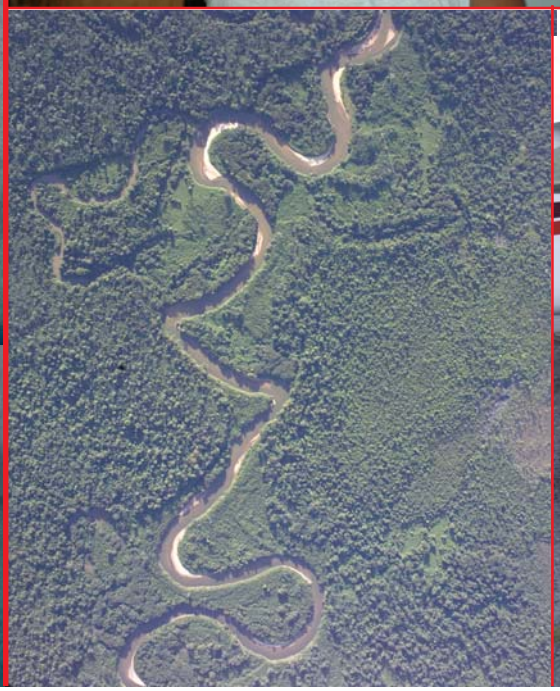
INFORMATION: THE FIRST CONSERVATION ASSET

A Demonstration and Training Project to Amplify Indigenous Community Capacities in Environmental Information Management

Punta Gorda, Belize, April 2007
First Peoples Worldwide
Local Earth Observation



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First Peoples Worldwide/Local Earth Observation

This is the companion report for a parallel project that will take raw data gathered during the demonstration and training project as the baseline for asset allocation mapping (AAM) exercises in three Toledo communities: Conejo, Medway and Barranco - to be completed over the next 2-3 months.The main funder for this sub-project is CTA Wageningen, The Netherlands, under its mandate to support uses of ICT, Information and Communication Technology, by land-based communities. The lead funder for the AAM exercises is the New York Community Trust.

THE INTENT OF ASSET ALLOCATION MAPPING

since the 1992 Earth Summit, land-based peoples living in remote areas have obliged to deal with a succession of newcomers to the frontier: scientists, conservationists, eco-tourist operators, bio-prospectors. In contrast to loggers and miners, these resource interests are not extractive but depend upon the habitat remaining intact. Not surprisingly, the global conservation community has joined this industry, which so far has displayed scant inclination to share the revenues with the traditional and customary owners of such assets. Allocation signifies choosing between options for asset management, which may complement or conflict with one another. This must be informed choice but in that sense indigenous communities are disadvantaged. The ultimate purpose of asset allocation mapping is to enable indigenous communities to assume informed control, not consent, over the allocation of their territorial assets. To do this, they need not only to arrive at their own evaluations of these assets but also to understand the multiple values assigned to their assets by others: to map the ways in which assets are imagined, defined and evaluated by an unfamiliar and mutating array of external interests. Just as a specific genre of mapping, “tenure mapping” evolved as a way of enabling communities to pursue negotiations over tenure, so asset allocation mapping prepares communities to implement the results: to exercise stewardship of their territories and deal with rival claimants. Tenure mapping is about the past; asset allocation mapping is about the future.

The Stewardship of biodiversity is an information-intensive activity and local capacities in environmental information management are essential if scattered groups in remote areas are to take on the practical tasks of land stewardship. It is not enough to have a unique traditional knowledge base coupled to traditional conservatiom codes that are based upon compliance. These are self-evidently effective in the absence of external pressure upon indigenous lands, but are unlikely to deter outsiders with designs upon community assets but no respect for traditional authorities. To cope with such external pressures some indigenous communities have made opportunistic use of the information technologies applied by exponents of science-based conservation. To amplify traditional knowledge and codes, communities need capacities in three areas:

1) The generation of a unique data base, that combines data from two sources: traditional and direct field observations,
2) Technical capacity to analyse the data in terms of local agendas.
3) Practical capacity to monitor, protect and manage their territory.

INTENTIONS, RESULTS AND UNINTENDED CONSEQUENCES

Capacity-Building Strategy: Build on Proven Capacities; combine training with gathering of useful data, that meetscommunity stewardship needs.

Where tenure mapping is widely practiced, a complementary organizational relationship has evolved, whereby community-based mapping teams groups gather original data, from GPS-based observations and conversations with traditional authorities, while mapping centres, housed in indigenous associations or local support NGO's, provide the GIS-based services needed to compile and print final maps, under the direction of the teams. This demonstration and training project builds upon this mutual support relationship and trainees will be invited from both community mapping teams and the mapping centres.

Localisation, of Information Technology and Community Control Mechanisms.

Localisation depends upon a variety of questions. Can the skills be learned in a community or association setting? Can appropriate geomatic technologies be successfully transferred to a community setting? Are the facilities and power adequate? What kinds of local institutions are required to manage the environmental information process, from the gathering of raw data, through its subsequent conversion to information, to applying this information so as to advance community stewardship agendas. These agendas provide context for designing the demonstration and training exercises. All these exercises were planned to acquire immediately useful data to the participating groups and the communities they worked with. This applications-driven development process serves dual purposes: to demonstrate to communities that this data-gathering makes sense, to provide trainees with data that they can spend several months analyzing and applying. This 'learning by doing' strategy works well in a community setting.

Demonstration and Training: Intentions, Effects, Results.

This demonstration and training project builds upon this mutual support relationship and trainees with varied experience and expertise in community-directed mapping will be invited from both community mapping teams and the mapping centres. Equal emphasis is placed upon demonstration and training in this workshop. Successful demonstration indicates that trainees understand the *utility* of the data gathered, even if they cannot immediately master whole sequence, from gathering raw data to its conversion to useful information to its eventual application. The training effect sought was for trainees to be taken through the process, and reach the point where they feel confident that, given more practice, good manuals, and mentoring, they could take over the entire process without any mor direct training. (see Toledo Mapping Centre follow-up).

Individual Capacity-building: Results

Of the 9 trainees, 5 felt that, given more practice, some mentoring, and good operational manuals, they could learn the entire sequence: mission planning, aerial data acquisition, image analysis and processing, conversion to applicable information. The other 4 trainees preferred to first acquire more experience with computers and photography, and with field verification methods. However, although these 4 trainees did not feel as confident as the other 5, they made it clear that they understand the value and utility of the data that was acquired during the training exercises. As Karel and George from Suriname put it "We haven't yet learned how to acquire and process aerial data but we understand its utility and know how to use the results."

Indigenous Association and NGO Capacity-Building

By coincidence, several of the Punta Gorda based groups have lately been considering combining their GIS resources and capacities and create a mapping centre for communities in Toledo District. This makes sense; they could then buy and share equipment that is relatively expensive but needed only from time to time: eg, wide-format scanners, laminators. In this sense the workshop was timely. Now, the same groups are unanimous in support of acquiring a shared DADA system as part of such a Toledo community mapping centre. After learning how the raw data can used for mosaic making and the generation 3D models, the Punta Gorda trainees felt that the imagery gathered in 22 hours of flyimg had generated a year's worth of analytical work.

Unintended Consequence: Toledo Public Access Image Library

This result was not imagined while planning this workshop. It is a measure of the enthusiasm voiced by other organisations than the participating communities and mapping groups: among them the Toledo Development Council, the Mayor of Punta Gorda, the local tourism association. As the map on the following page indicates, the over 3500 images acquired during 13 combined training exercises cover a significant portion of the District of Toledo, all of them critical areas for marine and terrestrial stewardship. It was clear from the training that although image sets may be gathered for a single specific purpose, they are in fact typically multi purpose and this response clearly shows that the interest is multi-faceted. The image library emerged as an instrument for archiving the digital imagery and making it available to all interested persons, from community members who may wish only for individual images to research and enforcement officials from resource management agencies. All participating groups signed an agreement that the images are to be made freely available; that they could be used in reports and research documents but may not be used for commercial purposes. Users are asked only to pay for the costs of CD-making, printing, mosaic making or other image processing. SATIIM has agreed to act as the 'custodian' for the imagery for the time being. A proposal on the image library is contained within the Toledo Mapping Centre proposal.

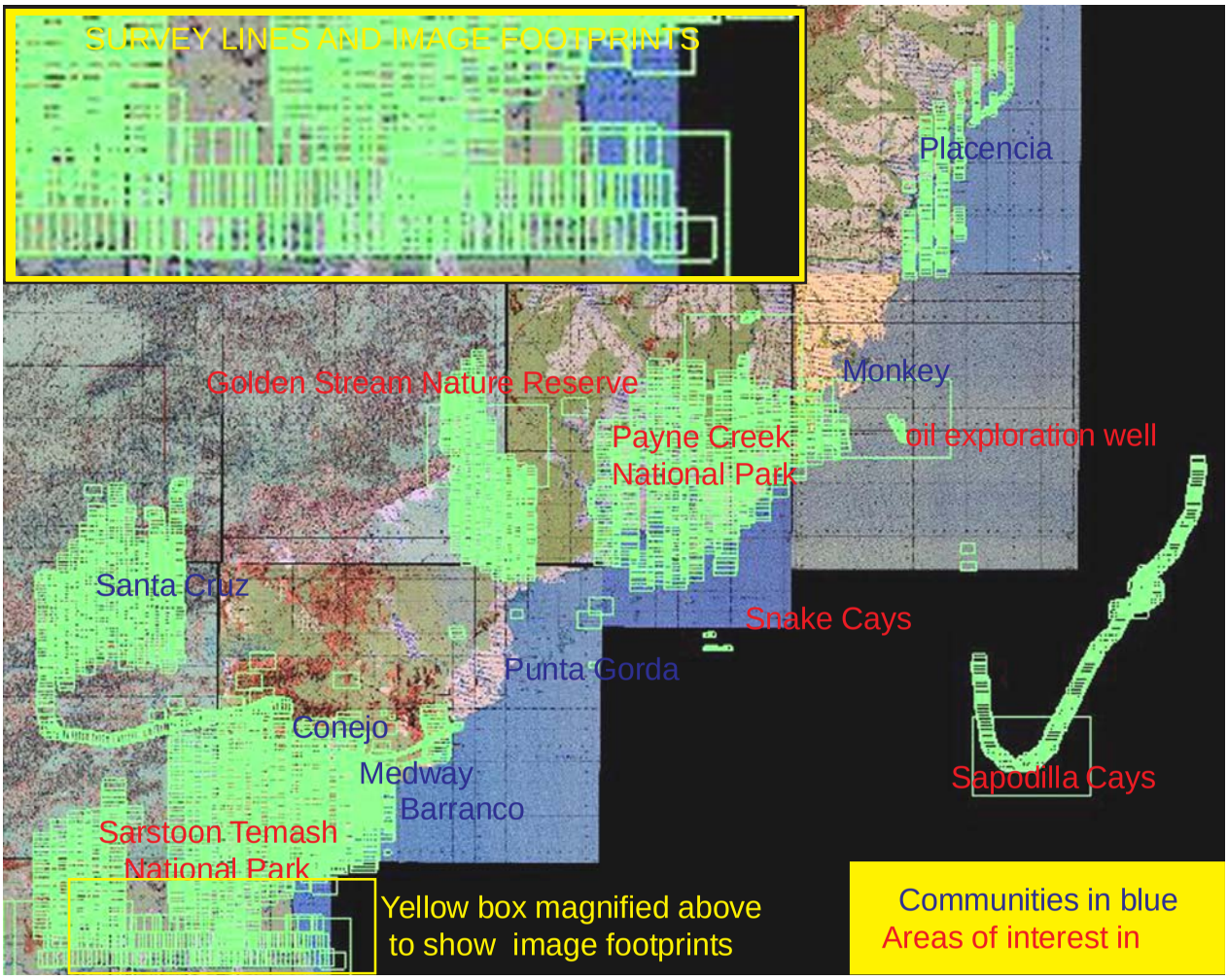
Unintended Consequence:Adding DADA to the Toledo Mapping Centre

This was partially intended, specifically by those Punta Gorda-based groups that have recently began to talk about increasing efficiency and minimising duplication by merging their GIS and community mapping resources into one Toledo Mapping Centre. Such a centre could qualify as the natural and eventual custodian of theToledo Image Library. After training and demonstration sessions, the groups felt that these capacities for aerial and space-based data gathering should be added to the Centre, in the form of one camera system, to be maintained by the Centre

SURVEY AREAS AND MAIN APPLICATIONS

The map below shows the original 8 survey ares and applications identified in during the March 2006 planning meetings. Since then, several more locally-based NGO's joined the four Punta Gorda groups: the Monkey River Fishermen's Association, Julian Cho Society, Widlife Conservation Society (WCS), and several communities and NGO's compaigning to control industrial-scale resort development around Placencia. As the appended letters from six of these participating groups indicate, one they received the imagery, they quickly identified new applications for the new data.

Barranco community: Village planning, logging impacts,
Medway community: Village planning, family and community boundaries
Conejo community: For current legal challenge over recognition of community lands
Santa Cruz community; For current legal challenge over recognition of community lands
Monkey River community: Fishermens Association; protected area over fishing grounds
Oil exploration well: GPS position for legal challenge on absence of an impact assessment.
Snake Cays: Garifuna National Council and local communities, to plan a 'spiritual sanctuary'
Sapodilla Cays: Reef International for training community-base marine 'para-biologists'
Sarstoon Temash National Park: For SATIIM to contest proposed oil exploration
Golden Stream Nature Reserve: For Yax Che Trust, management and monitoring
Payne Creek National Park: For WCS for coastal and off-shore management.
Placencia: for local communities and NGO's contesting resort industry impacts
Punta Gorda: For town planning and as illustration for tourist brochures

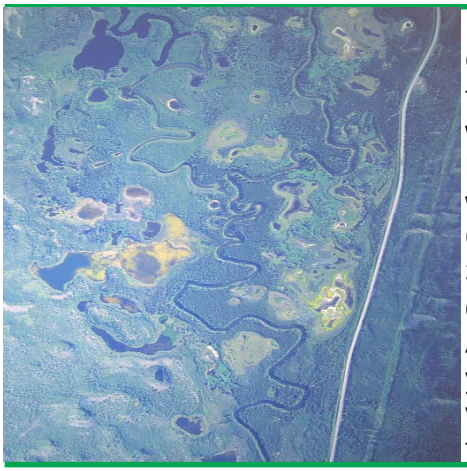


THREE PRIMARY SOURCES FOR LANDSCAPE DATA

Trainees will be introduced to three image sources: satellites, aircraft, kites/inflatables.These vary in terms of image resolution, ground coverage, acquisition costs and the potential for localisation. For indigenous stewardship purposes, the more detailed the ground resolution, the better. Satellites typically cover large areas at low ground resolutions; but these are improving. The image acquisition system which offers the finest detail and is most easily localised is a kite-borne camera. Where larger ground coverage is required, vertical photography from light aircraft is a viable option.

IMAGES FROM SATELLITES

Satellite images typically cover large tracts at low ground resolution. Such resolutions are improving, but at considerable cost. It is possible to acquire older, 30metre resolution Landsat imagery at either low cost or free and trainees will be introduced to methods for obtaining such free imagery. The most expensive civilian imagery is from Quickbird, which has a ground resolution of 60cm. A single image, used for investigating catastrophic floods in the Pilippines, in late 2004, cost $5000. The images to the right compare 60 cm imagery gathered with a Kodak N14 camera, at about a third of the cost, and delivered next day - rather than 3 months later.



IMAGES FROM LIGHT AIRCRAFT

Often called “reconnaissance photography” this technique has traditionally relied upon 70mm or 35 mm cameras.This image was obtained for the Little Salmon/Carmacks First Nation, Yukon, Canada, for use in planning a Wildllife Management Area. It was taken from a height of 8,200 about ground with a Rolleiflex 6008 Integral. At a scale of 1:50,000, this image covers 3km x 3km on the ground. With a lupe, it is possible to discern the dashed line along the Alaska Highway, which is 10cm in width. Although even the more advanced digital cameras cannot yet yield equivalent ground resolution, they have compensatory advantages, in terms of image replicability, spectral consistency and the scope for making mosaics and 3D models from digital files.

TETHERED AERIAL IMAGES

Cameras can be attached to either kites, balloons or blimps. Most cradle/camera/control combines weigh 500 - 700 grams and include an 8-10 MP camera, with infra-red control and video downlink. A kite-based system costs less than $1000; blimp-camera combines cost around $8000. Kites require steady moderate winds and higher flying skills; blimps need low winds or calm air and are more controllable. Camera retrieval is a problem when flying kites over water. However, image quality is equivalent. Kite photography is a good introduction to tethered aerial imaging

This image was enlarged to one 1x2m for Galibri (Suriname) to use for community planning,

MULTIPLE APPLICATIONS

As the annexed letters indicate, groups participating in the workshop imagined a variety of applications for the aerial data gathered. The above stereoscopic sequence was acquired for Stinasu the NGO responsible for managing Suriname's network of Nature Reserves. An earlier attempt to evict the miners was frustrated by a venal judge , on the grounds that the mines were outside the reserve, an opinion reversed by his GPS position image. The survey of clear-cuts was used by the Algonquin forestry team to contest a government attempt to reduce the width of uncut forest along waterways.

For the Algonquin community of Lac la Barriere to monitor compliance by loggers with rules on distance between clear-cuts and water bodies.

THREE CAMERA MOUNT OPTIONS

Inside Door..... Outside Door..... Cargo Door

On the left, the first Inside Door mount used by LEO, with a redundant yaw compensation mechanism, soon droppped in favour of the wooden construction used for a training in Colombia. All units are attached to the platform: camera, light -meter, stopwatch, GPS. The Outside Door mount below is a prototype, designed for the Punta Gorda training and based upon Dana Slaymaker's earlier mounts. Outside Door mounts are compact, relatively discrete and do not need certification. But in-flight access is a problem: no reliable ways of reaching into the slipstream to adjust the camera or change batteries and cards. Another problem is the consequent dependance upon the aircraft cigarette lighter, for- computer, cameraand GPS. This initially caused the system to crash, but was resolved by taking portable power sources along. The advantages of door/inside mounts is that the camera can be manipulated and system operation can be simplified accordingly. This incurs penalties, in terms of the suitability of the imagery for later mosaic and 3D modelling, but works well as a training system for in-flight camera operation. During the 10-day Cali Colombia training, all 12 trainees, got to plan and fly one mission and to learn how to evaluate the results. Missions were planned on a computer and the flights lines entered into a large-screen GPS. The pilot flew the lines; the camera operator fired a 70mm. Rolliflex 6008 Integral at designated photo-intervals, using a stop watch, and changed film every 24 frames. Camera operation is even further simplified by using the intervalometer built into the Kodak N14. The disadvantages for modified doors are the bureaucratic chore of maintaining the required certification - and the door itself is cumbersome and conspicuous. A cargo hatch was not used as direct operator-pilot contact was essential for training purposes, and for prototype testing,.

COST OF A COMPLETE SYSTEM : $10,000. The system goes beyond the technology for planning and executing aerial data-gathering missions to include: a quality flatbed scanner, $700) for mission planning, a medium format archival printer ($900). Software, including Manifold GIS and Adobe ($1200), laptop ($1200), GPS plus accesories ($8 00), Kodak N14, plus spare camera ($3500), 3 wide angle Nikon lenses (1000), camera mount ($700)

Discrete Aerial Data Acquisition - DADA

AIRCRAFT IMAGING: Narrative, Missions Completed, System Trials, Lessons. Revisions

Although the middle of the dry season, it rained heavily every morning and some afternoons. However on five days, it was marginal and we managed to get in one or two missions each day. Even then, the sky was generally overcast and most missions were conducted below 2,000 feet – using 24mm or 28 mm wide angle lenses. All trainees had the opportunity to participate in one or two missions. However, the aircraft did not have a 4-way headphone capacity. Dana and the pilot could talk, but the trainees were excluded.

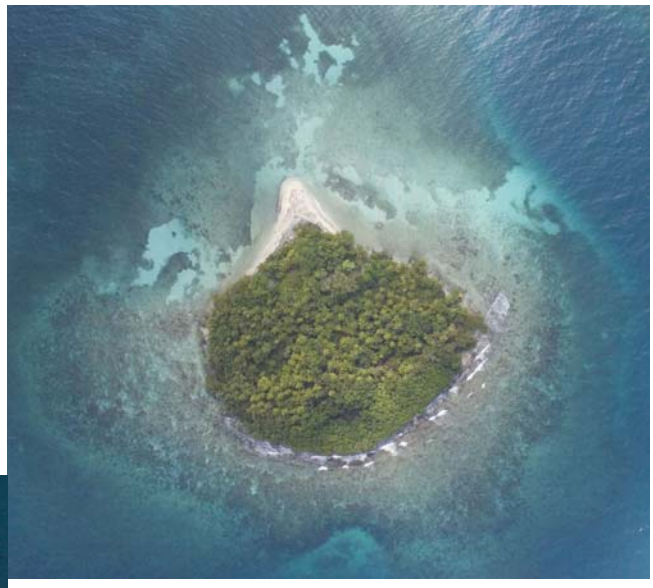
We covered a larger total area than envisioned during last years planning, provided imagery for more user groups, covered more communities and completed thirteen missions, compared to ten planned. About 3500 images were taken. Their cost: air time, pilot, camera operator, per frame was less than $2.00.

Early technical hitches were caused by plugging too much equipment into the aircraft cigarette lighter: camera, laptop, 1/2 GPS units. Resolved by using the AVMAP EKIV GPS power supply, and using the camera batteries: posing the problem of changing batteries in the slipstream. The pilot had initial problems, in reading the navigation guide on the laptop screen. The large screen on the AVMAP GPS was far easier to read but of course did not have flights planned.

The original design goal was a mount prototype that could fit either front window, or the cargo hatch. However, it both types lost functions when blended, with hardly any weight-saving, so we stayed with the window mount. In any event, given the demands for system adjustment and dealing with constantly-changing weather patterns the pilot and operator needed to be in close contact.

Revisions and Additions

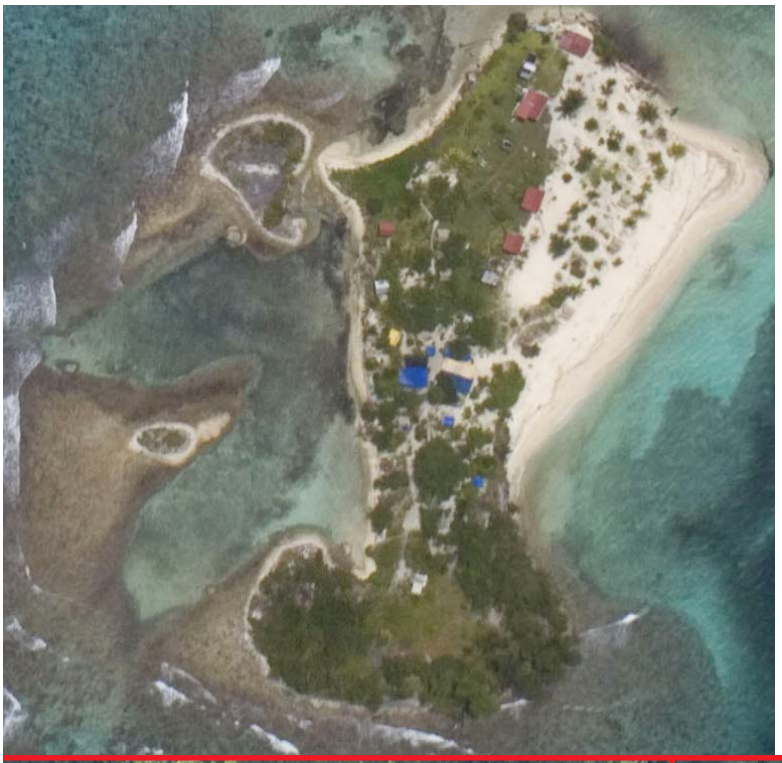
1. An operational system should include an independently powered 3-headphone set that can be plugged into the pilot intercom.
2. All system elements should use a portable power supply.
3. Pilot should have his own navigation screen; either a Programmed AVMAP or an equivalent sunlight-readable screen linked to the laptop.
4. For the next phase, LEO will make a cargo door mount, Sujoy will look into programming the AVMAP with mission flightlines.



These two images are of Snake Cays, currently part of the Port Honduras Marine Reserve, a no-take conservation area. Snake Cays are of strong spiritual importance to Garifuna communities, who use them 4-5 times a year for rituals - which require a species of local shellfish. The Garifuna National Council would like to see the Snake Cays designated as a 'spiritual sanctuary' permitting the strictly limited use of shellfish.

COMMUNITY PLANNING

The top image is of the Maya community of Santa Cruz and its lands. This is in fact an image mosaic consisting of 40-50 merged images. The enlarged extract indicates the ground resolution, an estimated 30cm. The lower image is of the Garifuna community of Barranco, currently being courted by the oil exploration industry as a base for seismic drilling within Sarstoon National Park. Coordinated by SATIIM, Barranco and 5 MayA communities are contesting the project



The image on the left was obtained for Reef Conservation International, a local research an dtraining NGO, and is one of a series covering the Sapodilla Cays - also of interest to the Garifuna National Council. This enlarged image indicates how even a relatively modest tourist operation can stress such a vulnerable reef/ mangrove/lagoong habitat.

The image below was obtained for the Ya'axche' Conservation Trust, a Maya-controlled NGO responsible for managing the privately-owned Golden Stream Nature Reserve.The source data was obtained at a 30cm ground resolutions. The enlargement shows that this allows dominant or indicator species to be identified and subsequently counted automatically.

All of the aircraft imagery had a 'forward lap' to facilitate stereoscopic analysis and optimise mosaic making. The stereo-pair to the left is of the sphagnum moss habitat in Sarstoon Temash NP, unique in the region and threatened by oil exploration. SATIIM,as co-manager of the park. will be using this and other images in ITS efforts to prevent, or control, oil development

Detecting and Monitoring Impacts of Industrial-Scale Development

The upper and left images show in detail the effects of intensive tourist development in Placencia. These images will be made available to Destinations Belize, a responsible tourist operation, which is challenging such intensive resort development and associated mangrove destruction.

The lower right images show an exploratory oil drilling platform, 5 km east of Monkey River. According to local environmental groups, there was no environmental impact assessment registered for this exploratory drilling platform. All that was needed, in that case was evidence, in the form of a GPS position tagged to an image, for the local groups to demand an EIA. The Monkey River Fishermen's Association was provided with imagery needed to plan a locally-managed marine protected area.

LEFT TO RIGHT

Thomas Caal,
David Itch
Ron James
Joe Villafranco
Sujoy Chaudhuri
George Awankaroe
Joshua Lichtenstein
Karel Aloewanai
Cordelia Che
Jessica Friswelll

Photographer, Ron Vave

FOLLOW-UP ACTIONS

The first three follow-up actions will be combined in a proposal to be submitted elsewhere for funding the fourth will be covered by an existing budget. The fifth is yet to be decided.

1. After 6 months, a review of progress in the Toledo Image Library. Who has used it and what image forms were requested? Suggestions for improvements – not funded.

2. After the participating groups have had 6 months to analyse and apply the data gathered during the workshop, a review of progress and utility of mosaic and 3D model making methods – not funded.

4. A demonstration of a version of the Punta Gorda system, adapted to a cargo hatch. This demonstration will be part of the 'field trip' element of the Round Table on FPW's Indigenous Stewardship Initiative, slated for Fiji this June. This prospect was discussed with Ron Vave, University of the South Pacific, during the workshop. There will be a strong contingent of community-based stewardship at the round table and we hope that this demonstration will lead to a full, South Pacific, training workshop later in the year. To be covered by Round Table budget


Ron James (right)
George Awankaroe

5. Suriname Training in Impact Assessment and Habitat Recuperation. Suriname.
(see next page).

A FOLLOW-UP PROPOSAL FOR SURINAME

Training Exercise: Mining Impact Assessment and Landscape Recovery Plan

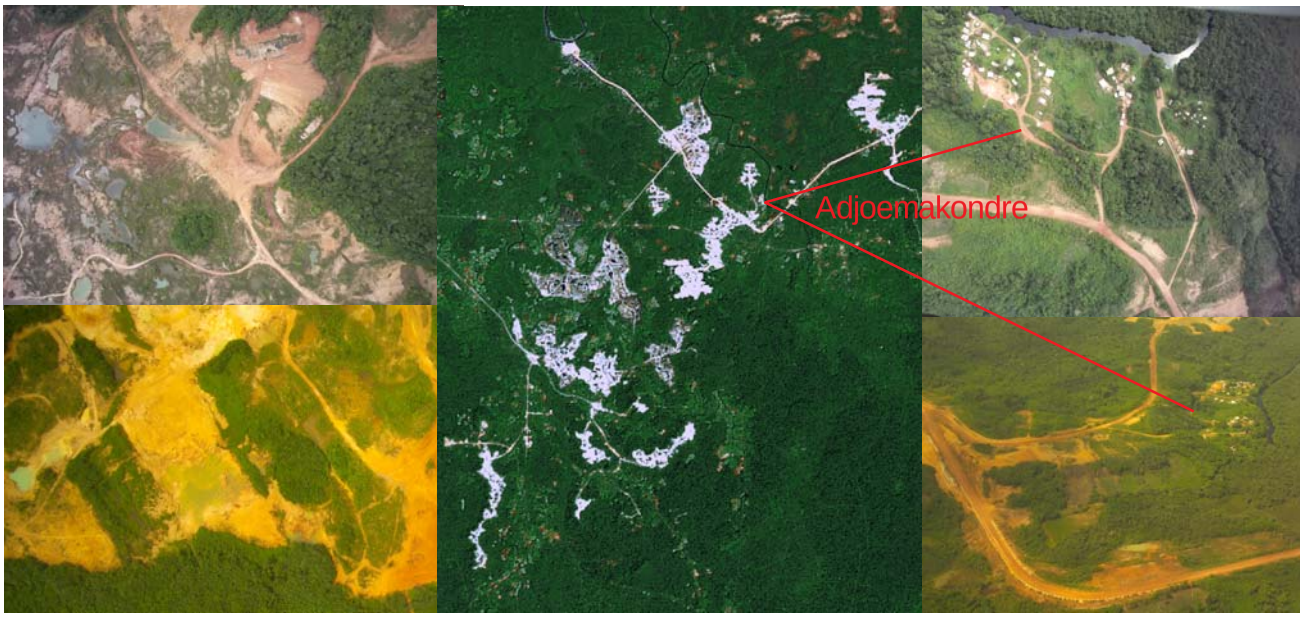
This follow-up proposal evolved while planning Allan Smith's catch-up training in kite photography. It would enable the three trainees from Guyana and Suriname, with the least experience in GIS, to get started in aerial imaging.

The training area would be a huge tract in northern Suriname affected by over 20 years of bauxite mining. In 2004, VIDS (the Association of Inidgenous Village Leaders) asked LEO to obtian aerial evidence of the impacts of buaxite mining on the community of Adjoemakondre. With support from the National Geographic Conservation Trust, LEO acquired 115 images of these impacts.

These images are ideal for training. The atmosphere, broken, low-level clouds made systematic, parallel line survey impossible and the images were obtained opportunistically at varying altitudes. This presents trainees with the tasks of locating individual images in the landscape, estimating their varying scales and resolutions and dealing with the affects of varying light conditions.

The Landsat-based background image map below shows how conspicuous these impacts are from space. To the right is Adjoemakondre hemmed in against the river by the bauxite workings. Much of the affected terrain is open and therefore ideal for kite-flying. This will enable the trainees to utilise and compare all the three levels of imaging summarised earlier: satellite, aircraft, kites. The Garmin iQue M GPS/PDA combines will be put to use in this training.

The trainees will be able to observe and record the variety of impacts and their duration. They will also be able to trace and compare recovery rates in various micro-habitats, and compare these with the progress in any current managed reforestation projects. Suralco (the Suriname subsidiary of Alcoa Aluminium) has committed in public their intention to restore the landscape to "better" then before the mining. However, there is scant evidence of this intent upon the ground. The two images on the left contain what might turn out to be reforestation nursery plots, but could be squared off forest patches. This will enable the trainees to evaluate the current restoration effort and propose a more effective process of landscape restoration, one in which the affected communities would participate, both in planning and the restoration process itself, and which will be sent to Suralco.



ANNEX 1

REPORT FROM PLANNING SESSION, TOLEDO, 2006

ASSET ALLOCATION AND INDIGENOUS PEOPLES
PROTECTED AREAS PROJECT

Belize Report April 2006

Peter Poole PhD
Local Earth Observation

Forward: *Indigenous peoples and protected areas research conclusions, suggestions and implications for the design of*
a fund to support indigenous peoples protected areas.

1. **General**

2. **Place**

3. **Organisations and Issues**
   - 3.1. Sarstoon Temash National Park (STNP)
   - 3.2. Five SATIIM Communities
   - 3.3. Otoxha and Mabil Forests
   - 3.4. Golden Stream Nature Reserve (GSNR)
   - 3.5. Payne's Creek National Park (PCNP)
   - 3.6. Port Honduras Marine Reserve (PHMR).
   - 3.7. Snake Cays
   - 3.8. Sapodilla Cays

4. **Asset Allocation Mapping Exercises**
   - 4.1. Sarstoon-Temash National
   - 4.2. Snake Cays

5. **Provisional Data Gathering Training Exercises**

6. **Belize Trip Record**

7. **Belize Contacts**

ANNEX ONE: SARSTOON TEMASH NATIONAL PARK
ANNEX TWO: RAMSAR REPORT FOR SARSTOON TEMASH NP.
ANNEX THREE: GOLDEN STREAM CORRIDOR PRESERVE
ANNEX FOUR: UNESCO PROCLAMATION ON GARIFUNA CULTURE
ANNEX FIVE: TOLEDO INSTITUTE FOR DEVELOPMENT AND ENVIRONMENT

Indigenous peoples and protected areas research conclusions, suggestions and implications for the design of a fund to support indigenous peoples protected areas.

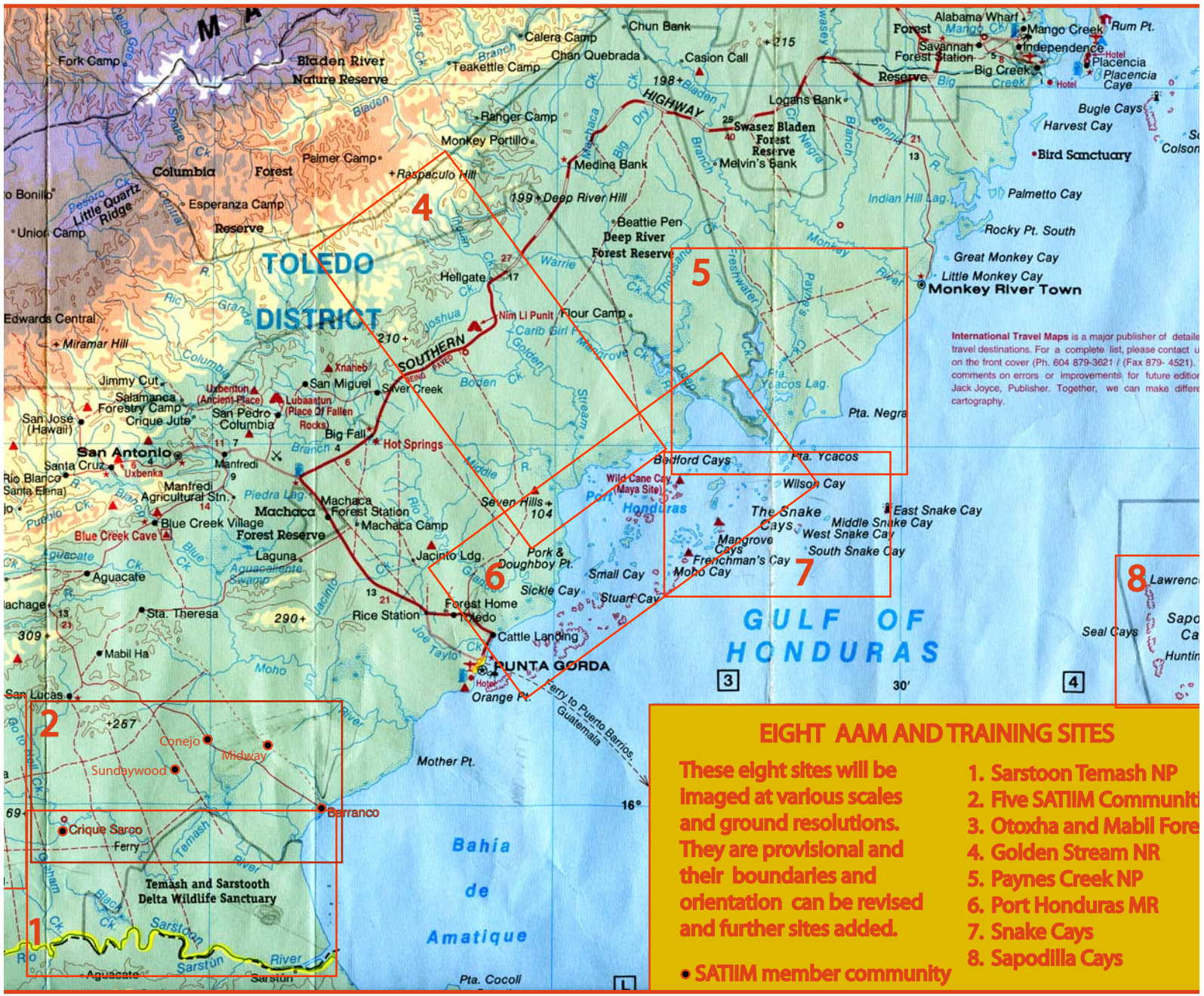
On the global, the science-based conservation community is running out of places to designate as new PA's. Some of the countries with large proportions in protection, Botswana ($43%) and Belize (20%), have declared their "PA Systems" complete. As one result, some global conservation NGO's are turning towards the long-term management of PA. This is both a harder sell to the donors and a potential comparative advantage to communities interested in setting up their own PA's. Inter-community indigenous NGO's such as SATIIM are demonstrating that locally trained "para-biologists" can competively, gather the serial environmental data needed for both on-the-ground conservation and monitoring and analysis by scientists. Local para-biologists are low maintenance and have access to traditional authorities, their conservation codes and knowledge.

The research confirmed the original supposition regarding relationships between indigenous peoples and protected areas: that fully autonomous indigenous peoples protected areas (IPPA's) are the exception; there are far more examples where PA's have been superimposed upon indigenous territories with a range of mostly negative effects upon resident communities. A few positive examples of equitable PA co-management prove that this doesn't have to be the case. The fund can expect a large volume of requests from communities already within PA's for support in assessing their situation and developing an strategy to incrementally improve it. However, although totally controlled IPPA's are rare, they should be encouraged and supported as beacons, for other communities, as well as the science-based conservation and donor communities.

The fund should not support land rights litigation. However, it could assemble a group of experts, as referrals, on copywrite law, intellectual property as it affects indigenous communities. The Fund should distance itself from the newly-fashioned "rights-based conservation", at least until those who coined this expression or find useful come up with a useful definition, not to mention some operational examples.

On the ratio between financial and technical support, there are two cases where training or technical assistance makes sense. Novice groups may need direct guidance and referred expert assistance while planning and proposing a new IPPA or a strategy to re-negotiate the relationship with PA agencies in the direction of equitable co-management. The second, as suggested above, are autonomous IPPA's that show promise as beacons.

The hierarchy of IUCN categories of protected areas has Strict Nature Reserves (scientists only) at its peak and community-based conservation areas at its base. That works in terms of degree of protection. If the criterion was degree of difficulty in sustainable PA management, IPPA's would be at the top


TOLEDO
DISTRICT
SOUTHERN
HIGHWAY
GULF OF HONDURAS
Bahia de Amatique
PUNTA GORDA
Bladen River Nature Reserve
Columbia Forest Reserve
Swasey Bladen Forest Reserve
Deep River Forest Reserve
Temash and Sarstooth Delta Wildlife Sanctuary
Monkey River Town
Placencia
Placencia Caye
Bird Sanctuary
Port Honduras
The Snake Cays
Machaca Forest Reserve
Blue Creek Cave
Wild Cane Cay (Maya Site)
Ferry to Puerto Barrios, Guatemala
Crique Sarco Ferry
Conejo
Midway
Sundaywood
Barranco
Cattle Landing
Forest Home
Rice Station
Hot Springs
Big Fall
Nim Li Punit
Xnaheb
Lubaantun (Place of Fallen Rocks)
Uxbenka
Uxbenka (Ancient Place)
Blue Creek Village
Machaca Camp
Machaca Forest Station
Manfredi Agricultural Stn.
Sta. Theresa
Mabil Ha
Aguacate
Laguna
Jacinto Ldg.
Pork & Doughboy Pt.
Small Cay
Sickle Cay
Stuart Cay
Frenchman's Cay
Moho Cay
Mangrove Cays
East Snake Cay
Middle Snake Cay
West Snake Cay
South Snake Cay
Wilson Cay
Bedford Cays
Pta. Ycacos
Pta. Negra
Seven Hills
Medina Bank
Melvin's Bank
Logans Bank
Monkey Portillo
Ranger Camp
Calera Camp
Chun Bank
Chan Quebrada
Casion Call
Teakettle Camp
Fork Camp
Palmer Camp
Esperanza Camp
Union Camp
Raspaculo Hill
Deep River Hill
Beattie Pen
Hellgate
Flour Camp
Miramar Hill
Edwards Central
Jimmy Cut
Salamanca
Forestry Camp
Crique Jute
San Jose (Hawaii)
San Antonio
Santa Cruz
Rio Blanco
Santa Elena
San Miguel
Silver Creek
San Pedro Columbia
Manfredi
Mother Pt.
Orange Pt.
Seal Cays
Alabama Wharf
Mango Creek
Rum Pt.
Savannah Forest Station
Independence
Big Creek
Bugle Cays
Harvest Cay
Palmetto Cay
Rocky Pt. South
Great Monkey Cay
Little Monkey Cay
Indian Hill Lag.
Pta. Lacos Lag.
Piedra Lag.
Aguacaliente Swamp
Little Quartz Ridge
Bonilla
Colson
1
2
3
4
5
6
7
8
EIGHT AAM AND TRAINING SITES
These eight sites will be imaged at various scales and ground resolutions. They are provisional and their boundaries and orientation can be revised and further sites added.
• SATIIM member community
1. Sarstoon Temash NP
2. Five SATIIM Communit
3. Otoxha and Mabil Fore
4. Golden Stream NR
5. Paynes Creek NP
6. Port Honduras MR
7. Snake Cays
8. Sapodilla Cays
International Travel Maps is a major publisher of detaile travel destinations. For a complete list, please contact u on the front cover (Ph. 604 879-3621 / (Fax 879- 4521). comments on errors or improvements for future editio Jack Joyce, Publisher. Together, we can make differe cartography.

1. General

This follows a two-week trip to Belize. The resulting plan is two combine two asset allocation mapping (AAM) exercises with four training modules in data-gathering, which will provide the data needed both for the AAM exercises and 8-10 training exercises – oriented towards the protection and management of protected areas and buffer zones. All together, the training exercises will involve 5 protected areas, either managed entirely, co-managed, or proposed by indigenous communities and NGO's. Because of the intensity of the training, this first session will be in English, However qualified staff from SATIIM and YCT's allied groups in Guatemala will be invited to attend. During the workshop, all training materials will be translated into Spanish and FPW will seek funding for second training, in a Spanish-speaking country.

2. Place

Four groups are interested in becoming actively involved in the training workshop.

Garifuna Nation Council (GNC)
Sarstoon Temash Institute for Indigenous Management (SATIIM)
Ya'axche' Conservation Trust (YCT)
Toledo Institute for Development and Environment (TIDE)

By general concensus, Punta Gorda was chosen as the best workshop location. Three hotels offer conference facilities, but these proved to be inadequate. However, TIDE has offered the use of their conference facilities and these are ideal. In addition, YCT has a new field facility in the Golden Stream Nature Reserve.

There was equal interest in the four training modules. The high definition aerial imagery attracted attention, as well as PDA/GPS combinations that enable people who cannot read or write, to make accurate field maps. Also general interest in low cost access to satellite imagery and entry-level GIS software. Provisionally, this divided into four modules

Open-Source GIS and Earth Image Access
Ground and Water-Based GPS/PDA Surveys
Kite Photography in coastal habitats
Aerial Imaging from Light Aircraft

3. Organisations and Issues

3.1 Sarstoon Temash National Park (STNP)

STNP was declared in 1994, without any local consultation, and has been subjected to a number of pressures since then: from a new highway in Toledo, from illegal loggers from Guatemala, increasing milpa agriculture and most recently oil exploration. STNP is also recognized as a Wetland of International Importance under the RAMSAR Convention

3.2 Five SATIIM Communities

The four Maya and one Garifuna communities adjoining the STNP collaborated to form Sarstoon-Temash Institute for Indigenous Management (SATIIM**)** which has since negotiated a co-management agreement for the park, under which it assumes full responsibility for local monitoring and management, depending only upon the police or the military for enforcement in potentially violent cases such as illegal logging.

Local Parabiologists and Rangers: Last year, SATIIM initiated a programme to train and employ 5 park rangers and 10 **parabiologists** from the 5 communities. In pairs, the parabiologists regularly record along 5 biodiversity transects, each representing 5 of the 13 ecosystems identified in the park. This year, SATIIM plans to add another 10 parabiologists and 5 more transects. Eventually, they plan for 26 parabiologists from the 5 communities to maintain records of all 13 ecosystems. The 5 rangers are also trained in parabiological technique but also take Special Constable training. Ranger salaries are US$400 a month. At present, the para-biologists monitor changes in pre-selected indicator species, plus incidental observations. Having established these basic monitoring skills SATIIM plans to take advantage of the PDA-Cybertracker training module, to upgrade parabiologists' skills and diversify the volume of data from the transects.

Illegal logging in STNP: The most serious, criminal, problem faced by the rangers is illegal loggers. SATIIM has strong evidence that loggers from Guatemala are crossing the Sarstoon River (the frontier), removing mahogany trees and subsequently laundering them as certified timber, via an approved logging operation in the Peten, Guatemala.

promises for local employment and the community strongly suspects that several of the rules regulating logging practice were violated. These include the number of allowable trails and the distance between logging activity and water bodies. Both these impacts should be clearly visible on the aerial imagery.

Oil Exploration in STNP: The most serious environmental problem is the impact of an imminent seismic oil exploration programme in and around STNP. Evidently, the government does not see this as a violation of the IUCN Category 2, national park status, which is only supposed to accommodate tourism as an economic activity.

Recently Mr King jr (son of the local logging concessionaire) assured SATIIM that the seismic lines would be limited to one-person paths and the seismic holes drilled to only 10 ft. However, they have no techniques for containing environmental impact to propose, once they encounter swamps or flooded areas – which tend to amplify impacts rather than contain them. SATIIM's declared objective is to halt the oil exploration. They are aware that this would deprive Barranco from the economic benefits promised by Mr King jr (at the Barranco GNC meeting, it was recalled that King sr had failed to meet his promises of economic benefit from logging) and the SATIIM strategy includes investigating other means of deriving revenues from the landscapes slated for oil development, which are sustainable and within the reach of local residents.

In the worst case, the exploration will lead to oil development. SATIIM is prepared for the eventuality that the development process cannot be reversed. In that case, they will press for, as co-managers of the STNP, assuming responsibilities for environmental impact assessing, monitoring and mitigation. The data to be gathered during the STNP AAM and training excercises should support SATIIM's strategy, by providing information on financial mechanisms for environmental services from the park and a detailed analysis of the impacts of the oil exploration programme, which is timed for 100 days and will probably be completed before the workshop.

STNP in the Workshop context: SATIIM is one of several local groups currently organizing to oppose the seismic oil exploration programme slated to begin April 2006. As part of this effort, we agreed to carry out a full **asset allocation (AAM) exercise -** including both the park and the adjoining 5 communities. SATIIM is already in possession of a large body of information on community traditional and livelihood assets for the 4 Maya communities. Judy Lumb and Carson Tuttle have gathered a large amount of similar data for Barranco, the Garifuna community. This should compress to time needed by the trainees to work through AAM Phase One: mapping traditional and livelihood assets. Basic data for working through AAM Phase Two, externally defined assets, will be gathered ahead of the workshop. This exercise will detail and compare the STNP and community lands in terms, of oil, timber, non-timber products, tourism, environmental services etc.

As a coastal wetland, with no roads and virtually no trails, the STNP is seen by SATIIM as an ideal candidate for high resolution aerial digital imaging – particularly of a distinctive sphagnum moss habitat which is unique within Central America. and are seeking to delay

the project until they can make their case about the negative environmental impacts. If they are unable to prevent the exploration going ahead as planned, they will use the aerial data as evidence of its impacts.

Aerial Imagery from the park and villages will be used for:

Refining existing ecological landscape and habitat categories.
Detecting, categorizing and mapping impacts of oil exploration.
Reviewing existing biodiversity transects and placing new transects.
Delineating villages common lands and demarcating these on the ground
Community planning

3.3. Otoxha and Mabil Forests

SATIIM is also interested in determining the condition of the forests surrounding two fairly remote communities, not part of the SATIIM co-management group: Otoxha and Mabil. The forests are reputed to be in good shape but there are also signs of illegal logging and some clearance for milpas. High resolution aerial imaging will provide baseline data for making a first approximation of forest condition, first from the aerial imagery, then from ground verification surveys. From this data base, SATIIM will assist these communities to develop forest management scenarios, including protected areas.

3.4. Golden Stream Nature Reserve (GSNR)

In late 1998 the GSNR became the first area of threatened land to be purchased with support from Fauna and Flora International's (FFI) Arcadia Fund. The Ya'axche' Conservation Trust (YCT) is a community-managed IPO, was set up to manage the GSNR, a 20,000 hectare area designed to protect important tracts of forest on the southern coast of Belize, most of which have already been fragmented by timber extraction, citrus cultivation and shrimp farming. Measures to protect and restore the watershed are combined with introduction of more appropriate agricultural practice, such as the production of shade-grown organic cacao. YCT has a biologist, a GIS specialist and 6 rangers on staff and have already developed procedures for biodiversity surveys and monitoring. They are interested in using the training to amplify those capacities. These applications will be worked on from a watershed perspective: the imagery will provide a full cross-section of the Golden Stream watershed.

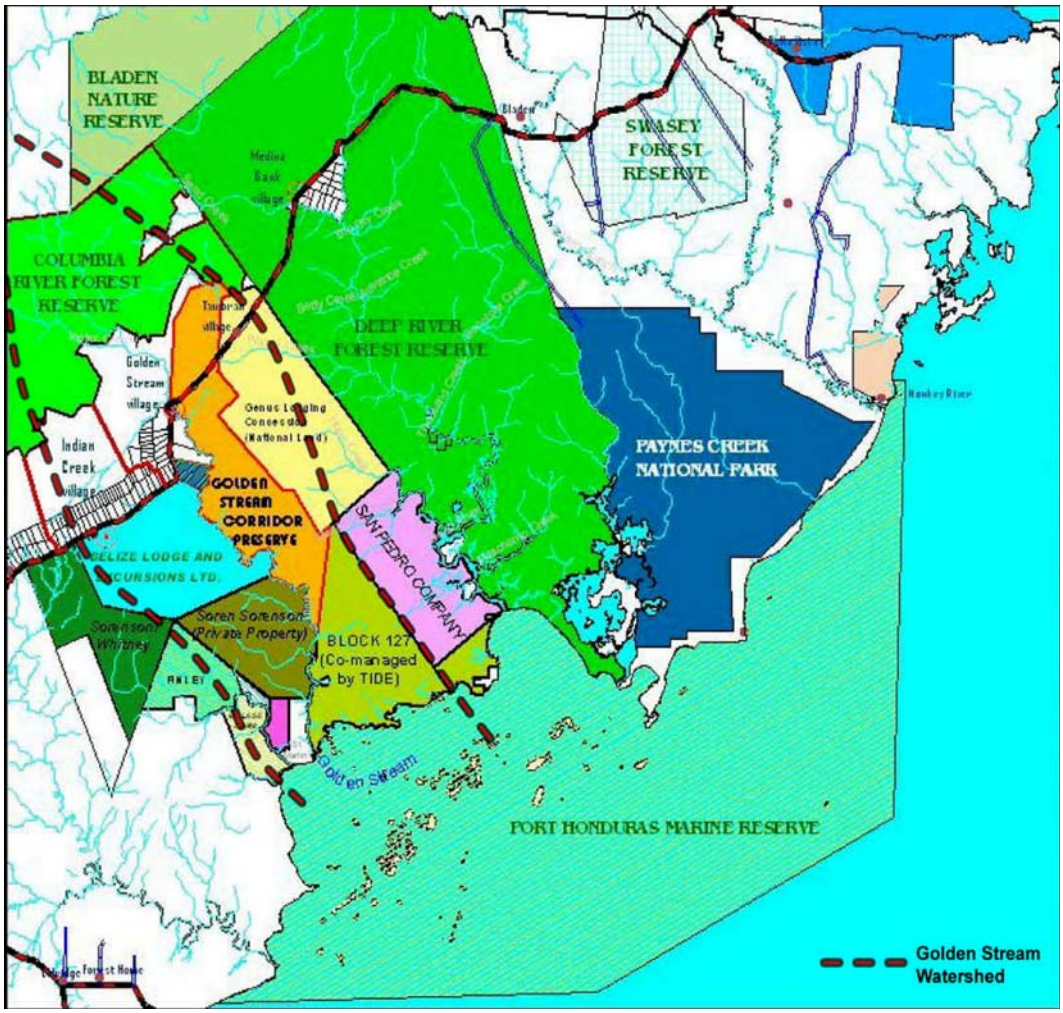
3.5. Payne's Creek National Park (PCNP)

A Punta Gorda NGO, the Toledo Institute for Development and Environment (TIDE) co-manages two National Protected Areas: Payne's Creek National Park (PCNP) and Port Honduras Marine Reserve (PHMR).

At its core, the PCNP coastal wetland park is more impenetrable than Sarstoon Temash. The PCNP Advisory Committee, which oversees TIDE's management, is comprised of community members. The committee decides how the park is governed, putting the park's management directly in the hands of the community. Due to the continual presence of park guards, they have drastically reduced incidences of illegal logging, hunting and fishing in the park. One factor in this was the provision of free cell phones to community members on condition that they report instances of illegal logging and poaching.

3.6. Port Honduras Marine Reserve (PHMR).

TIDE also co-manages the PHMR, declared in 2000 after TIDE had enlisted local community support through an education programme. Initial objectives included: ending damaging fishing practices, stopping poaching, developing alternative livelihoods for fishermen, ensuring community commitment and participation, Monitoring and maintaining ongoing sustainable management of the reserve. Progress has been made in all these areas, through training local rangers, establishing ranger stations and community outreach. The PHMR managers are interested in using aerial imagery to assess water turbidity, beach erosion, mangrove conditions and impacts of river flows.



3.7. Snake Cays

The cays to the northeast, clustered around the Snake Cays lie at the core of Garifuna spirituality. They continue to be in use for rituals, some requiring species of crustaceans only found in these cays. The Garifuna National Council (GNC) has a strong interest in creating a Garifuna protected area, around these cays. The agencies managing the Port Honduras Marine Reserve, and of course, TIDE, would have to agree to re-designate the

north-eastern part of the reserve. One project exercise will provide aerial imagery to the GNC, TIDE and other interested local groups. The Snake Cays, which the GNC would like to see declared a Garifuna Protected Area, will be used as the training site for using the PDA/Cybertracker devices for mapping traditional and livelihood assets. In 2001, UNESCO proclaimed "The Garifuna Language, Dance and Music" as a "Masterpiece of the Oral and Intangible Heritage of Humanity". This prompted the government of Belize to sign an MOU with the GNC "which commits itself to according proper recognition to the Garifuna culture." Amongst the cultural rejuvenation projects contemplated in this MOU is a Garifuna Heritage Park.

3.8. Sapodilla Cays

Lying 35 miles off-shore, the Sapodilla Cays are traditionally used by Garifuna communities. Belize's ownership is signified by their designated as the Sapodilla Cays Marine Reserve (SCMR). However both Guatemala and Honduras do not recognize Belize's claim to the Cays. Recently a proposal has been aired for turning the cays into a Peace Park. However, this would depend upon Belize even recognizing rival claims. Aerial image maps would provide a base for the Garifuna communities from Belize to document their traditional occupancy. This could work as a reprise of the nineteenth century gambit used by the British to use Garifuna occupancy of southern Belize – having earlier deported them there - as a pretext to claim southern Belize from Spain.

4. Asset Allocation Mapping Exercises

4.1. Sarstoon-Temash National Park

(STNP)and surrounding community lands. The 5 Kekchi Maya and Garifuna communities whose lands adjoin the park formed SATIIM, which co-manages STNP. While their traditional uses are now limited to plant gathering and exclude hunting and fishing, the government had no compunction in permitting oil exploration in this wetland which, according to its classification as an IUCN category 2 Protected Area - in which industrial resource development is prohibited. The STNP is also recognised as a RAMSAR site of global significance. While some peoples in the communities support oil development as a boost to the local economy, SATIIM's mandate obliges it to oppose the oil development. In the context the AAM process is a way of gathering the information and laying it out so as to inform the communities on the economic and environmental implications of oil development, compared with options for generating revenues, that a founded upon environmental services and tourism.

4.2. Snake Cays

Snake Cays is a site of intense spiritual importance to Garifuna. Rituals performed there go back several centuries and some of the shellfish types needed for ceremonial purposes are only found within these Cays. The larger archipelago of cays and reefs is contained within the Port Honduras Marine Reserve, in which the gathering of all kinds of shellfish are prohibited. But this is only part of the reason why the GNC would like to see Snake Cays assume a different identity. It is not a question of obtaining a dispensation to gather

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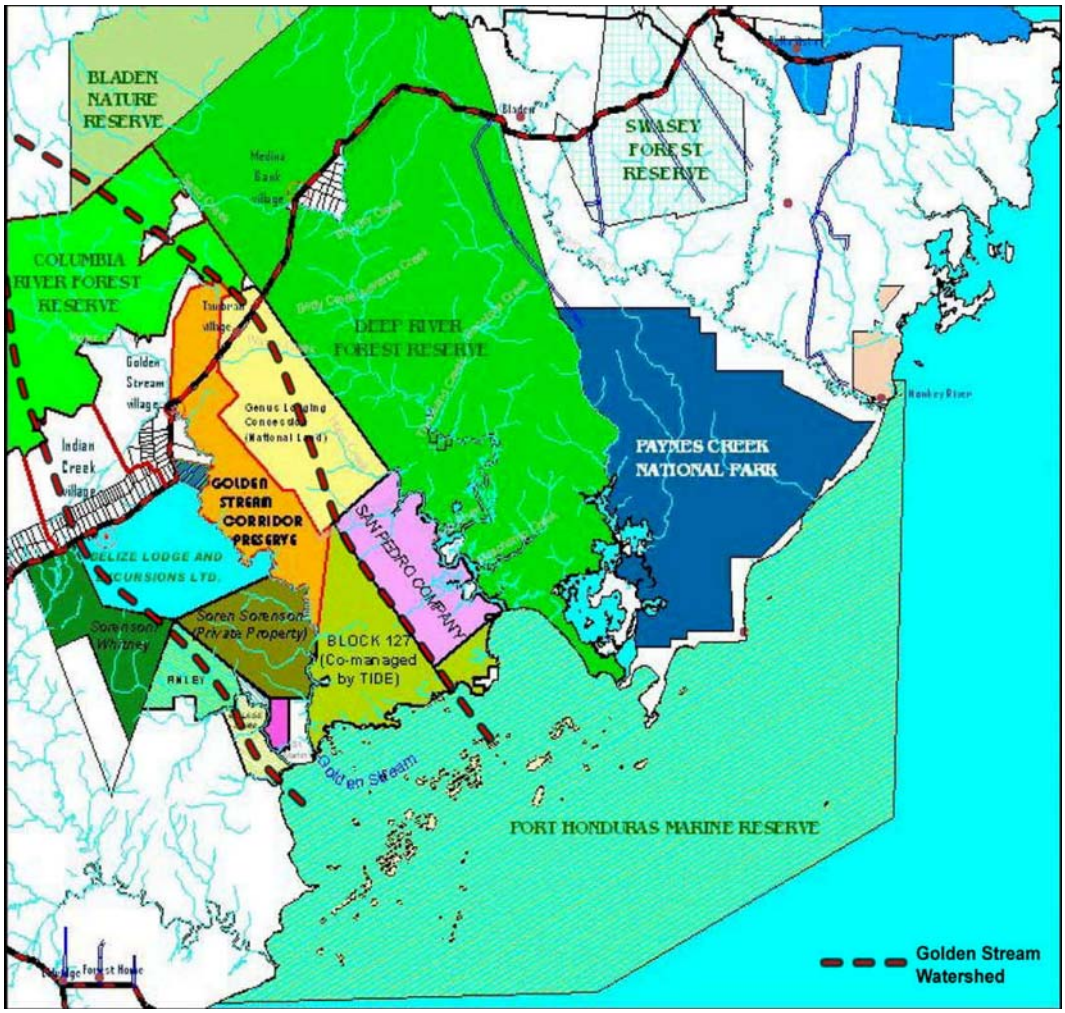

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shellfish ceremonial purposes, it is to have this place formally recognized as a special Garifuna place. This is consistent with the MOU between the GNC and Belize, after the UNESCO proclamation of "The Garifuna Language, Dance and Music" as a "Masterpiece of the Oral and Intangible Heritage of Humanity", which expressed a commitment to reinforcing Garifuna culture in various ways, including "Garifuna Heritage Park". Snake Cays lie about 10 miles from Punta Gorda and it is conceivable that a first approximation AAM Phases 1 & 2 could be accomplished during the course of the training, leading to a PA plan and a strategy for negotiating with the managers of the Port Honduras Marine Reserve.

5. Provisional Data Gathering Training Exercises

These will all address immediate problems and are designed to produce useful data. They will be organized with 4 main partner groups and other groups that these partners invite.

Trainees will start by comparing various earth image sources and generating, in a open source GIS, a project base map, covering all exercise sites, one that can be used as a base map for traditional and livelihood asset mapping and air survey planning and navigation.

The creation of legends for the two AAM exercises, Sarstoon-Temash and Snake Cays, sets context for setting up GPS/PDA combinations. All projects will involve GPS/PDA ground verification of satellite and aerial imagery for a wide range of applications, which demonstrate the multi-purpose qualities of aerial data. The provisional list follows.

1. **Sarstoon Temash National Park (STNP) - co-managed by SATIIM**
   Impacts of oil exploration in STNP.
   Base-lines for future aerial monitoring transects
   Detailed imaging of sphagnum moss ecosystem

2. **STNP Buffer Zone:**
   SATIIM Community members: Crique Sarco, Midway, Sunday Wood, Conejo, Barranco. Imagery for community land use planning, logging impacts of local 1000 acre concession

3. **Toledo: Remote Forest Assessment: - coordinated by SATIIM**
   Assess conditions of Otoxha and Mabil forests
   Possible candidates for community protected forests

4. **Golden Stream Nature Reserve – managed by YCT**
   Establish aerial monitoring transects: high res
   Land use in adjoining areas: low res

5. **Payne's Creek National Park - co-managed by TIDE**
   General biodiversity/habitat mapping: medium res
   Establish aerial monitoring transects: high res
   Land use in adjoining areas: low res

6. **Port Honduras Marine Reserve – Co-managed by TIDE**
   General biodiversity/habitat mapping: medium res

Establish aerial monitoring transects: high res
Detecting beach erosion
Water turbidity assessments
Detecting coral bleaching
Assessing mangrove conditions and shrimp farms impacts

7. A Garifuna Protected Area around the Snake Cays – with GNC

Base image map for AAM Phase 1 exercise: high res
Proposal for a Garifuna PA compatible with the Marine Reserve

8. Traditional and Livelihood Mapping of Sapodillo Cays

High resolution curved transect of cay string
Low resolution coverage of whole SCMR

ANNEX 2

LETTERS FROM COLLABORATING GROUPS DESCRIBING APPLICATIONS

SATIIM

SARSTOON TEMASH INSTITUTE FOR INDIGENOUS MANAGEMENT

127 Jose Maria Nunez Street • Punta Gorda Town; Toledo • Belize C.A • Phone: 501-722-0103 •
Fax: 501-722-0124 Email: satiim@btl.net

31 March, 2007

Ms Rebecca Adamson
First People's Worldwide
3307 Bourbon Street
Fredericksburg, VA 22408
USA

Dear Ms Adamson

We would like to express gratitude to your organization in providing the necessary support in conducting the training in Punta Gorda, Belize. The images collected will be available to the communities of Barranco, Midway, and Conejo for decision making purposes and better land use management. The communities were very impressed with the result of the exercise and they hope that FPW continues to provide this type of support. Through this exercise, communities will now be able to analyze the data and compare it overtime and use it to their advantage. SATIIM is grateful for this training as it enhances the organization's GIS capacity in community mapping.
We look forward to working closely together with FPW in assisting indigenous communities take control of the resources around them.

Signed. _____

Date. March 30, 2007

SATIIM

TOLEDO INSTITUTE FOR DEVELOPMENT AND ENVIRONMENT (TIDE)
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Ref: TIDE/ADM-GEN/07(36), Vol. 3

March 30, 2007

Rebecca Adamson, President
First Peoples Worldwide
3307 Bourbon Street
Fredericksburg, VA 22408

Dear Ms. Adamson,

The Toledo Institute for Development and Environment (TIDE) hereby expresses a sincere gratitude to First Peoples Worldwide for the opportunity you have given us. The images collected during the training will certainly allow us to assist the local communities in which we work. Below is how we plan to use the information.

1. Assist buffer communities in resource management and planning.
2. Influence decision making in protected areas management.
3. Lobby the Government of Belize for new policies of policy amendments.
4. Monitor land use charges overtime.
5. Map important vegetation in and around protected areas.

Thank you for your invaluable contribution to TIDE.

Sincerely,

Celia Mahung
Executive Director
Toledo Institute for Development and Environment

Ya'axché Conservation Trust

www.yct.bz

Town Office
Maya Organizations' Building
José Maria Nuñez Street
P.O. Box 177
Punta Gorda, Toledo District
Belize, Central America

Phone/Fax: (+501) 722-0108
Email: town.office@yct.bz

Field Centre
Golden Stream Village
Southern Highway
Toledo District
Belize, Central America

Email: field.centre@yct.bz

Ya'axché Conservation Trust | P.O. Box 177 | Punta Gorda | Belize

Ms. Rebecca Adamson
President of First Peoples Worldwide
3307 Bourbon Street
Fredericksburg, VA 22408
USA

April 5th 2007

Dear Ms Adamson

I am writing to thank you and your team at First Peoples Worldwide for the assistance that you provided in obtaining excellent aerial imagery of the Golden Stream Corridor Preserve (GSCP), a private protected area owned and managed by the Ya'axché Conservation Trust for the people and biodiversity of Southern Belize.

We intend to use these images in each of our four programme areas, including:

Integrated Protected Areas and Landscape Management
- The creation of detailed ecosystem maps
- Monitoring of long term changes in land use
- Assessing forest recovery following hurricane Iris (2001)
- Zoning and management of GSCP.

Local Enterprise development
- Sustainable forest product use.

Advocacy and awareness
- Increasing awareness of the importance of protected areas in local communities.
- Lobbying for more incentives to create private protected areas.

Institutional Management and Strengthening
- Increasing interest of funding agencies to invest in the area.

We look forward to working with you again in the near future.

Yours gratefully,

Nicholas Wicks
Scientific Coordinator

ReefCI
Reef Conservation International

Rebecca Adamson
President
First Peoples Worldwide
3307 Bourbon Street
Fredericksburg
VA 22408
USA

30th March 2007

Dear Rebecca

I would like to take this opportunity to thank you for the imagery of the Sapodilla Cayes Marine Reserve that your aerial mapping team was able to acquire on their last survey day in Belize. This is extremely valuable to us and will be put to very good use with our work on coral reef conservation and ecology.

The imagery is of particular use to ReefCI to help us with our work with lobster, conch and spawning fish aggregations. We will now be able to look at the sites where we know that the numbers of lobsters are in higher abundance on the wall during the breeding season and able to see other contributory factors, such as the channel where the eggs can be carried to the lagoon areas. We will be able to see where the channels are for conch near to the breeding grounds (especially in deep water areas) in order to ascertain the migratory paths. For spawning fish aggregations, in particular for Groupers, we can look at the typical topography of the sites and use it to help us find new spawning sites in the area. We can then work with the Belizean Department of Fisheries in order to enforce protection zones in the areas concerned.

ReefCI are an international organization that sustains ourselves by using recreational divers who pay to come on trips and help us with our work. We do general surveys of the reef to ascertain anthropogenic impacts using Reef Check methodology. We are working very closely with the Belizean Department of Fisheries in particular on commercial species such as lobster, conch and commercial fish. ReefCI are community driven and run projects where we offer Dive Master training programs to young local people who have little or no opportunity in life. This has already enabled 4 young people to get good, well paid jobs as Dive Masters and Boat captains in San Pedro, Belize.

Thank you again we are very grateful.

Best regards

Polly Wood
Founder and Managing Director

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Reg No. 04937007

WILDLIFE CONSERVATION SOCIETY

International Conservation - Marine Program - Belize
P.O. Box 37, Punta Gorda, Belize
Tel/Fax: 501-672-7777 Cell: 501-602-1750 Email: rgraham@wcs.org

March 30, 2007

Rebecca Adamson, President
First Peoples Worldwide
3307 Bourbon Street
Fredericksburg, VA 22408

Dear Ms. Adamson,

We would like to express our thanks and appreciation for the use of the Asset Mapping Program made possible by the First People Worldwide and further acknowledge receipt of the images taken during the GIS and mapping activities. We are particularly grateful that you invited Ms. Cordelia Che to participate in the mapping workshop. The images taken will provide us with vital geo-referenced information when working with local communities to carry out our current research and conservation projects, including:

- Population and habitat use of Goliath grouper in the Payne's Creek National Park.
- Elasmobranch population and species specific distribution assessment.
- Identification of impacts on sites populated by target research species
- Identification of additional research sites for target species.

This workshop's training and mapping products will enhance our outreach and conservation effectiveness. As such, we look forward to future opportunities of working together in our quest to engage communities in conservation based on sound research and traditional knowledge.

Sincerely yours,

Dr. Rachel Graham
Associate Conservation Scientist

Cc: Ms. Cordelia Che, Research Assistant, WCS


KITE IMAGE CAPTURED BY ALLAN SMITH - CANARI