Proceedings of the
First Belize Freshwater Summit

Belize Biltmore Plaza Hotel
14-15 January 2003

Monkey River mouth, Dry 2002 (Photo by P.C. Esselman)

Sponsored by Programme for Belize and The Nature Conservancy
Executive Summary

Sponsored by Programme for Belize and The Nature Conservancy, the First Belize Freshwater Summit was held at the Biltmore Plaza Hotel in Belize City on 14 - 15 January, 2003, in collaboration with the Ministry of Natural Resources and the Environment and the Ministry of Agriculture, Fisheries, and Cooperatives. The purpose of this summit was to draw together all organizations, agencies, and experts in the fields of freshwater ecosystem conservation and management to exchange information and explore the potential for collaboration on a national freshwater strategy for Belize. More than sixty-three individuals from 46 governmental, non-governmental, community based, and industry organizations attended the two-day conference, which is summarized in the document below.

Day 1 consisted of presentations in four topic areas: Water Science, Resource Use, Conservation Case Studies, and Water Policy. Noted Belizean and accomplished foreign researchers working in Belize presented their research findings on hydrologic and sediment models, rapid watershed assessment, ecosystem classification, and the ecology of malaria carrying mosquitoes in northern Belize wetlands. In the resource use segment, the Banana Growers Association presented on influences that banana production has on water in the Stann Creek and Toledo Districts, and the Petroleum and Mines Department summarized trends in sand and gravel extraction. Programme for Belize and the Toledo Institute for Development and Environment presented their current and planned freshwater conservation activities in New River Lagoon and the Maya Mountain Marine Corridor respectively. Finally, presentations were given by the Department of Environment and the Fisheries Department on existing and planned policies protecting freshwater resources, and proposed inland fisheries regulations. Audience questions and comments during these presentations focused on: (1) reconciling the perspectives of scientists, civil society, and policy makers; (2) the need to quantify threats to water quality, quantity, and biodiversity from resource use activities; (3) the need for NGOs to forge strong alliances in communities and government; and (4) the need to match regulations with enforcement and monitoring capacity.

Day 2 started with a discussion about the role of scientists in the policy making process, and moved into a forward-thinking dialogue about integrated freshwater management in Belize. When asked, "Do we need a national strategy to help manage Belize’s Freshwaters?", the group replied with a unanimous “Yes”. Next, regional breakout groups summarized threats to human health and water quantity, water quality, and biodiversity. The greatest perceived threats to quantity, quality, and biodiversity were (1) human settlements; (2) commercial agrochemical runoff; and (3) subsistence agriculture on the floodplain. Ten waterborne health threats, key stakeholders in the regional water management process, and information needs were also identified and are summarized below. A Policy breakout group identified strengths and weaknesses of existing policies protecting freshwater.

Toward the end of Day 2, following a presentation about the status, achievements, and challenges of the Coastal Zone Management Institute and Authority in Belize, a whole-group discussion led to consensus on the following three points—important end products of the summit:

1. A task force should be formed by the Ministry of Natural Resources that builds on existing efforts to create a National Freshwater Management Strategy for Belize.

2. Freshwater Summit coordinators should follow up with MNR to share results from this productive forum.

3. The process of developing a national strategy should include extensive stakeholder consultations at multiple levels.
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List of Acronyms

BGA – Banana Grower’ s Association
CZM – Coastal zone management
CZMAI – Coastal Zone Management Authority and Institute
DoE – Department of Environment
EIA – Environmental Impact Assessment
FAO – United Nations Food and Agriculture Organization
MBRS – Mesoamerican Barrier Reef Systems Project
MNR – Ministry of Natural Resources and Environment
NGO – Non-governmental organizations
PfB – Programme for Belize
SPAG – Reef fish spawning aggregation site
TIDE – Toledo Institute for Development and Environment
Conference Overview

Sponsored by Programme for Belize and The Nature Conservancy, the *First Belize Freshwater Summit* was held at the Biltmore Plaza Hotel in Belize City on 14 - 15 January, 2003, in collaboration with the Ministry of Natural Resources and the Environment and the Ministry of Agriculture, Fisheries, and Cooperatives. The purpose of this summit was to draw together all organizations, agencies, and experts in the fields of *freshwater ecosystem conservation and management* to exchange information and explore the potential for collaboration on a national freshwater strategy for Belize. More than sixty-three individuals from 46 governmental, non-governmental, community based, and industry organizations attended the two-day conference, which is summarized in the document below.

Dr. Vincent Gillett facilitated the two day summit, which consisted of one day of information exchange in a presentation format (Day 1), and a day of dynamic discussion within the entire community present and in breakout groups (Day 2). Details of these two days of presentations and discussions are summarized in the main body of this document in bulleted format. These details were distilled from minutes taken during most of the course of the two days (Appendix A), and were left in bulleted form to avoid subjectivity in the translation of peoples remarks and comments. Where appropriate tables have been included below that synthesize information gathered in the breakout group sessions on Day 2. As with the details of the various discussions, the "raw" results of breakout group discussions are included in the Appendices so that readers may refer to the specific thoughts of participants from various regions of the country in an unaltered form. Finally, PowerPoint presentations and text documents of most presentations given at the conference can be found on the companion compact disc on which these proceedings were originally distributed (archived copies available at Programme for Belize, #1 Eyre St., Belize City).

Summary of Day 1

Introduction

- Belize is gifted with more water per capita than any other country in Latin America, but the water is changing.
- Human activities, industry, and climate change are all affecting water resources at different spatial and temporal scales.
- This forum on Water is one whose time has come.
- Purpose of summit is to discuss possibility of an interdisciplinary task force to assess and manage water in Belize

Water science

*Lessons learned:*

- Methods and approaches like modeling and rapid watershed assessment are available to provide information, project the future, and educate students, policy makers, and communities along the way.
- Both terrestrial and aquatic "ecosystem classifications" now available to provide a basic concept of the types and distributions of ecosystems/biodiversity to assist EIAs, resource assessment, conservation, etc.
- Human enrichment of marshes can lead to higher rates of malaria in Belize leading to recommendation that "in no case should wetlands be used as a waste water treatment system"

*Issues/Questions:*

- GROUNDWATER. Why don’t we know much about it; why is it never addressed?
• RECONCILING PERSPECTIVES. How can science be used to assist policy development? How can scientists, communities, and policy makers find a “common language” or common ground for idea exchange?

Resource Use

Lessons learned:
• Bananas are a substantial component of S. Stann Creek District economy
• Banana industry uses water in a variety of ways, especially irrigation and fruit processing. Drainage ditches, chemicals are threats, but BGA is always updating equipment and techniques for greater efficiency.
• Gravel use is on the rise and will continue
• A substantial portion of this extraction is unmeasured (Dept. of Works)
• Private users are regulated and monitored for compliance.

Issues/Questions:
• WATER QUANTITY CONTROL. Need assessment of minimum flow requirements (S. Stann Creek example)
• MONITORING; Pesticide levels in wells; individual farmers resist compliance
• Long term viability of bananas questioned by Costa Rican report.
• Look to other countries for examples of the end point of conventional production methods.
• Petroleum and Geology must monitor Department of Works
• Recognizing increasing demands, what is the future for gravel supply, and for rivers themselves?

Conservation Case Studies

• PfB’s efforts are currently focused on developing baseline information for New River Lagoon
  o Studies will investigate basic limnology and water quality and ongoing biodiversity inventory efforts will continue.
• TIDE has implemented a rapid assessment technique based on mapping of impact points in the riparian corridor and river channel.
  o These studies have led them to focus on subsistence agricultural activities in upper Rio Grande and lower Swasey Branch to promote passive and active riparian buffer restoration and maintenance.

Issues/Questions:
• ALLIANCES. NGOs must work to forge and maintain meaningful alliances with pertinent government departments and communities.

Freshwater Policy

DoE
• Various legislation exists, particularly pertaining to effluent regulations
• Legislation developed and recommended in early 1990s (FAO 1994) but failed to be implemented...this work still very good and pertinent to today.
• Complete and comprehensive law badly needed; review of effluent regulations important.
• MNR has identified this as a need for this year.

Issues/Questions:
• INFORMATION: What is capacity of water bodies to absorb effluent?
• Little to no recognition of ecological integrity, ecological services, or biological assessment is a shortcoming of current legislation that is focused mainly on water quality.

Fisheries
• Fisheries Dept. tabling new freshwater fisheries legislation, translating a lot that has been done in coastal zone to freshwater setting
  o This may include closed seasons, size limits, gear restrictions, freshwater protected areas, etc.
• Abundant information is needed to inform implementation of new legislation.

Issues/Questions:
• MATCHING REGULATION TO ENFORCEMENT CAPACITY. There is a persistent need for compliance monitoring to make sure regulations can be enforced, but there is little resources within agencies to make this happen.
• MONITORING. How is/can freshwater fishing be monitored in inland areas in a standard fashion? Can ministerial option be used as a tool to assist communities?

Summary of Day 2
On Politics and Science
• The political process cannot be sidestepped.
• As a community, we must make science reliable and well-represented.
• Scientists may participate in policy discussions, but the Minister makes the final decision and they are accountable to the public.
• The role of scientists is to generate unbiased information to inform the policy process.
• Wetlands management as an example:
  o Wetland management should consider history, ecology, sustainable solutions, economics, International Conventions, and biodiversity…not just science, not just politics.
• Policy makers are left within the auspices of the Govt., scientists make purist recommendations, but who carries the costs?
• Does the Government have the ultimate say? Or does civil society?
• When all pertinent parties are brought into the discussion, full support through government is more likely (Nassau Grouper example).

Moving forward
• Where do we want to go with this summit in terms of broad objectives, strategies to achieve objectives, and a framework?
• Question to group from facilitator: "Do we need a national strategy to help manage Belize’s Freshwaters?"
  o Unanimous Yes. [No objections].

Freshwater Threats and Information Needs
• Breakout Groups were formed based on the following regions (group facilitators in parentheses) plus a special Policy group: Northern Region (J. Meerman); Central Region (E. Boles); Southeast Region (O. Arzu); Southern Region (P. Esselman); Policy Group (I. Morrison)
• **Threats** to (1) human health, and (2) water quantity, water quality, and freshwater biodiversity were assessed and ranked in a rudimentary fashion, and key stakeholders were identified in each region.

• Ten direct threats to human health were identified across all regions (Table 1).

• Priority threats to water quantity, water quality, and freshwater biodiversity at the national level were: (1) human settlements (bathing, laundry, solid waste disposal, etc.), (2) commercial agrochemical runoff, (3) subsistence agriculture on the floodplain, and (4) general deforestation (Table 2).

• High-priority information needs at the national scale fall into six categories. These are (1) Water quantity studies; (2) water quality studies; (3) assessment and monitoring of high and medium priority threats; (4) ecological inventory/baseline studies; (5) buffer zones/riparian forests extent and adequacy; (6) social and economic "valuation" of ecological goods/services from water (Appendix C).

• More than 30 key stakeholders were identified (Appendix B).

• The Policy Group performed a desktop review on what exists and what is available

• They identified positive and negative aspects of 11 existing policies that protect freshwater resources and watersheds (Table 3).

• They called for improved inter- and intra-departmental coordination and recommended the creation of a "permanent working group" to deal with freshwater issues.

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**Table 1.** Waterborne threats to human health determined from regional breakout groups.

<table>
<thead>
<tr>
<th>Disease/Threat</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaria</td>
<td>Eutrophication, yard hygiene, pooled/stagnant water</td>
</tr>
<tr>
<td>Dengue Fever</td>
<td>Eutrophication, yard hygiene, pooled/stagnant water</td>
</tr>
<tr>
<td>Cholera</td>
<td>Organic/fecal contamination of water</td>
</tr>
<tr>
<td>Dysentery</td>
<td>Organic/fecal contamination of water</td>
</tr>
<tr>
<td>Typhoid</td>
<td>Organic/fecal contamination of water</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>Organic/fecal contamination of water</td>
</tr>
<tr>
<td>Persistent Organic Pesticides</td>
<td>Agricultural malaria control</td>
</tr>
<tr>
<td>Gastro-intestinal diseases</td>
<td>Hygiene, population growth</td>
</tr>
<tr>
<td>Cancerous disease</td>
<td>From exposure to air and waterborne pesticides</td>
</tr>
<tr>
<td>Sterility in humans/birth defects</td>
<td>Exposure to air and waterborne pesticides</td>
</tr>
</tbody>
</table>
Table 2. Prioritized threats to water quantity, water quality, and freshwater biodiversity on a region-by-region and national basis. Regional breakout groups determined and ranked activities according to their perceived threat levels (Low, Medium, High). National ranks were calculated by assigning numeric values to these regional ranks (Unranked=0, L=1, M=2, H=3) and averaging the sum of these across the 4 regions. Scores are shown in parentheses. A full breakdown of these results can be found in Appendix C.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Notes</th>
<th>National</th>
<th>South</th>
<th>S. East</th>
<th>Cent.</th>
<th>North</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human settlements</td>
<td>Bathing/laundry, solid waste management, storm water drainage</td>
<td>M+ (2.38)</td>
<td>M (2)</td>
<td>M-H (2.5)</td>
<td>H (3)</td>
<td>M (2)</td>
</tr>
<tr>
<td>Commercial agrochemical runoff</td>
<td>From banana, shrimp, citrus, pepper processing; groundwater contamination.</td>
<td>M+ (2.25)</td>
<td>L (1)</td>
<td>H (3)</td>
<td>M (2)</td>
<td>H (3)</td>
</tr>
<tr>
<td>Subsistence agriculture on floodplain</td>
<td>Buffer clearing, sediment, temperature, habitat alteration, herbicide use</td>
<td>M+ (2.25)</td>
<td>H (3)</td>
<td>H (3)</td>
<td>-- (0)</td>
<td>H (3)</td>
</tr>
<tr>
<td>Deforestation</td>
<td>From lime-production (wood as a fuel source)</td>
<td>M+ (2.13)</td>
<td>-- (0)</td>
<td>M-H (2.5)</td>
<td>H (3)</td>
<td>H (3)</td>
</tr>
<tr>
<td>Tourist Development</td>
<td>Placencia Peninsula, high speed boats</td>
<td>M (2.00)</td>
<td>-- (0)</td>
<td>H (3)</td>
<td>H (3)</td>
<td>M (2)</td>
</tr>
<tr>
<td>Unsustainable fishing practices</td>
<td>Gill nets in river mouths, cast nets, spear fishing</td>
<td>M (2.00)</td>
<td>M (2)</td>
<td>M (2)</td>
<td>L (1)</td>
<td>H (3)</td>
</tr>
<tr>
<td>Domestic effluents</td>
<td>From residential development</td>
<td>M- (1.75)</td>
<td>-- (0)</td>
<td>M (2)</td>
<td>H (3)</td>
<td>M (2)</td>
</tr>
<tr>
<td>Tilapia introductions</td>
<td>Sarstoon, Temash, and Moho Rivers</td>
<td>M- (1.75)</td>
<td>M (2)</td>
<td>-- (0)</td>
<td>H (3)</td>
<td>M (2)</td>
</tr>
<tr>
<td>Sand and gravel mining</td>
<td></td>
<td>L-M (1.50)</td>
<td>-- (0)</td>
<td>H (3)</td>
<td>H (3)</td>
<td>-- (0)</td>
</tr>
<tr>
<td>Road construction</td>
<td>Guatemala link road, S. Hwy ext., N. Belize</td>
<td>L-M (1.50)</td>
<td>H (3)</td>
<td>-- (0)</td>
<td>L (1)</td>
<td>M (2)</td>
</tr>
<tr>
<td>Commercial agriculture nutrient runoff</td>
<td>From fertilizer use in agriculture</td>
<td>L-M (1.50)</td>
<td>L (1)</td>
<td>M (2)</td>
<td>-- (0)</td>
<td>-- (0)</td>
</tr>
<tr>
<td>Subsistence agriculture on slopes</td>
<td>Erosion, hydrological alterations, pesticide contamination</td>
<td>L+ (1.25)</td>
<td>H (3)</td>
<td>M (2)</td>
<td>-- (0)</td>
<td>-- (0)</td>
</tr>
<tr>
<td>Transboundary pollution</td>
<td>Pollutions from unknown sources across borders</td>
<td>L+ (1.25)</td>
<td>-- (0)</td>
<td>-- (0)</td>
<td>M (2)</td>
<td>H (3)</td>
</tr>
<tr>
<td>Cattle Grazing</td>
<td>Erosion, fecal contamination, hydrologic alteration, herbicides, nutrients</td>
<td>L+ (1.13)</td>
<td>M-H (2.5)</td>
<td>L (1)</td>
<td>L (1)</td>
<td>-- (0)</td>
</tr>
<tr>
<td>Agricultural processing effluents and waste</td>
<td>Citrus, Banana, Sugar, Aquaculture</td>
<td>L (1.00)</td>
<td>-- (0)</td>
<td>L (1)</td>
<td>-- (0)</td>
<td>H (3)</td>
</tr>
<tr>
<td>Quarry operations</td>
<td>Hydrology, erosion</td>
<td>L (1.00)</td>
<td>M (2)</td>
<td>-- (0)</td>
<td>-- (0)</td>
<td>M (2)</td>
</tr>
<tr>
<td>Hunting</td>
<td>Guts, turtle depletion</td>
<td>L (1.00)</td>
<td>-- (0)</td>
<td>L (1)</td>
<td>L (1)</td>
<td>M (2)</td>
</tr>
<tr>
<td>Channelization</td>
<td>From mining, land subdivision (Placencia)</td>
<td>L- (0.75)</td>
<td>-- (0)</td>
<td>M (2)</td>
<td>-- (0)</td>
<td>L (1)</td>
</tr>
</tbody>
</table>
Table 3. Eleven national and international policies affecting Belize freshwater management. Positive attributes of each policy are preceded by a plus sign (+), and negative attributes of the policies are preceded by a minus (-).

<table>
<thead>
<tr>
<th>Policy</th>
<th>Positive Attributes</th>
<th>Negative Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Utilization Act</td>
<td>(+) Special Development Areas program (already have consultative process)</td>
<td>(-) Need regulations</td>
</tr>
<tr>
<td>Mines and Minerals Act</td>
<td>(+) Belize Mineral Resources Policy (1994)</td>
<td>(-) Information available through CEO</td>
</tr>
<tr>
<td>Forest Act</td>
<td>(+) protection of watersheds (forest reserves and management) (+) draft wetlands policy</td>
<td>(-) Lack of resources to manage</td>
</tr>
<tr>
<td>Env. Protection Act</td>
<td>supporting regulations</td>
<td>(-) Non-Belize specific</td>
</tr>
<tr>
<td>Water Industry Act</td>
<td>(+) umbrella policy (multi-ministerial integrated approach)</td>
<td>(-) Overly general (need regulations)</td>
</tr>
<tr>
<td>Fisheries Act</td>
<td>(+) Fisheries regulations (+) Protected areas management (+) Updating of legislation underway</td>
<td>(-) Limited reference to water resource management issues (-) Limitations in enforcement</td>
</tr>
<tr>
<td>Crown Lands Rules</td>
<td>(+) 66 foot buffer</td>
<td></td>
</tr>
<tr>
<td>RAMSAR Convention</td>
<td></td>
<td>(-) National policies don’t consider and compliment convention</td>
</tr>
<tr>
<td>Proposed Nat'l Water Res. Mgm't Act (FAO 1994)</td>
<td>(+) Global Water Partnership initiative to revise</td>
<td></td>
</tr>
<tr>
<td>Public Health Act</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nat'l. Park Systems Act</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Institutional Case Study: Coastal Zone Management Authority and Institute:

- Three objectives of CZMAI:
  1. Knowledge and Sustainable use
  2. Supporting planned development
  3. Building alliances to benefit Belizeans
- Challenges and Lessons Learned
  - Sectoral fragmentation must be overcome
  - Integration of institutional dimensions must occur
  - It takes time

Issues/Questions:
- Over 13 years, (1) how many successful examples, (2) how much coordinated research has taken place, (3) after 5 years, was there a CZM Plan?
- Reply: (1) SPAGS; (2) water quality monitoring, research with Caye Chapel dredging, (3) Caye Caulker and Turneffe Islands plans

Final Discussion: What next?
- MNR is responsible for moving freshwater management forward, and they are acting.
- Ministry has identified it as one priority for 2003.
• Non-MNR parties want to actively participate in idea generation and implementation, and want to know if other key persons/agencies can be invited into this process.
• Efforts should, as much as possible, dovetail with the Global Water Partnership activities (Noel Jacobs [MBRS], national contact).
• Farmers must sit down with scientists and government office in a balanced process.
• A working group needs to be formed within the MNR. Others must wait and see what their role is. This forum could provide a starting point for the ministry.
• If DoE has something already standing, then should go along with that. But pressure and stimulation must be applied to keep the process moving forward.

Resolutions (full group consensus)
1. A task force should be formed by MNR that builds on existing efforts to create a National Freshwater Management Strategy for Belize.
2. Freshwater Summit coordinators should follow up with MNR to share results from this productive forum.
3. The process of developing a national strategy should include extensive stakeholder consultations at multiple levels.

Closing Remarks (E. Romero, PfB; M. Gorrez, TNC)
• Summit was not to recommend policies, but to initiate the process of working toward better management of freshwaters in Belize. More integration is key…Development and conservation are complementary efforts that need to go hand in hand.
• Without conservation development fails and vice versa.
• The challenge before us is to find the way that both facets can be carried out
• Uninformed and unwise decisions will have a permanent effects on Belize
• Sincere thank you to all in attendance and supporting staff and Ministries for making the summit possible