Lac – Implementation of long term monitoring and research plan

Applicant name:	Pieter K. Kats
Position:	Project manager
Organization:	Foundation for Progressive Environmental Solutions
Contact address	Lighthouse Beach Resort # 15
Telephone #	--
Cell phone #	(+599)7861799
E-mail:	kriskats@gmail.com
Website:	www.proes.org

Project Manager	Project Executive
Pieter K. Kats	Carina M. Kalke
Date: 22 September, 2006	Date: 22 September, 2006

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1. Project rationale

Mangrove wetlands, sea grass meadows and coral reefs dominate the land-sea margins in the Caribbean tropics. They harbor high biological diversity and, together with the land nutrient run-off, they form the basis of the coastal marine productivity. The primary productivity of mangrove, sea grass and coral reef ecosystems is assumed to be the basis of present and potential future yields of shallow water marine resources in the region. Lac has seen a decline in its mangrove population since the 60's. Lac supports Bonaire's only significant mangrove and sea grass ecosystem. As such, it is a recognized RAMSAR site. The mangrove stands are particularly important as nesting and roosting areas for birds. Most reef fish in the area spend at least some portion of their lives within the mangroves when mangroves are available. This has obvious implications for an island whose main tourist attraction is currently diving. The sea grass beds are important foraging areas for turtles (especially green turtles), which are protected by international law. This species that has already been designated as "endangered" is falling victim to unidentified stressors in Lac. Twenty percent of the green turtles captured in 2005 by Sea Turtle Conservation Bonaire, had cancerous tumors resulting from the fibropapilloma virus. The numbers of infected green turtles have increased rapidly in only the last seven years since the first infected turtle was observed.
It has become increasingly apparent that Caribbean coastal ecosystems are degrading because of increasing anthropogenic stresses, which are superimposed upon natural, local, regional and global trends. All this corresponds with the overall goal of Lac and the Bonaire National Marine Park.

> *"To protect the natural environment of Lac together with the naturally occurring species from degradation, and preserve the aesthetic appeal of Lac as an unspoiled and developed area promoting day recreational use"*

Approaching the present threatened problems, like the mangrove die back and the sand accumulation, is a considerable part of the conservation and protection of this unique environment.
In order to do this, some specific abiotic parameters and socioeconomic parameters are to be monitored. In the case of the abiotic monitoring, most of the attention will be called to the parameters of salinity, dissolved oxygen levels, temperature, nutrient levels. The socio-economic monitoring parameters will be based on recreation activities and overall use.
An important first step to any conservation effort is to establish a baseline to serve as an indicator of not only problems but also sustainable solutions.
Aside from its environmental importance, Lac also needs to be recognized for its attractiveness to tourists. Lac draws windsurfers from around the world. The Mangrove Info Kayak Center has one or more tours of the mangroves daily. Each tour often contains up to sixteen people. The riding academy Warahama does horseback trails in and around Lac. Lac has also been a favorite weekend place for the local Antilleans. This area already has two resorts, with possibilities for more in the future.

The sand accumulation and mangrove die off continue to threaten this delicate ecosystem, which in turn effects its viability for tourism. Bonaire has been an example for its planning

and implementation of structures that aid in sustainable tourism thus protecting our most valuable resource, the environment. Lac has so far been left relatively unstudied and is therefore slowly deteriorating without any real understanding as to why or what can be done to save this system.

With increasing pressure, but also increasing potential, the time to begin a thorough monitoring program is now. With proper monitoring and maintenance, Lac can continue to grow as a tourist attraction, but in a way that ensures its sustainability.

2. Description of the project

Much of the Lac area is either unstudied or understudied. This is an excellent opportunity to begin collaborations with universities that have Marine Science studies. Interns who have achieved a certain level of knowledge on field research will do three to six month internships focusing on Lac. After initial training, interns will participate in the monitoring as well as participate in outreach activities. The supervisory staff will be involved with and closely supervise all activities. These activities include:

- Temperature
- Nutrient level analysis
- Dissolved oxygen levels/ Salinity
- Monitoring circumstances (Temperature, Wind, Rainfall, Water level, etc
- GPS Recording
- Presentations: education/awareness for local people/tourists/students
- Socio-economic parameters
- Exit strategy
- Data processing/ data analysis

Some interns may wish to do additional activities depending on their school curriculum and area of expertise. If time and budget allow, the activities we would like to add include:

- Sediment mapping
- Water circulation (current speed and direction)
- Sand movement monitoring
- The inclusion of three additional monitoring points (points 13-15 shown in Attachment 1). These points are in open water areas and are therefore more difficult to access on a regular basis.

2.1 Goal(s)

Upon completion of this project, there will be a complete set of data for at least one full year of monitoring the Lac area. This data will serve as a baseline. From this baseline, sustainable solutions for the mangrove die-off, sand accumulation and fibropapilloma in green turtles can be derived. Further, this base line will be an important tool during the decision making of new developments in the area of Lac.

2.2 Objective(s)

We expect to achieve a greater level of understanding of the factors that are influencing Lac both positively and negatively. Only through increased understanding can any future plans for restoration and protection measures be devised. This data set can then be used by BNMP to assess the sustainability of any new proposed plans to use the area for recreation and tourism. Any proposed plans for building in Lac and thereby increasing tourism potential, will ultimately be useless if the end result is the destruction of the environment that people are coming to enjoy. This data will also address the causation of the three issues we believe to be most threatening to Lac: mangrove dieback, sand accumulation and the rapid increase of fibropapilloma in the green turtle. The exit strategy that we have devised will provide a standardized methodology for the long term monitoring of this area. Having a program already in place will prove to be an invaluable warning tool as pressure from tourism increases and in the event of other environmental changes.

2.3 Timeframe including tolerances

- Initial three-month control period – No interns will be involved at this point
- One-year of monitoring activities and data collection

See Explanation of the detailed project work plan for specific dates and timeframes for given activities.
Tolerances will need to be made for inclement weather when it renders certain monitoring points inaccessible

2.4 Preconditions & limitations (legal/ financial/ resources)

- Budget for at least 1 year
- Equipment (transport, office, boat, monitoring equipment)
- Quality of interns

2.5 Relations to other projects

- Continuation of the first two phases of the project to solve the actual problems in Lac, which includes the dieback of the mangroves and sand-accumulation.
- This monitoring will serve as preparation for an additional study of fibropapilloma affecting green turtles
- The data obtained from this monitoring project will be useful as a baseline for impact studies, which should be required of anyone planning to build around Lac.
- The data obtained from this monitoring project will be useful for Cynthia Lott as she continues her conch studies

3. Explanation of the detailed project work plan

- October 1st 2006 - December 31st 2006 - Preliminary monitoring - (No interns involvement at this point) Twelve monitoring points have been pre-selected based on their accessibility and distribution. This phase will provide time to readjust for any unforeseen logistic difficulties with equipment and/or said monitoring locations.
- January 1st 2007 - December 31st 2007 – One year monitoring phase
- Temperature – Temperature will be recorded automatically through the use of ten submersible thermometers that will be placed at ten points to be determined within initial 3-month logistic planning phase.
- Nutrient level analysis – Phosphate levels will be recorded monthly using chemical water test kits. Water samples may eventually be sent to Puerto Rico for evaluation, but the self-testing with a kit will be our back up until other arrangements have been secured.
- Dissolved oxygen levels/ Salinity – Values will be recorded 5 times per week using a multi parameter probe that digitally displays the values for all 12 monitoring locations (1 -12). (See attachment 1 for map of actual locations)
- Monitoring circumstances (Temperature, Wind, Rainfall, Water level, etc.). – Will be recorded from one point only, 5 days per week using a portable weather station, a tide gauge and permanent rain gauge.
- GPS Recording – GPS point record of monitoring points, submersible thermometer locations, key die-off points and general mapping. Also, when applicable, recording of fresh water inflow points.
- Presentations: education/awareness for local people/tourists/students – Ongoing community outreach to raise interest and awareness through Power Point presentations and the distribution of hard copy info materials.
- Socio-economic parameter-analysis of tourist numbers in and around Lac by compiling information already collected by STINAPA.
- Exit strategy –Report to STINAPA-Bonaire for the proposed long term monitoring plan based on initial 15 months
- Data processing/ data analysis– Will be carried out by R. Burnham

4. Reporting requirements

All surveyors (interns, volunteers and supervisory staff) will be required to input all data collected on a weekly basis. This data will then be compiled by a specialist for the final report and journal at the end of the one-year period.

Additionally, any grantors who donate funds for this project will require documentation as to how funds have been allocated. Many also require some form of written document as to the success of the project. Specific grantors have not been determined at this time and as such, given outside reporting requirements will vary.

5. Quality control

Interns will be selected based on a number of criteria and the confirmation of all references.

All interns and volunteers will first complete a training period where they will demonstrate a commitment to quality and level of understanding. All interns and volunteers will work closely with supervisory staff. Interns will have weekly meetings with supervisors. Interns found to be conducting themselves in an inappropriate manner while participating in monitoring activities, will be terminated.
Presentation of progress reports every three months to STINAPA-Bonaire will give an accurate view as to whether the proposed schedule is realistic and on track. These presentations will also allow for feedback from an outside source. While the supervisory staff and project manager are coordinating the program, quarterly meetings with STINAPA will serve as an additional evaluation tool.

6. Project risks

One challenge that we will face is the fact that our timeframe is somewhat dependant on the involvement of interns. There can be issues arising with the availability of interns seamlessly throughout the one-year period. Data will need to be collected daily in some areas and that responsibility will fall to the supervisory staff when interns are not available. Should there be a shortage of help over an extended period, delays with journals and data processing will arise. Our best defense in preventing delays due to shortages in help is to have a strong network of trained volunteers that are available on an "as needed" basis. This network is already growing as enthusiasm mounts with the idea that action will finally be taken to protect this area that is important to so many people on Bonaire.

7. Stakeholders

- STINAPA-Bonaire/Bonaire National Marine Park
- Universities
- Funders
- Government of Bonaire and Dutch Government
- Visitors to Bonaire
- Local population of Bonaire
- Business owners in and around Lac
- Progressive Environmental Solutions
- Wannadive Bonaire

8. Budget

October 1st 2006 – December 31st 2007

REVENUE

Corporate Grants:	STINAPA-Bonaire Grant		n.y.d.[1]
Donations:	Housing Interns		15.000
In Kind:	STINAPA-Bonaire (BNMP):		
	Boat (limited use)		25.000
	Monitoring Equipment		10.000
	NGO-Platform:		
	Meeting room		3.000
	Progressive Environmental Solutions		
	Office equipment		10.000
	Office supplies		1.500
	Vehicle		6.500
	Wannadive Bonaire:		
	Diving equipment		2.000
	Underwater-survey equipment		500
	Info Mangrove Kayak Centre:		
	Kayaks (1 or 2 days a month)		1.000
		TOTAL:	**74.500**

EXPENSES

Personnel

• Title of person: Project manager (FT)[2]	37.500
• Title of person: Supervisor (FT)	37.500
• Accounting personnel (PT)	4.500
• Interns	6.000
• Benefits/insurances	4.000
SUBTOTAL:	**89.500**

Non-Personnel Costs

• Rent:	Office	9.500
• Office Equipment:	Printer/Fax/Copy	600
• Software:	Duflow/Idrisi	4.500
	G.I.S.-software	2.500
Monitoring Equipment:	Garmin portable G.P.S.-unit	500
	Portable weather station	460
	Rain gauge	60
	Portable water quality kits	4.000
	Staff gauge	100
• Transport	Truck/Fuel	20.000
• Website:	Design	1.500
	Domain	200

[1] N.Y.D.: Not yet decided
[2] FT: Full Time

• Internet:	Connection	400
	Monthly costs	1.125
• Telephone		1.500
• Publications of quarterly and annual report		3.500
• Information materials		2.000
• Postage		300
	SUBTOTAL:	**52.845**
Extra/Unsuspected costs (5%)		10.842,25
	TOTAL[3]:	**227.687,25**

[3] Budget in ANG

9. Attachments

Attachment 1: Monitoring locations Lac