CARIBBEAN COMMUNITY CLIMATE CHANGE CENTRE/ SPACC PROJECT

TECHNICAL REPORT

DESIGN OF BUFFER ZONES FOR THE MORNE DIABLOTIN NATIONAL PARK AND MORNE TROIS PITONS NATIONAL PARK WORLD HERITAGE SITE

Prepared for the Government of the Commonwealth of Dominica

By

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TECHNICAL REPORT

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LIST OF FIGURES

ACRONYMS

CANARI	Caribbean Natural Resources Institute
CARICOM	Caribbean Community
CBD	Convention on Biological Diversity
CCCCC	Caribbean Community Climate Change Centre
CCD	Convention to Combat Desertification
CDERA	Caribbean Disaster Emergency Response Agency
CEHI	Caribbean Environmental Health Institute
CERMES	Centre for Resource Management and Environmental Studies
Programme	
CIMH	Caribbean Institute of Meteorology and Hydrology
CPACC	Caribbean Planning for Adaptation to Climate Change Project
Dbh	Diameter breast height
DOMLEC	Dominica Electricity Services
DOWASCO	Dominica Water and Sewerage Company
FDD	Fisheries Development Division
FWD	Forestry, Wildlife & Parks Division,
GIS	Geographic Information Systems
GOCD	Government of the Commonwealth of Dominica
GEF	Global Environment Facility
IWCAM	Integrating Watershed and Coastal Areas Management
IWRM	Integrated Water Resource Management
IUCN	International Union for the Conservation of Nature
MTPNPWHS	Morne Trois Pitons National Park, World Heritage Site
MDNP	Morne Diablotin National Park
NEPA	National Environment and Planning Agency
NSO	National Statistical Office
OAS	Organization of American States
OECS	Organization of Eastern Caribbean States
UNDP	United Nations Development Programme
UNEP	United Nations Development Programme
UNESCO	United National Educational Social Organization
WHS	World Heritage Site

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EXECUTIVE SUMMARY

OBJECTIVE OF THE STUDY

The development of buffer zones for the Morne Trois Pitons National Park World Heritage Site, (MTNP WHS) and the Morne Diablotin National Park, (MDNP), is one of several initiatives being undertaken by the Government of Dominica under the Global Environment Facility, GEF-funded "Special Programme for Adaptation to Climate Change, SPAAC", a regional programme, implemented by the World Bank and executed by the Caribbean Community Climate Change Centre, CCCCC, as part of a strategy to reduce the vulnerability of Dominica's ecosystems to the impact of climate change.

Among other initiatives being undertaken in this regard are improvement of the management plans for the Morne Trois Pitons National Park World Heritage Site and the Morne Diablotin National Park that are expected to include detailed design and implementation of adaptation measures relevant to the Parks and their neighbouring communities, as well as the development of a Sustainable Land Management Plan for Dominica (SLM) and data collection and monitoring aimed at establishing an effective hydro-meteorological data base management system for the National Parks.

Dominica has been selected as one of the beneficiary countries under the GEF-World Bank Special Programme for Adaptation to Climate Change (SPACC) project. The goal of the project is to implement specific (integrated) pilot adaptation measures that primarily address the impacts of climate change on the natural resource base specifically biodiversity and land degradation along coastal and near-coastal areas. It is expected that detailed pilot adaptation measures geared at reducing expected negative impacts of climate change on the marine and terrestrial biodiversity and land degradation will be designed and implemented.

The objective of this assignment is to design buffer zones for the two national parks that ensure the protection and conservation of the ecosystems and water resources within the national parks while enabling stakeholder communities adjacent to the Park to sustain livelihoods.

Collaboration with the Sustainable Land Management Project (SLM) was proposed as a mechanism to assist in the design of elements of the buffer zone through evaluation of identified target communities that were considered critical points for anthropogenic pressures on the parks as well as the engagement of these key target communities in the development of the land use plan.(The identified target communities were Petit Savannes, Cochrane,Laudat, Boetica and Colihaut, Bioche, Dublanc that are adjacent to the two national parks in question).

METHODOLOGY

All previous studies, management plans and proposed buffer zones, as well as legislation pertinent to the Parks were collated and evaluated. Evaluation of the natural resources of the parks, land use and threats (both man-induced and natural) were undertaken through desk research, interviews with forestry and national parks personnel, field visits, as well as through the use of Geographic Information Systems (GIS).

Field assessments were carried within a 300 m area internal to the boundaries of the Park to evaluate activities within the Park and in 200 m, 400 m and 600 m areas external to the boundary of the Park to evaluate activities external to the boundary of the Parks. Additional information was obtained from satellite images and these were mapped.

A socio-economic evaluation of the communities adjacent to the Parks was undertaken through meetings with some village councils as well as desk research utilizing existing socio-economic data , like national poverty assessment reports and national population statistical reports.

A series of consultations were held with stakeholders- the village councils, communities and farmers groups to obtain their input into the process. Stakeholder consultation took the form of community workshops, focus group meetings and interviews as well as 2 national consultations with stakeholders which included the above mentioned groups as well as policy makers and other NGO groups. Recommendations from these consultations were incorporated into the final document.

OVERVIEW OF THE NATIONAL PARKS

The Government of Dominica has established 3 national parks and 2 forest reserves in an effort to conserve the biodiversity of the island. Morne Trois Pitons National Park was the first unit of the National Park system to be established in July 1975, followed by Morne Diablotin National Park in 2000 under the National Parks and Protected Areas Act. In 1997, Morne Trois Pitons National Park became the first in the Eastern Caribbean to be enlisted by UNESCO as a "World Heritage Site"

The Cabrits National Park (which is not included in this project), was officially designated a national park in 1987. The Major components of this Park are ecological, historical and marine.

Morne Diablotin National Park (MDNP)

Morne Diablotin National Park (MDNP) was carved out of the existing Northern Forest Reserve primarily for conservation of the habitat of the 2 endemic species of the Amazona parrots. It is bounded by the northern forest reserve on the north-east, east and southern sides. On the north and south western sides it is bounded by privately- owned agricultural land. The park is centred on Morne Diablotin, Dominica's highest peak,1,422 m (4,747 ft) and has a total area of 8,425 acres (3,360 ha). It is home to the largest population of the endangered

parrots: the Sisserou or Imperial Parrot, *Amazona imperialis* and the Jaco or red-necked Parrot, *Amazona arausiaca, as well as to* the endemic plants: *Chromolaena impetiolaris* and *Chromolaena macrodon.*

Bird watching and hiking are the most popular activities undertaken in the Park.

Morne Trois Pitons National Park World Heritage Site (MTNPWHS)

Morne Trois Pitons National Park WHS is an ecological park located in the south –central part of the island and consists of 16,980 acres (6,900 ha). The main objective for the establishment of the Park was to conserve the extensive virgin forest and its unique flora and fauna as well as the major watersheds located in the area, while at the same time providing educational recreational opportunities for Dominicans.

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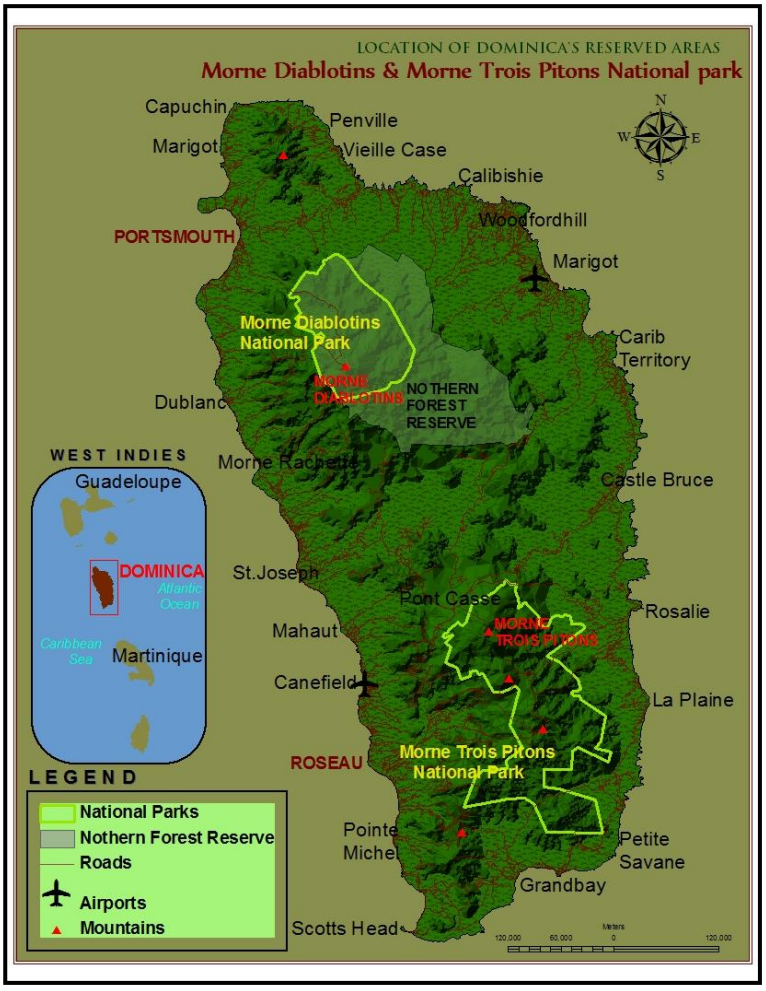


Figure 1 –Location of the Parks

Dominica's second highest mountain, Morne Trois Pitons, is the most dominant topographical feature of the park. It rises to just over 1,387 m (4,550 ft) and is one of the 4 more recent volcanic complexes along the

central spine. The Park contains the most extensive almost undisturbed tropical forest in the Lesser Antilles and the headwaters of most of the major streams and rivers in the southern half of the island. These support a high level of biodiversity. Many of the island's attractions are found within the park: Middleham Falls, Emerald Pool, Boiling Lake, Valley of Desolation, Boeri Lake and Fresh Water Lake.

The Archbold Preserve, a large component of the Park comprising of 940 acres, has not yet been legally incorporated within the National Park. The boundaries of the Park have been legally established and gazetted. However, field surveys have indicated that these gazette boundaries do not correlate to what is actually seen on the ground and in many cases the discrepancy is not only large, there is absolutely no cut lines or demarcation.

IMPORTANCE OF THE PARKS AS PROTECTED AREAS

Dominica has been described as having the largest and most diverse and pristine forest in the Eastern Caribbean. The 2 parks make up 39% of protected land managed by the Forestry Division (59% being privately owned).

The Parks are home to many of Dominica's, rivers, and endemic plants and animals and have been listed by Birdlife International as "Important Bird Areas, IBA" on the basis of 25 key bird species including three globally threatened birds, 19 restricted ranges and six congregatory seabirds "that variously trigger the IBA criteria". According to "Birdlife International", the 2 parks contain populations of all the restricted range species and the majority of the population of all 3 globally threatened species of the two endemic species of the Amazona parrots and the Forest thrush, *Cichlherminia lherminieri* thus reinforcing the critical biodiversity characteristics of the Parks.

Additionally, both Parks are very important for watershed protection The water systems within the watershed that emanate from the MTNPWHS provide potable water for domestic, commercial, and industrial uses by the Dominica Water and Sewage Company (DOWASCO) to almost the entire south, south east and south west of the island. MDNP is a critical water catchment for the northwest area of Dominica.

The ecological integrity and the various functions of the Park have been threatened by natural and man-induced activities. Evaluation of the parks indicate that the most significant threats are encroachment from agricultural, residential and commercial development, hunting, and the impact of climate change which can trigger natural disasters like hurricanes, floods and landslides with devastating effects on the biodiversity and economic importance of the Park. Forests will become increasingly vulnerable from increased severity and frequency of hurricanes triggered by global warming and climate change.

Threats to the resources of the Park are exacerbated by the fact that prior to the formal establishment of the Park there were issues with land tenure that were never resolved particularly in the MTNPWHS hence agricultural activities mainly subsistence agriculture, are continuing in these areas. Other threats specific to the MTNPWHS include the Government's establishment and active use of a shooting range and a quarry.

The limited management of the Parks as a result of inadequate human and financial capital also poses a threat to the national Park. Presently, the Forestry Division is responsible for the management of the Park and is constrained by limited resources for fully operationalizing the Park and managing its biological resources. As such there is limited research, management and monitoring of the park and its resources.

The Government of Dominica must implement mitigation measures for the protection of the national parks and their resources, one of which is the establishment of buffer zones for the Parks.

RECOMMENDATIONS FOR THE ESTABLISHMENT OF BUFFER ZONES

Definition of a buffer Zone

The operational guidelines for the implementation of the World Heritage Convention clearly states that the boundaries of a World heritage Site should **'***Include sufficient areas immediately adjacent to the area of outstanding universal value in order to protect the site's heritage values from direct effects of human encroachment and impacts of resource use outside of the nominated area"*

It defines a buffer zone as "an area surrounding the property which has restrictions placed on its use to give an added layer of protection: the area consisting of a buffer zone should be determined through technical studies. Details on the size, characteristics and authorized uses of a buffer zone as well as a map indicating its precise boundaries, should be provided"

Government has an obligation to establish a buffer zone for the MTNPWHS so as to fulfill its international commitment to maintain its status as a World Heritage Site, WHS.

Objectives of the buffer zones

The overall objective of the buffer zone is to protect the natural resources of the Park from human encroachment and activities that are destructive to the biodiversity of the Park. Specifically to achieve the following:

- To reduce the direct impact of agriculture on the biodiversity of the park
- To protect the nesting sites of the parrots and minimize human disturbance
- To afford some level of protection to the watersheds.
- To reduce the possibility of increased potential residential development adjacent to the boundary of the park since farmers indicated that they have had several requests for the sale of land for residential and other commercial enterprises
- To ensure that stakeholder communities can sustain livelihoods that are compatible with the objectives of the Park

Methods of Acquisition of land for a buffer zone

Land acquisition can be effected through the following:

- Compulsory acquisition
- Land exchange or
- Direct purchase

In terms of purchase of land, government should seek to prioritize purchase options. Lands that are under forest that do not pose an immediate threat to the biological resources of the park; that have minimal value for residential or commercial development and are physically inaccessible without major financial input by the owners should not be considered for immediate acquisition. Priority should be given to lands that have an immediate impact on the biological resources of the Park; that are accessible and considered to be of high demand.

In terms of the MDNP, the 200m buffer area would be considered priority for acquisition by Government or for alternative uses as identified by the relevant government agency. For MTNPWHS prioritized purchase options would be more practical since the proposed buffer zones have various characteristics which lend itself to this.

ESTABLISHMENT OF A BUFFER ZONE FOR MDNP

Threats

The major anthropogenic threats to the MDNP are from potential agricultural encroachment from private estates on the west and northwest of the Park, from hunting, from the expansion of residential property into the parks as well as from the potential sale of private land adjacent to the Park for commercial activities. Other major threats include the impact of climate change which could trigger frequent hurricanes leading to the destruction of nesting and feeding trees of the parrots and their imminent extinction as well as the destruction of the overall biodiversity of the Park.

In assessing the buffer zone for MDNP one needs to be cognizant of the fact that the primary objective for the establishment of the Park is the protection of the remaining populations of the Imperial and Red-necked Parrots. The populations of both species, particularly the Imperial Parrot is still on average small and restricted to primary forest. The loss of even a few birds can substantially increase the risk of extinction. Nests of the parrots are made in the hollow cavities of old growth Gommier, *Dacryodes excelsa* and Chatannye', *Sloanea spp.* trees. There are three nesting sites located within 300m of the southwestern boundary of the park that are at risk from human disturbance- one Sisserou nest located at approximately 300 feet and 2 "Jaco" Red-necked parrot nests about 200 feet. The proposed buffer will minimize human disturbance to these nesting sites and reduce the possibility of encroachment in the Park. It will afford protection to some watersheds and will reduce the possibility of potential increase of residential development adjacent to the boundary of the park.

Size and Characteristics of the Proposed Buffer Zone

The recommended buffer will comprise of a depth of approximate 200m (656.2 ft.) south west on lands adjoining the national park and 500m (1690.5 ft) on the northern and eastern areas within the adjoining forest reserve.

The proposed buffer zone consists of three sub-zones (see map below):

- Government- owned forest lands of the Northern Forest Reserve along the eastern and southern boundaries;
- Privately- owned forest lands on rugged terrain within 1 km. of the northern boundary; and,
- Privately- owned agricultural lands within 2 km. of the western boundary.

The proposed buffer zone for the Park has a total area of 2793.65 acres (1130.5 ha) of which 358.66 acres (145.2 ha) are privately-owned, cultivated land from the adjoining Syndicate, Dyer and Morne Plaisance Estates.

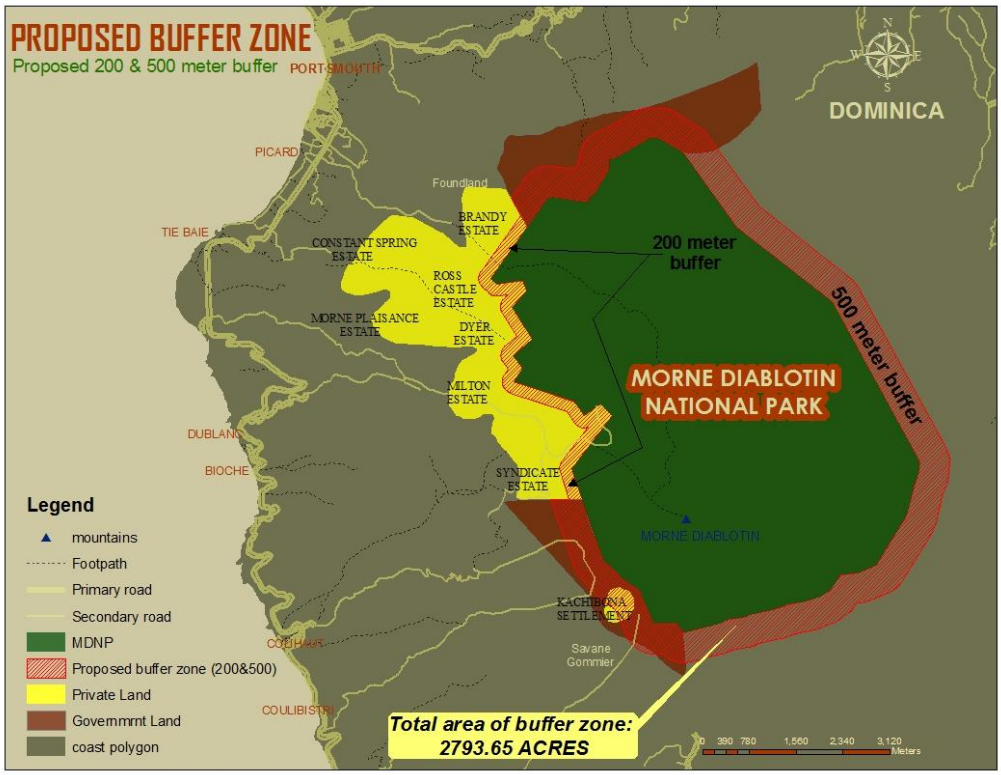


Figure 2- Proposed Buffer Zone for MDNP

The selection of 200 m (656.2 ft) is based on the fact that the acreage is sufficient to protect some existing nesting trees of the parrots, to protect the forest from further encroachment by farmers, to minimize the impact of existing agriculture on the biodiversity of the forest and to protect the watershed areas that are at risk. It is also the most practical option for ensuring that land owners can continue their livelihood given the small

acreage of land owned by some of the land owners and the need to protect the Sisserou parrot that is very sensitive to any type of human disturbance

Limitations

Parrots are high elevation species and their range is much larger than the existing forest reserve and National Park. The ultimate goal for preservation of the parrots would be to make the entire area including all private land in the area, a protected area. This implies that the size of the proposed buffer will have very little effect on protecting the range of the parrots.

Most of the land within the northern and western boundaries of the Park is privately owned, well cultivated lands. Farmers depend on their land for their livelihood. Most of the farmers are between 55- 75 years and have indicated a reluctance to negotiate with government because of past experience on this issue of land acquisition. There is also a general reluctance by farmers to any kind of change.

In addition, existing activities in the proposed buffer zone do not contribute to protection of the parrots. The parrots, especially the Sisserou, are intolerant of human activities which can affect their reproductive cycle.

Farmers consider their land as prime areas for development because of the level of demand by potential investors and their willingness to pay market prices for the land. One investor has already purchased land up to the boundary of the Park and has constructed a residential building there.

The issue of alternative uses of the land will require the provision of incentives to the farmers. Government's ability to provide incentives will be limited by the present economic challenges.

Acquisition of land for the buffer zone

It is important that government adopts a strategy for land acquisition, land exchange options and co-operation with land owners, affected individuals and communities through provision of incentives. Incentives can take the form of duty free concessions, incentive zoning, technical assistance, the development of micro-credit schemes or other such provisions.

The issue of land acquisition with respect to private lands recommended for inclusion in the buffer zone is a major issue for government especially in a situation where land owners wish to develop land for purposes not consistent with the objectives of the buffer zone. In this case government has an option of direct purchase, swapping of the land "land exchange" with the land owner or compulsory acquisition. There are problems with all 3 options which must be intensely negotiated.
In terms of land acquisition discussions with farmers have indicated the following:

- Most famers are interested in selling the land in question to government at market price. Market price ranges from $E.C. 25,000-80,000/acre

- Others indicated that they would be interested in land exchange but the land exchange should “add value” since their land is already cultivated. They have also indicated that at their age they are not willing to start farming and agricultural production: thus implying that they would prefer an exchange for coastal land which would provide reasonable financial value for exchange with their cultivated land.
- A smaller percentage has no interest in land exchange and would like to continue their agricultural activities.

Direct Purchase

In terms of direct purchase, the problem arises with respect to setting a financial value to the land. Farmers have indicated that there is a demand for land for residential and commercial development and they are able to get “commercial prices’ for their land rather than government’s prescribed value for agricultural land. They also indicated apprehension in selling their land to government for 2 main reasons- the price offered by government is unacceptable and the time frame for payment is too long and drawn out. Hence there will be need for meaningful negotiation with the farmers.

Cost of Direct Purchase of Land
Cost of direct purchase of private land utilizing the standard rate for agricultural land utilized by government is as follows:
The approximate area of private land is 358.99acres (145.2 ha). The total cost for acquisition of the land at $E.C. 15,000/acre (standard government prices) is $ E.C.5,384,850.00 = $U.S.1, 982,420

Cost of purchase of land using existing commercial prices could range from E.C$. 8.97M ($U.S.M3.31) at $E.C.25,000/acre to $E.C.M 287.2 ($U.S. M105.71) at $E.C.80,000/acre.

There are a number of international agencies that could be approached for financial assistance in purchase of the land as follows:

- Conservation International which in the past provided finance for acquiring the private land for the establishment of MDNP.
- Bird Life International
- World Wildlife Fund
- Nature Conservancy

Priority for direct purchase should be given to private land adjacent to the identified nesting trees of the Amazona parrots.

Land swap

In order to encourage farmers to swap their land, government should attempt to meet the needs of the farmers by “adding value” to the land exchange so as to compensate farmers for projected loss of income from

agriculture. As such, land on the coastal areas with a higher potential of resale which will be attractive to farmers should be considered.

This is feasible since there are large areas of state land on the west coast that would meet the criteria for land exchange. One area that has already been identified by the Forestry, Wildlife & National Parks Service and proposed to Government is Plat Ma Pierre area which is state owned and flat and in close proximity to farmers who have land holdings in the area. In addition to this there are other government owned land that can be considered for land swapping.

Compulsory Acquisition

There is the option of compulsory acquisition of land. However, given the fact that this represents the livelihood of farmers, this is not recommended if other options can be negotiated.

Alternative Uses of the Land

Another option is alternative uses of the land for activities that do not contribute to the deterioration of soil, water and biological resources of the forests. Some farmers have expressed an interest in undertaking such activities if adequate incentives are made available to them as well as the provision of technical assistance in the development and marketing of potential projects.

As such it is recommended that incentive packages should be developed to assist farmers in the development and implementation of projects /activities for alternative use of their land. This could include duty free concession, low interest micro-credit schemes, various forms of technical assistance. Guidelines for development and management of these programmes should be developed with the farmers in question.

Recommended Options for acquisition

Land swapping and/or alternative uses of the land in question through the provision of incentives are the most affordable and amicable methods for effective establishment of the proposed buffer. Direct purchase of land allows for complete control and management of the buffer zone however this depends on the availability of financial resources. Government could consider a mixture of various options for establishment of the buffer zones.

Management and Recommended Use of Buffer Zone

To ensure proper control and management of activities in that zone, the privately owned lands should preferably be acquired through land exchange and placed under the control of the Forestry and Parks Division. The Buffer should be designated an Environmental Protection Area pursuant to Part VI of the Physical Planning Act, PPA.

The area in question should be re forested with trees that are typical to this area with some emphasis on replanting of some trees that are important for the nesting and feeding of the parrots. A wind break should be established as a protection for the entire south west of the area.

However, private land owners who wish to retain ownership of their land for development along lines consistent with the prescribed use below should be allowed to do so, thereby reducing the area of land to be acquired.
The following represent some guidelines for use of the area designated as buffer:

1. These lands can be classified as Environmental Protection Areas (EPAs) in accordance with the Physical Planning Act of 2002. As such activities in these areas should contribute to conservation of soil, water and biological resources.

2. Farmers retaining existing agriculture would be expected to modify their method of field preparation and agricultural activities to desist from using weedicides for controlling the growth of grass and to do some selective planting of trees that are important to the nesting and feeding of parrots.

3. Any proposed re-forestation programme would entail development of forest cover and activities that would reduce soil erosion and increase the infiltrative capacity of the soil. A carbon sequestration programme would complement this initiative so that farmers wishing to do this would benefit financially.

4. Other proposed land use programmes are
   - Agro- forestry with undergrowth of anthurium lilies or other suitable crops
   - Tree crops with high crown cover in shelter wood system over annual crops.
   - Natural or Plantation Forestry - with valuable local or exotic species or a mixture of both mahogany, *Swietenia macrophylla,* gommier, *Dacryodes excelsa* trees to increase the economic value of the forest and so enhance its protective functions of watershed, biodiversity and wildlife protection

5. Use of all lands should take into account the need for streamside reserves where they occur, growth and retention of parrot feeding and nesting trees, windbreak strips and a roadside buffer of natural forest where it occurs.

6. Existing residential development in this zone that does not meet the guidelines developed by the Forestry and National Parks service should be allowed to conform to these guidelines. If not, they should be designated non-conforming and the owners not be allowed to expand or rebuild in the event of destruction. Owners of such property should only be allowed to maintain the building for continued habitation. For residents who have to rebuild they could be compensated through land exchange and provided with duty free concession so as to encourage them to meet the prescribed guidelines and/or to consider land exchange for so doing.

7. Eco-tourism activities in this area could be considered. However strict guidelines for their development and operations must be drawn up and adopted by land owners for implementation. Some proposed projects are as follows. However these must be supported by clear projections of demand.
    - Construction of cottages, tent cabins and camp sites to accommodate tourists and overnight
    - accommodation for trail users and
    - research facilities for researchers
    - Other amenities for potential visitors to the site

ESTABLISHMENT OF A BUFFER ZONE FOR MTNPWHS

The following factors were considered in selection of the buffer zone:

- The status of the Park as a World Heritage Site and the need for the establishment of a buffer zone
- The primary objective of the Park in ensuring the protection and conservation of the ecosystems and water resources within the national park including the populations of other endemic species of plants and animals
- Enabling the stakeholder communities to sustain livelihoods that are environmentally safe.
- Preserving the recreational potential of the Park while preserving its environmental integrity
- Mitigating the impacts of natural hazards by minimizing the impact of anthropogenic activities
- The buffer zone is expected to contain elements suitable for carbon sinks

Threats

The most common activity occurring in the areas proposed as buffer zones and in some cases within the boundary of the Park is agriculture, either by squatters within or adjacent to the boundary of the park or by private land owners in the same areas. Most of the farming is subsistence farming while a smaller percentage of activity within the boundary of the Park is illegal planting of *Cannabis sativa*. To a lesser extent, there are areas with residential expansion in and around the Park as well as road construction.

The impact on the terrestrial biodiversity of the Park from these developments is common to all areas and can translate into loss of habitat for wildlife depending on the extent of clearing of land as well as the disturbance of micro climates or niches suitable for other species of wildlife in the Park.

Agriculture and /or home gardening may be the vehicle for inadvertently introducing invasive and/ or exotic species into forest environment which may have the ability to out-compete the local species and in so doing the habitat of native species and thus compromise the ecological integrity of the Park. There is also the problem of the introduction of plant disease through this medium.

As such the establishment of a buffer zone is important to protect the biodiversity of the Park from these and other activities.

SIZE AND CHARACTERISTICS OF PROPOSED BUFFER ZONE

The determination of the size of the buffer zone was based on the evaluation of the existing biological resources of the Park, the existing impact of anthropogenic activities on the Park by the adjacent communities and the acreage of land from the boundary of the Park that would afford a reasonable level of protection to the resources of the Park. In some areas, proximity to inhabited communities was taken into consideration.

The total acreage of the proposed buffer zone consists of 3045 acres (1232.3 ha) of which 722 acres (292.2 ha) is privately owned. The acreage of the buffer zone indicates that 76 % of the land is state-owned and the other 24 % is privately owned. The description of the buffer zone is as follows: (refer to Figure 3 below)

In the northern area of the Park from Corona to Newfoundland, recommendations by Baptiste & Associates are being adopted as follows: The depth of the proposed MTNP buffer in the northern area of the Park has a range between 500 feet (152.4 m) in localities where residential development is dense and in close proximity to the boundaries of the Park (Corona) to 1,000 feet (305m) in areas where the land is under forest, marginal and state owned (Petite Terre Ferme). South of Corona the buffer follows the existing forest edge.

In the other areas of the Park, a 656.2 feet / 200m buffer zone is being recommended.

Government Owned lands

An evaluation of the agricultural activities on government- owned land indicated that in most areas there is very little “active” agricultural production. Most of the farmers have virtually ceased activities in these areas except for the planting and harvesting of Bay leaf. In other areas, there is a low level of subsistence agriculture consisting mainly root crops, bananas and citrus. In other less accessible areas there is illegal planting of cannabis sativa. In the areas of Petite Savanne, Bagatelle and Delices, Bay leaf, *Pimenta racemosa,* trees are planted and harvested for the production of Bay oil which is essential for the livelihood of farmers of these areas.

Privately Owned lands

An evaluation of the land use indicated that most of these areas have been cleared of their vegetation cover for agricultural purposes. Low level subsistence agriculture with basically the same types of crops, have been identified.

With respect to agricultural holdings and private land all areas within and directly external to the Park boundaries are classified as high agricultural erosion hazard except for some areas in the northwestern and northern areas (in Terre Ferme) which are classified as poor or very poor agricultural land.

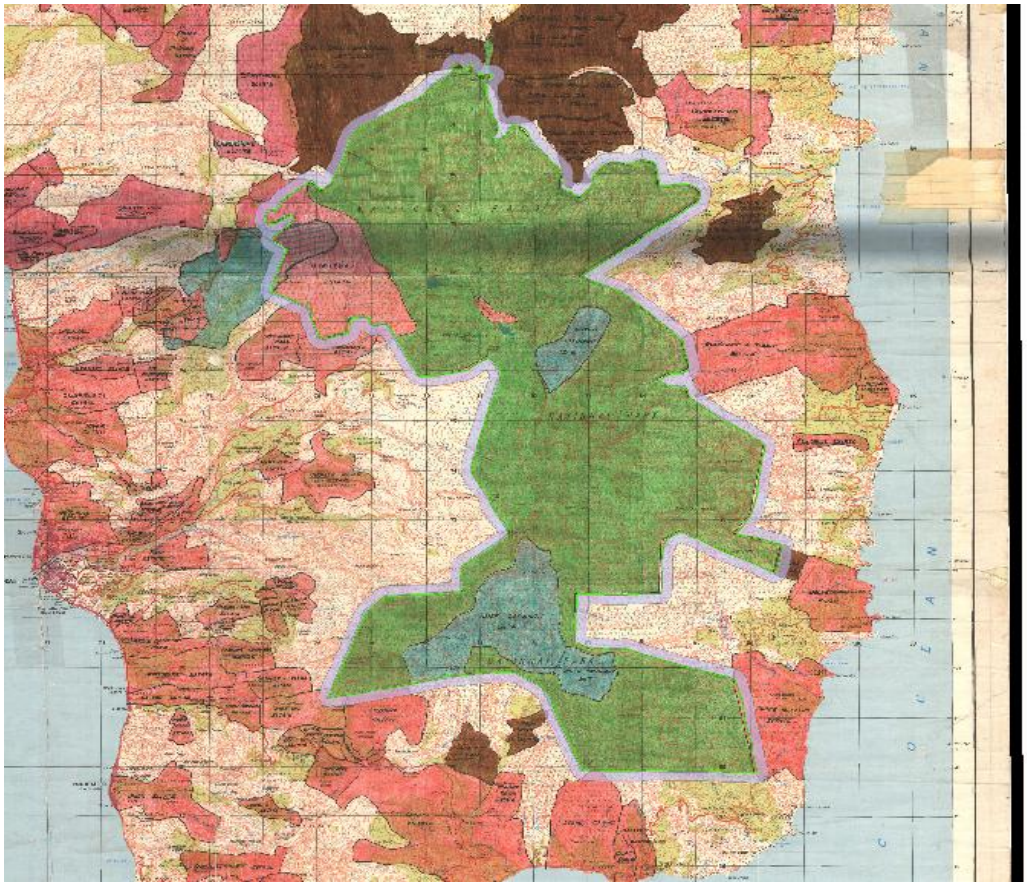


Figure 3 - Proposed Buffer Zone - MTNPWHS

These areas generally have slopes of over 30 degrees with moderate to high erosion hazard. The recommended land use in these areas based on the land capability map for Dominica prepared by David Lang is timber plantations, tree crops, forest enrichment and forest recreation. These lands are not suitable for the type of agriculture that is generally observed in the area.

Limitations

A number of conflicts are envisaged with respect to proposal for the establishment of buffer zones. There will be conflict with government and private land owners with respect to independent use of their land as well as with farmers or squatters who are utilizing government-owned land for subsistence agriculture.

Except for the large private estates, ownership of small parcels of land within and outside of the Park boundary is still scanty. Some farmers claim ownership but in some cases it could not be verified legally.

Farmers have stated openly that they are not willing to sell their land below market price. Land is a very sensitive issue and it will require extensive negotiations and sensitization of land owners on the importance and value of national parks in order to encourage them to cooperate fully in the establishment of buffer zones.
The issue of alternative uses of the land will require the provision of incentives to the farmers.

ACQUISITION OF LAND FOR THE BUFFER ZONE

The process of acquisition would basically be the same as indicated for the MDNP above.

Cost of Direct Purchase of Land

Total area of private lands affected 722 acres (292.2 ha)
Total buffer acreage 3045 acres (1232.3ha)
Total area of privately- owned land amount to 722 (292.2ha) acres. The basic price per acre for agricultural land is E.C. $15,000. The total cost to government for outright purchase would be approximately E.C $M $10.83

In terms of commercial prices, there is considerable fluctuation in for this area

In terms of purchase of land government should seek to prioritize purchase options. Lands that have minimal impact on the biological resources of the Park; that have minimal value for residential or commercial development and are physically inaccessible without major financial input by the owners should be not be considered for immediate acquisition. Priority should be given to lands that have an immediate impact on the biological resources of the Park.

MANAGEMENT AND RECOMMENDED USE OF BUFFER ZONE

- For Government Owned lands

In the areas of Petite Savanne, Bagatelle and Delices, Bay leaf, *Pimenta racemosa,* trees are planted and harvested for the production of Bay oil which is essential for the livelihood of farmers. It is recommended that this activity should be allowed to continue with the specific proviso that farmers do not plant root crops under the Bay-leaf trees since it enhances erosion of the area.

In all other areas farmers should be asked to vacate the land so that it could be reforested so as to provide some protection to the National Park. Displaced farmers could be provided with alternative land for agricultural production. On the east in the vicinity of Grand Fond, there is some unallocated government land that can be considered for this purpose.

- For Privately Owned lands

In areas with agricultural holdings within and directly external to the Park boundaries that are classified as high agricultural erosion hazard the recommended land use based on the land capability map prepared by David Lang for Dominica is timber plantations, tree crops, forest enrichment and forest recreation. These lands are not suitable for the type of agriculture that is generally observed in the area. As such it is recommended that land owners who wish to retain their land are encouraged to invest in these ventures. Private lands included in the buffer area that are already forested should maintain their forest cover.

Some incentives should be considered and offered as part of a package to encourage farmers to do so. As discussed later the concept of developing carbon sequestration programmes that can benefit these land owners who wish to retain forest cover should also be considered.
Other livelihood projects recommended are scale eco-tourism projects like eco- cottages, small restaurants and other visitor amenities- gift shops, small spas.

The following is recommended for the establishment of the buffer zone:

- All plots in the Terre Ferme Settlements which have not been allocated or allocated but not utilized nor paid for should remain State owned and under forest.
- The privately owned lands should preferably be acquired through land swapping and placed under the control of the Forestry and Parks Division or land owners encouraged to comply with the recommendations of the Forestry and Parks Service through provision of a suite of incentives.

- The Buffer should be designated an Environmental Protection Area pursuant to Part VI of the PPA. However, private land owners who wish to retain ownership of their land for development along lines consistent with regulations governing activities in the buffer should be allowed to do so, thereby reducing the area of land to be acquired.

- Existing residential development in this zone that are designated as non-conforming should be encouraged to meet the criteria established by the Forestry & Parks Service failing which the owners not be allowed to expand or rebuild in the event of destruction. Owners of such property who do not conform should only be allowed to maintain the building for continued habitation.

For the communities within and around the buffer zones, a conservation education programme should be implemented so as to sensitize them on the importance of the establishment of a buffer zone for conservation of the resources of the Parks and their role in the successful implementation and management of the entire process.

1.0 INTRODUCTION

1.1 BACKGROUND

The Government of the Commonwealth of Dominica has undertaken several initiatives to protect its natural resources which constitute an integral component of its social and economic development strategy. Following the ratification by government of Convention on Biological Diversity (CBD), the United Nations Convention to Combat Desertification (UNCCD), the United Nations Framework Convention on Climate Change (UNFCCC), the Stockholm Convention on Persistent Organic Pollutants (the Stockholm Convention), and the Montreal Protocol on Substances that Deplete the Ozone Layer (the Montreal Protocol, a number of programmes are being undertaken combat the impact of climate change on the biodiversity of Dominica.

Under the Special Programme for Adaptation to Climate Change (SPACC) implemented by the World Bank and executed by the Caribbean Community Centre for Climate Change, (CCCCC) a number of initiatives including this one are being undertaken as part of a strategy to reduce the vulnerability of Dominica's ecosystems to the impact of climate change. These include the following:

- Improving the management plans for the Morne Diablotin National Park and the Morne Trois Pitons National Park World Heritage Site.
- The development of a Sustainable Land Management Plan (SLM) as a mechanism to assist in the design of elements of the buffer zone through the engagement of key target communities adjacent to the boundary of the MTPNP and MDNP considered as critical points for anthropogenic pressure on the two park
- Data Collection and Monitoring aimed at achieving the following:
    - An assessment of existing meteorological data and recommended data needs of the National Parks
    - Development of an asset Mapping legend to capture all ecological information relevant to SLM
    - Development of a database on biodiversity in Dominica to include the procurement of computer equipment and software for data repository to inform the Park management process and to serve as baseline data against which future data collection could be assessed
- Procurement, installation and testing of meteorological instruments and training of relevant personnel in the use and management of these instruments.
- The development of projects in communities adjacent to the Park aimed at reducing negative impacts of communities on the national parks. One such project is a "Feasibility Study and Design for the Installation of Storage and Distribution System for Irrigation Water"

Other studies undertaken include the development of a National Forest Policy in 2010 to guide the sustainable management of the forest resources while maintaining or improving the present area of forest cover as well as a number of programmes under the OECS (Organization of Eastern Caribbean States) Protected Areas and

Associated Sustainable Livelihoods (OPAAL) Project funded by the GEF- World Bank and Fond Francais pour l'Environnement Mondial, FFEM aimed at developing a framework for managing protected areas so that the region's biodiversity will be protected from further degradation. Some of the projects included the following:

- Review of National Protected Areas Policy, Legal and Institutional Framework; and the development of a Communication Plan for the Cabrits National Park in 2006.
- Opportunities for Sustainable Livelihoods in the Cabrits National Park (Espeut, 2006),
- Cabrits National Park Marine Section Management Plan 2007-2012. (Edwards, 2007),
- Environmental and Socio-Economic Studies for Cabrits National Park, Dominica (Ecoengineering, 2007)
- Cabrits National Park (Marine Section) Sustainable Livelihood Project, (NICE/SIE, 2008).
- Implementation of a livelihoods sub-projects for the communities in the vicinity of the national park 2009-2011)

The design of buffer zones for the 2 national Parks is funded under the GEF-World Bank **Special Programme for Adaptation to Climate Change (SPACC).** The goal of the SPAAC project is "*to implement specific (integrated) pilot adaptation measures addressing primarily the impacts of climate change on the natural resource base, focused on biodiversity and land degradation along coastal and near-coastal areas. This will be achieved through: (i) the detailed design of pilot adaptation measures to reduce expected negative impacts of climate change on marine and terrestrial biodiversity and land degradation; and (ii) the implementation of pilot adaptation measures*".

The project also seeks to "produce knowledge of global value on how to implement adaptation measures in small island states that can be applied in other countries in the region". The two sites identified for the detailed design and implementation of adaptation measures are: (a) the Morne Trois Pitons National Park World Heritage Site and its neighbouring communities and the Morne Diablotin National Park (MDNP) and its neighbouring communities.

There have been significant threats of encroachment in the park, particularly due to residential, commercial and agricultural development. Buffers have been determined to be necessary in order to provide some level of protection to the biodiversity of the forest, to minimize landslide risk, provide watershed protection downstream and overall to minimize anthropogenic activities that exacerbate climate change. Additionally, Dominica has an obligation to establish buffer zones in the Morne Trois Pitons National Park (MTPNP) to meet its commitment and maintain the designation of the Park as a World Heritage Site. The buffer zones are expected to contain elements suitable for carbon sinks and to demonstrate the potential compatibility of communities in harmony with nature.

1.2 OBJECTIVES

The objective of this assignment is to design buffer zones for the two national parks that ensure the

protection and conservation of the ecosystems and water resources within the national parks taking into account the need to sustain the livelihood of stakeholder communities adjacent to the Parks.

1.3 APPROACH AND METHODOLOGY

This study was carried based on literature review, field studies, discussion with the Forestry and National Parks service, meetings with farmers and land owners as well as the use of Geographic Information Systems (GIS).

METHODOLOGY

All previous studies, management plans and proposed buffer zones, as well as legislation pertinent to the Parks were collated and evaluated.

Evaluation of the natural resources of the parks, existing land use and threats (both man-induced and natural) were undertaken through desk research, interviews with forestry and national parks personnel, field visits, as well as through the use of Geographic Information Systems (GIS).

Field assessments were carried within a 300 m area internal to the boundaries of the Park to evaluate activities within the Park and in 200 m, 400 m and 600 m areas external to the boundary of the Park to evaluate activities external to the boundary of the Parks. Additional information was obtained from satellite images and these were mapped.

A socio-economic evaluation of the communities adjacent to the Parks was undertaken through meetings with some village councils as well as desk research utilizing existing socio-economic data like the national poverty assessment reports and national population statistical reports.

A series of consultations were held with stakeholders- the village councils, communities and farmers groups to obtain their input into the process. Stakeholder consultation took the form of community workshops, focus group meetings and interviews with all communities adjacent to the Park as well as 2 national consultations with stakeholders which included the above mentioned groups as well as policy makers and other NGO groups. Recommendations from these consultations were incorporated into the final document.

METHODOLOGY FOR GIS SURVEYS - Sensitive areas around the both parks were identified. These areas were either very close to communities or had intensive agricultural or housing activities taking place in and around the Park. The survey points for the two Parks were as follows:

For Morne Trois Pitons National Park WHS:

- Southern boundary of the Park from La Roche, Delices /Victoria to Perdu Temps River,

- The area around New Florida Estate/ Bellevue Chopin,
- Grand Fond, Newfoundland, Bois Diable, Emerald Pool areas,
- Review of the northern Pont Cassé Area up to Sylvania
- Western boundary to include, Cockrane, Laudat/Trafalgar/Giraudel

For Morne Diablotin National park:

- The area from Petit Macoucherie to Savane Gommier up to the Foundland area.

In order to study the land use threats in the 2 Parks, areas of 200m, 400m and 600m external to the boundary of the Park were demarcated as well as 300m area internal to the boundary of the Park to evaluate activities that were taking place inside and directly external to the boundaries of the park.

From the maps, the boundaries of the parks were demarcated and imported into GIS format. Two Trimble Juno SC and a Trimble GeoXH were used to gather data in the field. A data dictionary was set up to gather the necessary data in the field. A known point on the map was set into one of the Juno and driven to, to ensure that the map was correctly geo-referenced.

Data was collected from all the above sites through site visitation and land use evaluation utilizing Geographic Information Systems (GIS) to assess and produce land use maps for villages that pose threats to the National Parks Boundaries.

Areas that were not listed to be surveyed were studied against satellite imageries, polygons were placed over each activity corresponding to the point, demarcating the boundaries of the shown activities. A complete land use map was formed.

Other GIS files were utilized to produce the maps: Rainfall, Roads, Soils, Vegetation and Landslides were obtained from Lands and Survey and Physical Planning Division in Dominica. Geological map of Dominica was obtained from *http://dominicapsn.freeyellow.com/maps.php.*

1.4 OVERVIEW OF THE PARKS

1.4.1 MORNE TROIS PITONS NATIONAL PARK WORLD HERITAGE SITE

The **MTPNP WHS** is located in the central portion of southern volcanic complex of the island, covering an estimated 6,900 ha (17,000 acres) that includes four of Dominica's seven mountain ranges, Morne Trois Pitons, the highest peak at 1,387 m (4,550 ft), Watt Mountain (1,224 m or 4,017 ft), Morne Macaque (1,221 m or 4,006 ft), and Morne Anglais (1,113m or 3,650 ft), three lakes, the Freshwater and Boeri Lakes, the Boiling Lake described as the largest in the western hemisphere, the Emerald Pool. Other features include Middleham Falls and the fumaroles within the Valley of Desolation.

It was established in 1975 under the National Parks and Protected Areas Act. At the time of establishment, there were a number of private in-holdings predominantly in the western and eastern sections of the Park most of which have never been resolved. There were also a number of farmers utilizing government land in some areas east of the Park for subsistence agriculture and planting of bay leaf, *Pimenta racemosa,* trees for the production of bay oil. To date, no arrangements have been made with the farmers some of whom continue their livelihood of production of bay oil and subsistence farming.

In 1997 it was established as a UNESCO World Heritage Site - Inscribed on the World Heritage List under **Natural Criteria viii**- *"to be outstanding examples representing major stages of the earth's history, including the record of life, significant on-going geological processes in the development of landforms or significant geomorphic or physiographic features"*

and criteria x. *"To contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation"*.

The present status of the boundary of the National Park indicates the following:

- The Archbold Preserve comprising of 940 acres though considered part of the park has not yet been legally incorporated within the National Park.
- The boundaries that have been gazetted for the National Park do not correlate to what is actually seen on the ground and in many cases the discrepancy is not only large, there is absolutely no cut lines or demarcation. Additionally, a large percentage of the boundaries of the National Park have not been maintained over the years.

CONSERVATION VALUE

The United Nation Environment Programme, UNEP, World Conservation Monitoring Centre describes the conservation value of the MTNPWHS thus:

"Morne Trois Pitons National Park includes large highly scenic tracts of the most extensive almost undisturbed tropical forest in the Lesser Antilles and the headwaters of most of the major streams and rivers in the southern half of the island. These support a high level of biodiversity. The Park lies within a Conservation International-designated Conservation Hotspot, a WWF/IUCN Centre of Plant Diversity and a BirdLife-designated Endemic Bird Area".

The operational guidelines for the implementation of the World Heritage Convention clearly states that the boundaries of a World heritage Site should "include sufficient areas immediately adjacent to the area of outstanding universal value in order to protect the site's heritage values from direct effects of human encroachment and impacts of resource use outside of the nominated area"

It defines a buffer zone as "an area surrounding the property which has restrictions placed on its use to give an added layer of protection: the area consisting of a buffer zone should be determined through technical studies. Details on the size, characteristics and authorized uses of a buffer zone as well as a map indicating its precise boundaries, should be provided"

1.4.2 MORNE DIABLOTIN NATIONAL PARK

Morne Diablotin National Park was established in 2000 under the National parks and Protected Areas Act of 1975. It is located at 15° 31′N and 61° 24′W in the northwest section of Dominica within the parishes of St. John, St. Andrew, St Peter and St. Joseph.

It was carved out of the northern forest reserve with the specific objectives of protection of the two endemic Amazona species of parrots- *Amazona imperialis* and *Amazona arausiaca* and the preservation of their habitat- the virgin forest types in the area.

It consists of 8425 acres (3439 hectares) of land and contains the highest mountain in Dominica, Morne Diablotin which rises 4747 ft (1,422m).

CONSERVATION VALUE

It is comprised of some of the finest and least disturbed rainforest in the insular Caribbean. The majority of the area is very rugged and above 2000 ft. elevation. Several peaks occur within the Park and a deep ravine, the Picard Gorge, runs through the north-west section. The majority of its forest has no or little value as timber and much of the land is either too steep or prone to landslides or the soils too poor to permit agriculture. Yet the Park has tremendous value as protection forest since it includes portions of the watersheds of 12 rivers, four of which provide water to domestic, agricultural and industrial users in the north of the island. It is also host to a number of rare or endemic species including the endemic plants, Chromolaena impetiolaris and Chromolaena macrodon which are only known from Morne Diablotin[1]

1.5 REVIEW OF LEGISLATION GOVERNING THE PARKS

The National Parks and Protected Areas Act of 1975, is the principal legislation which established the National Parks and defined areas of State lands that could, by order of the Minister, be set apart as protected. This Act allows for the creation of a National Park Service and National Park Advisory Council and is administered by the Ministry of Agriculture and Forestry. This Act gives the Forestry & Wildlife Division, jurisdiction of all areas designated as national park.

There was an amendment to the Act in 2001. This amendment, "The National Parks and Protected Areas

[1] Allen Putney "Morne Diablotin National Park Management Plan 2000 -2014" (2008)

(Amendment Act), No. 8 of 2001" authorizes the President by order to amend the Schedule to the Act for purposes of including a description of any area designated as a national park.
There are a number of regulations with respect to the National Park. The National Parks Regulations, S.R.O No. 54 of 2003 provide for the following in the national parks:

- Opening and closing hours;
- Prohibited activities;
- Selling of goods;
- Use of a national park by the media for filming purposes.

The National Parks and Protected Areas (Eco-Tourist Site) (User Fee)Regulations S.R.O No. 27 of 1997 and S.R.O No. 22 of 2008 also provide for the establishment of user fees that persons are required to pay to visit (eco-tourism) sites and provide a list of eco-tourist (eco-tourism) sites and the relevant fees.

Other relevant Acts with respect to the National Parks are as follows:

- The Forestry and Wildlife Act of 1976 which established that all wildlife in the country is the property of the State and is entitled to protection by the Division of Forestry.
- The Forest Act of 1958, that allows for conservation and control of forests and for the establishment of forest reserves and protected forests.
- Dominica Water and Sewerage Act, Cap. 43:40 under the Ministry of Housing, Lands, Settlement and Water Resources. Under the Act the Dominica Water & Sewerage Company, DOWASCO, has the authority to undertake, operate and manage any work concerning provision of water to take any action required to conserve, redistribute or otherwise supplement the water resources.

Where a water catchment is under serious threat from deforestation or animals, the Company is mandated to request the Ministries with responsibility for Forestry or Health, as the case maybe, to take the necessary action to mitigate the threat, failing which the Company will act to address the situation.

- Physical Planning Act, No. 5 of 2002- administered under the Ministry of Environment, Natural Resources, Physical Planning and Fisheries, makes provision for the orderly and progressive development of land; grants permission for the development of land and has powers to acquire and develop land for planning purposes as well as the declaration of an area as an environmental protected area, EPA, taking into consideration the following:
    - The flora and fauna of the area
    - The natural features and beauty of the area

- Any outstanding geological, physiographical, ecological, or architectural, cultural or historical features of the area which it is desirable to preserve and enhance
- Any special scientific interest in the area
- Any special natural hazards to which the area is or may be subjected to
- The characteristics, circumstances and interests of the people living and working in the area.

- Tourism (Regulations and Standards) Act, No. 19 of 2005 & Tourism (Regulations and Standards) (Amendment) Act, No. 11 of 2008 under the Ministry of Tourism and Legal Affairs speaks to the creation of standards to guide the development of the tourism industry and the regulation and certification of select tourism services and related matters.

- Environmental Health Services Act, No. 8 of 1997 under the Ministry of Health speaks to the issue of provision for the conservation and maintenance of the environment as it relates to issues of health, environmental pollution, management and disposal of wastes as well as the planning and implementation of measures towards the wise and safe use of the environment.

Of interest to the MDNP and the development of a buffer zone, is the Forest Industries Development Corporation Act, Cap. 85:01. This Act establishes the Forest Industries Development Corporation which is principally concerned with the establishment of a large scale timber industry in Dominica. The functions of the Corporation are of particular importance as it is empowered under Section 17 to "carry out or provide for the felling and planking of all timber on State land in Dominica". This entails the following:

- Locating, felling and extracting of timber;
- Laying, constructing and maintaining cableways and roads as may be necessary in, on or over all State lands;
- Processing and storing of timber; and
- Making regulations to govern the cutting of timber and the protection of immature trees.
- Re- afforestation programmes

The MDNP is bordered by the northern forest reserve. Under the regulations governing the reserve, permission may be granted for selective felling of trees hence the need to consider this in any management and development programme for the MDNP.

In terms of management responsibility for the Parks, there is some shared responsibility for management of the Morne Trois Pitons World Heritage Site and the Morne Diablotin National Park and several eco-sites within the National Parks between the Division of Forestry, Wildlife and National Parks and the Ministry of Tourism .The Division of Forestry, Wildlife and National Parks is in the Ministry of Agriculture and Fisheries. There are subtle but very important differences within these agencies with respect to the management and use of the Park. The Forestry Division's mandate is fundamentally the conservation of the biodiversity and other natural resources of

the Park for future generations utilizing these resources sustainably as a basis for recreation. The Ministry of Tourism and Legal Affairs' major interest is the provision of services to the tourism industry. The Ministry does not see the importance of establishing Limits of Acceptable Change, LAC, in the use of some ecotourism sites in the Park and as such, can compromise the biodiversity of the Park to meet the needs of visitors especially cruise ship visitors.

The National Park Legislation is currently being reviewed as well as the management structure for all protected areas and is expected to address management responsibilities for all sites within the national parks.

2.0 CLIMATE CHANGE – TRENDS AND PROJECTIONS FOR DOMINICA

There is evidence to suggest that the climate of Dominica is changing. Both maximum and minimum temperatures have increased in the recent past. The warming trend is expected to continue. The country is projected to be warmer by up to 1.3^0C by the 2050s and between 2 and 3 degrees by the end of the century.

- Winter months will see marginally larger increases in temperature than summer months.
- The frequency of very hot days and nights will increase, while the number of very cool days and nights will decrease.
- The country is likely to be drier in the mean. Projections are for up to 20% drier by mid century and up to 50% drier by 2100.July-August will likely be drier.
- The seasonality of Dominica will be largely unchanged. The cooler (with respect to late season temperatures) dry early months and wet hotter late months will still prevail.
- Hurricane intensity but not necessarily frequency is likely to increase
- Caribbean sea levels are projected to rise by up to 0.24 m by mid-century.
- Sea surface temperatures in the Caribbean are projected to warm up to approximately 2oC by the end of the century.
- El Niño Southern Oscillation, ENSO's impact on Dominican rainfall (early and late season) will likely continue given projections of the phenomenon's continued occurrence in the future.

HURRICANES

Dominica is located in the hurricane belt and is therefore susceptible to tropical storms and hurricanes. Since 1979, tropical systems of note (storms and hurricanes) which have impacted Dominica include David (1979), Gert (1981), Gilbert (1988), Hugo (1989), Iris (1995), Marilyn (1995), Hortense (1996) Lenny (1999) and Dean (2007). The island is impacted approximately once every four years. The north Atlantic hurricane frequency is characterized by a multidecadal cycle which yields active and inactive phases lasting 10 or more years (Goldenberg et al. 2001). Since 1995, the north Atlantic has swung into an active hurricane phase. Some of the country's most devastating recent hurricanes (e.g. Marilyn, Lenny, Dean) have occurred in the current active phase of the north tropical Atlantic.

2.1 GREEN HOUSE GAS INVENTORY FOR DOMINICA

The 1994 GHG Inventory for Dominica indicated the following:

Dominica's INC described Dominica as a net sink of Greenhouse Gases (GHG) in 1994. The data showed that Dominica had gross emissions of 76.53Gg of CO2, which were offset by removals from changes in forest and other woody biomass stock and from the abandonment of managed lands, resulting in a net sink of 295.14 Gg of carbon dioxide.

There were also small quantities of methane, nitrous oxide and non-methane volatile organic compounds – 2.73 Gg, 0.042 Gg and 6.13 Gg respectively. The following indicates the key sources of carbon dioxide emissions:

- Transport – 50%
- Energy Industries – 26%
- Commercial and Industrial Uses – 10%
- Industry – 5%.
- Residential – 4%.
- Other – 5%

The GHG inventory indicates that Dominica is net sink for carbon dioxide and there is no major threat to the national parks from GHG.

2.2 IMPLICATIONS OF CLIMATE CHANGE ON THE NATIONAL PARKS

Climate and weather conditions including elevated temperatures, natural disasters like drought, hurricanes and storm surges, floods and landslides periodically affect or threaten Dominica. These natural disasters, particularly hurricanes have been cited as one of the root causes of land degradation in Dominica.

Both Parks are characterized by outstanding plant diversity, density and endemism. They are the largest source of potable water for more than 60% of the population of Dominica. In terms of the biodiversity of the national parks, climate change can have an impact on species distribution, community composition and configuration, ecosystem functioning, services and states. This was aptly demonstrated by Hurricane David in 1979 which incurred significant damage to the forest resource by damaging 50% of the trees in the southern half of the island as a result of which there was loss of habitat and food supplies for wildlife species which resulted in extensive wildlife mortality. While there were no scientific studies on the impact, Forestry and Parks personnel indicated that there were visible changes in the forest configuration specifically in the elfin woodland and "palm brake" as well as changes in the phenology of some plant species.

Destruction of food sources and nesting sites are 2 of the many causes for the decline of Dominica's two endemic species of parrots as experienced by the effect of past hurricanes. As such, forests will become increasingly vulnerable to the problems associated with global warming and climate change especially in the face of predicted increase in the severity and frequency of hurricanes.

Climate change can negatively impact the economic and social well being of Dominica. Dominica relies on the conservation of its forest resources to maintain the ecotourism concept as the main product of the tourism

industry. Impact of climate change can effect closure of parks to visitors, endangerment of visitors in the Park through floods and storms and increased maintenance of infrastructure, amenities and facilities.

Flooding and or drought can impact potable water through increase silting of watersheds during the rainy season and reduce water availability for consumption and hydroelectricity.

As such a number of management strategies must be adopted to combat the impact of climate change one of which is the establishment of buffer zones for the national park

3 DEVELOPMENT OF A BUFFER ZONE FOR THE MORNE DIABLOTIN NATIONAL PARKS

3.1 BIOPHYSICAL CHARACTERISTICS OF THE NATIONAL PARKS

3.1.1 ELEVATION

The MDNP has a range of altitude of 579 -1447 m. The elevation map below shows a decrease in elevation from the south to the north of the map. The highest elevation represents Morne Diablotin.

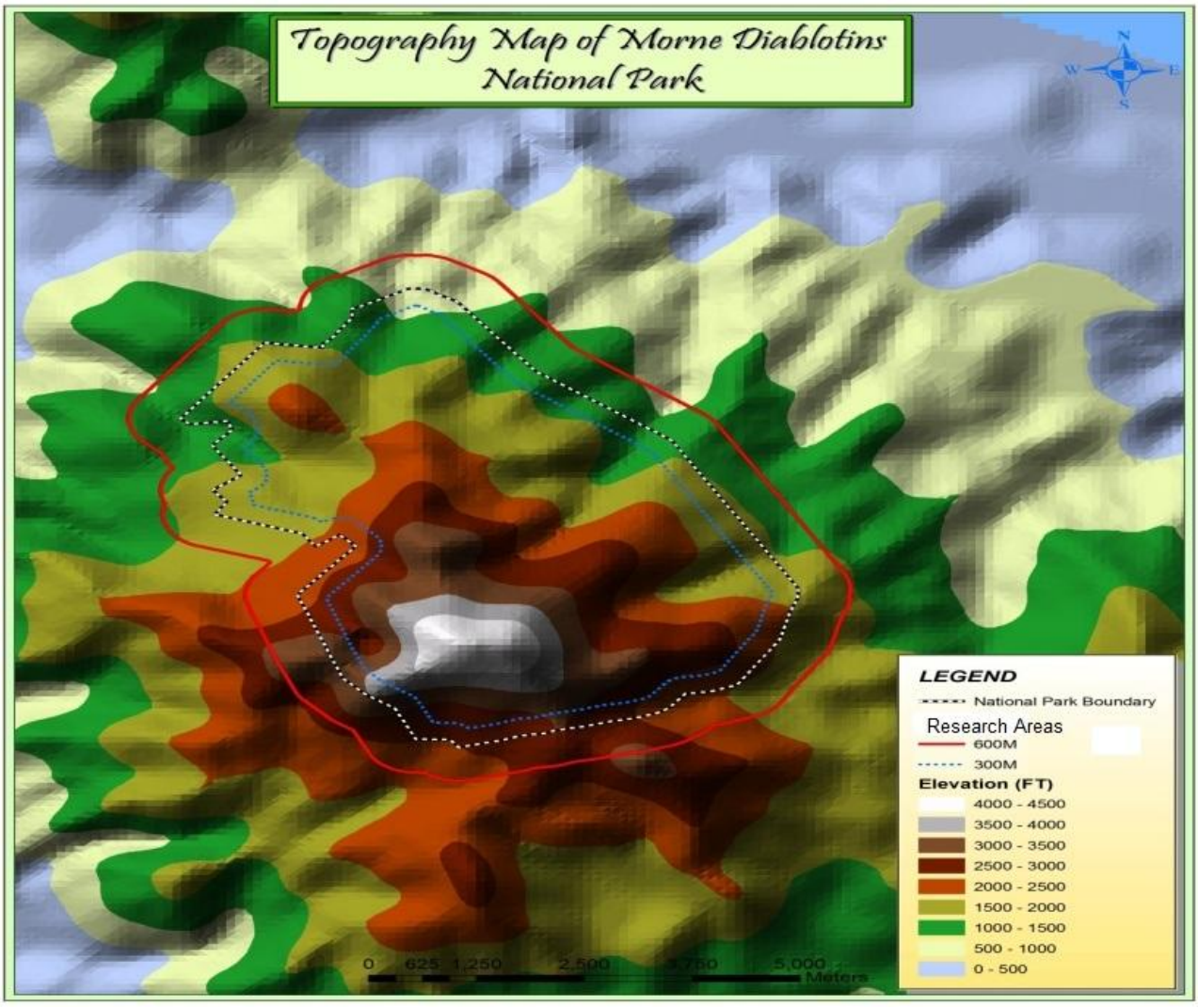


Figure 4 – Topography of Morne Diablotin National Park

3.1.2 HAZARD ANALYSIS

The east, west and southern areas of the MDNP are described as centralized high landslide risk areas. The majority of the park is identified as medium risk. The adjoining Syndicate and Dyer estates are classified as low and medium landslide risks.

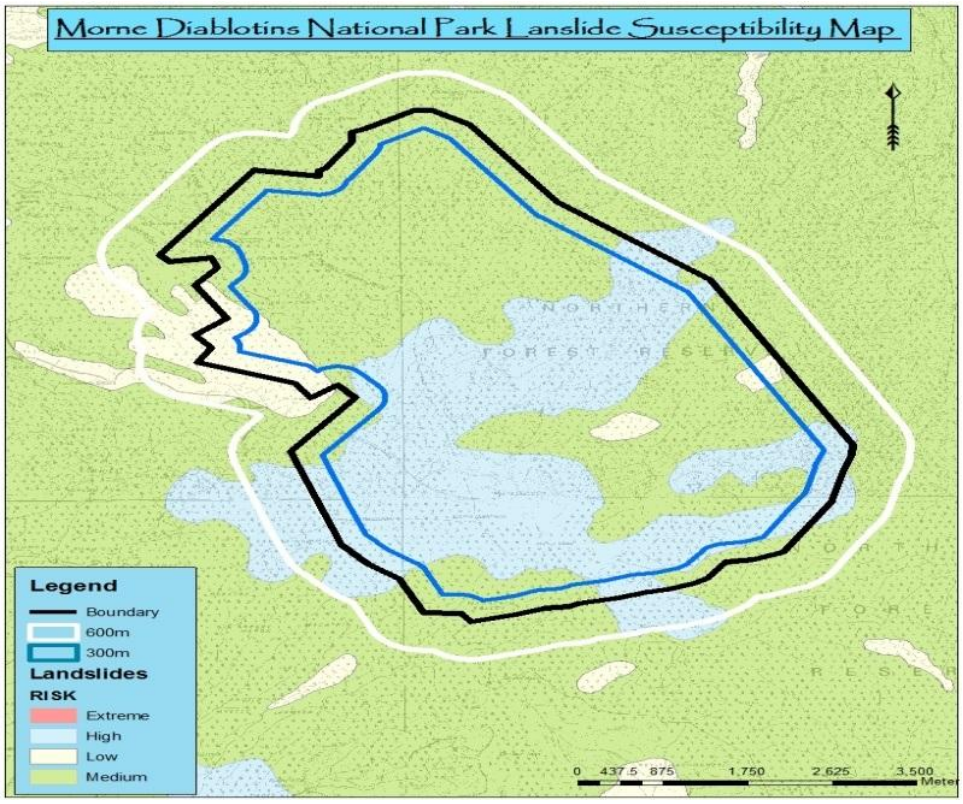


Figure 5- Landslide Susceptibility of Morne Diablotin National Park

3.1.3 GEOLOGY AND SOIL TYPES

This national park is underlain by older pyroclastic aprons over which are younger Pelean domes. These domes give rise to the high peaks of Morne Diablotin which in turn cause orographic rainfall which influence high rainfall in the area.

The predominant soil types within the park are Allophanoids latosolics towards the north and Skeletal in and around Morne Diablotin, with minimal presence of Allophanoids podzolics. These soils are porous and shallow exhibiting high water withholding capacity in the topsoil and high permeability in the sub soils. These areas are exposed to high to medium rainfall levels and thus are prone to landslides because of these two factors.

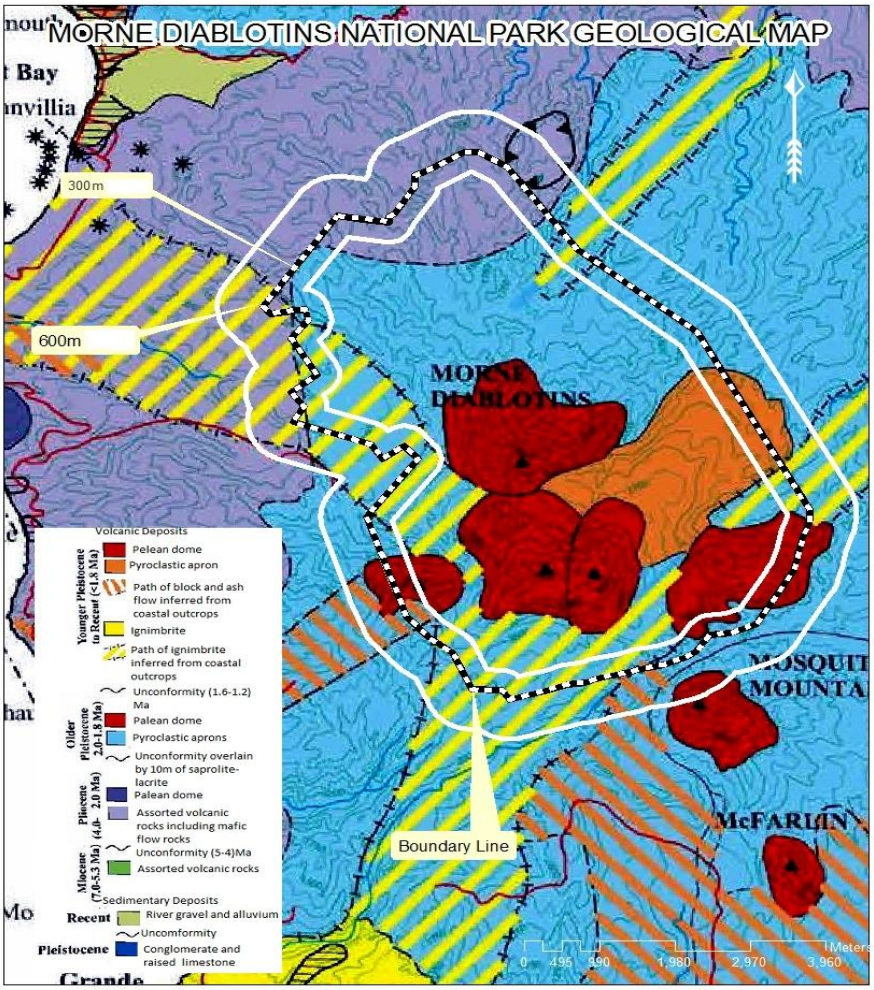


Figure 6- Geology of Morne Diablotin National Park

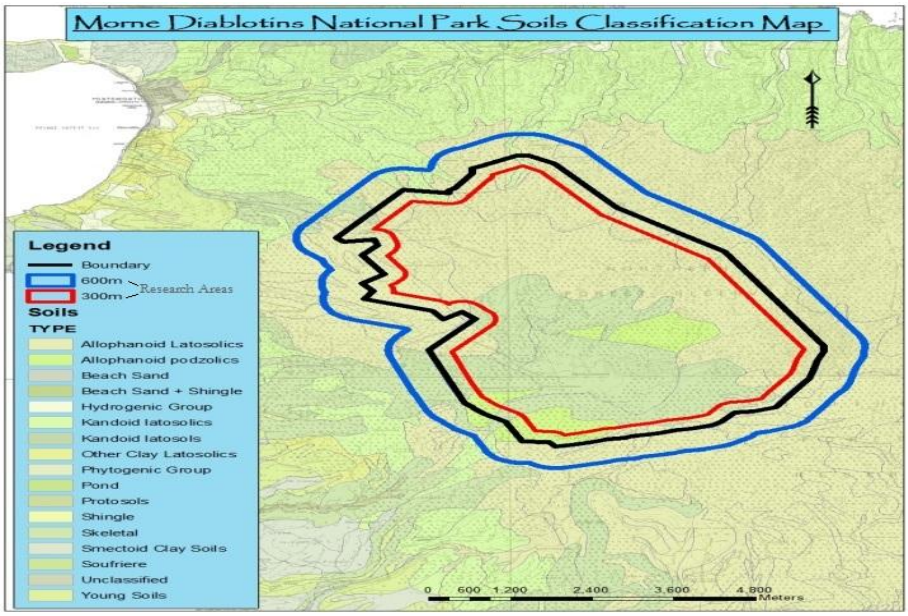


Figure 7-Soil Profile of the of Morne Diablotin National Park

3.1.4 RAINFALL

The rainfall distribution map below shows a southern central region of 300+ inches of precipitation in the MDNP. This region surrounds Morne Diablotin. Going north from that point rainfall measurement decreases. Savane Gommier falls within the 200 to 249 inches rainfall range, Syndicate and Dyer Estates are within the 150 to 199 and Foundland is within the 100 to 149 inches range.

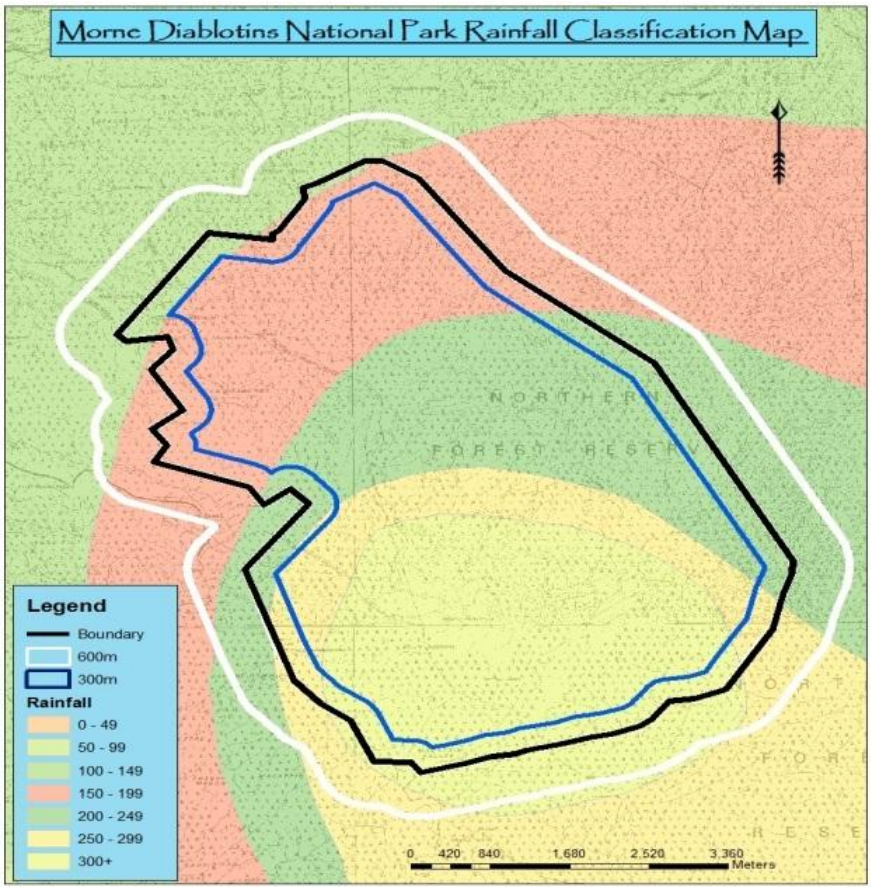


Figure 8 – Rainfall Classification of Morne Diablotin National Park

3.1.5 IMPORTANT ECOLOGICAL RELATIONSHIPS

In terms of ecological relationships the Management Plan describes the important ecological relationships in the Park as follows:

"Hurricanes and rainfall have shaped the composition of flora and fauna in the Park .Forest vegetation and soils absorb most of the rainfall, which is gradually lost through evapo-transpiration and evaporation thereby keeping humidity high and promoting further rain. Droughts are rare. The soils of the Park are nutrient poor since most of the nutrients are bound up in the plant material. There are tight plant-animal interactions for pollination, seed dispersal, feeding by mammals and birds. Introduced spp. probably cause damage to native vegetation, but this has not been documented. Rats are probably the most damaging".

3.1.6 FLORA AND FAUNA

Flora

A recent evaluation of the flora and fauna of the Park was carried out by Allen Putney in 2008 as follows “No extensive survey of the Park's flora has been carried out. A list of mainly woody species from the western slope identifies about 180 species but there are many other species that are yet to be recorded. The main vegetation type in the Park is the rainforest with a dense canopy and rich diversity of lianas. Secondary rainforest occurs on the northern and western boundaries where pioneer and secondary trees have come in after hurricanes, agricultural clearings, or selective logging.

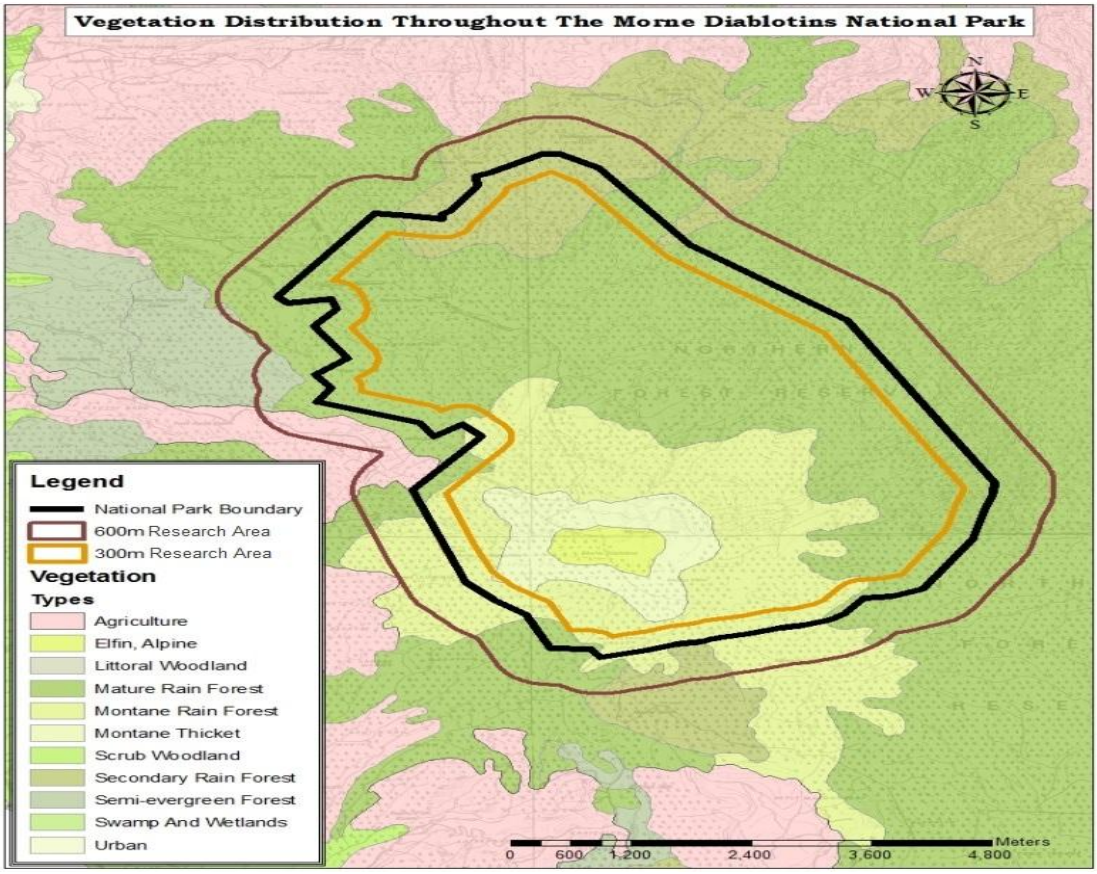


Figure 9 - Vegetation Distribution in the Morne Diablotin National Park

The Montane Thicket vegetation type occurs above 850 m. on thin soils, but not on exposed ridges or summits, and its canopy reaches only 10-15 m. The Elfin Woodland vegetation type occurs above 850 m. on the most exposed ridges and summits; covers only a small portion of the Park and is constantly shrouded in mist and hence is often called "cloud forest". It is characterized by impenetrable growth of small, gnarled trees 3-9 m. high. A survey undertaken by Varty et Al. 1993 indicated that four (4) of the six (6) endemic plant species recorded for Dominica are found in the park”

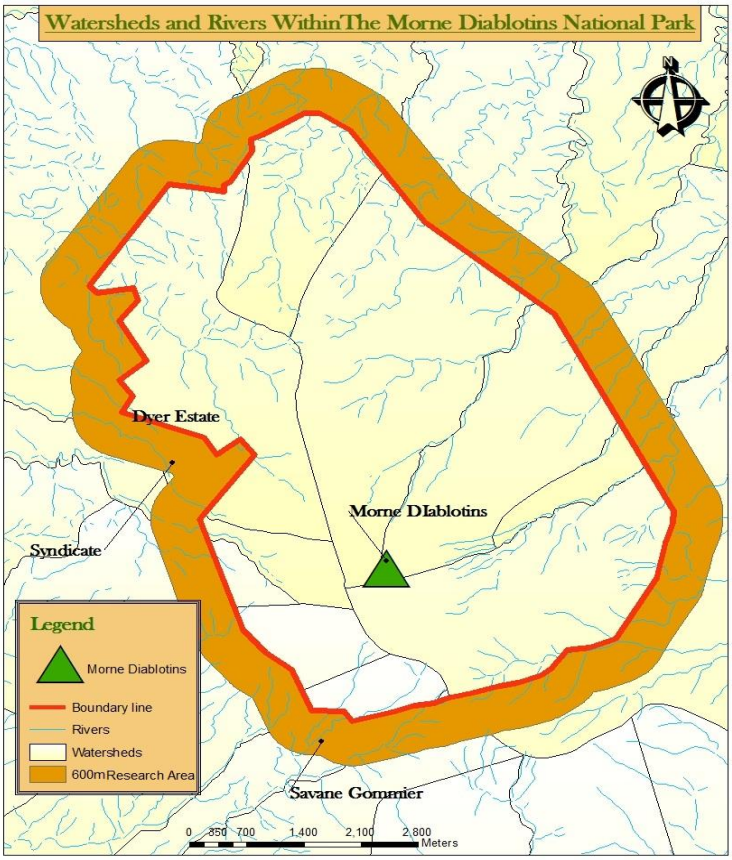
Fauna

The 2008-2012 Management Plan describes the fauna as follows: “Only the higher invertebrates have been documented in the Park. Invertebrates, such as freshwater shrimp and freshwater and terrestrial crabs occur in the Park, but no collections have been made. There are 24 species of butterflies identified in the Park, but fishes have not been studied. Amphibians identified in the Park include 2 spp. of frogs, while reptiles include 5 spp. of lizards, and 4 spp. of snakes. Some 53 spp. species of bird have been recorded for the Park of which 30 are regular breeders.

Both the Imperial (*Amazonia imperialis)* and Red necked (*Amazonia arausica)* parrots are endangered and endemic to Dominica. Ongoing studies by the Forestry and National Parks Service put the total population at 80-100 and 500-1000 birds for the Imperial and Red-necked Parrots respectively. The mammals recorded in the Park include 17 spp., mostly bats and the wild pig”.

3.1.7 WATER SUPPLY AND WATERSHED FUNCTION

The MDNP is a critical water catchment for the northwest area of Dominica. The Picard catchment serves the Portsmouth area, while the other water catchment areas serve the villages of Dublanc, Hodges and Coulibistrie as well as the cruise ships that berth at the Cabrits. In addition, the high water retention and permeability of the soils within the park helps to ameliorate the flow of water in streams and rivers leaving the area. .



3.2 LAND OWNERSHIP AND LAND USE

The MDNP is crown land. Private and crown lands bound with the MDNP western boundary. The north western part is primarily private lands. The south western boundary is primarily government owned lands.

The area consists of natural forest and is relatively untouched except for encroachment from private land owners bordering the Park

Surrounding Land Use

The areas to the east and south of the Park are part of the Northern Forest Reserve. The north is comprised of large estates (Chilenbain, Maikay and Brandy) that are on rugged and inaccessible lands that are mostly covered in forest. Land to the south (En L'ilet and Macatrin Valley) are also very rugged and unpopulated. The greatest concentration of human use for agriculture around the Park occurs to the west and north-west on the Syndicate, Dyer and Morne Plaisance Estates. The main agricultural crops are citrus, ground provisions and bananas, plantain, cocoa and other tree crops representing 20% of overall farming in Dominica.

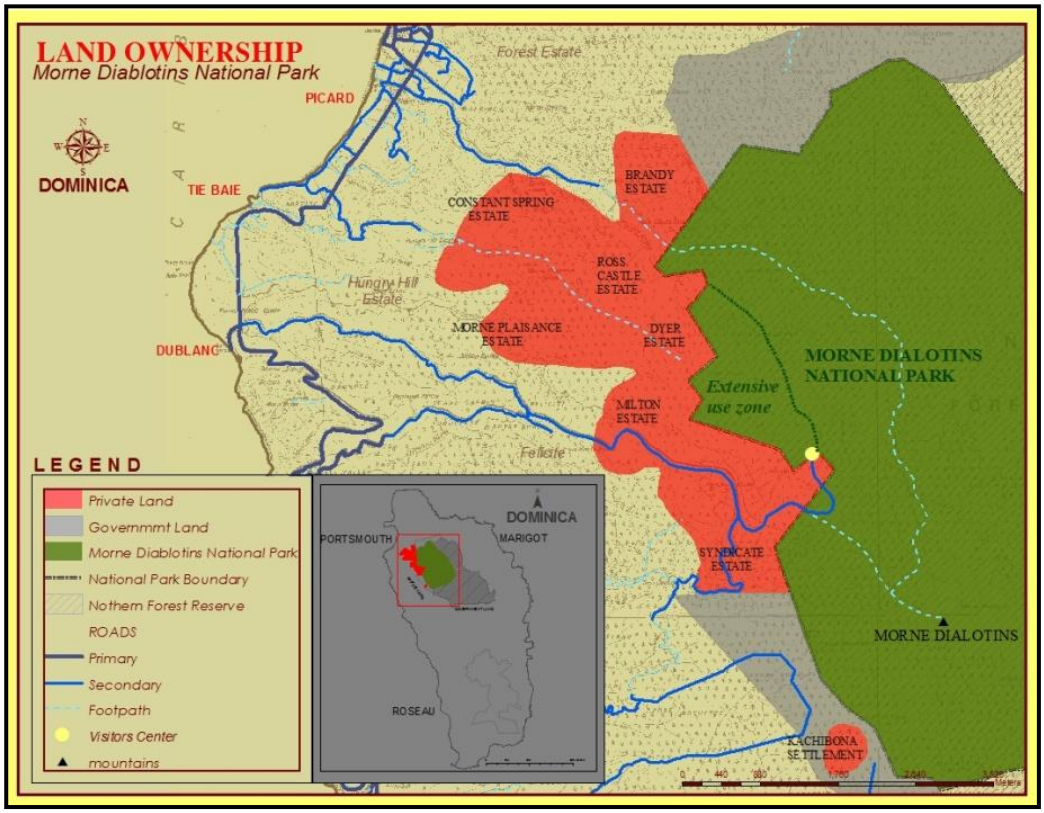


Figure 11 – Land Ownership within Morne Diablotin National Park

3.3 ACCESS AND ATTRACTIONS

Access Road

The map below (Refer to figure 12) shows the available access routes to the MDNP**.** There are two main routes to reach Morne Diablotin. The western boundary of the Park can be accessed by a 4 mile agricultural feeder road, the Syndicate road, which leaves the main Roseau to Portsmouth road ¼ mile north of the village of Dublanc. This paved one- lane road winds up through dry coastal scrub forest past citrus, banana, and mango plantations of the Milton and Syndicate Estates to the Park's visitor centre. This road links in with a track that leads south, outside the boundary of the Park, and then west to Colihaut. It is currently blocked by landslides. Excluding the Syndicate primary road, all other access routes into the park are footpaths /trails.

Public transportation to Morne Diablotin is non-existent. Private tour operators transport tourists to the trails through the Syndicate road.

Trails

Within the Park there are two major trails. The Morne Diablotin Trail leads from the Syndicate Estate near the Visitor Centre to the top of Morne Diablotin. The lower portions of the trail in the rainforest have been maintained, but the upper portion in the elfin woodland and montane thicket formations is in poor shape. Due to hurricane and storm damage, tree trunks and limbs across this part of the trail make it difficult to pass. The Morne Turner Ridge Trail is an unused trail that has not been maintained. It leads from the Picard Estate up the Picard Valley along Morne Turner Ridge, eventually joining the Morne Diablotin Trail at about 4,000 ft.

Another trail, described as an unmarked hunter's trail, approaches to within 1 mile of the northeast boundary of the Park. It originates in Bense Village following an historic French-built trail and is paved up to the entrance to the trail leading to Chaudiere Pool on the Hampstead River. A dirt track then continues up a ridge to the last agricultural lands to the boundary of the Northern Forest Reserve.

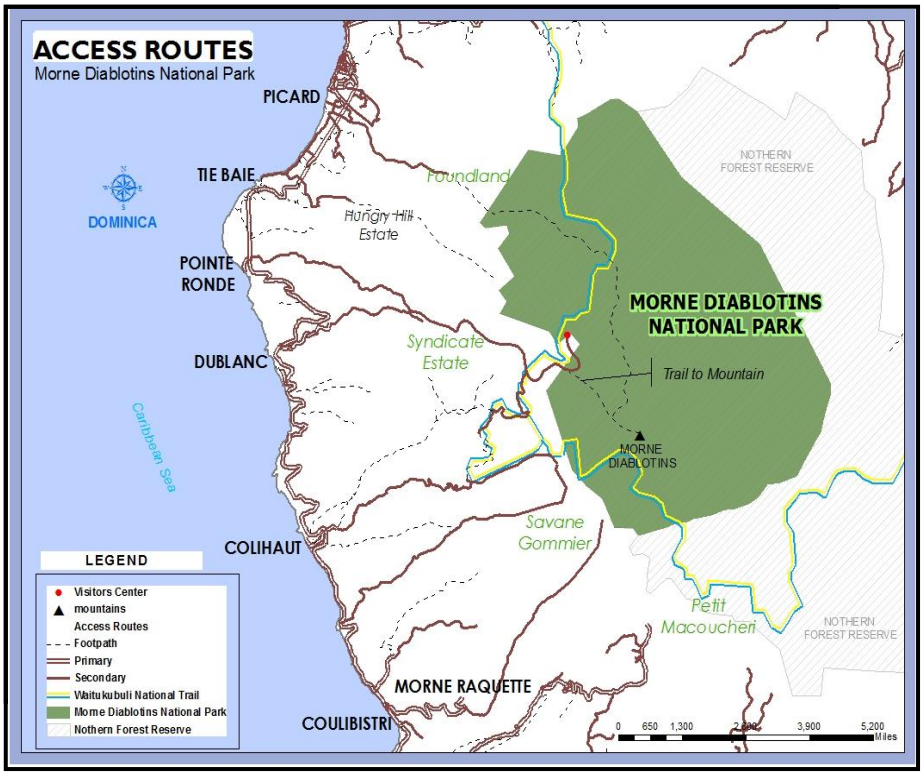
The Waitukubuli trail also passes through the park.

Attractions

Bird watching is the predominant attraction within the MDNP through the Syndicate entrance. Another important activity is hiking to Morne Diablotin as well as ecological tours/ research

Hunting

Hunting is an illegal activity undertaken by locals. The area is attractive for hunting of agouti, *Dasyproctor antillensis*, opossum,*Didelphys marsupialis insularis, the wild pig, Sus spp.* and various species of bird (mainly the Red-necked Pigeon) and crabs mainly for local consumption and to a lesser extent for sport. The slopes of Morne Diablotin are also an important area for hunting of wild pigs. Hunter's trails and pit traps are regularly found.



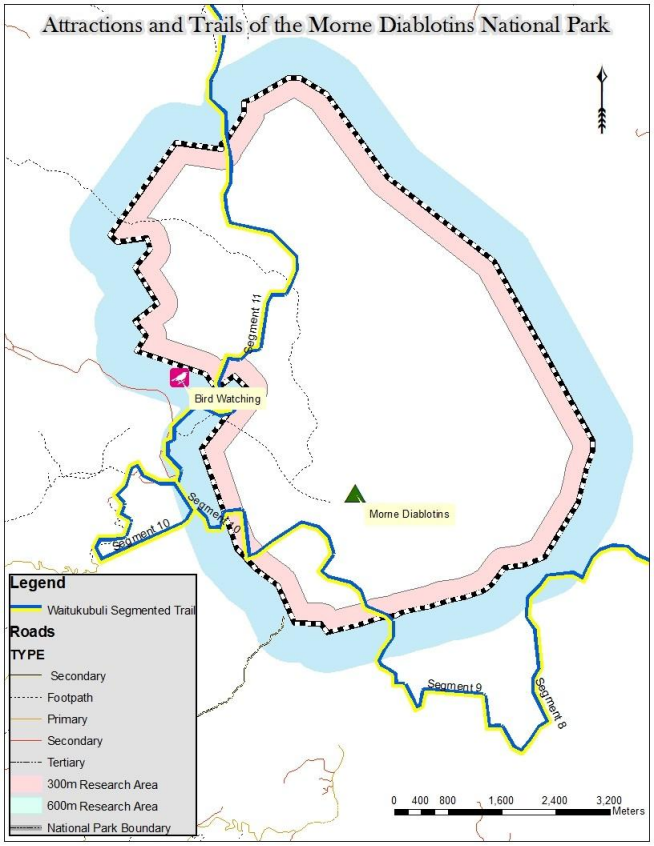


Figure 12 – Attractions and Trails of the Morne Diablotin National Park

3.4 SOCIAL, ECONOMIC AND LIVELIHOOD ACTIVITIES OF THE MDNP

3.4.1 PRESENT POPULATION AND SETTLEMENT PATTERNS AROUND THE PARK

Morne Diablotin is a protected area and as such nobody lives within the area. However, houses can be found approximately 2km (1 mile) from the area. The population within 2 km of the park is in the parish of St Peter and has approximately 1421 persons within an approximate area of 12.6 sq. mi. The majority (57 %) of the population is in the 15 – 64 years category. The under 15 years old contributed to 30% of the population and 13% is over 65 years of age.

Table 1: Population and Settlement Patterns

Parish	Male	Female	Total
Bioche	120	125	245
Colihaut	370	327	697
Dublanc/ Syndicate Estate	209	202	411
Dublanc/Bioche	37	31	68
TOTAL St Peter	741	680	1,421

Source: 2001 Population and Housing Census of Dominica, Central Statistical Office

Most persons within the 2 km of the Park attained a primary education (82%). Thirteen percent of this population attained a secondary education, 3% nursery/kindergarten, 1% did not state their educational attainment, 0.6% pre – university and 0.2% each for university and other means of education.

The number of households is 527 with an average household of 2.7 persons. In terms of poverty levels statistical data categorize 31% of the population as being poor based on the following levels: 6% indigent, 12% poor, 17% all poor. 83% of the population is considered not poor.

The majority of the population depends on farming and fishing. 22% of the population was skilled in agriculture and fisheries. 16.6 % had craft related trade, 16% were professionals and associate professionals, 17.6 were clerks, service workers and shop market sales workers, 23.6% were machine operators and other elementary occupations

1. The most productive pelagic fishery areas, apart from Marigot, are in these communities[3]
2. Most of the population and infrastructure are located on the narrow coastal plain and the population is vulnerable to both coastal and river flooding during heavy rains and storm surges.

[3] Reference "Coastal Vulnerability Assessment for Dominica- Smith Warner International Coastal Environment/Chemonics International Inc."

3. Other Parishes within 10 miles of the Park are as follows:

Table 2: Population of Communities

Parish/ Name of Community	Population	Approximate Area (Mi 2)
St. John	5,932	22.8
St. Peter	1,421	12.6
St. Joseph	5,961	46.8
Total	13,314	82.2
Total Dominica	71,727	289.5

4. *Source: Office, Ministry of Finance and Planning, Population and Housing Census – 2001*

3.4.2 TOURISM AND RECREATION

Visitor arrivals to the Park have been drastically reduced from 12,014 in 2000 to 3,841 in 2009 - 68% decrease over the last 9 years as a result of the loss of cruise ships to the Cabrits National Park located on the northwest of the island in Portsmouth.

The primary users of the Morne Diablotin National Park are Tourists (National and International) researchers, and schools groups.

Table 3: Total Visitor Use- 2000 - 2009

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Syndicate	12014	11361	9340	7183	16674	14392	14422	13699	10739	3841
Morne Diablotin	240967	221836	148508	178839	316000	234601	275482	251458	42	43

Source: Forestry, Wildlife & National Parks Service

Bird watching

There are no statistics with respect to bird watching in the Park. However, this area is the most popular for bird watching.

3.4.3 ECONOMIC IMPACTS

Net revenue generated from site passes for Syndicate for 2009-2010=E.C. $22,271.52 and for Morne Diablotin = E.C$14,046.58
One concessionaire operates a bar restaurant and provides souvenirs to visitors. The operator has indicated that the business operates at a loss.

As the Park becomes more known (increased marketing by the Tourism Ministry and the Government of Dominica) there will be increase demand on the resources. There will be increased bird watchers, hikers and nature lovers.

3.5 THREATS TO THE PARK

Evaluation of Activities

A survey was undertaken with the objective of identifying threats, both natural and man-induced, within 300 and up to 600m external to the boundary of the Park so as to provide the necessary information for evaluating activities adjacent to the park and to make recommendations on the proposed size, characteristics and use of the proposed buffer to ensure that it serves the purpose of providing some level of protection to the biodiversity of the Park while attempting to provide some level of compatibility with the goals of the farmers, private land owners and the community for the sustenance of livelihood.

Methodology

There were no available geo-referenced maps from the Department of Lands & Survey or from the Department of Forestry, Wildlife & National on the boundaries of the MDNP. From the maps, the boundaries of the parks were demarcated and imported into GIS format for later use.
Using these demarcated boundaries, 600m buffer outward of the parks' boundary and 300m buffer inward of the parks' boundary were designed. These buffers were later used as guidelines for collecting data to evaluate activities taking place there

Two Trimble Juno SC and a Trimble GeoXH were used to gather data in the field.

1. A data dictionary was set up to gather the necessary data in the field.

2. A known point on the map was set into one of the Juno and driven to, to ensure that the map was correctly geo-referenced.

Data was collected through field visits to various locations in the Park and photographs were taken to enhance data collection. Data was collated and edited to create the maps which are an integral aspect of the evaluation of the Park.

The data was loaded in GIS software. Areas that were not listed to be surveyed were studied against satellite imageries - polygons were placed over each activity corresponding to the point, demarcating the boundaries of the shown activities. A complete land use map was formed.

Other GIS files, Rainfall, Roads, Soils, Vegetation and Landslides, were obtained from Lands and Survey and Physical Planning Division in Dominica and a geological map of Dominica was obtained from *http://dominicapsn.freeyellow.com/maps.php*

Surveyed Points and Results - Morne Diablotin

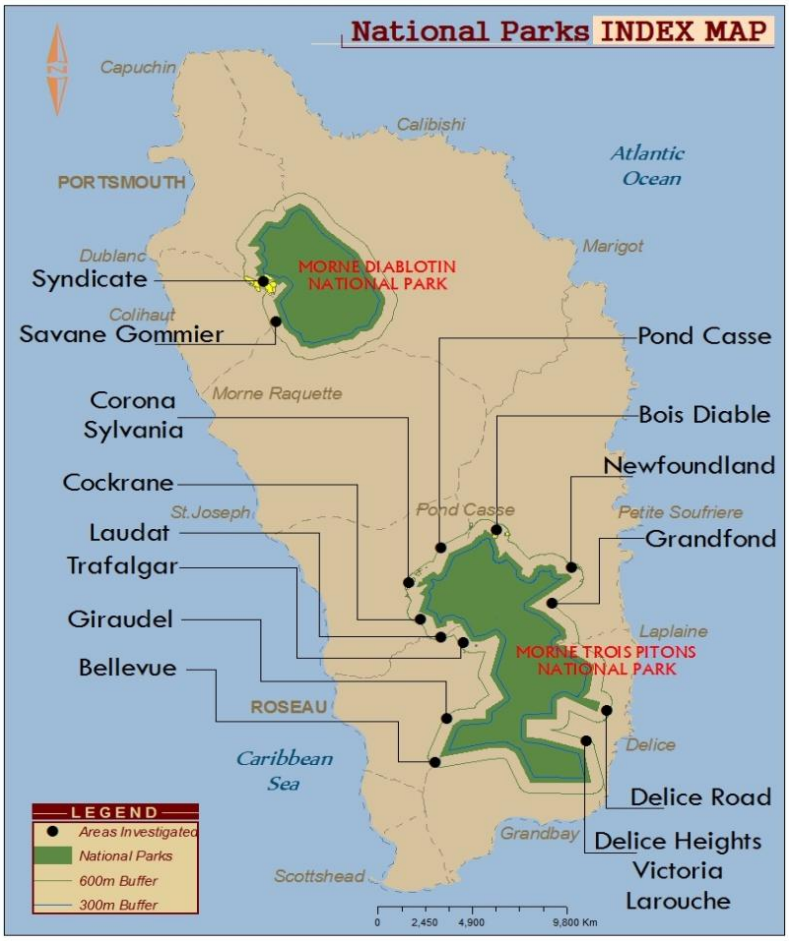


Figure 13 – Map Indicating Survey Points

Because of time constraints, the areas of Syndicate and Savanne Gommier that traditionally had intensive agricultural activities adjacent to the Park were surveyed as indicated in the map above. The level of threat was evaluated on the basis that these lands were privately owned and were heavily cultivated and in the case of Savanne Gommier, this area is part of the watershed and is classified as a high landslide risk. Other areas were evaluated as described above under “Methodology”.

General Overview of Threats

From the land use map, intensive agricultural activities are taking place within 600m external to the park boundary at all surveyed points especially in Syndicate and Dyer estates. These agricultural plots consisted mainly of citrus plants, mango, ground provisions and bananas. Signs of pesticide use were observed on many farms bordering the park. In the Syndicate Estate area adjacent to the park, abandoned farms were observed within 300m inside the Park's boundary. Forestry Officials confirmed that this area of land was purchased from a private owner and incorporated into the Park hence the abandoned agricultural activities.

Agricultural activities were also seen well within 600m external to the boundary of the Park at Savane Gommier. These activities stopped near the national park boundary. Although signs of pesticide use were not observed in Savane Gommier, erected signs of "Pesticide disposal here" were seen at two different locations in Savane Gommier thus indicating that pesticides were used in the area.

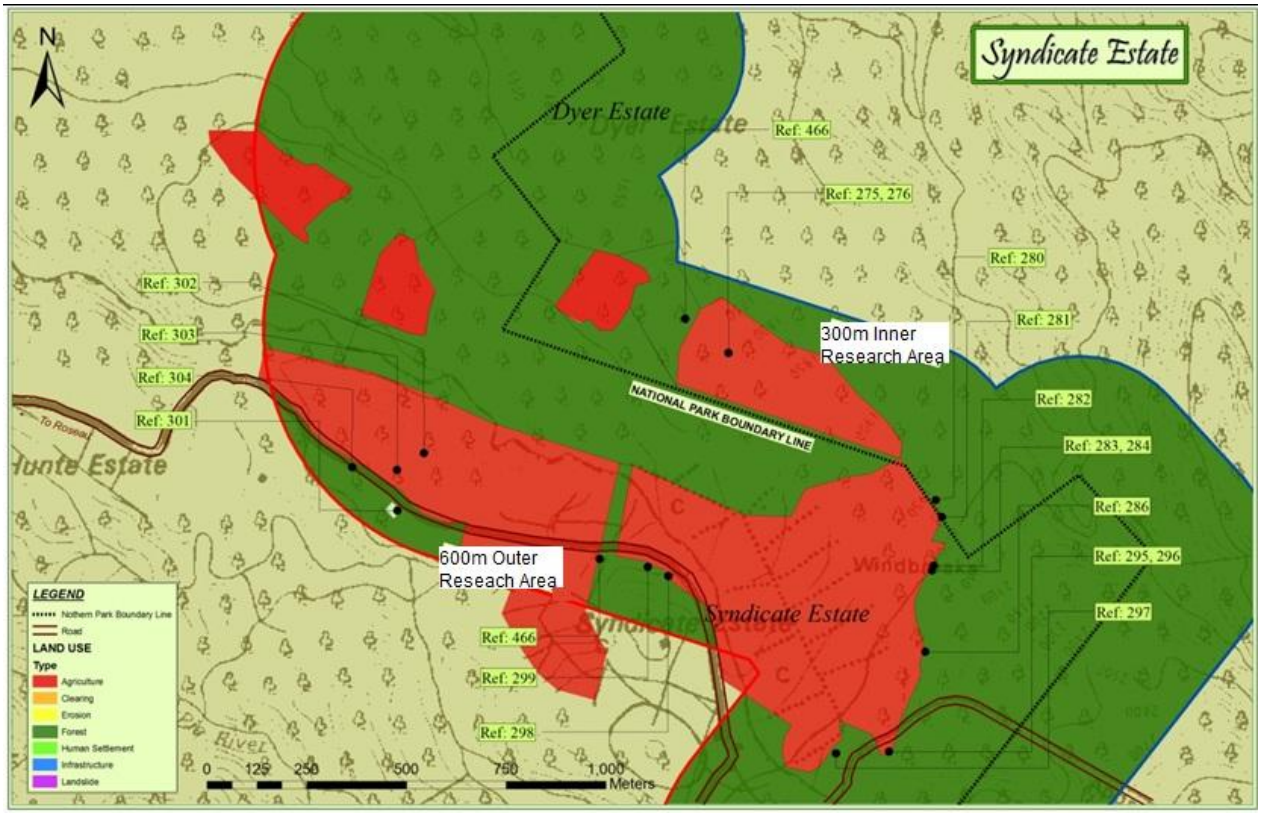


Figure 14 - Syndicate Estate

Morne Plaisance/ has been described predominantly as state lands with some parcels of private lands. It is adjacent to the Park on the west and with Dyer, Ross Castle and Constant Spring estates, constitutes the watershed for the greater Portsmouth area. Observation indicates that there is need for re-foresting of the area. It is an important habitat for the Amazona parrots, but had been harvested for timber up to 1990 and should be reforested so as to increase the biodiversity of the area.

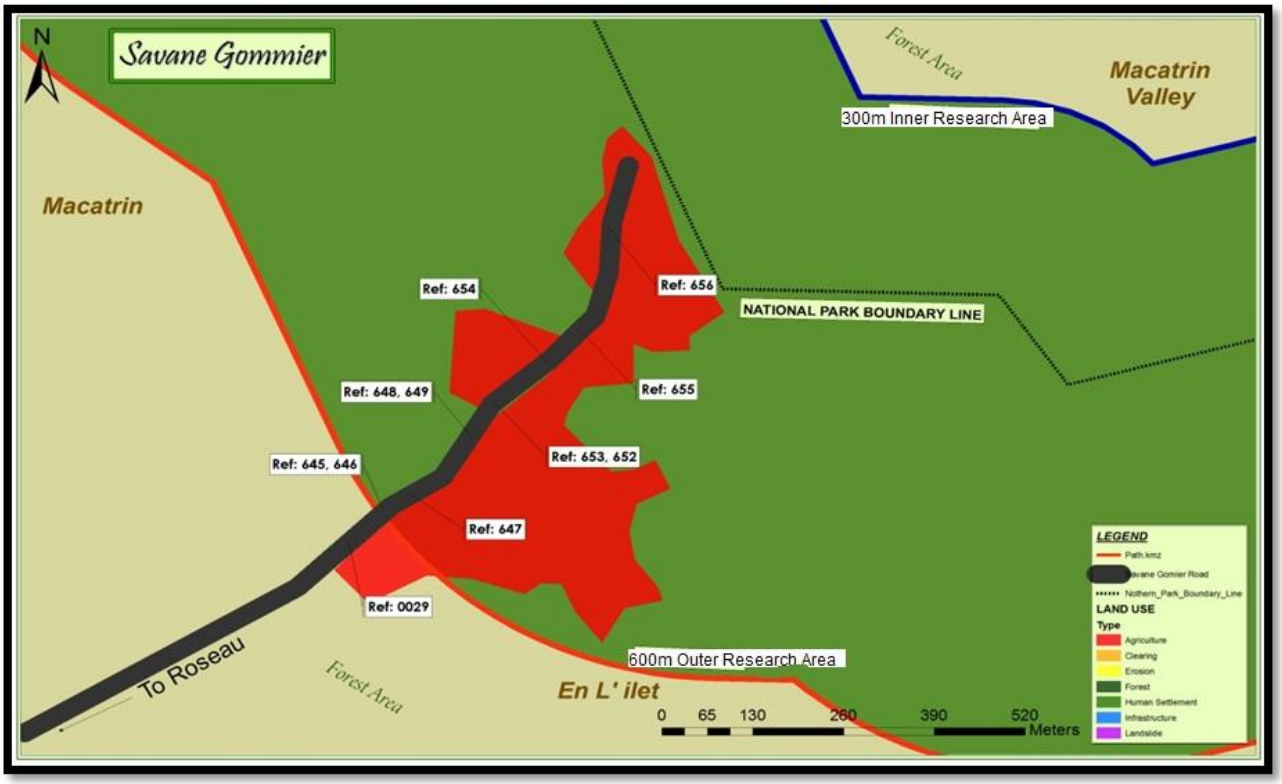


Figure 15 - Savanne Gommier

Increase visitation to the Park

This could have a negative effect on the Amazona imperialis which has low tolerance to human disturbance. Human disturbance has a negative impact on the breeding of these parrots.

Impact of Climate Change

There have been no scientific studies on the impact of climate change in the Park.

Some of the impacts observed include the destruction of the nesting and food bearing trees of the Amazona parrots which led to the death of some of these species .Pre- hurricane populations of the parrots were 400 Amazona arausiaca and 120 Amazona imperialis. They were diminished to 250 and 75 respectively. (Thomas Duncan Nichols, Ph.D./ MD-November 1979). With respect to the overall vegetation of the Park, Dr Nichols indicated that the lower slopes of the Park suffered 10% damage, the upper slopes of Morne Diablotin into the Elfin woodland suffered 30- 40 % damage with trees being uprooted while in the slopes east and south of the Park suffered heavy damage with the majority of the trees being mutilated or uprooted.

D.H. Kulkarni (1981) noted that two years following the hurricane there was a plethora of “epicormic twigs or invasive climbers” among the stems of the damaged forest trees and that elfin woodland was severely impacted as a result of the death of a large number of trees in big patches and the subsequent thick suppression of weeds and vines which slowed down the natural process of regeneration after 2 or more years.

Changes in phenology of some plants species were observed by Forestry and Parks personnel which affected plant/ wildlife relationship where there were reported cases of reduced food supplies for some bird species.

There was also an increase in the conversion of forest land to agricultural land as a result of the loss of forest trees.

The impact of natural disasters triggered by extreme weather events may cause severe and irreversible impacts on the natural habitats, ecological and biological processes of the park which could be manifested in the extinction of endemic species and changes in community composition and configuration. The impact on elfin woodland indicates that successive storms could virtually wipe out this vegetation. Observations on the impact of Hurricane David on the Park have reinforced this.

The park is home to the largest population of Dominica's endangered parrots: the Sisserou or Imperial Parrot *Amazona imperialis* and the Jaco or red-necked Parrot, *Amazona arausiaca, as well as to* the endemic plants, *Chromolaena impetiolaris* and *Chromolaena macrodon.* The populations of both species, particularly the Imperial Parrot are very small and restricted to primary forest. The loss of even a few birds can substantially increase the risk of extinction. Climate change could potentially lower ability of the forest to sustain the parrots over a period of time and hence negate the objectives of the Park.

Landslides are triggered by extreme rainfall. Landslide analysis indicates that the majority of the Park is characterized as a centralized high landslide risk especially in the east, west and southern areas. Increased rainfall especially during the "hurricane Season"- July to November could trigger landslides which could impact negatively on the biodiversity of the forest.

3.6 EVALUATION OF THREATS AND PROPOSALS FOR THE ESTABLISHMENT OF A BUFFER ZONE

3.6.1 THREATS

The greatest concentration of human use for agriculture around the Park occurs to the west and northwest on the Syndicate, Dyer and Morne Plaisance Estates and Gommier. These agricultural plots were mainly citrus plants, root crops, mangoes, plantains, coffee and bananas. While farmers do not use agro-chemicals extensively, most farmers used weedicides to control the growth of grass. In Gommier, there was proof that pesticides were being utilized.

The MDNP is a critical water catchment for the northwest area of Dominica. Some of the lands over which they drain are privately owned like Dyer, areas of Syndicate, Morne Plaisance and Gommier. Agricultural activities in these areas could have an impact on the water quality through increased erosion and sedimentation of the water. The use of pesticides could create greater problems for water quality.

The Picard and other catchment areas are important for the increased economic development taking place in Portsmouth and environs, hence efforts must be made to protect the Picard, and other rivers from direct

effects like turbidity, poor water quality, decreased stream flow and increased susceptibility to flash flooding as a result of accelerated run-off during heavy precipitation, indirect effects of fertilizers, weedicides and other agrochemicals getting into the water from surface run-off or from leaching into the ground water reserves. In such cases water quality would be compromised to the point where treatment could create a heavy financial burden to government.

Dominica has already capitalized on the sale of freshwater to neighbouring islands and the cruise industry. The ongoing shortage of freshwater worldwide indicates that there will be increasing demand for fresh water and as such, this resource will continue to contribute substantially to Dominica's economy. The average annual income from sale of water to cruise ships in 2008-2009 for the Roseau cruise ship berth was E.C$ 252,872.00. It is important that the quality and volume of water is retained to ensure the marketability of the water.

Privately owned lands of Morne Plaisance, Syndicate, Dyer and Milton, Jude Estates northwest of the Northern Forest Reserve are still extensively used by Red-necked Parrots as part of their range. Between October and February, Red-necked Parrots regularly move down from the Park into these privately owned lands and even to lower areas close to the coast. During this period, the Parrots feed on and damage agricultural crops especially citrus. This movement is believed to be in response to the fact that these areas were converted from forest to agriculture hence the traditional movement. Other reasons suggest that the taste for citrus has been linked to a shortage of food in the forests following Hurricane David.

Farmers regularly threaten to kill the birds leading to confrontation between local farmers and the Forestry and Wildlife Division. The problem is likely to become worse since the range of the Red-necked Parrot is expanding. As a result of this it might be worthwhile to encourage farmers to dispose of land either by purchase or land exchange to be reconverted into forest land or to encourage alternative use of the land rather than citrus production which is the major crop in these areas.

The impact of pesticides use on water has been discussed earlier. This could also negatively impact on wildlife since these are itinerant and could move to the affected areas.

3.6.2 RATIONALE FOR ESTABLISHMENT OF THE BUFFER ZONE

The following factors were considered in the selection of the buffer zone:

- The primary objective of the Park -the protection of the remaining populations of the Imperial and Red-necked Parrots.
- Feeding habits of the parrots, between October and February, Red-necked Parrots move down to adjacent lands/estates and feed on and damage agricultural crops, particularly citrus.
- Providing some level of protection and conservation of the ecosystems and water resources within the national park;
- Enabling the sustenance of livelihoods for farmers in the area.

Parrots are high elevation species and their range is much larger than the existing forest reserve and National Park. Development of a buffer zone will not make any meaningful impact on improving their range except if the size of the buffer includes all the private land in the area.

The ultimate goal for preservation of the parrots would be to make the entire area including all private land in the area, a protected area. It is unrealistic to try to achieve this given the financial implications. However, the establishment of a 200m (656.2 ft) buffer zone will serve to reduce the direct impact of agriculture on the biodiversity of the park, minimize human disturbance to the parrots and afford some level of protection to the watersheds. It would also reduce the possibility of increased potential residential development adjacent to the boundary of the park since farmers indicated that they have had several requests for the sale of land for residential and other commercial activities.

The populations of both species of parrots are still small. The loss of even a few birds can lead to extinction due to natural catastrophes such as hurricanes. Consequently, special attention needs to be paid to the food requirements and nesting habits of the parrot by trying to ensure that proposed nesting and feeding trees are available and reducing the impact of human activities on these trees. Replanting of trees identified as feeding and nesting trees used by the parrots would be one of the long term measures for securing the population of the parrots. Visitor management programmes must be implemented to manage the volume of potential visitors to the nesting sites of the parrots some of which are very close to the boundary of the park.

Discussions with Forestry staff responsible for the ongoing "Parrot wildlife Conservation Project" have indicated that both species of parrot are sensitive to human disturbance, though the Red-necked Parrots are more tolerant of humans and are frequently seen close to or in agricultural and inhabited areas. At least one nesting site of the Imperial parrot is approximately 300 feet from the Park boundary and 2 nesting trees of the Red-necked parrot are approximately 200 feet from the boundary. An extension of the existing boundary would provide additional protection to these nest trees. Additionally discussions with some land owners in the Syndicate and Dyer Estates indicated their desire to sell land for residential purposes since there is very little income from agriculture. There is therefore a race against time to ensure that this land does not go into residential development.

The selection of 200 m is based on the fact that the acreage is sufficient to protect the existing nesting trees of the parrots, to protect the forest from further encroachment and to minimize the impact of existing agriculture on the biodiversity of the forest. Additionally, given the acreage of land owned by several farmers, the issue of livelihood of the farmers must be taken into consideration so that entire land holdings do not constitute the proposed buffer zone. It is also the most practical option for the immediate protection of the parrots and the forest resources given the socio economic needs of the farmers, limited options for land exchange, the financial challenges facing Dominica and government's reluctance for "added value" land exchange options.

3.6.3 PROPOSED BUFFER ZONE

The extent of the proposed buffer is 200 m (5.2 ft.) west on lands adjoining the national park and 500m (1690.5 ft.)on the northern, southern and eastern areas within the forest reserve.

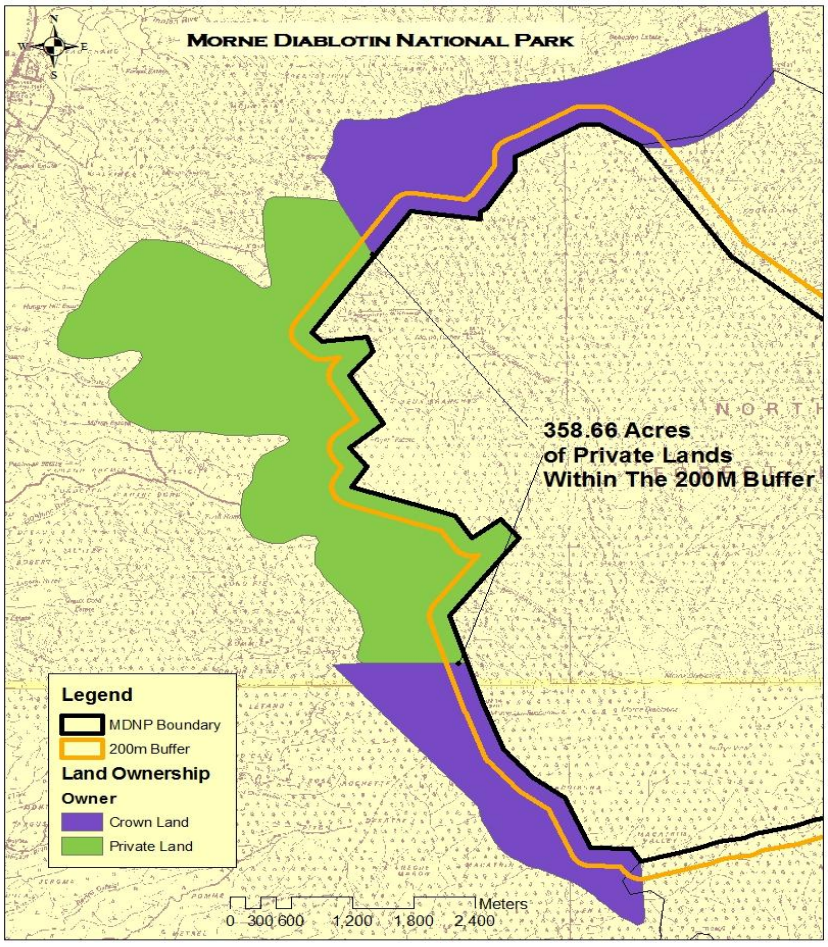


Figure 16 – Proposed Buffer Zone

The proposed buffer zone consists of three sub-zones (see map below):

- Government- owned forest lands of the Northern Forest Reserve along the eastern and southern boundaries;
- Privately- owned forest lands on rugged terrain within 1 km. of the northern boundary; and,
- Privately- owned agricultural lands within 2 km. of the western boundary.

The proposed buffer zone for the Park has a total area of 2793.65 acres (1130.5 ha), of which 358.66 acres (145.2 ha) are privately owned

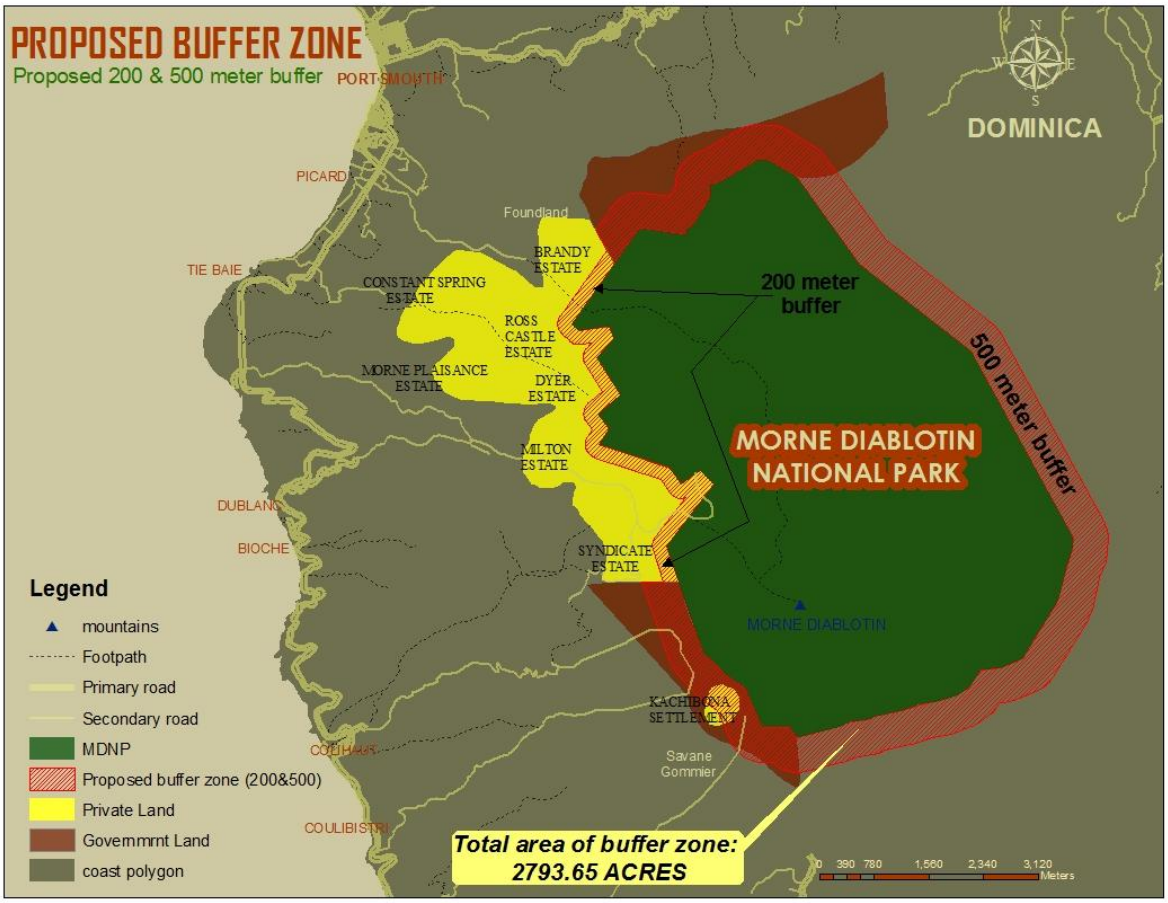


Figure 17 – Proposed Buffer Zone for Morne Diablotin National Park

It is recommended that this is adopted for the MDNP that it is properly demarcated and enforced and all necessary actions are taken to ensure that encroachment, or expansion of existing activities does not take place within this defined area.

The Buffer should be designated an Environmental Protection Area pursuant to Part VI of the PPA. However, private land owners who wish to retain ownership of their land for development along lines consistent with regulations governing activities in the buffer should be allowed to do so, thereby reducing the area of land to be acquired.

Existing residential development in this zone that does not meet the guidelines developed by the Forestry and National Parks service should be allowed to conform to these guidelines. If not, they should be designated non-conforming and the owners not be allowed to expand or rebuild in the event of destruction. Owners of such property should only be allowed to maintain the building for continued habitation. For those residents who have to rebuild they could be compensated through land exchange and provided with duty free concession so as to encourage them to rebuild on alternative land.

To add further protection to the Park it is recommended that lands immediately adjacent to the buffer is designated as an environmentally sensitive under the Physically Planning Act and that guidelines for the use and development of the land are developed in collaboration with all stakeholders.

Cost of direct purchase of private land utilizing the standard rate for agricultural land is as follows:
The approximate area of private land is 358.99acres (145.2 ha). The total cost for acquisition of the land at $E.C. 15,000/acre
358.99acres.at $E.C.15,000/acre is $5,384,850.00 = $U.S.1, 982,420

3.6.4 RECOMMENDATIONS FOR ESTABLISHMENT AND USE OF THE PROPOSED BUFFER ZONE

Potential Conflicts

The issue of land acquisition through compulsory purchase, land exchange or direct purchase is problematic to government for the following reasons:

- The present economic crisis facing governments that will decrease their ability for direct purchase and the provision of incentives,
- The fact that farming is an important economic activity for the farmer and the country as a whole and the farmers in question are not willing to "start all over again" with respect to land swap of agricultural land
- The negative social and political impacts associated with compulsory acquisition and payment for land.

There is also the issue of allowing farmers to keep land on the premise that the land is developed within certain prescribed guidelines.
Any method of land acquisition or use will require intense negotiation, gentle persuasion through the provision of incentives, and sensitivity by government with respect to the traditional culture of land ownership.

Discussions with land owners in the area of the MDNP are mixed with respect to use of their land for establishment of a buffer zone.

- Some farmers have indicated that they will be willing to sell their land at "market prices". Market price ranges from $E.C. 25,000-80,000/acre
- Others indicated that they would be interested in land exchange but the land exchange should add value for loss of their livelihood from agriculture.
- A third group indicated some willingness to look at alternative uses of the land which will not impact on the biodiversity of the Park only if they are provided with attractive incentives and can get involved in activities with some level of demand so as to maintain their livelihood.
- A smaller percentage has no interest in land exchange and would like to continue their agricultural activities.

Acquisition of land for the buffer zone

The issue of land acquisition with respect to private lands recommended for inclusion in the buffer zone is a major issue for government especially in a situation where land owners wish to develop land for purposes not consistent with the objectives of the buffer zone. In this case government has an option of direct purchase, swapping of the land "land exchange" with the land owner or compulsory acquisition. There are problems with all 3 options which must be intensely negotiated.

Direct Purchase

In terms of direct purchase, the problem arises with respect to setting a financial value to the land. Farmers have indicated that there is a demand for land for residential development and they are able to get "commercial prices' for their land rather than government's prescribed value for agricultural land. They also indicated apprehension in selling their land to government for 2 main reasons- the price offered by government is unacceptable and the time frame for payment is too long and drawn out. Hence there will be need for meaningful negotiation with the farmers.

Cost of Direct Purchase of Land

Cost of direct purchase of private land utilizing the standard rate for agricultural land utilized by government is as follows:

The approximate area of private land is 358.99acres (145.2 ha). The total cost for acquisition of the land at $E.C. 15,000/acre (standard government prices) is $ E.C.5, 384,850.00 = $U.S.1, 982,420

Cost of purchase of land using existing commercial prices could range from E.C$. 8.97M ($U.S.M3.31) at $E.C.25,000/acre to $E.C.M 287.2 ($U.S. M105.71) at $E.C.80,000/acre.

There are a number of international agencies that could be approached for financial assistance in purchase of the land as follows:

- Conservation International which in the past provided finance for acquiring the private land for the establishment of MDNP.
- Bird Life International
- World Wildlife Fund
- Nature Conservancy

Priority for direct purchase should be given to private land adjacent to the identified nesting trees of the Amazona parrots.

Land swap

Farmers interested in "land exchange option" indicated the land exchange should "add value" since their land is already cultivated. They also stated that that at their age they are not willing to start farming and agricultural production: thus implying that they would prefer an exchange for coastal land which would provide reasonable financial value for exchange with their cultivated land e.g. land on coastal areas close to their habitation. The

rationale is that these farmers are “not so young” and that they could re -sell some of the “added value land” to ensure some level of livelihood which would make up for the loss of income from agriculture which they would forego by swapping their land.

In order to encourage farmers to swap their land, government should attempt to meet the needs of the farmers by “adding value” to the land exchange so as to compensate farmers for projected loss of income from agriculture. As such land on the coastal areas with a higher potential of resale which will be attractive to farmers should be considered.

This is feasible since there are large areas of state land on the western coast that would meet the criteria for land exchange. One area that has already been identified by the Forestry, Wildlife & National Parks Service and proposed to Government is Plat Ma Pierre area which is state owned and flat and in close proximity to farmers who have land holdings in the area. In addition to this there are other government owned land that can be considered for land swapping.

Compulsory Acquisition

There is the option of compulsory acquisition of land. However, given the fact that this represents the livelihood of farmers, this is not recommended if other options can be negotiated.

Alternative uses of land

The option of alternative uses of the land for activities other than farming or Forestry has sparked the interest of some land owners. However, they have indicated that proposed alternatives must be demand driven, that technical assistance must be provided for marketing and adequate incentives must be made available to them for undertaking these projects.

- Potential projects are as follows:
  - Agro- forestry with undergrowth of anthurium lilies
  - Tree crops with high crown cover in shelter wood system over annual crops.
  - Natural or Plantation Forestry - with valuable local or exotic species or a mixture of both mahogany, *Swietenia macrophylla,* gommier, *Dacryodes excelsa* trees to increase the economic value of the forest and so enhance its protective functions of watershed, biodiversity and wildlife protection

- Proposed eco-tourism activities for consideration. However these must be supported by clear projections of demand and must follow guidelines developed by the Forestry & parks Service.
  - Construction of Cottages, tent cabins and camp sites to accommodate tourists and overnight
  - accommodation for trail users and
  - research facilities for researchers

As such it is recommended that incentive packages should be developed to assist farmers in the development and implementation of projects /activities for alternative use of their land. This could include duty free concessions, low interest micro-credit schemes for farmers, various forms of technical assistance.

Recommended Options for land acquisition

Land swapping and/or alternative uses of the land in question through the provision of incentives are the most affordable and amicable methods for effective establishment of the proposed buffer. Direct purchase of land allows for complete control and management of the buffer zone but this requires financial resources.

There are a large number of farmers that are affected. A combination of the options for use of the land would minimize the need for direct financial investment by the GoCD for acquisition of land for the buffer zone. As such it is important that farmers and communities are educated with respect to the importance of maintaining the biodiversity of the Park, the need to protect the endemic plants and animals as well as the environment for future generations. There should be ongoing dialogue with the farmers and a number of policies and incentive packages should be discussed and developed with the farmers in question.

Recommended Management Guidelines for the Buffer Areas

To ensure proper control and management of activities in the buffer zone, it should be designated an Environmental Protection Area pursuant to Part VI of the Physical Planning Act, PPA. and placed under the control of the Forestry and Parks Division.

However, private land owners who wish to retain ownership of their land for development along lines consistent with the policies of the Forestry & National Parks Service should be allowed to do so.

The following represent some guidelines for use of the area designated as buffer:

- A wind break should be established as a protection for the entire south west of the area.
- Where feasible, the area should be re- forested with trees that are typical to this area with some emphasis on replanting of some trees that are important for the nesting and feeding of the parrots.
- Any proposed agricultural activity should entail development of forest cover and activities that would reduce soil erosion and increase the infiltrative capacity of the soil at the same time ensuring that pesticides and herbicides are not used. One such activity could be reforestation and carbon sequestration outlined below.
- Farmers retaining existing agriculture would be expected to establish a wind break in keeping with the recommendations, to modify their method of field preparation and agricultural activities and desist from using weedicides for controlling the growth of grass and to undertake selective planting of trees that are important to the nesting and feeding of parrots.

- Use of all lands should take into account the need for streamside reserves where they occur, growth and retention of parrot feeding and nesting trees, windbreak strips and a roadside buffer of natural forest where it occurs.

- Guidelines should be developed for all infrastructure development in keeping with the objectives and policies of the MDNP

Reforestation and Carbon Sequestration

Recommendations outlined by Allen Putney with respect to reforestation are in sync with the objectives of the development of the buffer zones and the need to adapt to and combat the impact of climate change and is being recommended under this project. “There are considerable extensions of land in the buffer zone that need to be reforested. Given the benefit of reforestation for carbon sequestration, ecosystem restoration, and watershed protection, reforestation is an attractive investment. This should be approached on a cooperative basis with the Division of Forestry providing technical assistance, the landowner providing the land, and the Conservation Trust Fund or other identified institutions providing the finance. If a large enough area can be lined up, and contracts signed with landowners to guarantee the permanence of the forest cover over a specific time period, then it will be possible for the Conservation Trust Fund /other relevant institution to pay for the reforestation work and the farmers through the sale of carbon credits”. Trees typical of the vegetative zone as well as those identified as important for feeding and nesting for the parrots will be planted.

3.6.5. RECOMMENDED ACTIVITES IN THE AREAS ADJACENT TO THE BUFER ZONE

The Forestry & Parks Service should develop guidelines for the use of land adjacent to the buffer zone and educate farmers on the feasibility of this. These lands should be demarcated as environmentally sensitive areas under the Physical Planning Act and guidelines set for the uses or development of the area compatible with the goals of the MDNP and the protection of the endemic species of the parrots.

Incentives should be provided to those wishing to undertake the prescribed types of development. Some proposed activities that can be considered in areas directly external to the buffer zone are as follows:

- Tree orchards
- Horticulture.
- Small scale eco-tourism activities like
    - Development of huts for overnight stay- overs
    - Agro /Ecotourism- the development of farmsteads so as to decrease any potential building density in the area
    - Development of farmstead with demonstration farms and floral gardens
    - Development of eco camp grounds
- Plantation Forestry

4.0 MORNE TROIS PITONS NATIONAL PARK WORLD HERITAGE SITES

Research areas of 300m internal to and 600m external to the boundary of the Park were demarcated to assess activities within these areas as indicated in the figure below.

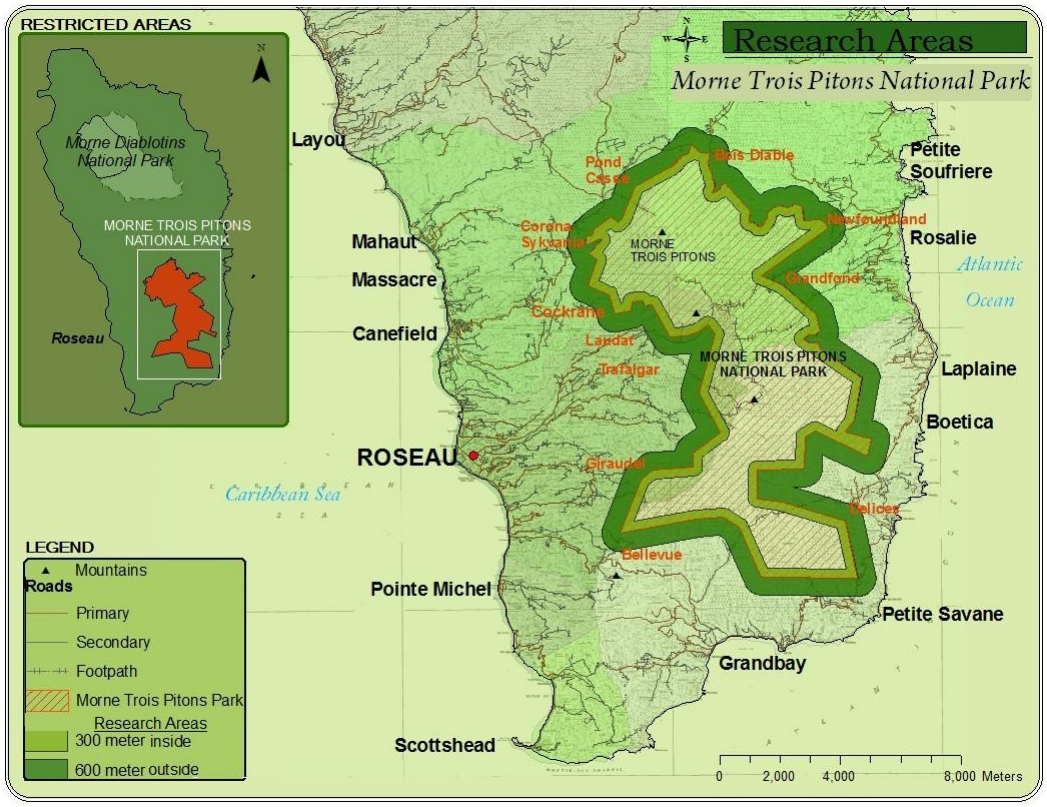


Figure 18 – Research Areas

4.1 BIOPHYSICAL CHARACTERISTICS OF THE NATIONAL PARKS

4.1.1 ELEVATION

The altitude in the Park ranges from 152 -1424 m. The topographical map below highlights the elevation of the Morne Trois Pitons National Park. When compared to the geological map, the areas of highest elevation are those of the younger pelean formation found in the center of the park in a north to south direction. Moving to the park boundaries, the elevation decreases.

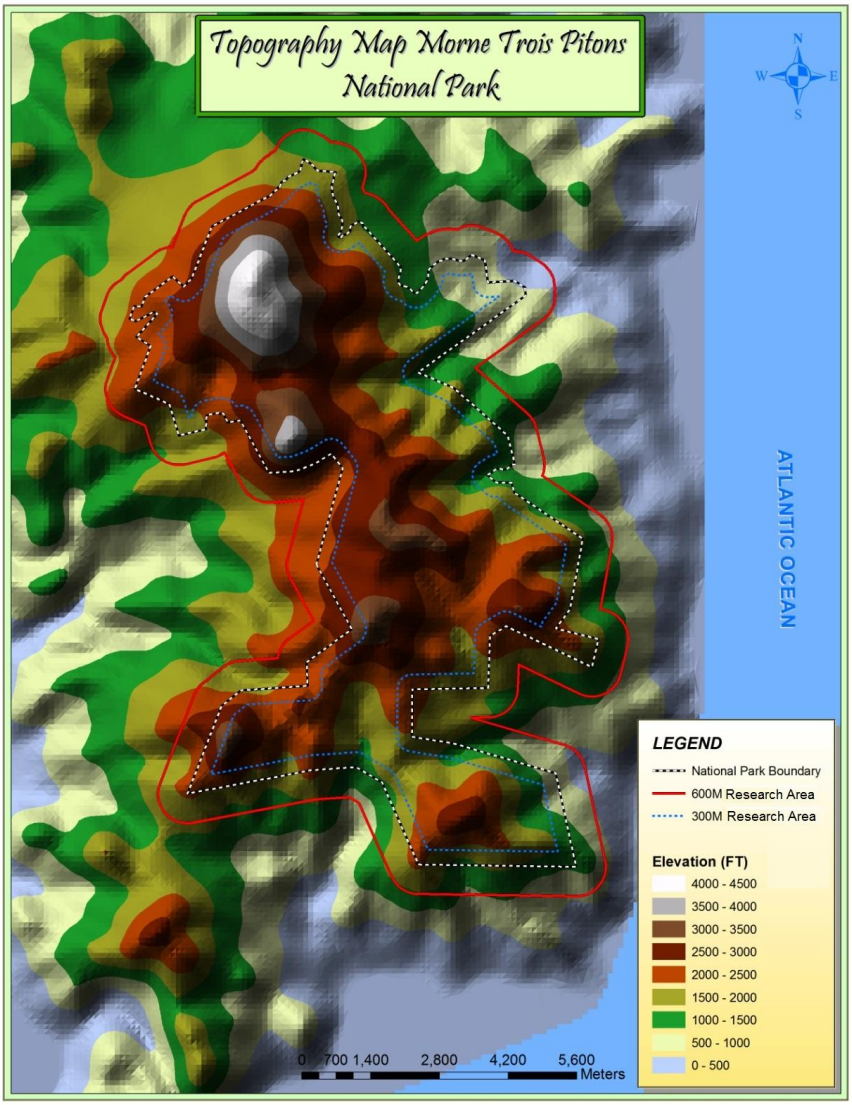


Figure19 – Topography - Morne Trois Pitons National Park

4.1.2 HAZARD ANALYSIS

The majority of the MTPNP is susceptible to high risk landslide. The figure below indicates that west and South of Morne Micotrin are within the high landslide risk including the entire village of Laudat. The Boiling Lake, Fresh Water Lake and Boeri Lake fall within medium risk range. To the south of the park away from the 600m buffer an extreme landslide risk zone is noticed at Perdu temps.

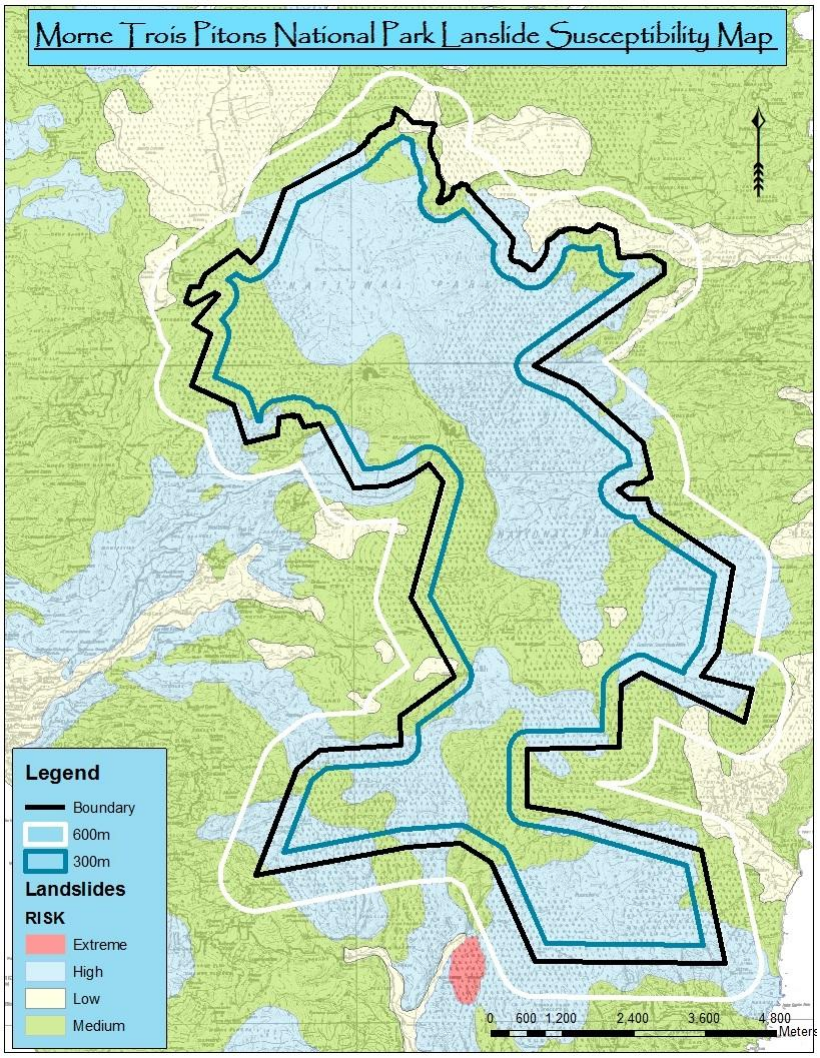


Figure 20 – Landslide Susceptibility Map

4.1.3 GEOLOGY AND SOILS

The majority of the park is underlain with a pyroclastic apron, above which younger pelean domes are situated, highlighting the mountain peaks within the park. Towards the middle, around Wotten Waven is an ignimbrite flow cutting the park almost in half.

In the northern section of the park and around Morne Micotrin Allophonoids podzolic soils are found. These are normally related to wet climates and as seen by the rainfall map, these areas receive a tremendous amount of rain. Allophanoid latosolics make up the rest of the park, except for Morne Micotin which is mainly phytogenic.

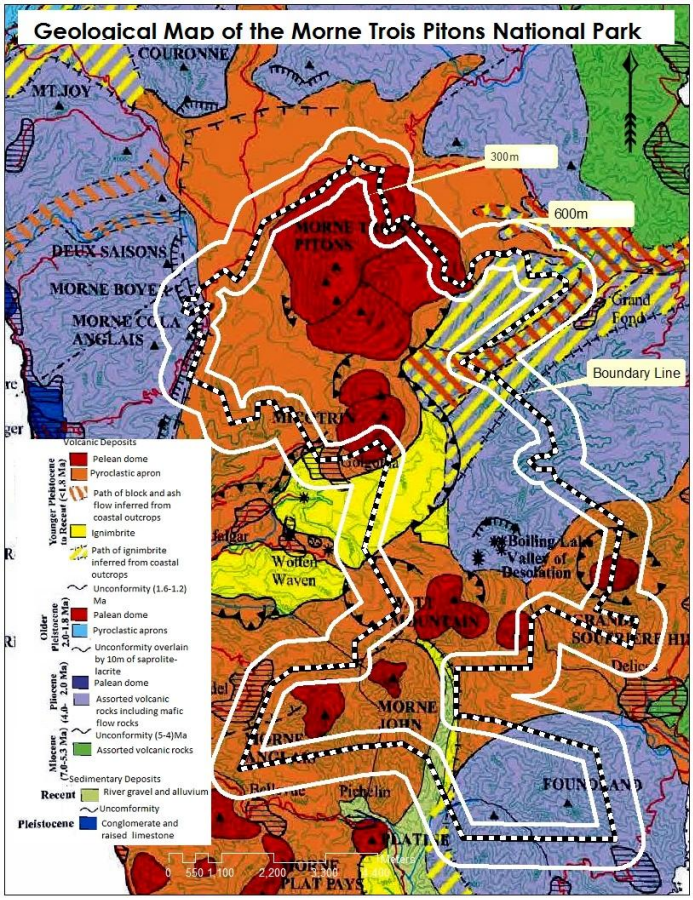


Figure 21 – Geological Map of Morne Trois Pitons National Park

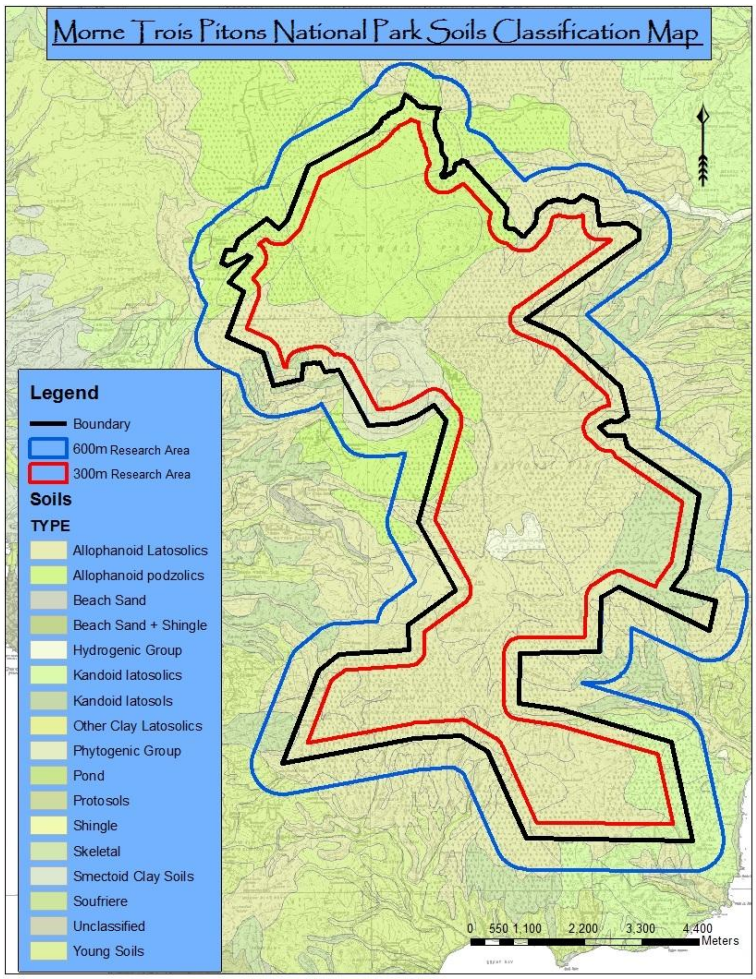


Figure 22 – Soil Classification of Morne Trois Pitons National Park

4.1.4 TEMPERATURE AND RAINFALL

The climate of the Park is dominated by four characteristics:

- Very high rainfall over most of the area through most of the year
- Consistent cover of low cloud for much of the year
- High Wind speeds

Annual mean temperature is estimated at 16 to 20^0 C

The Morne Trois Pitons National park has an average of 250+ inches of precipitation in more than 90 percent of the park. Morne Trois Pitons and Morne Micotrin experience over 300+ inches of rain. There is an extended arm from the northern to almost the southern boundary of 250 to 299 inches of rainfall. 200 to 249 inches is the lowest rainfall range seen in the MTPNP within 600 m external to the boundary of the Park in most areas.

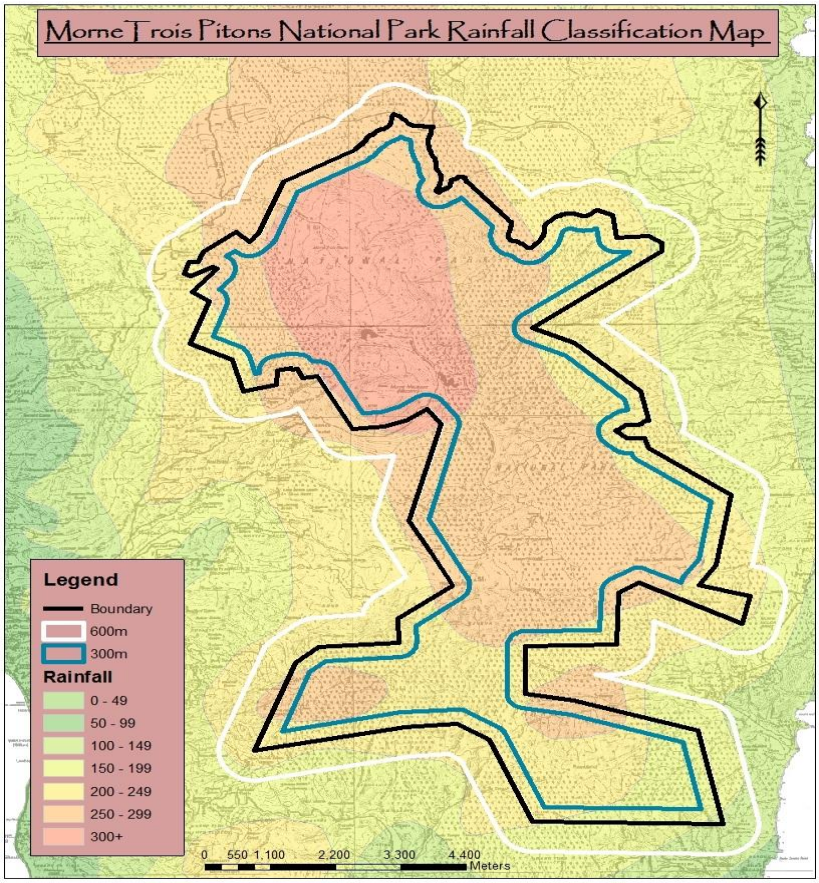


Figure 23 – Rainfall Classification Within Morne Trois Pitons National Park

4.1.5 BIODIVERSITY

OVERVIEW OF FAUNA AND FLORA

Flora

The island as a whole is still 60 to 75% covered with undisturbed forest which is the most extensive in the Lesser Antilles. It supports a high level of biodiversity which includes over 1,000 species of flowering plants with about sixty woody plant and tree species per hectare (Environmental Coordinating Unit, 2000). There is considerable microclimatic variability.

Five natural vegetation zones exist within the area. First: elfin/cloud forest, at the highest elevations above 930m, is almost constantly covered by mist and is subject to high winds, rain, and cold temperatures. Its main vegetation is of mosses, ferns, shrubs and stunted trees covered with lichens. The dominant species is Clusia venosa, with Lobelia cirisifolia. Second: montane thicket, which is transitional between elfin and montane forests, and is dominated by spindly trees, about 12-15m high with small canopies. The main tree found on the steep slopes is Podocarpus coriaceus, the island's only native conifer. At high levels three endemic plants, *Belseria petiolaris, Chromolaena impetiolaris and C. macrodon* and three newly recorded plants, *Elaphoglossum smithi,*

Spiranthes adnata and *Pteris grandifolia* have been found. In flatter areas, the commonest tree is *Amanoa caribaea*

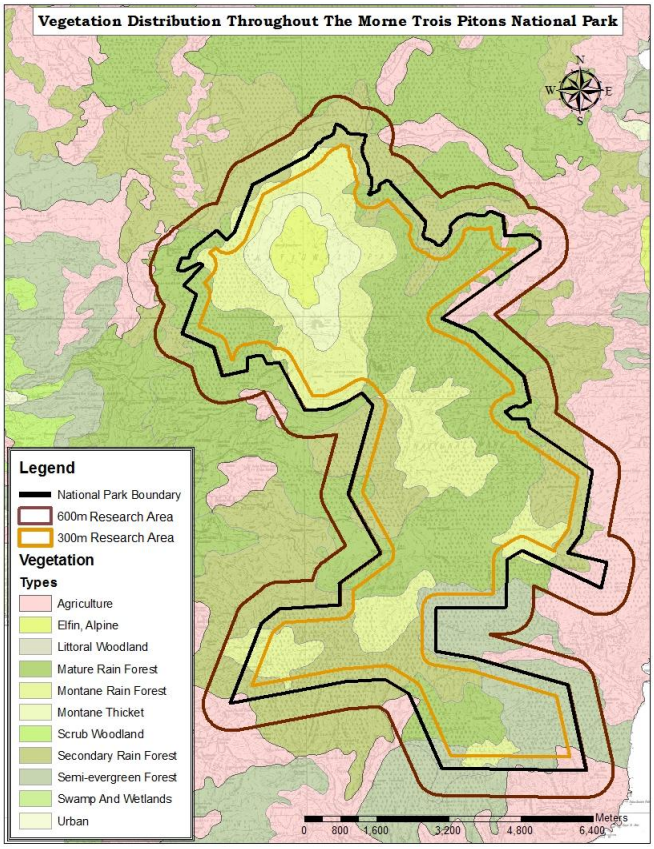


Figure 24 – Vegetation Map Within Morne Trois Pitons National Park

Third: montane rain forest, above 600m, which is frequently in cloud or fog. The species composition is similar to that of mature rain forest, but the trees are smaller. Non-vascular epiphytes cover most montane rain forest plants. Fourth: mature rain forest, which grows between 300-500m. This zone contains the most luxuriant growth, and is dominated by gommier*, Dacryodes excelsa,* and *Sloanea spp*. Understory species include *Licania ternatensis* and *Tapura antillana* with numerous epiphytes and lianas. Fifth: secondary rain forest; vestigial old stands often remain, surrounded by smaller re-growth. Common species *include Cyathea spp., Miconia mirabilis, Cecropia schreberiana, Simarouba amara* and *Chimarrhis cymosa* (McKenzie, 1984-The Nature Conservancy)

Fauna

Surveys of the site indicate at least 13 species of mammals, 50 birds, 12 reptiles and amphibians and 12 crustaceans. Apart from seven species of bats and the introduced opossum, *Didelphys marsupialis,* agouti, *Dasyprocta antillensis*, there are no terrestrial mammals beside feral cats, pigs and two species of rats. Birds include the endemics, Imperial Amazon parrot, *Amazona imperialis* (EN) and Red-necked Amazon parrot, *A. arausiaca*, both once common but now threatened. A reduced population of A. imperialis existed in the Morne

Watt area before Hurricane David in 1979, but its existence in the Park is now uncertain, and red-necked amazon is now seen in only a few small areas. Other birds include the broad-winged hawk *Buteo platypterus,* red-necked pigeon, *Columba squamosa,* the fairly abundant rufous-throated solitaire *Myadestes genibarbis,* hummingbirds and tremblers. Boa constrictor nebulosa which grows to 3.6m in length is common in the Park. There are no poisonous snakes. Three species of lizards, including the endemic *Anolis oculatus*, exist in the Park along with several species of freshwater shrimps and crabs. The island's two native species of tree frogs, including the endemic *Eleutherodactylus amplinympha*, also occur in the Park. There is a wide variety of moths and 55 species of butterflies (Environmental Coordinating Unit, 2000).Nature conservancy

4.1.6 WATER SUPPLY AND WATERSHED FUNCTION

The MTPNP is made up of numerous rivers and watersheds. These watersheds feed almost the entire south, south east and south west of the island. The Park has radial drainage from the large mountains massifs. The

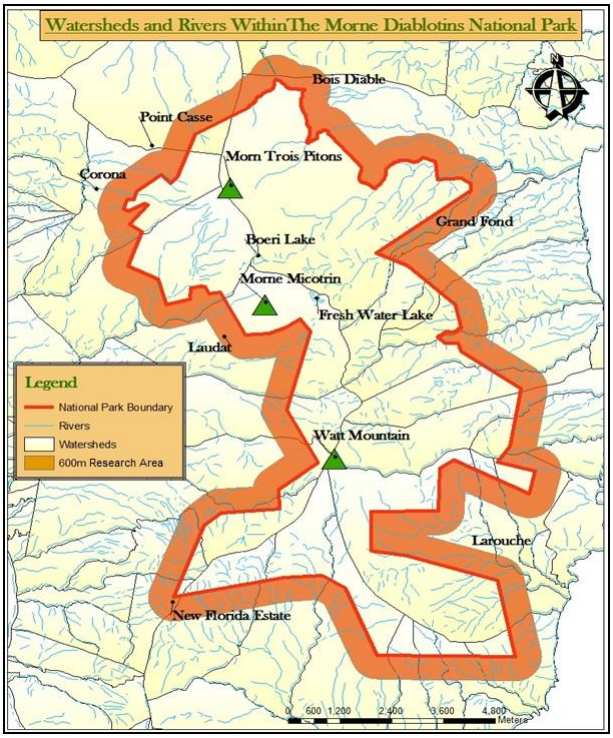


Figure 25 – Rivers and Watersheds Within Morne Trois Pitons National Park

backbone of the Park divides the major watersheds of the south of the island with the headwaters of the Geneva, Gillon, Roseau, Boeri, Belfast, Layou, Castle Bruce, Rosalie, Taberi, Ouayaneri, Sari Saris, La Ronde, Boetica, Pt. Mulatre, Savanne and Malabuka Rivers. (Maximea, Edwards & Lang).

4.2 LAND OWNERSHIP AND LAND USE

LAND OWNERSHIP

98 % of the land in the Park is state land and government- owned. Within the boundaries of the Park are a few private in-holdings located west of the Park in the area of the Freshwater Lake and in the east in the La Plaine

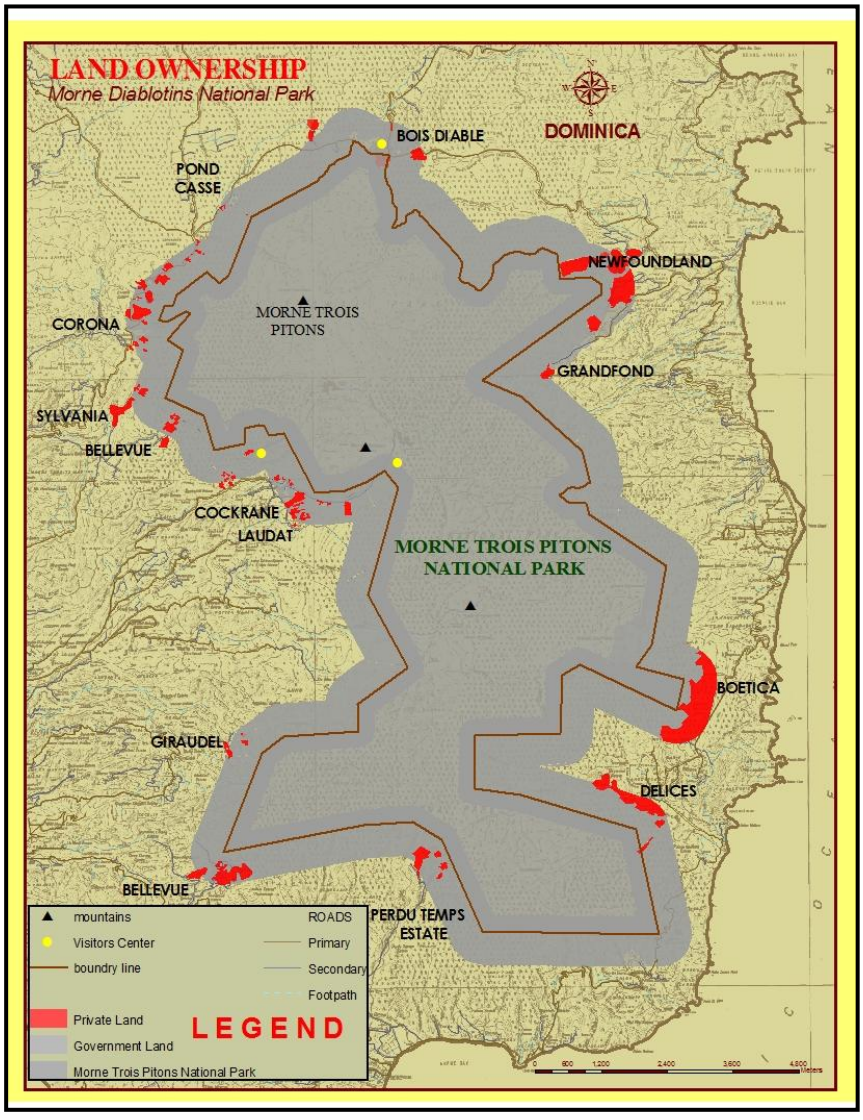


Figure 26 – Land Ownership Within Morne Trois Pitons National Park

area as well as in Giraudel/ Bellevue Chopin, and in the Morne Jaune/ Chemin Letang areas

There are a number of private lands and estates bordering the Park as follows:

Table 4: Estates and Settlements Bordering the MTNPWHS

East	West	North	South
Guayaneri &Taberi Estates	Middleham Estate	Pont Casse Settlement	Rosehill
Pointe Mulatre	Stewart Hall Estate	William settlement	New Florida
Bois Belvue Estate	Rose Hill Estate	Bwa Diable/ Fond Melle Settlement	Perdu Temps South Settlement
Palmiste Estate	Providence Estate	Petit Terre Ferme	Stowe
Plaisance Estate	Sandringham	Terre Ferme Settlement	Lisdara
	Brigandy Estate		
	Castleton Estate		
	Curbin and Berlin Estates		
	Laudat Settlement		

Land Use In and Around the Park

The location of the Park has made it more susceptible to anthropogenic activities. Roughly 25 % of Dominica's population lives in villages in close proximity to the Park. The road to the eastern coast traverses the area and residential development has been gradually increasing along this thoroughfare as some of these lands have been converted from forest to agricultural and into residential use in some areas. The main road traversing from south west to the East and the north is adjacent to the Park from Sylvania to Pont Casse' on to the Bois Diable areas, thus rendering these areas of the Park susceptible to all types of development.

Within the boundaries of the MTPNWHS legal rights of way have been granted by the GoCD to utility companies for establishment of infrastructure. In the case of DOMLEC, for generation and expansion of hydro-electricity and to Cable & Wireless for the establishment of a communication towers in the elfin woodland both in areas west of the Park.

Other legally sanctioned activities include the following:

- An active rock quarry, north of the Park above the Emerald Pool area directly affecting the natural resources of the Park in the area- silting of the river to the Emerald Pool.

- An inactive rock quarry at Freshwater Lake.
- A shooting range in the northern area of the Park in “Williams Area”

Threats to the resources of the Park are exacerbated by the fact that prior to the formal establishment of the Park there were parcels of private land in the east, south and west of the Park some legally held, others in dispute, most of which had agricultural holdings. The land tenure in these areas was never resolved hence agricultural activities mainly subsistence agriculture, are continuing in these areas.

There is a predominance of agriculture in some areas within the boundary of the Park as well as within the 600m radius external to the boundary of the Park. Major agricultural crops are bananas, citrus and ground provisions. As such, these areas have been subject to extensive as well as shifting agriculture which involves the clearing of trees and other vegetation that lead to erosion, silting of waterways and destruction of wildlife habitat.

West and south west within the boundary of the Park in the Laudat/ Freshwater Lake there are approximately 17 acres of land that is privately owned. Some of this land is under agriculture. Subsistence agriculture is also prevalent in Giraudel/ Bellevue Chopin areas where there are private in-holdings in the Park as well as in the areas of Morne Jaune/ Chemin Letang are**a**

East and south east of the Park there is subsistence farming in Grand Fond where there are approximately 9 squatters, in La Plaine where farmers claimed that the state provided them with land grants and also the/Heights of Delices to Victoria. In Petite Savanne, farmers have traditionally planted Bay leaf used for the production of Bay oil.

There are a number of villages within a 600m radius external to the Park’s boundary. Approximately 98% of the village of Grand Fond is within the 600m external to the boundary of the Park. The “Three Rivers Eco Lodge” in New Foundland NE of the Park is well into the 600m. One residential building is located NNW of the Park in the area of Corona.

The villages of Laudat and Cockrane on the western side of the Park, Petite Savanne on the east are located within 1.5 km from the Park boundary.

North of the Park in the Pont Cassé area are proposed residential developments right up to the boundary of the Park. Additionally there is one residential building within the boundary of the Park in the area of Corona

Hunting is prohibited in the Park. However, there is still illegal hunting and fishing taking place in the Park.

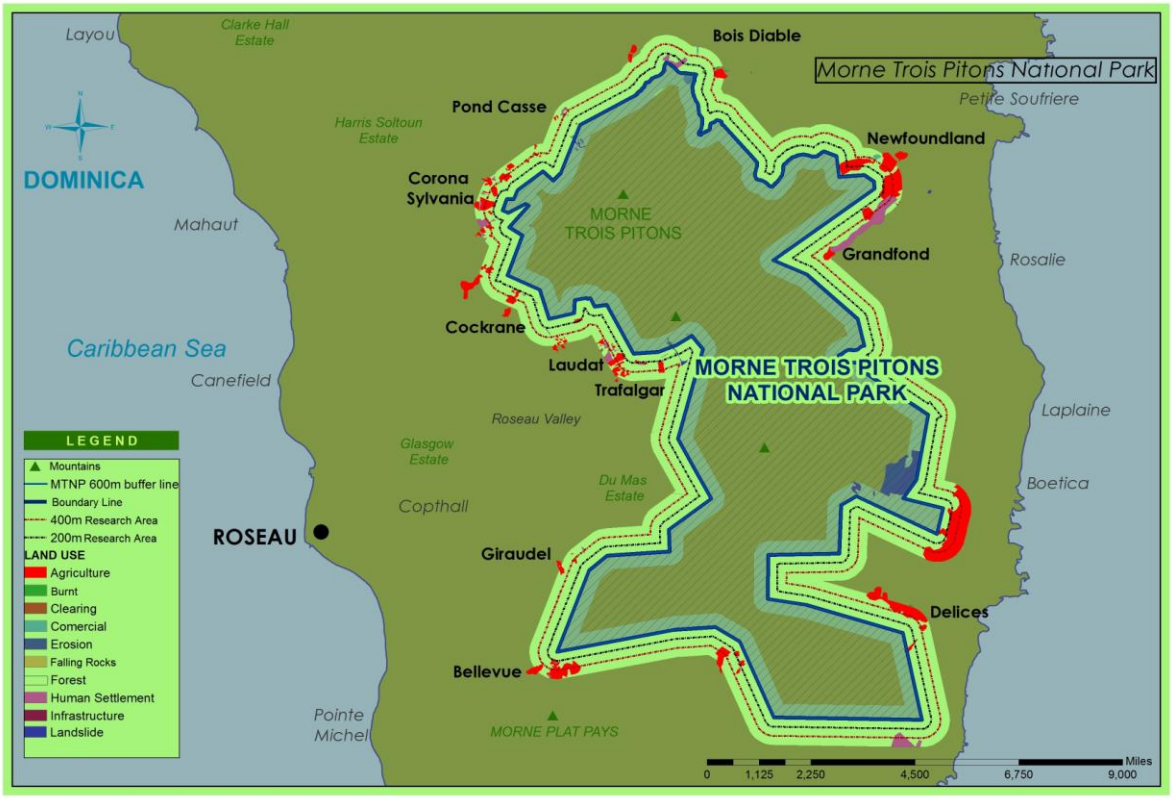


Figure 27 – Anthropogenic Activities Within the Park

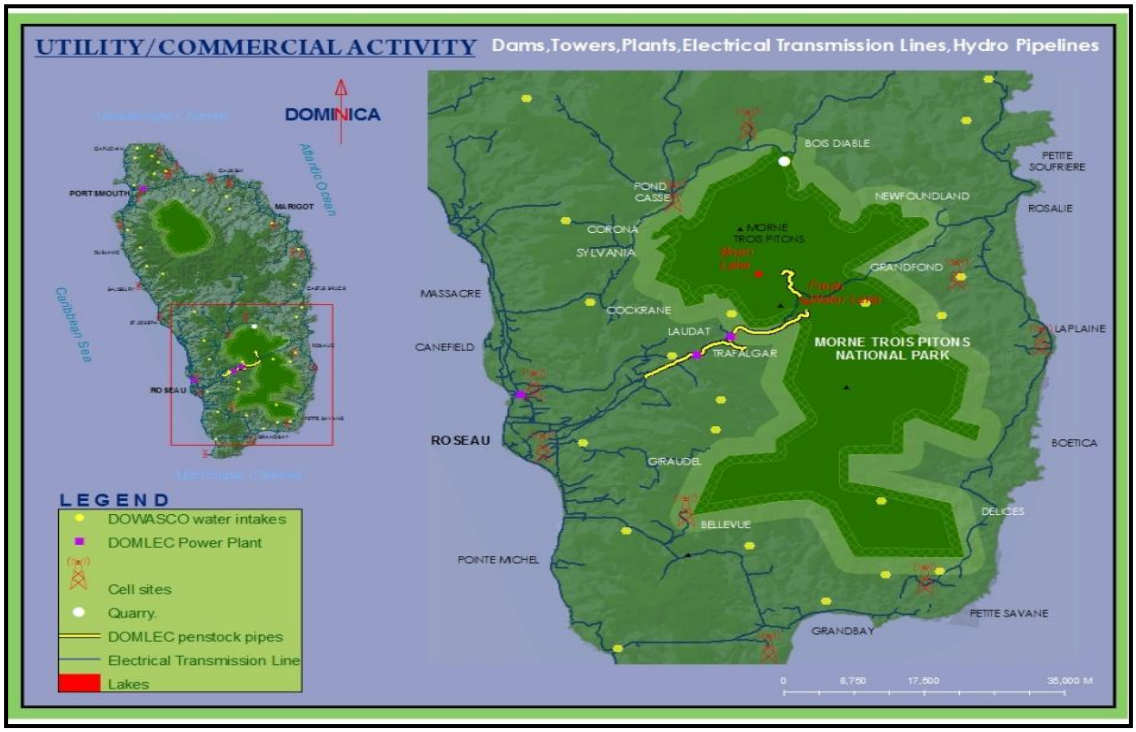


Figure 28 – Utility and Commercial Activity Within Morne Trois Pitons National Park

4.3 RESOURCES, ACCESS AND ATTRACTIONS

Access

There are several access routes to the national park from neighboring villages. Pont Casse', Bois Diable, New Foundland, Grandfond, Delices, Bellevue and Giraudel all have direct access via footpath to the park. Only in Laudat does a primary road go into the park. Between Laudat and Grand Fond, a foot path cuts through the park joining the two villages. The Waitukubuli trail passes only through the north western tip of the park.

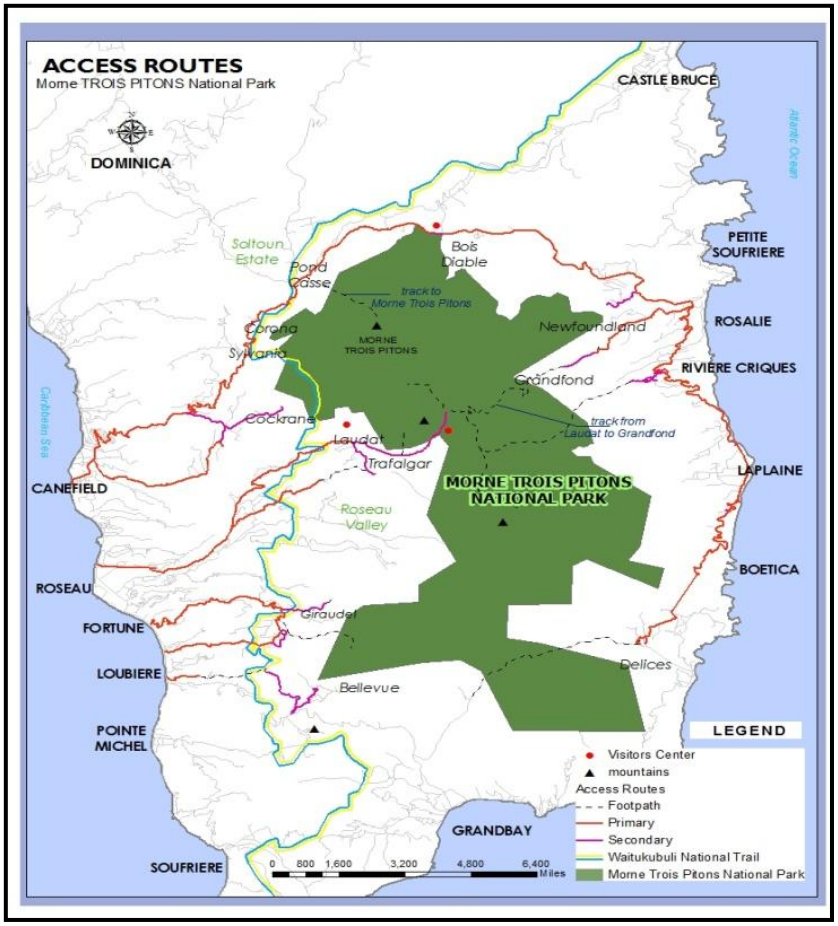


Figure 29 – Access Within Morne Trois Pitons National Park

Attractions

Many attractions are found within the MTPNP. The world's famous Boiling Lake and the Valley of Desolation are found within this park, as well as a number of waterfalls- Victoria, Sari Sari, Middleham Falls and Emerald Pool, rivers and two major lakes, Boeri Lake and Fresh Water Lake are also within the park.

The mountainous landscape, pristine forest and the presence of varied flora and fauna have resulted in this area being regarded as one of high aesthetic value to eco- lovers.

Scientific Research

Numerous scientific studies have been undertaken in the park over the years, and to date it is the preferred location for ecological research in Dominica.

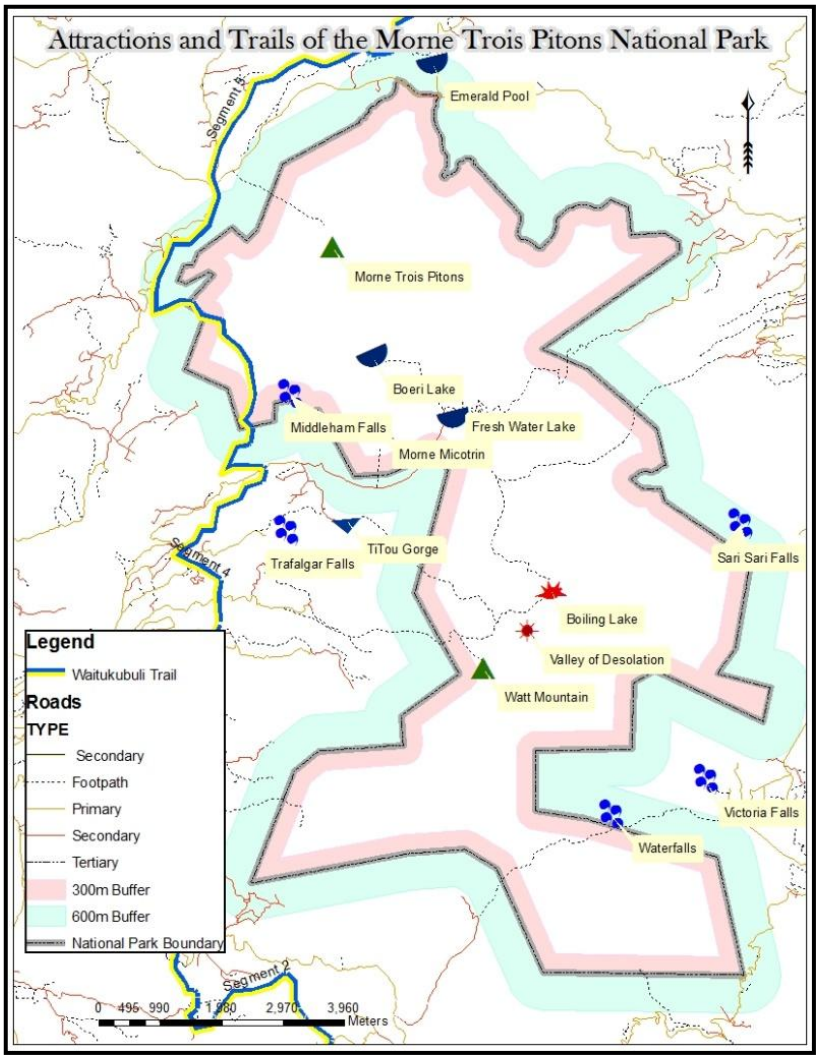


Figure 30 – Attractions and Trails of Morne Trois Pitons National Park

4.4 SOCIO ECONOMIC AND LIVELIHOOD CHARACTERISTICS OF THE PARK

4.4.1 PRESENT POPULATION AND SETTLEMENT PATTERNS AROUND THE PARK

A total of 28 communities are located around the Park with a total area of 109. 8 sq. mi and a total population of 5991 persons approximately 8% of the population of Dominica

There are a number of villages located within a one mile boundary of the Park as follows:

East of the Park

- Laroche
- Delices
- Boetica
- La Plaine
- Morne Jaune
- Grand Fond
- Rosalie

West of the parks

- Sylvania
- Cochrane
- Laudat
- Morne Prosper
- Wotten Waven
- Copt Hall
- Giraudel
- Trafalgar
- Shawford

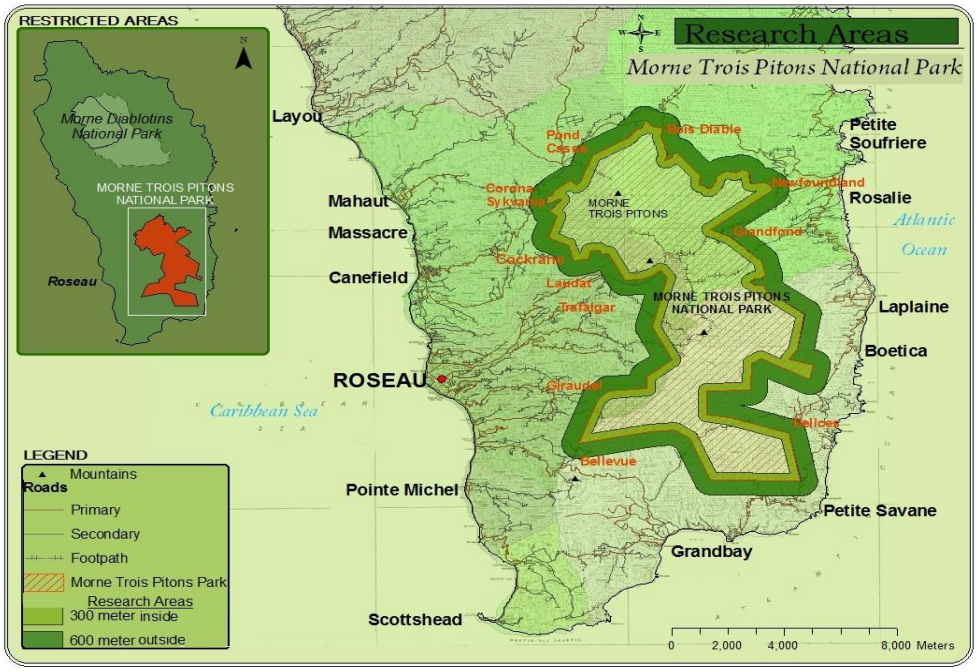


Figure 31 – Communities Around the Park

North of the Park

- Pont Cassé
- Fond Melle
- Crete Palmiste
- Terre Ferme
- Bois Diable

South of the Park

- Bellevue Chopin
- Pichelin
- Geneva
- Stowe
- Dubique (dubuc)
- Bagatelle
- Petite Savanne

4.4.2 Patterns and Poverty Assessment

Table 5: Poverty Indices at Individual and Household Level (%), SLC 2002

PARISH	Indigent	Poor	All Poor		Not Poor	Total	% of all poor
Rest of St. George	11%	12%	24%	(39%)	76%	100%	6%
St. Paul	12%	11%	23%	(36%)	77%	100%	9%
St. Patrick	9%	32%	41%	(48%)	59%	100%	16%
St. David	28%	23%	52%	(67%)	48%	100%	15%
TOTAL	10%	18%	29%	(39%)	71%	100%	100%

Source: Statistical data (Government of the Comm. Of Dominica Poverty Assessment Report 2003)

"IMF Country Report No. 06/289 of August 2006, Dominica: Poverty Reduction Strategy Paper" indicated that some of the catchment areas adjacent to the Parks namely, St. David and St. Patrick have the highest incidence of poverty.

The main economic activities of the majority of workers in poor households in the catchment area are in the construction and agricultural sectors. In terms of occupation, over half the employed poor are to be found in the skilled and unskilled manual sectors and another quarter is farmers. A survey undertaken indicates that in the main catchment areas of the park there are a large number of farmers. This implies that farming is a significant activity in and around the Park. Of significance are the main parishes around the NPWHS - St David, St. Patrick and the Rest of St. George.

Table 6: Registered Farmers by Parish and Farm Size

Parish	Size of Farms (acres)							
	>1	1.5	5.1 -10	10.1-25	25.1-50	50.1-75	75.1-100	
St. George	34	41	8	8	2	-----	---	
Rest of St. George	99	96	12	11	2	---	---	---
St. Paul	44	206	47	17	5	2	----	60
St David	95	818	87	28	3	-----	------	
St. Patrick	138	401	24	4	2	-------	-------	

Source: Central Statistical Office- Visitation records 2001 Population and Housing Census

In terms of economic benefits from the Park, the parishes of St. George and St. Patrick benefit the most through the provision of tourism services- tour guiding, vending and food and beverage. The highest number of visitors to the Park occurs in attractions located in these parishes. There is no available statistics on the economic value of the Park to adjacent communities. However, in terms of revenue generation from the Parks, the average revenue generated per annum over the last 13 years (1997- 2010) is E.C$M 4.7 =U.S$M1.75 based on the projection that 29% of cruise ship visitors visit the MTNPWHS (Min of Finance- User Fee System for Eco-tourist Sites in Dominica - Activity Report 2009-2010).

4.4.3 SOCIAL AND ECONOMIC ACTIVITIES THAT IMPACT OR POSE THREATS TO THE VIABILITY AND INTEGRITY OF THE MTNP WHS

Major socio- economic activities are as follows:

- Potable water for consumption managed by DOWASCO.
- Harnessing water from the Boeri and Freshwater Lakes for alternative energy/hydro electricity-these services are provided by DOMLEC, Dominica Electricity Services, a privately owned company
- Tourism and Recreation
- Hunting and fishing in rivers and streams

4.5 THREATS TO THE PARK

Methodology

A number of areas which pose a threat to the Park were identified with the assistance of the Forestry, Wildlife and National Parks. These areas generally had squatters, were traditionally cultivated, were high erosion areas and in some cases had residential buildings on or were earmarked for future residential development by the private land owners. These area are as follows; Corona, Sylvania, Cockrane, Laudat, Giraudel, Bellevue/New Florida Estate, Larouche/Victoria, Delice, Grand Fond, New Foundland, Bois Diables and Pointe Casse'.

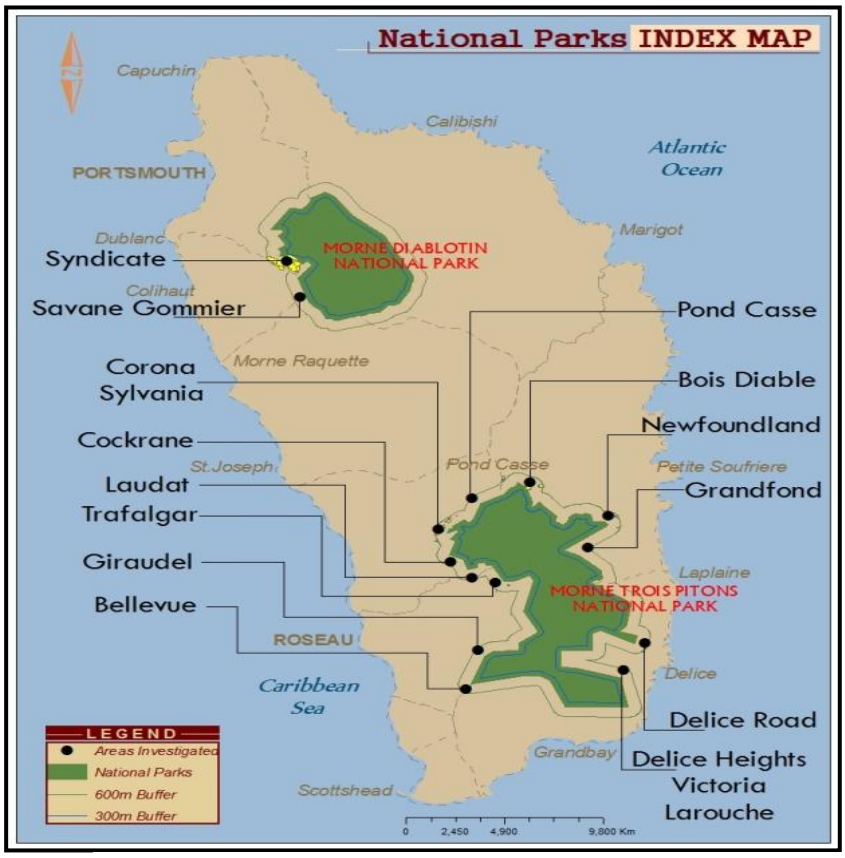


Figure 32 – Map Indicating Survey Points

Site visits were undertaken to these area and data collated. Areas that were not listed for on-the -ground surveys were studied against satellite imageries. Polygons were placed over each activity corresponding to the point, demarcating the boundaries of the shown activities. A complete land use map was formed.

Surveys were carried with the use of Geographic Information Systems (GIS) to identify activities internal and external to the Park boundaries and to identify threats to the National Parks. From the maps, 600m external to the National Parks' boundaries were demarcated and activities were evaluated within this area. A 300m internal to the boundary of the park was also demarcated to evaluate activities that were taking place inside of

the parks' boundaries. These areas were used as guidelines to collect data through field visits and were imported into GIS format for later use.

Two Trimble Juno SC and a Trimble GeoXH were used to gather data in the field. A data dictionary was set up for this purpose. A known point on the map was set into one of the Juno and driven to ensure that the map was correctly geo-referenced.

Field data was collected at various locations, photographs were taken. The data was edited, collated and loaded in the GIS software to create the required maps.

Objectives

The objectives is to identify threats, both natural and man –induced, within the boundary and up to 600m external to the boundary of the Park and to assess the level of dependence of the communities on the park and its environment for their livelihood by evaluating the activities undertaken in these areas. This will provide the necessary information on the characteristics of the proposed buffer zone as well as recommendations for the design of the buffer zone that will protect the biodiversity of the Park while attempting to provide some level of compatibility with the goals of the community and sustenance of livelihood.

Results of Survey

4.5.1 WESTERN SECTION OF THE PARK

This area is still very heavily forested. It is characterized by very shallow soils, is classified as high erosion and is very prone to landslides. Landslides were observed in several areas within and external to the buffer zones as illustrated in the maps- in the Laudat area two major landslides were seen, one of which started well in the national park and headed in a south easterly direction, another along the edge of the Stewart Hall water catchment, particularly the area known as "Red Gully", and others within the buffer zone northeast of Sylvania and Corona.

Human Settlement and agricultural activity are common within 600m external to the Park boundary in Laudat, Cochrane, Corona, Sylvania and in Middleham. Agricultural activity is mainly subsistence agriculture with major crops that include bananas, limes and root crops.
The Laudat Power station is border line with the 600m buffer, however the penstock pipes run through the 600m buffer and into the national park. Power company electrical lines also pass through the 600m buffer from Laudat to the village of Grand Fond.

In the Morne Anglais area are parcels of private land bordering the Park.

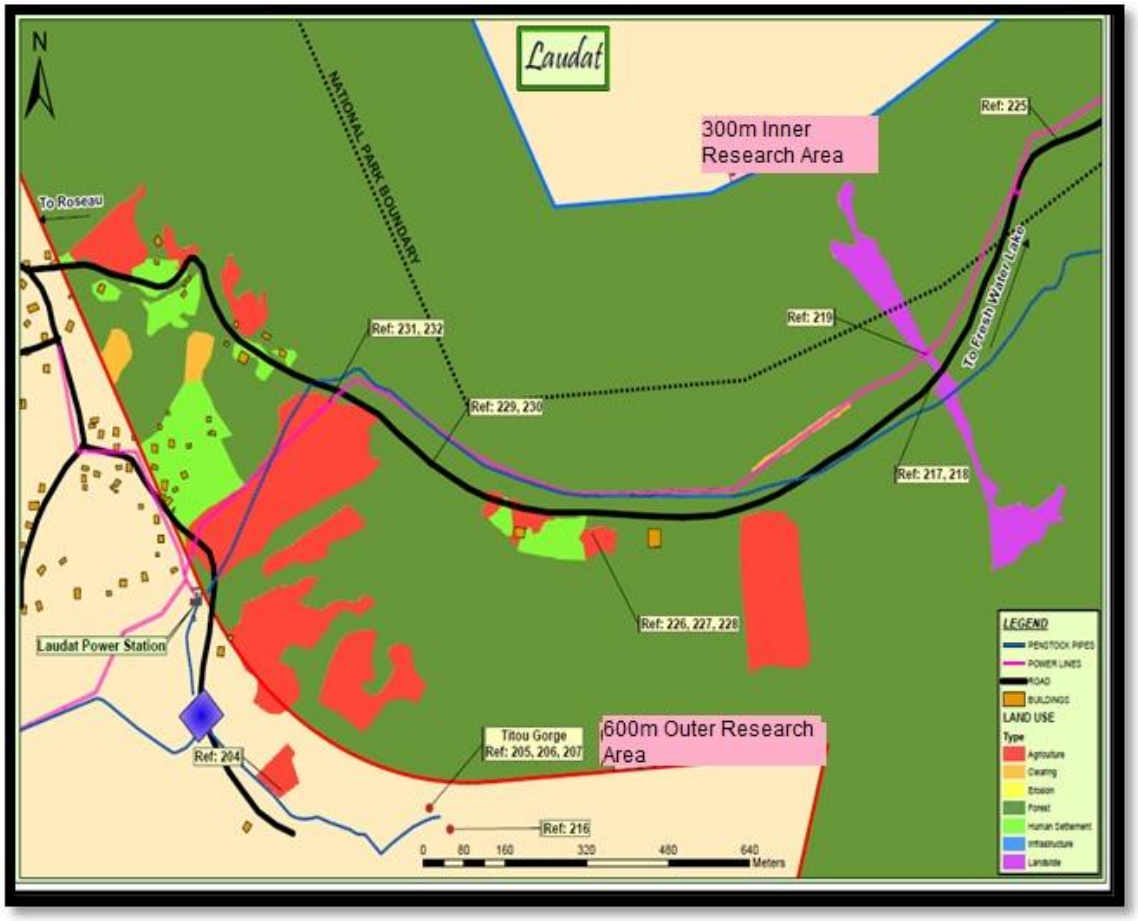


Figure 33 – Laudat

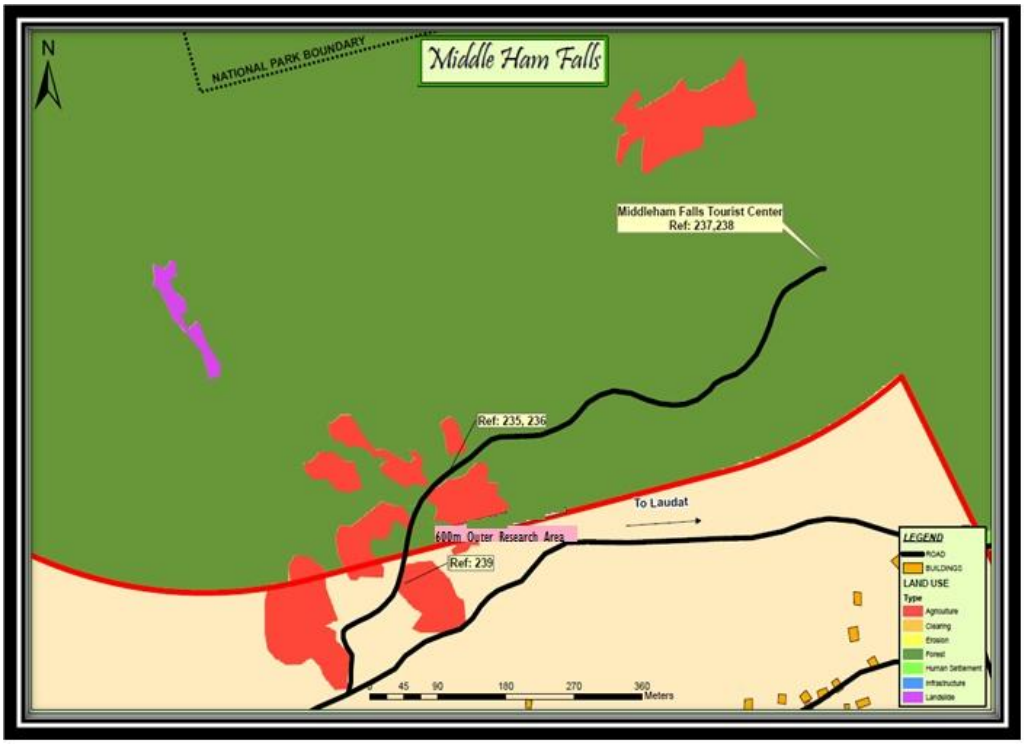


Figure 34 – Middleham

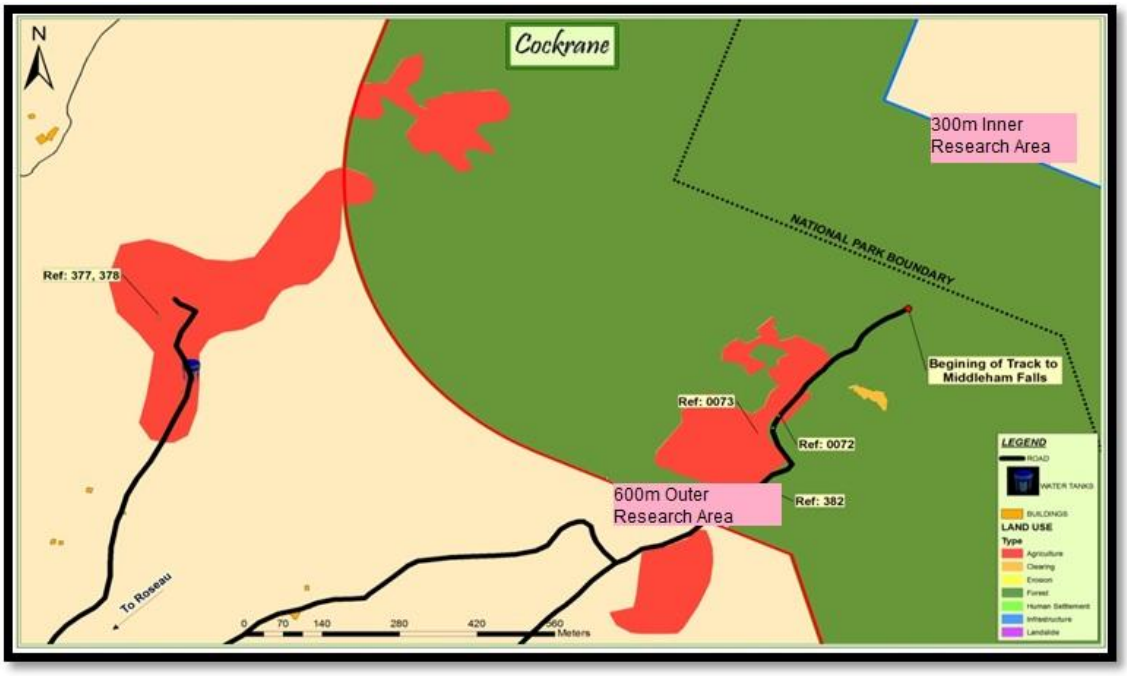


Figure 35 – Cockrane

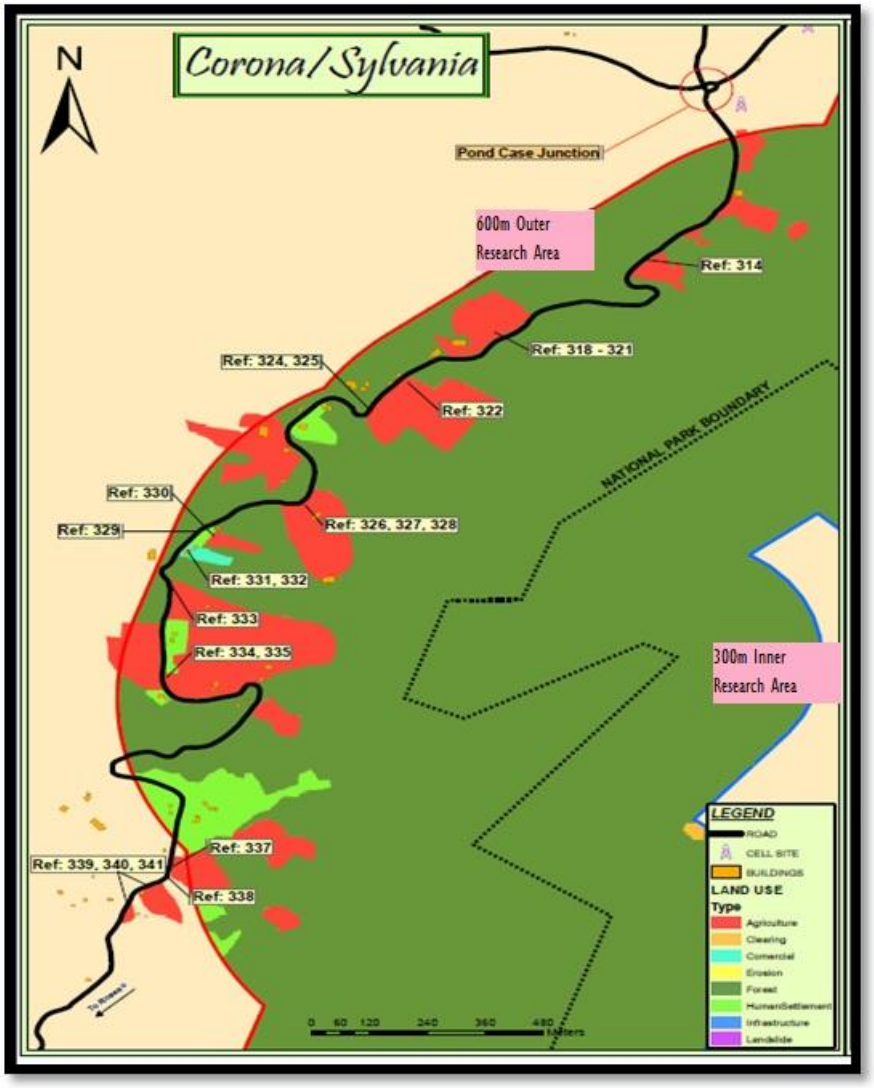


Figure 36 – Corona/ Sylvania

4.5.2 EASTERN SECTION OF THE PARK

This includes areas from Delices to Grand Fond

The area is a mixture of private and state land predominantly steep and susceptible to landslides. It is subject to shifting agriculture, high erosion and landslides. The main road from south to east to the village of Delices runs through the National Park. Further north the boundary line also passes through the Pointe Mulatre and the Quayeneri Estate. Most of the activities observed are taking place within a 600m area outside of the boundary of the Park.

The major activities within this area are agricultural. The entire village of Grand Fond is found within the 600m buffer zone. On the outskirts of the village agricultural plots are present right up to the boundary of the National

Park in some areas. Most of the land directly adjacent to the park is government-owned and in some areas occupied by squatters whose main crops are dasheen and bananas.

The main road to the Village of Delices touches the 600m external to the Park boundary. The lands within this area are mainly agricultural and occupy the entire 600 m area. Several springs are seen gushing out of these agricultural lands. There are also some parcels of private land under agriculture within the boundary of the Park.

The activities within Laroche/Victoria are taking place mainly along the 600m buffer line encroaching into the National Park.

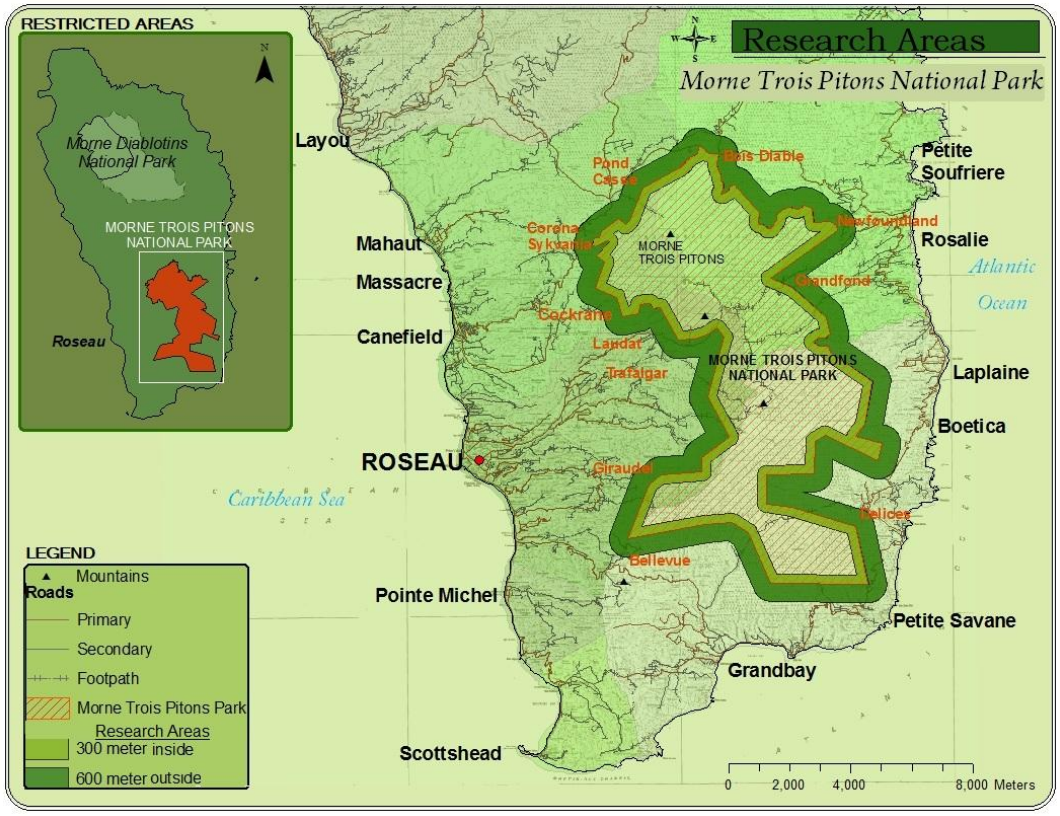


Figure 37 – Map Indicating Communities Around the Park

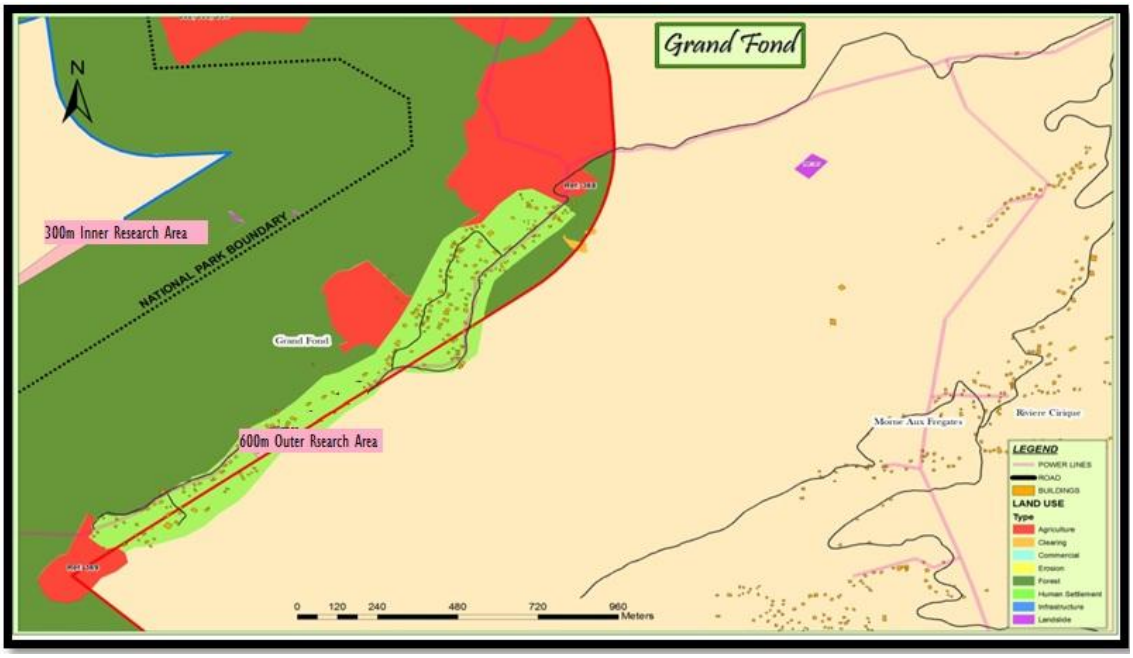


Figure 38 – Grand Fond

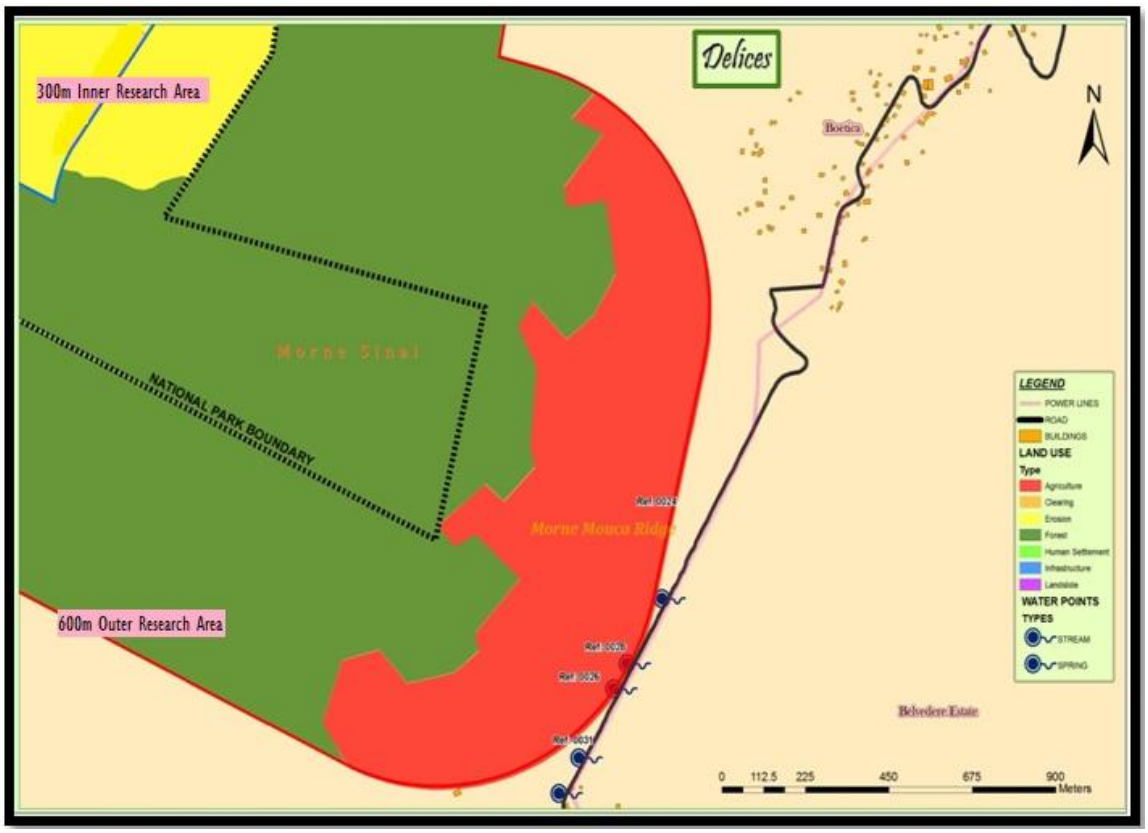


Figure 39 – Delices

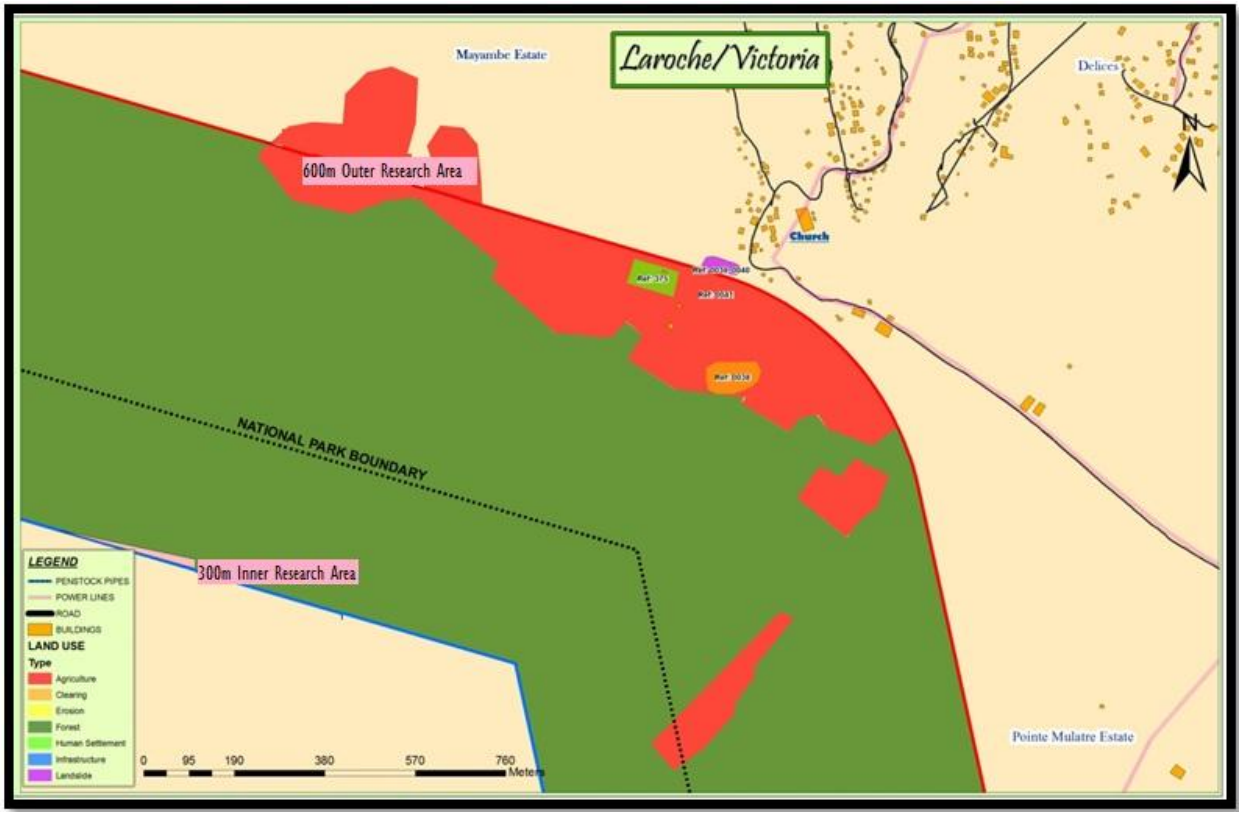


Figure 40 – Laroche/Victoria

4.5.3 SOUTHERN SECTION OF THE PARK

Adjacent to the southern area of the Park are extensive areas of unallocated crown as well as private land. This area is designated as high erosion hazard area and high agricultural erosion hazard. The communities of Petite Savanne and Bagatelle are agricultural and fishing villages with a high dependence on farming. The main cash crop in Petite Savanne is bay oil. Farmers were established within the boundaries of the National Park before it was designated as such and have expanded into extremely steep land into the National park to farm. A major landslide occurred in Bagatelle in 1977 and one of the reasons cited was intense farming practices in the area.

In the Bellevue/ New Florida Communities, the area adjacent to the park is predominantly untouched forest except for the clearing to a cell site area owned by Cable & Wireless. Agriculture is evident with very scattered human settlement. Potential for tourist attraction has been expressed within the area.

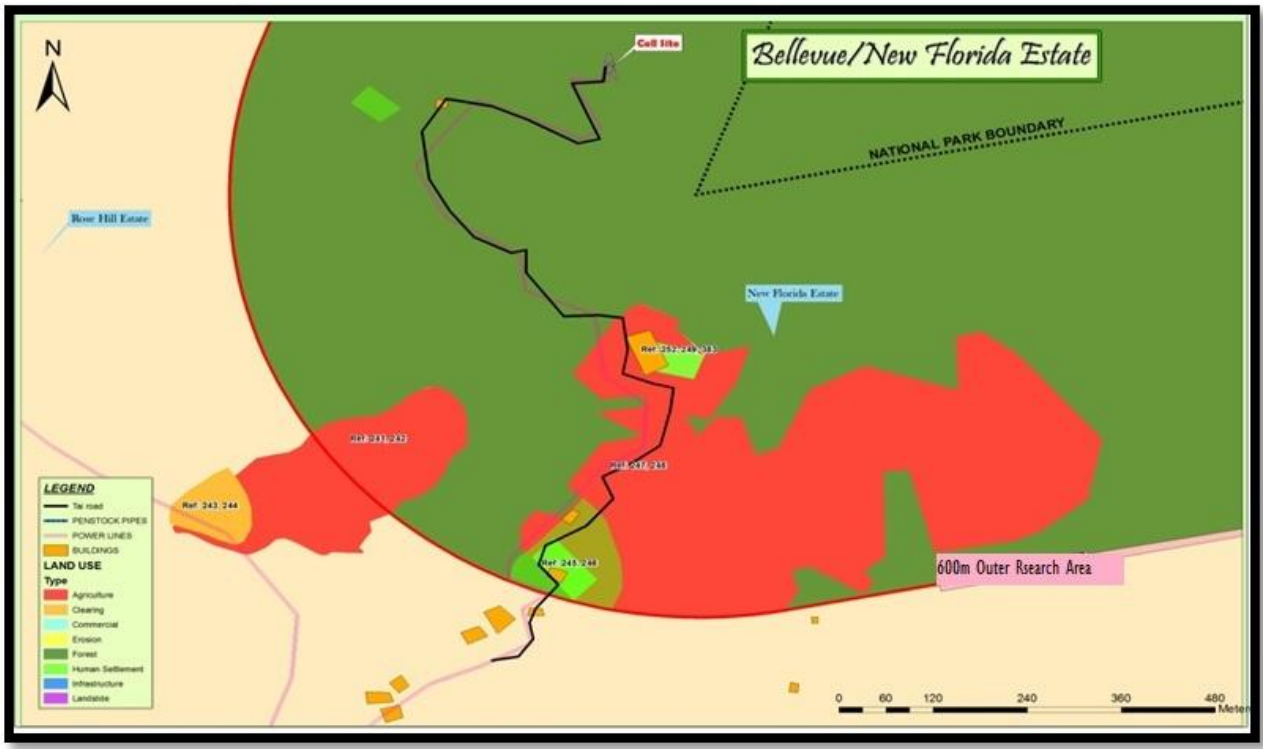


Figure 41 – Bellevue / New Florida Estate

4.5.4 NORTHERN SECTION OF THE PARK

Activities in the northern section of the Park includes development of commercial and residential facilities adjacent to the boundary of the Park in the areas of Pont Casse' and Emerald Pool as well as shifting

agriculture in the areas of Newfoundland, Brantridge and William Settlements. There is an active quarry (highlighted in blue) located inside the national park boundaries within the 300m inner buffer.

The William Settlement represents abandoned agricultural area (for about 20 years). Shifting agriculture has been taking place in the area. The land use activity in New Foundland is mainly agricultural. There is the newly developing Eco Lodge (labeled as commercial ref 351,352) located within 600m external to the boundary of the Park. No other signs or residential land use is present within the 600m buffer in New Foundland.

Agricultural activity is taking place right up to the boundary of the Park in the areas of Pont Cassé, Newfoundland and Terre Ferme.

Settlements around the park consist of Brantridge, Pont Cassé Settlement, William and Bwa Diable/ Fond Melle.

Soil type is allophanoid podzolics. Drainage of this soil is limited by a hard pan and there is heavy erosion from water.

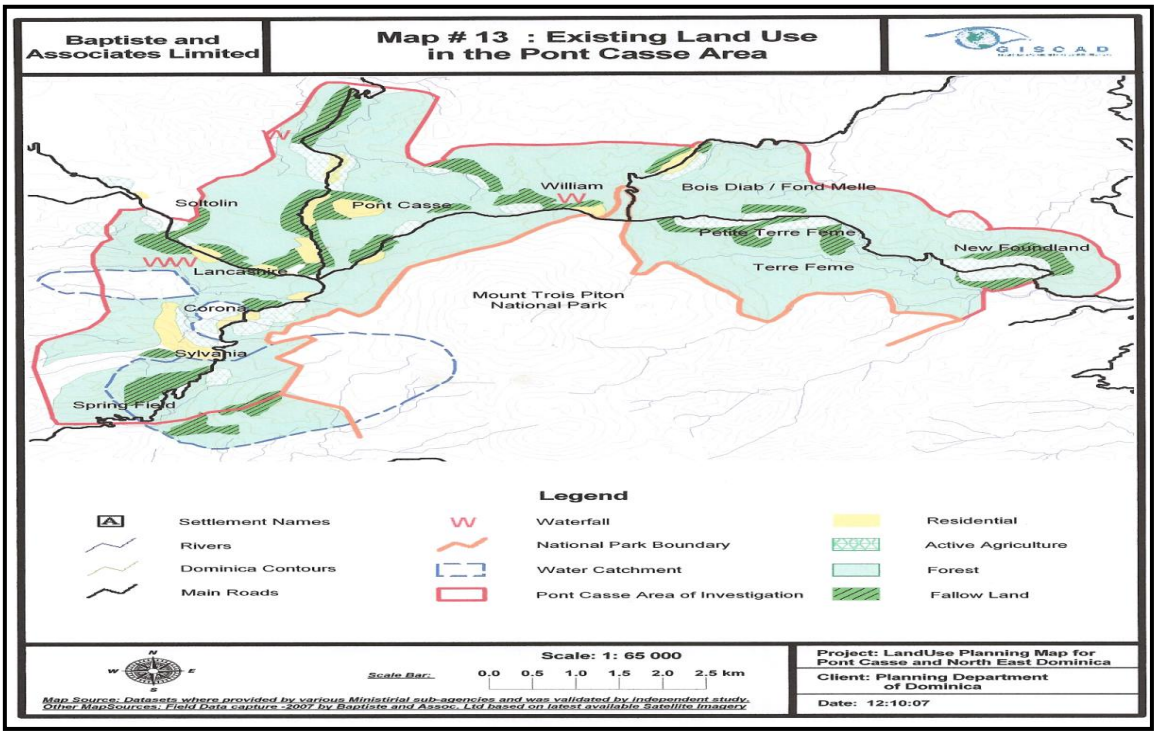


Figure 42 –Existing Land Use in Pont Cassé

(Source: Baptiste & Associates- Pont Cassé and Environs Development Plan, 2008)

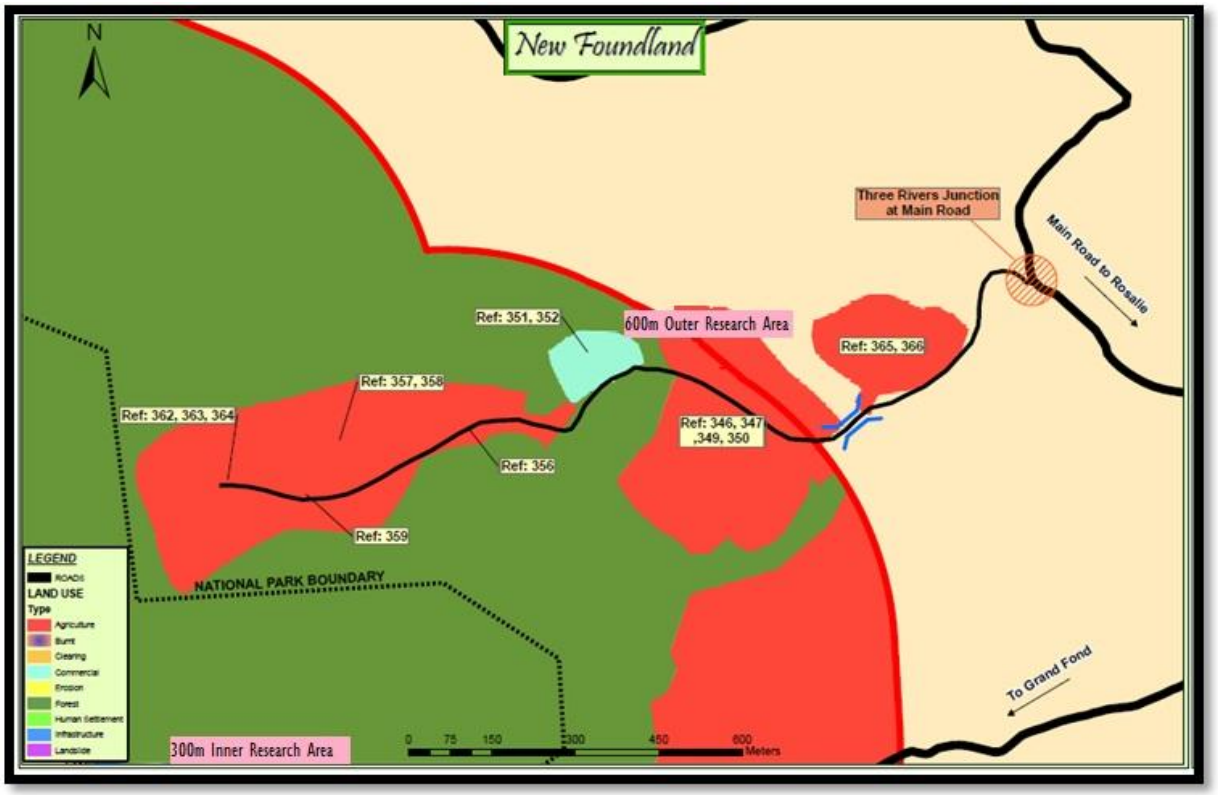


Figure 43 - Newfoundland

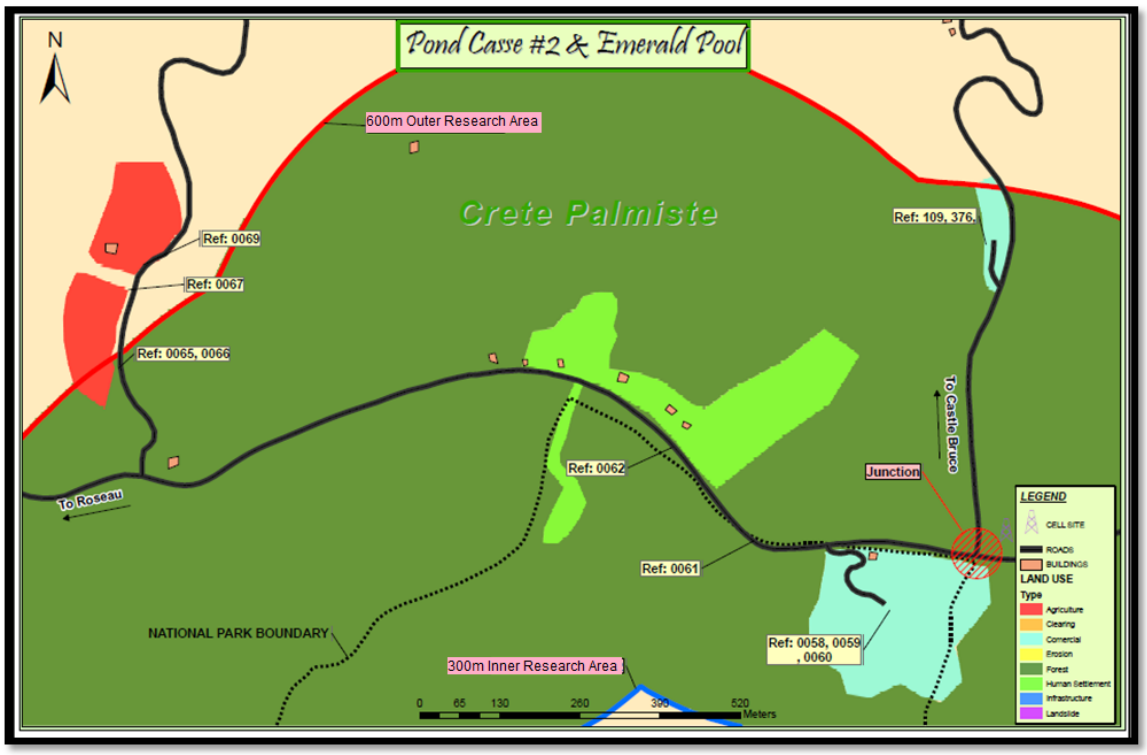


Figure 44 - Pont Cassé & Emerald Pool

4.6 SOME POSSIBLE IMPACTS OF CLIMATE CHANGE

4.6.1 Hurricanes and Tropical Storms

There have been no scientific studies on the impact of climate change on the national parks and no scientific data to establish the effects of climate change on the MTNPWHS. However some observation on the impacts of Hurricane David on the biodiversity of the Park was undertaken by visiting scientists as well as the staff of the Forestry Division.

Hurricane David in 1979 did significant damage to the forest resource by damaging 60% of the tropical forests in the southern half of the island. Most of the trees were debranched hence the loss of habitat and food supplies for wildlife species which resulted in wildlife mortality. 42 % of the standing volume was damaged and 11% completely destroyed. The climax rainforest association of Dacryodes / Sloanea suffered the least while palm brakes suffered the most. Trees of larger diameter were uprooted with greater frequency (Reference- D.H. Kulkarni, 1981). He also noted that two years following the hurricane there was a plethora of “epicormic twigs or invasive climbers” among the stems of the damaged forest trees. With respect to elfin woodland, he noted that there was severe damage where these trees died “outright en masse in big patches”

He indicated that after 2 years there were ample seedlings beneath the thick suppression of weeds and vines which “seem to be trying hard to penetrate”. He recommended simple treatment of weeding and vine cutting to ensure their rescue and to quicken the restoration to the original growth.

Observation from some of forestry personnel also noted excessive dryness and cracking of the soil in some areas in the elfin woodland.

An indirect effect of tropical weather systems such as Hurricane David is the conversion of wildlife habitat to agriculture. In accessible areas the toppled trees provided an opportunity to more easily clear land for farming thus resulting in a further reduction and fragmentation of wildlife habitat. These natural disasters particularly hurricanes can be attributed to one of the root causes of land degradation in Dominica.

Forestry and Parks personnel also indicated signs in the change in phenology of some plant species after hurricanes. There were changes in the flushing of flowers and fruits with implications of reduced food supplies for some bird species.

Flooding

Most of the small radial streams from the various peaks respond very quickly to rainfall events and may dry up completely within thirty six (36) hours of a heavy rainfall. The larger streams are also subject to large variations in flow and sudden floods (flash floods) and can be a source of danger to unwary walkers in the Park.

Additionally, flooding will have an impact on potable water supply as a result of soil erosion and silting of rivers and streams and destruction of infrastructure.

Drought

Drought on the other hand can lead to fires, increase in disease and invasive species as well as decrease availability of water for hydroelectricity as well as reduction in the volume of potable water. There is very little evidence of its impact on vegetation except for what was observed on elfin woodland following hurricane David.

Landslides and Soil Erosion

These are triggered by extreme rainfall and land slope modification through agriculture or infra structure development for construction of roads or housing.

Overall, Dominica is susceptible to major landslides because of its rugged terrain and high precipitation. Landslide analysis indicates that the majority of the MTPNP is classified as high landslide vulnerability except for some areas in the west and north west of the Park. However, it is an accepted fact that the removal of vegetative cover increases the potential for landslides. There have been major landslides in the Park as follows:

- On the Boiling Lake trail descent into the Valley of Desolation on both slopes there were 4 slides in the Valley of Desolation between the months of April and May, 2010

- On the southern face of Morne Micotrin on the road to the FWL a major landslide occurred in 1991 and in 2007 and the area remains unstable with smaller landslides occurring in the area.
- On the northern face of Morne Watt descending to the Valley of Desolation
- On the trail around the Fresh Water Lake

External to the Park were two major landslides in the Bellevue Chopin and Bagatelle areas

Evaluation of activities within and directly external o the boundaries of the national Park indicate that overall, the most serious threat is agriculture development in most areas of the Park.

4.6.2 Impacts of Anthropogenic Activities on Watersheds in the Park

Anthropogenic activities- deforestation and agricultural and human encroachment into the forests from the communities in the north, south, east and west of the Park have been outlined above. The impact of these activities on watersheds and water resources is of major concern. Hence the need to control these activities within buffer zones which result in erosion and increase discharge of sediments into the headwaters of the watersheds that originate in the area. The proposed residential development as well as agricultural activities in the north of the park from Pont Casse' to Newfoundland area could have a major impact on the headwaters of Layou to the south. Further expansion to the west or east could impact the watershed of Belfast to the west and Belle Fille and Rosalie to the east. The Emerald Pool, a major attraction in the Park, falls within the Belle Fille watershed and could also be impacted on.

The Belfast watershed headwaters extend from the Pont Cassé area southward to Middleham and Sylvania Estate areas. The Belle Fille watershed headwaters are demarcated by the Crête Palmiste and Emerald Pool areas and the Rosalie watershed headwaters drain a significant area of the northeastern portion of the National Park, south and east of the Emerald Pool area. Grand Fond is the main community that lies within this watershed. As such, the management of anthropogenic activities in these areas adjacent to and within the park boundaries will ensure a reliable and safe water supply for a number of communities located west and north of the Park

In the western section of the Park, are the Stewart Hall catchment area and the Roseau river watershed with headwaters in the Park. The Roseau watershed covers an area of 3,172.5 ha The upper tributaries of the Roseau River are the Trois Pitons River, Padu River and River Blanc, while the lower tributaries are River Claire and River Douce. These are perennial rivers with water year round. Morne Trois Bitons, Watt Mountain, and Morne Anglais mountains are the source areas for many of these rivers.

The following are the water systems within the Roseau River Watershed: Morne Prosper Water System / River Claire Wotten Waven/Trafalgar Copthall Water System, (River Blanc River/River Padu River Douce Intake, Bulk Water Supply (Padu River), WA-1 Water supply Augmentation (River Claire, Boeri River and Fresh Water Lake catchments). The Table below gives an overview of source and users of water in the catchment area.

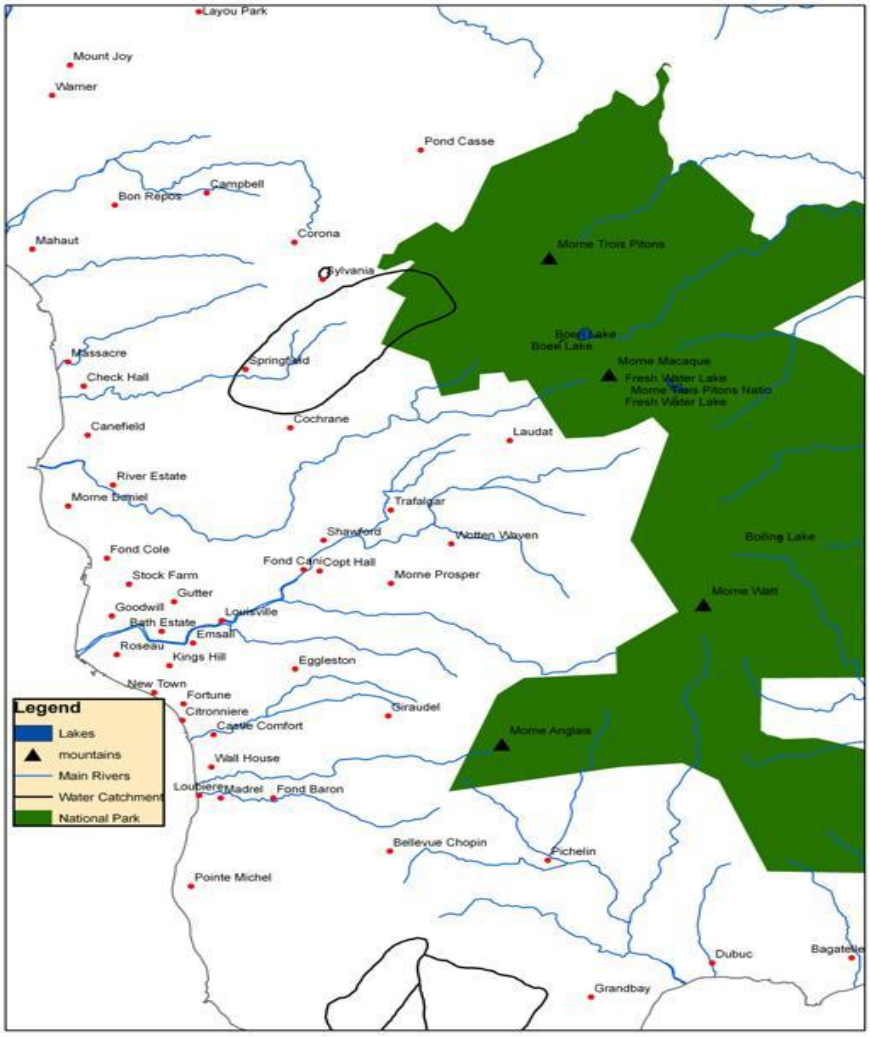


Figure 45 – Roseau River Watershed - Source and Users of Water in the Catchment Area

Table 7: Water intakes in the Roseau River Watershed (U.S Army Corps 2004)

Source/water Intake	Projected Water demand (M litres/day)	Area served	Population	Intake Elevation (feet & meters)	Catchment size	Minimum River Flow
River Douce	NA	Roseau	16, 978	225 ft. (68 m.)	238ha	NA
Padu River	NA	Trafalgar	700	1274 ft. (388m.)	16ha	NA
	NA	Laudat	300	2250 ft. (686m)	44ha	NA
Branch of River Blanc	NA	Wotton Waven	200	550ft. (168m)	16 ha	NA
River Claire	NA	Morne Prosper	500	1120ft. (341m)		
Padu River	NA	Bulk Water supply			16 ha	

In the southern section of the Park the water catchment systems 7 & 8 serve Delices to Boetica and Dubique to Bellevue Chopin respectively. The park affords protection to the headwaters of River Jack, the Perdu Temps, Pichelin and Geneva Rivers.

Water catchment # 6 is located east central of the Park provides water systems for the Castle Bruce, La Plaine and Grand Fond areas. The proposed White river hydro electric catchment is in this area. The Sari Sari and Victoria waterfalls are afforded some level of protection from the rivers that emanate from the Park in this area.

4.7 EVALUATION AND ESTABLISHMENT OF A BUFFER ZONE

4.7.1 ASSESSMENT OF EXISTING PROPOSALS FOR A BUFFER ZONE IN THE PARK

Christopher Cox PhD (August 2005): "An Impact Assessment of Potential Residential Development in the Vicinity of The Morne Trois Pitons National Park Commonwealth of Dominica Final Report" recommended a 1000 m buffer zone around the entire National Park, in keeping with his recommendation of establishing a 1000 m buffer along the Post Cassé road.

In his report he states that "The rationale for extending the buffer to 1,000 m lies in the status of the MTPNP as a World Heritage Site. The buffer does not equate to an exclusion zone; rather it is a special development area within which only activities and development consistent with maintaining the integrity of the Park should be considered". He also recommended a 200 metre buffer for all other national parks and the forest reserves.

Maximea, Edwards and Lang (2001) "Morne Trois Morne Pitons National Park Management Plan 2002-2010" an update of the previous 1990-2000 MTPNP Management Plan, recommended a 200 m buffer zone around the entire Park except for the area of "Corona to "William/ Castle Bruce junction" where the buffer zone" follow a road line where the boundary of the park has been established and that land owners below this road line would be restricted from clearing the first 50 m of land except at the chosen high points" (Maximea et al., 2001).

Baptiste & Associates did a study later, "Pont Cassé and Environs Development Plan: Existing Land Use and Proposed Zoning, 2008" and suggested that Dr Cox's 1000m was too extensive, and would have great economic impact for private and public sectors. He therefore recommended the establishment of a buffer as follows: "The depth of the proposed MTNP buffer ranges between 152.4 m (500 feet) in localities where residential development is dense and in close proximity to the boundaries of the Park (Sylvania) to 305 m (1,000 feet), in areas where the land is under forest, marginal and State owned (Petite Terre Ferme)."

He went on to state that only activities ancillary to the use, development and maintenance of a conservation park should be allowed in that zone

4.7.2 RATIONALE FOR THE PROPOSED BUFFER ZONE

Figure 46 below shows the existing land use activities at all the surveyed points internal and external to the boundary of the Park.
The following factors were considered in selection of the buffer zone:

- The status of the park as a world heritage site and the need for the establishment of a buffer zone
- The primary objective of the Park to ensure the protection and conservation of the ecosystems and water resources within the national park including the populations of both species of parrot and other endemic species
- Enabling the stakeholder communities to sustain livelihoods that are environmentally safe.
- Preserving the recreation potential of the Park while preserving its environmental integrity
- Mitigating the impacts of natural hazards by minimizing the impact of anthropogenic activities

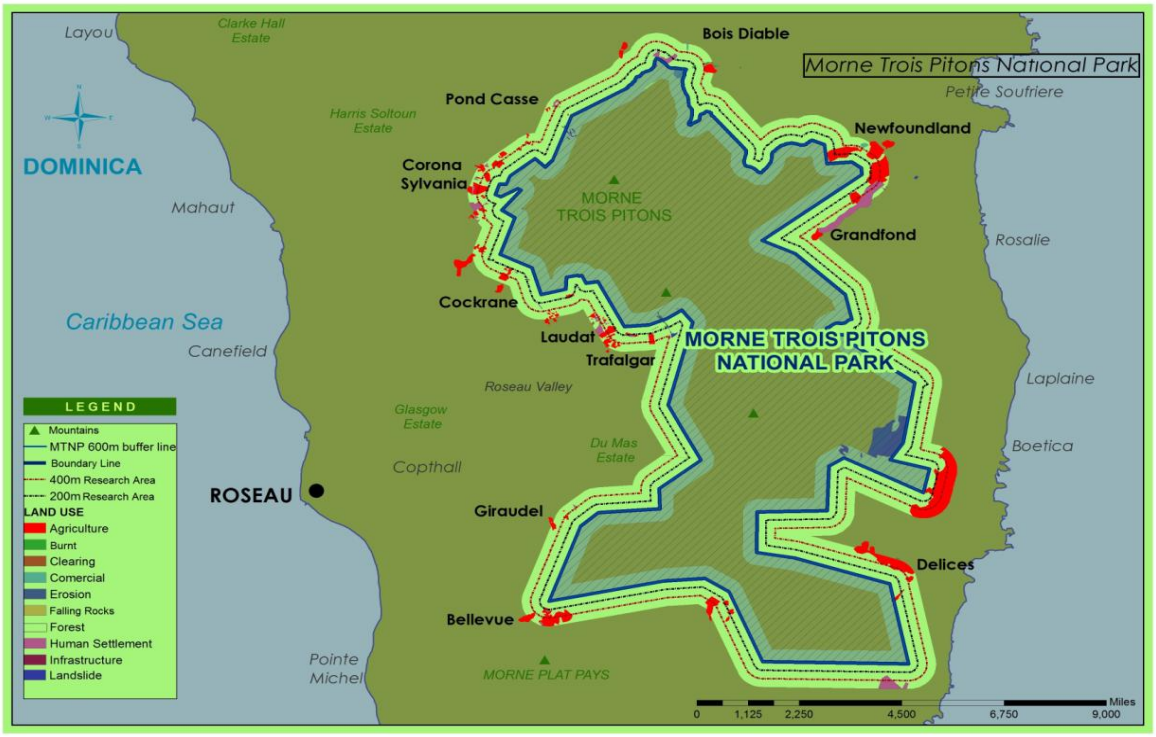


Figure 46 – Existing land use activities at surveyed points internal and external to the boundary of the Park.

The buffer zone is expected to contain elements suitable for carbon sinks. The most common activity occurring in the buffer zones and in some cases within the Park is agricultural activity either by squatters within or adjacent to the boundary of the park or by private land owners in the same areas. Most of the farming is subsistence farming and illegal planting of Cannabis sativa

To a lesser extent, there are areas with residential expansion in and around the Park as well as road construction. The impact on the terrestrial biodiversity of the Park from these developments is common to all areas and can translate into loss of habitat for wildlife depending on the extent of clearing of land as well as disturbance of micro climates or niches suitable for other species of wildlife in the Park.

Agriculture and /or home gardening may be the vehicle for inadvertently introducing invasive and/ or exotic species into forest environment which may have the ability to out-compete the local species and

in so doing the habitat of native species and thus compromise the ecological integrity of the Park. There is also the problem of the introduction of plant disease through this medium.
As such the establishment of a buffer zone is important so as to protect the biodiversity of the Park from these activities.

Northern Section of the Park

All lands east of the road running along Corona Estate to the Castle Bruce/La Plaine junction back to the Morne Trois Pitons National Park boundary should be maintained under forest primarily to provide a buffer between the Park and existing/planned developments, based on the following considerations:

- This area contains mainly transitional Montane Rain Forest. It is classified as high to medium landslide hazard and is a high rainfall area which predisposes it to landslide and intense runoff from the major slopes which make up its topography. The area is not good for commercial lumbering, due to the small size, but is a good source of round wood used in the construction industry, which in itself poses vulnerability risks. There is a small section of mature rain forest midway to the east of Lancashire and Castleton Estates (private estates) along the National Park boundary which should be maintained

- It will provide protection to water quality downstream.

- Lands adjoining the Morne Trois Pitons National Park boundary in the Terre Ferme area are not very accessible except close to the road near Bois Diable. The buffer here should be established at 200 metres. This area is subject to high rainfall, is also described as high to medium category land slide hazard and poor soil conditions for agriculture. The area contains forest trees that are not economically important for lumbering except in the Terre Ferme area where mature rain forest is represented. The established buffer in this area will not only protect the watersheds in this area but also provide protection to the vegetation to the wildlife and vegetation of the National Park.

- The proposed buffer for this area is approximately 946 acres (384 ha) of land, of which 334 acres (137.5 ha) is believed to be privately owned in the northern area.

- Marginal agricultural production is present in Bois Diable and Newfoundland and residential settlement occurs in Sylvania
- Threatened regimes in the area constitute the headlands of four major watersheds. Clark's River and Stuart's River and tributaries of Rosalie River come from the Park .This area is also a significant nesting and feeding habitat of the Red-necked or "Jaco" Parrot.

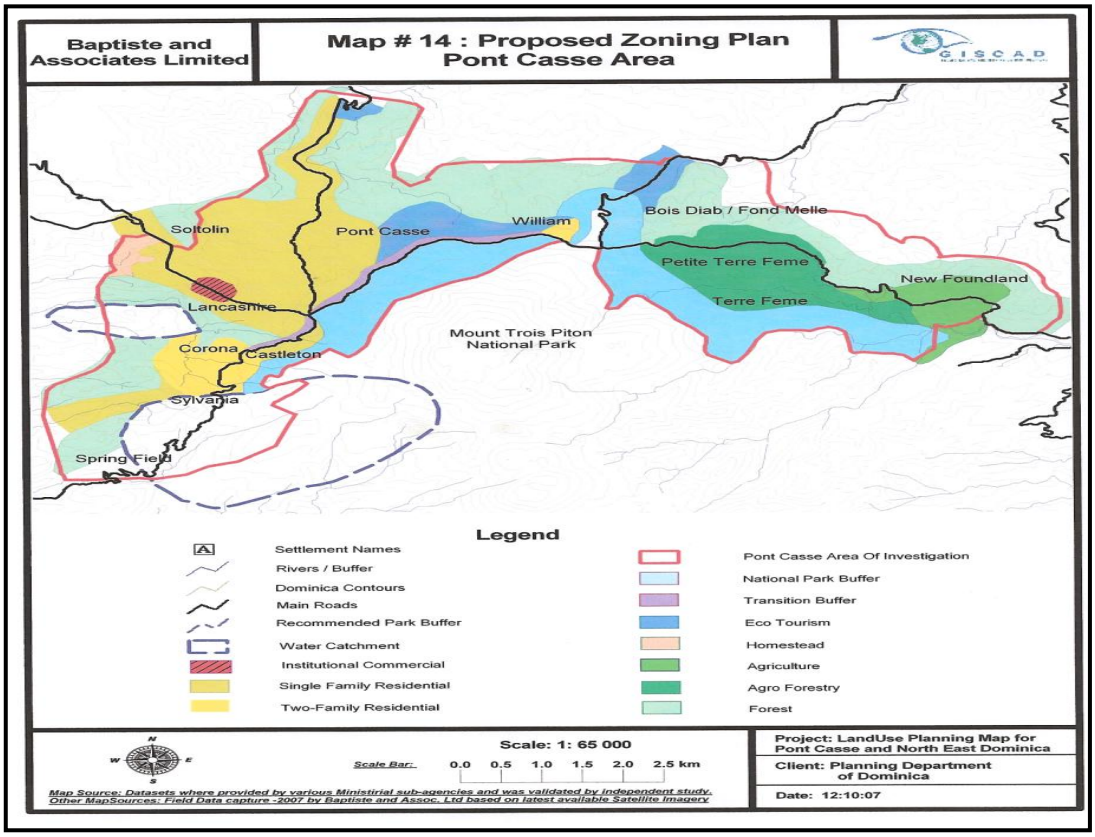


Figure 47 – Proposed Zoning Area - Northern Section of the Park

Western Section of the Park

This area extends from the Middleham area to Morne Anglais and Rose Hill Estate. This area has some of the best stands of the various vegetation types and associations typical of the rain forest ranging from rain forest to elfin woodland and specialized area of edapahic forests- swamp forest.

In terms of land use the greater part of this area is still very heavily forested. Human Settlement and agricultural activity are common within 600m external to the Park boundary in Laudat, Cochrane, and in Middleham. Activities did not extend to the 200m buffer except for the Sylvania /Corona areas which are included as part of the northern section of the park. Agricultural activity is mainly subsistence agriculture with major crops that include bananas, limes, root crops.

All the lands in the area should be protected by the establishment of a 200 m buffer zone for the following reasons:

This area is characterized by very shallow soils, is classified as high erosion and very prone to landslides. The north western areas have a very high rainfall and areas adjacent to the Park are very steep and not conducive to agricultural production.

Ground water resources are found throughout the western section of the Park. It varies from heated ground water in geothermal areas of Trafalgar, Laudat to cold groundwater found throughout. It is important to protect these resources form fertilizers and pesticides which could contaminate them through agricultural activities.

Some of the headwaters for major catchment areas are within the Park- the Roseau River Catchment areas serving communities in the western area of the park as well as the bulk water supply to the cruise ship industry. The identified, agricultural production on the boundaries of the park in this area could compromise the quality of water.

The Jaco Parrot is resident in the National Park and there have been sightings of the Sisserou Parrot in the area of Morne Prosper. This indicates that the nesting and feeding trees could be located in the Park and protection from agricultural encroachment would lend additional protection to the parrots and increase its range for foraging.

Finally most of the land in the 200m buffer is government-owned. As seen from the description, most of the activities are subsistence agriculture most of which is not actively pursued.

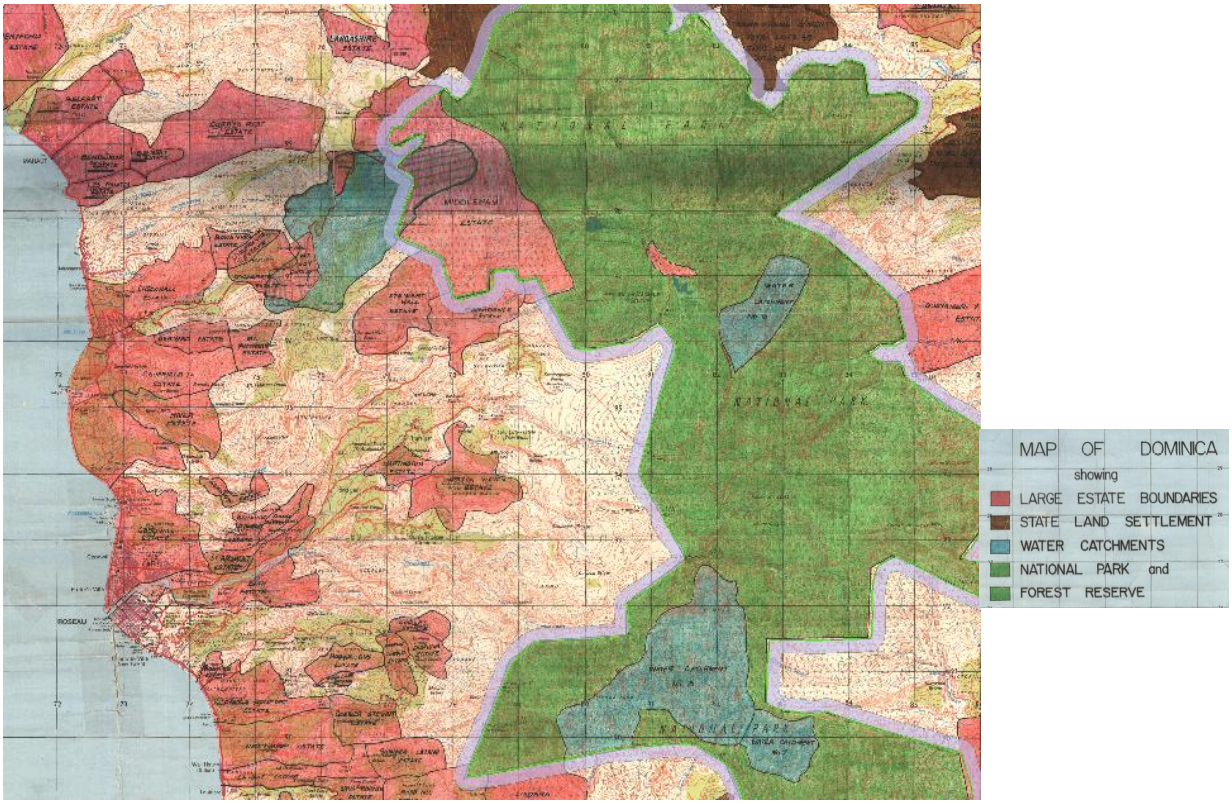


Figure 48 – Western Section of the Park

Southern Section of the Park

Southern area of the Park consists of very steep land classified as high erosion hazard some with shifting agriculture which can trigger landslides. Most of this agriculture within and external to the boundary of the Park come from the Petite Savanne and Bagatelle areas.

Most of the ongoing agricultural activities in the area threaten the catchment areas for the water systems of Bagatelle/ Fond St. Jean, Petite Savanne, Grand Bay, Pichelin, Bellvue Chopin, Dubic and Tete Morne.

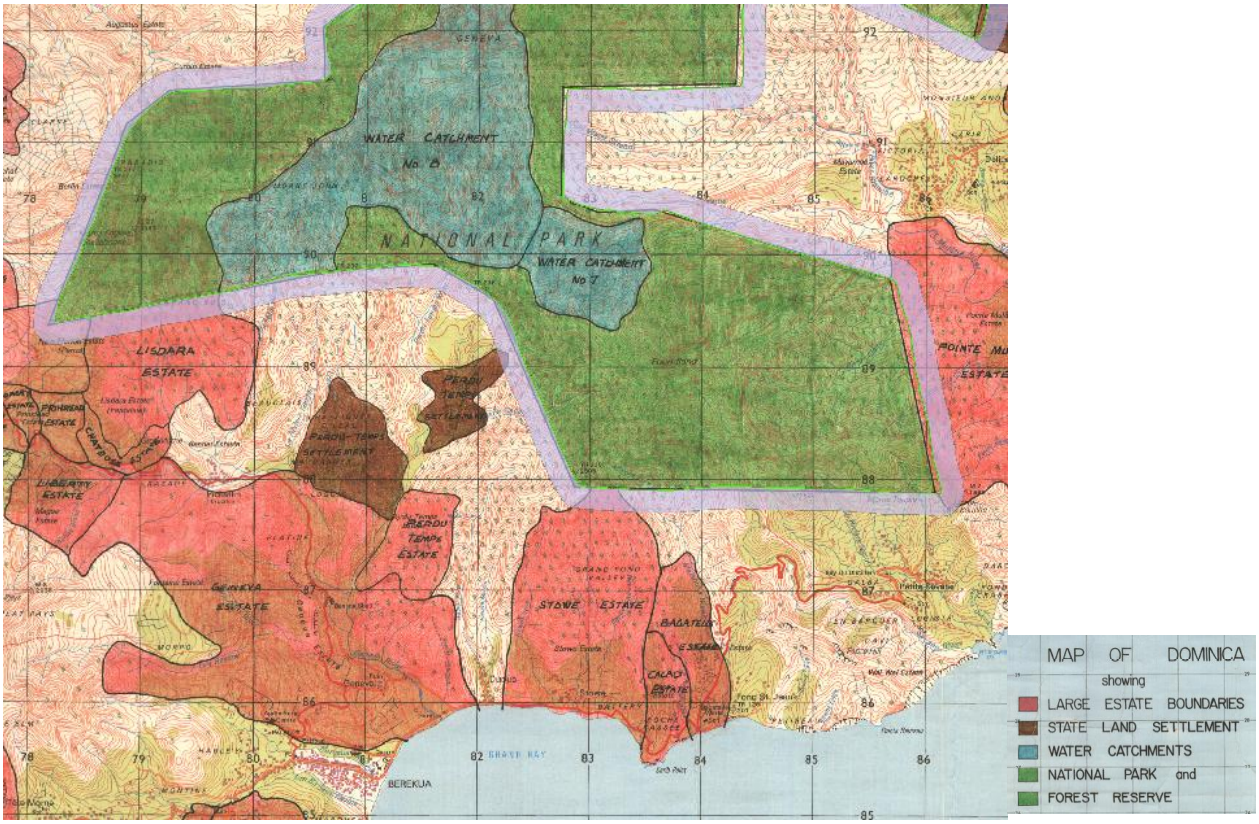


Figure 49 – Southern Section of the Park

Acreage of private land will come from Rose Hill and Lisdara Estates as well as Stowe Estate and Perdu Temps Estates. Private land includes catchment areas for communities of Bagatelle /Fond St Jean, Petite Savanne, Grand Bay, Pichelin, Bellevue Chopin, Dubic and Tete Morne.

Eastern Section of the Park

Overall, this area is steep, is classified as high to moderately high agricultural erosion hazard.
Some catchment areas within this section of the park are the proposed White River hydro-electric catchment as well as the Rosalie Stuarts River and the Boetica catchment. The Rosalie watershed headwaters drain a

significant area of this section of the National Park. Grand Fond is the main community that lies within this watershed. The Boetica catchment provides water to the village of Boetica.

The head waters for the very popular Sari Sari and Victoria waterfalls emanate from this area in the lower south east section and will also be afforded increased protection as a result. Sari-sari falls and some minor cascades and waterfalls along the southern boundary are not included in the 200 m buffer. This particular area is extremely steep land.

The majority of the proposed 200 buffer for the southeast area consists of government- owned land except for Quayaneri and Taberi estates that are adjacent to the Park and some portions of private lands in Boetica, Plaisance and Palmiste areas.

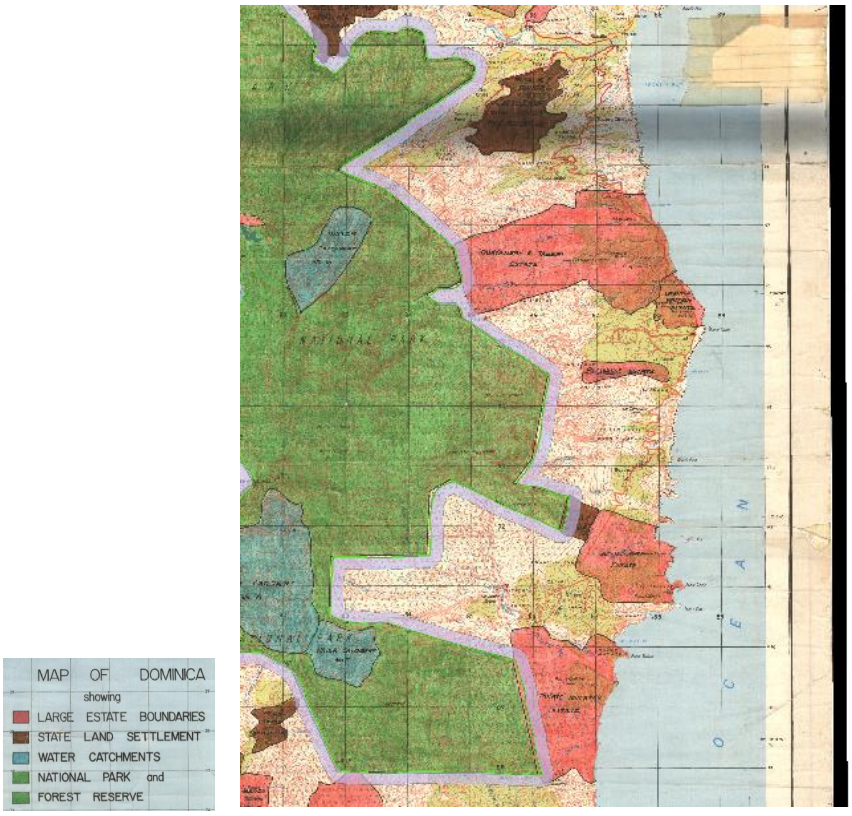


Figure 50 – Eastern Section of the Park

The area proposed does not include the village of Grand Fond. Evaluation of the land use in the Grand Fond area indicates that subsistence agriculture is taking place there with main crops being bananas and the root crop, dasheen, most of which is taking place on government-owned land.

4.7.3 PROPOSED BUFFER ZONE

Based on the above evaluation, current land use within and external to the boundary of the Park, the current economic and social climate in Dominica and discussions with various community groups, land owners and stakeholders the recommended buffer zone for the Park constitutes the following:

Recommendations from Baptiste & Associates (2008) for the establishment of buffer along the northern section of the park from Springfield to Newfoundland- The depth of the proposed buffer would be 1000ft. / 305m “in areas where the land is under forest, marginal and state owned in the Petite Terre Ferme area; 152.4 m (500 feet) “in localities where residential development is dense and in close proximity to the boundaries of the park (Sylvania). South of Corona the buffer should follow the existing forest edge.

In this regard it is recommended that plots in Terre Ferme Settlements which have not been allocated or allocated but not utilized nor paid for should remain State owned and under forest.

In other areas of the Park, a 200 m buffer zone is being proposed for adoption. It is recommended that activities directly external to the buffer zones are regulated to include minimum harm to the biodiversity, landscape and geomorphology of the Park.

The map below shows the proposed buffer zone for the MTPNP, with a total acreage 3045 acres, (1232.3 ha)

Figure 51 – Proposed Buffer Zones

Private Lands Affected

It should be noted that there is very little information on ownership of private lands adjacent to the Park except for the large private estates. The Lands & Survey Department as well as the Forestry and National Parks Division reported that they do not have or could not locate information on land ownership adjacent to the Park except for these major estates. As such land ownership was determined from the available data from the Department of Lands and Surveys. There are limitations to this because of the possibility of change in land ownership and reallocation of crown land over the last 30 years since the report. However, this is practically the only verifiable source of information as well as meetings held with farmers.

Areas of Private land – size in acres

Northeast: William Settlement- 45.06 (18.5 ha), Bois Diable Settlement - , Terre Ferme Settlement -35.94 (16.2 ha), Petite Terre Ferme Settlement - 38.5 (15.6 ha).

East: Quayaneri & Taberi Estates – 40.71 (16.5 ha), Bois Belvue Estate- 30.86 (12.5 ha) Pointe Mulatre Estate-110.62 (44.8 ha)

South**:** Stowe Estate – 18.03 (7.3 ha), Perdu Temps Settlement - 3.14 (1.3 ha), Lisdara Estate - 59.09 (23.9 ha), Rose Hill Estate -31.36 (12.6 ha)

West**:** Rose Hill Estate- 31.36 (12.6 ha), Providence Estate – 97.68 (39.5 ha), Stewart Hall Estate – 41.89 (16.9 ha)

Northwest: Castleton Estate – 84.48 (34.2 ha), Pont Casse' (Brantridge) Settlement – 85.20 (34.5 ha), William Settlement – 45.06 (18.5 ha)

Total area of private lands affected 722 acres (292.2 ha)

Total buffer acreage 3045 acres (1232.3ha)

Total area of privately owned land amounts to 722 (292.2ha) acres. The basic price per acre for agricultural land is E.C. $15,000. The total cost to government for outright purchase would be approximately E.C $M $10.83

Other Areas of Private Land

Small portions of private land not included in the evaluation were identified by the Forestry & Wildlife Division and some members of the community, whose acreage could not be determined- the lands were located on the east in the area of La Roche (Private land belonging to the Etienne family), as well as in the village of Boetica in the Palmiste area in LaPlaine, and private land between Point Mulatre and Belvedere Estate Private, private land adjacent to the Rosalie settlement.

4.7.4 RECOMMENDATIONS FOR MANAGEMENT AND USE OF THE PROPOSED BUFFER ZONE

Potential Conflicts

A number of conflicts are envisaged with respect to the proposal for the establishment of buffer zones. There will be conflict with government and private land owners with respect to independent use of their land as well as with farmers or squatters who are utilizing government-owned land for subsistence agriculture.

The major conflicts occur in the Northern area of the park where one private land owners adjacent to the Park was given approval by government to subdivide land into residential lots for sale. There are other private land

owners with land in this area including the Emerald Pool. Rapid proliferation of residential development in this area could compromise the integrity of the Park and its recreational sites.

In the eastern area of the Park specifically in the Delices, Petite Savanne and Bagatelle areas farmers have traditionally planted and harvested Bay leaf, *Pimenta racemosa,* in and around the Park for the production of Bay oil but have also intercropped with agricultural crops .

In terms of direct purchase of land, there is a major conflict in the pricing of land by government and that requested by land owners. Land owners have indicated that appraisals undertaken by government for forested or for agricultural land tend to be arbitrary. Land owners indicated that they are not willing to accept the standard rate used by government for pricing of agricultural or forest land unless government intends to negotiate and to create a win-win situation acceptable to both parties with respect to pricing and payment of land.

Recommended land use of Buffer Areas:

- Government Owned lands

An evaluation of the agricultural activities on government- owned land indicated that in most areas there is very little "active" agricultural production. Most of the farmers have virtually ceased activity in this area except for the Bay leaf. Most of the activities taking place are subsistence agriculture, mainly root crops, bananas and citrus and the illegal planting of cannabis sativa. In the areas of Petite Savanne, Bagatelle and Delices, in addition to these, Bay leaf trees are planted and harvested for the production of Bay oil.

Most of the lands in question are steep, high erosion and landslide hazard and are prone to flooding. As such it is recommended that persons are discouraged from planting in these areas. Some exceptions that must be given consideration are the planting and harvesting of bay leaf trees, *Pimenta racemosa,* in the major areas of Petite Savanne, Delices and to a lesser extent, in Bagatelle, where the leaves of these trees are processed for the production of Bay oil.

Dominica is the biggest producer of Bay oil in the world. Bay oil is one of the many essential oils used in the production of perfumes and cosmetics. Locally produced bay rum is also a bi-product and is sold locally and regionally. The Dominica Essential Oils and Spices Co-operative has over 560 active members and produces approximately 4,500 gallons of oil per year. The oil is sold on the US or European markets. These communities depend on fishing and the bay oil industry (agro-processing) for their livelihood.

It is therefore recommended that the existing farmers continue with the growth and harvesting of bay leaf, *Pimenta racemosa,* trees in this area so as to sustain their livelihood with monitoring by the Forestry and Wildlife Division to ensure proper harvesting methods and replanting techniques so as to ensure a continuous

forest cover. Farmers will not be allowed to plant root crops beneath these trees since this tends to enhance erosion in the area. .

In all other areas farmers should be asked to vacate the land so that it could be reforested so as to provide some protection to the National Park. Displaced farmers could be provided with alternative land for agricultural production. On the east in the vicinity of Grand Fond, there is some unallocated government land that can be considered for this purpose.

- Agricultural holdings and private land

All areas within and directly external to the Park boundaries are classified as high agricultural erosion hazard except for some areas in the northwestern and northern areas in the Terre Ferme area which are classified as poor or very poor agricultural land. Most of these areas have been cleared of their vegetation cover for agricultural purposes. These areas generally have slopes of over 30 degrees and are classified as moderate to high erosion hazard. The recommended land use in these areas based on the land capability map for Dominica prepared by David Lang is timber plantations, tree crops, forest enrichment and forest recreation. These lands are not suitable for the type of agriculture that is generally observed in the area.

As such it is recommended that all land under agriculture should be reverted to forested land and/ utilized as per recommendation put forward by David Lang. Private land included in the buffer area that is already forested should maintain their forest cover and be included in the proposed carbon sequestration programme.

Alternative Uses of Land

For land owners in the northern section of the Park who want to utilize their land for livelihood development programmes only activities ancillary to the use, development and maintenance of a conservation park should be allowed in that zone.

The following activities as recommended by Baptist & Associates[3] are being adopted. - "Agricultural development in Pont Cassé and Environs should therefore be contained and managed with consideration to the following:

- Low density – i.e. necessitate very little soil disturbance (low tillage)
- Agro-forestry in nature– i.e. as little forest disturbance as possible – e.g., Anthurium lilies under forest.
- Re-forestation in nature- i.e. replanting of commercial forest species in areas previously denuded of natural forest.

[3] It should be noted that these recommendation have been put forward to Cabinet for ratification by the Physical Planning Unit.

- Planting of tree crops on the contour in ledge rows, inter-planted with low tillage cash crops – e.g. Dasheen.

- Sub-division of agricultural land should be planned and not be allowed with plots of less than five (5) acres in the better Agricultural belts of Newfoundland and 1-3 acres in Sylvania, Corona, Sultan, Brantridge, Fond Melle and William Settlements.

- The Farmstead/Homestead (farm/house plots) concept should be encouraged instead of contemporary housing subdivisions, in order to decrease building density and further pressures on the fragile environment.

- All agricultural and other developments along rivers and streams should be subjected 50 and 20 meters forest buffer zone respectively, as prescribed in SR&O #13 of 1995.

- All future sale/lease of state lands should include conditions for observing/enforcing the above regulation.

- Agricultural activities in all designated water catchments should be phased out.
- Government should regularize farmers presently squatting on State lands only if such lands are suitable for agriculture.

Southern, Western and other Areas of the Park

In the western section of the Park within the 200m area demarcated for a buffer zone, there were very little anthropogenic activities involving the communities. Most of the activities identified were external to the 200m buffer. In fact most of the area was heavily forested except for an area leading to the Freshwater Lake where an access road has been built. Proposed activities that can be considered on privately-owned land in the buffer zone in some areas in the western section of the Park in Laudat, Cockrane and Middleham, in the Grand Fond area east of the Park and other small pockets south of the Park are small scale eco-tourism projects like eco-cottages, small restaurants and other visitor amenities- gift shops, small spas etc- that meet the objectives and policies of the Park.

Management and Establishment of the Buffer Zone

The acreage of the buffer zone indicates that 76 % of the land is state-owned and the other 24 % is privately owned. The objective of establishing the buffer one is to ensure some level of protection to the biodiversity of the national park and to ameliorate the impact of climate change through the reduction of anthropogenic activities while at the same time ensuring sustainability of livelihoods for the adjacent communities. In order to achieve this, a strategy for land acquisition, cooperation with land owners, affected individuals and communities must be developed.

It is recommended that the proposed buffer zone should be designated an Environmental Protection Area pursuant to Part VI of the Physical Planning Act, PPA. However, private land owners who wish to retain ownership of their land for development along lines consistent with regulations governing activities in the buffer should be allowed to do so, thereby reducing the area of land to be acquired. Acquisition of land could be effected through land exchange, direct purchase or compulsory acquisition as discussed in "section 3.6.4- *Acquisition of land for the buffer zone"* However, in cases where land owners are not willing to sell or swap land some incentives should be given to those land owners to ensure the establishment and integrity of the buffer zone. Where land is already forested as is the case in a large percentage of the private land or where the land has to be re-forested, land owners could be invited to participate in the carbon sequestration programme previously discussed so as to obtain mutual benefit from the proposed sale of carbon credits.

In the rest of the Park on government-owned lands that make up the buffer zone, except for designated areas described above, the integrity of the buffer zone should be strictly adhered to and all lands reverted to forested lands. Existing residential development in this zone should be allowed to redesign their building based on guidelines approved by the Forestry & Parks Service. Failing this, they should be designated as non-conforming and the owners not be allowed to expand or rebuild in the event of destruction. Incentives should be provided to property owners for redesign of their respective properties to meet the criteria set by the Forestry & Parks.

It is recommended that a wind break be planted as part of the buffer zone in areas that adjoin agricultural land and residential areas to provide more effective protection measures to the Parks

For the communities within and around the buffer zones a programme of conservation education should be developed by the Forestry & parks service and implemented with the communities.

4.7.5 RECOMMENDED ACTIVITES IN THE AREAS ADJACENT TO THE BUFER ZONE

Some activities allowed in areas directly external to the buffer zone should entail some of the following:

- Eco- tourism - type activities.
- Agro forestry.

- Horse- back riding only in areas that do not provide a habitat for the endemic species of parrots. The neighing of the horses could disturb the parrots. Horse- back riding trails should be exclusive of trails utilized by hikers / pedestrians because these two are incompatible.

- Mountain biking in areas that are suitable to this. This trail should also be exclusive of pedestrian trails.

- Facilities/ amenities to provide service to users of the Parks.

5. PROCESSES FOR ESTABLISHING THE BUFFER ZONES FOR THE PARKS

5.1 LEGISLATIVE INSTRUMENTS (Refer to Appendix 3 for full legal instruments)

There are a number of legislative instruments for land acquisition and for protection of biodiversity

- Declaration of Protected Forest under Section 4 of the Forest Ordinance 1992, Chapter 80 of The Laws of Dominica with respect of private lands
- Declaration of Crown Lands as Forest Reserves by proclamation in the Gazette in accordance with Section 3 of the Act;
- Establishment of Protected Areas under the National Parks and Protected Areas Act of 1975;
- Declaration of Environmental Protection Areas under Sections 56 (and 57) of the Physical Planning Act No. 5 of 2002.

The Ministry of Legal affairs would be expected to advise the Forestry & National Parks Service on the most appropriate legal instrument to be utilized to effect this.

Unallocated State Lands fall under two separate public sector ministries since 2005- The Lands & Surveys Division and the Forestry, Wildlife & Parks Division. They are thus governed by separate acts. The land under the jurisdiction of the Lands and Survey Division is under the jurisdiction of the State Lands Act, while that governed by the Forestry and wildlife Division is under the Forestry Act Chapter 60:01 and the Wildlife Act Ch.60: 60:02.

As such in case of re-allocation of state lands the two departments must share the responsibility.

5.2 STAKEHOLDER CONSULTATION

A number of meetings and consultations must be held with relevant stakeholders to fully discuss the process

Major stakeholders are the land owners, adjacent communities, and the relevant departments as outlined below.

PRIMARY STAKEHOLDERS

- Government of Dominica
- The Department of Agriculture
- Forestry Wildlife and Parks Division

- Farmers and land owners
- Department of lands & Surveys
- Physical Planning
- Ministry of Tourism and Legal Affairs
- Communities in and around the Park and other communities

SECONDARY STAKEHOLDERS

- Environmental Coordinating Unit
- Discover Dominica
- DOWASCO
- Division of Agriculture
- DOMLEC
- Local Authorities/Community Groups

5.3 ESTABLISHMENT OF THE BOUNDARIES OF THE MTNPWHS AND THE MDNP

The Forestry Division must undertake activities that would re-establish the park boundaries on the ground and ensure that there is correlation between the gazetted boundaries and the demarcated boundary lines before implementing the buffer zones for the Parks. This is required for the 2 parks. As such, it is important that additional extensive work is undertaken through the use of aerial photographs, the use of GIS and field exercises/ground truthing, to achieve this.

Once this is done and the department is satisfied that the proposed buffer zones meet the objectives of the management of the Parks the process of assessment of the value of the land would commence

5.4 ESTABLISHING AND VERIFYING LAND OWNERSHIP

The GoCD should undertake a cadastral survey of the MTNPWHS parks to verify land ownership external and internal to the boundaries of the Parks and develop a land ownership map.

5.5 ASSESSING THE VALUE OF THE LAND

This would entail government's own assessment of the classification of the land as forest land, agricultural land or commercial land and using the prescribed value. Information of this value was not available from the relevant department. This would be the responsibility of the Lands and Survey Department

PROCESS OF RATIFICATION

The Forestry, National Parks & Wildlife Division would prepare a Cabinet paper for adoption of the recommendations for establishment of the buffer zone which would also entail means of acquisition of the land to present to Cabinet through the responsible Ministry, the Ministry of Agriculture and Forestry, for ratification.

The other following processes would have to be undertaken to finalize and legalize the process:

DIALOGUE AND NEGOTIATIONS WITH LAND OWNERS

This is vitally important for the success of this. Land owners in the area of the MDNP stated openly that they are not willing to sell their land to government below market price. Land is a very sensitive issue and it will require extensive negotiation and sensitization of land owners on the importance and value of national parks.

FINANCING THE COST OF LAND PURCHASE

There are a number of international agencies that could be approached for financial assistance in purchase of the land as follows:

- Conservation International which in the past provided finance for acquiring the private land for the establishment of MDNP.
- Bird Life International
- World Wildlife Fund
- Nature Conservancy

Alternatively there are other possibilities like land exchange with farmers or mechanism for the sale of carbon credits discussed earlier. A properly designed scheme would provide an effective mechanism for land acquisition and biodiversity conservation respectively.

Recommended Options

Land swapping and/or alternative uses of the land in question through the provision of incentives are the most affordable and amicable methods for effective establishment of the proposed buffer. Direct purchase of land allows for complete control and management of the buffer zone. A mixture of options could also be considered if financial resources are available.

6. OVERALL COST ESTIMATE $ E.C

This does not include any cost related to land acquisition since this has to be negotiated. It is estimated that the government would use technical staff from the relevant Ministries to undertake some of the tasks required to effect the demarcation on the buffer zone. However, where technical expertise is limited, recommendations will be made for hiring of consultants to undertake the tasks as follows:

- Establishment and demarcation of the boundaries - $80, 000
- GIS specialist and assistants - $30,000
- Local labour for cutting clearing and demarcation - $12,000.00
- Equipment - $8,000
- Surveyor - $30,000 (This cost could be absorbed by the Lands & Surveys Dept. through use of their staff

- Proposed total cost for boundary demarcation = E.C $ 160,000 = $U.S.59, 000.00

7. LAND ACQUISITION AND INCENTIVES

Land acquisition via purchase is a common practice. Land may be compulsorily acquired by government or through negotiation. Other forms of land acquisition are land exchange where government provides an alternative parcel of land of equal size and value to the land owner. The current economic crisis facing small economies like Dominica may make direct purchase unachievable especially where a large number of land owners are involved. As such the issue of land exchange may be more feasible. However, land exchange can be problematic especially when land owners are looking for added value. In the case of farmers interviewed, the issue of land exchange with similar land with potential for agricultural development did not appeal to most of them since most of them were 50 years and over and were not interested in starting all over again. They also indicted that their children were not interested in agriculture.

As such, it may be in the interest of government to provide incentives to the farmers for land exchange whereby they are offered concessions for appropriate development activities that farmers may want to undertake on the alternative piece of land offered by Government to encourage them to consider land exchange. Other forms of incentives could be the development of micro credit schemes for land owners/ farmers and provision of technical assistance for project concept development and implementation based on the recommended development activities for the buffer zones. Some farmers indicated an interest in low –impact ecotourism development. A larger number were interested in selling their land at “market price”
In terms of purchase, Government may have to adopt a phased approach to purchase of land whereby they prioritize the areas for purchase based on the greatest risk to the endemic species of parrots and develop plans for the purchase of the other areas. In terms of purchase, Government may also consider negotiations with friendly conservation organizations which share the same goals of preservation of the parrots to raise the necessary finance to assist in this process. In the past, Conservation International and Rare Species Conservation Foundation have assisted government in this effort.

This indicates that the process of negotiation is very important and a suite of incentives should be developed as an integral part of the process. In addition, public education and sensitization on the importance of this process to conservation of the biodiversity of Dominica is also critical to the process

8.0 CONCLUSION AND RECOMMENDATIONS

It is very important that buffer zones around the 2 parks are established so as to protect the biological integrity of the Parks. It is a requirement for the MTNPWHS to maintain its status as a World Heritage Site.

Dominica faces serious economic challenges like all small island states worldwide and this may not be a financial priority for Government. However as was recommended above there are options for land exchange, outright acquisition or negotiations. Farmers have stated openly that they are not willing to sell their land below market price. Land is a very sensitive issue and it will require extensive negotiation and sensitization of land owners on the importance and value of national parks. In terms of purchase of land, government should seek to prioritize purchase options. Lands that have minimal value for residential or commercial development, that are physically inaccessible without major financial input by the owners and which do not pose a major threat to the biodiversity of the Park should not be considered for immediate acquisition. Priority should be given to lands that have an immediate impact on the biological resources of the Park. In terms of the MDNP, the 200m buffer area would be considered priority for acquisition by Government or for alternative uses as identified by the relevant government agency. For MTNPWHS, prioritization with respect to land acquisition would be more practical.

With respect to MTNPWHS, A large percentage of the boundaries of the National Park have not been maintained over the years. As such, much work has to be done to re-establish these boundaries. The Forestry Division has indicated that it is important to undertake activities that would re-establish the park boundaries on the ground and ensure that there is correlation between the gazetted boundaries and the demarcated boundary lines before establishing buffer zones for the Park. As such, it is important that an extensive work be done through the use of aerial photographs, the use of GIS and field exercises/ground truthing, to achieve this.

With respect to the MDNP, there are no geo-referenced maps with the demarcated official boundary of the National Park. Neither the Forestry and Wildlife Division responsible for national Parks nor the Department of Lands and Surveys responsible for all state lands, could provide a map indicating the boundaries of the Morne Diablotin National Park. As such, it is important that survey and mapping of the boundaries of the Park be undertaken and re-gazetted.

In terms of demarcation of the buffer a very visible and practical boundary demarcation of both parks is recommended. The existing boundary demarcations consisted of buried bottles, concrete markers and painting of trees most of which were not very visible. The use of concrete markers could be improved by increasing the height of the concrete pillars to allow for higher visibility. Overall it is recommended that internationally recognized methods of demarcation should be adopted both for the boundaries and the buffer zones of the Park. The current usage of trees and buried bottles pose problems in terms of long term recognition especially since they can be tampered with and affected by storms. In addition to this a boundary maintenance programme should be initiated as an integral part of the Park boundary administration.

It is important that extensive research and monitoring is undertaken in the park. Conservation planning should also be integrated with climate risk assessment and a coordinated regional effort should be established to analyse information and assess the risk of biodiversity loss. Installation of a monitoring regime to assess the degree to which degradation is occurring from activities that have already been undertaken in and around the boundary of the Park should be considered as well as a number of specific projects in the field of research and education related to Climate Change.

Other recommendations include the strengthening the park authority and improving its financial situation, further strengthening of the cooperation among the Forestry and national parks service, land owners and the private sector.

Dominica is a signatory to several Multilateral Environmental Agreements (MEAs) including the United Nations Convention on Biological Diversity (CBD) as well as the UNCCC. It should be noted that such international treaties have no direct applicability in Caribbean jurisdictions (such as the COD) and therefore depend on legislative interventions to bring them into the realm of domestic law.
The UNCCC and CBD are directly relevant to protected areas but such legislation is not reflected in the National Parks and Protected Areas Act.

Government should consider putting in place a land policy and a land zoning plan that will guide the use of land adjacent to the national Parks to ensure that future development of these areas do not compromise the objectives of the Park. This is critical to the MDNP where the parrots are sensitive to noise and human interference. Accessible, privately-owned land currently adjacent to the Park is utilized for agricultural development. However, there is nothing to stop a land owner from selling land for commercial activities that may impact negatively on the endemic species of parrots. In addition, recommendations should be made for potential uses of the land other than agriculture in the event that land owners want to dispose of land.

Policies to be Considered

In the development of buffer zones for the national park the following policies were recommended to government for adoption by Dr. Christopher Cox and further endorsed by Baptiste and Associates.[4] This report supports and recommends the policies.

[4] "An Impact Assessment of Potential Residential Development in the Vicinity of The Morne Trois Pitons National Park Commonwealth of Dominica Final Report - Baptiste & Associates, " Pont Casse' and Environs Development Plan: Existing Land Use and Proposed Zoning, 2008"

1. **Land policy:** A national policy that guides land management in general should be developed for Dominica. The absence of a land policy is by no means unique to Dominica and is proving to be a challenge hindering ordered development of land resources in conservation of water, soil and biodiversity resources. A land policy will uphold guiding principles that will seek to ensure that lands are not exploited beyond their capacity to sustainably support development. The development of a land policy requires a participatory approach by all state and non–state institutions, and civil society stakeholders. The important outcome of a national policy will be the realization of broad consensus on the management of lands in general, which will include lands with special status designations. Once policy is articulated, support regulations may be crafted to give effect to the policy. It must be pointed out that elements of land policy is already in existence by virtue of legislative instruments such as the National Parks and Protected Areas Act and other laws related to land. However the challenge of the harmonization of these existing legislative instruments, and filling the wide gap in terms of regulating how private lands adjacent to the National Parks are developed remains.

2. **Statutory land zoning plan:** Land zoning plans are important support instruments that articulate policy pronouncements regarding land management. According to FAO (2003), zoning is a planning procedure where a designated zone is allocated for a specified use or uses. Zoning promotes the orderly development and serves to reduce or avoid inconsistent uses adjacent to one another. If the Government of Dominica engages the process to develop guidelines to facilitate the development of national zoning plans, consideration of the Treatment-Oriented Approach for agricultural and forestry land zoning should be integrated in the context of rural land development planning. The landslide hazard vulnerability mapping approach advanced by DeGraff (1987) should also be integrated in any national land zoning initiatives. It must be underscored that the Treatment-Oriented Approach and the landslide hazard vulnerability mapping are broad-scale; for smaller geographic space, especially in urban areas, specific criterion will need to be developed where they do not already exist.

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10. APPENDICES

APPENDIX A - LEGAL AND REGULATORY AND POLICY FOR LAND MANAGEMENT

Physical Planning Act No. 5 2002

It makes provisions for the orderly and progressive development of land and for the preservation and improvement of amenities; for the granting of permission for the land development, control of land use and regulation of the construction of buildings. It requires the preparation of a national structure plan, a written statement of national planning and development policy that includes environmental and physical assessment.

The Land Acquisition Act:

It gives government the power to acquire lands for public purpose. This can be used whether it is registered or unregistered land. A board of assessment will determine compensation if the sale price cannot be agreed upon.

Agricultural Small Tenancies Act, 1953

The critical element of this Act is that it requires all tenancies for "small holdings "0.5 – 10 acres, defined as an area of land under cultivation or pasture or intended for cultivation or pasturage with or without buildings to observe a list of several natural resources related conditions which a tenant must agree to include good husbandry, soil conservation and fertility maintenance.

The Forest Ordinance/Forest Act (1958)

The Act includes the designation of forest Reserves on State lands and also authorizes the designation of private lands as Protected Forests for soil and water conservation. The Forest Act empowers the Government to declare any area of State Land a Forest Reserve and declare private lands as protected forests.

The Forest Rules (1972)

Subsidiary legislation of the Forest Ordinance specifies actions prohibited in Forest Reserves and provides greater detail on issuing licenses and permits for harvesting forest produce. In addition, the Stewart Hall Water Catchment Rules (1975) allowed for a water catchment established on privately owned lands to come under government control by designating it a protected forest under the Forests Act.

The Forestry and Wildlife Act (1976)

The Act empowers The Forestry and Wildlife Division to oversee all forest and wildlife matters. It establishes national responsibility for the protection and conservation of selected groups/species of wild fauna and their habitat. The Act addresses wild mammals, freshwater fishes, amphibians, crustaceans and reptiles. This Act makes provision for the creation and management of Forest and Wildlife reserves.

Crown Lands Ordinance (1958)

Allowed for the transfer of public lands to the private sector. Under this legislation all government lands not in reserved status were available for private acquisition. However, the sale of lands had conditions attached allowing government to add regulations and exercise control over land-use.

APPENDIX B - RESPONSIBILITY MATRIX

Department	**Areas of Responsibility**
Forestry, Wildlife and Parks Division Will make the necessary recommendation to Cabinet	Protection and management of forests and wildlife, watershed management, development and management of parks
Ministry of Tourism and Legal Affairs Will provide legal advice	Legal responsibility with respect to sale or acquisition
Agriculture Division Will work with the Forestry Division to liaise with the farmers	Promotion and management of sustainable agriculture, agricultural research and mining.
Lands and Surveys Division – Responsible for evaluation the buffer zone and verifying the extent and quantity of private and state land	Surveying, mapping, administration, and sale of government lands, regulation of
Physical Planning Unit	Unit Development control and physical planning, administration of sand removal and quarrying permits, impact assessments. Environmental
Environmental Coordinating Unit	Design of macro-plans and policies for Environmental management, coordination of environmental activities, facilitate the implementation of multilateral environmental agreements, environmental education.
Department of Local government and Community Development- to liaise with relevant communities	Responsible for local government and the village councils

APPENDIX C - LIST OF PERSONS BOUNDING THE MDNP AREA

Barber Shillingford - Coulibistrie

Cynthia Daniel - Coulibistrie

Pat Vidal - Salisbury

Ashton Vidal - Salisbury

Euford Joseph - Coulibistrie

Peter Vidal - Salisbury (

Ann Winn (None Dominican) - USA.

Those within the general vicinity of the national park, but not bounding:

Remy Joseph - Coulibistrie

Ericson & Ruby Joyce - Coulibistrie

Ross Charles - Coulibistrie

James Royer Jr - Salisbury

Roudette Curlson - Coulibistrie

Others:

*State Lands west side (Morne Plaisance area) including private lands claimed by the Lawrence family of Portsmouth.

*Mountain & Brandy areas to the north-east.

*Colihaut heights (fond-Pie area) towards the south.

APPENDIX D - LIST OF PERSONS INTERVIEWED

David Williams - National Parks Superintendent, Forestry and Wildlife Division

Ronald Charles - Head, Forest Protection Unit

Jacqueline André – Assistant Forest Officer

Cyril John – Forester 1, National Parks

Bertrand Jno. Baptiste – Forester 1 Ag.

Stephen Durand –Forester 1, Protection

Esther Thomas - Permanent Secretary, Min. of Tourism & Legal Affairs

Clarisian Joseph – Forest Ranger

Phillip Rolle – Forester 2

Lloyd Pascal - Head of the Environmental Coordinating Unit

P. Lestrade - Head, Department of Lands and Surveys

Wallace James - Focal Point SPAAC Project Dominica

Annie Edwards – Senior Physical Planning Officer

Arlington James – Head Research-Forest Officer

Meetings with land owners

Laudat Improvement Committee

Trafalgar Village Council

Petite Savanne Village Council

Grand Fond Village Council

Delices Village Council

Campbell Village Council

APPENDIX E - LIST OF THE NATIONAL CONSULTATION ATTENDEES

FULL NAME	ORGANIZATION/ ADDESS	CONTACT #	EMAIL
Betty Perry Fingal	P.O.Box 1915	449-0859	bfingal@cwdom.dm
Julietta Richards	Cockrane Village Council	245-5461	
Lauretta Smith	Boetica Village Council	225-9158	nadinelaurettasmith@gmail.com
Sheryl E Leblanc	Dominica Met service	449-1990	metoffice@cwdom.dm
Raphael Carbon	Bellevue Chopin Organic group	265-7476 /448-2401	
Phillip Guiste	Boetica Village Council	235-2145	
Alleyne Daniel	Coulibistrie	225-2164	
Mareus Thomas	Bagatelle Village Council	225-7744	
Ashton Lugay	Forestry & Parks Service	266-5856	Asstforestofficer3@cwdom.dm
Cyrille John	Forestry & Parks Service	265-4146	Johncab3@hotmail.com
Jacqueline Andre	Forestry & Parks Service	266-5857	asstforestofficer@cwdom.dm
Jones Royer	Salisbury	449-6392	

Petronald Green	P.O.Box 668	613-8655	
Sherman Mills	Min. Of Environment	266-3546	mills@dominica.gov.dm
Roselyn Paul	Waitikubuli National Trail	266-3589	
Keith Stephens	Physical Planning	266-3741	Physicalplanningdiv@cwdom.dm
Gwennie Dickson	DOWASCO	255-2911	gdickson@dowasco.dm
Eric Hypolite	Min. Of Argriculture	276-4252	forester@cwdom.dm
Marcella Harris	DOMSETCO	235-4091	errolmar@cwdom.dm
Errol Harris	DOMSETCO	275-0724	errolmar@cwdom.dm
Kelvin Rolle	Physical Planning	266-3747	physicalplanningdiv@cwdom.dm
Laurina Smith	Boetica Village Council	446-1540/ 225-7594	Laurinal003@hotmail.com
Atherton Martin	Geotourism stewardship Council	276-1878	Aem_75@hotmail.com
Francis Antoine	Grand Bay Tourism Environmental Committee	613-8029	Worldpeace365@hotmail.com