be restricted in the protected area

### 5.3.2.6 Attitudes and Perceptions

A series of statements were read to the respondents and were asked whether they agreed or disagreed with them. The purpose of this was to measure how people value the resources that they may or may not use.

The responses for all the stakeholders are summarized below.

- Seventy five percent (75%) of the respondents agreed that reefs are important for protecting the land from storm waves while five percent (5%) disagreed with this statement. The five percent that disagreed with this statement include three fishermen and two divers.

- Fifty three percent (53%) disagreed with the statement that coral reefs are only important if you fish or dive while twenty two percent (22%) agreed with the statement. The majority of respondents that agreed with this statement were residents, followed by fishermen and yachters.

**TABLE 26: "REEFS ARE IMPORTANT FOR PROTECTING THE LAND FROM STORM WAVES"**

| RESPONSE | FREQUENCY | PERCENTAGE |
|---|---|---|
| Strongly disagree | 3 | 3 |
| Disagree | 2 | 2 |
| Neutral | 2 | 2 |
| Agree | 45 | 44 |
| Strongly agree | 33 | 31 |
| No response | 18 | 18 |

**TABLE 27: "CORAL REEFS ARE ONLY IMPORTANT IF YOU FISH OR DIVE."**

| RESPONSE | FREQUENCY | PERCENTAGE |
|---|---|---|
| Strongly disagree | 37 | 36 |
| Disagree | 17 | 17 |
| Neutral | 3 | 3 |
| Agree | 21 | 20 |
| Strongly agree | 2 | 2 |
| No response | 23 | 22 |

- Fifty four percent (54%) disagreed with the statement that in the long run fishing would be better if we cleared the coral, while sixteen percent (16%) agreed with the statement. The respondents that agreed with the statement were residents and fishermen.

**TABLE 28: "IN THE LONG RUN FISHING WOULD BE BETTER IF WE CLEARED THE CORAL"**

| RESPONSE | FREQUENCY | PERCENTAGE |
|---|---|---|
| Strongly disagree | 38 | 37 |
| Disagree | 18 | 17 |
| Neutral | 4 | 4 |
| Agree | 12 | 12 |
| Strongly agree | 4 | 4 |
| No response | 27 | 26 |

- Sixty seven percent (67%) agree with the statement that fishing should be restricted in certain areas to allow the fish and coral to grow while eight percent (8%) disagreed with this statement. The respondents that disagreed with the statement were mainly residents and fishermen.
-

**TABLE 29: "FISHING SHOULD BE RESTRICTED IN CERTAIN AREAS TO ALLOW THE FISH AND CORAL TO GROW"**

| RESPONSE | FREQUENCY | PERCENTAGE |
|---|---|---|
| Strongly disagree | 3 | 3 |
| Disagree | 5 | 5 |
| Neutral | 1 | 1 |
| Agree | 31 | 30 |
| Strongly agree | 38 | 37 |
| No response | 25 | 24 |

- Seventy two percent (72%) agreed that future generations should be able to enjoy the coral reefs. The five percent (5%) that disagreed with the statement was mainly residents and fishermen.

**TABLE 30: "FUTURE GENERATIONS SHOULD BE ABLE TO ENJOY THE CORAL REEFS"**

| RESPONSE | FREQUENCY | PERCENTAGE |
|---|---|---|
| Strongly disagree | 3 | 3 |
| Disagree | 2 | 2 |
| Neutral | 1 | 1 |
| Agree | 32 | 31 |
| Strongly agree | 42 | 41 |
| No response | 23 | 22 |

- Sixty seven percent (67%) agreed that we should restrict development in some coastal areas just to allow the fish and coral to grow while eleven percent (11%) disagreed with the statement. Those who disagreed were mainly fishermen.

**TABLE 31: "WE SHOULD RESTRICT DEVELOPMENT IN SOME COASTAL AREAS JUST TO ALLOW THE FISH AND CORAL TO GROW"**

| RESPONSE | FREQUENCY | PERCENTAGE |
|---|---|---|
| Strongly disagree | 1 | 1 |
| Disagree | 10 | 10 |
| Neutral | 2 | 2 |
| Agree | 34 | 33 |
| Strongly agree | 35 | 34 |
| No response | 21 | 20 |

- Fifty one percent (51%) of the respondents disagreed that sea grass beds have no value to people while ten percent (10%) agreed with the statement.

**TABLE 32: "SEA GRASS BEDS HAVE NO VALUE TO PEOPLE"**

| RESPONSE | FREQUENCY | PERCENTAGE |
|---|---|---|
| Strongly disagree | 37 | 36 |
| Disagree | 15 | 15 |
| Neutral | 3 | 3 |
| Agree | 6 | 6 |
| Strongly agree | 4 | 4 |
| No response | 38 | 37 |

### 5.3.3 Secondary Stakeholders

Three hotels within the Cabrits / Portsmouth area were interviewed for this assignment. These hotels also had restaurants on the premises. The main objectives of these interviews were:

- The level of interaction that hotel guests have with the MC/CNP;
- Whether the hotels buy fish from fishermen that fish within the MC/CNP.

Two of the respondents indicated that they not organised trips for their guests to visit the reefs. Instead, the respondents indicated that guests usually organised their trips themselves with one of the many fishermen along the beaches. One hotel, Picard Beach Cottages generally organised tours to the reef, as well as sunset cruises and whale watching tours. This is usually arranged once per week or as often as guest's request.

Only one respondent was able to provide information on the fish bought for the restaurant. She indicated that the restaurant purchases fish from a few regular fishermen. Approximately 40 lbs of fish is bought each week including such species as Mahi Mahi, Marlin, Kingfish and Tuna. Generally the fish bought are deep seas species however, occasionally reef fish is bought.

## 5.4 Summary of Key Findings

Fishing is the primary source of income for most of the families in the areas studied. A small number also worked at the Ross University and fished part time.

The majority of the respondents agreed that the quality of the reef has changed over the years mainly due to the hurricane and increase in construction on the roads.

The majority of the respondents were in general agreement that the reef should become a marine protected area. The all agreed that it would have a positive impact on the reef.

The majority of the respondents indicated that the Marine Protected Area (MPA) would not affect their livelihood. The few that felt their livelihood would be affected were fishermen, divers and yachters who feared that their activities on the reef would be restricted.

There are few Hotels / Restaurants within the Cabrits / Portsmouth area. Only one indicated organising tours for guests. Fish bought was usually from deep sea fishermen.

Based on the response to the statements about the importance of coral reefs, it was evident that most of the respondents valued the reef even if they do not use the reef often.

# 6 DRAFT MANAGEMENT PLAN

This chapter summarizes relevant information from the 2007 – 2010 Management Plan for the Cabrits National Park – Marine Area (Final Draft April 2007), prepared by Ms. Marie Jose Edwards. These aspects of the plan will be used in the SWOT Analysis in Chapter 7, from which recommendations will be made for the environmental management of the MC/CNP. An important tool for the Management of MC/CNP is a Monitoring and Evaluation Score Card which has been adapted for use in Protected Areas in the OECS, and this tool is introduced in the last section of this chapter.

## 6.1 Goals and Objectives

### 6.1.1 Goal

The overall goal of the management plan is:

*To manage the cultural, recreational and economic values of the marine park in such a manner as to maintain its biological diversity and value for future generations.*

### 6.1.2 Objectives

The objectives that this management plan seeks to fulfill are:

- To provide an effective management framework that will contribute to the integrated and ecological sustainable use and management of the marine park.
- To manage the area as part of the national representative system of the Cabrits national parks.
- To encourage participatory management of the park and minimize user conflict.
- To manage livelihood opportunities for the protection and enhancement of the values of the marine park
- To provide recreation and education

## 6.2 Management Structure Options

Figure 13 provides the proposed management structure for the Cabrits National Park (including the marine component).

As noted in the draft Management Plan, the preferred management approach for the park is as a private entity under a Local Management Authority (LMA). This entity would exist in partnership would the public sector under the direction of the Director of National Parks. It is anticipated that this approach would result in the active involvement of stakeholders and some level of autonomy for effective decision making.

The draft Management Plan also proposes the following levels of participation:

- Government Agencies – Fisheries, Port Authority, Local Government / Village Council, Dominica Police Marine / Coast Guard, Forestry and Wildlife Division.

- Marine Interests – Dominica Watersports Association, Local Marine Training Institute, Tour Guides.

- Private Sectors Interests – Tourism Service Providers, local conservation association, cruise ship agents.

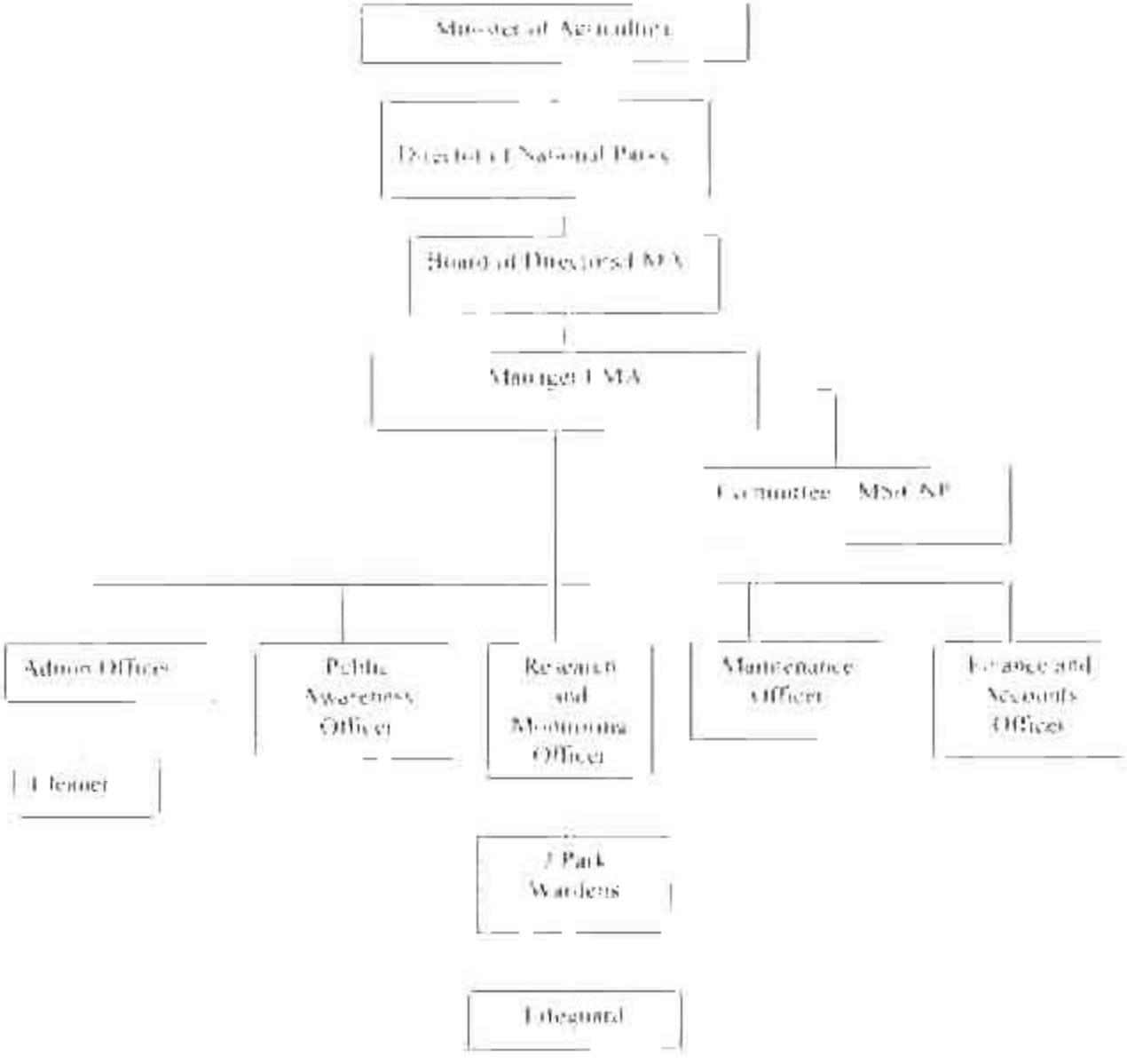
- Community Interests – Fishermen, village councils, NNETEDC (North North-eastern Tourism and Environmental Development), Portsmouth Town Council, Women's Groups.

## 6.3 Zonation

The draft Management Plan envisages that the CNP will have designated zones. The zones envisaged are:

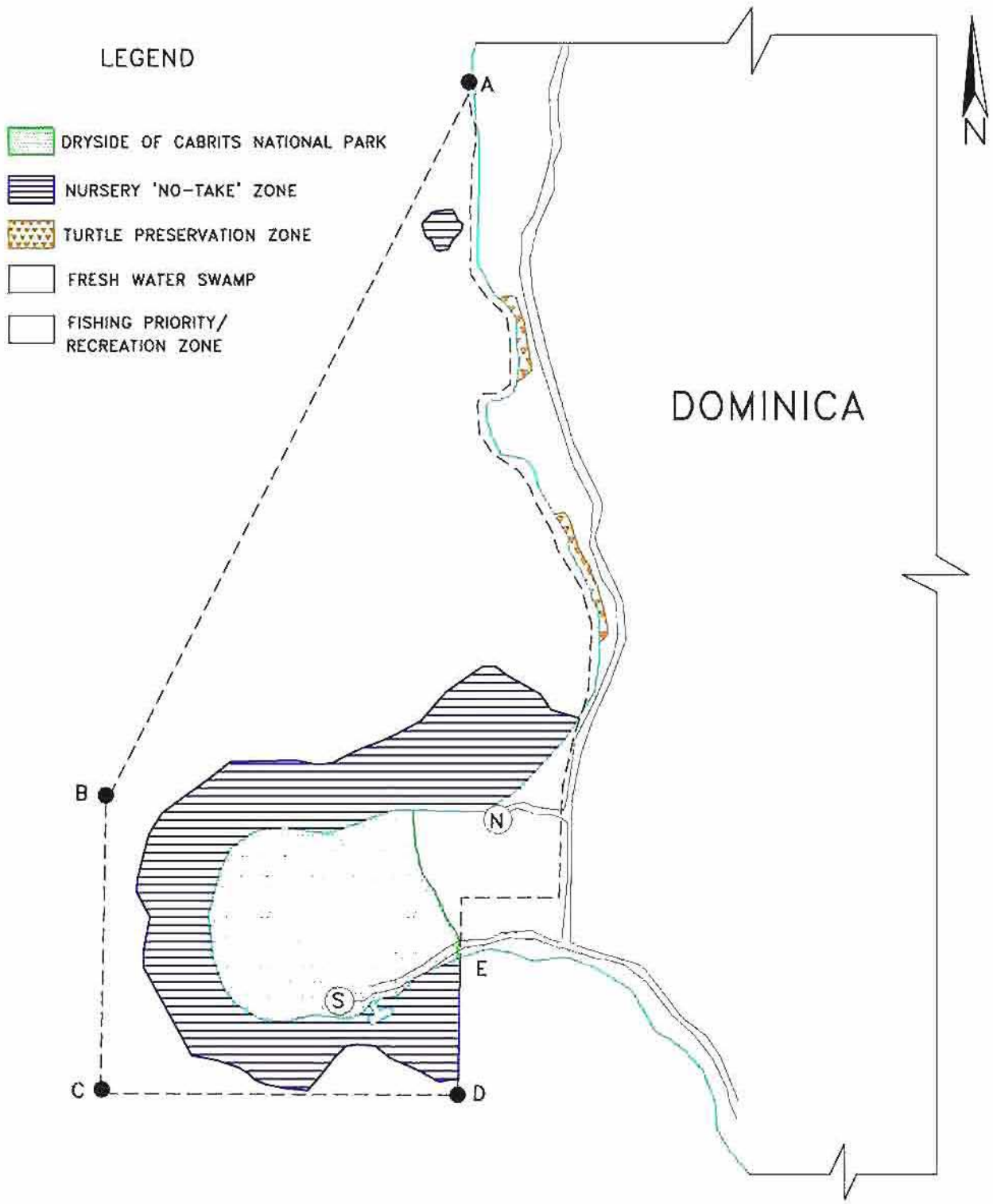
- A "No-take" or Nursery Zone;
- A Recreation Zone
- A Fishing Priority Zone
- A Turtle Preservation Zone.

Figure 14 shows the locations of these zones as proposed in the draft Management Plan.




SOURCE: MINISTRY OF AGRICULTURE, TRADE AND NATURAL RESOURCES, 1989

| | | | |
|---|---|---|---|
| Ecosystems Caribbean Ltd | Eco Report No. 11/2007 | CLIENT: OECS - ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT | FIGURE NUMBER 13 |
| | | PROJECT: CABRITS NATIONAL PARK (MARINE COMPONENT) SIRE REPORT | |
| | Date: 31/07/07 | DWG. NAME: PROPOSED MANAGEMENT STRUCTURE FOR THE CABRITS NATIONAL PARK | |




SOURCE: MINISTRY OF AGRICULTURE, TRADE AND NATURAL RESOURCES, 1989

| | | | |
|---|---|---|---|
| Ecoengineering Caribbean Ltd. | Eco Report No. 11/2007 | CLIENT: OECS – ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT | FIGURE NUMBER 14 |
| | Date: 31/07/07 | PROJECT: CABRITS NATIONAL PARK (MARINE COMPONENT) SIRE REPORT | |
| | | DWG. NAME: PROPOSED ZONING PLAN | |

### 6.3.1 "No-Take" or Nursery Zone

The primary purpose of a nursery zone or "no take" is to protect the natural spawning and nursery areas and provide an undisturbed habitat/residence area for genetic protection and replenishment of marine species- reef biology, especially reef fish and seagrass beds. This will be a "no take" zone that will allow for the restoration of degraded ecosystems and for the replenishment of fish populations.

The secondary purpose is further research and development planning and to provide a controlled environment against which to monitor changes in the ecosystem. No extractive uses of any kind or anchoring will be permitted.

### 6.3.2 Recreation Zone

The recreation zone will be established to provide for sustainable, non-extractive multiple-use of the resources of the area so as to sustain existing livelihood opportunities like snorkelling, diving, yachting and boating, to ensure that the recreational value of the area for users is not compromised and to minimize user conflict.

This area will include all waters within the CNP boundaries not included in the nursery and fishing priority zone. There is insufficient scientific data at this time to demarcate this zone.

### 6.3.3 Fishing Priority Zone

The Fishing Priority Zone will be established to sustain the livelihood opportunities of the main users of the resource, the fishers and to ensure that user conflict is minimized. This open fishing zone will allow sustainable fishing practices and will serve as a benchmark for assessing the impact of zoning on the marine biological resources

There was insufficient in-depth scientific research to demarcate the fishing priority zone from the recreation zone. As such, further research and discussion with the FDD and the fishers are recommended for further demarcation of these zones.

### 6.3.4 Turtle Preservation Zone

To protect the integrity of beaches to encourage continued nesting of turtles. Toucarie and Douglas Bays, traditionally nesting sites for turtles will be declared as turtle preservation areas. Discussions with fishermen and the community indicate that in spite of the present stony nature of the beach the turtles continue to nest there.

While there are measures in place at the national level to protect turtles (Ninth Schedule of the Forestry & Wildlife Act, 1976) and (Fisheries Act 1987, Part 111 section 22), it is important that the nesting areas for endangered turtles within the boundaries of the MS/CNP are protected.

Regulations governing access, lighting levels and infrastructural development will be developed to ensure the protection of the turtles while preserving the public‘s right to use of the beach.

However, more in-depth research and input of fishers are required for more accurate designation of the proposed zones.

## 6.4 Fee Structure

The draft Management Plan proposes that funding for the operations of the park may be derived from several sources including:

- Subvention from Government;
- Funding from international institutions;
- Development of a Marine Park Fund;
- User fees; and
- Sale of park paraphernalia.

User fees suggested are those currently in place at the existing Soufriere Scotts Head Marine Reserve (SSMR) (see Table 33):

**TABLE 33: SUGGESTED USER FEES**

| ACTIVITY | CHARGE RATE | (E.C. $) | (U.S. $) |
|---|---|---|---|
| Scuba diving | Per individual diver | 5.00 per tank used | 20/month |
| | Per individual / month | 50/month | 10/month |
| | Members of the Dominica Watersports Association | 25/annum | 10/month |
| | Non-Members of the SWA, or affiliate associations, but residents of Dominica | 50/annum | 20/annum |
| Snorkelling | A daily entry fee of | 5.00 per individual | 2.00 per individual |
| Kayaking | A daily entry fee of | 5.00 per individual | 2.00 per individual |
| Whale & Dolphin watching | Per tour | 5.00 per individual | 2.00 per individual |
| Yachting | | | |
| Watersports Business | For registration and operation | 300.00 per annum | 120.00 per annum |

## 6.5 Management Programmes

The draft Management Plan outlines the following programmes to be implemented during the life of the plan:

- Conservation;
- Education and Sustainable Use;
- Administration and Finance; and
- Monitoring and Evaluation.

In addition, the draft management Plan proposes the implementation of a Disaster Management Plan. The objective of a Disaster Management Plan would be to put in place an effective disaster management plan to ensure the safety and security of staff equipment and other resources

## 6.6 Staffing

It is proposed that the management of the MC/CNP would require the following staff:

| STAFF | RESPONSIBILITIES |
|---|---|
| Park Manager | Administration and implementation of the management plan, finance and fund raising. |
| Research Officer | Research, monitoring, licensing and enforcement. |
| Education and Public Awareness Officer | Implementing the marketing, education, public awareness and communications programme. |
| Accountant/Financial Officer | Accounting, finance |
| Maintenance Officer | Maintenance |
| Park Wardens | Monitoring and enforcement |
| Administrative Officer / Secretary | General administration, office procedures |
| Cleaner | |
| Boat Captain | Manage, operate the boat for park operations |
| Life Guard | |

Once the park is established there may be need to recruit additional staff. In an effort to provide alternative livelihoods for fishermen and other persons, recruitment will focus on the adjacent communities.

## 6.7 Monitoring and Evaluation Scorecard

A Monitoring and Evaluation Score Card has been adapted for use in Protected Areas in the OECS, and the Management Plan for MC/CNP suggests that this tool may be used in assessing progress in achieving its management effectiveness goals. To this end, the Management Plan recommends training in the use of the tool. The Scorecard itself has been applied to MC/CNP by the OECS, and a copy of that evaluation is included in Appendix E of this report. This section provides a summary of the tool, in preparation to recommendations which will be made in Chapter 8.

### 6.7.1 Overview

According to the information provided in Appendix E, the M & E Scorecard is a simple site-level tracking tool to facilitate reporting on management effectiveness of Protected Areas. It has been built around the Framework illustrated in Table 34. The Scorecard facilitates a basic level of assessment, and it requires little or no additional data collection. As shown in Table 34, the Scorecard focuses on the context of the PA along with the appropriateness of planning, inputs and processes of management. Because it relies largely on available data (through literature searches and informed opinions of site managers and/or independent assessors) this tool:

- takes a short period of time,
- costs little,
- issues are broadly covered, but
- depth of analysis is generally low.

It is recommended that the scorecard should be completed by PA Staff. Ideally, local stakeholders should be involved in the exercise to validate the scoring.

### 6.7.2 Scoring

The Scorecard consists of 34 Questions, arranged under the same 6 headings (Elements of Evaluation) listed in Table 34. A typical example is found in the section headed:

Context: Where are we now? Assessment of important threats and the policy environment

In this section, Question 6 asks:

Resource Inventory – Is there enough information to manage the area?

## TABLE 34: FRAMEWORK FOR THE M & E SCORECARD

*(From documentation provided by ESDU. See Appendix E)*

| Elements of Evaluation | Explanation | Criteria that are Assessed | Focus of Evaluation |
|---|---|---|---|
| ***Context*** | **Where are we now?** Assessment of importance, threats and policy environment | Significance. Threats. Vulnerability. National context. | Status |
| ***Planning*** | **Where do we want to be?** Assessment of protected area design and planning | Protected area legislation and policy. Protected area system design. Reserve design Management planning. | Appropriateness |
| ***Inputs*** | **What do we need?** Assessment of resources needed to carry out management | Resourcing of agency. Resourcing of site. Partners. | Resources |
| ***Process*** | **How do we go about it?** Assessment of the way in which management is conducted | Suitability of Management processes. | Efficiency Appropriateness |
| ***Output*** | **What were the results?** Assessment of the implementation of management programmes and actions: delivery of products and Services | Results of management Actions. Services and products. | Effectiveness |
| ***Outcome*** | **What did we achieve?** Assessment of the outcomes and the extent to which they achieved Objectives | Impacts: effects of Management in relation to objectives. | Effectiveness Appropriateness |

Under this question, there are 5 descriptors, with appropriate scores in each case:

- There is little or no information available on the biophysical, socio-cultural and economic conditions associated with the protected area (0 points)

- Information on the biophysical, socio-cultural and economic conditions associated with the protected area is not sufficient to support planning and decision making (1 point)

- Information on the biophysical, socio-cultural and economic conditions associated with the protected area is sufficient for key areas of planning / decision making but the necessary survey / M&E work is not being maintained (2 points)

- Information on the biophysical, socio-cultural and economic conditions associated with the protected area is sufficient for key areas of planning / decision making (3 points).

The user of the scorecard selects the applicable descriptor and the corresponding points is entered in the appropriate column. Provision is also made for additional points and for comments to be entered to allow a clearer understanding of the choice of descriptor. The scores are totalled to give a "snapshot" of conditions at the time of scoring.

### 6.7.3 Limitations

According to the documentation in Appendix E, the Score Card tool has been adapted/developed to provide a quick overview of the initial state of management efforts and subsequent progress, over a period of years, in improving the effectiveness of management in a given marine protected area. Specifically, it is noted that:

- The tool does not allow a detailed evaluation of outcomes, but rather serves to provide a quick overview of the status of management steps;

- Therefore, the use of the scorecard should not replace more thorough methods of assessment for the purposes of adaptive management.

Of particular importance, it is noted that the whole concept of "scoring" progress is fraught with difficulties and possibilities for distortion. The current system assumes, for example, that all the questions cover issues of equal weight, whereas this is not necessarily the case. Accuracy might be improved by weighting the various scores, although this would provide additional challenges in deciding differing weightings.

In our professional practice, Ecoengineering has had extensive experience in the assigning of importance weights to environmental components, and we fully agree that there will be some challenges in assigning a system of weights to the various components. However, we do not believe that it would be either impossible or undesirable to do so. Indeed, we have seen examples where unweighted checklists have skewed the final decision in a particular (and not necessarily a desirable) direction. What we would recommend is the following:

- The present unweighted scorecard should be used when marine PAs are established, and for a period of perhaps 5 to 7 years thereafter.

- After this initial period, it is expected that the PA staff and key stakeholders will be sufficiently familiar with the scorecard to upgrade it to a weighted scorecard.

- Weightings should be assigned on a site-specific basis, to reflect local ecological and socio-economic conditions as well as local sensitivities.

- The actual importance weights should be assigned by the PA Staff and Key Stakeholders themselves, using a system of structured approach (such as the Delphi System), moderated by an experienced environmental / socio-economic practitioner. Our experience suggests that a regional practitioner is more likely to be effective in this work than an extra-regional practitioner.

# 7 STRENGTHS, WEAKNESSES, OPPORTUNITIES, THREATS (SWOT) ANALYSIS

SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis is an extremely useful tool with which data is subjectively assessed and organized into a logical order (see Section 7.1). By identifying Strengths, Weaknesses, Opportunities and Threats associated with the marine component of the Cabrits National Park (MC/CNP), it will be easier to identify appropriate measures for protecting the environment and specifically for addressing potential adverse impacts. In any SWOT Analysis, it is important to note that the categories are not mutually exclusive. It is quite possible for a single aspect to be associated with a strength and also with a threat.

## 7.1 SWOT Identification

The first step in the SWOT analysis involved an open discussion involving all members of the Study Team (except Ms. Cumberbatch) to identify Strengths, Weaknesses, Opportunities and Threats relevant to the MC/CNP. Table 35 lists the results of the SWOT Identification. The remaining sections of this chapter each discuss one category.

**TABLE 35: SWOT IDENTIFICATION**

| STRENGTHS | WEAKNESSES |
|---|---|
| Legally Defined Site | Ambiguous Boundaries |
| Government owned Land and Seabed | Cruise Ship Terminal within CNP boundaries |
| Still relatively unknown | Lack of Management Structure |
| Quality of Reefs | Stakeholders object to present boundaries |
| Clarity of Water | Lack of Communication |
| Variety of Dive Types | |
| Depth of Reefs | Lack of Environmental NGOs |
| Well-defined and documented Wetlands | Lack of available Statistical Data |
| Promotion of area of interest via video | |

| OPPORTUNITIES | THREATS |
|---|---|
| Abuts Existing Terrestrial Park | Anchoring of Yachts |
| Increased Diving and Snorkelling | Spearfishing |
| Tour Boat Operators as Wardens | Erosion / sedimentation from Land |
| Tourist attraction to include wetlands | Illegal Dumping in Wetlands |
| High diversity of mangrove | Illegal Harvesting |
| Only 1 dive shop within the Cabrits area | Littering |
| Tour boats and glass bottom boats | Hurricane damage to Environmental Assets |
| | Illegal grazing in Wetlands |
| | Illegal Camping |
| | Potential for discharge of waste from cruise ships |
| | Discharge of Wastes from Cruise Ships |
| | Discharge of wastes from land |

## 7.2 Strengths

The strengths are discussed under the following headings as itemized in Section 7.1 above:

- Legally Defined Site,
- Government Owned Land and Seabed,
- Still Relatively Unknown.
- Quality of Reefs,
- Clarity of Water,
- Variety of Dive Types,
- Depth of Reefs,
- Well Defined and Documented Mangrove, and
- Promotion of Area via Video.

### 7.2.1 Legally Defined Site

The marine component of the Cabrits National Park is defined in the National Parks and Protected Areas Act (see Section 2.2.1). This is considered a strength since a legally defined site can be better managed.

### 7.2.2 Government Owned Land and Seabed

Land tenure can create quite a barrier in trying to establish an MPA if the land owner is private and not inclined to cooperate. In this instance, the seabed is part of the Economic Exclusive Zone (EEZ) of the country and is therefore owned by the Government of Dominica. As a result, the inherent problems of incompatible use do not apply here. Additionally, the coastline up to the high water mark also forms part of the marine component of the park. The majority of the coastline abuts the existing terrestrial component and is therefore owned by the Government of Dominica. In areas north and south of the terrestrial component of the National Park where the coastline does not abut the National Park, there is no evidence of infringement beyond the high water mark by built development. These factors make the marine component of the CNP more easily managed.

### 7.2.3 Still Relatively Unknown

As noted in the draft Tourism Master Plan (CHL Consulting Ltd, 2006), the country as a whole is not well known on the international tourism market. In fact a simple search on the internet for Dominica will provide results the majority of which applies to the Dominican Republic. By extension, the CNP inclusive of the marine component is unknown. This lack of popularity has resulted in the environmental assets not being exposed to significant anthropogenic influences. This has resulted in the maintenance of good quality reefs, seagrass beds and wetlands.

### 7.2.4 Quality of Reefs

The quality of reefs within the CNP is of a high standard. There were few signs of coral stress in the majority of reefs and dense algal overgrowth was restricted to a few areas within the park. Though populated mainly by gorgonians, there were also areas dominated by sponges and hard corals, especially at Pinnard and at Cabrits South. Such pristine reefs are always sought after by divers who wish to experience the beauty of a flawless environment. This can add to the marketability of the MC/CNP.

### 7.2.5 Clarity of Water

The clarity of the water in the MC/CNP is amazing. Visibility of 20 – 30 m can be encountered when conditions are favoured and these are not uncommon within the park. Again, this adds to the marketability of the park and offers some new opportunities. Though known for its deeper waters, there are areas within the park where reefs are present at depths less than 10 m. These would be around Cabrits Point, Bell Hall, the northern end of Douglas Bay and the southern end of Toucarie.

### 7.2.6 Variety of Dive Types

The MC/CNP offers a variety of reef types for divers. Walls, coral platforms, soft coral gardens, caves, canyons and an artificial wreck all exist within the marine component. This provides ample variety for divers and promise new environments with almost every dive. This high dive diversity in such a relatively small area can be used as a major marketing factor for encouraging diving-based tourism.

### 7.2.7 Depth of Reefs

The majority of reefs lie in deeper waters (more than 10 m) and can only be accessed by SCUBA divers. This negates the very common problem of 'reef-walking' which occurs on most shallow Caribbean reefs.

### 7.2.8 Well Defined and Documented Wetland

The wetland system of the Cabrits National Park has well defined boundaries. The wetlands are included within the legal boundaries of the Cabrits National Park as laid down in the National Parks and Protected Areas Act. The park is 1,313 acres in extent, but the terrestrial portion is only 260 acres, with a substantial portion being occupied by the wetland system. The wetlands occupy an area of 89 acres within the Cabrits National Park and is bounded as follows: the Portsmouth-Tantane Road to the east, a small area of dry land and sea to the south, the lower slopes of the eastern face of the East Cabrits to the west, and the backshore of the Belle Hall Beach at Douglas Bay to the north.

Over the last two decades, the ecology of the Cabrits wetlands has been studied and documented mainly by the Forestry and Wildlife Division of Dominica. A number of environmental studies as well as a book on the flora and flora of the Cabrits National Park have been published by the Forestry and Wildlife Division. The Cabrits wetlands are well defined legally and the environmental assets have been studied and documented which will allow this ecosystem to be properly managed in the future.

### 7.2.9 Promotion of Area via Video

During discussions with the tour boat operators that provide a service to the site, they indicated that the Government was in the process of producing a promotional video on the nearby Indian River. It was also revealed that this promotion was expected to extend to the Cabrits National Park including the marine component in the near future. At present the CNP is relatively unknown (see Section 7.2.3) therefore, this promotional video will assist in marketing the site.

## 7.3 Weaknesses

The weaknesses are discussed under the following headings as itemized in Section 7.1 above:

- Lack of Management Structure,
- Ambiguous Boundaries,
- Stakeholders object to Present Boundaries,
- Cruise Ship Terminal within CNP Boundaries,
- Lack of Communication,
- Lack of Available Statistical Data,
- Lack of Environmental NGOs, and
- Abandoned Construction Area within Wetlands.

### 7.3.1 Lack of Management Structure

Effective management of the MC/CNP is essential to the maintenance of the environmental assets which exist within its boundaries. At present, there is no management system in place for the MC/CNP. This has resulted in conflicts of interest between the various agencies that claim some jurisdiction namely: the Fisheries Division, the Port Authority and the National Parks Department of the Ministry of Agriculture, Fisheries and the Environment. If this continues, the environmental assets

will continue to deteriorate. The draft Management Plan outlines one option for management (see Section 6.2). This option recommends the sharing of the responsibility of the MC/CNP with the CNP authority and a special authority such as a private entity to incorporate private sector interests.

### 7.3.2 Ambiguous Boundaries

The designation of the CNP at present includes the cruise ship berth. However, this has resulted in some confusion as to the management of the area. The cruise ship dock is presently managed by the Port Authority which conflicts with the rest of the CNP which falls under the purview of the National Parks Division. According to the draft Management Plan, this boundary issue has been raised by the Port Authority but no formalizing of the CNP boundaries has been undertaken.

### 7.3.3 Stakeholders object to Present Boundaries

During discussions with the Port Authority and with fishermen there were strong objections to the present boundaries of the MC/CNP. As noted in Section 7.3.2, the Port Authority has jurisdiction for the cruise ship dock which they plan to expand. It was noted that exclusion of the cruise ship terminal from the CNP would allow proper and effective management of the berth. The fishermen also objected to the present boundaries since for many of them their preferred fishing grounds lie within the boundaries of the MC/CNP at Toucarie and Cabrits. They have suggested that the boundaries should exclude their fishing grounds. These objections are considered a weakness as there would be less buy-in by stakeholders if the Management of the MC/CNP continues with the boundaries as they exist now. Additionally, there may infringements by the fishermen into the park to fish if the boundaries are not changed. Although the draft Management Plan suggests that there should be a fishing zone within the park, discussions should be held with the fishermen to identify the best areas for this fishing zone. However, careful consideration should be given to the present status of the fisheries. This can only be done through on-going monitoring of the fisheries. Another option presented by the fishermen is for the no-fishing zones to be for a known time period after which fishing can be allowed.

### 7.3.4 Cruise Ship Terminal within CNP Boundaries

As noted above, at present the existing cruise ship dock lies within the boundaries of the MC/CNP. Information in Section 5.2.2 indicates that approximately 13,500 persons visit the CNP annually. The result of this is the potential for the contamination of the seawater through the discharge of sewage into the marine environment. While there are facilities on-land for visitors to dispose of their sewage, there are no such facilities for passenger wastes prior to arrival at the CNP.

### 7.3.5 Lack of Communication

One cause of concern that arose during discussions with the fishermen is the question of spear fishing. All of the fishermen interviewed indicated that there was a dedicated group of spear fishermen that fish in the waters of the MC/CNP. Efforts to meet with these fishermen proved unsuccessful since they were not known by the local fishermen and actually came from the other side of the island at Marigot. Discussions with the Fisheries Division revealed that this group of fishermen were unaware of this group of fishermen. This lack of communication also translates to the feeling that the authorities in Roseau are out-of-touch with the fishermen and therefore unable to represent them on matters that concern them. Since the fisheries as a resource and the fishermen as a stakeholder are so important to the sustainability of the park, there is need for closer consultation between all stakeholders.

### 7.3.6 Lack of Available Statistical Data

One of the challenges encountered during the collection of data for this project was the lack of available documented information. In most cases, the data was merely anecdotal. This made it difficult for the comparison of original data with any historical data. A system of documentation of data such as fisheries statistics, yacht arrivals, number of cruise ship arrivals etc. must be implemented.

### 7.3.7 Lack of Environmental NGOs

A strong environmental NGO presence has proven to be useful in ensuring that the management of MPAs in the region are successful. While the communities in the study area have strong community based participation in the form of the village councils, there are no environmental advocates apart from one or two individuals. One such person was our diver master during the surveys who was very knowledgeable about both the natural and human environment as they relate to the CNP. However, he commented that there was the need for more to be done in terms of monitoring etc.

### 7.3.8 Abandoned Construction Area in Wetlands

On the northern side of the Cabrits Isthmus, there are abandoned paved areas (see Photograph 42) which were used for stockpiling construction material used in building the Guillette - Pennville Road. There is also an area adjacent to the stockpiling area that was used to offload material from barges (see Photograph 43). These areas are paved areas so they hamper the growth of trees and even grasses and weeds.

## 7.4 Opportunities

Opportunities identified through the establishment of the MC/CNP include:

- Increased Diving and Snorkelling,
- Diverse Wetland Ecosystem,
- Tour Boat Operators as Wardens,
- Tourist Attraction to include Wetland Areas,
- Abuts Existing Terrestrial Park, and
- Glass Bottom Boats.

### 7.4.1 Increased Diving and Snorkelling

The MC/CNP offers excellent opportunities for diving and snorkelling. There is currently only one established dive shop (Cabrits Dive) in the area which offers tours throughout the MC/CNP. With such a variety of dives and dive sites within the park, it may be feasible for another shop to provide access for divers. Also, for those who snorkel only, there are excellent areas for snorkelling within the Park. It may be possible to develop snorkelling tours as well based on the demand for this activity by visitors.

PHOTOGRAPH 42: ABANDONED STOCKPILING AREA

PHOTOGRAPH 43: ABANDONED BARGE LOADING DOCK

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| | DWG title: | PHOTOGRAPHS 42 & 43 |

### 7.4.2 Diverse Wetland Ecosystem

As noted in Section 4.3.6.5.1 this wetland system supports the only true stands of mangrove trees in Dominica. The Cabrits National Park contains Dominica's most extensive wetland system and in turn this ecotype supports a wide variety of wildlife species and provides important habitats for native and migratory birds. This ecosystem can thus be used as part of environmental awareness programmes which advertises the uniqueness of the Cabrits National Park in Dominica.

### 7.4.3 Tour Boat Operators as Wardens

One of the key stakeholders in the park is the tour boat operators / water taxis (see Section 5.2.5). Discussions with this group revealed that they are willing to act as wardens to the MC/CNP. This recommendation is a great opportunity as the park would benefit from the years of experience of these operators in travelling the waters of the park. Also as noted in Section 5.2.5, the operators are well educated as they also provide tours up the Indian River and are able to speak knowledgeably on the flora and fauna.

### 7.4.4 Tourist Attraction to include Wetland Areas

The mangrove swamp and marshland of the Cabrits wetland have been cited as important sites for migratory birds on the island, particularly for waterfowl and wading birds, and these sites have been recommended as major bird watching areas in Dominica. The location of the cruise ship complex to the Cabrits wetland presents opportunities in ecotourism. Currently cruise ship tourists are mainly exposed to the historical aspect of the Cabrits National Park (i.e. Fort Shirley) which has a well developed visitor center and walking trails, while few venture into the wetlands. The Forestry and Wildlife Division (James, 2001) has made recommendations for the "development" of the wetlands for nature tourism and education through the following:

- The provision of a carefully laid-out network of boardwalks to facilitate bird-watching and environmental education activities.
- Enhancement of the existing nature trails within the wetlands.
- Provision of interpretive facilities (signs, interpretive panels, etc.) for interpretation of the fauna and ecological processes of the wetlands.
- Provision of literature (booklets, brochures, posters) related to the natural history of the wetlands for visitors.

### 7.4.5 Abuts existing Terrestrial Park

There is already an existing management plan for the terrestrial component of the Cabrits National Park and a draft plan for the marine segment of the park. Visitors and residents are already familiar with the management of the CNP. Although there is room for some improvement, there is general agreement with the plans and proposals for the site. Once the two plans do not conflict with each other they should provide cohesive management of the entire park.

### 7.4.6 Glass Bottom Boats

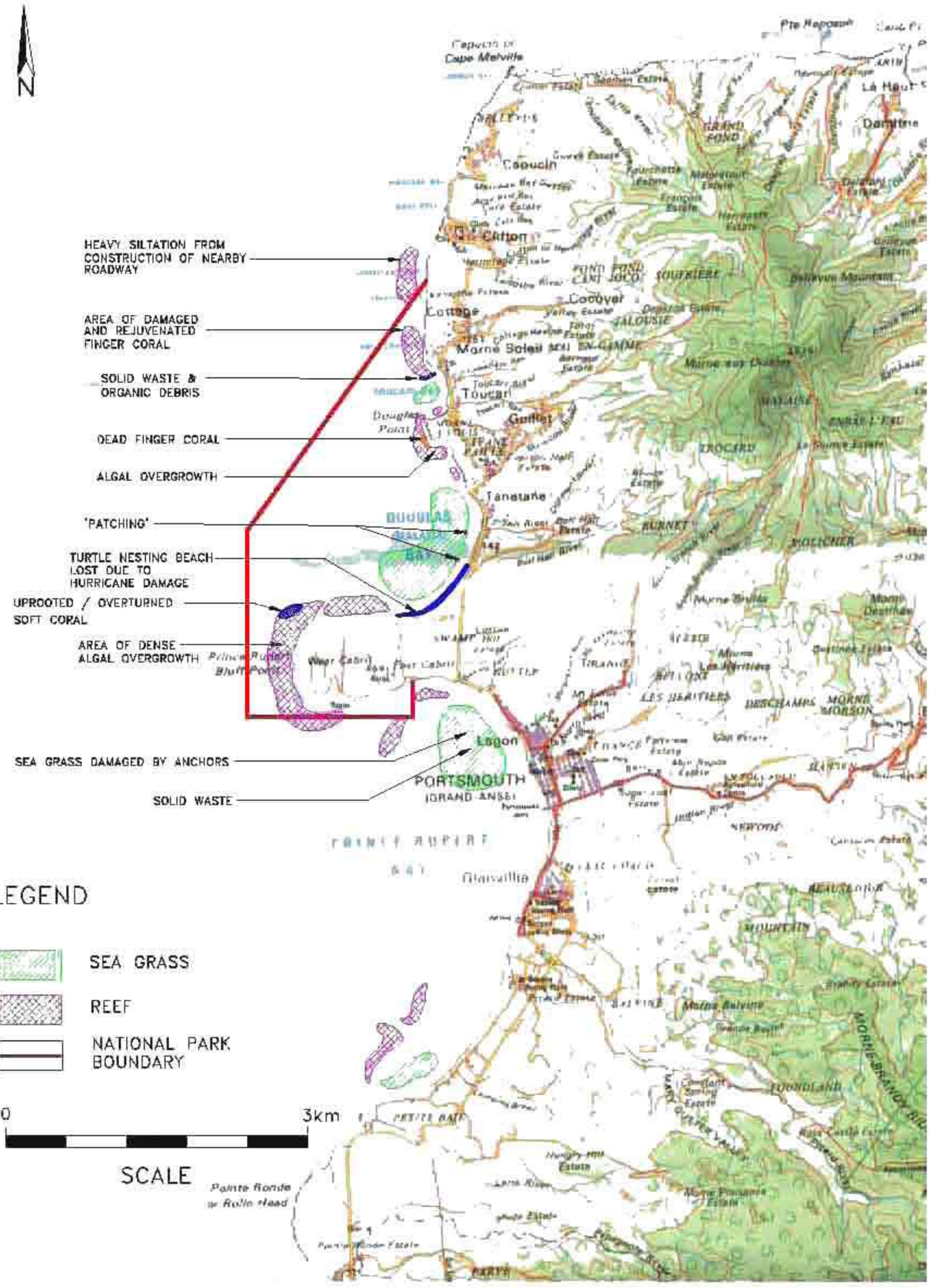
The quality of the reefs and the clarity of the waters were discussed in Sections 7.2.4 and 7.2.5 above. These qualities offer a perfect opportunity for an entrepreneur to provide boat tours on glass bottom boats. This would facilitate visitors and locals who may not dive or snorkel but may wish to see the diversity of the ecosystems present in the MC/CNP.

## 7.5 Threats

Threats identified in establishing the MC/CNP include:

- Hurricane Damage to Environmental Assets,
- Discharges from land.
- Erosion / Sedimentation from Land,
- Spearfishing,
- Illegal Dumping in Wetlands,
- Discharge of wastes from Cruise Ships,
- Anchoring of Yachts,
- Illegal Grazing in Wetlands,
- Littering,
- Illegal Harvesting, and
- Illegal Camping.

Existing and potential threats are mapped in Figures 15, 16 and 17.

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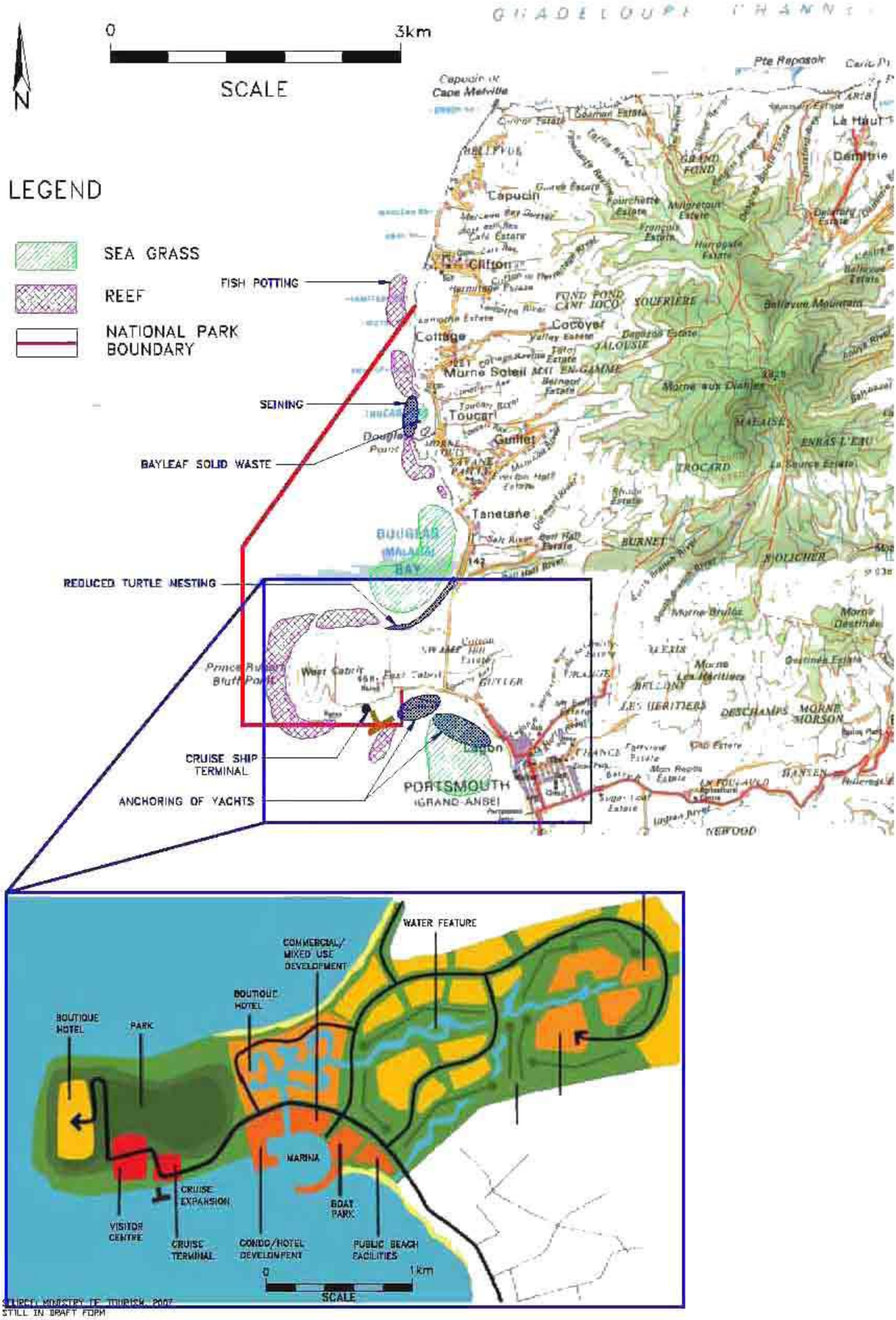
| Eco Report No. 11/2007 | CLIENT: OECS – ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT | FIGURE NUMBER 15 |
| Date: 31/07/07 | PROJECT: CABRITS NATIONAL PARK (MARINE COMPONENT) SITE REPORT | |
| | DWG. NAME: EXISTING THREATS TO THE MARINE ENVIRONMENTAL ASSETS | |




SOURCE: MINISTRY OF TOURISM, 2007
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| Date: 31/07/07 | PROJECT: CABRITS NATIONAL PARK (MARINE COMPONENT) SITE REPORT | |
| | DWG. NAME: POTENTIAL THREATS TO THE MARINE ENVIRONMENTAL ASSETS | |

LEGEND

- PAVED AREAS
- ILLEGAL LITTERING & DUMPING
- ILLEGAL LITTERING
- ILLEGAL HARVESTING
- ILLEGAL GRAZING
- ILLEGAL CAMPSITE
- MANGROVE SWAMP
- MARSHLAND
- SWAMP FOREST
- MAIN ROADS
- COASTLINE

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0 250m

SCALE


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| | PROJECT: | CABRITS NATIONAL PARK (MARINE COMPONENT) SITE REPORT |
| Date: 31/07/07 | DWG. NAME: | EXISTING AND POTENTIAL THREATS TO THE WETLAND SYSTEMS |

FIGURE NUMBER 17

### 7.5.1 Hurricane Damage to Environmental Assets

The island of Dominica is located within the Hurricane belt. Marylin (1995), Lewis (1996) and Lenny (1999) were the most recent to hit the island and have resulted in serious damage and losses to the coastal ecosystems present in the CNP.

- Reefs - Marylin and Lewis caused severe destruction to reef systems in the MC/CNP. Toucarie and Douglas Bay were noted as the two areas to have experienced most of the coral damage. Broken / overturned pencil and finger corals and sponges lay testimony to the destructive nature of hurricanes upon reefs and was well documented during studies in the aftermath of the hurricanes.

- Sea grass beds - Hurricane driven waves and currents were documented to have ripped out portions of sea grass and deposited sand over the grass (thereby smothering it) in both Toucarie and Douglas Bay.

- Beaches - Hurricane driven waves and currents, in much the same way they have damaged the reefs and sea grass, has eroded and transported much of the volcanic sand away from the beaches of Toucarie and Douglas Bay. From 1999 to 2007, they have not yet reverted to their pre-1999 state.

- Turtles - Reports in 1980 indicated that hawksbill and green turtles have used Toucarie and Douglas Bay as nesting sites. However with the removal of the beach sand and the exposure of boulders in its absence, many of these turtles have not been able to continue their annual nesting patterns. This, in addition to ongoing poaching has led to a decline in their numbers.

### 7.5.2 Discharges from Land

The fact that the MC/CNP is bounded by land increases the potential for land-based sources of pollution such as domestic waste water, improperly treated or un-treated sewage (from nearby residential areas) and solid waste to impact on the quality of the marine environment. While there is no significant agricultural activity occurring on the adjacent lands surrounding the coastline, there may be some agricultural activity occurring on the hillsides above which may result in pesticides entering the marine environment.

### 7.5.3 Erosion / Sedimentation from Land

There is evidence both under the water as well as localised observations of sediment plumes in the water that sedimentation from the land has played a role in the deterioration of the reefs and seagrass in some areas. This was noted in the sea grass at Douglas Bay as well as on Pinnard Reef. Measures must be put in place that will prevent increased run-off (especially during construction activities) from entering the marine environment. These will be discussed in Section 8.2.2 below.

### 7.5.4 Spear Fishing

Spear fishing is rarely done by members of the local community but most of the spear fishermen that fish in the MC/CNP are from the other side of the island at Marigot. Spears do damage the corals that they hit and this adds to the total degradation of the reef. More so, it is likely that the larger fish would be targeted. Fish may also adopt a 'hide and run' behaviour when encountering spear fishers. This in turn may cause them to 'shy' from Park visitors that are interested in observing them. In addition, there is the potential for conflict as local fishermen believe that spear fishers should not be able to come into their area and catch what should be theirs, reduce the number of fish in their reef and jeopardize their livelihood. Spear fishing was observed by Ecoengineering off Bell Hall Beach on March 13, 2007.

### 7.5.5 Illegal Dumping in Wetlands

In the 1980s an area in the north-eastern portion of the wetland was used as the municipal solid waste disposal site for the greater Portsmouth area. The dumping of garbage at that site was subsequently discontinued, although a site nearby is still used as an unofficial "garbage transfer station" where dumpsters are kept loaded with garbage until they are hauled away to the landfill at Pointe Ronde. Although there is a sign along the road (see Photograph 44) indicating the prohibited activities in the park, there is still evidence of illegal dumping of old vehicles and appliances and other litter (see Photographs 45 and 46) along the nature trail skirting the northern boundary. This dumping has led to the die-back of two small stands of white mangrove in the swamp. It is recommended that cleanup activities be conducted to rid the wetlands of the solid waste and that future dumping be discouraged through awareness and educational programmes.

PHOTOGRAPH 44: PROHIBITED ACTIVITIES SIGN

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| | DWG. NAME: | PHOTOGRAPH 44 |

PHOTOGRAPH 45: DUMPING IN MANGROVE SWAMP

PHOTOGRAPH 46: LITTERING IN MANGROVE SWAMP

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| | DWG. NAME: | PHOTOGRAPHS 45 & 46 |

### 7.5.6 Discharge of Wastes from Cruise Ships

The potential for the deterioration of water quality due to discharge from cruise ships was alluded to in Section 7.3.4 above. The plan for expansion of this dock will further serve to aggravate this problem if measures are not put in place to deal with ship waste. One positive aspect is the fact that the cruise ships are generally in port for a short period of time and while they are at berth, passengers are able to use the on-land facilities.

### 7.5.7 Anchoring of Yachts

There is no question that anchoring is preferred over moorings in Prince Rupert Bay and in the MC of the CNP. Apart from the fact that there are few moorings in the area, yachts were observed at anchor adjacent to moorings.

There is no question that anchoring on the reefs and on the seagrass beds result in significant physical and ecological damage. At present due to the presence of the cruise ship dock, no anchoring of cruise ships occur within the CNP. There is the potential that during the peak season yachts will encroach into the CNP and anchor there. This will inevitably lead to the deterioration of the reef.

While there is no plan for a specific anchoring zone proposed in the draft Management Plan, there is the intention to establish mooring buoys with the objective of minimizing negative impacts on the reef ecology. To change the culture of “anchor anywhere”, the effects of anchor damage (including evidence of actual damage at MC/CNP or elsewhere in the Caribbean) should be a focus of the educational material prepared for the Park.

### 7.5.8 Illegal Grazing in Wetlands

A few livestock owners from the Tantane and Lagon areas still use the wetland for grazing their cattle (see Photograph 47) although it is illegal. There is evidence that the marsh has been burnt in the past, probably to provide fresh grazing material. This practice changes the soil conditions and thereby changes the types of vegetation that would grow. This therefore results in a widening of the margins of the wetlands.

### 7.5.9 Illegal Harvesting

Persons were observed illegally collecting Citronella grass (*Cymbopogon citratus*) for herbal purposes along the roadsides of the southern boundary of the Cabrits wetland. Residents have also been known to illegally hunt crabs in the mangrove swamp area.

### 7.5.10 Illegal Camping

There was evidence of an illegal campsite (see Photograph 48) about 50 m from the Belle Hall beach area which is located at the north-western corner of the wetland. Camp site are created by clearing of the original vegetation for the structures. This again reduces the wetland area.

PHOTOGRAPH 47: ILLEGAL CATTLE GRAZING

PHOTOGRAPH 48: ILLEGAL DWELLING IN SWAMP

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| Date: 31/07/07 | DWG. NAME: | PHOTOGRAPHS 47 & 48 |

# 8 POTENTIAL IMPACTS AND MITIGATION MEASURES

This chapter describes potential environmental impacts of the establishment of the MC/CNP and the use of the resources by various stakeholders on the natural and socio-economic environment. Both adverse and beneficial impacts are identified in this chapter along with appropriate mitigation measures. Impacts are rated on a systematic basis both before the application of mitigation measures as well as after the successful implementation of mitigation measures. For convenience, impacts are divided into the following:

I Impacts associated with environmental assets, and
II Impacts associated with the socio-economic environment.

The final section of the chapter is a summary of the classification of impacts.

## 8.1 Classification of Impacts

Impacts were classified on a structured basis and were based on three criteria: extent, intensity, and nature (see Appendix B). Based on this, impacts (both without and with mitigation) were classified as low, moderate or high. Where adverse impacts were considered to be insignificant, no classification was applied. The Classification of each impact is indicated in the respective sub-section of this chapter, and a summary of the Classification is provided in Section 8.5.

## 8.2 Impacts Associated with the Physical Environment

While the establishment and proposed management of the MC/CNP will not affect the physical components of the environment these may have impacts on the MC/CNP. Impacts of the following components of the physical environment on the MC/CNP are discussed under the following headings:

- Climate,
- Upland Development,
- Water Quality.

### 8.2.1 Climate

Extreme weather events have impacted significantly on the coral reefs and beaches within the MC/CNP. Evidence of the physical damage to the reef system were discussed and documented in Sections 7.5.1 and 7.5.3 of this report. Since Dominica is located within the hurricane belt, it is expected that these storms will continue to impact on the marine environment. Scientists also expect the severity of these storms and hurricanes to increase due to increased global warming.

In addition to the direct effect of the passage of hurricanes and storms on the coral reefs, the accompanying rains result in increased sediment runoff which (as was discussed in Section 7.5.3 above) has led to smothering of the corals and seagrasses.
In the event of a hurricane the damage to marine and coastal areas may be inevitable depending on the characteristics of the event and cannot be mitigated. An Emergency Response Plan should be developed for the MC/CNP which would include response to natural disasters. The various elements of this plan should be activated once there is warning of an approaching hurricane. The draft Management Plan speaks briefly about the development and implementation of a Disaster Management Plan for the entire park.

The rate and volume of run-off from surrounding areas (watershed and coastal) will be influenced by conditions such as presence of vegetative cover, steepness of slopes, presence of dams, etc. Discharge of watersheds along the north-west coastline into the waters of the MC/CNP is through mangroves in the Cabrits area (see Section 4.3.6.3). These mangroves act as natural filters which trap silt. In other areas to the north where there are no mangroves, runoff flows freely out the mouths of rivers directly into the marine environment. Without watershed and coastal protection the impact of heavy rainfall on the assets in the MC/CNP is classified as:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| LOCALISED | MEDIUM | REVERSIBLE | MODERATE |

Measures recommended in the draft Management Plan to mitigate the impact of increased runoff on the environmental assets in the MC/CNP include:

- Development of an Emergency Response Plan.
- Extending management to a zone of influence (ZOI) which will extend beyond the park boundaries north to Capuchin and south to Pointe Ronde. While the protected area management will have no jurisdiction on the adjacent areas, a system of negotiations, tradeoffs and persuasion will be used in an attempt to minimize the impacts of developments in these areas on the marine environment.
- Maintenance of vegetative cover on slopes above the Cabrits area to reduce the incidence of erosion.

If these measures are implemented, the impact of climatic conditions on the environmental assets within the MC/CNP can be classified as:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| LOCALISED | MINOR | REVERSIBLE | LOW |

### 8.2.2 Upland Development

As noted in Section 7.5.3, the reefs and seagrass beds within the MC/CNP have experienced sedimentation due to the construction of roads along the adjacent coastal areas. Any construction activity in this area will have the same result if no measures are implemented to prevent sediment run-off from construction sites to the marine environment. There are plans by various agencies to undertake further development in the Portsmouth, Cabrits area as part of the development of tourism in the area. This includes:

- The construction of a yachting marina,
- The construction of a wharf at Toucarie Bay,
- The construction of a number of boutiques / hotels,
- The construction of a boat park,
- The construction of public beach facilities,
- The expansion of the existing Cruise Terminal,
- The International Maritime Training and Development Institute of the Caribbean
- Regional Office of the Dominica Maritime Registry, Inc.
- The Offices of the Dominica Maritime Administration, and
- The Lesser Antilles Oil Spill Response & Dominica Search and Rescue.

If no measures are put in place the impact of upland development on the marine environment of the MC/CNP is expected to be:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| LOCALISED | MAJOR | REVERSIBLE | MODERATE |

The draft Management plan provides for the following measures to mitigate against the impact of upland development on the marine environment within the CNP:

- Regulation of storm water and waste water from facilities and amenities adjacent to the park.
- Dredging, extraction of sand or gravel, discharging or depositing waste or any other water polluting matter or disturbing or destroying the natural environment are prohibited in the park.

In addition, it is recommended that an Environmental Impact Assessment be required for all development which is proposed for the zone of influence (see Section 9.3). The EIA must contain proposals to adequately address sediment run-off and other effluent run-off from the proposed development.

Once the above proposals are implemented, the impact of upland development on the MC/CNP is expected to be:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| LOCALISED | MINOR | REVERSIBLE | LOW |

### 8.2.3 Water Quality

While the water quality in the park has been complimented for its clarity, there is some evidence that activities within the park and in the adjacent areas are having some negative impact. Good water quality is critical to the functioning and growth of coral reefs. The clarity of the water and therefore its ability to transmit sunlight will determine whether there is the continued growth of corals. Additionally, clear waters are also essential to the growth of seagrasses as these marine plants like all plants rely on sunlight for photosynthesis.

Water clarity in the MC/CNP has been impacted by the loading of silt and sediment directly related to built development in the adjacent coastal area (see Sections 7.5.2, and 4.3.2.5.2). This resultant smothering of corals, sponges and seagrasses has created some die-off in these ecosystems. Apart from sedimentation, the water quality has also been impacted by the release of sewage effluent from yachts and cruise ships and from on-land sources. As noted in Section 4.2.7, this has resulted in faecal contamination as evidenced by the high coliform bacterial counts measured at Toucarie Bay, Glanvillia and Indian River. This addition of nutrients in the water encourages algal blooms which out-compete the corals on the boulder substrates. Evidence of this was seen in Toucarie Bay and Douglas Point South (see Section 4.3.2.1 and 4.3.2.2). Measures to address sedimentation were discussed in Section 8.2.3 above. If no measures are put in place to mitigate against the introduction of water pollutants (sewage effluents, etc) into the MC/CNP the classification of this impact is expected to be:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| LOCALISED | MEDIUM | REVERSIBLE | MODERATE |

The draft management Plan proposes the following measures to reduce this impact:

- Prohibition of the disposal or dumping of solid or liquid waste, debris or pollutants from any vessel or boat or from land-based sources in the park.
- Prevention of the discharge of pollution from unwanted substances from boats and cruise ships in near shore waters.
- Implementing a requirement for yachts entering the waters of the CNP to be equipped with holding tanks.
- Regulation of storm water and wastewater from facilities and amenities adjacent to the park.
- Ongoing monitoring of water quality and of critical marine resources, such as coral reefs, seagrass beds and fish populations is required. Such monitoring should be specifically directed at detecting the impacts of land-based activities in conjunction with the ongoing monitoring of impact from inappropriate extractive and recreational uses. Figure 18 provides proposed monitoring locations for water quality by the Environmental Health Unit. It is proposed that these locations be extended north within the park and that additional parameters such as pesticides be added to the menu of parameters.

Once the above measures are implemented, it is expected that the impact of anthropogenic sources of pollution on water quality will be:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| LOCALISED | VERY SMALL | REVERSIBLE | LOW |

## 8.3 Impacts Associated with Environmental Assets

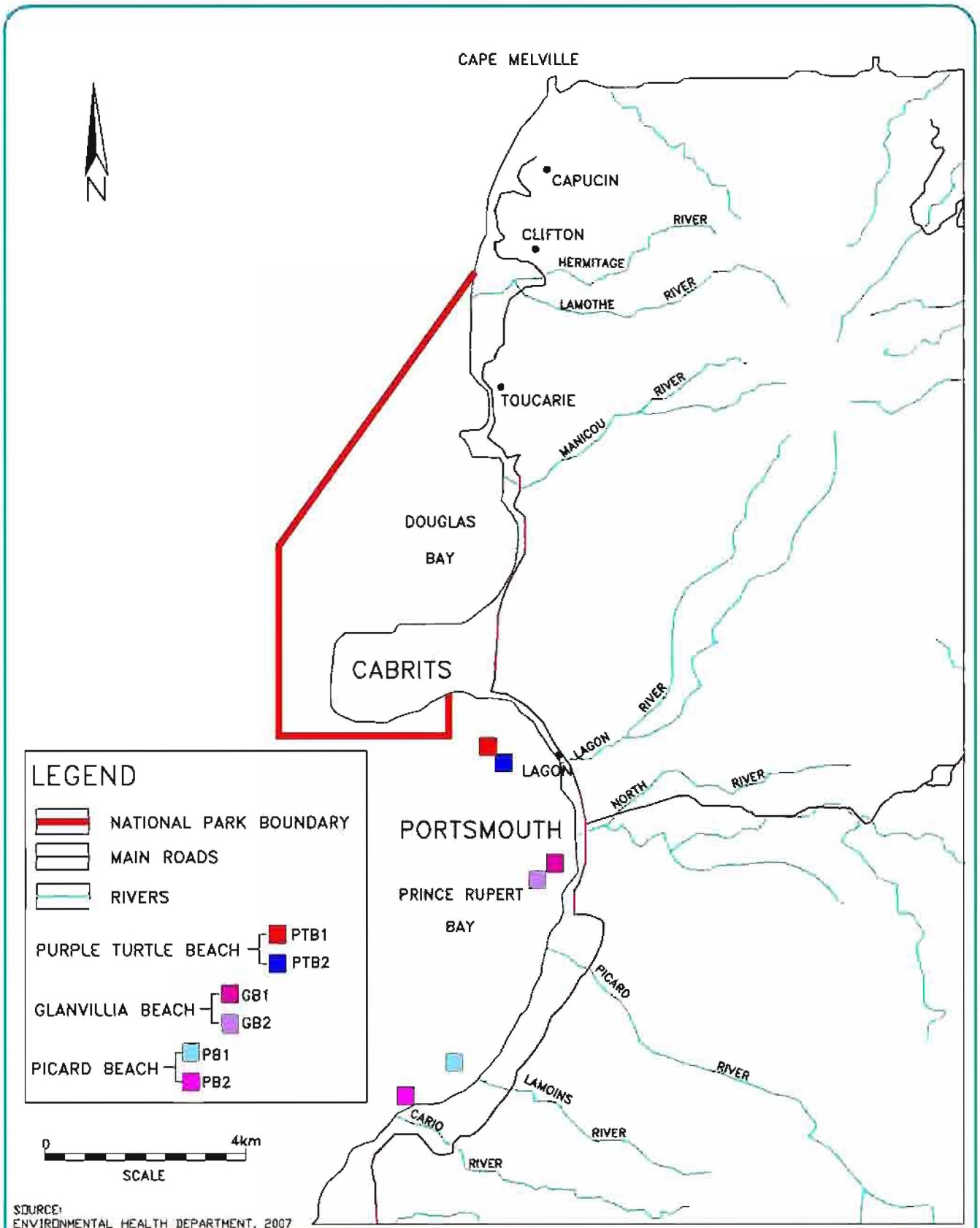
The environmental assets within the MC/CNP were identified and discussed in Section 4.3. Impacts associated with use of these assets will be described under the following headings:

- Coral Reefs,
- Seagrass Beds,
- Fisheries,
- Marine Mammals,
- Sea Turtles,
- Mangroves, and
- Beaches.

### 8.3.1 Coral Reefs

Coral reefs are the dominant environmental asset within the MC/CNP. Section 4.3.2 provides a full description of the diversity, status and unique qualities of the reefs within the park. As is the case with MPAs in the region, these reefs are the basis for the attractiveness of the park to visitors both local and foreign. In the CNP there is the added benefit of the combination of coral reef, seagrass beds and mangrove wetland which provide the habitat for the complex interactions of the diverse fauna that exist there. At the MC/CNP there are several activities that have resulted in some degradation of the coral reefs:

- Diving and snorkelling,
- Fishing,
- Anchoring of yachts, and
- Cruise ship visits.

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| Ecoengineering Caribbean Ltd. | Eco Report No. 11/2007 | CLIENT: OECS – ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT | FIGURE NUMBER 18 |
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| | | DWG. NAME: PROPOSED WATER QUALITY LOCATIONS | |

Divers have the potential to accidentally hold onto corals or hit them with their fins while under the water. At other times they may even stand upon corals or break off souvenirs for collection. All such activities have resulted in physical damage to the corals within the park. One of the opportunities discussed in Section 7.4.1 above is the promotion of diving which is under-developed at present. However, this must be carefully managed if the damage to the reefs is to be stopped.

Fishing within the MC/CNP is done using several methods, fish pots, seining and spear fishing (see Section 5.3.2.2.3). All of these activities if not carefully monitored, have the potential to physically damage the coral reef. Spear fishers do physical damage to reef structures with their spears as well as deplete the numbers of adult fish thereby leaving an abundance of juveniles. Discussions with fishermen suggest that there are a significant number of these fishers which can translate to a significant depletion in the adult reef fish population (5.3.2.2.4).

Fish pots, if left unattended and built of non bio-degradable materials, have the potential to continue 'ghost fishing' long after they were deployed. Also, they may be set over live corals. The manner of retrieval can also be harmful to corals as well, using grappling hooks from the surface and pulling them across the seafloor till they attach onto the pot. In lifting the pot there is also damage that may be caused as the pot scrapes the seafloor before the rope tension lifts it off the bottom.

Nets are used mainly in inshore shallow areas to catch pelagic species, such as in Toucarie and Douglas Bay. Some are outfitted with weights at the bottom and drag along the seafloor. If they are dragged over corals and seagrass, they can leave large scars which may take many years to regenerate.

As stated in Section 5.2.4, yachts are commonly seen anchored in Prince Rupert Bay. In addition, the chain which attaches onto this anchor can also cause physical damage to any corals which it may run over or be in the vicinity of (see Photographs 27-29). This type of damage was referred to by fishermen when they were interviewed (see Section 5.3.2.2.3).

Cruise-ships do not use their anchor while berthing in the cruise-ship dock. However, there is the possibility that such a large vessel can run aground and destroy a large quantity of corals and large barrel sponges to the west and adjacent to the docking area.

Finally, the passage of hurricanes has resulted in significant damage to the corals within the park. In fact, discussions with all stakeholders revealed that this may be the number one cause of the physical damage that has occurred on the reefs over the past 7-10 years (see Sections 5.3.2.1.5 and 5.3.2.3.5).

Apart from the physical damage, activities that impair the quality of the water such as discharges from land, sediment laden run-off and discharges from yachts and cruise ships all have negative impacts on the reefs (see Section 7.5.2 and 7.5.3). These impacts include smothering or enabling the growth of algae which out-compete the corals (see Section 4.3.2).

If left un-managed, impacts on the coral reefs caused by the various uses can be classified as:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| ON-SITE | MAJOR | REVERSIBLE | MODERATE |

Measures to mitigate the impacts of these activities as outlined in the draft Management Plan include those discussed in Section 8.2.3 above which are expected to mitigate against contamination to the water as well as the following:

- Ensure that divers in the park are always under the trained supervision of a local dive master / operator.
- Give a dive screening test (buoyancy control) and educate divers on the importance of keeping at least 1 m off the reef and not taking / collecting souvenirs.
- Have sufficient patrols to ensure compliance.
- Establish zones and timeframes (rotational) for fishing in the park.
- Regularise, standardise and enforce the fishing type / equipment to be allowed within the park and its zones.
- Conduct periodic surveys, fish stock analysis and landings data to determine if implemented measures are effective.
- Establish a marina for mooring of yachts.
- Establish sound mooring buoys onto which yachts can be moored.
- Legally prohibit dropping of anchors.
- Provide assistance to cruise ships entering the docking area to prevent accidental groundings.

Once the above measures are implemented the impact of non-sustainable practices on the coral reefs can be classified as:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| ON-SITE | VERY SMALL | REVERSIBLE | LOW |

### 8.3.2 Sea Grass Beds

There are only two areas of seagrass beds (Toucarie and Douglas Bay) within the park (see Section 4.3.3) and another just outside at Prince Rupert Bay (see Section 4.3.3.2). Of these three areas, only Prince Rupert Bay is used as a natural harbour for yachts. Predictably, heavy scaring from anchoring of these yachts occurs within this nursery area as compared to the previous two. Within the MC/CNP there are several activities that have resulted in some degradation of the seagrass beds:

- Fishing, and
- Anchoring of yachts.

Additionally, activities outside of the park have the potential to result in degradation of the seagrass beds. These include construction projects where sediment-filled run-off is allowed to drain into the marine environment (see Section 8.2.2). This results in the smothering of the seagrasses and the increased turbidity reduces the ability of these plants to photosynthesize (see Section 8.2.3).

Fishing with nets that have a weighted line on the bottom will damage the seagrass over which it passes (Toucarie and Douglas Bays, see Section 4.3.3). Damage due to the movement of fishing lines did not appear to cause as much damage as anchors from yachts and other vessels (see Section 4.3.3).

During the site visit, yachts were not observed anchoring in the MC/CNP but just outside in Prince Rupert Bay. However, it is our understanding from discussions with various stakeholders that these yachts spill over into the park during peak times. No less than 40 were observed in any day during the duration of Ecoengineering's study. In the absence of a marina, mooring devices, legislation and enforcement against anchoring, yachters have no other choice but to drop anchor within the natural harbour to stabilise their vessels. As the area still has a fair coverage of seagrass, it is not practical for each yacht to seek out an area of sandy bottom upon which to drop their anchor. This results in significant damage to the seagrasses.

If this is allowed to continue unabated, the classification of this impact is expected to be:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| ON-SITE | MEDIUM | REVERSIBLE | LOW |

Measures recommended in the draft Management Plan to eliminate these activities include:

- Regularise, standardise and enforce the fishing type / equipment to be allowed within the park and its zones.
- Have sufficient patrols to ensure compliance.
- Conduct periodic surveys, fish stock analysis and landings data to determine if implemented measures are effective.
- Establish a marina for mooring of yachts.
- Establish sound mooring buoys onto which yachts can be moored.
- Legally prohibit dropping of anchors.

Once adequately implemented, these measures have the potential to reduce the classification of impacts on the seagrass beds to:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| ON-SITE | VERY SMALL | REVERSIBLE | LOW |

### 8.3.3 Fisheries

The reef fishery is very important in the Portsmouth area (see Section 5.2.1). A fair number of the fishermen in the area target this fishery in the Toucarie, Lagon and Cabrits areas which are within the boundaries of the MC of the CNP. Edwards 2006 indicated that the demersal fishery may be overexploited and this concern was confirmed through discussion with fishermen as well as the observations made during the dive surveys (see Section 4.3.2). The methods used within the area include fish pots (see Photograph 20), beach seines, trolling and long line (see Section 5.2.1.2). Fish pots which are not monitored can result in “ghost fishing” whereby fish are caught indiscriminately.

Spear fishing in the vicinity of the coral reefs can result in physical damage to the corals. This can also result in a change in the physical behaviour of the fish making them ‘shy’ which impacts on the ability for Park visitors to view them (see Section 7.5.4). Additionally, spear fishing can also lead to a scarcity of the fish and, if unregulated, to a

loss of the very fish species that divers want to see (French Mission for Cooperation, 1995). If left to continue, the impact of fishing pressure on the nearshore demersal fishery is expected to be:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| ON-SITE | MINOR | REVERSIBLE | LOW |

The draft Management Plan provides detailed recommendations apart from the designation of fishing zones as to the fishing practices that will not be allowed to occur within the MC/CNP. These include:

- Use of destructive gear (including seine nets);
- Use of small mesh in nets and traps;
- Use of SCUBA or hooks to fish in the park.

Additionally, the following measures are also recommended:

- The enforcement of no-take zones;
- The enforcement of closed seasons on certain species (like lobster and conch);
- The enforcement of a system of limiting new entrants into the fishery;
- The enforcement of effluent discharge standards that are friendly towards fish habitat;
- Establishment of marine protected areas through zonation to control over-fishing and to preserve reef fish stocks at an ideal level for fish reproduction and reef health;
- Promotion of deep-water fishing to reduce fishing pressure on the coral reef;
- Education of the local public on the importance of the park to conservation, livelihood development through education;
- No fishing shall be allowed in the restoration and nursery zone;
- Minimal fishing practices will be permitted in the recreational zone;
- Spear gun fishing is only permitted in the open fishing zone;
- Fish pots may only be used in the open Fishing zone;
- Fishing with explosives or poison is prohibited in the Park;
- Fishing nets and fish gear used in the open fishing zone must comply with the regulated national standards set by the FDD;
- The use of trammel nets is not permitted in the marine park;
- Fishing to include restriction of fishing gear used in the Park and review; and implementation of fishing regulations as it pertains to the park.

If the measures listed above are implemented the impact of fishing pressure on the fishery is expected to be:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| ON-SITE | VERY SMALL | REVERSIBLE | LOW |

### 8.3.4 Sea Turtles

As noted in Section 4.3.5, Douglas Bay is an important nesting site for the endangered hawksbill and green turtles. These turtles have been reported to nest on beaches in the bay since the early 1980's. Reports indicate that the turtles still nest on both beaches in spite of the loss of sand. The most significant threat experienced by this sea turtle population is the loss of the nesting beaches due to hurricane damage. Although, reports are that these animals do still nest there, the presence of rubble and boulders on the beaches (see Photographs 38 and 39) has resulted in a reduction in their numbers. Another potential threat to the turtles is the loss of seagrass beds where they feed. Although the damage of seagrass beds have been small in the past, if this continues there will be a direct and significant impact on the population of turtles that nest and feed in the CNP.

Measures suggested in Section 8.3.2 to mitigate against the destruction of the seagrass beds are also applicable here.

### 8.3.5 Mangrove

The wetland system found on the Cabrits Isthmus can be considered unique to Dominica, however none of the individual species can be considered rare or endangered. Presently the activities that occur within the wetlands of the Cabrits National Park that have a negative impact on the wetland ecosystems include:

- illegal harvesting of floral and faunal species within the wetlands for medicines (Citronella grass), fuel (fire wood) and food (crabs);
- illegal dumping and littering within the wetlands;
- illegal livestock grazing within the marshlands;
- illegal camping, which includes clearing of trees; and
- future development adjacent to the wetlands.

Although the wetland area of the Cabrits National Park is currently a protected area and there are laws prohibiting illegal activities such as dumping and animal grazing, there is still evidence of these activities occurring in the area. Nearby residents regularly hunt crabs (a local delicacy) in the mangrove swamps, and various plants are used in local homemade remedies. The crab population within the mangrove swamp has been reduced over the years by indiscriminate harvesting. Illegal dumping on the site is another significant impact within the wetlands. In the 1980's a portion of the site was used as a municipal solid waste disposal site for Portsmouth and although this dumping was discontinued and the activity made illegal, locals still use this area to dump old vehicles and appliances.

The marshlands within the wetlands have been prone to illegal grazing by livestock owned by residents in the Tantane and Lagon area. These animals if left unregulated can destroy a significant area of the marshlands. There was evidence of a campsite in the mangrove swamp where the area had been cleared (see Section 7.5.10). All camping activities should be prohibited since it can lead to the indiscriminate clearing of flora.

If no mitigation measures are recommended to remove the activities that result in wetland destruction, the classification of this impact is expected to be:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| ON-SITE | MEDIUM | REVERSIBLE | MODERATE |

While the draft Management Plan does not provide any specific measures to address the activities that are causing a negative impact on the wetlands, the following are proposed:

- Enforcement of the laws governing entrance to the park, illegal grazing, dumping and harvesting.
- Educate the public on the dangers of unsustainable practices.
- Provide alternative dump / landfill sites.

If these measures are implemented, the classification of the impact of unsustainable practices on the wetland is expected to be:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| ON-SITE | VERY SMALL | REVERSIBLE | LOW |

### 8.3.6 Beaches

The main beaches in the study area are Coconut Beach, Purple Turtle Beach and Tanetane Beach (see Section 4.3.7). Threats to these beaches include hurricane damage, sand mining and dumping of solid waste. As noted in the draft Management Plan, prior to the hurricanes of 1995 and 1996 these beaches were broad bands of well-established volcanic sand beaches consisting of light grey sand. More recent hurricane systems in 1999 have removed most of the sand from the beaches. These beaches are now strewn with boulders (see Section 4.3.7). While sand mining was not observed during the site visits, it is understood that this activity has threatened the beaches in the past and continues. Apart from sand mining, the indiscriminate dumping of garbage results in the loss of the aesthetics of the beaches. While little can be done to mitigate against storm surges as a result of hurricane damage, if no measures are implemented to reduce the impact of sand mining and garbage disposal on the beaches within the CNP the classification is expected to be:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| ON-SITE | MINOR | REVERSIBLE | LOW |

Measures proposed to mitigate against sand mining and disposal of garbage include:

- Prohibit sand mining from the beaches in the CNP and source aggregate from other areas.
- Provide a designated landfill site for the town of Portsmouth and surrounding villages.
- Educate the general public on appropriate methods of solid waste management.
- Educate the general public on the hazards associated with the indiscriminate dumping of garbage.

Once these measures are implemented the impact of sand mining and dumping of garbage on beaches within the CNP can be classified as:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| ON-SITE | VERY SMALL | REVERSIBLE | LOW |

## 8.4 Impacts on the Socio-Economic Environment

The socio-economic environment including consultation with stakeholders was discussed in Chapter 5. Impacts associated with the socio-economic environment will be described under the following headings:

- Tour Boat / Water Taxi Operators, and
- Fishermen,
- Divers,
- Yachters / Tourists,
- Residents.

### 8.4.1 Tour Boat Operators

No information on the exact number of tour boats that service the yachts in Prince Rupert Bay was available for inclusion into this report. However, this group was the most organised of all the stakeholders, in that they were organised into a group and were usually led by one of the operators who owned several boats. During the surveys, 11 operators were interviewed as a group (see Section 5.3.2.1). The operators were primarily Indian River guides that on occasion provide taxi and vending services to the yachts. The information provided by them indicates that this group would welcome the establishment of the MC of the CNP because they agree that the site needs some form of management. They even suggested the following options that could be implemented to sustain the site:

- Making the tour boat operators into marine wardens to patrol the reef at intervals.
- Placing buoys and mooring stations for yachts so that they would not have to anchor on the reef and damage the corals.
- Placing restrictions on divers since a number of the divers shoot the fish when they go out on dives.

The first bulleted item above indicates that the tour boat operators are willing to participate in the management of the MC of the CNP. Taking this suggestion would benefit the park since these operators are very experienced, they already have some knowledge about dealing with visitors and they are very knowledgeable about the features and the importance of the ecosystems in the area.

### 8.4.2 Fishermen

As noted in Section 5.2.1.1, 184 fishermen are registered in the area of interest, however, there is no indication of what percentage of this number represents fishers that actually fish within the MC of the CNP. During the field visit, 19 fishermen were interviewed all of which fished in the waters of the CNP (see Section 5.3.2.2). Although, there are accounts from historical data that fishing has resulted in the overexploitation of demersal species, this discussion focuses on the impact that the establishment of the MC/CNP and its subsequent management will have on the livelihood of the fishermen who fish in the area.

Discussions with the fishermen indicated that they were dissatisfied with the present boundaries of the MC/CNP (see Section 7.3.3). As far as they are concerned even if fishing is allowed within the boundaries restrictions will still be imposed on their livelihood. The establishment of the MC/CNP is therefore considered a negative impact on their livelihood. Mention was also made of the infringement of spear fishermen who the fishermen accuse of creating most of the problems by overfishing the reefs (see Section 7.5.4). As discussed in Section 6.3.3, the draft Management Plan proposes a fishing zone within the park which will be governed by a series of rules. If no measures are implemented the impact on the livelihood of fishermen is expected to be:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| LOCALISED | MAJOR | IRREVERSIBLE | HIGH |

The draft Management Plan puts the following restrictions on fishing within the park which the fishermen will have to abide by:

- Establishment of a fishing zone to control over-fishing but also to ensure that the livelihood of the fishermen is sustained,
- Promotion of deep-water fishing to reduce fishing pressure on the coral reef,
- Minimal fishing practices will be permitted in the recreational zone,
- Spear gun fishing is only permitted in the open fishing zone,
- Fish pots may only be used in the open Fishing zone,
- Fishing nets and fish gear used in the open fishing zone must comply with the regulated national standards set by the FDD,
- The use of trammel nets is not permitted in the marine park.

Additionally, the livelihoods assessment report by Espeut, 2006 proposes the following alternatives that may be feasible for the area:

- Construction of a vending facility within Cabrits.
- Tour guide training for the attractions in Cabrits and surrounding areas.
- Development of a craft centre for training and production.
- Training in the production of high quality (sustainable) art and craft.
- Establish glass bottom boats for tours.

If these measures are implemented the impact of the establishment of the MC/CNP on the livelihood of the fishermen can be classified as:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| LOCALISED | MEDIUM | IRREVERSIBLE | MODERATE |

### 8.4.3 Divers

There is one dive shop within the Cabrits area which caters to divers wishing to dive within the park (see Section 5.2.3). At present it seems that diving within the park is under-developed. Six divers were interviewed during the survey, one associated with the dive shop (a commercial diver) and 5 others who were visitors to the country and to the CNP (see Section 5.3.2.3.1). It is expected that with the establishment of the MC/CNP that there would be more opportunity for expansion of diving in the CNP (see Section 7.4.1).

During the interviews all the divers were in favour of the establishment of the MPA. The only concerns expressed were whether there would be any restrictions on recreational diving.

Notwithstanding the benefit that the proposed MPA would have on diving, the following rules are expected to be implemented to regulate divers:

- Snorkelling and Scuba diving are prohibited in the Park without a special permit issued by the Director of Parks. Snorkellers and Scuba Divers will only be allowed to enter the Park at areas designated by the Park Management- (This will provide for control points and collection of fees).
- User fees will be charged to all persons who operate or engage in scuba diving, snorkelling or any authorized aquatic activity in the reserve.

- The operation of snorkelling or scuba diving tourism in the Marine Park is restricted to local certified dive operators, members of the DWA or others permitted by the Director of Parks or designee.
- Fishermen of the surrounding communities are exempt from the snorkelling regulations inside the open fishing zone.
- Scuba diving activities in the Park are subject to all diving regulations applicable in Dominica.

### 8.4.4 Yachters / Tourists

There are two types of tourists that visit the park, yachters and cruise ship passengers. Although there is some uncertainty as to whether the existing cruise ship berth as well as the proposed expansion of the dock will be excluded from the park, the establishment of the MC/CNP and its subsequent management is expected to be beneficial to the cruise ship industry as it is expected to attract more visitors.

The anchorage at Portsmouth is considered the only safe haven for yachts and other such vessels along the coastline of Dominica. During peak season, some yachts are observed anchoring within the park and thereby causing damage to the reefs. Discussions with one coastal business that provides some services to the yachts revealed some dissatisfaction with the proposal to establish the MPA. In fact the view was expressed that if the MPA is established and there are restrictions then he will close down his business and that will leave a number of his local workers out of work. Although this reflects the view of only one person / business, the view expressed bears consideration. If no measures are put in place, the impacts of the establishment of the MPA on the yachters / tourists would be:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| LOCALISED | MINOR | REVERSIBLE | LOW |

The following measures from the draft Management Plan are recommended to mitigate against this impact:

- Provision of a marina for mooring of yachts.
- An inventory to assess the status of the existing mooring buoys and to identify areas requiring mooring buoys.
- Using GIS methods, a database of the mooring programme will be developed for ongoing monitoring.

- Install the moorings based on inventory. Moorings may be used to identify zones-restoration, diving and fishing in the park using a colour code system.
- Establish an effective maintenance programme to support the mooring buoys.
- Mooring fees shall be charged to all users of the mooring structures in the Park and shall be paid to the National park authority.
- All crafts executing scuba diving and snorkelling operations shall fly the internationally recognized flags and surface markers to indicate the said operations.
- All craft operating in the marine park must adhere to boating standards set by the Dominica Water sports Association
- Developing inter-agency cooperation and agreement with the Port, customs and Dominica coast guard and the FDD.
- Implementing public awareness and education programmes to all stakeholders.

Once these measures are implemented the impact of the establishment of the MPA on the yachters / visitors can be classified as:

| EXTENT | INTENSITY | NATURE | CLASSIFICATION |
|---|---|---|---|
| LOCALISED | VERY SMALL | REVERSIBLE | LOW |

### 8.4.5 Residents

The communities that surround the CNP are all, with the exception of Portsmouth, small rural villages. The communities were all very close knit and in some cases everyone in the communities were related in some way to everyone else. While the indications are (from the interviews, see Section 5.3.2.5) that the residents did not frequent the reefs as much as other stakeholders, they were knowledgeable about the area because of the fact that the source of income for many households was fishing and at least one member of each family fished or worked on a fishing vessel. The majority of residents agreed that the establishment of the MC of the CNP would reap positive rewards including increase in employment, increase in tourism and sustainability of the reef. They felt that some of the negative changes they have seen over the past few years such as decrease in water quality and clarity and prevalence of smaller fishes would improve. The establishment of the MC of the CNP as an MPA is expected to have a beneficial impact on the residents.

## 8.5 Summary of Impact Classification

Table 36 below provides a summary of the classification of potential adverse environment impacts.

**TABLE 36: SUMMARY OF CLASSIFICATION**

Note: * denotes a difference in intensity

| CLASSIFICATION OF POTENTIAL ADVERSE IMPACTS | | | | | |
|---|---|---|---|---|---|
| **ENVIRONMENTAL COMPONENT / STAKEHOLDER** | **WITH MITIGATION** | | | | **WITHOUT MITIGATION** |
| | **EXTENT** | **INTENSITY** | **NATURE** | **CLASSIF-ICATION** | **CLASSIF-ICATION** |
| Climate | localised | minor | reversible | LOW | MODERATE |
| Upland development | localised | minor | reversible | LOW | MODERATE |
| Water quality | localised | very small | reversible | LOW | MODERATE |
| Coral reefs | on-site | very small | reversible | LOW | MODERATE |
| Sea grass beds | on-site | very small | reversible | LOW* | LOW |
| Fisheries | on-site | very small | reversible | LOW* | LOW |
| Mangrove | on-site | very small | reversible | LOW | MODERATE |
| Beaches | on-site | very small | reversible | LOW* | LOW |
| Fishermen | localised | medium | irreversible | MODERATE | HIGH |
| Yachters / Tourists | localised | very small | reversible | LOW* | LOW |

# 9 RECOMMENDATIONS AND COMMENTS

This chapter proposes recommendations based on the SWOT Analysis conducted and documented in Chapter 7 as well as the discussion of impacts in Chapter 8. These recommendations are discussed under the following headings:

- Coordination / Collaboration between Agencies;
- Wetland Policy;
- Control of Future Development;
- Marketing of the CNP;
- Management Regulations;
- M & E Tool;
- Disposal of wastes from Yachts and Cruise ships;
- Training;
- Monitoring of Natural Assets; and
- Livelihood Assessment.

The final section in this chapter is the application of a matrix adapted from the Canadian Environmental Assessment Act.

## 9.1 Coordination / Collaboration Between Agencies

The Cabrits National Park including the marine component of the park was legally established under the National Parks and Protected Areas Act, 1975. At present the park is administered by the Forestry, Wildlife and National Parks Division of the Ministry of Agriculture. There are however, several other agencies which also have some jurisdiction in the management of the park:

- The Fisheries Division which falls under the same Ministry of Agriculture has jurisdiction over all marine faunal species.
- In addition, marine reserves can be designated under the Fisheries Act.
- The Fisheries Division has therefore been informally 'in charge' of the marine component of the CNP.
- The Dominica Ports Authority also has some jurisdiction in that the Cruise Ship Terminal at Cabrits was constructed within the park boundaries. This berth is managed by the Port Authority.
- Additionally, the Tourism Ministry in their draft Tourism Master Plan (December 2006) has proposed a number of initiatives aimed at developing the tourism product offered in the Cabrits area.

What this means for the management of the marine component of the Cabrits National Park is the potential for significant conflict with respect to activities and future development. It is therefore recommended that the jurisdictions of these various agencies be clearly defined. This would be in conjunction with the proposal in the draft Management Plan for the formation of an LMA (Local Management Authority). However, before such an authority can function, the roles of the Governmental stakeholders must be clearly established.

## 9.2 Wetland Policy

The draft Management Plan describes the Cabrits wetlands as one of the most significant and important in the island of Dominica. Although, the island is not a signatory to the Convention on Wetlands of International Importance especially as wildfowl habitat, there is provision for the conservation of wetlands in the Protected Areas Policy and the Biodiversity Strategy and Action Plan.

The Protected Areas Policy of 1979 has as some of its objectives the following which pertain to the conservation of wetlands:

- Maintain sample ecosystems in a natural state;
- Maintain ecological diversity; and
- Retain scenic beauty and green areas.

Additionally, the Biodiversity Strategy and Action Plan states the need to:

- Identify and protect sensitive / fragile / threatened ecosystems;
- Identify and protect buffer areas required to protect and conserve threatened flora / fauna and ecosystems; and
- Identify and protect sensitive / fragile / threatened coastal and marine ecosystems and establish coastal and marine protected areas.

It is clear that the wetlands of Cabrits are sensitive, as noted in Section 4.3.6.3; they are also home to a wide range of fauna. The wetlands are presently under threat from illegal harvesting, camping, dumping and grazing (see Sections 7.5.5, 7.5.8, 7.5.9, and 7.5.10). The proposals described in the draft Tourism Master Plan (see Section 8.2.2) will result in significant alteration of this system and therefore the survival of the ecosystem is threatened.

It is therefore recommended that a wetlands policy be formulated and adopted to conserve all the wetlands of Dominica including the Cabrits wetlands. Once this policy is formulated, any development which takes place within the Cabrits Peninsula must be in accordance with this policy.

## 9.3 Control of Future Development

As discussed in Section 8.2.2, there are plans by various stakeholders to develop the Cabrits Peninsula. The following proposals were highlighted:

- The construction of a yachting marina (draft Tourism Master Plan),
- The construction of a wharf at Toucarie Bay for fishermen,
- The construction of a number of boutiques / hotels (draft Tourism Master Plan),
- The construction of a boat park,
- The construction of public beach facilities (draft Tourism Master Plan),
- The expansion of the existing Cruise Terminal (Ports Authority),
- The International Maritime Training and Development Institute of the Caribbean,
- Regional Office of the Dominica Maritime Registry, Inc.
- The Offices of the Dominica Maritime Administration, and
- The Lesser Antilles Oil Spill Response & Dominica Search and Rescue.

Under Schedule II of the Physical Planning Act, 2002 certain types of development may require an EIA before approval can be granted. However, as stated in the Review of Policy Areas Management Framework in Dominica, the EIA process treats protected areas the same as other areas, in that, the process uses the same standards. It is therefore recommended that the standards used to apply to development within the Cabrits National Park should be those applicable to protected areas. In addition, some codes of practice should be developed for those proposals that may not be considered as development under the Physical Planning Act.

As discussed in Section 8.2.2, there needs to be strict adherence to the requirement for an EIA for certain types of development within the Cabrits National Park. Any EIA that is submitted for development within the Cabrits National park should be reviewed by the Park management to ensure that there is adequate provision of mitigation measures to eliminate or reduce any negative impacts anticipated. Within the Zone of Influence (see Section 8.2.1) from Pointe Ronde to Capuchin, there is also the need to include the Park management in the review of any EIA submitted for development. As noted in

Section 8.2.1, developments that take place outside of the national park still have the potential to negatively impact the marine environment. An example of this was the construction of the Guillette - Pennville road which resulted in severe sedimentation within Prince Rupert Bay.

A key component of any EIA for development must be a comprehensive monitoring plan for monitoring of impacts during all phases of the project. This monitoring should be in liaison with the relevant Government agencies and the Park Management.

Another component of the proposal for development within the Cabrits area is the enforcement of the Beach Control Ordinance which stipulates a setback of 50 yards for construction along the beach. At present, this stipulation is clearly not enforced. If more intense construction is anticipated and proposed for the Cabrits area, this needs to be enforced. Again, this should be covered under the environmental impact assessment submitted for the proposed development.

## 9.4 Marketing of the CNP

Espeut details that at present, the CNP is not financially sustainable. This is felt to be an issue of marketing as well as the product being offered. In fact, tourists have expressed the opinion that there is nothing to do when the cruise ship docks at Cabrits. The draft Tourism Master Plan 2006 also emphasizes this lack of sustainability of the tourism product. One of the key recommendations is therefore marketing of the CNP. This has implications both for the sustainability of the park as well as the associated livelihoods. This should be undertaken as a priority item. Both the terrestrial and the marine sides of the CNP should be marketed together, highlighting the various attractions that are available. However, marketing should only occur when there is a consensus on what should be marketed based on visitor surveys, carrying capacity studies, etc.

## 9.5 Management Regulations

### 9.5.1 Rotation of Fishing Zones

One of the recommendations that came out of the discussions with fishermen is the need to provide for rotation of the fishing zones proposed. They recognise that the fish populations within the MC/CNP may be stressed due to fishing pressure and that some measures must be put in place to reduce this. However, their livelihoods are intimately

connected to any restrictions imposed on fishers. Therefore, they proposed a system whereby certain areas are kept for conservation and that no fishing be allowed in this area. After a period of time (to be determined through consultation and the results of monitoring of the fisheries) the no-fishing ban will be lifted and fishing will be allowed in these areas. This recommendation should allow for both goals to be accomplished. Allowing the fish stocks to recover and limiting the impact on the livelihood of the fishermen.

### 9.5.2 Buffer Zone for Cruise Ship Terminal

The cruise ship terminal lies within the boundaries of the Cabrits National Park. The issue of the jurisdiction of the Port Authority within the Cabrits National Park was discussed in Section 9.1. However, the terminal is also within the nursery "no-take" zone as proposed in the draft Management Plan. Additionally, there is an area of pristine coral growth (identified during the 2007 survey by Ecoengineering) just west of the terminal. These factors may result in a deterioration of the marine environment as well as a failure of the stated goal of the nursery zone:

> **…"to protect the natural spawning and nursery areas and provide an undisturbed habitat / residence area for genetic protected and replenishment of marine species – especially reef fish and seagrass beds…."**

It is therefore recommended that a buffer zone be established within the nursery "no-take" zone which will allow the continued use of the cruise ship terminal but will also allow the fulfilment of the purpose of the nursery zone. This buffer zone will, of necessity, reduce the size of the nursery zone.

### 9.5.3 Safety

At present the numbers of users within the marine component of the Cabrits National park is relatively small and consists of:

- Fishermen,
- Yachts
- Water taxis,
- Cruise ships,
- Divers / snorkellers,
- Swimmers.

There are plans to provide additional services for yachts, fishermen and cruise ships within the marine component of the Cabrits National Park. This will result in an increase in the number of users in a relatively small area. This increase in users has the potential to increase safety concerns. It is therefore recommended that a safety management plan be drawn up to address the issues associated with increases in water borne traffic. This plan must address, boating traffic as well as in-water uses such as divers, snorkellers and swimmers. This is especially important given that the zone plan proposed in the draft Management Plan does not differentiate between different uses within the fishing priority / recreation zone. Additionally, it is also recommended that the fishing priority and recreation zone be further differentiated to indicate varied uses within this zone.

### 9.5.4 Physical Demarcation of the Cruise Ship Approach Channel

The concerns raised with respect to the presence of the cruise ship terminal within the Cabrits National park were raised in Sections 7.3.4 and 8.3.1. Another issue which must be raised is the lack of demarcation of the approach to the cruise ship terminal. In conjunction with the safety management plan should be physical demarcation of proposed zones as well as the approach to the cruise ship terminal. It is our understanding that there is a 50 yard (45 m) setback which must be observed by other vessels from the cruise ships when they are at berth. It is recommended that this be expanded to include a comprehensive listing of procedures for the operation of the cruise ship terminal. This should be prepared with the other stakeholders in mind and should be drafted in consultation with these stakeholders.

### 9.5.5 Regulations on Fishing Techniques

The Fisheries Act 1987 provides for the Minister to make regulations for the management and development of fisheries in the fishery water. Given that the marine component of the Cabrits National Park is an important fishing ground for the many fishermen that live within the area, it may be important for regulations (under the existing Fisheries Act) to be drafted to properly define fishing within the park. The designation of the fishing priority / recreation zone must be accompanied by regulations on the types of gear that will be allowed as well as specifications for the gear. These regulations must be drafted in close consultation with the fishermen. When these regulations are implemented, incentives must be offered to the fishermen to ensure that they make the necessary changes to their fishing gear.

## 9.6 M & E Scorecard

Ecoengineering anticipates that the new information gathered as part of this assignment will considerably assist MC/CNP staff and key stakeholders in applying the M & E Scorecard described in Section 6.7. This section identifies questions in the Scorecard to which the information in this report is particularly applicable, and comments on on-going data-collection to continually update this information. Throughout this section, reference to the ESDU Scorecard refers to a scorecard evaluation undertaken by ESDU prior to this assignment). That scorecard is included in Appendix E.

### 9.6.1 Context

The following questions appear under the Section of the Scorecard headed:

"Context: Where are we now? Assessment of Important Threats and the Environmental Policy."

#### 9.6.1.1 Unsustainable Human Activities

Question 2 asks whether there are unsustainable human activities (eg poaching) are controlled within MC/CNP. The ESDU Scorecard indicates that "Mechanisms for controlling unsustainable human activities in the protected area exist but there are many problems in effectively implementing them".

Examples of unsustainable human activities include:

- Spear Fishing, reported to be predominantly done by residents of the other side of the island (see Section 7.5.4).
- Illegal Dumping in Wetlands, which has resulted in die-back of two small stands of white mangrove (see Section 7.5.5).
- Anchoring of Yachts (as opposed to the use of fixed moorings), which has caused physical and ecological damage to reefs and seagrass beds (see Section 7.5.7).
- Illegal Grazing in Wetlands, even though this activity is illegal in the National Park (see Section 7.5.8).

- Illegal Harvesting of Citronella Grass and of Crabs (see Section 7.5.9).

- Illegal Camping, including clearing to create the camp site (see Section 7.5.10).

Changes in the occurrence of such activities will have to be tracked over time to allow future updates of the scorecard.

#### 9.6.1.2 Law Enforcement

Question 3 asks whether rules are effectively enforced, and the ESDU Scorecard indicates that "there are major deficiencies in capacity / resources and activities to enforce protected area legislation and regulations". In the case of CNP, where there is a cruise ship terminal within the park and significant residential land use in close proximity (see Sections 5.1.1 and 5.2.2), this concern should be extended to planning regulations as well. It has already been noted that waste water, sediment and solid waste from these neighbouring sources is adversely affecting the park (see Sections 7.5.2 and 7.5.3), which may reflect a lack of effectiveness in enforcing regulations. As before, changes in these activities will have to be tracked over time to allow future updates of the scorecard.

#### 9.6.1.3 Boundary Demarcation

Question 4 asks whether boundaries of the PA are known and demarcated. The ESDU Scorecard indicates that "the boundary of the protected area is known by the management authority but not by other stakeholders". The results of this study suggest that the problem is not only one of not knowing the boundaries but also one of disagreeing with the boundaries. Indeed, this study revealed an objection to the present boundaries of the PA by some key stakeholders (see Section 7.3.3):

- The Port Authority wishes to exclude the Cruise Ship Terminal (as presently configured and as will be expanded in future) from the PA.

- Fishermen object to the fact that their preferred fishing grounds are within the boundaries of the PA. They wish to have the boundaries re-drawn to exclude these areas.

- If the PA boundaries are not to be re-drawn, then fishermen would like to have fishing permitted within the PA.

- If fishing is to be excluded, fishermen want this to be enforced only for a limited period of time, after which the ban would be lifted.

#### 9.6.1.4 Resource Inventory

Question 6 asks whether there is enough information to manage the protected area. The ESDU Scorecard indicates that "Information on the biophysical, socio-cultural and economic conditions associated with the protected area is sufficient for key areas of planning / decision making but the necessary survey / M&E work is not being maintained". Ecoengineering considers this evaluation to be somewhat optimistic, based on our review of pre-existing data. Notwithstanding, the information gathered on this assignment has strengthened the data-base somewhat; so that the evaluation is probably now accurate. It cannot be over-emphasized, however, that continual updating of the data-base is essential both to keep current the description of conditions within MC/CNP and also to track changes with a view to addressing and rectifying adverse changes.

#### 9.6.1.5 Stakeholder Awareness and Concern

Question 7 asks whether stakeholders are aware and concerned about resource conditions and concerns. The ESDU Scorecard indicates that "Approximately 25% to 50% of stakeholders are aware or concerned about the resource conditions and threats". This evaluation was not supported by the findings of this study. Among all primary stakeholder groups, there was majority support and concern for the PA (see Chapter 5):

- Almost half those interviewed felt that the quality of the reef had deteriorated due to hurricanes and road construction on the shoreline.

- Three-quarters of those interviewed felt that coral was important in protecting land from storm waves.

- Two-thirds of those interviewed agreed that fishing should be restricted in certain areas to allow fish and coral to grow.

Even though the results of this study indicate a commendable level of awareness and concern, one challenge would be to maintain it over time. Another challenge relates to sectoral interests. For example, there was generally a high level of support for restriction of fishing, but fishermen felt that their preferred fishing areas should be excluded from the PA, that fishing should not be restricted within the PA, and that any restrictions should only apply for a limited time. Such sectoral differences must be carefully managed to maintain the present uniformly high levels concern about preserving MC/CNP.

### 9.6.2 Management Plan

The second Section of the Scorecard is headed:

"Planning: Where do we want to be? Assessment of Protected Area design and planning."

In this section, Question 9 asks whether a management plan exists and is being implemented. The ESDU Scorecard indicates that "a management plan is being prepared or has been prepared but is not being implemented". Clearly, this has moved to the stage where a management plan has been prepared, but it is too early to comment on implementation.

### 9.6.3 Survey and Research

The third Section of the Scorecard is headed:

"Input: What do we need? Assessment of resources needed to carry out management."

In this section, Question 10 asks whether there is a program of management-oriented survey and research work. This is an extremely opposite question in the context of protected areas, where the attraction is nature itself. The ESDU Scorecard indicates that "there is some ad hoc survey and research work". Ecoengineering expects that the new information gathered on this assignment, and the methods used in that data-gathering, will form the basis for a more structured program of on-going data collection within CNP (see Section 9.9).

### 9.6.4 Context

A series of questions pertaining to Education, Communication, Staffing and Equipment appear under the Section of the Scorecard headed:

"Process: How do we go about management? Assessment of the way in which management is to be conducted."

Ecoengineering's recommendations on Staff Training is found in Section 9.8.

## 9.7 Disposal of Wastes from Yachts, Cruise Ships and Charter Boats

Waste from Yachts and Cruise Ships consists of solid waste and toilet waste. The recommended approach to each of these types of waste is presented in the following sub-sections.

### 9.7.1 Solid Waste

Recommendations for the management of solid waste differ for the cruise ships and the yachts. Because the cruise ships are at present able to dock directly into the CNP, some provision for solid waste collection and disposal should be made at the port. In terms of solid waste from yachts, a similar concept should be followed in that there should be some central area provided where the yachts can dispose of their wastes. The proposal for the marina should ensure that there is a central location for the disposal of solid wastes from the yachts. However, once it is centrally collected, arrangements must then be made for disposal to a landfill site. This is especially important since dumping of garbage within the park is already a concern (see Section 7.5.5 and 8.3.5.

The regulations must also include a system of fines for violations, as will be described in Section 9.7.3, below.

### 9.7.2 Toilet Waste

The recommendation regarding toilet waste and other waste water (bilges) from both cruise ships and yachts is the same: enforcement of a "zero tolerance" policy for dumping within the MC/CNP. In this approach, all vessels must keep this waste water in their holding tanks until they leave the Park. Again, the park regulations must include a system of fines for violations (see Section 9.7.3).

### 9.7.3 Fines for Violations

Even with a very effective public education program, provision must also be made for the (hopefully few) irresponsible visitors who will violate the rules by discharging waste water or dumping garbage within the MC/CNP. The following are recommended in setting the fines:

- The system must clearly define the "responsible party" when a violation occurs. It may be prudent to define the "responsible party" as the Master and/or the Owner of the vessel. The "and/or" definition allows the management board of the MC/CNP to levy against either party should the other party prove to be a "man of straw" in the legal sense of that term.

- Court prosecution should not be necessary before fines are levied. However, a clear appeal process must be established for persons who feel that fines are imposed unfairly or without justification.

- Fines should be large enough to act as a deterrent.

- The system of fines should be progressive. Repeat offenders should be fined higher amounts than first-time offenders. This will require the creation and maintenance of a data-base of offenders who have been fined.

- The fines should also be linked to a provision where multiple repeat offenders can be banned from entering the MC/CNP.

- In the case of flagrant violations (such as the discharge of oily waste), the regulations should allow the MC/CNP to recover the cost of actual damage to environment assets or the cost of remediation (clean-up measures), in addition to the fine.

- Also in the case of flagrant violations, the regulations should allow the management board of the MC/CNP to approach the courts to hold ("arrest") a vessel against the cost of environmental damage or of environmental remediation.

## 9.8 Training

Critical to the management of the park is the need for extensive training of park staff. The Management Plan proposes the following staff members for running of the MC/CNP:

- A Manager/Park Superintendent
- A Research Officer and Enforcement Officer
- An Education and Public Awareness Officer
- A Maintenance Officer
- 2 wardens
- Administrative Officer
- Finance/Accounts/ Officer
- Cleaner
- Boat Captain
- Life guard

Training opportunities should be focussed on the following key areas:

- Administrative Training, and
- Biological Assessment.

### 9.8.1 Administrative Training

In order for the wardens to effectively function, the following training needs to be conducted on a continuous basis:

- First Aid / CPR,
- Lifeguard,
- Certified Diving,
- Boat Maintenance and Repair
- Seamanship,
- Boat Handling/Navigation, and
- Enforcement Skills.

### 9.8.2 Biological Assessment

A comprehensive monitoring programme to assess the status of the biological resources within the MC/CNP is critical. To properly assess these resources management personnel such as the wardens and additional officers need to be trained in biological monitoring.

### 9.8.3 Training Needs Assessment

A Protected Areas Training Needs Assessment study (Parsram, 2007) was conducted for this project and the training recommendations made by the consultant should be implemented.

Training for national agencies should include:

- Organizational Management and Leadership
- Assessing management effectiveness
- Communications
- Project management
- Protected areas financing
- Fundraising and resource mobilization
- Partnerships and Networking
- Natural resources monitoring and assessments
- Socioeconomic monitoring and assessments
- Co-management
- Site operations and Management
- Community Outreach and management
- Protected area planning methods and management plan development
- Protected areas policy analysis, development and implementation
- Tourism and sustainable livelihoods management

Site Management should be trained in the areas of:

- Organizational Management and Leadership
- Communications
- Project Management
- Protected areas financing
- Fundraising and resource mobilization
- Partnerships and Networking

- Natural resources monitoring and assessments
- Co-management
- Conflict resolution
- Ecosystems/conservation management
- Site operations and Management
- Protected area planning methods and management plan development
- Enforcement
- Tourism and sustainable livelihoods management
- Education awareness and outreach
- Project Monitoring and Evaluation
- Statistical analysis and data handling
- Socio-economic monitoring and assessments
- Community Outreach and management
- Protected areas policy analysis, development and implementation
- Assessing management effectiveness
- Understanding small medium enterprise development and management

MC/CNP Sustainable Livelihoods Stakeholders should be trained as appropriate in:

- Knowledge of ecosystems and environmental management
- Business Management
- Education and awareness
- Tour guiding
- Communications
- Customer relations
- Marketing
- Survival skills
- First aid
- Health and safety
- Mooring Buoys installation and maintenance
- Boat and Vehicle maintenance
- Accounting/book keeping
- Craft production
- Seamoss production
- Fish preservation and preparation
- Culinary arts
- Marketing and sales
- Interpersonal skills
- Customer relations
- Maritime Navigation
- Boat building and maintenance
- Fishing gear construction

- Mariculture
- Certification and standards
- Report writing
- Information technology (websites etc)

Based upon the aforementioned training needs, training for site and national management agencies and associated livelihoods stakeholders in Dominica can be provided through a regional training of trainer's course that provides comprehensive training in all aspects of protected areas planning and management. This training course can be designed and developed by national/regional consultants and/or training institutions with the relevant expertise and experience. The training developed should take the approach of experiential learning (learning by doing). Key representatives from national, site and associated livelihoods stakeholders can be selected for this training, and after receiving training they should be supported to deliver training within their respective constituencies.

Specific relevant national and site training needs such as small business management, customer service and relations and tour guide training which may not be addressed by the regional training of trainers' course can be approached by building the capacity of and/or partner with relevant national and local level vocational training institutions or projects to design, develop and deliver specific training in which they are capable or have expertise. Additionally, national and regional consultants and training institutions with relevant skills and experience can assist national vocational training institutions to develop their capacity where it does not exist to provide protected areas related training in Dominica.

## 9.9 Monitoring of Natural Assets

The Management Plan discusses the need for continuous monitoring of the biological resources within the MC/CNP (see Section 6.5). Monitoring of the following are considered critical for the success of the MC/CNP:

- Water Quality
- Wetlands,
- Seagrass Beds,
- Coral Reefs
- Marine Turtles,
- Fisheries, and
- Beaches.

The monitoring plans developed for the MC/CNP should take into consideration the existing regional efforts of broader initiatives such as the Wide Cast Project.

### 9.9.1 Water Quality

As a means of measuring change in the water quality over time, continuous monitoring should be conducted throughout the MC/CNP and within the rivers that discharge into the marine environment. As noted in Section 8.2.3, the Environment Health Division has proposed a system of water quality monitoring which includes locations within Prince Rupert Bay. It is recommended that this programme be expanded to include locations in Douglas and Toucarie Bay. Additionally, the monitoring programme proposed by Environment Health concentrates on bathing water quality parameters. This should be expanded to include environmental parameters such as pH, temperature, salinity, turbidity, conductivity, total and faecal coliforms, BOD, COD, nitrates and phosphates. This information should be collected in the dry season as well as in the wet season to account for the changes that occur. As a first instance monitoring of water quality within the MC/CNP should be on a quarterly basis. After the first year of monitoring, a report should be generated to determine the changes in the water quality over time. It is at this time that the frequency of monitoring and the monitoring parameters should be re-assessed before any changes are made.

Finally, there should also be continuous monitoring of the effluents from hotels / restaurants that discharge into the MC/CNP. This should be in accordance with the assessment discussed in Section 9.11.3.1.

### 9.9.2 Wetlands

The importance of wetlands (including mangroves) as a filter for regulating biological exchanges between land and marine systems is well known and documenting. Additionally, they are an important source of nutrients to the marine community; they also stabilize the shoreline, trap pollutants, and provide shelter for juvenile fish and some invertebrates. The wetlands have been acknowledged in the draft Management Plan as one of the most important wetland systems in Dominica. Despite their importance, there is no formal continuous monitoring of the state of the ecosystem. This monitoring is also considered critical because of the past disturbances of this system and the present illegal activity such as grazing, camping, dumping and harvesting. It is also of note that the proposals for the Cabrits peninsula as described in Section 8.2.2 will result in significant alteration of this system.

As noted in Section 9.2, a Wetlands Policy is being proposed to allow for conservation of this very important resource. It is therefore recommended that any proposals for the Cabrits peninsula must only be subject to rigorous assessment to ensure that there is minimal disturbance to the wetlands.

### 9.9.3 Seagrass Beds

Seagrass beds are found in Douglas Bay within the MC/CNP. These areas help to stabilize loose sand thereby retarding coastal erosion and also function to trap sediment from water entering coral reefs. They help sustain the local fisheries, by providing habitats for juveniles of commercially important fish and sea turtles, such as the hawksbill turtle (*Eretmochelys imbricata*) and Green Turtles (*Chelonia mydas*). This community has experienced disturbance in the past due to anchoring of yachts as well as sedimentation from past coastal construction projects. Additionally, solid waste and other debris from the beaches have been observed to accumulate within the seagrass beds in Douglas Bay (see Section 8.3.2).

At present, only some of the seagrass beds within Douglas Bay have been included in the nursery “no-take” zone proposed for the MC/CNP. It is recommended that all of the seagrasses should be included within this zone, and monitored in conjunction with the mangroves. Where sea grass beds exist outside this zone (such as in Prince Rupert Bay), it is recommended that moorings should be installed to prevent anchoring on the seagrass beds. Also an education programme should be established to explain to visitors the negative impacts of damaging the seagrass beds.

### 9.9.4 Coral Reefs

The coral reefs within the MC/CNP are some of the most pristine within the Caribbean. However, these reefs are exposed to the damaging effects of hurricanes and have been degraded by algal overgrowth and siltation from coastal construction.

The coral reefs are one of the most important environmental assets within the MC/CNP and important to the tourism industry. Areas of high biological diversity and pristine reefs such as exist around the Cabrits are already included in the nursery “no-take” zone as proposed in the draft Management Plan.

Suitable training (Reef Check, AGRRA) should be given to park wardens to monitoring abundance of key reef species. This should coincide with the monitoring undertaken at Cabrits as part of Reef Check in 2003. The information from monitoring provides a quantitative view on overall reef health and condition, with an emphasis on visible effects of human impact. This may also involve the recruitment of local fishermen or other capable divers.

### 9.9.5 Marine Turtles

Green Turtles (*Chelonia mydas*) and hawksbill turtles (*Eretmochelys imbricata*) feed in the nearshore waters of the MC/CNP as well as nest on beaches within the Cabrits National Park. No information on the numbers that nest on the beaches was available for this study since no monitoring of turtles is conducted. Additionally, while there is consensus by many of the stakeholders that the numbers of turtles nesting in the area has decreased due to loss of the beaches from hurricane activity, no definitive numbers are available.

The beaches that support nesting turtles are proposed as a turtle preservation zone by the draft Management Plan. The inclusion of such sensitive areas as a turtle preservation zone would engender further scientific research into the health of the turtles and the sea grass beds. Tagging exercises could also be undertaken to monitor the migration patterns of the turtles and population dynamics.

The monitoring of turtles is an excellent way to involve the community. This approach has been successfully used in Trinidad and Tobago and Barbados. The use of the community volunteers will have a two-fold effect. The community will be able to learn about the biology of these animals and the importance of ensuring that the beaches and seagrasses are not degraded, as well as fostering a feeling of goodwill and involvement within the community.

### 9.9.6 Fisheries

The fisheries of the MC/CNP are generally associated with the numerous reefs. The importance of maintaining this resource is indicated by the large number of fishermen whose livelihoods are inextricably linked to the success of the MC/CNP. Both the draft Management plan and some of the fishermen have indicated that the fisheries within the MC/CNP are on the decline due to overfishing and some level of habitat degradation. It

is therefore recommended that the fisheries be monitored to determine the status of the fish populations, especially those commercial species favoured by fishermen. One proposal for the MC/CNP is for rotation of the fishing zones within the CNP to allow some areas to replenish themselves. This can only be achieved through monitoring of the resources and consultation with the fishermen (see Section 9.5.1).

### 9.9.7 Beaches

There are three popular bathing beaches within the study area, one within the CNP and two others to the south (see Figure 10). These beaches have been impacted by the passage of tropical storms and hurricanes in the past. As noted in section 5.3.2.5.2, sometimes the only interaction that the residents have with the MC/CNP is use of the beaches. The beaches are also important nesting sites for the two main endangered marine turtles that nest in Dominica: the hawksbill and the green turtle. It is therefore recommended that these beaches be monitored to determine changes in profile area and width. This is one activity where the community can become involved. At other sites across the region, beach profile monitoring has actually been conducted by high school children. This would be an excellent means of including the community as well as an opportunity for educating the next generation about the importance of the environmental resources in the study area.

## 9.10 New Sustainable Livelihoods:

Espeut 2006 has established that:

- The parish of St. John (in which Cabrits falls) had the highest mean annual population growth rate over the last ten years.

- The unemployment rate in the Cabrits area is relatively low (9.0%) in comparison with the rest of Dominica (11.0%); the standard of living is low; and 9% of all of Dominica's poor households are in St. John.

- There are few options to fishing available in the Portsmouth area.

Based on his observations Espeut, 2006 has made the following conclusions regarding improving the livelihoods in the Cabrits/Portsmouth area:

- If the current trend in population growth continues there will be an increase in the number of persons needing livelihoods in the Cabrits area over time.

- Employment and standard of living levels can be increased and poverty lowered in the surrounding communities by taking advantage of the large number of tourists (an estimated 13000 annually) that arrive at the cruise ship terminal at Portmouth.

- Diversification into new economic sectors is required to employ the large numbers of young persons born into the fishing communities around Cabrits each year.

Espeut has made a number of suggestions regarding increased livelihoods opportunities:

### 9.10.1 Art and craft

It is expected that there will be an increase in the demand for art and craft items by visitors who arrive through Portsmouth. Opportunities therefore exist for expanding the art and craft industry in the north of the island. Persons may take advantage of the following employment opportunities:

- Research. This is needed to investigate the use of locally available natural materials on a sustainable basis.

- Growth/Production. Once suitable art and craft materials are identified, these may have to planted, harvested and processed.

- Manufacture and Sale of items. The raw material will have to manufactured and packaged into the final product which is offered for sale. The possibility exists for the development of a craft center at Portsmouth which in itself can be a touris attraction.

Some tour boat operators have indicated that they have skills in making of craft (see Section 5.3.2.1.1). These skills can be utilized. In addition persons lacking the necessary skills will have to be given training in the various areas discussed above and including courses in operating a small business.

### 9.10.2 Tour guiding

Espeut has observed that there are no tour guides employed or certified by the park authorities. Tours of the marine features of the CNP are currently provided by the tour boat operators/water taxis who are both familiar and knowledgeable about the CNP. There are no guided tours of the terrestrial features at present and cruise ship tour operators must provide their own or the tourists hire locals to provide them with this service. It is estimated that some 13000 tourists arrive at Portsmouth annually and it is expected that with increase in the marketing of the CNP this number will increase.

There are opportunities therefore for interested persons from the surrounding communities to be trained for conducting tours of the marine and terrestrial natural features of the Park. Espeut also suggests the development of heritage tours incorporating local activities such boat building and other cultural activities. Training for tour guides should focus on first aid, CPR, flora and fauna species identification, local area history, inter-personal skills, customer relations, etc).

### 9.10.3 Glass-bottom boat tours

One of the characteristics of the CNP is the clarity of the waters (see Section 7.4.6). This can be made use of by entrepreneurs to provide boat tours on glass bottom boats. This would facilitate persons who may not dive or snorkel but may wish to experience the CNP undersea world.

### 9.10.4 Game-fishing

Game fishing is another product that can be developed and marketed for the Park. This activity can be developed as elsewhere in the Caribbean where annual competitions are held. Such an activity will have to be regulated by the Park management.

### 9.10.5 Diving/Snorkelling

There are currently only two dive shops in the Portsmouth area and an estimated 600 divers visiting the Park annually (See Section 5.3.2.3.1). These existing livelihoods can be strengthened by installing mooring buoys in and implementing briefing programmes for snorkellers and divers using the Park.

There are livelihood opportunities for other similar services to become established given the popularity of the Park, the variety of dives and dive sites available and the marketing plans to attract an increased number of visitors to the site. There are similar opportunities for snorkeling. Such business activities will have to be developed based on the demand for such services by visitors (local and foreign, see Section 9.4) as well as on the carrying capacity of the CNP for various uses (see Section 9.11.2).

### 9.10.6 Horseback riding

Espeut suggests promoting the use of horses and donkeys for touring of the terrestrial areas of the Park. He also suggests that donkey-carts could be used to shuttle visitors from the pier to Portsmouth. Persons can be trained to offer this type of service which will also have to be regulated by Park management.

### 9.10.7 Shops and Entertainment

Tourists arriving at Portmouth aboard cruise ships are most times not in port for more than a few hours. Such a short time stay can be made enjoyable and attractive by offering a taste of local entertainment, foods and culture.

With the large number of visitors arriving at Portsmouth through the port and on yachts, there are livelihood opportunities for small entrepreneurs to establish restaurants, supply shops such as chandleries, craft shops, etc. Such entrepreneurs will require training in small business operations and customer relations.

### 9.10.8 Tour boat operators as wardens

Tour boat operators/water taxis are currently one of the major stakeholders in the park. This group has expressed an interest in acting as wardens within the CNP (see Section 5.3.2.1.4). These operators have many years of experience in travelling within the CNP and are knowledgeable about the assets within the Park. Some additional training would be required in terms of customer relations, 9.8.3.

## 9.11 Future Studies

Arising out of the field studies conducted for this project as well as the information provided in the Management Plan, the following future studies are recommended for sustainability of the MC/CNP:

- Regional Environmental Assessment;
- Carrying Capacity Studies;
- Water Quality Assessment;
- Oceanographic Patterns;
- Vending within the MC/CNP; and
- Disaster Management Plan.

### 9.11.1 Regional Environmental Assessment

Given that there are proposals to develop the Cabrits peninsula and surrounding areas for realising its tourism potential, it is recommended that a higher level environmental assessment for the entire northwest of the island be undertaken. This study would include the Cabrits peninsula as well as the areas covered under the zone of influence as discussed in Section 8.2.1. This study would be consistent with the recommendations by Gardner for undertake a protected areas system planning process to develop a comprehensive management framework. It is important to note that an important component of the environment is the human environment. This study will consider the impacts of existing and planned development of the agricultural and tourism sectors as well as infrastructure for the protected area. In conducting this study consultants and researchers will be required to focus on the cumulative impacts of these sectors on the Cabrits National Park with a view to recommending preferred development arrangements. Such a study will assist in minimizing conflict between development of the north western areas of Dominica that can potentially impact on the CNP and the operation of the CNP as a protected area.

The results of Carrying Capacity (see Section 9.11.2), Water Quality (see Section 9.11.3) and Oceanographic studies (see Section 9.11.4) will be required as inputs to this Regional Environmental Assessment.

### 9.11.2 Carrying Capacity Studies

Although the uses of the MC/CNP with the possible exception of the fishermen have been under-utilised, the proposal for significant development within the CNP will lead to more extensive use of the park. It therefore recommended that carrying capacity studies be undertaken to determine how to regulate uses within the CNP. These studies must focus on the following:

- Fishing,
- Tour Boat Operators,
- Cruise Ship visitors,
- Users of trails,
- Hotels, etc.

### 9.11.3 Water Quality Assessment

As noted in Section 8.2.3, water quality within the MC/CNP has been affected by solid wastes and siltation from coastal construction projects. In addition, poor water quality may also arise from discharges from hotels and restaurants as well as from sewage from nearby residences without sewage facilities. Poor water quality in turn has been identified as one of the reasons for the degradation of the environmental assets within the MC/CNP. As will be discussed in Section 9.9.1, monitoring of water quality is critical to management of the resources of the MC/CNP, however, a water quality assessment should be conducted to form the basis of continuous water quality monitoring within the MC/CNP. The objective of this exercise would be:

- to determine the ambient water quality of the seawater in the MC/CNP;
- to determine the quality of the discharges of the existing hotels,
- to identify the sources of pollution entering the marine environment,
- to determine the quality of the fresh water entering the marine environment from the various watercourses.

In order to meet these objectives the following is recommended:

- Sampling and testing of hotel / restaurant discharges
- Sampling and testing of marine water;
- Sampling and testing of fresh water.

### 9.11.3.1 Sampling and testing of Hotels / Restaurant Discharges

There are several hotels and restaurants that discharge into the MC/CNP (see Section 5.3.3). While there has been discussions indicating that water pollution from these developments may be a serious issue, there has been no study to assess the quality of water being discharged from these establishments. It is recommended that the Environment Health Division undertake the monitoring of the effluent from the hotels and restaurants that discharge into the MC/CNP. Sampling and testing undertaken should include but not be limited to a range of parameters including pH, temperature, salinity, TSS, oil and grease, faecal coliforms, BOD.

### 9.11.3.2 Ambient Marine Water Quality

In order to determine the present water quality within the MC/CNP, ambient water quality monitoring should be conducted. Sampling undertaken should include but not be limited to a range of parameters including pH, temperature, salinity, turbidity, conductivity, total and faecal coliforms, BOD, COD, nitrates and phosphates. This information should be conducted in the dry season as well as in the wet season to account for the changes that occur. This information will be the baseline data that can be compared to a comprehensive continuous monitoring programme that will be discussed in Section 9.9.1.

### 9.11.3.3 Ambient River Water Quality

There are several water courses that discharge into the MC/CNP. These rivers provide the means for siltation after heavy rainfall to enter into the marine environment. Additionally, in one instance, the river also provides the path for debris associated with Bay leaf processing to enter the marine environment. It is therefore also important to conduct ambient water quality testing within the rivers that enter the MC/CNP. This monitoring should be conducted just upstream of the mouths of the rivers. A similar range of parameters should be tested in the river water as for the marine sampling. Again, this information will form the baseline fresh water quality conditions.

### 9.11.4 Assessment of Physical Oceanographic Conditions

In conjunction with the assessment of water quality, a study should be conducted to determine the physical oceanographic conditions that presently exist within the MC/CNP. A description of the oceanographic conditions within the project area would include:

- Current velocities and directions at different tidal states;
- Tidal heights and capacity for tidal flushing of nearby rivers and wetlands;
- Capacity for tidal flushing of the mouth of any existing rivers
- Prevailing wind/wave directions and heights.

The information collected above would be useful in determining the dispersion of effluents within the MC/CNP. This in turn would inform decision making processes.

### 9.11.5 Status of Vending

The livelihoods assessment report conducted by Espeut does not make mention of vending as a livelihood within the CNP. However, during the field visit for this study, vendors were identified at the cruise ship terminal during the time that a cruise ship was berthed. Although we were unable to speak to them and they are generally speaking associated with the terrestrial side of the CNP, some survey specifically targeting these vendors should be conducted to determine their role within the CNP. This stakeholder should be properly assessed to ensure that they are included in the management of the MC/CNP and the livelihoods opportunity captured.

### 9.11.6 Disaster Management

The MC/CNP has had a history of hurricane damage which has had a negative impact on its resources (see Section 7.5.1). The draft Management Plan for the MC/CNP recommends the development of a Disaster Management Plan as well as a Disaster Management Committee. This recommendation is endorsed here in order to attempt to minimize the adverse impacts of hurricanes, storms and other natural disasters on the resources within the MC/CNP.

## 9.12 Evaluation Matrix

Matrices have been developed under the Canadian Environmental Assessment Act (CEAA) to evaluate Environmental Issues, Social Issues and Livelihood Issues. Notes on the use of these matrices have been prepared by the Canadian International Development Agency (CIDA, 2002), and an excerpt from these notes forms Appendix F of this report.

Tables 37, 38 and 39, adapted from the CEAA originals, evaluate environmental issues, social issues and livelihood issues, respectively. The Project Undertakings in each case are the actions in the Management Plan and Livelihood Reports for Cabrits National Park. The ratings for each project undertaking are shown on the appropriate matrix.

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**MATRIX FOR EVALUATING ENVIRONMENTAL ISSUES**

| Blank | A | B | C | D | E |
|---|---|---|---|---|---|
| No Significant negative environmental effect and there is no significant public concern | Significant positive environmental effect | **Significant negative environmental effect that can be mitigated** | Potential significant negative environmental effect unknown | Significant public concern | **Significant negative environmental effect that cannot be mitigated** |

**BIOLOGICAL**

| For additional help, please refer to the User Notes or to the help notes included in the e-form | | Climate | Air Quality | Waves and Currents | Sea Water Quality | Natural Hazards | Shoreline Erosion | Noise | | Shoreline Vegetation | Wetlands | Coral Reefs and Seagrass Beds | Fish Stocks | Wildlife, Marine | Wildlife, Avian | Biodiversity | Ecosystem Functions, Marine | Rare Species / Ecosystems | Protected Areas | | | Interactive Effects | Cumulative Effects |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PROJECT UNDERTAKINGS | | | | | | | | | | | | | | | | | | | | | | | |
| **Park Development** | | | | | | | | | | | | | | | | | | | | | | | |
| Undertake Carrying Capacity Studies | | | A | | A | | | A | | A | A | A | | A | A | | | | | | | | |
| Develop and Implement a Zoning Plan | | | | | A | | A | | | | | A | A | A | A | A | A | | | | | | |
| Marketing of Cabrits NP | | | E | | E | | E | E | | E | E | E | | E | E | | E | | | | | | |
| Upgrade and Develop Interpretation Centre | | | | | | | | B | | A | A | A | A | A | A | A | A | | | | | | |
| Install Mooring Buoys | | | | | | | | | | | | A | | | | A | A | | A | | | | |
| Establish Snorkeling | | | | | B | | | | | | | B | | B | | | | | | | | | |
| Establish Glass Bottom Boats | | | B | | A | | | | | | | A | | A | | A | A | | A | | | | |
| Briefing Program for Divers | | | | | | | | | | | | A | A | A | | | | | | | | | |
| Physical Demarcation of Park Boundaries | | | | | | | | | | | | A | | | | | | | A | | | | |
| | | | | | | | | | | | | | A | A | | A | A | A | A | | | | |
| **Monitoring and Policing** | | | | | | | | | | | | | | | | | | | | | | | |
| Surveillance and Enforcement | | | A | | A | | A | A | | A | A | A | A | A | A | A | A | | | | | | |
| Participatory Monitoring Program | | | A | | A | | A | A | | A | A | A | | | | | | | | | | | |
| Monitor Sources of Pollution | | | A | | A | | | A | | | | | | | | | | | | | | | |
| Education and Public Awareness Programmes | | | | | A | | | | | A | A | A | A | A | A | A | A | | | | | | |
| Manage Marine Species & Habitats | | | | | | | | | | | | | A | A | | A | A | A | A | | | | |
| Develop and Implement Park Operating Procedures and Best Practice Protocols | | | | | A | | | A | | | A | A | A | A | | A | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| **Fishermen** | | | | | | | | | | | | | | | | | | | | | | | |
| Provide Resources to Fishers | | | | | | | | | | | | | A | | | A | A | | A | | | | |
| Enhance Capacity of Fishers for Deep Sea Fishing | | | | | | | | | | | | | A | | | A | A | | | | | | |
| Establish Game Fishing | | | | | | | | | | | | | B | | | B | B | B | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |

Matrix adapted from the Canadian Environment Assessment Act.

## MATRIX FOR EVALUATING SOCIAL ISSUES

| Blank | A | B | C | D | E |
|---|---|---|---|---|---|
| No Significant negative social effect and there is no significant public concern | Significant positive social effect | Significant negative social effect that can be mitigated. | Potential significant negative social effect unknown | Significant public concern | Significant negative social effect that cannot be mitigated |

| | | SOCIAL | | | | | | | | | | CULTURAL | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| For additional help, please refer to the User Notes or to the help notes included in the e-form | | Gender equity | Community participation | Stakeholder participation | Partner collaboration | Training | Public Education | Disabled | Community conflict | Vandalism | Noise | | Politics | educational | Religious practices | Health practices | Recreational customs | medicinal | Historic sites | Community traditions | | Interactive Effects | Cumulative Effects |
| PROJECT UNDERTAKINGS | | | | | | | | | | | | | | | | | | | | | | | |
| **Park Development** | | | | | | | | | | | | | | | | | | | | | | | |
| Develop/Implement a Zoning Plan | | | A | A | A | | A | | A | | | | | | | | A | | | | | | |
| Marketing of Cabrits NP | | | | A | A | A | A | | | | | | | | | | | | | | | | |
| Upgrade and Develop Interpretation Centre | | A | A | A | A | | | | | | | | | | | | | | | | | | |
| Install Mooring Buoys | | | | A | | A | | | | | | | | | | | B | | | | | | |
| Establish Snorkeling | | | | A | A | | A | | | | | | | | | | | | | | | | |
| Establish Glass Bottom Boats | | | A | A | A | A | | | | | | | | | | | C | | | | | | |
| Physical Demarcation of Park Boundaries | | | | | | | | | A | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| **Monitoring and Policing** | | | | | | | | | | | | | | | | | | | | | | | |
| Surveillance and Enforcement | | | C | | | | | | D | A | | | | | | | B | | | | | | |
| Participatory Monitoring Program | | | A | A | | | A | | | | | | | | | | | | | | | | |
| Monitor Sources of Pollution | | | | A | A | A | A | | | | | | | | | | | | | | | | |
| Education and Public Awareness | | | A | A | A | A | A | | | | | | | | | | | | | | | | |
| Manage Marine Species & Habitats | | | | | | | | | | | | | | | | | B | | | | | | |
| Develop and Implement Park Operating Procedures and Best Practice Protocols | | | | | | | | | | | | | | | | | B | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| **Fishermen** | | | | | | | | | | | | | | | | | | | | | | | |
| Provide Resources to Fishers | | | A | | | | | | A | | | | | | | | | | | | | | |
| Enhance Capacity of Fishers for Deep Sea Fishing | | | | | | | | | A | | | | | | | | | | | | | | |
| Establish Game Fishing | | | | | | | | | A | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| **Other Employment** | | | | | | | | | | | | | | | | | | | | | | | |
| Implement a Dominica-specific Training Program | | A | A | A | A | A | | | A | | | | | | | | | | | | | | |
| Register of Small Businesses | | A | A | A | A | A | | | | | | | | | | | | | | | | | |
| Training in Art and Crafts | | A | A | A | A | A | | | | | | | | | | | | | | | | | |
| Develop Portsmouth Craft Centre | | A | A | A | A | A | | | | | | | | | | | | | | | | | |

Matrix adapted from the Canadian Environment Assessment Act.

## MATRIX FOR EVALUATING LIVELIHOOD ISSUES

| No Significant negative livelihood effect and there is no significant public concern | Significant Livelihood positive effect | Significant negative livelihood effect that can be mitigated. | Potential significant negative livelihood effect unknown | Significant public concern | Significant negative livelihood effect that cannot be mitigated. |
|---|---|---|---|---|---|

| | SOCIAL | | | | | | | | | | | ECONOMIC | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| For additional help, please refer to the User Notes or to the help notes included in the e-form | Traditional livelihoods | Gender | Co-management | Information | History of site area | Partnership mechanisms | Responsive of community/group/area | Households | Cultural assets | | | income | Food security | Employment | Fishing | handicraft | investments | Alternative Products | Natural assets | Access to credit | Physical assets | | Interactive Effects | Cumulative Effects |
| PROJECT UNDERTAKINGS | | | | | | | | | | | | | | | | | | | | | | | | |
| **Park Development** | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop/Implement Zoning Plan | B | | A | | | | | | | | | | | | D | | | | A | | A | | | |
| Marketing of Cabrits NP | | | | | | | | | | | | A | | A | C | A | A | | | | | | | |
| Upgrade and Develop Interpretation Centre | | | | | | | | | | | | | | A | | | | | | | | | | |
| Establish Snorkeling | | | | | | | | | | | | A | | A | | | A | | | | | | | |
| Establish Glass Bottom Boats | | | | | | | | | | | | A | | A | | | A | | | | | | | |
| Physical Demarcation of Park Boundaries | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| **Monitoring and Policing** | | | | | | | | | | | | | | | | | | | | | | | | |
| Participatory Monitoring Program | | | | | | | | | | | | | | A | | | | | | | | | | |
| Education and Public Awareness Programmes | A | | A | A | | | | | | | | A | | | | | | | A | | A | | | |
| Manage Marine Species & Habitats | | | | | | | | | | | | | | | B | | | | | | | | | |
| Develop and Implement Park Operating Procedures and Best Practice Protocols | | | | | | | | | | | | | | | | | | | A | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| **Fishermen** | | | | | | | | | | | | | | | | | | | | | | | | |
| Provide Resources to Fishers | | | | | | | | | | | | A | A | A | A | | | | | | | | | |
| Enhance Capacity of Fishers for Deep Sea Fishing | | | | | | | | | | | | A | A | A | A | | A | | | | | | | |
| Establish Game Fishing | | | | | | | | | | | | A | | A | A | | A | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| **Other Employment** | | | | | | | | | | | | | | | | | | | | | | | | |
| Establish a Register of Small Businesses | | | | | | | | | | | | A | | A | | A | A | | | | | | | |
| Training in Art and Crafts | | | | | | | | | | | | A | | A | | A | A | | | | | | | |
| Develop a Craft Centre at Portsmouth | | | | | | | | | | | | A | | A | | A | A | | | | | | | |

Matrix adapted from the Canadian Environment Assessment Act.

# APPENDIX A

## STRUCTURED QUESTIONNAIRE TEMPLATES

# ATTITUDE SURVEY - (Yachties)

## ECOENGINEERING CONSULTANTS LIMITED

## STUDIES FOR OPAAL DEMONSTRATION PROJECTS

### *ATTITUDE SURVEY-(Yachties)*

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of this survey is to gather social data about the yachters who use this area, which will enable us to determine how managing the protected area might have an impact on you. Are you available for an interview?

### RESPONDENT INFORMATION

Name *(optional)*:_____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Nationality: _____

### INFORMATION ON CURRENT USE OF THE PROTECTED AREA

1. How many nights are you spending in this country? _____

2. How often do you visit this area?
☐ Weekly ☐ Monthly ☐ Yearly ☐ Other _____

3. How many persons traveled on your yacht on this trip? _____

4. Is this your first visit to this country?
☐ Yes ☐ No ☐ Don't Know ☐ No Response

*If the response is yes, please skip question 2.*

5. How often have you visited this country?

_____

6. How did you hear about this place?
☐ Travel agent ☐ Friends / Family ☐ Internet ☐ Television
☐ Newspaper / Magazine ☐ Other

## ACTIVITIES

7. What activities do you engage in while in this country?
☐ beaches ☐ diving ☐ fishing ☐ snorkeling
☐ other *(please specify)* _____

8. How often have you visited the reef on this trip? _____

9. How did you access the reef?

☐ Private boat ☐ Water taxi ☐ Diving ☐ Snorkeling
☐ Catamaran ☐ No response ☐ Other (specify) _____

10. What activities have you engaged in at the reef?

☐ Diving
☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenir)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing
☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify) _____

## QUALITY

11. Has the quality of the reef changed since the last time you visited? (*If this is the first visit, skip this question*)

☐ Yes ☐ No ☐ Don't know ☐ No response

Please describe the changes noticed:

☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

## MANAGEMENT

12. Do you think that making the reef into a marine protected area (MPA) would help protect the coral reefs?

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

## ATTITUDES AND PERCEPTIONS

Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

| | 1 | 2 | 3 | 4 | 5 | NR |
|---|---|---|---|---|---|---|
| The reefs are important for protecting land from storm waves | | | | | | |
| Coral reefs are only important if you fish or dive | | | | | | |
| In the long run fishing wound be better if we cleared the coral | | | | | | |
| Fishing should be restricted in certain areas just to allow the fish and coral to grow | | | | | | |
| Future generations should be able to enjoy the coral reefs | | | | | | |
| We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow | | | | | | |
| Seagrass beds have no value to people. | | | | | | |

13. If the reef becomes a marine protected area (MPA) what impact do you think it would have on you, if any?

_____
_____
_____

14. Do you think the reef should become a marine protected area?

☐Yes ☐No ☐No Response

**THANK YOU FOR YOUR COOPERATION**

# ATTITUDE SURVEY - VENDORS

## ECOENGINEERING CARIBBEAN LIMITED

## STUDIES FOR OPAAL DEMONSTRATION PROJECTS

### *ATTITUDE SURVEY – VENDORS*

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of the survey is to gather social data on vendors who operate in this area, which will enable us to determine how managing the protected area might impact on you. Are you available for an interview?

### RESPONDENT INFORMATION

This questionnaire seeks information on how you think management of the protected area would affect you.

Name (optional):_____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Address: _____

What is the highest level of education received?

- ☐ Primary
- ☐ Secondary
- ☐ Technical / Vocational
- ☐ Tertiary

Do you have any other skills?

☐No ☐Yes (*Please Specify*) _____

## HOUSEHOLD INFORMATION

The next set of questions concerns your household. This is basic demographic data, the sort that is normally collected by the Central Statistical Office during a Census.

1. Are you the main income earner in your household?

   ☐ Yes ☐ No ☐ No response

2. How many people are reliant on your income? _____

3. Do all of these persons reside in one household?

   ☐ Yes ☐ No *(please indicate no. of households)*_____ ☐ No response

   Please indicate their ages:

| AGE GROUP | GENDER | | TOTAL |
|---|---|---|---|
| | Female | Male | |
| 0 to 5 years | | | |
| 6 to 11 years | | | |
| 12 to 17 years | | | |
| 18 to 29 years | | | |
| 30 to 45 years | | | |
| 46 to 60 years | | | |
| More than 60 years | | | |
| **Total** | | | |

4. Number of adults in the family currently employed outside of the household:
   _____

5. Type of occupation:

| Member of Household | Occupation/ Skill | Duration in Occupation | Location of Workplace |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

6. Number of children/young adults currently at school _____

*Please indicate level:*
☐ ____ Kindergarten / Pre-school
☐ ____ Primary
☐ ____ Secondary
☐ ____ Technical / Vocational
☐ ____ Tertiary

**INFORMATION ON CURRENT USE OF PROTECTED AREA**

The next set of questions seeks to identify the current use of the reef.

7. Type of product being sold
☐ T-shirts ☐ Souvenirs ☐ Craft items
☐ Other _____ ☐ No response

8. How long have you been vending in this area?
☐ less than 5 years
☐ 5 to 10 years
☐ more than 10 years but less than 20 years
☐ more than 20 years but less than 30 years
☐ more than 30 years
☐ no response

9. What is the average amount of customers daily? _____

10. What months of the year do you have the most amount of visitors to the reef?

_____
_____
_____

11. How has your business changed within the last ten years:

☐ Increased ☐ Decreased ☐ Stayed the Same ☐ More Operators
☐ Other (specify):_____

12. For what purpose do you use the reef?

_____

13. How do you access the reef?
☐ Private boat ☐ Water taxi ☐ Other (specify) _____
☐ No response

14. Are you faced with any constraints in using the protected area?

_____

## ACTIVITIES

15. Please describe the activities that you know takes place at the Reef:

_____
_____
_____
_____

☐ Diving
☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenier)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing
☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify) _____

16. What activities have negatively impacted on the quality of the reef?

_____
_____
_____

17. What efforts have been made to protect this area?

_____
_____
_____

## QUALITY

18. Has the quality of the reef changed?

☐ Yes ☐ No

If yes, please describe the changes noticed:

_____
_____
_____
_____

☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

## MANAGEMENT

19. What measures do you recommend to protect the quality of the coral reef?

_____
_____
_____
_____

20. Do you think that making the reef into a marine protected area (MPA) would help protect the coral reefs?

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

## ATTITUDES AND PERCEPTIONS

Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

| | 1 | 2 | 3 | 4 | 5 | NR |
|---|---|---|---|---|---|---|
| The reefs are important for protecting land from storm waves | | | | | | |
| Coral reefs are only important if you fish or dive | | | | | | |
| In the long run fishing wound be better if we cleared the coral | | | | | | |
| Fishing should be restricted in certain areas just to allow the fish and coral to grow | | | | | | |
| Future generations should be able to enjoy the coral reefs | | | | | | |
| We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow | | | | | | |
| Seagrass beds have no value to people. | | | | | | |

21. Do you think the reef should become a marine protected area?

☐Yes ☐No ☐No Response

**THANK YOU FOR YOUR COOPERATION**

# ATTITUDE SURVEY FOR TOURISTS

## ECOENGINEERING CARIBBEAN LIMITED

## STUDIES FOR OPAAL DEMONSTRATION PROJECTS

### *ATTITUDE SURVEY FOR TOURISTS*

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of the survey is to gather social data on your community, which will enable us to determine how managing the protected area might impact on you. Are you available for an interview?

### RESPONDENT INFORMATION

This questionnaire seeks information on how you think management of the protected area would affect tourists who visit this location.

Name:(optional)_____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Nationality: _____

### INFORMATION ON CURRENT USE OF THE PROTECTED AREA

1. Is this your first visit to this country?
☐ Yes ☐ No ☐ Don't Know ☐ No Response

*If the response is yes, please skip question 2.*

2. How often have you visited this particular country?
_____

3. What is the purpose of your visit?
☐ Pleasure ☐ Work
☐ Other

4. How did you hear about this place?
☐ Travel agent ☐ Friends / Family ☐ Internet ☐ Television
☐ Newspaper / Magazine ☐ Other

5. Number of people currently with you: _____

6. How many nights are you staying in the country? _____

7. Type of occupation:

| Male / Female | Occupation/ Skill | Duration in Occupation |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

**ACTIVITIES**

8. What type of activities do you normally engage in when you visit this country?
_____
_____
_____

9. What activities on the reef have you noticed in the duration of your stay?
_____
_____
_____
_____

☐ Diving
☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenier)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing

☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify _____

**QUALITY**

10. Have you visited the reef during your visit ?

☐ Yes ☐ No
(If No, skip to next section

11. By what means did you visit the reef?

☐ Tourboat ☐ Diving ☐ Snorkeling ☐ Catamaran
☐ Other _____

12 What did you enjoy most about the reef?
_____
_____
_____

13 Has the quality of the reef changed since the last time you visited?
☐ Yes ☐No

Please describe the changes noticed:
_____
_____
_____

☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

**MANAGEMENT**

14. Do you think that making the reef into a marine protected area (MPA) would help protect the coral reefs?

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

15. Do you think that the development of a marine park management system will improve the quality of the coral reefs?

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

**ATTITUDES AND PERCEPTIONS**

Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

| | 1 | 2 | 3 | 4 | 5 | NR |
|---|---|---|---|---|---|---|
| The reefs are important for protecting land from storm waves | | | | | | |
| Coral reefs are only important if you fish or dive | | | | | | |
| In the long run fishing wound be better if we cleared the coral | | | | | | |
| Fishing should be restricted in certain areas just to allow the fish and coral to grow | | | | | | |
| Future generations should be able to enjoy the coral reefs | | | | | | |
| We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow | | | | | | |
| Seagrass beds have no value to people. | | | | | | |

16. If the reef becomes a marine protected area (MPA) what impact do you think it would have on your vacation experience?

_____
_____
_____

17 Do you think the reef should become a marine protected area?

☐Yes ☐No ☐No Response

**THANK YOU FOR YOUR COOPERATION**

# ATTITUDE SURVEY - TOUR BOAT OPERATORS

## ECOENGINEERING CARIBBEAN LIMITED

## STUDIES FOR OPAAL DEMONSTRATION PROJECTS

### *ATTITUDE SURVEY – TOUR BOAT OPERATORS*

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of the survey is to gather social data on your community, which will enable us to determine how managing the protected area might impact on you. Are you available for an interview?

### RESPONDENT INFORMATION

This questionnaire seeks information on how you think management of the protected area would affect you.

Name (optional):_____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Address: _____

What is the highest level of education received?

- ☐ Primary
- ☐ Secondary
- ☐ Technical / Vocational
- ☐ Tertiary

Do you have any skills other than tour boat operations?

☐No ☐Yes (*Please Specify*) _____

## HOUSEHOLD INFORMATION

The next set of questions concerns your household. This is basic demographic data, the sort that is normally collected by the Central Statistical Office during a Census.

1. Are you the main income earner in your household?

   ☐ Yes ☐ No ☐ No response

2. How many people are reliant on your income? _____

3. Do all of these persons reside in one household?

   ☐ Yes ☐ No *(please indicate no. of households)*_____ ☐ No response

   Please indicate their ages:

| AGE GROUP | GENDER | | TOTAL |
|---|---|---|---|
| | Female | Male | |
| 0 to 5 years | | | |
| 6 to 11 years | | | |
| 12 to 17 years | | | |
| 18 to 29 years | | | |
| 30 to 45 years | | | |
| 46 to 60 years | | | |
| More than 60 years | | | |
| **Total** | | | |

4. Number of adults in the family currently employed outside of the household: _____

5. Type of occupation:

| Member of Household | Occupation/ Skill | Duration in Occupation | Location of Workplace |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

6. Number of children/young adults currently at school _____

   *Please indicate level:*
   ☐ ____ Kindergarten / Pre-school
   ☐ ____ Primary
   ☐ ____ Secondary
   ☐ ____ Technical / Vocational
   ☐ ____ Tertiary

## INFORMATION ON CURRENT USE OF PROTECTED AREA

The next set of questions seeks to identify the current use of the reef.

7. How long have you been a tour-boat operator in this area?
   - ☐ less than 5 years
   - ☐ 5 to 10 years
   - ☐ more than 10 years but less than 20 years
   - ☐ more than 20 years but less than 30 years
   - ☐ more than 30 years
   - ☐ no response

8. Do you own your own boat?
   ☐ Yes ☐ No ☐ No response

   If yes how many? _____

9. What material is your boat made of?
   ☐ Fibreglass ☐ Wood ☐ Both ☐ Other ☐ Don't know ☐No response

10. How is your boat propelled?
    ☐ Motorised ☐ Non-motorised ☐ Other ☐ No response

11. Are the boat(s) licensed?

    ☐ Yes ☐ No ☐ Don't Know ☐ No Response

12. What is the average amount of people per trip? _____

13. How many trips do you make daily?

    ☐ 1 ☐ 3 ☐ Don't Know
    ☐ 2 ☐ > 3 ☐ No Response

14. What is the length of a trip (hours)?

    ☐ 1- 1hr. 30 mins
    ☐ 1 hr. 30 mins – 2 hrs
    ☐ 2 hrs – 2hrs 30 mins
    ☐ 2 hrs 30 mns – 3 hrs
    ☐ > 3 hrs

15. What months of the year do you have the most amount of visitors to the reef?

    _____
    _____
    _____

16. What is your primary route?

_____

17. Are you faced with any constraints in using the protected area?

_____

18. What is your rate? _____

## ACTIVITIES

19. Please describe the activities that you know takes place at the Reef:

_____
_____
_____
_____

☐ Diving
☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenier)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing
☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify) _____

20. What activities have negatively impacted on the quality of the reef?

_____
_____
_____

21. What efforts have been made to protect this area?

_____
_____
_____

22. How has the of reef tour business changed within the last ten years:

☐ Increased ☐ Decreased ☐ Stayed the Same ☐ More Operators
☐ Other (specify):_____

## QUALITY

23. What makes this reef attractive to reef touring?

_____
_____
_____

24. Has the quality of the reef changed?

☐ Yes ☐ No

If yes, please describe the changes noticed:

_____
_____
_____
_____

☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

## MANAGEMENT

25. What measures do you recommend to protect the quality of the coral reef?

_____
_____
_____
_____

26. Developing the reef into a marine protected area (MPA) would help protect the coral reefs.

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

## ATTITUDES AND PERCEPTIONS

Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

| | 1 | 2 | 3 | 4 | 5 | NR |
|---|---|---|---|---|---|---|
| The reefs are important for protecting land from storm waves | | | | | | |
| Coral reefs are only important if you fish or dive | | | | | | |
| In the long run fishing wound be better if we cleared the coral | | | | | | |
| Fishing should be restricted in certain areas just to allow the fish and coral to grow | | | | | | |
| Future generations should be able to enjoy the coral reefs | | | | | | |
| We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow | | | | | | |
| Seagrass beds have no value to people. | | | | | | |

27. Do you think the reef should become a marine protected area?

☐Yes ☐No ☐No Response

**THANK YOU FOR YOUR COOPERATION**

# ATTITUDE SURVEY - RESIDENTS

## ECOENGINEERING CARIBBEAN LIMITED

## STUDIES FOR OPAAL DEMONSTRATION PROJECTS

### *ATTITUDE SURVEY – RESIDENTS*

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of this survey is to gather social data on your community, which will enable us to determine how managing the protected area might have an impact on you. Are you available for an interview?

### RESPONDENT INFORMATION

Name: _____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Family Status: ☐ Mother ☐ Father ☐ Other (specify) _____

Address: _____

What is your highest level of education received?

- ☐ Primary
- ☐ Secondary
- ☐ Technical / Vocational
- ☐ Tertiary

## HOUSEHOLD INFORMATION

The next set of questions concerns your household. This is basic demographic data, the sort that is normally collected by the Central Statistical Office during a Census.

1. How long has your family lived at this address?
   - ☐ less than 5 years
   - ☐ 5 to 10 years
   - ☐ more than 10 years but less than 20 years
   - ☐ more than 20 years but less than 30 years
   - ☐ more than 30 years
   - ☐ no response

2. No. of people in this household: _____

3. Please indicate the number of persons in your household within the following groups:

| AGE GROUP | GENDER | | TOTAL |
|---|---|---|---|
| | Female | Male | |
| 0 to 5 years | | | |
| 6 to 11 years | | | |
| 12 to 17 years | | | |
| 18 to 29 years | | | |
| 30 to 45 years | | | |
| 46 TO 60 years | | | |
| More than 60 years | | | |
| **Total** | | | |

4. Number of adults in the family currently employed outside of the household _____

5. Type of occupation:

| Member of Household | Occupation/ Skill | Duration in Occupation | Location of Workplace |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

6. Number of children/young adults currently at school _____

   *Please indicate level:*
   - ☐ ____ Kindergarten / Pre-school
   - ☐ ____ Primary
   - ☐ ____ Secondary
   - ☐ ____ Technical / Vocational
   - ☐ ____ Tertiary

## INFORMATION ON CURRENT USE OF THE PROTECTED AREA

7. How often do you visit the reef?

☐ Daily ☐ monthly ☐ yearly
☐ weekly ☐ never ☐ No response

8. Do you visit the reef at a particular time of the year?
☐ No ☐ Yes , (*Please specify*) _____
☐ no response

9. How do you access the reef?
☐ Private boat ☐ Water taxi ☐ Other ☐ No response

## ACTIVITIES

10. Please describe the activities that you engage in when you visit the reef:

_____
_____
_____
_____

☐ Diving
☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenier)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing
☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify _____

## QUALITY

11. The Reef been an ideal location for recreation.

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

12. Has the quality of the reef changed?

☐ Yes ☐ No ☐ Don't know ☐ No response

Please describe the changes noticed:

_____
_____
_____
_____

☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

## MANAGEMENT

13. Are there any activities that you think should be prohibited or controlled on the reef?
☐ Yes _____
☐ No ☐ Don't know ☐ No response

If yes, please indicate a reason for your answer:

_____
_____
_____
_____

14. How do you think having a marine protected area would impact the reef?

_____

## ATTITUDES AND PERCEPTIONS

Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

| | 1 | 2 | 3 | 4 | 5 | NR |
|---|---|---|---|---|---|---|
| The reefs are important for protecting land from storm waves | | | | | | |
| Coral reefs are only important if you fish or dive | | | | | | |
| In the long run fishing wound be better if we cleared the coral | | | | | | |
| Fishing should be restricted in certain areas just to allow the fish and coral to grow | | | | | | |
| Future generations should be able to enjoy the coral reefs | | | | | | |
| We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow | | | | | | |
| Seagrass beds have no value to people. | | | | | | |

15. If the reef becomes a marine protected area (MPA) what impact do you think it would have on your livelihood?

_____
_____
_____

16. Do you think the reef should become a marine protected area?

☐Yes ☐No ☐No Response

**THANK YOU FOR YOUR COOPERATION**

# ATTITUDE SURVEY FOR FISHERMEN

## ECOENGINEERING CARIBBAEAN LIMITED

## STUDIES FOR OPAAL DEMONSTRATION PROJECTS

### *ATTITUDE SURVEY FOR FISHERMEN*

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of this survey is to gather social data on the fishermen who live and work in the area, which will enable us to determine how managing the protected area might have an impact on you. Are you available for an interview?

### RESPONDENT INFORMATION

Name: _____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Family Status: ☐ Mother ☐ Father ☐ Other (specify) _____

Address: _____

What is the highest level of education received?

- ☐ Primary
- ☐ Secondary
- ☐ Technical / Vocational
- ☐ Tertiary

Do you have any skills other than fishing?

☐No ☐Yes (*Please Specify*) _____

## HOUSEHOLD INFORMATION

1. Are you the main income earner in your household?

   ☐ Yes ☐ No ☐ No response

2. How many people are reliant on your income? _____

3. Do all of these persons reside in one household?

   ☐ Yes ☐ No *(please indicate no. of households)*_____ ☐ No response

   Please indicate their ages:

| AGE GROUP | GENDER | | TOTAL |
|---|---|---|---|
| | Female | Male | |
| 0 to 5 years | | | |
| 6 to 11 years | | | |
| 12 to 17 years | | | |
| 18 to 29 years | | | |
| 30 to 45 years | | | |
| 46 to 60 years | | | |
| More than 60 years | | | |
| **Total** | | | |

4. Number of adults in the family currently employed outside of the household:
   _____

5. Type of occupation:

| Member of Household | Occupation/ Skill | Duration in Occupation | Location of Workplace |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

6. Number of children/young adults currently at school _____

   *Please indicate level:*
   ☐ ____ Kindergarten / Pre-school
   ☐ ____ Primary
   ☐ ____ Secondary
   ☐ ____ Technical / Vocational
   ☐ ____ Tertiary

**INFORMATION ON CURRENT USE OF THE PROTECTED AREA**

7. How long have you fished in this area?
☐ < 1 year ☐ 1- 5 years ☐ 6- 10 years
☐ 11-15 years ☐ 16 – 20 years ☐ > 20 years

8. How often do you go out to fish?
☐ Every morning ☐ many times a day ☐ once a month
☐ Every evening ☐ once a week ☐ many times a month
☐ once a day ☐ many times a week ☐ No response

9. What is the location of your primary fishing ground?

☐ Yes ☐ No ☐ Don't know ☐ No response

10. Do you own your own boat?
☐Yes ☐No ☐No response

If yes how many boats do you own? _____

11. What material is your boat made of?
☐ Fibreglass ☐ Wood ☐ Both ☐ Don't know ☐No response

12. How is your boat propelled?
☐ Motorised ☐ Non-motorised ☐ Other *(specify)* _____
☐ No response

13. Are the boat(s) licensed?

☐ Yes ☐ No ☐ Don't Know ☐ No Response

14. Is your fishing seasonal?
☐No ☐Yes (Please specify the particular months)
_____
_____

15. What type of fish do you catch?
_____

16. What is your average catch size per week?
_____

17. Do you use a particular fishing method?

☐ Yes *(please specify):* _____
☐ No ☐ Don't Know ☐ No Response

**ACTIVITIES**

18. Do you use the reef for any activity other than fishing?
☐ Yes *(please specify):* _____

19. How do you think fishing has impacted on the reef over the period that you have been fishing in this area?

_____
_____
_____

20. Please describe the activities that you know take place at the Reef:

☐ Diving
☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenier)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing
☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify _____

21. Can you identify any activities that may have a negative impact on the reef?

_____
_____
_____

**QUALITY**

22. Has your catch size:

☐ Increased ☐ Decreased ☐ Remained the same

since you started fishing?

23. Has the quality of the reef changed since you started fishing?

☐ Yes ☐ No ☐ Don't know ☐ No response

Please describe the changes noticed:

☐ Decrease in fish
☐ Fish Nurseries
☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

## MANAGEMENT

24. What measures do you recommend to protect the reef or improve the quality of the reef?
_____
_____
_____
_____

25. How do you think having a marine protected area would impact the reef?
_____
_____
_____

## ATTITUDES AND PERCEPTIONS

26. Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

| | 1 | 2 | 3 | 4 | 5 | NR |
|---|---|---|---|---|---|---|
| The reefs are important for protecting land from storm waves | | | | | | |
| Coral reefs are only important if you fish or dive | | | | | | |
| In the long run fishing wound be better if we cleared the coral | | | | | | |
| Fishing should be restricted in certain areas just to allow the fish and coral to grow | | | | | | |
| Future generations should be able to enjoy the coral reefs | | | | | | |
| We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow | | | | | | |
| Seagrass beds have no value to people. | | | | | | |

27. If the reef becomes a managed protected area (MPA) what impact do you think it would have on your livelihood?

_____
_____
_____

28. Do you think the reef should become a managed protected area?

☐Yes ☐No ☐No Response

**THANK YOU FOR YOUR COOPERATION**

# ATTITUDE SURVEY - DIVERS

## ECOENGINEERING CARIBBEAN LIMITED

## STUDIES FOR OPAAL DEMONSTRATION PROJECTS

### *ATTITUDE SURVEY - DIVERS*

Date: _____ Name of Interviewer: _____

We are working on the OECS Protected Areas and Associated Livelihoods Project which aims to collect information that will help OECS member states to better manage their coral reefs, fish and other natural resources. This project is being coordinated by the OECS ESDU. Our firm, Ecoengineering has been asked to collect information to put together a baseline on the environment, social and economic situation in this area and to identify any possible impacts that could affect the resources.

The purpose of this survey is to gather social data on divers who use the reef, which will enable us to determine how managing the protected area might have an impact on you. Are you available for an interview?

### RESPONDENT INFORMATION

Name *(optional)*:_____

Gender: ☐ Male ☐ Female

Age: ☐ 18 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65
☐ > 66 ☐ No response

Nationality: _____

What is the highest level of education received?

- ☐ Primary
- ☐ Secondary
- ☐ Technical / Vocational
- ☐ Tertiary

## INFORMATION ON CURRENT USE OF THE PROTECTED AREA

1. For what purpose do you dive? *(If for leisure skip next section)*
   ☐ Leisure ☐ Commercial ☐ Other *(please specify)*_____

2. How long have you dived in this area?
   ☐ < 1 year ☐ 1- 5 years ☐ 6- 10 years
   ☐ 11-15 years ☐ 16 – 20 years ☐ > 20 years

3. How often do you go out to dive?
   ☐ once a day ☐ several times a day ☐ 1 – 3 times a week
   ☐ 4-7 times a week ☐ once a month ☐ more than once a month
   ☐ No response

4. Is the reef your primary diving ground?
   _____

5. How do you access the reef?
   ☐ Private boat ☐ Water taxi ☐ Other ☐ No response

## HOUSEHOLD INFORMATION

6. Are you the main income earner in your household?

   ☐ Yes ☐ No ☐ No response

7. How many people are reliant on your income? _____

9 Do all of these persons reside in one household?

   ☐ Yes ☐ No *(please indicate no. of households)*_____ ☐ No response

Please indicate their ages:

| AGE GROUP | GENDER | | TOTAL |
|---|---|---|---|
| | Female | Male | |
| 0 to 5 years | | | |
| 6 to 11 years | | | |
| 12 to 17 years | | | |
| 18 to 29 years | | | |
| 30 to 45 years | | | |
| 46 to 60 years | | | |
| More than 60 years | | | |
| **Total** | | | |

9. Number of adults in the family currently employed outside of the household:_____

10. Type of occupation:

| Member of Household | Occupation/ Skill | Duration in Occupation | Location of Workplace |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

11. Number of children/young adults currently at school _____

*Please indicate level:*
☐ ____ Kindergarten / Pre-school
☐ ____ Primary
☐ ____ Secondary
☐ ____ Technical / Vocational
☐ ____ Tertiary

**ACTIVITIES**

12. What activities are you interested in other than diving?
_____

13. What activities have you noticed other people doing when you go on your dives?

☐ Snorkelling
☐ Reef Walking
☐ Swimming/Sea Bathing
☐ Anchoring
☐ Mooring
☐ Natural Impacts
☐ Collecting coral (souvenier)
☐ Glass-Bottomed Boating
☐ Water Skiing
☐ Wind Surfing
☐ Over-fishing
☐ None
☐ No Response
☐ Other (specify _____

## QUALITY

14. Has the quality of the reef changed since you started diving?

☐ Yes ☐ No ☐ Don't know ☐ No response

Please describe the changes noticed:

_____
_____
_____
_____

☐ Coral Bleaching
☐ Algae
☐ decrease in water quality
☐ decrease in water clarity
☐ reef breakage
☐ None
☐ No Response
☐ Other (specify) _____

15. What activities might have contributed to these changes?

_____

## MANAGEMENT

16. How do you think having a marine protected area would impact the reef?

_____

## ATTITUDES AND PERCEPTIONS

Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); strongly disagree (1)

| | 1 | 2 | 3 | 4 | 5 | NR |
|---|---|---|---|---|---|---|
| The reefs are important for protecting land from storm waves | | | | | | |
| Coral reefs are only important if you fish or dive | | | | | | |
| In the long run fishing wound be better if we cleared the coral | | | | | | |
| Fishing should be restricted in certain areas just to allow the fish and coral to grow | | | | | | |
| Future generations should be able to enjoy the coral reefs | | | | | | |
| We should restrict development in some coastal areas even if no one ever fishes in those areas just to allow the fish and coral to grow | | | | | | |
| Seagrass beds have no value to people. | | | | | | |

17. If the reef becomes a marine protected area (MPA) what impact do you think it would have on your livelihood?

_____
_____
_____

18. Do you think the reef should become a marine protected area?

☐Yes ☐No ☐No Response

**THANK YOU FOR YOUR COOPERATION**

# APPENDIX B

## CLASSIFICATION OF IMPACTS

# APPENDIX B

# CLASSIFICATION OF ENVIRONMENTAL IMPACTS

## B.1 OBJECTIVE AND APPLICATION

### B.1.1 Objective

This system provides a structured method of post-mitigation classification of the environmental impacts related to the establishment of the Marine Component of the Cabrits National Park. The objective is to have a unified classification structure which can then be used to determine the significance of environmental impacts of the proposed project.

### B.1.2 Application

While it is recognized that beneficial environmental impacts can also arise from this development, this classification system will be used only to rate adverse environmental impacts. In addition, this system rates impacts both before the application of mitigation measures and after available and realistic mitigation measures have been applied to minimize adverse impacts.

## B.2 PARAMETERS

In this system, environmental impacts are rated on the basis of three parameters:

- Extent,
- Intensity, and
- Nature.

### B.2.1 Extent

"Extent" describes the geographical area likely to be impacted by the project. In this classification system, four classes of extent (see Figure B-1) have been defined:

| | |
|---|---|
| **On-Site** | Within the boundaries of the CNP. |
| **Localized** | Extending to include the villages along the west coast from Capuchin in the North to Bioche in the South. |
| **National** | The island of Dominica |

### B.2.2 Intensity

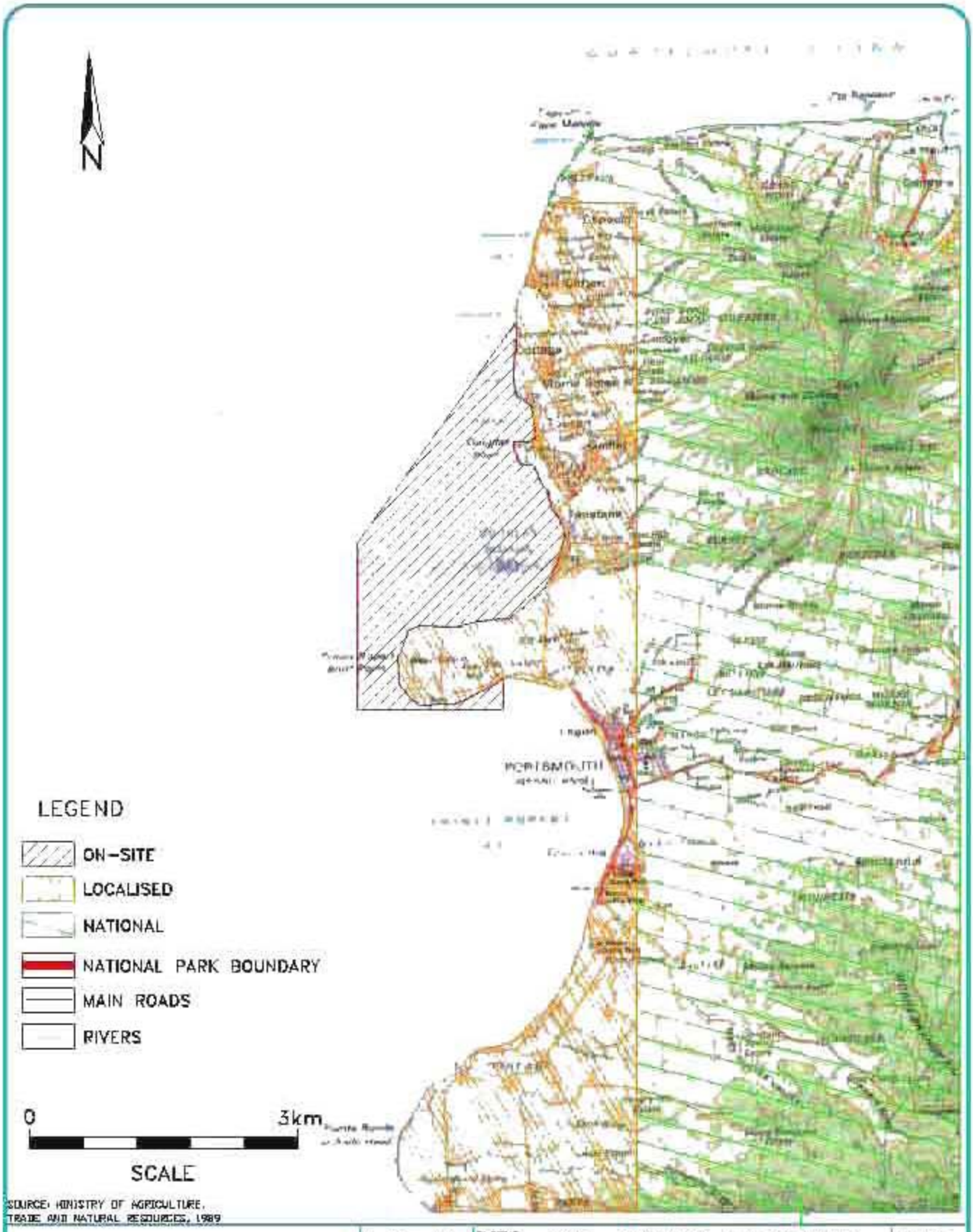
"Intensity" describes the degree of change which may result from the potential impact. In this classification system, intensity has been based on ecosystem effects and the effects to social groups, and four classes have been defined:

| | |
|---|---|
| **Very Small** | Effects on a few persons or individual organisms, but no significant effects on the functioning or sustainability of social groups, specific ecosystems or services. |
| **Minor** | Marked effects on several individuals, and limited effects on the functioning or sustainability of social groups, specific ecosystems or services. |
| **Medium** | Significant effects on the functioning or sustainability of social groups, specific ecosystems or services. |
| **Major** | Serious impairment of the functioning or sustainability of social groups, specific ecosystems, or services. |

### B.2.3 Nature

"Nature" considers the whether the potential impact is expected to be reversible or irreversible. In this classification system, these have been defined as:

| | |
|---|---|
| **Reversible** | Impacts which can be reduced or modified. |
| **Irreversible** | Impacts which are considered to be unavoidable and cannot be reduced or modified. |




| | | | |
|---|---|---|---|
| Ecosystems Caribbean Ltd. | Eco Report No. 11/2007 | CLIENT: OECS – ENVIRONMENT AND SUSTAINABLE DEVELOPMENT UNIT | FIGURE NUMBER |
| | Date: 31/07/07 | PROJECT: CABRITS NATIONAL PARK (MARINE COMPONENT) SIRE REPORT | B-1 |
| | | DWG. NAME: CLASSES OF EXTENT | |

## B.3 CLASSIFICATION OF IMPACTS

Tables B-1and B-2 indicate the classifications of impacts on a scale of "Low", "Moderate", "High" and "Extreme", based on extent, intensity and nature. However, the following are rated as "Extreme" regardless of extent, intensity or nature:

- impacts which exceed the limits set in environmental standards or rules,
- impacts which violate Dominica's international commitments, and
- impacts which affect environmentally sensitive areas or species.

### TABLE B-1: CLASSIFICATION OF REVERSIBLE IMPACTS

| INTENSITY | AREA | | |
|---|---|---|---|
| | On-Site | Localized | National |
| **Very Small** | LOW | LOW | MODERATE |
| **Minor** | LOW | LOW | MODERATE |
| **Medium** | LOW | MODERATE | MODERATE |
| **Major** | MODERATE | MODERATE | HIGH |

### TABLE B-2: CLASSIFICATION OF IRREVERSIBLE IMPACTS

| INTENSITY | AREA | | |
|---|---|---|---|
| | On-Site | Localized | National |
| **Very Small** | LOW | MODERATE | MODERATE |
| **Minor** | MODERATE | MODERATE | HIGH |
| **Medium** | MODERATE | HIGH | EXTREME |
| **Major** | HIGH | HIGH | EXTREME |

Environmental Impacts are evaluated following the implementation of appropriate mitigation and control practices. Assigning a consequence severity and likelihood to each event qualitatively rates the risk of each environmental impact. The risk level is determined by the position on the risk matrix where the event falls. An appropriate response and prioritization to each environmental risk has been developed:

- Extreme: Intolerable environmental risk with significant and urgent actions required to reduce risk.
- High and Moderate: Implement actions necessary to reduce risk to as low a level as reasonably practical.
- Low: Monitor and manage risk to the extent necessary.

# APPENDIX C

## SPECIES LISTS AND NOTES OF AQUATIC FLORA AND FAUNA

# APPENDIX C:

# SPECIES LISTS AND NOTES OF AQUATIC FAUNA AND FLORA

This appendix contains the following:

- Lists of fish fauna noted in the CNP,
- List of coral noted in the CNP,
- List of other fauna noted in the CNP,
- List and notes of aquatic flora noted in the CNP, and
- Notes on fish fauna in the CNP (Annex).

The fauna are separated into the following headings:

- Fish
- Corals
- Other Fauna

The flora is separated into the following headings:

- Seagrass
- Algae

## C.1 Aquatic Fauna

### C.1.1 Fish

A total of 7 roving diver surveys were conducted for this study and at least 46 species were noted. Table C-1 below lists the fish fauna within the CNP. The species notes to these species are present in the annex to this appendix.

**TABLE C-1: LIST OF FISH FAUNA IN CNP (ECOENGINEERING 2007)**

| FISH SPECIES | SCIENTIFIC NAME |
|---|---|
| Angelfish - French angel | *Pomacanthus paru* |
| - Rock beauty | *Holacanthus tricolour* |
| - Gray angel | *Pomacanthus arcuatas* |
| Barracuda | *Sphyraena sp.* |
| Black-bar Soldierfish | *Myripristis jacobus* |
| Chromis - Blue Chromis | *Chromis cyanea* |
| - Brown chromis | *Chromis multilineata* |
| Butterfly fishes | *Chaeetodon spp.* |
| Creole fish | *Paranthias furcifer* |
| Damselfish | *Stegastes spp.* |
| Eels - Garden eels | *Heteroconger halis* |
| - Sharptail eel | *Myrichthys breviceps* |
| Flying Gurnard | *Dactylopterus volitans* |
| Goat fish | *Mulloidichthys martinicus* |
| Gobies | *Coryphopterus spp.* |
| | *Ioglossus spp.* |
| Groupers - Grasby | *Cephalopholis cruentata* |
| - Red hind | *Epinephelus guttatus* |
| Grunts - Black margate | *Anisotremus surinamensis* |
| - Blue stripped grunt | *Haemulon sciurus* |
| - Caesar grunt | *Haemulon carbonarium* |
| - French grunt | *Haemulon flavolineatum* |
| - Porkfish | *Anisotremus virginicus* |
| - Smallmouth grunt | *Haemulon chrysargryeum* |
| - Striped grunt | *Haemulon striatum* |
| - White grunt | *Haemulon plumieri* |
| Lizardfish | *Synodus sp.* |
| Cero | *Scomberomorus sp.* |
| Parrotfish - Princessparrotfish | *Scarus taeniopterus* |
| - Queen parrotfish | *Scarus vetula* |
| - Stoplight parrotfish | *Sparisoma viride* |
| - Striped parrotfish | *Scarus iserti* |
| Puffer Fish - Bandtail puffer | *Sphoeroides spengleri* |
| - Sharpnose puffer | *Canthigaster rostrata* |
| Sergeant Major | *Abudefduf saxatilis* |

| FISH SPECIES | SCIENTIFIC NAME |
|---|---|
| Snappers - Dog tooth snapper<br>- Glass eye snappers<br>- Mahogany snapper<br>- Yellowtail snapper | *Lutjanus joco*<br>*Heteropriacanthus cruentatus*<br>*Lutjanus mahogoni*<br>*Ocyurus chrysurus* |
| Spanish hogfish<br>Spotted scorpianfish | *Bodianus rufus*<br>*Scorpaena plumieri* |
| Surgeon Fish - Doctorfish<br>- Blue tang | *Acanthurus chirurgus*<br>*Acanthurus coeruleus* |
| Trumpetfish<br>Wrasse - Bluehead wrasse<br>- Creole wrasse<br>Yellowhead jawfish | *Aulostomus maculates*<br>*Thalassoma bifasciatum*<br>*Clepticus parrai*<br>*Opistognathidae aurifrons* |

C.1.2 Corals

A total of 7 roving diver surveys were conducted for this study and a total of 11 classes of coral were noted. Table C-2 below lists the corals within the CNP.

**TABLE C-2: LIST OF CORALS IN CNP (ECOENGINEERING 2007)**

| COMMON NAME | SCIENTIFIC NAME | SPECIES NOTES |
|---|---|---|
| Finger Coral<br>Thin Finger Coral<br>Branched Finger coral | *Porites porites*<br>*Porites divaricata*<br>*Porites furcata* | Colonies of this genus form smooth branches, with embedded corallites. *P. porites* has stout, irregular, stubby branches with blunt and often enlarged tips. *P. divaricata* has finger-like, widely spaced branches that often divide near the tip. *P. furcata* has finger-like, tightly compacted branches.<br><br>All three forms are common to most reef environments and depths. Brittlestars, sea urchins and chitons often live among tightly compacted braches. |

| COMMON NAME | SCIENTIFIC NAME | SPECIES NOTES |
|---|---|---|
| Lamarck's Sheet Coral, Lettuce / Plate coral | *Agaricia lamarcki* | A common Caribbean species, this coral inhabits sloping reef faces and walls. It is one of the most abundant coral on deep reefs and walls. Colonies form large, thin sheets or flattened plates that often overlap. Colonies' undersides have no polyps and are quite smooth. |
| Boulder Star Coral | *Montastrea annularis* | A very common and often predominant coral species to reef environments and the Caribbean. Surface densely covered with small, protruding corallites. Colours range from green to brown to yellow-brown to grey. |
| Boulder Brain coral | *Colpophyllia natans* | Generally inhabiting reef tops and seaward reef slopes. Colonies generally form runded domes, but also encrust constructing large rounded plates. The surface is covered with convoluted system of ridges and valleys. |
| Grooved Brain Coral | *Diploria labrinthiformis* | Colonies form hemispherical heads with deep, narrow, polyp bearing valleys. Valleys are highly convoluted and often interconnected. These inhabit seaward slope of reefs, most common between 15-50 ft. |
| Symmetrical Brain Coral | *Diploria strigosa* | An abundant reef coral, they inhabit many marine environments. Most commonly between 20-40 ft. Colonies form contoured plated with long valleys, often connected and convoluted. Green to brown, yellow-brown and bluish gray with valleys often brighter or of contrasting colour. |
| Blade Fire Coral | *Millepora complanata* | Colonies form thin, upright blades or plates that extend from an encrusting base. M*. complanata* inhabits shallow water reef tops, usually in areas with some water movement and most common in areas with constant surge. |

| COMMON NAME | SCIENTIFIC NAME | SPECIES NOTES |
|---|---|---|
| Branching Fire Coral | *Millepora alcicornis* | This hydrocoral forms colonies of multiple branching structures, often encrusting and overgrow gorgonian colonies and taking their shape. They inhabit all marine environments and common in depths greater than 30 ft. |
| Maze Coral | *Meandrina meandrites* | Colinies form both hemispherical heads and flattened plates; on occasion may encrust or form columns resembling Pillar Coral. Ridges are created by smooth, widely separated, vertical plates. They inhabit most reef environments at depths 25 – 75 ft., especially on the seaward side. |
| Giant Split-Pore Sea Rod | *Plexaurella nutans* | Colonies very tall with thick stalks and sparse, dichotomous branching. Branch tips usually somewhat enlarged. Primarily inhibit clear water patch and fore reefs. |
| Sea Plume | *Pseudopterogorgia biplinnata* | Colonies generally inhabit moderate to deep, clear water patch reefs. Branches most commonly purple to violet occasionally bright yellow to whitish. |

C.1.3 Other Fauna

**TABLE C-3 LIST OF SPONGES IN MC/CNP (ECOENGINEERING 2007)**

| SPECIES NAME | SCIENTIFIC NAME |
|---|---|
| Azure vase sponge | *Callyspongia plicifera* |
| Barrel sponges | *Xestospongia muta* |
| Branching Tube Sponge | *Pseudoceratina crassa* |
| Brown tube sponge | *Agelas conifera* |
| Brown clustered tube sponge | *Agelas wiedenmyeri* |
| Green finger sponge | *Iotrochota birotvlata* |
| Viscous sponge | *Plakortis angulospiculatus* |

**TABLE C-4 LIST OF SEGMENTED WORMS IN MC/CNP (ECOENGINEERING 2007)**

| SPECIES NAME | SCIENTIFIC NAME |
|---|---|
| Feather Duster Worms | Family: Sabellidae |
| Spaghetti Worm | Family: Terebellidae |

**TABLE C-5 LIST OF CRUSTACEANS IN MC/CNP (ECOENGINEERING 2007)**

| SPECIES NAME | SCIENTIFIC NAME |
|---|---|
| Channel Clinging Crab | *Mithrax spinosissimus* |
| Caribbean Spiny lobster | *Panulirus argus* |
| Shrimp | Suborder; Natantia |
| Arrowhead Crab | *Stenorhynchus seticornis* |

**TABLE C-6 LIST OF MOLLUSCS IN MC/CNP (ECOENGINEERING 2007)**

| SPECIES NAME | SCIENTIFIC NAME |
|---|---|
| Queen Conch | *Strombus gigas* |
| Flamingo tongue | *Cyphoma gibbosum* |
| Caribbean Reef Squid | *Sepioteuthis sepiodea* |
| | |

**TABLE C-7 LIST OF ECHINODERMS IN MC/CNP (ECOENGINEERING 2007)**

| SPECIES NAME | SCIENTIFIC NAME |
|---|---|
| Cushion Sea Star | *Oreaster reticulates* |
| Giant Basket Star | *Astrophyton muricatum* |
| Long-spine Urchin | *Diadema antillarum* |
| Red Heart Urchin | *Meoma ventricosa* |
| Sea Cucumber | *Holothuria mexicana* |

## C.2 Flora

### C.2.1 Seagrass

Turtle Grass (*Thalassia testudinum)*: A very abundant sea grass to sandy bottoms and areas of mixed sand and coral rubble. The leaves are generally erect, flat, ribbon-shaped and green with rounded tips. Leaves are usually covered with sediment and encrusting organisms.

Manatee Grass (*Syringodium filiforme*): Manatee grass shares the same habitat as Turtle grass, and is generally found mixed in with the latter. Leaves are erect, thin, stem-like, green and cylindrical.

### C.2.2 Algae

Dead Man's Fingers (*Codium isthmocladum*): An occasional alga in the Caribbean growing on rocky substrates, occasionally on reefs. Most common in shallow areas between 5 – 25 ft.

Encrusting Fan-Leaf Algae (*Lobophora variegate*): *Lobophora* is an abundant Caribbean alga, growing in most reef environments, encrusting great areas of shaded, rocky substarte. Blade surfaces often covered with sediment and encrusted with other growths (epiphytes)

Feather Algae (*Caulerpa sp.*): An occasional alga in the Caribbean growing in shallow sandy areas, often between protected shallow reefs. Also grow in areas of mangroves and occasionally attach to their roots.

Sargassum Algae (*Sargassum sp*): *Sargassum* is a very common reef alga. They attach to substrate and grow in a bushy, upright form. Leaves are long, oval shaped blades and vary from smooth to striated edged. Along the stems are spherical gas filled floats.

Y branched alga (*Dictyota sp*): Another alga abundant within the Caribbean, growing in most reef environments. This species grows on rocky substrates, often covering boulders around the base of coral heads and vertical rock faces. They are easily recognised by the fork near their ends. Generally they form mats of dense to loose packed flat leaves that overgrow the substrate

Watercress Alga (*Halimeda sp.*): These Green Algae grows in this, profusely branched clumps of rounded, three-lobed or ribbed leaf-like segments. They grow in shallow depressions, cracks and crevices between hard corals. The calcified leaves of this and other species of *Halimeda* are considered major contributors of calcium carbonate to the reefs and sand.

# ANNEX TO APPENDIX C

## FISH SPECIES NOTES

# ANNEX TO APPENDIX C

## FISH SPECIES NOTES

Banded Butterflyfish (*Chaetodon striatus*) inhabit coral reefs. Occur singly or in pairs. Feed on polychaete worms, coral polyps, crustaceans and mollusc eggs. Form pairs during breeding. Adults may form plankton-feeding aggregations of up to 20 individuals, and occasionally clean other reef fishes which join the group, such as grunts, parrotfishes and surgeon fishes. Depth range 3 – 55 m.

Blackbar Soldirefish (*Myripristis jacobus*): A small red to silvery red fish with big eyes, a vertical black bar just behind the head. They often hide in dark recesses, often swimming upside-down, orienting themselves to cave ceilings. They are curious and often peer out at divers.

Blue Chromis (*Chromis cyanea*) is common above deep outer reefs and feeds in aggregations of the small zooplankton, primarily copepods. It is often with creole wrasse. Distribution included the Western Atlantic: Bermuda, southern Florida (USA), and the Caribbean Sea including the Bahamas, Gulf of Mexico and Antilles.

Bluehead Wrasse (*Thalassoma bifasciatum*): Body elongate; 3 primary colour phases, the smallest with a black mid-lateral stripe which continues as pale red blotches on the head; back above stripe yellow on reef fish and whitish on fish from inshore non-reef areas, and body below white. The largest phase has a bright blue head and a green body with two broad vertical black bars anteriorly which are separated by a light blue interspace; this phase is always male. The small yellow phase with the black stripe may be either male or female. These fish inhabit reef areas, inshore bays and seagrass beds and feed mainly on zooplankton and small benthic animals. They may also feed on ectoparasites of other fishes

Blue Tang (*Acanthurus coeruleus*) is a deep-bodied surgeonfish with a conspicuous yellow caudal spine. It has the most distinctive coloration of all western Atlantic surgeonfishes. It inhabits coral reefs (2-40m), inshore grassy or rocky areas. Forms small groups and is mainly diurnal, feeding entirely on algae.

Brown Chromis (*Chromis multilineata*): like the blue chromis, is common above deep outer reefs and feeds in aggregations of the small zooplankton, primarily copepods.

Damselfish (*Stegastes partitus*): Inhabits shallow coral reefs and isolated patch reefs in deeper water. This fish feeds primarily on algae but also on polychaetes, hydroids, copepods and ascidians. They are aggressively territorial, will chase and nip intruders of all sizes, including divers.

Caribbean Sharpnose-puffer (*Canthigaster rostrata*) inhabits reefs and marginal habitats such as seagrass beds. Diet consists of seagrass, sponges, crabs and other crustaceans, molluscs, polychaete worms, sea urchins, starfishes, hydroids and algae. Distribution includes Western Central Atlantic: South Carolina, USA and Bermuda to Tobago and the Lesser Antilles. Depth range 1 – 40 m.

Doctorfish (*Acanthurus chirurgus*) is usually found in waters 2 – 25 m in depth, with a global distribution spanning the Western Atlantic: Massachusetts (USA), Bermuda, and the northern Gulf of Mexico to São Paulo, Brazil. Eastern Atlantic: Senegal. It inhabits shallow reefs or rocky areas and is found in loose aggregations. It is mainly diurnal and ingests sand when feeding on algae

Flying Gurnard (*Dactylopterus volitans*): Grayish body with white spots, blunt snout and huge, fan-like pectoral fins that have iridescent blue line and dot markings. Inhabit sad, coral rubble and sea grass, often near shallow patch and fringe reefs. Normally fold pectoral fons on side and perch, or 'walk' on ventral fins. When alarmed, spreads pectoral fins and swims away.

French Angel (*Pomacanthus paru*): Black with bright yellow rims on scales. Tail is rounded. Bright yellow ring around eye. All fins black except base of pectoral which is yellow. Swims about reefs often in pairs and are relatively unafraid of divers.

French Grunt (*Haemulon flavolineatum*): Mostly yellow, paler below. Scales are below lateral line in oblique rows and much larger than those above lateral line. No other grunt has enlarged scales below the lateral line. Occurs in large schools on rocky and coral reefs, often under ledges or close to elkhorn coral. Juveniles are abundant in near-shore seagrass beds. This species feeds mainly on small crustaceans.

Garden Eel (*Heteroconger halis*): very common in the Caribbean. Thin body, dark brown to gray, jutting lower jaw. Found in colonies on sand near coral reefs. Extend head and upper body from burrows. Continiously move in wave like motions to catch plankton. They are extremely shy and withdraw into burrows when approached.

Grasby Grouper (Cephalopholis cruentata): light reddish brown to grey, with darker orangish-brown spots over body. Can change to pale or dark tones. This is a commercially important species.

Gray Angelfish (*Pomacanthus arcuatus)*: Pale gray around mouth, and pale gray margin on caudal fin. The inside of the pectoral fin is yellow. Juveniles are black with two light yellow bars on body and three on head; caudal fin yellow with a vertically elongate, nearly rectangular or hemispherical black spot in middle. This species is common in coral reefs, usually solitary, occasionally in pairs. Juveniles are part-time cleaners. Feed mainly on sponges, but also takes tunicates, algae, zoantharians, gorgonians, hydroids, bryozoans, and seagrasses.

Great barracuda (*Sphyraena barracuda*): Distinguished by the double emarginate tail fin with pale tips on each lobe, and (usually) the presence of a few scattered black blotches on the lower sides. Top of head between eyes flat or concave while the mouth is large. Found predominantly at or near the surface. Juveniles occur among mangroves, estuaries and shallow sheltered inner reef areas; adults occur in a wide range of habitats from murky inner harbours to open seas. Diurnal and solitary, but can also be found in small aggregations. They feed on fishes, cephalopods and sometimes on shrimps.

Lane Snapper (*Lutjanus synagris*) found over all types of bottom, but mainly around coral reefs and on vegetated sandy areas. Often forms large aggregations, especially during the breeding season. They feed at night on small fishes, bottom-living crabs, shrimps, worms, gastropods and cephalopods. Good food fish, it is marketed fresh.

Porkfish (*Anisotremus virginicus*) is a reef-associated, non-migratory fish found in waters ranging between 1 – 15 m in depth. This species is strictly an Atlantic species found in the Atlantic Ocean: Rhode Island, USA to Uruguay in the western Atlantic, abundant on Caribbean reefs; around islands of the mid-Atlantic, Cape Verde, and along the tropical coast of western Africa south to Angola. Juveniles are common in tide pools while adults found over shallow reef tops. Adults frequently form large feeding aggregations of up to several hundred individuals. Food items include algae, small crustaceans and fish, and various invertebrate larvae.

Princess parrotfish (*Scarus taeniopterus*): Juveniles and young adults dark olive above with 2 broad dark stripes: upper from tip of snout through eye to middle of caudal fin base, lower from chin through pectoral fin base to lower caudal fin base; white area above upper stripe continues around front of head above eye. Found on bottoms with coral or rock. Juveniles often occur in association with Thalassia. Forms large feeding aggregations and feeds on plants. They sleep in a mucus cocoon.

Queen Parrotfish (*Scarus vetula*): Young adults of both sexes dark gray overall, with broad white stripe slightly below mid-side. Super males have upper pectoral fin margin and upper and lower margins of tail dusky with submarginal band of brownish orange. They inhabit coral reefs and adjacent habitats. Feeds on algae scraped from rocks or dead coral and sleep in a mucus cocoon. They are often seen in groups of one super male with several young adults, most of which are probably females. A protogynous hermaphrodite.

Red Hind (*Epinephelus guttatus*): similar to the grasby grouper with whiter / paler skin colour. Is also commercially important.

Rock beauty (*Holacanthus tricolour*): Front of body yellow; remaining parts of body, dorsal fin, and front of anal fin black. Caudal fin entirely yellow. Front margin of anal fin and edge of gill cover orange; bright blue on upper and lower part of iris. The young are approximately an inch in length are entirely yellow except for a blue-edged black spot on the upper side of the body posterior to the midpoint; with growth the black spot soon expands to become the large black area covering most of the body and dorsal and anal fins. They inhabit rock jetties, rocky reefs and rich coral areas. Juveniles often associated with fire corals. They feed on tunicates, sponges, zoantharians and algae.

Sharptail Eel (*Myrichthys breviceps*): Often greyish with small yellow spots on head. Body spots have pale yellow. This species is relatively rare in the Caribbean. They hide during the day in sand or shallow reef patches and forage in the open at night. It allows a close approach before disappearing into its hole or the sand.

Smallmouth grunt (*Haemulon chrysargyreum*) inhabits exposed rocky areas and coral reefs. Often near elkhorn and staghorn corals. Commonly found in schools. Juveniles are encountered in *Thalassia* beds. Adults are observed in coral reefs during the day but enter open waters at night to feed mainly on plankton, but also on small crustaceans and molluscs.

Stoplight Parrotfish (*Sparisoma viride*): A distinctive, colourful and abundant fish. Young adults and females have scales outlined in darker gray; often bright red below. Super males green, with bright yellow spot at upper edge of gill cover, yellow bar at base of tail, curved orange-yellow mark on caudal fin rays. Initial phase fish with a brown head, the scales of the upper two-thirds of the body with pale centers and dark brown edges, the lower third of body and fins bright red. Terminal phase males are green with three diagonal orange bands on upper half of head. They inhabit coral reefs with clear water. Young may be found in seagrass beds and other heavily vegetated bottoms. Feeds mainly on soft algae, but has been observed to graze on live corals like, *Montastraea* annularis. Produces a significant amount of sediment through bio-erosion using its strong beak-like jaws and constantly re-growing teeth

Striped Parrotfish (*Scarus iseri*): Found over shallow, clear waters, generally over Thalassia beds. Also found rocky or coral areas. A schooling species, they feed on plants. A protogynous hermaphrodite. Super males spawn individually with striped females, while sexually mature males in the striped phase spawn in aggregation.

Trumpetfish (*Aulostomus maculatus*) is commonly found in weedy areas and especially around reefs, where they usually swim snout-down among sea whips (gorgonians). It is a solitary ambusher of small fishes and crustaceans that lurk among branching coral or gorgonians. Often swims behind large herbivorous fishes to sneak up on prey. Mouth opens to diameter of body to suck in prey.

Yellow Goatfish (*Mulloidichthys martinicus)* White, upper body may have shadings ranging from olive to red. They have yellow tails and mid body stripe and to barbells on the upper tip of chin. They are very common. They feed by digging up sand and areas of rubble.

# APPENDIX D

## CABRITS TERRESTRIAL FLORA AND FAUNA

# APPENDIX D

## CABRITS TERRESTRIAL FLORA AND FAUNA

This appendix contains the following:

- Species list of flora species in CNP (Notes in Annex 1)
- Species list of Avifauna in CNP (Notes in Annex 1)
- Species list of other fauna in CNP (Notes in Annex 1)

### TABLE D-1 LIST OF FLORA SPECIES IN CNP

| COMMON NAME | SCIENTIFIC NAME |
|---|---|
| White Cedar | *Tabebuia heterophylla* |
| Wezinye | *Cocoloba pubescens* |
| Savonnet | *Lonchocarpus benthamianus* |
| Naked Indian | *Bursera simaruba* |
| Kanpech | *Haematoxylum campechium* |
| Bay Leaf | *Pimenta racemosa* |
| Kachimon Mawon | *Annona glabra* |
| Hoopwood | *Dalbergia ecastaphyllum* |
| White Mangrove | *Laguncularia racemosa* |
| Roseau Reed | *Gyerium sagitata* |
| Sawgrass | *Cladium jamaicens* |
| Jon | *Eleocharis mutata and E. interstincta* |
| Swamp Fern | *Achrosticum danaefolium* |
| Gwenn Job | *Coix lacryma-jobi* |
| Water Lily | *Typhae sp* |
| Swamp Bloodwood | *Pterocarpus officinalis* |
| Strangler Fig | *Ficus citrifolia* |

## TABLE D-2 LIST OF AVIFAUNA IN CNP

| COMMON NAME | SCIENTIFIC NAME |
|---|---|
| Scaly-naped Pigeon | *Columba squamosa* |
| Smooth-billed Ani | *Crotophaga ani* |
| Little blue Heron | *Egretta caerulea* |
| Cattle Egret | *Bubulcus ibis* |
| Green Heron | *Butorides striatus* |
| Teals | *Anas sp.* |
| Dowitchers | *Limnodromus sp.* |
| Warblers | *Dendroica sp.* |
| Sandpipers | *Calidris sp.* |
| Yellowlegs | *Tringa sp.* |
| Common Moorhen | *Gallinula chloropus* |

## TABLE D-3 LIST OF OTHER FAUNA IN CNP

| COMMON NAME | SCIENTIFIC NAME |
|---|---|
| Dominican Tree Lizard | *Anolis oculatus* |
| Dominican Ground Lizard | *Ameiva fuscata* |
| Fantastic Gecko | *Sphaerodacylus fantasticus* |
| White Crab | *Cardisoma guanhumi* |
| Fiddler Crab | *Uca sp.* |
| Freshwater Shrimp | *Machrobrachium sp.* |
| West Indian Tree Frog | *Eleutherodactylus martini* |

# ANNEX TO APPENDIX D

## SPECIES LISTS AND NOTES OF TERRESTRIAL FLORA AND FAUNA

# ANNEX 1

## FLORA SPECIES NOTES

White Cedar (*Tabebuia heterophylla*) is a common tree along the dry leeward coast of Dominica. The tree is deciduous and has short, thick buttresses. Its flowers are bell-shaped and mauve, pink or whitish. Its leaves are compound with up to five digits. The species can be found in coastal areas.

Wezinye (*Cocoloba pubescens*) is a common tree species in the dry forest at the Cabrits. It is found mostly on the northern side where it receives a steady breeze and a small amount of salt spray.

Savonnet (*Lonchocarpus benthamianus*) is one the most common species of trees in Cabrits. It has a tall straight stem with relatively smooth grey bark. Its flowers are small and lavender or pink. It has light, flat, greyish brown seedpods.

Naked Indian (*Bursera simaruba*) is a deciduous tree with compound leaves. A common characteristic of it is its peeling outer bark. The bark is smooth, thin and reddish-brown or grey in colour. As the bark peels it exposes a deep green under-bark that is spotted with several white lenticels. It is fairly widely distributed at Cabrits.

Kanpech (*Haematoxylum campechium*) is a thorn bearing tree that is common to some parts of Cabrits. Its flowers are small, fragrant and bright yellow. It produces small, papery fruits.

Bay Leaf (*Pimenta racemosa*) is not a common tree in Cabrits. The tree is an evergreen with a small dense crown of shiny, dark green leaves, near vertical branches and slight buttresses. It also has a slightly fluted trunk with light brown bark that flakes off in large chunks exposing a relatively smooth stem. Its leaves have a pungent fragrance.

Kachimon Mawon (*Annona glabra*) is one of the most common swamp trees in Cabrits. It is a small tree that branches from near its base and produces an open crown of shiny dark green leaves. It is a fruit bearing tree to which its fruit ripens to a golden yellow colour. The tree usually produces several short, thick, tightly packed buttresses at the base of the short stem. Older trees produce pneumatophores that can grow to be two feet tall and four feet in circumference at the base. The species grows in pure stands that merge into patches with other swamp tree species.

Hoopwood (*Dalbergia ecastaphyllum*) grows in or on the edges of the marsh at Cabrits. It is a trailing shrub with white flowers.

White Mangrove (*Laguncularia racemosa*) is the second most common tree in the Cabrits wetland and is the only typical swamp tree in the area that is able to withstand brakish soil conditions. These trees can grow up to 50 feet tall and they have generally straight stems with no buttresses. The trees usually produce dense mats of pneumatophores near their base or along watercourses.

Wild cane (*Gyerium sagitata*) can be found in areas to the east of the wetlands. These areas are under cultivation but also contains wetland plants such as this one.

Sawgrass (*Cladium jamaicens*) covers the greater part of the Cabrits wetland. This is a sedge with a thick, 7-8ft tall stem with a triangular cross-section, and sharp cutting edges on its leaves and stems. The plant grows in tussocks that are supported by large “balls” of spongy prop roots.

Jon (*Eleocharis mutata and E. interstincta*) are dominant sedges in the marshlands of Dominica. E. interstincta has a three-sided stem. However the stem of Eleocharis mutata is circular in cross-section. Neither of the two has cutting edges.

Swamp Fern (*Achrosticum danaefolium*) can be found in the marsh of Cabrits growing in patches. It grows in large, thick tussocks. This fern has leathery fronds that are about 10-12 feet long. The leaves are a golden colour due to the numerous golden spores on the surface of its leaves. It has prop roots.

Gwenn Job (*Coix lacryma-jobi*) grows in or on the edges of marsh in Cabrits. It is a common plant found in these areas.

Water Lily (*Typhae sp*) is a small plant with white flowers which exists on the western edge of the wetland. It dies back annually in the dry season when the marsh dries up and rejuvenates in the wet season.

Swamp Bloodwood (*Pterocarpus officinalis*) is a freshwater swamp tree of the Cabrits wetlands. They can grow distinctly or in the stands with other tree species.

Strangler Fig (*Ficus citrifolia*) is a tree that is restricted to the built up areas of Cabrits and to the narrow band of coastal vegetation. It is a strangler tree which eventually replaces its host. This tree produces adventitious roots from its branches.

## AVIFAUNA SPECIES NOTES

Scaly-naped Pigeon (*Columba squamosa*) is a resident bird which can be found at Cabrits. It is a commonly hunted bird outside the Cabrits National Park. It is a herbivore which feeds on seeds, nectar or fruit.

Smooth-billed Ani (*Crotophaga ani*) is a common bird species associated with the swamps of Dominica. It can be found in Cabrits and acquires food directly from the swampy areas.

Little blue Heron (*Egretta caerulea*) has been a common resident in Cabrits over the years. These birds feed on the flesh of the other animals such as insects and juvenile fish. They are predators in these areas.

Cattle Egret (*Bubulcus ibis*) is a resident bird commonly found in the wetlands at Cabrits. It feeds on insects especially grasshoppers and crickets but also on spiders, frogs and lizards. Nearly all feeding is done in freshwater areas.

Green Heron (*Butorides striatus*) is a common resident in Cabrits over the years. These birds feed on the flesh of the other animals such as insects and juvenile fish. They are predators in these areas.

Teals (*Anas sp.*) are common winter visitors from the north. They can be found in freshwater marshes when present. They feed on aquatic vegetation.

Dowitchers (*Limnodromus sp.*) are visitors that frequent mudflats. They feed on molluscs, aquatic insects and worms.

Warblers (*Dendroica sp.*) are migratory birds of the wetlands of Cabrits. They feed on small insects or berries

Teals (*Anas sp.*) are common winter visitors from the north. They can be found in freshwater marshes when present. They feed on aquatic vegetation.

Dowitchers (*Limnodromus sp.*) are visitors that frequent mudflats. They feed on molluscs, aquatic insects and worms.

Warblers (*Dendroica sp.*) are migratory birds of the wetlands of Cabrits. They feed on small insects or berries.

Sandpipers (*Calidris sp.*) Have been recorded over the years in the Cabrits National Park. It is a migratory bird that frequents the wetlands. It feeds on aquatic vegetation and small organisms.

Yellowlegs (*Tringa sp.*) are common winter visitors frequenting the swamps of Dominica. It has been sited in Cabrits. It feeds on crustaceans, molluscs and insects.

Common Moorhen (*Gallinula chloropus*) is a common resident bird at Cabrits. It feeds on seeds and leaves of water plants as well as aquatic insects, worms and tadpoles.

## SPECIES NOTES FOR OTHER FAUNA

### Reptiles

Dominican Tree Lizard (*Anolis oculatus*) is one of the most common lizards at Cabrits. It is endemic to Dominica. At the Cabrits Peninsula they are most abundant. Adults are mostly found on trees. They frequent the wetland to feed on the fallen fruit of the Pond Apple and to scavenge when the ground on the swamp are marsh and dry.

Dominican Ground Lizard (*Ameiva fuscata*) is a common resident of Dominica to which it is endemic to. It is a large blue, grey and white lizard often found basking on rocks or on the sides of the trails at Cabrits. Juveniles are copper-brown. These lizards feed on fallen fruit and scavenge in the dry parts of swamps.

Fantastic Gecko (*Sphaerodacylus fantasticus*) is the smallest lizard in Cabrits having a length of 1.5 inches. It is one of the rarest species in Dominica. These lizards feed on fallen fruit and scavenge in the dry parts of swamps.

### Crustaceans

White Crab (*Cardisoma guanhumi*) is a common crab species to which the Cabrits swamp areas are important to in Dominica. This crab is the largest of all the terrestrial crabs found in Dominica. It is a scavenger in these areas.

Fiddler Crab (*Uca sp.*) is a wetland crab commonly found in Dominica. It is the smallest crab found on the island. It is the typical scavenger in Cabrits.

Freshwater Shrimp (*Machrobrachium sp.*) is another common crustacean associated with the wetlands of Dominica. It feeds on aquatic vegetation and scavenges on the marsh grounds.

## Amphibians

West Indian Tree Frog (*Eleutherodactylus martinicensis*) is a common resident of Dominica. This small frog bypasses the tadpole stage in its breeding cycle. It can be found in the cooler areas of the dry forest and in the wetlands. It has a greyish-brown colour and reaches a body length of about 1.25 inches.

# APPENDIX E

## MONITORING AND EVALUATING SCORECARD

**The WWR-World Bank Alliance's Scorecard to Assess Progress in Achieving Management Effectiveness Goals for Marine Protected Areas adapted for Protected Areas of the Organisation of Eastern Caribbean States**

# Presentation of the Score Card (SC)

The Score Card has been adapted from a tool developed by the World Bank – WWF Alliance for terrestrial Protected Area (Stolton S. et Al. 2003) and from other tools (Hocking M. et Al. 2000: Mangubhai S 2003). It is a simple site-level tracking tool to facilitate reporting on management effectiveness of Protected Areas (Pas). It has been built around the application of the WCPA Framework document has provided its basic structure (the WCPA framework aims both to provide some overall guidance in the development of assessment systems and to encourage standards for assessment and reporting).

TABLE 1

**Summary of the WCPA Framework**

| *Elements of evaluation* | *Explanation* | *Criteria that are assessed* | *Focus of evaluation* |
|---|---|---|---|
| ***Context*** | **Where are we now?** Assessment of importance, threats and policy environment | Significance. Threats. Vulnerability. National context. | Status |
| ***Planning*** | **Where do we want to be?** Assessment of protected area design and planning | Protected area legislation and policy. Protected area system design. Reserve design Management planning. | Appropriateness |
| ***Inputs*** | **What do we need?** Assessment of resources needed to carry out management | Resourcing of agency. Resourcing of site. Partners. | Resources |
| ***Process*** | **How do we go about it?** Assessment of the way in which management is conducted | Suitability of management processes. | Efficiency appropriateness |
| ***Output*** | **What were the results?** Assessment of the implementation of management programmes and actions: delivery of products and Services | Results of management Actions. Services and products. | Effectiveness |
| ***Outcome*** | **What did we achieve?** Assessment of the outcomes and the extent to which they achieved Objectives | Impacts: effects of management in relation to objectives. | Effectiveness appropriateness |

*Source*: Hockings et al. (2000)

The WCPA Framework[1] is based on the idea that good protected area management follows a process that has six distinct stages, or elements:

[1] For a copy of the WPCA Framework or a more detailed summary please visit the WCPA web-site at: www.iucn.org/themes/wcpa

1. context
2. planning
3. inputs
4. processes
5. outputs
6. outcomes

Table 1 contains a very brief summary of the elements of the WCPA Framework and the criteria that can be assessed. The Score Card has been designed to fulfill the elements of evaluation included in the Framework.

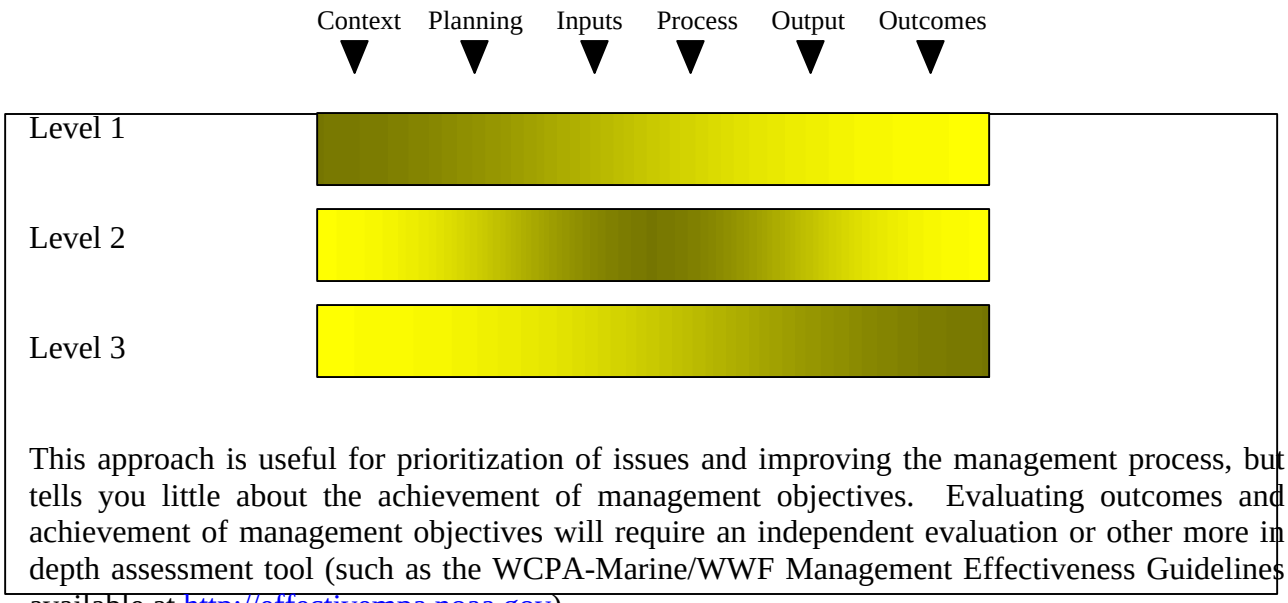
The original version of the Score Card is also available (in English, French and Spanish) online at the following web site: www.mpascorecard.net. Results may also be made available online if PA managers are willing to share them.

**Level of detail in the assessment**

Hockings et al.2000 identified 3 possible levels of evaluation, each requiring different amounts of data collection and financial input. The scorecard presented here is a level 1 assessment (see figure 2). This type of assessment (level 1) requires little or no additional data collection and focuses on the context of the PA along with the appropriateness of planning, inputs and processes of management. It relies largely on available data through literature searches and informed opinions of site managers and/or independent assessors, takes a short period of time and costs little. Issues are broadly covered, but depth of analysis is generally low.

FIGURE 2

**Three levels of assessment**




This approach is useful for prioritization of issues and improving the management process, but tells you little about the achievement of management objectives. Evaluating outcomes and achievement of management objectives will require an independent evaluation or other more in depth assessment tool (such as the WCPA-Marine/WWF Management Effectiveness Guidelines available at http://effectivempa.noaa.gov).

**Limitations and disclaimer**

The Score Card is aimed at helping managers report progress on management effectiveness from a given baseline. It should not replace more thorough methods of assessment for the purposes of adaptive management. The Score Card tool has been adapted/developed to provide a quick overview of the initial state of management efforts and subsequent progress, over a period of years, in improving the effectiveness of management in a given marine protected area. The Score Card is designed to be filled in the manager or other relevant site staff.

The tool does not allow a detailed evaluation of outcomes, but rather serves to provide a quick overview of the status of management steps identified in the WCPA Protected Area Management Framework, up to and including outputs.

The whole concept of "scoring" progress is fraught with difficulties and possibilities for distortion. The current system assumes, for example, that all the questions cover issues of equal weight, whereas this is not necessarily the case. Accuracy might be improved by weighting the various scores, although this would provide additional challenges in deciding differing weightings. In the current version a simple scoring system is maintained, but the limitations of this approach should be recognized.

**Guidance notes for using the Score Card**

The Score Card has many uses as an orientation tool to help managers of new protected areas scope out issues to be addressed in establishing an effective PA, or as tracking tool to provide managers with a sense of "where they are" along the management continuum. It also serves as a use-friendly reporting tool on PA status based on information largely already collected without any additional field level research.

The Score Card should be completed by protected area staff and, ideally, local stakeholders to validate the scoring. It is designed to be completed within relatively short period, such as during a staff meeting or other routine meeting, by referencing available reports or datasets.

Further written guidance to facilitate application of the Score Card to assess progress in achieving management effectiveness goals in OECS Protected Areas is given on the following page.

**Written Guidance to Facilitate Application of Scorecards to Assess Progress in Achieving Management Effectiveness Goals in OECS Protected Areas**

**Background**:
One objective of the recently completed regional OECS workshop[2] on "Designing Tools for Monitoring and Evaluating the Effectiveness of Protected Areas in the OECS" was to review the utility of the WWF/WB Alliance protected area management tool (scorecard) in measuring management effectiveness in protected areas (PAs). During the workshop, the proposed scorecard was evaluated and a number of suggestions were proposed and agreed in order to enhance the relevance of the methodology to the specific needs of PA sites in OECS generally, and the OPAAL-supported sites, specifically. Following the incorporation of the suggested changes in the scorecard, a main recommendation from the participants was to develop additional guidance in its application supported with a follow-up regional training workshop. The scorecards are projected to be finalized by March 2006.

**Objective**:
To provide additional written guidance to facilitate the application of scorecards to OECS protected areas.

**Score card: a summary**
A few brief points to be highlighted with respect to intent and application of PA scorecards. They were developed to be: (i) simple, (ii) easy and quick to use, (iii) applied at the level of the site, (iv) focused on measuring "management effectiveness" measured by predefined parameters, (v) give all questions equal weight, and (vi) filled out by site managers (or similarly trained professionals). There are two sections to the scorecard: (i) a data sheet, and (ii) the scorecard itself. The scorecard in turn, is divided into two parts: (i) Sections A – D which support the data sheet in describing the existing situation (or baseline), and (ii) Sections E – F which are applied at some future date to assess changes over time in management effectiveness. For purposes of OPAAL-supported PAs, after completing the baseline information (Data Sheet and Sections A - D), Sections E - F should be applied in anticipation of mid-term and end of project evaluations.

**Approach**:
A case study approach (available under separate cover from OECS ESDU) has been adopted based on the hypothetical Paradise Mountain National Park (PMNP), an IUCN Category II protected area, in the mythical country of Serendib. The PMNP has been described in a one page profile (Attachment 1). Based on this description, the scorecard Data Sheet has been filed out (Attachment 2) as have Sections A - D of the scorecard itself (Attachment 3). The Data Sheet plus Sections A-D, provide the baseline or existing situation in terms of management effectiveness in PMNP. From this baseline, a modest investment program to improve PMPA was assumed (Attachment 4). Following the implementation of the investment program, sections E - F of the scorecard were applied and the final scores tallied (Attachment 3).

In addition to the examples described above, further guidance is provided in the "Comments" column of the scorecard. There are three types of comments: (i) Comments based on clarifying/justifying the score selected, (ii) Issues based on possible problems one may encounter in attempting to decide between parameter rankings due in part to the qualitative ambiguity associated with such terms as "adequate", "significant" , "acceptable"), and (iii) Recommendations that may clarify how best to address the associated Issue.

[2] This was held in St. Lucia over the 17th and 18th of January 2006.

**Description of forms**

After the profile information on the Protected Area has been recorded (attachment 1), two forms need to be completed:

- *Datasheet* (attachment 2)
  The datasheet provides key information on the site, its characteristics and management objectives.
- *Assessment Form* (attachment 3)
  The assessment form includes distinct sections, all of which should be completed.

  - ❖ Questions and scores

    The main part of the assessment form is a series of questions grouped by management stage or element (i.e. context, planning, inputs, processes, outputs, outcomes). Each question should normally be ranked between 0 (low) and 3 (high) based on level of performance. A series of answers is provided for each question to help assessors determine the appropriate ranking.

    Questions that are not relevant to a particular marine protected area should be omitted, with a reason given in the comments section.

    This is, inevitably, an approximate process and there will be situations in which none of the four alternative answers appears to fit conditions in the protected area very precisely. We suggest that users choose the answer that is nearest and use the comments section to elaborate.

  - ❖ Comments
    The comments box allows qualitative judgments to be justified by explaining why they were made (this could range from personal opinion, a reference document, monitoring results or external studies and assessments – the point being to give anyone reading the report an idea of why the assessment was made).

    In this section we also suggest that respondents add any useful information that should be shared with other MPA managers (for example good practices or successful activities).

**Final Score**

Users will have a score for each of the six elements of evaluation and a final score after completing the assessment form. If some questions are not scored (e.g., not relevant), the maximum score should be changed to an adjusted score (maximum possible score minus points for question that are not applicable). Your final score will be a percentage of your score over the adjusted maximum score.

**Investments** (attachment 4)

Users will list the investment activities determined as a consequence of the need to improve the management effectiveness score

**Attachment 1. Cabrits National Park – Marine Area (Commonwealth of Dominica): a profile** (baseline conditions)

**Location and Basic Characteristics**: Located in the Commonwealth of Dominica (Dominica) the Cabrits National Park, was established in 1986. The Park's/Area's boundaries were delineated and the terrestrial area was physically demarcated before it was legally established. The overall area (both terrestrial and marine) is Dominica's fifth (?) largest protected area, especially when forest reserves are considered, and the marine area borders the northwest coast of Dominica.

**Biodiversity and other significant characteristics**: The marine area contains coral, sea grasses, lobsters, conchs and a variety of fishes (both coral reef and coastal pelagic) and is utilised by marine sea turtles. Anecdotal information suggests that some whales are resident in the area, however this needs to be confirmed. Underwater hot water vents have been observed as have been wrecks [note other significant geophysical characteristics, habitats (size rated) and animal biological diversity, particularly threatened or endangered species]

**Management Planning**: The IUCN categorisation of the Cabrits National Park's conservation objectives has not yet been documented. Specifically, the marine area of the Park has been identified as needing protection for biological diversity conservation, fisheries management, cultural (wrecks) and recreational (including tourism) reasons.

The marine area has not yet been incorporated in the management plan for the overall park nor has there been any effort to develop a national systems plan to date, however work has commenced on developing a management plan for the area. Enabling regulations exist within the context of the National Parks and Protected Areas Act (Chap. 42:02 of 1975), viz. User Fee regulations of 1997 and SRO # 54 of 2004 which deal with the operating and functioning of eh Park, however no regulations have been promulgated under the Fisheries Act under which it is conceived that the Marine Area can be further designated. [designated as a port under (name) act ?].

**Management Staff**: The Area is, at present, managed by the Forestry, Wildlife and Parks Division of the Ministry of Agriculture, Fisheries and the Environment. The Area has no specific budget at this time, however it is expected that this may be forthcoming as a consequence of investments from the OPAAL project. A consultative Site Implementation Entity (SIE) within the context of the OPAAL project, composed of, *inter alia*, fishers, dive operators, local government, tourism sector, and small business has recently been designated by [authority].

**Infrastructure and Equipment**: The Marine Area has no control posts at present. There is no motorized vehicular transport being utilised for the area at this time however, procurement of a vehicle is being considered. No communications equipment is available at present, however it is anticipated that this will be built into the investment plan coming out of the management planning exercise.

**Population**: The Area has a cosmopolitan population comprised of mainly people of African descent adjacent to it.

**Land Tenure**: The marine and terrestrial areas within the CNP are the property of the State.

**Main Economic Activities***:* Fisheries, tourism, and recreation.

**Main threats to biodiversity**: natural and anthropogenic disasters, over-fishing and/or destructive fishing practices, resource use conflicts.

**Attachment 2. Cabrits National Park – Marine Area Data Sheet**

**Name of the protected area**: _Cabrits National Park
**Location of protected area**: (country and, if possible, map reference): DOMINICA
**Date PA was established**: __1986_____ Agreed: _____ Gazetted: _____

**Ownership details** (i.,e. owner, tenure rights etc): ___Government of Dominica__
**Management Authority**: ___Forestry,Wildlife & Parks Division
**Contact information and web site** (if any):forestry@cwdom.dm___Tel: 1 767 266 3817
**Size of protected area**: 1053.2 acres
**Percent of PA that is respectively terrestrial/marine** (%): terrestrial: 19.8% marine:80.2%_
**Number of staff**: _____4_____Permanent: ___4___Temporary: _____Volunteers: _____
**Annual budget**: (06/07)____EC$ 225,161 _____(US$ _____)_____
**Designation** (IUCN category, World Heritage, Ramsar, etc.):Land component is on the tentative list of the World heritage Site
**Reasons for designation**: _Protection of the marine environment and marine biological diversity

**The PA is part of a larger management zoning plan**: Yes __Ö__ No _____
**Brief details of World Bank funded project or projects in PA**: _____OPAAL_____
**Brief description of the primary habitats represented in the PA**
(rain forest, wetlands, dryland forest, reefs, seagrasses, mangroves etc.) _____
Habitat 1: _____Coral reef_____
Habitat 2: _____sea grasses_____
Habitat 3: _____adjacent wetland_____
Habitat 4: _____
Habitat 5: _____
**Two primary protected area objectives**:
Objective 1: _Ensure sustainability of biological diversity_____;
Objective 2: __Enhance livelihoods of the populations adjacent to the area_____;
**Two most important threats to the PA** (and reasons why):
Threat 1: _____Unsustainable fisheries_____
Threat 2: _____Inadequately managed tourism activities and development_____
**Top two critical management activities (not necessarily in order of priority)**:
Activity 1: _____Demarcate and regulate use in the area_____
Activity 2: _____Institute management structure (including management plan)_____
**Top 4 stakeholder groups**:
Stakeholder group 1: Tourism
Stakeholder group 2: Fisheries
Stakeholder group 3: Port Authority
Stakeholder group 4: _____
**Resources conditions**: Poor _____ Average _____Good ___√_____
**Date assessment was carried out**: _____16/08/2006_____
**Name/s of assessor**: _____Stakeholder Group_____
**Role (position)**: _____
**Contact information**: _____
**Date (s) of previous score card assessments (s)**: _____not applicable_____

DOM

## Attachment 3. A. Context: Where are we now? Assessment of important threats and the policy environment

| ***1. Legal status - Does the protected area have legal status? Note: see fourth option for private reserves*** | | ***Your Score*** | ***Comments*** |
|---|---|---|---|
| The area is neither gazetted nor given cabinet approval | 0 | | |
| The government has agreed that the protected area should be gazetted but the process has not yet begun | 1 | | |
| The protected area is in the process of being gazetted but the process is still incomplete | 2 | | |
| The protected area has been legally gazetted (or in the case of private reserves is owned by a trust or similar) | 3 | 3 | |
| **Additional Point** | | | |
| a. The PA has received national and/or international recognition for its importance (in the comments column, describe the recognition in detail) | +1 | 1 | On tentative list of World Heritage Sites |
| ***2. Protected area regulations - Are unsustainable human activities (e.g. poaching) controlled?*** | | ***Your Score*** | ***Comments*** |
| There are no mechanisms for controlling unsustainable human activities in the protected area | 0 | | |
| Mechanisms for controlling unsustainable human activities in the protected area exist but there are many problems in effectively implementing them | 1 | 1 | |
| Mechanisms for controlling unsustainable human activities in the protected area exist but there are a few problems in effectively implementing them | 2 | | |

| | | | |
|---|---|---|---|
| Mechanisms for controlling unsustainalbe human activities in the protected area exist and are being effectively implemented | 3 | | |
| ***3. Law enforcement - are enforcement rules effectively enforced?*** | | ***Your Score*** | ***Comments*** |
| No effective capacity/resources and activities to enforce protected area legislation and regulations | 0 | | |
| There are major deficiencies in capacity/resources and activities to enforce protected area legislation and regulations (e.g. lack of skills, no patrol budget, etc.) | 1 | 1 | |
| Acceptable capacity/resources and activities to enforce protected area legislation and regulations but some deficiencies remain | 2 | | |
| Excellent capacity/resources and activities to enforce protected area legislation and regulations | 3 | | |
| **Additional Point** | | | |
| a. There are additional sources of control (e.g. volunteers, national services, local communities, etc.) | +1 | 1 | |
| b. Infractions are regularly prosecuted and fines levied | +1 | | |
| ***4. Protected area boundary demarcation - Are the boundaries known and demarcated?*** | | ***Your Score*** | ***Comments*** |
| The boundaries of the protected area are not known by the management authority or other stakeholders | 0 | | |
| The boundary of the protected area is known by authority but is not known by other stakeholders | 1 | 1 | |

| | | | |
|---|---|---|---|
| The boundary of the protected area is known by both the management authority and others but is not appropriately demarcated | 2 | | |
| The boundary of the protected area is known by the management authority and stakeholders and is appropriately demarcated | 3 | | |
| ***5. Integration of the PA in a larger management plan - Is the PA part of a PA systems plan?*** | | ***Your Score*** | ***Comments*** |
| There is no discussion about the integration of the PA in a larger management or systems plan | 0 | | |
| There is some discussion about the integration of the PA into management or systems plan but the process has not yet begun | 1 | 1 | |
| The protected area is in the process of being integrated into a larger management or systems plan but the process is still incomplete | 2 | | |
| The protected area is part of a larger management or systems plan | 3 | | |
| **Additional Point** | | | |
| a. The PA is part of a network of PAs which collectively sustain larger ecosystem functions | +1 | | |
| b. The PA is part of a network of PAs which collectively represent the range of bio-geographic variation in a eco-region | +1 | | |
| ***6. Resource inventory - Is there enough information to manage the area?*** | | ***Your Score*** | ***Comments*** |
| There is little or no information available on the biophysical, socio-cultural and economic conditions associated with the | | | |

| | | | |
|---|---|---|---|
| protected area | 0 | | |
| Information on the biophysical, socio-cultural and economic conditions associated with the protected area is not sufficient to support planning and decision making | 1 | | |
| Information on the biophysical, socio-cultural and economic conditions associated with the protected area is sufficient for key areas of planning/decision making but the necessary survey/M&E work is not being maintained | 2 | 2 | |
| Information on the biophysical, socio-cultural and economic conditions associated with the PA is sufficient for key area of planning and decision-making | 3 | | |
| ***7. Stakeholder awareness and concern - Are stakeholders aware and concerned about resource conditions and threats?*** | | ***Your Score*** | ***Comments*** |
| Less that 25% of stakeholders are aware or concerned about the resource conditions and threats | 0 | | |
| Approximately 25% - 50% of stakeholders are aware or concerned about the resource conditions and threats | 1 | 1 | |
| Approximately 50% - 75% of stakeholders are aware or concerned about the resource conditions and threats | 2 | | |
| Over 75% of stakeholders are aware or concerned about the resource conditions and threats | 3 | | |
| **TOTAL for Context (A):** | **12 /26 or adjusted score** | | |
| **B. Planning - Where do we want to be? Assessment of protected area design and planning** | | | |
| ***8. Protected area objectives - Have objectives been agreed and the area managed to achieve them?*** | | ***Your Score*** | ***Comments*** |

| | | | |
|---|---|---|---|
| No firm objectives have been agreed for the protected area | 0 | 0 | |
| The protected area has agreed objectives that are not yet implemented | 1 | | |
| The protected area has agreed objectives but these are only partially implemented | 2 | | |
| The protected area has agreed objectives and is managed to meet these objectives | 3 | | |
| ***9. Management plan - Is there a management plan and is it being implemented?*** | | ***Your Score*** | ***Comments*** |
| There is no management plan for the protected area | 0 | | |
| A management plan is being prepared or has been prepared but is not being implemented | 1 | 1 | |
| An approved management plan exists but it is only being partially implemented | 2 | | |
| An approved management plan exists, includes the agreed objectives and is being implemented | 3 | | |
| **Additional Points for Planning** | | | |
| a. There is also a long term master plan (at least 5 years) | +1 | | |
| b. The planning process allows adequate opportunity for key stakeholders to influence the management plan | +1 | 1 | |
| c. Stakeholder participation includes representation from the various ethnic, religious and user groups as well as representation from both genders | +1 | 1 | |

| | | | |
|---|---|---|---|
| d. The socioeconomic impacts of decisions are considered in the planning process | +1 | | |
| e. The local culture, including traditional practices, social systems, cultural features, historic sites and monuments, is considered in the planning process | +1 | | |
| f. There is an established schedule and process for periodic review and updating of the management plan | +1 | | The management plan is currently being developed and this is to be incorporated |
| g. The results of monitoring, research and evaluation are routinely incorporated into planning | +1 | | |
| h. The management plan is tied to the development and enforcement of regulations | +1 | | |

**TOTAL for Planning (B): 3/14 or adjusted score**

## C. Input - What do we need? Assessment of resources needed to carry out management

| ***10. Research - Is there a program of management-oriented survey and research work?*** | | ***Your Score*** | ***Comments*** |
|---|---|---|---|
| There is no survey or research work taking place in the protected area | 0 | | |
| There is some ad hoc survey and research work | 1 | 1 | |
| There is considerable survey and research work but it is not directed towards the needs of protected area management | 2 | | |
| There is a comprehensive, integrated program of survey and research work which is relevant to management needs | 3 | | |
| **Additional Point** | | | |
| a. Carrying capacity studies have been conducted to determine | | | |

| | | | |
|---|---|---|---|
| sustainable use levels | +1 | | |
| ***11. Staffing - Are there enough people deployed to manage the protected area?*** | | ***Your Score*** | ***Comments*** |
| There are no staff | 0 | | |
| Staff numbers are inadequate for critical management activities | 1 | 1 | |
| Staff numbers are below optimum level for critical management activities | 2 | | |
| Staff numbers are adequate for the management needs of the site | 3 | | |
| ***12. Current budget - Is the current budget sufficient?*** | | ***Your Score*** | ***Comments*** |
| (In the comments column; please detail of the sources of funding) | | | |
| There is no budget for the protected area | 0 | | |
| The available budget is inadequate for basic management needs and presents a serious constraint to the capacity to manage | 1 | 1 | |
| The available budget is acceptable, but could be further improved to fully achieve effective management | 2 | | |
| The available budget is sufficient and meet the full management needs of the protected area | 3 | | |
| **Additional Points** | | | |
| a. There is a secure budget for the protected area and its management needs on a multi-year basis. | +1 | | |
| b. The budget is not entirely dependent on government funding: | | | OPAAL and other projects have the potential to assist |

| | | | |
|---|---|---|---|
| instead, funding also comes from NGO contributions, taxes, fees, etc. | +1 | | |

**TOTAL for Inputs (C): 3/14 or adjusted score**

## D. Process - How do we go about management? Assessment of the way in which management is conducted

| ***13. Education and awareness program - Is there a planned education program?*** | | ***Your Score*** | ***Comments (list your major communication actions)*** |
|---|---|---|---|
| There is no education and awareness program | 0 | | |
| There is a limited education and awareness program, but no overall planning for this component | 1 | 1 | |
| There is a planned education and awareness program but there are still serious gaps | 2 | | |
| There is a planned and effective education and awareness program fully linked to the objectives and needs of the protected area | 3 | | |
| ***14. Communication between stakeholders and managers - Is there communication between stakeholders and managers?*** | | ***Your Score*** | ***Comments*** |
| There is little or no communication between managers and stakeholders involved in the PA | 0 | | |
| There is communication between managers and stakeholders but this is not a planned or scheduled program | 1 | 1 | |
| There is a planned communication program that is being used to built support for the PA amongst relevant stakeholders but implementation is limited as yet | 2 | | |

| | | | |
|---|---|---|---|
| There is a planned communication program that is being implemented to build support for the PA amongst relevant stakeholders | 3 | | |
| **Additional Point** | | | |
| There is some communication with other PA managers (for example, exchanges of good practices) | +1 | | |
| ***15. Stakeholder involvement and participation - Do stakeholders have meaningful input to management decisions?*** | | ***Your Score*** | ***Comments*** |
| Stakeholders have no input into decisions relating to the management of the protected area | 0 | | |
| Stakeholders have some input into discussions relating to management but no direct involvement in the resulting decisions | 1 | 1 | |
| Stakeholders directly contribute to some management decisions | 2 | | |
| Stakeholders directly participate in making decisions related to management | 3 | | |
| **Additional Point** | | | |
| a. There are clear financial contributions/agreements between PA and tourism operators to recover PA resources rents for local benefits | +1 | | |
| ***16. Indigenous people - Do indigenous and traditional peoples resident or regularly using the PA have input to management decisions?*** | | ***Your Score*** | ***Comments*** |
| Indigenous peoples and traditional users have no input into decisions relating to management of the protected area | 0 | | |

| | | | |
|---|---|---|---|
| Indigenous peoples and traditional users have some input into discussions relating to management but no direct involvement in the resulting decisions | 1 | 1 | |
| Indigenous people and traditional users directly contribute to some decisions relating to management | 2 | | |
| Indigenous people and traditional users directly participate in making decisions relating to management | 3 | | |
| ***17. Staff training - Is there enough training for staff involved in the management of the PA?*** | | ***Your Score*** | ***Comments (list your major training needs)*** |
| Staff are untrained | 0 | | |
| Staff training and skills are low relative to the needs of the protected area | 1 | 1 | |
| Staff training and skills are adequate, but could be further improved to fully achieve the objectives of management | 2 | | |
| Staff training and skills are in the tune with the management needs of the protected area, and with the anticipated future needs | 3 | | |
| ***18. Equipment - Is the site adequately equipped?*** | | ***Your Score*** | ***Comments*** |
| There are little or no equipment and facilities | 0 | 0 | |
| There are some equipment and facilities but these are inadequate | 1 | | |
| Most of equipment and facilities are adequate and maintained | 2 | | |
| There is adequate equipment and facilities and it is well maintained | 3 | | |
| ***19. Monitoring and evaluation - Are biophysical, socioeconomic*** | | ***Your*** | ***Comments*** |

| *and governance indicators monitored and evaluated?* | | *Score* | |
|---|---|---|---|
| There is no monitoring and evaluation of the biophysical, socioeconomic and governance context of the PA | 0 | | |
| There is limited monitoring and evaluation, but no overall strategy and/or no regular production of results | 1 | 1 | |
| There is an agreed and implemented monitoring and evaluation system but results are not systematically used for management | 2 | | |
| A planned and effective monitoring and evaluation system exists and is well implemented and used in adaptive management | 3 | | |
| **Additional Points** | | | |
| a. The PA participates as a site in national or international environmental monitoring programs such CARICOMP, CPACC, GCRMN, AGGRA or similar (Provide the name of the program(s)) | +1 | 1 | Reef Check |
| b. There is an Emergency Response Capability in place to mitigate iPActs from threats | +1 | | |
| **TOTAL for process (D): 7/25 or adjusted score** | | | |

## E. Outputs - What were the results? Assessment of the implementation of management programs and actions; delivery of products and services

N. B. : The outputs should be assessed based on progress since the last assessement. If this is the first time the Score Card is being used, respondents should assess outputs over the last 3 years. For newly establish PAs, respondents may have to skip this section.

| *20. Context indicators - have there been improvements in context indicators ?* | | *Your Score* | *Comments* |
|---|---|---|---|
| a. Legal status has improved (refers to question 1. Legal status) | +2 | | |
| b. Regulations have improved (refers to question 2. PA regulations) | +2 | | |

| | | | |
|---|---|---|---|
| c. Law enforcement has improved (refers to question 3. Law enforcement) | +2 | | |
| d. Boundary demarcation has impoved (refers to question 4. PA Boundary demarcation) | +2 | | |
| e. The PA has been integrated into a PA systems plan (refers to question 5. Integration of the PA) | +2 | | |
| f. The resource inventory has improved (refers to question 6. Resource inventory) | +2 | | |
| g. Stakeholder awareness and concern has improved (refers to question 7) | +2 | | |
| ***21. Products and services*** | | ***Your Score*** | ***Comments*** |
| a. Signs - signs are now available, or new one have been installed | +1 | | |
| b. User related infrastructure and services are now available, or have been installed | +2 | | |
| c. Education materials - education materials are available, or new ones have been developed | +1 | | |
| ***22. Mechanisms for stakeholder participation in decision -making and/or management activities (e.g. advisory council) - are mechanisms available to ensure stakeholder participation?*** | | ***Your Score*** | ***Comments*** |
| There are no mechanisms for stakeholder participation in decision-making and/or management activities | 0 | | |
| There are some mechanism for stakeholder participation in decision-making and/or management activitites, but not sufficient | 1 | | |

| | | | |
|---|---|---|---|
| There are sufficient mechanisms for stakeholder participation in decision-making and/or management activities | 2 | | |
| ***23. Environmental education and awareness activities for stakeholders (e.g. public outings at the PA)- have education activities been developed for stakeholders?*** | | ***Your Score*** | ***Comments*** |
| There are no education and awareness activities available for stakeholders | 0 | | |
| There are some education and awareness activities available for stakeholders, but they are not sufficient | 1 | | |
| There are sufficient education and awareness activities available for stakeholders | 2 | | |
| ***24. Management activities - have the two critical management activities (listed in the data sheet) been improved to address threats*** | | ***Your Score*** | ***Comments*** |
| Management activities have not been improved | 0 | | |
| Some measures have been taken to improve management activities | 1 | | |
| Management activities have been sufficiently improved | 2 | | |
| ***25. Visitor facilities - does the PA have sufficient visitor facilities?*** | | ***Your Score*** | ***Comments*** |
| There are no visitor facilities and services | 0 | | |
| Visitor facilities and services are inappropirate for current levels of visitation or are under construction | 1 | | |
| There are some visitor facilities and services, but they could be improved | 2 | | |
| Visitor facilities and services are sufficient for current levels | | | |

| | | | |
|---|---|---|---|
| of visitation | 3 | | |
| ***26. Fees - If fees (entry fees - tourism, fines) are applied, do they help protected area management?*** | | ***Your Score*** | ***Comments*** |
| Although fees and/or fines systems exist, they are not collected | 0 | | |
| The fees/fines are collected, but they go straight to central government and are not returned to the protected area or its environs | 1 | | |
| The fees/fines are collected, but they are disbursed to the local authority rather than the protected area | 2 | | |
| There are fees and/or fines for the protected area that help to support this and/or other protected areas | 3 | | |
| ***27. Staff Training*** | | ***Your Score*** | ***Comments*** |
| Staff was trained but could be further improved to fully achieve the objectives of management | 2 | | |
| Staff was trained in tune with the management needs of the protected area, and with anticipated future needs | 3 | | |
| **TOTAL for outputs (E) /33 or adjusted score** | | | |
| **F. Outcomes - What did we achieve? Assessment of the outcome and the extent to which we achieved objectives** | | | |
| ***28. Objectives - Have PA objectives (listed in the data sheet page) been addressed?*** | | ***Your Score*** | ***Comments*** |
| Management objectives have not been addressed | 0 | | |
| Management objectives have been addressed somewhat | 1 | | |
| Management objectives have been sufficiently addressed | 2 | | |

| | | | |
|---|---|---|---|
| Management objectives have been significantly addressed | 3 | | |
| ***29. Threats - Have threats (listed in the data sheet page) been reduced?*** | | ***Your Score*** | ***Comments*** |
| Threats have increased | 0 | | |
| Threats have stayed at approximately the same levels | 1 | | |
| Threats have been reduced somewhat | 2 | | |
| Threats have been largely reduced | 3 | | |
| ***30. Recource conditions - Have resource conditios improved?*** | | ***Your Score*** | ***Comments*** |
| Resource conditions have declined | 0 | | |
| Resource conditions have stayed at approximately the same levels | 1 | | |
| Resource conditions have improved somewhat | 2 | | |
| Resource conditions have improved significantly | 3 | | |
| ***31. Community welfare - Has community welfare improved?*** | | ***Your Score*** | ***Comments (provide some examples)*** |
| Livelihoods and standards of living in the community have declined | 0 | | |
| Livelihoods and standards of living in the community have stayed approximately the same | 1 | | |
| Livelihoods and standards of living in the community have improved somewhat | 2 | | |

| | | | |
|---|---|---|---|
| Livehoods and standards of living in the community have improved significantly | 3 | | |
| **Additional points** | | | |
| a. PA management is coPAtible with the local culture, including traditional practices, relationships, social systems, cultural features, historic sites and monuments linked to resources and uses | +1 | | |
| b. Resource use conflicts have been reduced | +1 | 1 | |
| c. Benefits from the PA are equitably distributed | +1 | | |
| d. The non-monetary benefits of the resources to society have been maintained or enhanced | +1 | | |
| ***32. Environmental awareness - Has community environmental awareness improved?*** | | ***Your Score*** | ***Comments*** |
| Environmnetal awareness of resource conditons, threats and management activities has declined | 0 | | |
| Environmental awareness has stayed approximately the same | 1 | | |
| Environmental awareness has improved somewhat | 2 | | |
| Environmental awareness has improved significantly | 3 | | |
| ***33. Compliance - Are users complying with PA regulations?*** | | ***Your Score*** | ***Comments*** |
| Less than 25% of users are complying with regulations | 0 | | |
| 25% to 50% of users are complying with regulations | 1 | | |
| 50% - 75% of users are complying with regulations | 2 | | |

| | | | |
|---|---|---|---|
| Over 75% of users are complying with regulations | 3 | | |
| ***34. Stakeholder satisfaction - Are the stakeholders satisfied with the process and outputs of the PA?*** | | ***Your Score*** | ***Comments*** |
| Less than 25% of stakeholders are satisfied with the process and outputs of the PA | 0 | | |
| 25% to 50% of stakeholders are satisfied with the process and outputs of the PA | 1 | | |
| 50% to 75% of stakeholders are satisfied with the process and outputs of the PA | 2 | | |
| Over 75% of stakeholders are satisfied with the process and outputs of the PA | 3 | | |
| **Additional points** | | | |
| a. Stakeholders feel that they are able to effectively participate in management decisions | +1 | | |
| b. Stakeholders feel that they are adequately represented in the PA decision-making processes | +1 | | |
| **TOTAL for outcomes (F): /27 or adjusted score** | | | |

**Attachment 4. Investment Plan**

**[name of park/area]: 3 years later following the Implementation of a PA Investment Program**
(Components/activities)

1. Institutional Strengthening

[list]

2. Infrastructure and Equipment

[list]

3. Environmental Education and Public Awareness

[list]

4. Livelihood Activities

[list]

# APPENDIX F

## EXCERPT FROM USER OTES FOR CIDA'S ENVIRONMENTAL ASSESSMENT FORMS

## 14. Public Concern

People may be concerned about the effects of a project whether or not the environmental assessment concludes that the effects are significant. If these concerns are substantial, further public consultation, redesign of the project, or referral of the project to a mediator, a review panel, a joint review panel or an advisory committee may be warranted.

All public comments received on a project must be documented in the screening report.

## 15. Significance of Adverse Environmental Effects

For projects subject to environmental assessment, determinations of how CIDA will proceed are based on an assessment of the significance of likely, adverse environmental effects. Guidelines of the Canadian Environmental Assessment Agency (CEA Agency 1994) identify the following factors that should be taken into account when deciding whether an adverse environmental effect is significant:

(a) Magnitude of the effect;
(b) Geographic extent of the effect;
(c) Duration and frequency of the effect;
(d) Degree to which the effect is reversible; and
(e) The environmental context of the effect. (An effect may be significant if it occurs in areas/regions that are already degraded, or are ecologically fragile with little resilience to stress.)

An adverse environmental effect is significant if, in the judgement of the assessor, it is not insignificant -- there is no middle ground.

The CEA Agency (1994) directs that project proponents should always submit information on the five factors listed above, and that criteria used to determine significance should be based on them. The assessor must use his/her own judgement in determining the significance of environmental effects, based on the above factors (15 (a) - (e)). In addition to the factors listed by the CEA Agency, assessors might also consider if:

*Physical components*:

- An established standard (e.g., air or water quality) would be exceeded for unreasonable lengths of time.
- The effect would reduce the carrying capacity for biological components of the environment.
- The effect would pose an unacceptable risk to human health or safety.

*Biological components*

- The effect would be outside the range of natural variation in the size or distribution of the component population.

- The effect would persist for an unreasonable length of time (e.g., longer than one generation).

*Resource use components*

- The effect represents a reduction in use lasting an unreasonable length of time (e.g., a year or more).
- The effect would result in a significant socio-economic change.

*Health components*

- The magnitude of the effect would be outside the range of natural variation in the component.

*Socio-economic components*

- The effect would be of sufficient magnitude and duration that people, communities or governments could not adapt to the effect relatively quickly in a way that leaves them no less well off than they were previously.

*Cultural/heritage components*

- A locally or regionally important component is permanently affected.

## 16. Completing the Matrix of Environmental Issues

The purpose of the matrix of environmental issues is twofold:

(a) working methodically through the matrix assists in the assessment of potential effects of a project. Thus, the matrix can be used as a checklist when identifying potential effects for analysis; and

(b) the matrix provides an overview of the results of the assessment.

Completing the matrix of environmental issues involves several steps:

1. Develop a complete list of project undertakings which may cause environmental effects and enter them in the first column of the top part of the matrix. Ensure you consider all project phases (e.g. pre-construction, construction, operation, closure, and accidents and malfunctions). Use more than one matrix if the number of undertakings exceeds the number of rows in the matrix. Assign sequential numbers to each undertaking you list (Column "No."). Example lists of undertakings for different project types are given in Appendix A.
2. Based on the effects analysis, read across the row for each undertaking and code each cell where the undertaking is expected to cause a direct or indirect effect on a biophysical environmental component. Use the codes shown in **Table 1** below (e.g., "B"). Blank columns are provided in the matrix for specifying other biophysical environmental components.

Review each column corresponding to the various biophysical environmental components. Where effects are coded in more than one cell of a column, consider if there will be an interactive effect on that component. If so, code it in the "Interactive Effects" row as above.

3. For each coded biophysical effect where there would be a consequent (i.e., indirect) non-biophysical (NBP) effect, complete the bottom part of the matrix. First, from the examples in **Table 2**, identify the NBP components which might be affected and enter them in the first column. Then, write the relevant undertaking number(s) (Column "No." in the top part of the matrix) in the appropriate NBP cell in the bottom part of the matrix and add the appropriate significance code (e.g., "2B").

   Review each row corresponding to the various NBP components. Where effects are coded in more than one cell of a row, consider if there will be an interactive effect on that component. If so, code it in the "Interactive Effects" column as above.

   Click on the following link to view examples of completed matrices.

**Table 1 — Codes Used for the Matrix of Environmental Issues**

| Code | Meaning |
|---|---|
| Blank | No significant negative environmental effect *and* there is no significant public concern |
| A | Significant positive environmental effect |
| B | Significant negative environmental effect that can be mitigated |
| C | Potential significant negative environmental effect unknown |
| D | Significant public concern |
| E | Significant negative environmental effect that cannot be mitigated |

**Table 2 — Standard Non-Biophysical (NBP) Environmental Components**

| Group | Environmental Component |
|---|---|
| **Resource Use** | Water Supply / Use |
| | Agriculture / Animal Husbandry |
| | Forestry |
| | Hunting |
| | Fishing |
| | Gathering / Trapping |
| | Visual Features |
| | Tourism / Recreational Activities |
| | Land Uses by Aboriginals |
| | Use of Resources by Aboriginals |
| | Other (Specify) |
| **Health** | Individual / Community |
| | Occupational |
| | Services |
| | Other (Specify) |
| **Socio-Economic** | Population / Demographics |
| | Housing / Accommodation |
| | Community Infrastructure / Services |
| | Employment / Incomes |
| | Education / Training |
| | Access / Transportation |
| | Government Costs / Revenues |
| | Other (Specify) |
| **Cultural / Heritage** | Historic Sites / Features |
| | Archaeological / Paleontological Sites |
| | Traditional Sites / Uses |
| | Sites of Architectural Significance |
| | Other (Specify) |

## 17. Cumulative Environmental Effects

A cumulative environmental effect is an effect that is likely to result from the project *in combination with* effects due to other projects or activities that have been or will be carried out.

The purpose of analyzing cumulative effects is to identify and avoid situations where the effects of discrete projects or activities act together to create significant adverse effects. For example, one tube well project may not effect ground water supply, but should more tube well projects be implemented in the same area, the cumulative effect could be that ground water supplies would not be sustainable.

When a *likely* and *significant* cumulative biophysical effect is expected, code the appropriate cell in the "Cumulative Effects" row in the top part of the matrix. Again, use the codes shown in **Table 1**.

When a *likely* and *significant* cumulative non-biophysical (NBP) effect is expected, code the appropriate cell in the "Cumulative Effects" column in the bottom part of the matrix.