



**USAID** | **DEED**  
FROM THE AMERICAN PEOPLE

# ASSESSMENT OF COASTAL AND MARINE RESOURCES ALONG THE ARCADINS/LA GONÂVE AND LIMBÉ WATERSHEDS IN HAITI

(CORAL REEFS, SEA GRASSES, MANGROVES, AND BEACHES)



**SEPTEMBER 2008**

This publication was produced for review by the United States Agency for International Development. It was prepared by DAI.



# ASSESSMENT OF COASTAL AND MARINE RESOURCES ALONG THE ARCADINS/LA GONÂVE AND LIMBÉ WATERSHEDS IN HAITI

(CORAL REEFS, SEA GRASSES, MANGROVES, AND BEACHES)



**FONDATION POUR LA PROTECTION DE LA BIODIVERSITÉ MARINE  
FoProBiM**

[www.foprobiim.org](http://www.foprobiim.org)

Short Term Technical Assistance

for

DAI – Project DEED

<b>Program Title:</b>	<b>Economic Development for a Sustainable Environment</b>
<b>Sponsoring USAID Office:</b>	<b>USAID/Haiti</b>
<b>Contract Number:</b>	<b>EDH-I-00-05-00004-00 TO 12</b>
<b>Contractor:</b>	<b>DAI</b>
<b>Date of Publication:</b>	<b>September 2008</b>
<b>Author:</b>	<b>Jean Wiener</b>

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.



# CONTENTS

- TERMS OF REFERENCE ..... 1**
  - INTRODUCTION ..... 1**
  - PROJECT STUDY SITES..... 2**
- METHODOLGY..... 3**
  - MANGROVES ASSESSMENT AND CRITERIA FOR MONITORING ..... 4**
  - CORAL REEFS AND SEA-GRASSES ASSESSMENT AND CRITERIA FOR MONITORING..... 6**
  - ENDANGERED SPECIES..... 7**
- SITE DESCRIPTIONS AND EVALUATIONS..... 9**
  - ARCADINS COAST AND LA GONÂVE ..... 9**
    - ARCADINS COAST (Zone 1) ..... 9
    - ARCADINS ISLANDS (Zone 2) ..... 19
    - LA GONÂVE ISLAND (Zone 3) ..... 26
  - LIMBÉ COAST (ZONE 4)..... 33**
- PROPOSED PRIORITY CONSERVATION AREAS ..... 43**
  - ARCADINS COAST (ZONE 1) ..... 43**
  - ARCADINS ISLANDS (ZONE 2)..... 43**
  - LA GONÂVE (ZONE 3)..... 43**
  - LIMBÉ (ZONE 4)..... 43**
  - RANKINGS OF PROPOSED PRIORITY CONSERVATION AREAS .... 44**
  - OTHER SITES OF INTEREST NEAR THE STUDY AREAS..... 44**
    - La Gonâve ..... 44
    - Baie de l’Acul ..... 44
- THREATS TO COASTAL AND MARINE RESOURCES, THREAT REDUCTION ACTIVITIES, AND POTENTIAL IMPACTS (BENEFITS) ..... 45**
- PROPOSED FIVE YEAR ANNUAL TARGETS FOR COASTAL AND MARINE ECOSYSTEM CONSERVATION FOR ARCADINS/ LA GONÂVE AND LIMBE COASTAL ZONES ..... 52**
- ANNEX I..... 59**

<b>ANNEX II.....</b>	<b>63</b>
<b>ANNEX III.....</b>	<b>65</b>
<b>ANNEX IV .....</b>	<b>67</b>
<b>ANNEX V .....</b>	<b>69</b>
<b>ANNEX VI .....</b>	<b>71</b>
<b>ANNEX VII .....</b>	<b>73</b>
<b>ANNEX VIII .....</b>	<b>75</b>
<b>ANNEX IX .....</b>	<b>77</b>
<b>ANNEX X .....</b>	<b>79</b>

# TABLES AND FIGURES

## TABLE

1	Mangroves Assessment and Criteria for Monitoring .....	4
2	Monitor Priority Ecosystem Health/Integrity (Mangroves) .....	5
3	Coral Reefs and Sea – Grasses Assessment and Criteria for Monitoring .....	6
4	Monitor Priority Ecosystem Health/Integrity (Coral Reefs and Sea-Grasses) .....	6
5	Site 1: Bodmè Boula – Overall Condition = 2 .....	11
6	Site 1 – Measurements and Notes .....	11
7	Site 2 – Mang Mitan – Overall Condition = 2 .....	12
8	Site 2 – Measurements and Notes .....	12
9	Site 3 – Mang Royale – Overall Condition = 3 .....	12
10	Site 3 – Measurements and Notes .....	13
11	Site 4 – Arcahaie to Luly– Overall Condition = 4 .....	14
12	Sites 4a –4b .....	14
13	Site 5 – Trou Bagette – Overall Condition = 3 .....	15
14	Sites 5a and 5b .....	15
15	Site 6 – Trou Forban – Overall Condition = 3 .....	16
16	Sites 6a and 6b .....	16
17	Site 7 – Luly to Montrouis – Overall Condition = 3 .....	17
18	Site 8 – Zilé Fa (North) – Overall Condition = 4 .....	21
19	Site 8 – Measurements and Notes .....	21
20	Site 9 – Zilé Fa (South) – Overall Condition = 4 .....	22
21	Site 9 – Measurements and Notes .....	22
22	Site 10 – Ti Zilé – Overall Condition = 4 .....	22
23	Site 10 – Measurements and Notes .....	22
24	Site 11 – Zilé Wiene – Overall Condition = 4 .....	23
25	Site 11 – Measurements and Notes .....	23
26	Site 12 – Arcadins Islands – Overall Condition = 4 .....	24
27	Sites 12a, 12b, and 12c .....	24
28	Site 13 – Arcadins Bank – Overall Condition = 4 .....	25
29	Site 13a .....	25
30	Site 14 – Ti Zilé – Overall Condition = 4 .....	25

31	Site 15 – Zilé Wiene – Overall Condition = 4 .....	25
32	Site 16 – Zilé Fa – Overall Condition = 4 .....	26
33	Site 17 – Anse-a-Galets – Overall Condition = 3 .....	27
34	Site 17 – Measurements and Notes .....	28
35	Site 18 – Boucan Patat North – Overall Condition = 2 .....	28
36	Site 18 – Measurements and Notes .....	29
37	Site 19 – Boucan Patat South – Overall Condition = 2 .....	29
38	Site 19 – Measurements and Notes .....	29
39	Site 20 – Twa Lo – Overall Condition = 2 .....	29
40	Site 20 – Measurements and Notes .....	30
41	Site 21 – Grande Baie – Overall Condition = 3 .....	30
42	Site 21 – Measurements and Notes .....	30
43	Site 22 – Ti Gonâve 1 – Overall Condition = 3 .....	30
44	Site 22 – Measurements and Notes .....	31
45	Site 23 – Ti Gonâve 2 – Overall Condition = 3 .....	31
46	Site 23 – Measurements and Notes .....	31
47	Site 24 – La Gonâve – Overall Condition = 4 .....	32
48	Sites 24a, 24b, and 24c .....	33
49	Site 25 – Bodmè Margot/Bayeux – Overall Condition = 1 .....	35
50	Site 25 – Measurements and Notes .....	35
51	Site 26 – Diotin – Overall Condition = 2 .....	37
52	Site 26 – Measurements and Notes .....	37
53	Site 27 – Bas Limbé/Bassin Caiman – Overall Condition = 3 .....	38
54	Site 27 – Measurements and Notes .....	38
55	Site 28 – Ti Bourg Limbé – Overall Condition = 2 .....	38
56	Site 28 – Measurements and Notes .....	38
57	Site 30 – Bas Limbé Coast - East of Limbé Island – Overall Condition = 3 .....	40
58	Sites 30a and 30b .....	40
59	Site 31 – Margot – Overall Condition = 4 .....	41
60	Site 32 – Limbé Bay– Overall Condition = 4 .....	41
61	Site 33 – Zilé Limbé – Overall Condition = 4 .....	42
62	Site 34 – Ti Bourg Limbé– Overall Condition = 4 .....	42
63	Rankings of Proposed Priority Conservation Areas .....	44
64	Overall Threats to Zones .....	51
65	Arcadins Coast – Mangroves .....	59

66	Arcadins Islands – Mangroves .....	60
67	La Gonâve – Mangroves.....	61
68	Limbé Coast – Mangroves .....	62
69	Arcadins Coast (Arcahaie to Montrouis) – Coral Reefs and Sea-grass Beds .....	63
70	Arcadins Islands – Coral Reefs and Sea-grass Beds .....	63
71	La Gonâve – Coral Reefs and Sea-grass Beds.....	64
72	Limbé Coast – Coral Reefs and Sea-grass Beds (East of Limbé Island) .....	64
73	Arcadins Islands – Sandy Beaches.....	65
74	Limbé Coast – Sandy Beaches .....	65
75	Perimeter and Area of Arcadins Islands .....	67
76	Perimeter and Area of La Gonâve Islands .....	67
77	Perimeter and Area of Zilé Limbé.....	67
78	Rooms Available at Beach Hotels Along the Acadins Coast .....	69
79	Threats to area coastal and marine resources, threat reduction activities, and potential impacts (benefits) .....	71
80	Proposed Five Year Annual Targets for Coastal and Marine Ecosystem Conservation for Arcadins/La Gonâve and Limbe Coastal Zones .....	73
81	IUCN Protected Areas Management Categories.....	75

## **FIGURE**

1	Arcadins Coast and La Gonâve .....	9
2	Arcadins Coast (Zone 1) .....	10
3	Arcadins Islands (Zone 2) .....	20
4	La Gonâve Island (Zone 3) .....	27
5	Limbé Coast (Zone 4) .....	34
6	Map of Haiti .....	79



# TERMS OF REFERENCE

## INTRODUCTION

The DEED project (*Développement Economique pour un Environnement Durable*) aims to promote economic development principally through commercial agriculture in the watershed zones of Montrouis and Limbé, within the framework of sustainable agricultural and natural resource management practice that will promote the stabilization and ecological recovery of the watersheds. The management of coastal and marine resources is included in the programs of activities for both watersheds.

The marine area between the southern tip of Isle de La Gonâve and the Arcadins coast between Arcahaie and Montrouis includes the three small Arcadins Islands. The marine and coastal zone is the habitat for several endangered species including marine turtles and manatees. There are also extensive areas of coral reefs—several parts of which are being mined and the coral exported. The zone continues to be overfished; fish stocks are dwindling, and the livelihoods of the fishers along the coast, particularly in Luly, are increasingly at risk. If the area is not put under a sustainable management regime, it will continue to be degraded, threatening not only the ecosystem and the livelihoods of the fishing communities, but also the potential for beach tourism and ecotourism on the Arcadins coast.

The coastal zone of the Limbé watershed, while perhaps not as immediately threatened as the Arcadins coast, is also under considerable anthropogenic pressure. Although the Limbé watershed has a much smaller coastal area, it receives important amounts of siltation from the effluent of the Limbé river and its tributaries. This sediment load is on the increase as deforestation and resulting top soil loss continue to go unmitigated. The Limbé coastal area has a number of coral formations that are being overfished and negatively impacted by increased siltation. Marine turtles frequent the coastal zone which also contains two important mangrove/wetland areas both of which are being harvested regardless of government interdictions to do so. This coastal area has the potential to draw tourists for wildlife viewing and for historical tours but in order to halt the unsustainable use of both fishery and mangrove resources it must be managed in a rational manner.

The primary tasks of this study are to:

- Identify and map areas of coral reefs, sea-grass beds, mangroves and important littoral areas along the Montrouis and Limbé coasts
- Identify the major threats to each of these ecosystems/habitats
- Outline possible threat reduction activities that can be implemented by the DEED regional teams
- Establish criteria for assessing the “health” and “integrity” of the priority ecosystems
- Assess the “health” and “integrity” of the ecosystems based on these criteria (establish current or recent baseline conditions)
- Propose annual targets for ecosystem/habitat conservation that DEED can achieve of the next 5 years

## **PROJECT STUDY SITES**

The Arcadins/La Gonâve study area encompasses the coastal and marine area located between Montrouis, south to Arcahaie, across the bay to Pointe Fantasque, north to Anse-à-Galets, and across the bay to Montrouis. It includes the three Arcadins Islands as well as the Arcadins Bank (Récif Arcadins).

The Limbé Coast study area consists of the coastal area beginning in the West at l’Ilet Port Margot and ending in the east in the area just east of Petit Bourg du Limbé/Blain.

Twenty sites are to be evaluated.

# METHODOLOGY

A total of 41 sites were evaluated.

Research occurred during the months of June through August, 2008.

Data for this report was gathered through ground truthing activities by boat, vehicle, walking, Scuba diving, and snorkeling, as well as the use of Global Positioning System (GPS), satellite imagery, and aerial, underwater, and ground level photography. This data was used to establish baseline information including the exact locations of data collection, present condition of resources, areal extent of resources as well as samples of various sites. Areal data in particular was collected through a combination of on-the-ground measurements, aerial photography, and Google Earth Pro.

Data was collected by dividing the study site of the Arcadins Coast/La Gonâve into three zones: Zone 1, Arcadins Coast (from Arcahaie to Montrouis); Zone 2, the Arcadins Islands Bank and Arcadins Bank (Récif Arcadins); and Zone 3, La Gonâve Island from Pointe Fantasque to Anse-a-Galets. The Limbé study site was designated as Zone 4, the Limbé Coastal Area.

For the Arcadins Coast (Zone 1), Arcadins Islands (Zone 2), and La Gonâve (Zone 3) study areas satellite imagery from Google Earth (Digital Globe: 2008-01-15, 2008-02-02, 2008-02-15, 2008-06-02, 2008-06-15, 2006-01-04, 2006-01-22, 2006-04-17, 2006-06-05, 2006-06-18, 2005-05-02, 2005-12-30, 2005-03-22, 2005-04-01, 2005-07-31, 2005-08-13, 2005-04-09, 2005-04-04, 2005-05-20, 2002-06-20, 2002-06-02, 2002-07-03) was used along with aerial photography (FoProBiM, 2008-07-15).

For the Limbé study area (Zone 4) satellite imagery from Google Earth (Digital Globe: 2002-10-01, 2002-10-06, 2002-10-19) was used along with aerial photography (FoProBiM, 2008-07-15).

On-site interviews were performed with locals (fishers, farmers, hoteliers, land owners, etc.) encountered in order to gather information and determine if there were any unseen or unknown threats to the target ecosystems as well as to establish a relationship for any possible future interventions.

Major threats to the forty-one sites were evaluated and ranked on a scale of 0-5 in which 0 = least threatened and 5 = most threatened. An “Overall Condition” score (0-5 in which 0 = worst and 5 = best) was also given which assisted in the ranking of priority conservation sites and was based on a summary of all factors including such parameters as proximity to human habitation, extent of site, presence of resources, condition of resources, current threats, etc. Other data such as fish abundance and canopy cover were rated with poor, fair, good, and excellent rankings.

All of the parameters used in this study to determine the health/integrity of the targeted ecosystems are basic level rapid assessment methods. The variety of monitoring types, intensity and frequency available for all levels of monitoring are too numerous to enter into detail in this report. All methods require varying degrees of expertise, material resources, human resources, and time. With the goal of development of rapid and inexpensive methods/criteria to monitor priority ecosystem health/integrity the methods used below for this report took into consideration the extreme lack of monitoring capacity available within Haiti as well as the ability to replicate this methodology with current resources. Hopefully, with time, an increase in resources will allow for increased capacity for monitoring and the

ability to increase monitoring methods and intensity. There is a wide range of institutions which have established monitoring methodologies for coral reefs, sea-grasses, and mangroves (Annex IX).

Consideration was given for the varying conditions of the sites. All have been compared against each other as it would be impossible to compare a site such as the mangroves at Royale which have never been protected or managed to mangroves at, for example, the Darling National Wildlife Refuge in Florida which have a different overall regime, has been protected and managed since 1945, and has never experienced the types of threats experienced by the mangroves in Haiti. No Mangroves anywhere in the project area are comparable to “great” mangrove sites located in certain other countries. Most are, at best, secondary growth (i.e. previously cut and has re-grown).

A general evaluation of the current status of coral reefs, sea-grass beds, and mangroves was conducted using the parameters below in order to establish indicators of the health of their health to serve as a baseline in future management. These same parameters can continue to be used, and hopefully expanded upon, in order to provide continued monitoring of ecosystem health and through this the effects of the proposed threat reduction activities. The important parameter of monitoring the areal extent of ecosystems includes satellite and photo (underwater, aerial, ground level) assessment as used in this study, and should also be continued to monitor threats to and health of sites.

Due to their almost inseparability as closely linked ecosystems, and the current lack of capacity to monitor them in more detail, data for coral reefs and sea-grass beds are combined in this report.

All of the threat parameters below have the ultimate result of decreased ecosystem productivity resulting in decreased income for local communities including a decrease in potential tourism revenue.

## MANGROVES ASSESSMENT AND CRITERIA FOR MONITORING

Four parameters for threats to mangrove sites were evaluated. These include:

**TABLE 1: MANGROVES ASSESSMENT AND CRITERIA FOR MONITORING**

Parameter	Observable Effect	Impact on Ecosystem
Cutting – exploitation of mangroves, especially for use in the production of charcoal, fuel wood, and tannin	signs of cutting either along the perimeter or within the mangrove site	stress on and loss of mangroves due to exploitation
Fuel and Oil – gasoline, diesel, and oils	potential for the area to be affected by fuel or oil (e.g. boating activity and/or spills)	death of all types of life forms
Modification – the physical alteration of a site	change to the site such as fill-in and/or construction or farmland encroachment	loss of ecosystem integrity due to abrupt changes such as diminished size and/or parceling
Marine Debris – debris which has entered the coastal and marine environment	marine debris present near or within the site	strangulation, entrapment, and ingestion by marine life; growth restriction and aesthetic concerns

To monitor priority ecosystem health/integrity the following parameters were used for mangroves.

**TABLE 2: MONITOR PRIORITY ECOSYSTEM HEALTH/INTEGRITY (MANGROVES)**

Parameter	Definition	Diagnostic Justification
Canopy cover (shade/light cover %)	visual estimate of leaf cover (poor, fair, good, or excellent)	determines health of trees and stand by the amount of leaf growth in canopy
Trunk/branch diameter	three of the largest visible and accessible trunks/branches measured	provides a long-term indication of growth and health of stand
Estimated maximum height of stand (in feet)	visual estimate of the average height of trees in the stand	provides an indication of growth and health
Types of mangroves present	most predominant mangrove type	indicator of type and health of stand

The following more intensive parameters can also be used to further monitor mangroves (limited by monitoring capacity).

- Levels of dissolved oxygen
- pH
- Salinity
- Total nitrogen
- Ammonium
- Nitrates and nitrites
- Phosphorus ions
- Organic matter in sediments and seawater
- Aerobic bacteria
- N<sub>2</sub>-fixing bacteria
- Phytoplankton diversity
- Bird populations (migratory and resident)

## CORAL REEFS AND SEA-GRASSES ASSESSMENT AND CRITERIA FOR MONITORING

Four parameters for threats to coral reefs and sea-grasses were evaluated. These include:

**TABLE 3: CORAL REEFS AND SEA – GRASSES ASSESSMENT AND CRITERIA FOR MONITORING**

Parameter	Observable Effect	Impact on Ecosystem
Sedimentation – (soil washed down from watersheds which enters the coastal and marine environment causing harm to sea-grasses and coral reefs)	an obvious threat of sediment potentially affecting the site	smothering and killing of corals and sea-grasses
Overfishing/overexploitation – (the use of unsustainable and often inappropriate methods for the harvesting of seafood)	an obvious scarcity of fish	imbalance of food chain; (e.g. increased algal growth with the removal of herbivorous fishes)
Damage – (harm to coral reefs generally caused by boat groundings and anchors)	broken coral from boat impacts or anchoring damage	damage and death of corals; aesthetic concerns
Marine Debris – (trash which has entered the coastal and marine environment)	marine debris present near or within the site	strangulation, entrapment, and ingestion, by marine life; growth restriction and aesthetic concerns

To monitor priority ecosystem health/integrity the following parameters were used for coral reefs and sea-grasses.

**TABLE 4: MONITOR PRIORITY ECOSYSTEM HEALTH/INTEGRITY (CORAL REEFS AND SEA-GRASS)**

Parameter	Definition	Diagnostic Justification
Coral cover	percentage of coral present on reef in random 1m <sup>2</sup> quadrants	determines amount/health of coral growth
Algal cover on coral	percentage of algal cover on coral reef present in random 1m <sup>2</sup> quadrants	determines health of coral and presence or absence of herbivores as well as possible effects of eutrophication
Fish abundance	Presence of mature fish (poor, fair, good, excellent)	health of reef and determination of overfishing
Sea-grass cover <sup>1</sup>	percentage of sea-grass cover present in random 1m <sup>2</sup> quadrants	health of sea-grasses through density

<sup>1</sup> Taken at closest open patch of sea-grass adjacent to above measurements

The following more intensive parameters can also be used to further monitor coral reefs and sea-grasses (limited by monitoring capacity).

- Percentage cover of corals (both live and dead)
- Percentage cover of algae (both live and dead)
- Species or genus composition

- Size of coral communities
- Structure of coral communities (including rugosity)
- Presence of newly settled corals and juveniles
- Numbers of fishes
- Species composition of fishes
- Extent and type of coral disease
- Depth, bathymetry and reef profiles
- Water temperature
- Water quality
- Visibility
- Salinity
- Coral bleaching present

## **ENDANGERED SPECIES**

Species as identified by the United States Endangered Species Act (ESA) as either endangered or threatened inhabit the target sites. These include the elkhorn coral (Zones 1, 2, 3; Zone 4 unknown), five species of sea turtles (Zones 1, 2, 3, 4), and manatees (Zones 1,2,3,4 unknown). Locations of elkhorn coral and manatees would need to be identified as would sea turtle nesting beaches.

*For Google Earth Maps .kmz files showing the location of the study sites please email [bluemail@foprobim.org](mailto:bluemail@foprobim.org).*



# SITE DESCRIPTIONS AND EVALUATIONS

## ARCADINS COAST AND LA GONÂVE

The Arcadins/La Gonâve study area encompasses the coastal and marine area located between Montrouis, south to Arcahaie, across the bay to Pointe Fantasque, north to Anse-á -Galets, and across the bay to Montrouis. It includes the three Arcadins Islands as well as the Arcadins Bank (Récif Arcadins).

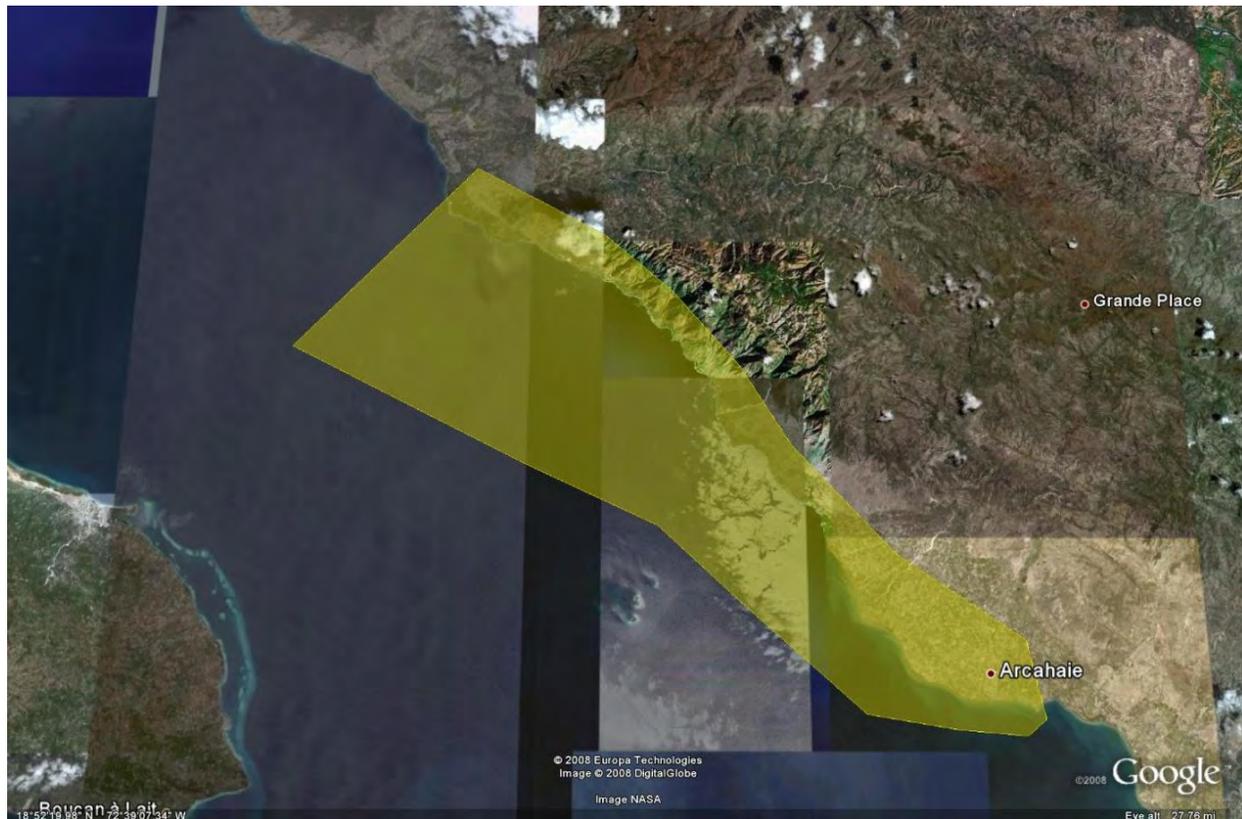
**FIGURE 1: ARCADINS COAST AND LA GONÂVE**



## ARCADINS COAST (ZONE 1)

The Arcadins Coast study site consists of the eastern side of the Gulf of La Gonâve north of Port-au-Prince from the mouth of the Riviere Coujollles (Arcahaie – 18°45'47.72"N, 72°29'45.11"W) to just north of the mouth of the Riviere Montrouis (Hotel Xaragua – 18°58'22.35"N, 72°43'45.97"W). It includes several small coastal towns and villages beginning with Arcahaie in the south, Mitan, Conte, Royale, Luly, and ending with Montrouis in the north.

**FIGURE 2: ARCADINS COAST (ZONE 1)**



## **ARCAHAIE to LULY**

### *Summary*

This site is located along the Arcahaie coastal alluvial fan and is supplied with water in its lower reaches by the rivers Coujollès, Conte, Mitan, and Matheux as well as several agricultural irrigation canals. Effluent from these rivers provide sediment which affects coastal and marine resources in the area. The largest human habitation in this area is the coastal town of Arcahaie.

### **MANGROVES**

There are three mangrove areas of interest in this area: Bodmè Boula, Mitan, and Royale. This area contains scattered stands of primarily the Red Mangrove *Rhizophora mangle*, but also as the second most abundant, scattered individuals of the Black Mangrove, *Avicennia germinans* as well as some lesser representation of the White Mangrove *Laguncularia racemosa* (Palétuvier blanc). All of the mangroves in this area are under various levels of threat from cutting for fuel wood, charcoal production, tannin, and farmland encroachment and are, at best, secondary growth with the exception of several large Black Mangroves. These three areas should be considered as significant enough for the area to merit protection and management. There are also, however, many other smaller stands which should not be ignored.

• **Site 1: Bodmè Boula – Overall Condition = 2**

A few black mangroves at Bodmè Boula were found to be of quite impressive size, signifying their survival as original primary growth individuals. Most of these trees are severely scarred with cutting marks on larger branches and trunks, burns from where the locals attempted to use fire to bring them down, and missing large upper branches which had been cut off.

**TABLE 5: SITE 1: BODMÈ BOULA – OVERALL CONDITION = 2**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Bodmè Boula	Perimeter	5,480 yards	4	0	1	3	2
		5,000 meters					
	Area	20 acres					
		7 hectares					

<sup>®</sup> Scale of 0-5, 0 = no threat, 5 = great threat; <sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 6: SITE 1 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average height	Canopy cover	Notes
Red Mangrove – 0.06m Red Mangrove – 0.08m Red Mangrove – 0.05m Black Mangrove – 1.35m Black Mangrove – 1.45m Black Mangrove – 1.10m	3-6m	Poor	- <i>Rhizophora mangle</i> dominant -impressive black mangroves -cows eating mangroves -back-cut -little new growth -marine debris -fishing community located in the middle -farmland encroachment from east -patchy growth



**Black mangrove at Bodmè Boula – photo by Jean W. Wiener**

- **Site 2: Mang Mitan – Overall Condition = 2**

**TABLE 7: SITE 2 – MANG MITAN – OVERALL CONDITION = 2**

Location	Areal Extent		Threats <sup>⊙</sup>				Overall Condition <sup>Δ</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Mang Mitan	Perimeter	1,260 yards	4	0	1	3	2
		1,160 meters					
	Area	10 acres					
		4 hectares					

<sup>⊙</sup> Scale of 0-5, 0 = no threat, 5 = great threat; <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 8: SITE 2 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average height	Canopy cover	Notes
Red Mangrove – 0.06m Red Mangrove – 0.07m Red Mangrove – 0.05m	3-6m	Poor	- <i>Rhizophora mangle</i> dominant -back-cut -some front-cut -little new growth -marine debris -fishing community located to the south -farmland encroachment from east

- **Site 3: Mang Royale – Overall Condition = 3**

Mang Royale is the best preserved mangrove stand along this section of coast.

**TABLE 9: SITE 3 – MANG ROYALE – OVERALL CONDITION = 3**

Location	Areal Extent		Threats <sup>⊙</sup>				Overall Condition <sup>Δ</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Mang Royale	Perimeter	1,560 yards	4	0	2	3	3
		1,430 meters					
	Area	8 acres					
		3 hectares					

<sup>⊙</sup> Scale of 0-5, 0 = no threat, 5 = great threat; <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 10: SITE 3 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.30m Red Mangrove – 0.15m Red Mangrove – 0.15m	3-8m	Good	- <i>Rhizophora mangle</i> dominant -back-cut -little front-cut -little new growth -some marine debris -fishing community located to the north -farmland encroachment from east

### CORAL REEFS AND SEA-GRASS BEDS

There are no coral reefs of note along this area. Small patch reefs are present and are in generally poor condition due to their proximity to the outfalls of the rivers in the area bringing in sedimentation.

- **Site 4: Arcahaie to Luly– Overall Condition = 4**

Sea-grasses are generally in good to very good condition in most part depending on their distance from sedimentation occurring along the coastline from area rivers. Composition of sea-grasses is mostly *Thalassia testudinum* in this area.



**Mangrove measurements being taken at Mang Royale – photo by Jean W. Wiener**

**TABLE 11: SITE 4 – ARCAHAIE TO LULY– OVERALL CONDITION = 4**

Location <sup>1</sup>	Extent <sup>2</sup>		Threats <sup>⊙</sup>				Overall Condition <sup>Δ</sup>
			Sedimentation	Fuel/Oil	Damage	Marine Debris	
Coral Reefs and Sea-grass Beds <sup>2</sup>	Perimeter	82,000 yards	4	1	2	4	3
		75,000 meters					
	Area	4,500 acres					
		1,800 hectares					

⊙ Specific threats to Arcahaie to Luly area – Scale of 0-5. 0 = no threat, 5 = greatest threat

Δ Scale of 0-5, 0 = poor, 5 – best

<sup>1</sup> Arcahaie to to Luly

<sup>2</sup> Total extent of Arcahaie to Montrouis coral reefs and sea-grasses; includes Trou Baget and Trou Forban coral reefs

**TABLE 12: SITES 4A AND 4B**

Parameter → Site ↓	Coral cover	Algal cover	Fish abundance	Sea-grass cover
a	n/a	n/a	Poor	90%
b	n/a	n/a	Poor	80%



Sea-grass bed along coast near Mitan – photo Jean W. Wiener

## SANDY BEACHES

There are no significant sandy beaches in this area. Most beaches are composed of gravel.

## LULY to MONTROUIS

### Summary

The coastal area from Luly to Montouis contains the largest concentration of near shore “upper class” residences (full-time or week-end), as well as the largest concentration of coastal hotels in Haiti. The eight beach hotels include: Kyona, Kaliko, Wahoo Bay, Ouanga Bay, Bora Bora, Moulin Sur Mer, Club Indigo (formerly Club Med), and Xaragua (appendix V). Along most of this area the “upper class” residences and beach hotels occupy the western (coastal) portion of the main road (Route Nationale #1) with scattered habitation along the lower slopes on the eastern side of the road.

In its lower reaches this area contains the Delugé and Montrouis rivers in its northern part. Seasonal ravines include the Rousseau and Seche. Heading north along the coast, agriculture in this area is negligible until one reaches the area near Montrouis and enters the Montrouis coastal alluvial fan.

## MANGROVES

There are no significant mangrove stands remaining along this area.

Although not very large there are two coral reefs of note in this area along with patchy reefs from Trou Forban north.

- **Site 5: Trou Bagette – Overall Condition = 3**

**TABLE 13: SITE 5 – TROU BAGETTE – OVERALL CONDITION = 3**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Sedimentation	Overfishing	Damage	Marine Debris	
Trou Baget	Perimeter	1,200 yards	0	5	1	4	3
		1,100 meters					
	Area	15 acres					
		6 hectares					

<sup>®</sup> Scale of 0-5. 0 = no threat, 5 = greatest threat; <sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 14: SITES 5A AND 5B**

Parameter → Site ↓	Coral Cover	Algal cover	Fish abundance	Sea-grass cover <sup>1</sup>
a	60%	20%	poor	50%
b	50%	20%	poor	40%

<sup>1</sup> Taken at closest open patch of sea-grass adjacent to other measurements



**Coral reef at Trou Bagette** – photo Jean W. Wiener

- **Site 6: Trou Forban – Overall Condition = 3**

**TABLE 15: SITE 6 – TROU FORBAN – OVERALL CONDITION = 3**

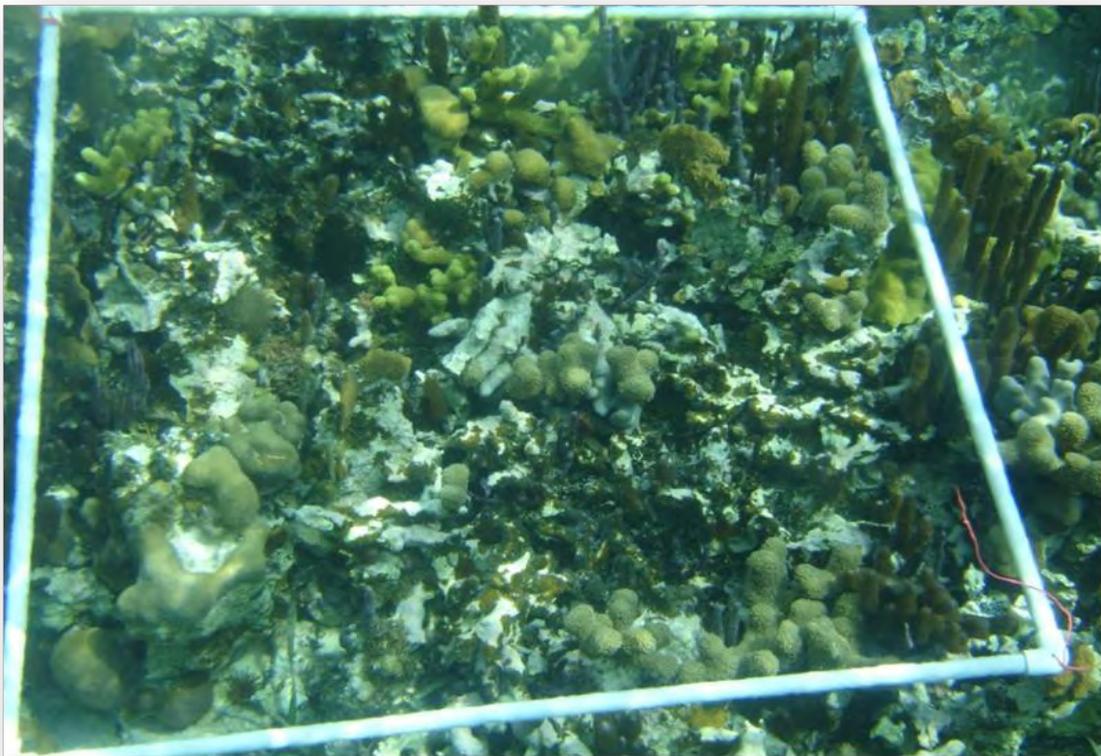
Location	Extent		Threats <sup>®</sup>				Overall Condition <sup>Δ</sup>
			Sedimentation	Overfishing	Damage	Marine Debris	
Trou Forban	Perimeter	1,600 yards	0	5	1	4	3
		1,500 meters					
	Area	22 acres					
		9 hectares					

<sup>®</sup> Scale of 0-5. 0 = no threat, 5 = greatest threat; <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 16: SITES 6A AND 6B**

Parameter → Site ↓	Coral Cover	Algal cover	Fish abundance	Sea-grass cover <sup>1</sup>
a	70%	10%	poor	60%
b	40%	30%	poor	40%

<sup>1</sup> Taken at closest open patch of sea-grass adjacent to other measurements



Quadrant measurements on reef at Trou Forban – photo Jean W. Wiener

• **Site 7: Luly to Montrouis – Overall Condition = 3**

Scattered sea-grass beds of varying health. Much more of a mix of sea-grass beds and coral reef than further south along the coast (Luly to Arcahaie). Mostly *Thalassia testudinum*.

**TABLE 17: SITE 7 – LULY TO MONTROUIS – OVERALL CONDITION = 3**

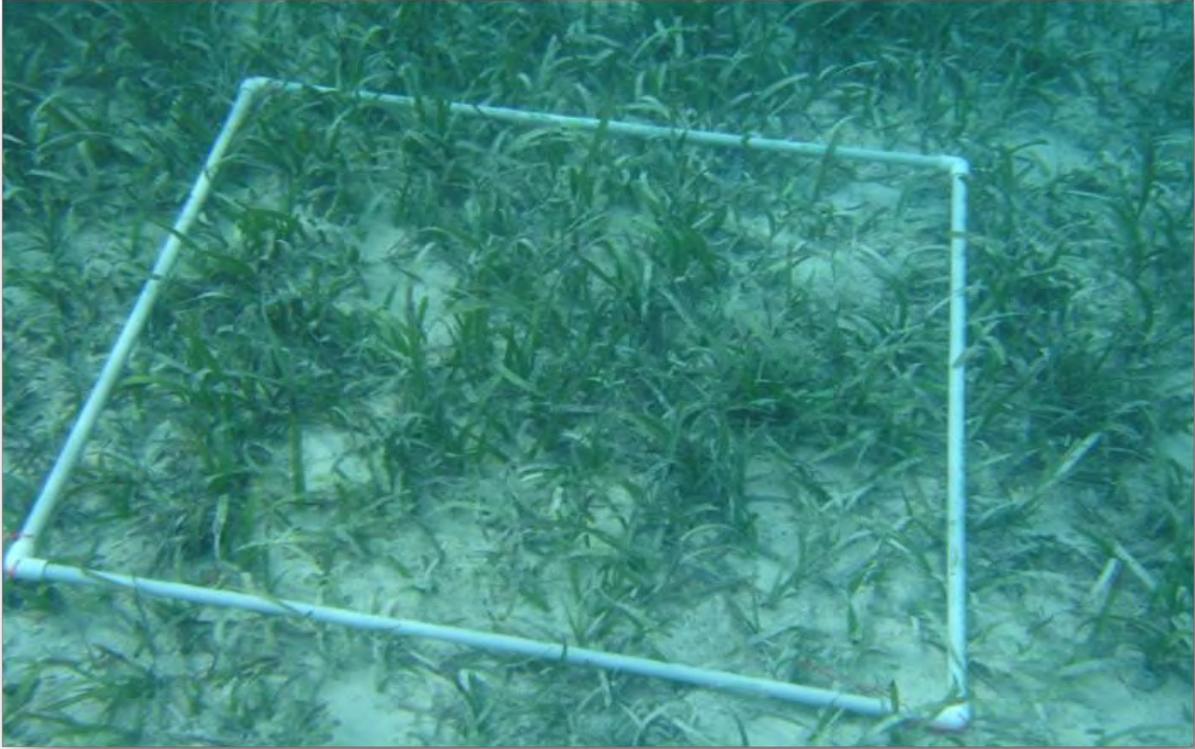
Location <sup>1</sup>	Extent <sup>2</sup>		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Sedimentation	Overfishing	Damage	Marine Debris	
Coral Reefs and Sea-grass Beds	Perimeter	82,000 yards	1	5	2	4	3
		75,000 meters					
	Area	4,500 acres					
		1,800 hectares					

® Specific threats to Luly to Montrouis area – Scale of 0-5. 0 = no threat, 5 = greatest threat

△ Scale of 0-5, 0 = poor, 5 – best

<sup>1</sup> Luly to Montrouis

<sup>2</sup> Total extent of Arcahaie to Montrouis coral reefs and sea-grasses; includes Trou Baget and Trou Forban coral reefs



**Sea-grass bed near Trou Forban – photo Jean W. Wiener**

## **SANDY BEACHES**

Except for the beach found at and near Club Indigo (approx. length 1,500 yds.) there are no sandy beaches of note in this area.



**Beach at Club Indigo** – photo Jean W. Wiener

## **ARCADINS ISLANDS (ZONE 2)**

### **Summary**

The Arcadins Islands consist of three small islands of the Arcadins Islands Bank centered at 18°48'07.07" N 72°38'53.02" W, as well as the Arcadins Bank (Récif Arcadins) located south-southeast of the Arcadins Islands Bank. Although they are uninhabited, these islands are heavily fished by coastal communities including apparently those coming from as far away as Léogane. During rough seas they are also a refuge for fishers to wait for calmer waters. Besides mangroves, sea grapes and Bayawonn are among the larger plants present on the islands.

**FIGURE 3: ARCADINS ISLANDS (ZONE 2)**



## **MANGROVES**

Most of the mangroves present appear to be primary/original growth. They also appear to be in extremely good condition and have almost certainly maximized their growth potential considering their location. Few of the mangroves at the Arcadins Islands reaches the sea to form potential fish nursery areas similar to those found along the Arcadins Coast (Zone 1) and La Gonâve (Zone 3).

- **Site 8 – Zilé Fa (North) – Overall Condition = 4**

This site surrounds a marshy area.

**TABLE 18: SITE 8 – ZILÉ FA (NORTH) – OVERALL CONDITION = 4**

Location	Areal Extent		Threats <sup>•</sup>				Overall Condition <sup>Δ</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Zilé Fa North	Perimeter	470 yards	1	1	0	5	4
		440 meters					
	Area	2.5 acres					
		1.0 hectares					

<sup>•</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 19: SITE 8 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.40m	3-6m	Fair	- <i>Rhizophora mangle</i> dominant
Red Mangrove – 0.25m			-little cutting
Red Mangrove – 0.20m			-little new growth
			-large amounts of marine debris
			-mosquitoes and biting flies



Zilé Fa – photo Jean W. Wiener

• **Site 9 – Zilé Fa (South) – Overall Condition = 4**

This site surrounds a much smaller marshy area than Zilé Fa North.

**TABLE 20: SITE 9 – ZILÉ FA (SOUTH) – OVERALL CONDITION = 4**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Zilé Fa South	Perimeter	170 yards	1	0	0	5	4
		160 meters					
	Area	0.4 acres					
		0.2 hectares					

<sup>®</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 21: SITE 9 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.20m Red Mangrove – 0.10m Red Mangrove – 0.15	4m	Poor	- <i>Rhizophora mangle</i> dominant -little cutting -little new growth -large amounts of marine debris -mosquitoes and biting flies

• **Site 10 – Ti Zilé – Overall Condition = 4**

**TABLE 22: SITE 10 – TI ZILÉ – OVERALL CONDITION = 4**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Ti Zilé	Perimeter	200 yards	1	0	0	5	4
		180 meters					
	Area	0.5 acres					
		0.2 hectares					

<sup>®</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 23: SITE 10 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.25m Red Mangrove – 0.25m Red Mangrove – 0.20m	3-6m	Good	- <i>Rhizophora mangle</i> dominant -little cutting -little new growth -large amounts of marine debris



Ti Zilé – photo Jean W. Wiener

- Site 11 – Zilé Wiene – Overall Condition = 4

**TABLE 24: SITE 11 – ZILÉ WIENE – OVERALL CONDITION = 4**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Zilé Wiene	Perimeter	720 yards	1	0	0	5	4
		790 meters					
	Area	6 acres					
		2.5 hectares					

<sup>®</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 25: SITE 11 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.30m Red Mangrove – 0.30m Red Mangrove – 0.25m	6-8m	Good	- <i>Rhizophora mangle</i> dominant -little cutting -little new growth -large amounts of marine debris -some sea grapes -mosquitoes and biting flies

## CORAL REEFS AND SEA-GRASS BEDS

- Site 12 – Arcadins Islands – Overall Condition = 4

**TABLE 26: SITE 12 – ARCADINS ISLANDS – OVERALL CONDITION = 4**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Sedimentation	Overfishing	Damage	Marine Debris	
Arcadins Islands	Perimeter	39,000 yards	0	5	1	4	4
		35,700 meters					
	Area	6,900 acres					
		2,800 hectares					

<sup>®</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 27: SITES 12A, 12B, AND 12C**

Parameter → Site ↓	Coral cover	Algal cover	Fish abundance	Sea-grass cover <sup>1</sup>
a	50%	30%	poor	40%
b	60%	30%	poor	50%
c	60%	40%	poor	40%

<sup>1</sup> taken at closest open patch of sea-grass adjacent to other measurements



**Reefs at Arcadins Islands** – photo Nicholas Hobgood

- Site 13 – Arcadins Bank – Overall Condition = 4

**TABLE 28: SITE 13 – ARCADINS BANK – OVERALL CONDITION = 4**

Location	Areal Extent		Threats <sup>•</sup>				Overall Condition <sup>Δ</sup>
			Sedimentation	Overfishing	Damage	Marine Debris	
Arcadins Bank (Recif Arcadins)	Perimeter	14,300 yards	1	5	1	0	4
		13,000 meters					
	Area	2,300 acres					
		930 hectares					

• Scale of 0-5, 0 = no threat, 5 = great threat, Δ Scale of 0-5, 0 = poor, 5 = best

**TABLE 29: SITE 13A**

Parameter → Site ↓	Coral Cover	Algal cover	Fish abundance	Sea-grass cover <sup>1</sup>
a	40%	40%	poor	40%

### SANDY BEACHES

All three Arcadins Islands have full perimeter sandy beaches.

- Site 14 – Ti Zilé – Overall Condition = 4

**TABLE 30: SITE 14 – TI ZILÉ – OVERALL CONDITION = 4**

Location	Extent (Perimeter)		Threats <sup>•</sup>		Overall Condition <sup>Δ</sup>
			Modification	Marine Debris	
Ti Zilé	Length	210 yards	0	5	4
		190 meters			

• Scale of 0-5, 0 = no threat, 5 = great threat, Δ Scale of 0-5, 0 = poor, 5 = best

- Site 15 – Zilé Wiene – Overall Condition = 4

**TABLE 31: SITE 15 – ZILÉ WIENE – OVERALL CONDITION = 4**

Location	Extent (Perimeter)		Threats <sup>•</sup>		Overall Condition <sup>Δ</sup>
			Modification	Marine Debris	
Zilé Wiene	Length	760 yards	0	5	4
		690 meters			

• Scale of 0-5, 0 = no threat, 5 = great threat, Δ Scale of 0-5, 0 = poor, 5 = best

- Site 16 – Zilé Fa – Overall Condition = 4

**TABLE 32: SITE 16 – ZILÉ FA – OVERALL CONDITION = 4**

Location	Extent (Perimeter)		Threats <sup>•</sup>		Overall Condition <sup>Δ</sup>
			Modification	Marine Debris	
Zilé Fa	Length	1,100 yards	0	5	4
		1,000 meters			

<sup>•</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best



**Beach at Zilé Fa** – photo Jean W. Wiener

### LA GONÂVE ISLAND (ZONE 3)

#### Summary

The La Gonâve Island study site consists of the coastal areas around southeastern La Gonâve beginning with Pointe Fantasque at 18°41'41.10"N, 72°49'07.61"W in the southeast and following the coast north to Anse-a-Galets at 18°49'55.81" N, 72°51'33.69"W in the north. From Pointe Fantasque heading north along the coast, coastal villages include Anse Ewa, Ti Gonâve, Grande Baie, Ti Anse, Boucan Riské, Twa Lo (Trou a l'Eau), Boucan Patat and ending at Anse-a-Galets. Two small islands off the southeastern tip of La Gonâve are included: Ti Gonâve and Caye Sable (aka Kaka Poul).

**FIGURE 4: LA GONÂVE ISLAND (ZONE 3)**



**MANGROVES**

- Site 17 – Anse-a-Galets – Overall Condition = 3

**TABLE 33: SITE 17 – ANSE-A-GALETs – OVERALL CONDITION = 3**

Location	Areal Extent		Threats <sup>•</sup>				Overall Condition <sup>△</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Anse-a-Galets*	Perimeter	5,430 yards	4	3	5	4	3
		4,960 meters					
	Area	130 acres					
		50 hectares					

<sup>•</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>△</sup> Scale of 0-5, 0 = poor, 5 = best, \* entire mangrove area including all disturbances

**TABLE 34: SITE 17 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.20m Red Mangrove – 0.10m Red Mangrove – 0.15m	3-6m	Fair	- <i>Rhizophora mangle</i> dominant -much cutting -little new growth -large amounts of marine debris -large construction disturbances -fuel/oil visible in water -highly threatened from multiple sources



**Mangroves at Anse-a-Galets** – photo Jean W. Wiener

- Site 18 – Boucan Patat North – Overall Condition = 2

**TABLE 35: SITE 18 – BOUCAN PATAT NORTH – OVERALL CONDITION = 2**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>Δ</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Boucan Patat North	Perimeter	1,190 yards	4	0	0	2	2
		1,090 meters					
	Area	4.5 acres					
		2 hectares					

<sup>®</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 36: SITE 18 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.05m Red Mangrove – 0.05m Red Mangrove – 0.10m	3-6m	Poor	- <i>Rhizophora mangle</i> dominant -some cutting -little new growth -large amounts of marine debris

- Site 19 – Boucan Patat South – Overall Condition = 2

**TABLE 37: SITE 19 – BOUCAN PATAT SOUTH – OVERALL CONDITION = 2**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>Δ</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Boucan Patat South	Perimeter	1,670 yards	4	0	0	2	2
		1,520 meters					
	Area	14 acres					
		5.5 hectares					

<sup>®</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 38: SITE 19 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.06m Red Mangrove – 0.08m Red Mangrove – 0.10m	4m	Poor	- <i>Rhizophora mangle</i> dominant -some cutting -little new growth -large amounts of marine debris

- Site 20 – Twa Lo – Overall Condition = 2

**TABLE 39: SITE 20 – TWA LO – OVERALL CONDITION = 2**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>Δ</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Twa Lo	Perimeter	3,850 yards	3	0	0	2	2
		3,520 meters					
	Area	30 acres					
		12 hectares					

<sup>®</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 40: SITE 20 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.10m Red Mangrove – 0.05m Red Mangrove – 0.15m	3-6m	Fair	- <i>Rhizophora mangle</i> dominant -little cutting -little new growth -marine debris

- Site 21 – Grande Baie – Overall Condition = 3

**TABLE 41: SITE 21 – GRANDE BAIE – OVERALL CONDITION = 3**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Grande Baie	Perimeter	1,620 yards	4	0	0	5	3
		1,480 meters					
	Area	12 acres					
		5.0 hectares					

<sup>®</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 42: SITE 21 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Shade	Notes
Red Mangrove – 0.12m Red Mangrove – 0.05m Red Mangrove – 0.15m	3-6m	Fair	- <i>Rhizophora mangle</i> dominant -little cutting -marine debris

- Site 22 – Ti Gonâve 1 – Overall Condition = 3

**TABLE 43: SITE 22 – TI GONÂVE 1 – OVERALL CONDITION = 3**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Ti Gonâve 1	Perimeter	670 yards	3	0	1	2	3
		620 meters					
	Area	5 acres					
		2 hectares					

<sup>®</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 44: SITE 22 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.05m Red Mangrove – 0.05m Red Mangrove – 0.08m	3-6m	Poor	- <i>Rhizophora mangle</i> dominant -little cutting -little new growth -marine debris

- Site 23 – Ti Gonâve 2 – Overall Condition = 3

**TABLE 45: SITE 23 – TI GONÂVE 2 – OVERALL CONDITION = 3**

Location	Areal Extent		Threats <sup>•</sup>				Overall Condition <sup>Δ</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Ti Gonâve 2	Perimeter	330 yards	3	0	1	2	3
		300 meters					
	Area	1 acres					
		0.5 hectares					

<sup>•</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 46: SITE 23 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.08m Red Mangrove – 0.10m Red Mangrove – 0.06m	3-6m	poor	- <i>Rhizophora mangle</i> dominant -little cutting -little new growth -marine debris



Mangroves at Ti Gonâve – photo Jean W. Wiener

## CORAL REEFS AND SEA-GRASS BEDS

- Site 24 – La Gonâve – Overall Condition = 4

**TABLE 47: SITE 24 – LA GONÂVE – OVERALL CONDITION = 4**

Location	Areal Extent		Threats <sup>●</sup>				Overall Condition <sup>△</sup>
			Sedimentation	Overfishing	Damage	Marine Debris	
La Gonâve	Perimeter	70,000 yards	2	5	1	3	4
		62,000 meters					
	Area	12,000 Acres					
		4,800 Hectares					

**TABLE 48: SITES 24A, 24B, AND 24C**

Parameter → Site↓	Coral Cover	Algal cover	Fish abundance	Sea-grass cover <sup>1</sup>
a	40%	30%	poor	40%
b	80%	10%	poor	50%
c	70%	10%	poor	30%

<sup>1</sup> Taken at closest open patch of sea-grass adjacent to other measurements



**Extensive reef at La Gonave** – photo Jean W. Wiener

### **Sandy Beaches**

No sandy beaches of note along this portion of La Gonave.

## **LIMBÉ COAST (ZONE 4)**

### **Summary**

The Limbé Coast study area consists of the coastal area beginning in the West at l’Ilet Port Margot (19°49’48.09” N, 72°25’59.08”W) and ending in the east in the area just east of Petit Bourg du Limbé/Blain (19°47’21.56”N, 72°21’39.63W).

The Limbé river was fairly clear until just south of the Nat. #1 bridge at Limbé. North of this point the sediment load appears to increase dramatically as the river slows and winds its way to the sea.

**FIGURE 5: LIMBÉ COAST (ZONE 4)**



## MANGROVES

Although unable to confirm at this point, older maps as well as oral history from several local fishers point to the possibility that mangroves were once present from their current locations (maximum pristine extent) all the way into the sea, covering almost all of what is now sandy beaches.

- **Site 25 – Bodmè Margot/Bayeux – Overall Condition = 1**

The mangroves at Margot (Bayeux) are under severe stress from cutting. There is extreme pressure on area mangroves as they are cut back and replaced by farm land. Virtually no marine debris was observed as this area is pretty much land-locked. Most of this area is, at best, secondary growth with no observed mangroves trees taller than 3m.



Mangroves at Margot cut back for farming – photo Jean W. Wiener

**TABLE 49: SITE 25 – BODMÈ MARGOT/BAYEUX – OVERALL CONDITION = 1**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>^</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Bodmè Margot (Bayeux)	Perimeter	4,260 yards	5	0	5	0	1
		3,900 meters					
	Area	65 acres					
		25 hectares					

<sup>®</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>^</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 50: SITE 25 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.03m Red Mangrove – 0.04m Red Mangrove – 0.04m	1-3m	poor	- <i>Rhizophora mangle</i> dominant -severe cutting -little new growth -farmland encroachment from all sides -large amounts of marine debris

- **Site 26 – Diotin – Overall Condition = 2**

The mangrove area at Diotin is under severe stress from cutting. There has been a very large and readily apparent area of cutting where there is no longer any mangrove growth. While visiting this area we observed two individuals cutting mangroves and more than six piles of cut wood. The majority of mangroves are *Rhizophora mangle* with some *Avicennia germinans* interspersed. Inhabitants of this area have relayed the heavy cutting, the decrease in size of this area, as well as the fact that in their youth they remember observing towering mangroves providing plenty of shade. Presently this site is covered by (at best) secondary growth. Not much in terms of marine debris was observed due to the fact that this estuarian system has only one fairly small outlet located along the center of the Limbé coastal arc. Some debris was found and appears to be mostly due to local activities at Diotin village. Very little to no recruitment was observed and overall the area appears to be shrinking dramatically. However, a comparison between aerial photography (July, 2008) and satellite imagery (October, 2002) shows an increase in mangrove cover along the southeast area of the Diotin mangroves.



**Piles of mangrove wood (Diotin)** – photo Jean W. Wiener

**TABLE 51: SITE 26 – DIOTIN – OVERALL CONDITION = 2**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Diotin	Perimeter	3,450 yards	5	0	5	0	2
		3,160 meters					
	Area	85 acres					
		35 hectares					

<sup>®</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 52: SITE 26 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.10m Red Mangrove – 0.06m Red Mangrove – 0.08	3-6m	poor	- <i>Rhizophora mangle</i> dominant -severe cutting -little new growth -farmland encroachment from all sides

• **Site 27 – Bas Limbé/Bassin Caiman – Overall Condition = 3**

Mostly secondary growth with a few very large Black Mangrove trees (height of 8m+) were observed near the fishing village.



**Mangroves at Bas Limbé** – photo Jean W. Wiener

**TABLE 53: SITE 27 – BAS LIMBÉ/BASSIN CAIMAN – OVERALL CONDITION = 3**

Location	Areal Extent		Threats <sup>•</sup>				Overall Condition <sup>Δ</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Bassin Caiman/ Bas Limbé	Perimeter	9,160 yards	4	0	4	0	3
		8,370 meters					
	Area	220 acres					
		90 hectares					

<sup>•</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 54: SITE 27 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.20m Red Mangrove – 0.10m Red Mangrove – 0.15	3-6m	Fair	- <i>Rhizophora mangle</i> dominant -little cutting -little new growth -trash from nearby community -farmland encroachment from all sides

• Site 28 - Ti Bourg Limbé – Overall Condition = 2

**TABLE 55: SITE 28 – TI BOURG LIMBÉ – OVERALL CONDITION = 2**

Location	Areal Extent		Threats <sup>•</sup>				Overall Condition <sup>Δ</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Ti Bourg Limbé	Perimeter	6,880 yards	4	0	4	0	2
		6,290 meters					
	Area	250 acres					
		100 hectares					

<sup>•</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 56: SITE 28 – MEASUREMENTS AND NOTES**

Maximum Circumferences	Average Height	Canopy cover	Notes
Red Mangrove – 0.09m Red Mangrove – 0.07m Red Mangrove – 0.13m	3-6m	fair	- <i>Rhizophora mangle</i> dominant -little cutting -little new growth -farmland encroachment from all sides



**Mangroves at Ti Bourg Limbé** – photo Jean W. Wiener

## **CORAL REEFS AND SEA-GRASS BEDS**

Much of the near shore area along Bord de Mer Limbé and Ti Bourg du Limbé is composed of rocky shoals.

- **Site 29 – Limbé Coast (Bord de mer Limbé) - West of Limbé Island – Overall Condition = 0**

Due to heavy sedimentation caused by the Limbé river during the study period only dredge samples were able to be taken within the larger Limbé Bay area. This sedimentation decreased visibility to less than six inches close to the mouth of the Limbé River and was at best 12 inches out to the furthest reach of the study area. Dredge samples, as expected, revealed mostly mud from the sea bed near the mouth of the river, and mud with scattered pebbles further out. This type of extremely heavy sedimentation, even on a season basis, makes it extremely unlikely that much coral or sea-grass is present within this area, and if so they would be extremely degraded.

- **Site 30 – Bas Limbé Coast - East of Limbé Island – Overall Condition = 3**

The area east of Limbé Island appears to have been spared the major effects of the sedimentation from the Limbé river due to the prevailing currents from the east. Even with the extreme sedimentation occurring within the larger Limbé Bay once one makes the turn from Limbé Bay around the Pointe Limbé the water becomes much clearer. This has provided the possibilities for certain small coral heads to survive as well as a fairly extensive sea-grass bed composed mostly of *Syringodium filiforme* near and southeast of the fishing village at Bas Limbé.

**TABLE 57: SITE 30 – BAS LIMBÉ COAST - EAST OF LIMBÉ ISLAND – OVERALL CONDITION = 3**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>Δ</sup>
			Sedimentation	Overfishing	Damage	Marine Debris	
Limbé Coast	Perimeter	3,700 yards	2	3	1	3	3
		3,400 meters					
	Area	120 acres					
		45 hectares					

<sup>®</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 58: SITE 30A AND 30B**

Parameter → Site ↓	Coral Cover	Algal cover	Fish abundance	Sea-grass cover <sup>1</sup>
a	n/a	n/a	poor	90%
b	n/a	n/a	poor	90%



*Syringodium filiforme* near the fishing village of Bas Limbé – photo Jean W. Wiener

## SANDY BEACHES

### *Limbé Coast – Sandy Beaches*

Area has beautiful sandy beaches but not too far into the water there are either sea-grasses, rocks, or mud. Marine debris was observed, but, again nowhere near the quantities observed in the Gulf of La Gonâve. Research would be needed to identify its potential as a marine turtle nesting area.

- **Site 31 – Margot – Overall Condition = 4**

**TABLE 59: SITE 31 – MARGOT – OVERALL CONDITION = 4**

Location	Extent		Threats <sup>•</sup>		Overall Condition <sup>Δ</sup>
			Modification	Marine Debris	
Bodmè Margot (Bayeux)	Length	630 yards	0	1	4
		575 meters			

<sup>•</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

- **Site 32 – Limbé Bay– Overall Condition = 4**

**TABLE 60: SITE 32 – LIMBÉ BAY– OVERALL CONDITION = 4**

Location	Extent		Threats <sup>•</sup>		Overall Condition <sup>Δ</sup>
			Modification	Marine Debris	
Limbé Bay Diotin	Length	5,000 yards	0	1	4
		4,560 meters			

<sup>•</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best



**Beach at Limbé Bay** – photo Jean W. Wiener

- **Site 33 – Zilé Limbé – Overall Condition = 4**

**TABLE 61: SITE 33 – ZILÉ LIMBÉ – OVERALL CONDITION = 4**

Location	Extent		Threats <sup>⊙</sup>		Overall Condition <sup>Δ</sup>
			Modification	Marine Debris	
Zilé Limbé	Length	160 yards	0	2	4
		150 meters			

<sup>⊙</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

- **Site 34 – Ti Bourg Limbé– Overall Condition = 4**

**TABLE 62: SITE 34 – TI BOURG LIMBÉ– OVERALL CONDITION = 4**

Location	Extent		Threats <sup>⊙</sup>		Overall Condition <sup>Δ</sup>
			Modification	Marine Debris	
Ti Bourg Limbé	Length	3,000 yards	0	1	4
		2,800 meters			

<sup>⊙</sup> Scale of 0-5, 0 = no threat, 5 = great threat, <sup>Δ</sup> Scale of 0-5, 0 = poor, 5 = best

# PROPOSED PRIORITY CONSERVATION AREAS

## ARCADINS COAST (ZONE 1)

With important mangrove areas at Royale, Mitan, and Bodmè Boula and adjacent sea-grass beds this area provides vital nursery areas for area fisheries. Coral reefs at Trou Bagette, Trou Forban and along the coast up to Montrouis along with providing nursery areas may provide coral reefs of minor interest for tourism.

Primary negatives include heavy siltation at times from area rivers as well as heavy fishing pressures. There are also a large number of coastal modifications. Area mangroves, although extremely important, are not large enough to draw tourism revenue.

## ARCADINS ISLANDS (ZONE 2)

With mangroves, coral reefs, sea-grass beds, sandy beaches, no inhabitants, a lighthouse, and a location not too far from the mainland the Arcadins Islands and Arcadins Bank rank as the highest priority for the creation of a CMPA for the Arcadins/La Gonâve Coastal Area.

The primary negatives include the presence of quite persistent biting flies and mosquitoes on Zilé Fa and Zilé Wiene, the high rate of accumulation of marine debris (believed to be primarily from Port-au-Prince), and the comparatively heavy artisanal fishing in the area.

If well protected and managed this area has an extremely high potential to assist in the recovery of local fisheries as well as provide substantial tourism revenue.

## LA GONÂVE (ZONE 3)

Extensive fringing coral reefs and sea-grass beds, low siltation and relatively low population density are the major pluses for this zone. Mangroves at Anse-a-Galets, Boucan Patat, Boucan Riské, Grande Baie, and Ti Gonâve provide one of the few areas where there are uninterrupted mangrove/seagrass/coral reef ecosystems.

Mangrove cutting and overfishing are harming the ecosystems, and its distance from the mainland may limit tourism potential. As with the Arcadins Coast, mangroves in this zone are not large enough to draw tourism revenue.

## LIMBÉ (ZONE 4)

The mangroves at Margot/Bayeux, Diotin, Bassin Caiman, and Ti Bourg Limbé although seriously threatened are still some of the largest sites in any of the four zones. Diotin in particular with its navigable tributaries has the potential to make for an interesting tourist destination if properly managed and allowed to recover. The area beaches, especially east of Bas Limbé, Zilé Limbé, and the fishing village of Bas Limbé may also make interesting day-trip tourist destinations.

Unfortunately the heavy siltation arriving from the Limbé river makes the crystal clear waters most tourists seek in a Caribbean beach impossible in the Bord de Mer Limbé area. This sedimentation is also problematic in terms of allowing for suitable habitat for fisheries production, and any type of scuba diving activities would be extremely limited in this area.

## RANKINGS OF PROPOSED PRIORITY CONSERVATION AREAS

**TABLE 63: RANKINGS OF PROPOSED PRIORITY CONSERVATION AREAS**

Site	Recommendations as Priority Conservation Sites	Rank within Zone	Overall Rank
Arcadins Coast (Zone 1)	All	1	4
	Arcahaie to Luly	2	6
	Luly to Montrouis	3	8
Arcadins Islands + Bank (Zone 2)	All	n/a	1
La Gonâve (Zone 3)	All	n/a	2
Limbé (Zone 4)	All	1	3
	Bord de Mer Margot/Bayeux	5	10
	Diotin	3	7
	Bassin Caiman + Ilet Limbé	2	5
	Petit Bourg du Limbé	4	9

## OTHER SITES OF INTEREST NEAR THE STUDY AREAS

### LA GONÂVE

The coastal and marine zone northwest of Anse-a-Galets to Richard should absolutely be considered in any future coastal and marine activities due to its potential as a marine park. It contains complex coral reef, sand flat, sea-grass, and mangrove ecosystems in an area which is not densely populated.

### BAIE DE L'ACUL

The coastal and marine zone east of the Limbé Coastal Zone studied in this report should also be considered in any future activities. This area includes the Baie de l'Acul east to Labadie and all its associated mangrove, coral reef, sea-grass bed and beach ecosystems.

# THREATS TO COASTAL AND MARINE RESOURCES, THREAT REDUCTION ACTIVITIES, AND POTENTIAL IMPACTS (BENEFITS)

Education and building understanding is an integral part of all threat reduction activities. In each of the cases of threat reduction the direct and complete implication of local stakeholders is critical to the success of the activity. Without this support and the ultimate understanding by the stakeholders of the importance of any activity it will fail. Providing all important educational and community capacity building activities such as environmental education, association building/strengthening, and resource use conflict resolution will provide local stakeholders and stakeholder groups the ability to increase their capacity to sustainably manage their resources while understanding the importance of the activities to their socio-eco-environmental well-being.

In the designation of coastal and marine protected areas (CMPA) there must be the provision of alternative income generating activities such as jobs creation in the form of helping protect resources (e.g. replanting/reforestation, installing artificial reefs, installing FADS, mangrove protection, park rangers, cleanup teams) until the local fisheries are restored to a sustainable level and/or equal or greater replacement income is able to be generated from the CMPA.

Although the public sector is very weak particularly in regard to the enforcement of environmental laws, there are laws already on the books relating to most of the types of threats listed below. Enforcement of pertinent laws and/or the development of new legislation is an important component in order to move forward on many of these interventions.

A new threat, the invasive species the Lionfish has recently been identified in Haitian waters. This invasive may exacerbate the already devastated fisheries in Haiti.

The first category listed below, “All Threats”, encompasses top level solutions which addresses all threat reduction activities, target audiences, and impacts (benefits) of all of the other categories.

## **All Threats – (all listed in other threat categories below)**

### ***Threat reduction activities -***

- Establishment of coastal and marine protected areas
- Educational activities including:
  - association building/strengthening
  - resource use conflict resolution

- environmental (particular attention to be paid to sector specific activities and the education of students/youth)
- (all listed in other threat reduction activities below)

***Target Audience(s)***

- (all listed in other target audiences below)

***Impacts (Benefits)***

- Increased fisheries production
- Increased income for coastal communities
- Protection of endangered species (e.g. marine turtles, manatees, elkhorn coral)
- (all listed in other impacts below)

**Damage to Coral Reefs – Damage to coral reefs generally caused by boat groundings and anchors**

***Threat reduction activities***

- Education
- Installation of mooring buoys
- Installation of marker/navigation buoys

***Target Audience(s)***

- Recreational boaters
- Fishers
- Transport vessels
- Public sector
- Tourism sector

***Impacts (Benefits)***

- Reduced damage to coral reefs
- Increased fisheries production
- Increased tourism appeal

- Increased income for coastal communities

### **Mangrove Cutting – Exploitation of mangroves by cutting especially for use in the production of charcoal, fuel wood, and tannins**

#### ***Threat reduction activities***

- Education
- Development of alternatives for fuel wood, charcoal production, and tannin

#### ***Target Audience(s)***

- Charcoal producers
- Households
- Street cooks
- Fishers
- Farmers
- Public sector

#### ***Impacts (Benefits)***

- Development of more efficient and environmentally friendly fuels
- Reduction of mangrove exploitation
- Increase in fisheries production
- Reduction of coastal erosion
- Increased coastline/beach stabilization

### **Fuel and Oil – gasoline, diesel, and oils**

#### ***Threat reduction activities***

- Education
- Implementation of proper disposal regime for used oils and bilge water

#### ***Target Audience(s)***

- Recreational boaters

- Fishers
- Transport vessels
- Public sector
- Tourism sector

***Impacts (Benefits)***

- Reduction of harmful hydrocarbons in the coastal and marine environment
- Increased fisheries production
- Healthier corals, sea-grasses, and mangroves
- Increased income for coastal communities

**Modification – the physical alteration of a site (e.g. construction, farmland encroachment)**

***Threat reduction activities***

- Education
- Development of alternative income generating activities

***Target Audience(s)***

- Coastal residents (land owners)
- Hoteliers
- Farmers
- Public sector
- Tourism sector

***Impacts (Benefits)***

- Reduction of damaging coastal structures (e.g. docks, jetties, groins)
- Increase in fisheries production
- Reduced beach erosion
- Increase in stable beaches
- Decrease in expenses for coastal defenses

## **Marine Debris – trash which has entered the coastal and marine environment**

### ***Threat reduction activities***

- Education
- Establishment of debris removal regimes such as collection (garbage cans) and disposal

### ***Target Audience(s)***

- All

### ***Impacts (Benefits)***

- Increase in the tourism appeal of beaches (increase in tourism)
- Decrease in harmful effects to coastal and marine organisms
- Increase in fisheries production
- Increased income for coastal communities

## **Sedimentation – soil washed down from watersheds and which enters the coastal and marine environment causing harm to sea-grasses and coral reefs**

### **Threat reduction activities**

- Establishment of vegetative buffer zones along rivers, streams, and gullies
- Installation of dry stone walls (e.g. gabions)
- Development of soil retention dams
- Increase soil retaining vegetation/reforestation

### ***Target Audience(s)***

- Farmers
- Public sector

### ***Impacts (Benefits)***

- Decrease in sediment entering the marine environment
- Decrease in arable land lost to erosion
- Increase in fisheries production

- Increase in agricultural production
- Increased income for coastal communities

**Overfishing/overexploitation – the use of unsustainable and often inappropriate methods for the harvesting of seafood**

***Threat reduction activities***

- Fisheries education
- Implementation of improved (SUSTAINABLE ! ) fishing methods
- Development of (SUSTAINABLE ! ) fisheries intensification activities (e.g. artificial reefs, FADS, aquaculture, mariculture)
- identification and protection of spawning aggregations

***Target Audience(s)***

- All fishers
- Fish merchants
- Hoteliers
- Public sector
- Tourism sector

***Impacts (Benefits)***

- Decrease in environmentally damaging (unsustainable) fishing methods
- Increased fisheries production
- Increased income for fishers
- Increased income for coastal communities

## Overall Threats to Zones

**TABLE 64: OVERALL THREATS TO ZONES**

Threat ▼ <sup>®</sup> Zone ►	Zone 1	TL	Zone 2	TL	Zone 3	TL	Zone 4	TL
Encroachment	Yes	5	No	0	Yes	2	Yes	5
Sedimentation	Yes	3	No	0	Yes	1	Yes	5
Hydrocarbons	Yes	1	Yes	1	Yes	2	Yes	1
Coral Exploitation	Yes	2	Yes	2	No	0	Yes	1
Mangrove								
-Cutting/Exploitation	Yes	3	No	0	Yes	2	Yes	5
-Fill-in	Yes	2	No	0	Yes	5	Yes	0
Sand Mining								
-Near-shore	Yes	2	No	0	No	0	No	0
-Beach	No	0	Yes	1	No	1	No	0
Coastal Development	Yes	5	No	0	Yes	2	Yes	1
Marine Pollution	Yes	4	Yes	5	Yes	4	Yes	2
Overfishing	Yes	5	Yes	5	Yes	5	Yes	3
Anchoring	Yes	1	Yes	1	Yes	1	Yes	1
Endangered Species*								
-Manatees	Yes	5	Yes	2	Yes	2	Yes	2
-Sea Turtles	Yes	5	Yes	5	Yes	5	Yes	5
-Elkhorn Coral	Yes	5	Yes	5	Yes	5	Yes	3
Overall Threat Score		4		2		2		3

TL – Threat Level

® Scale of 0-5, 0 = no threat, 5 = great threat

\*Remaining populations unknown

Zone 1 – Arcadins Coast

Zone 2 – Arcadins Islands

Zone 3 – La Gonâve

Zone 4 – Limbé Coast

# PROPOSED FIVE YEAR ANNUAL TARGETS FOR COASTAL AND MARINE ECOSYSTEM CONSERVATION FOR ARCADINS/LA GONÂVE AND LIMBE COASTAL ZONES

## Creation of Coastal and Marine Protected Area(s) (CMPA)

### *Target Audience - All*

#### • Year 1

- perform a complete bio-inventory of proposed site(s)
- perform a complete geo-survey of proposed site(s)
- finalize extent (final boundaries) of proposed site(s)
- finalize type(s) of site(s) to be designated
- educational activities for 2,000 stakeholders and public sector including: association building, resource use conflict resolution, environmental;

#### • Year 2

- official designation of site(s)
- prepare management plan
- finalize management plan with consultations
- educational activities for stakeholders and public sector including: association building, resource use conflict resolution, environmental
- identification of sites of extreme importance to endangered species (i.e. elkhorn coral, marine turtles, manatees)

#### • Year 3

- implementation of management plan

- environmental educational activities for stakeholders and public sector including training for CMPA “staff”

- **Year 4**

- environmental educational activities for stakeholders and public sector including training for CMPA “staff”

- **Year 5**

- educational activities including: association building; resource use conflict resolution; environmental

### **Damage to Coral Reefs**

*Target Audience - Recreational boaters, fishers, and transport vessels, public sector, tourism sector*

- **Year 1**

- survey of sites and input from stakeholders for installation of mooring and navigation buoys
- development of educational activities for 1,000 stakeholders

- **Year 2**

- installation of mooring and navigation/marker buoys

- **Year 3**

- maintenance

- **Year 4**

- maintenance

- **Year 5**

- maintenance

## **Mangrove Cutting**

*Target Audience - Charcoal producers, households, fishers, farmers, street cooks, public sector*

- **Year 1**

- educational activities for 2,000 stakeholders
- development and/or increased access to more efficient and environmentally friendly fuels

- **Year 2**

- education
- development of alternatives for fuel wood, charcoal production, tannin

- **Year 3**

- education
- development of alternatives for fuel wood, charcoal production, tannin

- **Year 4**

- education
- development of alternatives for fuel wood, charcoal production, tannin

- **Year 5**

- education
- development of alternatives for fuel wood, charcoal production, tannin

## **Fuel and Oil**

*Target Audience - Recreational boaters, fishers, and transport vessels, public sector, tourism sector*

- **Year 1**

- Educational activities for 500 stakeholders

- **Year 2**
  - Development of used oil and bilge water collection and processing facilities
  
- **Year 3**
  - Maintenance
  
- **Year 4**
  - Maintenance
  
- **Year 5**
  - Maintenance

**Modification**

*Target Audience - Coastal residents (land owners) and hoteliers, farmers, public sector*

- **Year 1**
  - Educational activities for 500 stakeholders
  
- **Year 2**
  - Education
  
- **Year 3**
  - Education
  
- **Year 4**
  - Education
  
- **Year 5**
  - Education

## **Marine Debris**

### ***Target Audience – All***

- **Year 1**

- educational activities for 2,500 stakeholders
- initiation of pilot projects for small communities (e.g. establishment of debris removal regimes such as collection, installation of garbage cans, and disposal)

- **Year 2**

- education
- initiation of pilot projects for small communities (e.g. establishment of debris removal regimes such as collection, installation of garbage cans, and disposal)

- **Year 3**

- education
- initiation of pilot projects for small communities (e.g. establishment of debris removal regimes such as collection, installation of garbage cans, and disposal)

- **Year 4**

- education
- initiation of pilot projects for small communities (e.g. establishment of debris removal regimes such as collection, installation of garbage cans, and disposal)

- **Year 5**

- education
- initiation of pilot projects for small communities (e.g. establishment of debris removal regimes such as collection, installation of garbage cans, and disposal)

## **Sedimentation**

### ***Target Audience - Farmers, public sector***

- **Year 1**
  - Educational activities for 5,000 stakeholders
  - establishment of vegetative buffer zones along rivers, streams, and gullies
  
- **Year 2**
  - education
  - installation of dry stone walls (e.g. gabions, terracing)
  - development of soil retention dams
  - increase soil retaining vegetation/reforestation
  - establishment of vegetative buffer zones along rivers, streams, and gullies
  
- **Year 3**
  - education
  - installation of dry stone walls (e.g. gabions, terracing)
  - development of soil retention dams
  - increase soil retaining vegetation/reforestation
  - establishment of vegetative buffer zones along rivers, streams, and gullies
  
- **Year 4**
  - education
  - installation of dry stone walls (e.g. gabions, terracing)
  - development of soil retention dams
  - increase soil retaining vegetation/reforestation
  - establishment of vegetative buffer zones along rivers, streams, and gullies
  
- **Year 5**
  - education
  - installation of dry stone walls (e.g. gabions, terracing)
  - development of soil retention dams

- increase soil retaining vegetation/reforestation
- establishment of vegetative buffer zones along rivers, streams, and gullies

### **Overfishing/Overexploitation**

*Target Audience - All fishers, fish merchants, hoteliers, exporters, public sector*

#### **• Year 1**

- fisheries and marine sciences educational activities for 2,000 stakeholders
- attempt to identify and protect spawning aggregations

#### **• Year 2**

- educational activities targeting the implementation of sustainable fishing methods
- feasibility studies for the development of sustainable fisheries intensification activities (e.g. artificial reefs, FADS, aquaculture, mariculture)

#### **• Year 3**

- implementation of sustainable fishing methods
- development of sustainable fisheries intensification activities (e.g. artificial reefs, FADS, aquaculture, mariculture)

#### **• Year 4**

- implementation of sustainable fishing methods
- development of sustainable fisheries intensification activities (e.g. artificial reefs, FADS, aquaculture, mariculture)

#### **• Year 5**

- implementation of sustainable fishing methods
- development of sustainable fisheries intensification activities (e.g. artificial reefs, FADS, aquaculture, mariculture)

# ANNEX I

## MANGROVES

**TABLE 65: ARCADINS COAST – MANGROVES**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Bodmè Boula	Perimeter	5,480 yards	4	0	1	3	2
		5,000 meters					
	Area	20 acres					
		7 hectares					
Mang Mitan	Perimeter	1,260 yards	4	0	1	3	2
		1,160 meters					
	Area	10 acres					
		4 hectares					
Mang Royale	Perimeter	1,560 yards	4	0	2	3	3
		1,430 meters					
	Area	8 acres					
		3 hectares					

<sup>®</sup> Scale of 0-5. 0 = no threat, 5 = greatest threat

<sup>△</sup> Scale of 0-5, 0 = poor, 5 - best

**TABLE 66: ARCADINS ISLANDS – MANGROVES**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Cutting	Fuel/oil	Modification	Marine Debris	
Zilé Fa North	Perimeter	470 yards	1	1	0	5	4
		440 meters					
	Area	2.5 acres					
		1.0 hectares					
Zilé Fa Marsh North <sup>1</sup>	Perimeter	400 yards	--	--	--	--	--
		370 meters					
	Area	1 acres					
		0.5 hectares					
Zilé Fa South	Perimeter	170 yards	1	0	0	5	4
		160 meters					
	Area	0.4 acres					
		0.2 hectares					
Zilé Fa Marsh South <sup>2</sup>	Perimeter	50 yards	--	--	--	--	--
		44 meters					
	Area	0.04 acres					
		0.01 hectares					
Ti Zilé	Perimeter	200 yards	1	0	0	5	4
		180 meters					
	Area	0.5 acres					
		0.2 hectares					
Zilé Wiene	Perimeter	720 yards	1	0	0	5	4
		790 meters					
	Area	6 acres					
		2.5 hectares					
Zilé Wiene Marsh <sup>3</sup>	Perimeter	240 yards	--	--	--	--	--
		220 meters					
	Area	0.5 acres					
		0.25 hectares					

<sup>®</sup> Scale of 0-5. 0 = no threat, 5 = greatest threat

<sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

<sup>1</sup> included in total calculations for Zilé Fa North

<sup>2</sup> included in total calculation for Zilé Fa South

<sup>3</sup> included in total calculation for Zilé Wiene

**TABLE 67: LA GONÂVE – MANGROVES**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Anse-a-Galets*	Perimeter	5,430 yards	4	3	5	4	3
		4,960 meters					
	Area	130 acres					
		50 hectares					
Anse-a-Galets Port 1	Perimeter	550 yards	--	--	--	--	-
		508 meters					
	Area	2.4 acres					
		1 hectares					
Anse-a-Galets Port 2	Perimeter	310 yards	--	--	--	--	-
		280 meters					
	Area	0.6 acres					
		0.25 hectares					
Anse-a-Galets Disruption 1	Perimeter	1,550 yards	-	-	-	-	-
		1,410 meters					
	Area	7 acres					
		3.0 hectares					
Boucan Patat North	Perimeter	1,190 yards	4	0	0	2	2
		1,090 meters					
	Area	4.5 acres					
		2 hectares					
Boucan Patat South	Perimeter	1,670 yards	4	0	0	2	2
		1,520 meters					
	Area	14 acres					
		5.5 hectares					
Twa Lo	Perimeter	3,850 yards	3	0	0	2	2
		3,520 meters					
	Area	30 acres					
		12 hectares					
Grande Baie	Perimeter	1,620 yards	4	0	0	5	3
		1,480 meters					
	Area	12 acres					
		5.0 hectares					
Ti Gonâve 1	Perimeter	670 yards	3	0	1	2	3
		620 meters					
	Area	5 acres					
		2 hectares					
Ti Gonâve 2	Perimeter	330 yards	3	0	1	2	3
		300 meters					
	Area	1 acres					
		0.5 hectares					

<sup>®</sup> Scale of 0-5. 0 = no threat, 5 = greatest threat

<sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

\*includes Anse-a-Galets Port 1, Port 2, and Disruption 1

**TABLE 68: LIMBÉ COAST – MANGROVES**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Cutting	Fuel/Oil	Modification	Marine Debris	
Bodmè Margot (Bayeux)	Perimeter	4,260 yards	5	0	5	0	1
		3,900 meters					
	Area	65 acres					
		25 hectares					
Diotin	Perimeter	3,450 yards	5	0	5	0	2
		3,160 meters					
	Area	85 acres					
		35 hectares					
Bassin Caiman/ Bas Limbé	Perimeter	9,160 yards	4	0	4	0	3
		8,370 meters					
	Area	220 acres					
		90 hectares					
Ti Bourg Limbé	Perimeter	6,880 yards	4	0	4	0	2
		6,290 meters					
	Area	250 acres					
		100 hectares					

<sup>®</sup> Scale of 0-5. 0 = no threat, 5 = greatest threat

<sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

# ANNEX II

## CORAL REEFS AND SEA-GRASS BEDS

**TABLE 69: ARCADINS COAST (ARCAHAIE TO MONTRUOUS) – CORAL REEFS AND SEA-GRASS BEDS**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Sedimentation	Overfishing	Damage	Marine Debris	
Coral Reefs and Sea-grass Beds <sup>1</sup>	Perimeter	82,000 yards	4	5	2	4	3
		75,000 meters					
	Area	4,500 acres					
		1,800 hectares					
Trou Baget Coral Reef	Perimeter	1,200 yards	0	5	1	4	3
		1,100 meters					
	Area	15 acres					
		6 hectares					
Trou Forban Coral Reef	Perimeter	1,600 yards	0	5	1	4	3
		1,500 meters					
	Area	22 acres					
		9 hectares					

<sup>®</sup> Scale of 0-5. 0 = no threat, 5 = greatest threat

<sup>△</sup> Scale of 0-5, 0 = poor, 5 - best

<sup>1</sup>includes Trou Baget and Trou Forban Coral Reefs

**TABLE 70: ARCADINS ISLANDS – CORAL REEFS AND SEA-GRASS BEDS**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Sedimentation	Overfishing	Damage	Marine Debris	
Arcadins Islands	Perimeter	39,000 yards	0	5	1	4	4
		35,700 meters					
	Area	6,900 acres					
		2,800 hectares					
Arcadins Bank	Perimeter	14,300 yards	1	5	1	0	4
		13,000 meters					
	Area	2,300 acres					
		930 hectares					

<sup>®</sup> Scale of 0-5. 0 = no threat, 5 = greatest threat

<sup>△</sup> Scale of 0-5, 0 = poor, 5 - best

**TABLE 71: LA GONÂVE – CORAL REEFS AND SEA-GRASS BEDS**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Sedimentation	Overfishing	Damage	Marine Debris	
Coral Reefs and Sea-grass Beds	Perimeter	70,000 yards	2	5	1	3	4
		62,000 meters					
	Area	12,000 acres					
		4,800 hectares					

<sup>®</sup> Scale of 0-5. 0 = no threat, 5 = greatest threat

<sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 72: LIMBÉ COAST – CORAL REEFS AND SEA-GRASS BEDS (EAST OF LIMBÉ ISLAND)**

Location	Areal Extent		Threats <sup>®</sup>				Overall Condition <sup>△</sup>
			Sedimentation	Overfishing	Damage	Marine Debris	
Coral Reefs and Sea-grass Beds	Perimeter	3,700 yards	2	3	1	3	3
		3,400 meters					
	Area	120 acres					
		45 hectares					

<sup>®</sup> Scale of 0-5. 0 = no threat, 5 = greatest threat

<sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

# ANNEX III

## SANDY BEACHES

**TABLE 73: ARCADINS ISLANDS – SANDY BEACHES**

Location	Extent (Perimeter)		Threats <sup>®</sup>		Overall Condition <sup>△</sup>
			Modification	Marine Debris	
Ti Zilé	Length	210 yards	0	5	4
		190 meters			
Zilé Wiene	Length	760 yards	0	5	4
		690 meters			
Zilé Fa	Length	1,100 yards	0	5	4
		1,000 meters			

<sup>®</sup> Scale of 0-5. 0 = no threat, 5 = greatest threat

<sup>△</sup> Scale of 0-5, 0 = poor, 5 = best

**TABLE 74: LIMBÉ COAST – SANDY BEACHES**

Location	Extent (Perimeter)		Threats <sup>®</sup>		Overall Condition <sup>△</sup>
			Modification	Marine Debris	
Bodmè Margot (Bayeux)	Length	630 yards	0	1	4
		575 meters			
Limbé Bay (Diotin) Diotin	Length	5,000 yards	0	1	4
		4,560 meters			
Zilé Limbé	Length	160 yards	0	2	4
		150 meters			
Ti Bourg Limbé/ Bas Limbé	Length	3,000 yards	0	1	4
		2,800 meters			

<sup>®</sup> Scale of 0-5. 0 = no threat, 5 = greatest threat

<sup>△</sup> Scale of 0-5, 0 = poor, 5 = best



# ANNEX IV

## PERIMETER AND AREA OF ISLANDS IN STUDY SITES

**TABLE 75: PERIMETER AND AREA OF ARCADINS ISLANDS**

Ti Zilé	Perimeter	210 yards 190 meters
	Area	0.47 acres 0.2 hectares
Zilé Wiene	Perimeter	760 yards 690 meters
	Area	6.6 acres 3 hectares
Zilé Fa	Perimeter	1,100 yards 1,000 meters
	Area	6.80 acres 2.7 hectares

**TABLE 76: PERIMETER AND AREA OF LA GONÂVE ISLANDS**

Kaka Poul	Perimeter	155 yards 140 meters
	Area	0.30 acres 0.12 hectares
Ti Gonâve	Perimeter	2,070 yards 1,890 meters
	Area	21.96 acres 8.9 hectares

**TABLE 77: PERIMETER AND AREA OF ZILÉ LIMBÉ**

Zilé Limbé	Perimeter	2,000 yards 1,880 meters
	Area	33 acres 13 hectares



# ANNEX V

**TABLE 78: ROOMS AVAILABLE AT BEACH HOTELS ALONG THE ACADINS COAST**

Hotel	# of Rooms
Kyona	42
Kaliko	55
Wahoo	26
Ouanga Bay	27
Bora Bora	12
Moulin Sur Mer	68
Club Indigo	200+*

\* Undergoing renovation/expansion



# ANNEX VI

**TABLE 79: THREATS TO AREA COASTAL AND MARINE RESOURCES, THREAT REDUCTION ACTIVITIES, AND POTENTIAL IMPACTS (BENEFITS)**

Threat	Threat Reduction Activity	Target Audience	Impact (Benefit) 1	Impact (Benefit) 2	Impact (Benefit) 3	Impact (Benefit) 4
<b>All (specific threats listed below)</b>	Establishment of coastal and marine protected areas (CMPA) – type tbd; Educational activities including: association building, resource use conflict resolution, environmental	All (listed below)	All (listed below)	All (listed below)	All (listed below)	All (listed below)
<b>Damage to coral reefs</b>	Education; Installation of mooring buoys; Installation of marker/ navigation buoys	Recreational boaters, fishers, and transport vessels, public sector, tourism sector	Reduced damage to coral reefs	Increased fisheries production	Increased tourism appeal	Increased income for coastal communities
<b>Mangrove Cutting</b>	Education; Development of alternatives for fuel wood, charcoal production, tannin	Charcoal producers, households, fishers, farmers, street cooks, public sector	Development of more efficient and environmentally friendly fuels	Reduction of mangrove exploitation	Increase in fisheries production	Reduction of coastal erosion and increased beach stabilization
<b>Fuel and Oil</b>	Education; Implementation of proper disposal regime for used oils and bilge water	Recreational boaters, fishers, and transport vessels, public sector, tourism sector	Reduction of harmful hydrocarbons in the environment	Increased fisheries production	Healthier coral reefs, mangroves and sea-grass beds	Increased income for coastal communities
<b>Modification</b>	Education; Alternative income generating activities	Coastal residents (land owners), hoteliers, farmers, public sector	Increased fisheries production	Reduction of damaging coastal infrastructure	Reduced beach/coastal erosion; increase in stable beaches	Decrease in expenses for coastal defenses

Threat	Threat Reduction Activity	Target Audience	Impact (Benefit) 1	Impact (Benefit) 2	Impact (Benefit) 3	Impact (Benefit) 4
<b>Marine Debris</b>	Education; Establishment of debris removal regimes such as collection (garbage cans) and disposal	All	Increase in the tourism appeal of beaches (increase in tourism)	Decrease in harmful effects to coastal and marine organisms	Increase in fisheries production	Increased income for coastal communities
<b>Sedimentation</b>	Establishment of vegetative buffer zones along rivers, streams, and gullies; Installation of dry stone walls (e.g. gabions); Development of soil retention dams; Increase soil retaining vegetation/reforestation	Farmers, public sector	Decrease in sediment entering the marine environment	Decrease in arable land lost to erosion	Increase in fisheries production; Increased income for coastal communities	Increase in agricultural production; Increased income for coastal communities
<b>Overfishing/ overexploitation; including conch, lobster, coral, etc.</b>	Fisheries education, implementation of improved (SUSTAINABLE !) fishing methods; Development of (SUSTAINABLE ! ) fisheries intensification activities (e.g. artificial reefs, FADS, aquaculture, mariculture); Identification and protection of spawning aggregations	All fishers, fish merchants, hoteliers, exporters, public sector	Decrease in environmentally damaging (unsustainable) fishing methods	Increased fisheries production	Increased income for fishers	Increased income for coastal communities

# ANNEX VII

**TABLE 80: PROPOSED FIVE YEAR ANNUAL TARGETS FOR COASTAL AND MARINE ECOSYSTEM CONSERVATION FOR ARCADINS/LA GONÂVE AND LIMBE COASTAL ZONES**

Target	Target Audience	Year 1	Year 2	Year 3	Year 4	Year 5
<b>Establishment of coastal and marine protected areas (CMPAs)</b>	All (listed below)	Perform a complete bio-inventory of proposed site(s); Finalize extent (final boundaries) of proposed site(s); Finalize type(s) of site(s) to be designated; Educational activities for 2,000 stakeholders and public sector including: association building, resource use conflict resolution, environmental	Official designation of site(s); Prepare management plan; Educational activities for stakeholders and public sector including: association building, resource use conflict resolution, environmental	Implementation of management plan; Environmental educational activities for stakeholders and public sector including: training for CMPA "staff"	Environmental educational activities for stakeholders and public sector including: training for CMPA "staff"	Educational activities including: association building, resource use conflict resolution, environmental
<b>Damage to coral reefs</b>	Recreational boaters, fishers, and transport vessels, public sector, tourism sector	Survey of sites and input from stakeholders for installation of mooring and navigation buoys; Development of educational activities for 1,000 stakeholders	Installation of mooring and navigation/marker buoys	Maintenance	Maintenance	Maintenance
<b>Mangrove Cutting</b>	Charcoal producers, households, fishers, farmers, street cooks, public sector	Educational activities for 1,000 stakeholders; Development of more efficient and environmentally friendly fuels	Education; Development of alternatives for fuel wood, charcoal production, tannin	Education; Development of alternatives for fuel wood, charcoal production, tannin	Education; Development of alternatives for fuel wood, charcoal production, tannin	Education; Development of alternatives for fuel wood, charcoal production, tannin
<b>Fuel and Oil</b>	Recreational boaters, fishers, and transport vessels, public sector, tourism sector	Educational activities for 500 stakeholders	Development of used oil and bilge water collection and processing facilities	Maintenance	Maintenance	Maintenance
<b>Modification</b>	Coastal residents (land owners)	Educational activities for 500 stakeholders	Education	Education	Education	Education

Target	Target Audience	Year 1	Year 2	Year 3	Year 4	Year 5
	and hoteliers, farmers, public sector					
<b>Marine Debris</b>	All	Educational activities for 1,000 stakeholders	Initiation of pilot projects for small communities (e.g. establishment of debris removal regimes such as collection/cleanups, installation of garbage cans, and disposal)	Initiation of pilot projects for small communities (e.g. establishment of debris removal regimes such as collection/cleanups, installation of garbage cans, and disposal)	Initiation of pilot projects for small communities (e.g. establishment of debris removal regimes such as collection and disposal)	Initiation of pilot projects for small communities (e.g. establishment of debris removal regimes such as collection and disposal)
<b>Sedimentation</b>	Farmers, public sector	Educational activities for 5,000 stakeholders; Establishment of vegetative buffer zones along rivers, streams, and gullies	Installation of dry stone walls (e.g. gabions, terracing); Development of soil retention dams; Increase soil retaining vegetation/reforestation	Installation of dry stone walls (e.g. gabions, terracing); Development of soil retention dams; Increase soil retaining vegetation/reforestation	Installation of dry stone walls (e.g. gabions, terracing); Development of soil retention dams; Increase soil retaining vegetation/reforestation	Installation of dry stone walls (e.g. gabions, terracing); Development of soil retention dams; Increase soil retaining vegetation/reforestation
<b>Overfishing/ overexploitation; including conch, lobster, coral, etc.</b>	All fishers, fish merchants, hoteliers, exporters, public sector	Fisheries and marine sciences educational activities for 2,000 stakeholders; Attempt to identify and protect spawning aggregations	Implementation of sustainable fishing methods; Development of sustainable fisheries intensification activities (e.g. artificial reefs, FADS, aquaculture, mariculture)	Implementation of sustainable fishing methods; Development of sustainable fisheries intensification activities (e.g. artificial reefs, FADS, aquaculture, mariculture)	Implementation of sustainable fishing methods; Development of sustainable fisheries intensification activities (e.g. artificial reefs, FADS, aquaculture, mariculture)	Implementation of sustainable fishing methods; Development of sustainable fisheries intensification activities (e.g. artificial reefs, FADS, aquaculture, mariculture)

# ANNEX VIII

**TABLE 81: IUCN PROTECTED AREAS MANAGEMENT CATEGORIES**

Category	Definition
<b>Category I.a Strict Nature Reserve</b>	Protected area managed mainly for science. Area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.
<b>Category I.b Wilderness Area</b>	Protected area managed mainly for wilderness protection. Large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.
<b>Category II National Park</b>	Protected area managed mainly for ecosystem protection and recreation. Natural area of land and/or sea, designated to: (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.
<b>Category III Natural Monument</b>	Protected area managed mainly for conservation of specific natural features. Area containing one, or more, specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.
<b>Category IV Habitat/Species Management Area</b>	Protected area managed mainly for conservation through management intervention. Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.
<b>Category V Protected Landscape/Seascape</b>	Protected area managed mainly for landscape/seascape conservation and recreation. Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.
<b>Category VI Managed Resource Protected Area</b>	Protected area managed mainly for the sustainable use of natural ecosystems. Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.



# ANNEX IX

## ORGANIZATIONS WITH PROTOCOLS FOR COASTAL AND MARINE ZONE MONITORING

The following organizations engage in various protocols for coral reef and/or sea-grass and/or mangrove monitoring (this list is not exhaustive):

- Global Coral Reef Monitoring Network – GCRMN
- US National Oceanic and Atmospheric Administration – NOAA
- International Coral Reef Initiative – ICRI
- The International Union for the Conservation of Nature – IUCN The World Conservation Union
- International Coral Reef Action Network – ICRAN
- Australian Institute of Marine Science – AIMS
- Atlantic Gulf Rapid Reef Assessment – AGRRA
- Caribbean Coastal Marine Productivity Program – CARICOMP
- ReefBase
- Reef Check
- CORAL
- The Coral Reef Alliance
- The Nature Conservancy
- Hawai'i Coral Reef Assessment and Monitoring Program (CRAMP);
- Florida Keys National Marine Sanctuary Coral Reef Monitoring Program (FKNMS CRMP)
- Florida Keys National Marine Sanctuary Sea-grass Monitoring Program (FKNMS SGMP)
- World Sea-grass Association (WSA)
- Sea-grassnet
- Sea-grasswatch



# ANNEX X

FIGURE 6: MAP OF HAITI

