

Case Studies of Watershed Valuation in Bolivia, Ecuador, Guatemala, Honduras and Mexico

Prepared for The Nature Conservancy by
Marcia Brown and Caroline Stem
Foundations of Success

December 2006

Case studies can be found at www.FOSonline.org

Strategic objective: To promote the use of water fees as a financing mechanism for supporting watershed sites of global biodiversity importance.

The Innovative Financing and Policy Initiatives for Sustainable Watershed Financing Through Water Fees project's long-term goal is to promote the use of water fees as a financing mechanism for supporting watershed sites of global biodiversity importance. To accomplish this, The Nature Conservancy has initiated, with the help of the U.S. Agency for International Development, a process for working with stakeholders to begin understanding the "value" of water. It is imperative that users understand the true value of water as a first step to changing their usage or increasing payment. From this initial understanding, the objective is to make the next link to have water users understand the role they play in protecting the watershed and the biodiversity at the source, including financial support

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Case Study of Watershed Valuation in the Sama Biological Reserve, Bolivia

Final Report

Based on November 2004 site visits

Prepared for The Nature Conservancy by
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Acronyms

BMP	best management practice
COSAALT	Cooperativa de Servicios de Agua Potable y Alcantarillado (Potable Water and Sewer Services Cooperative)
FOS	Foundations of Success
FUDENA	Fundación para la Defensa de la Naturaleza (Colombia)
GEF	Global Environmental Facility
PRO-AGUA	Association for the Protection of Tarija's Water
PROMETA	Protección del Medio Ambiente Tarija (Association for the Protection of the Environment of Tarija)
SERNAP	Servicio Nacional de Areas Protegidas (National Protected Areas Service)
TNC	The Nature Conservancy
USAID	United States Agency for International Development

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1 Introduction

1.1 Purpose of case study

For the last few years, The Nature Conservancy (TNC) has supported watershed valuation projects in several countries in Latin America as a strategy for achieving biodiversity conservation. Through the International Water Policy Program, TNC has provided technical assistance to the following countries and sites:

- Mexico: Chiapas (including the El Triunfo and La Encrucijada Biosphere Reserves)
- Mexico: Quintana Roo
- Guatemala: Sierra de las Minas Biosphere Reserve
- Honduras: Yojoa Lake Multi-use Area
- Bolivia: Sama Mountain Range Biological Reserve
- Ecuador: Condor Bioreserve

Watershed valuation projects are designed to link water users to watershed conservation. They seek to get water users to contribute to conservation either financially (through user fees or increased public financing of conservation activities) or by taking actions directly to reduce threats to water resources. Thus, watershed valuation projects involve close collaboration between conservation organizations and government agencies, water companies, citizens groups and other key stakeholder groups.

TNC asked Foundations of Success (FOS) to develop a series of case studies that document the experiences and knowledge that TNC and its partner organizations have gained about watershed valuation projects in these six sites. This document represents one of the six case studies. In addition to the case studies, we have written a cross-site lessons learned document to analyze the use and effectiveness of watershed valuation as a conservation strategy, based on the experiences of all of the sites. The purpose of developing these documents is to facilitate learning among these and other sites that are currently implementing watershed valuation projects or are interested in undertaking these activities.

1.2 Watershed valuation project theory

Many montane protected areas provide abundant, clean water that is valuable for human consumption, irrigation, hydro-electric production, industrial production, ecological processes and other uses. The basic intention of watershed valuation projects is to help local actors recognize the importance of these natural areas and take action to protect them, in order to ensure the integrity of this critical environmental service. Local people may not value the conservation of biological diversity, but they value water. Therefore, the theory is that if they can be motivated to take action to protect their water resources, this action will contribute to biodiversity conservation.

While this basic theory sounds relatively simple, in reality watershed valuation projects are quite complex. Before visiting these watershed valuation projects, we decided to develop a results chain to help clarify TNC's assumptions about how watershed valuation actions should lead to

Sama Biological Reserve Watershed Valuation Case Study

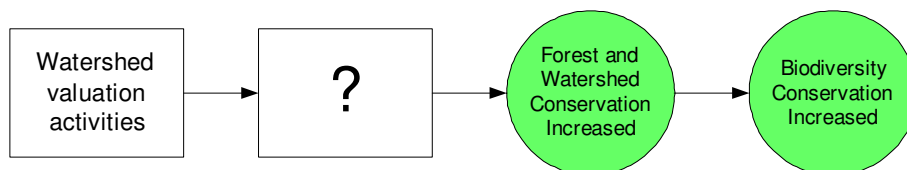
biodiversity conservation – in other words, to define in more detail the project theory and provide a framework for examining each step along the way from intervention to desired impact.

In order for any conservation project to be successful, the implementing organization must develop the project based on sound project theory, and they must execute the project well. Projects can fail to achieve their objectives due to poor theory, poor implementation, or both.

Usually, project theory remains hidden in the minds of the people who design and implement the project. Often, if a group of people is working together to implement a project, they each have different assumptions about how their actions will contribute to achieving their intended impact. Results chains graphically map a series of “if-then” statements that define how a project team believes that a specific conservation action will contribute to achieving a conservation impact. They are a tool used to make the project theory explicit so that it is clear to everyone involved and they can test and refine their assumptions over time.

FOS worked with TNC’s Senior Advisor for International Water Policy to develop the results chain shown in Figure 1. She provided technical assistance to most of these projects for several years. Therefore, her project theory has influenced the approach taken in most (though not all) of the sites. We explain the results chain here, and we use it as a framework for all of the case studies and the cross-site lessons learned document. Within this framework, we describe the actions taken in the sites and analyze the extent to which these projects are achieving their intended objectives.

When we began building the results chain, it looked like this:



This initial chain says that TNC and its partners are conducting watershed valuation activities to achieve two long-term impacts. The first is an increase in forest and watershed conservation in the specific sites, which TNC believes will contribute to an increase in biodiversity conservation. The difficult part of building the chain is defining the intermediate results needed for the activities to achieve their desired impact.

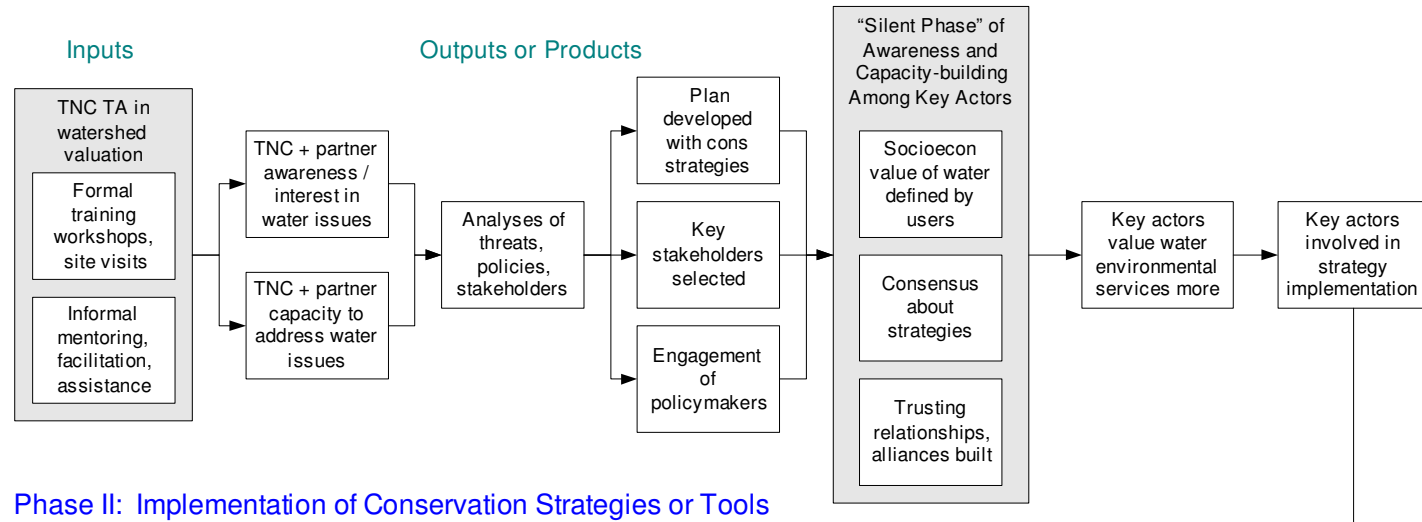
The complete chain (see Figure 1) includes two project phases. Phase I focuses on initial capacity development, planning and alliance-building. Phase II involves the implementation of specific conservation strategies or tools. TNC’s Senior Advisor for International Water Policy believes that Phase I is a necessary prerequisite to Phase II.

In Phase I, TNC provides technical assistance in watershed valuation, which contributes to building awareness and interest in water issues and capacity to address them. This interest and capacity enable partners to produce initial outputs or products such as analyses of threats, policies and stakeholders, which enable them to develop a watershed valuation action plan and select key stakeholders that need to be involved in implementing the plan. A “silent phase” of

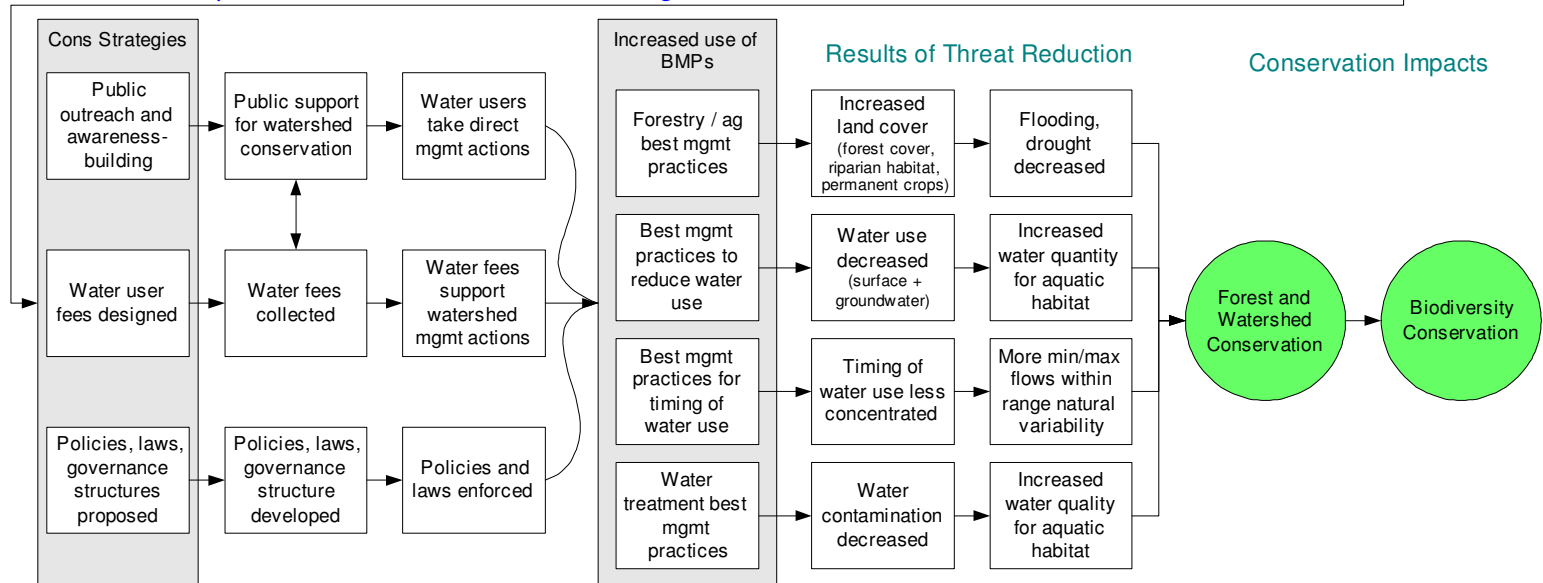
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Figure 1. Causal Chain Defining How TNC Watershed Valuation Projects Are Intended to Contribute to Biodiversity Conservation

Phase I: Initial Capacity Development, Planning and Alliance-building



Phase II: Implementation of Conservation Strategies or Tools



information-sharing, awareness and capacity-building among key actors is necessary to achieve consensus about what conservation strategies to undertake and to build trusting relationships among the key actors. TNC calls this the “silent phase” because it may appear to outsiders that little is going on during this phase, but the implementing organizations usually develop important alliances during this period that create the foundation for achieving results during Phase II. During this period, a water valuation process is usually conducted and the key actors may form a watershed group. All of the products of the silent phase contribute to increased recognition by these key actors of the value of watershed environmental services, which contributes to the involvement of these key actors in the implementation of conservation strategies in Phase II.

According to TNC’s program theory, Phase II focuses on the implementation of one or more of the following three conservation strategies: (1) public awareness campaigns, (2) water user fees, and (3) policy development and enforcement. For each of these strategies, a short chain explains expected results. Public outreach and awareness-building increase public support for watershed conservation, which will contribute to water users taking action to improve watershed conservation. The design of a water user fee will result in collection of water fees that are used to support watershed management actions. Engagement of policy-makers will result in the development of new laws, regulations or governance structures that are enforced.

If these conservation strategies are well executed, then they should result in increased adoption of best management practices (BMPs) related to forestry and agricultural activities, reduction of water use, the timing of water use, or water treatment. Which of these best management practices is relevant depends on the conditions in the specific site. For example, forestry and agricultural BMPs may be very important for montane areas, while water pollution reduction is vital to areas such as the Yucatan Peninsula that have complex groundwater systems that influence sensitive marine areas. Where they are relevant, forestry and agricultural best management practices can increase forest cover and other land cover, which will result in decreased flooding and drought. BMPs to reduce water use will reduce surface or groundwater use, which will increase the quantity of water available for aquatic habitat. BMPs related to the timing of water use will result in less concentration in the timing of water use (for example, by hydropower plants), which will increase the number of minimum and maximum river flows within the range of natural hydrologic variability. Water treatment practices will decrease water pollution, thus increasing water quality for aquatic habitat. According to TNC’s theory, all of this will contribute to increased forest and watershed conservation, which will increase forest and freshwater biodiversity conservation.

Although the results chain is presented as a linear sequence of actions and results, we must remember that this is program *theory* – in reality results are often not achieved in the order presented by the chain. For example, some sites have jumped directly to working on the development of water user fees, without an extensive capacity-building, planning and alliance-building phase. These differences help us to learn about the advantages and disadvantages of different approaches and their relative effectiveness under different conditions.

1.3 Case study structure

The structure of this document is based on the results chain. We begin by addressing the last two factors at the end (bottom right-hand side) of the chain. In the site description we describe the

biodiversity that TNC and its partners are trying to conserve in the protected areas where they are conducting watershed valuation activities and in the project objectives and strategies we describe the project's objectives related to watershed and biodiversity conservation.

We then move to the beginning of the results chain. In the project history and planning and alliance-building process sections, we describe all of the achievements made related to the Phase I portion of the results chain. In the implementation of conservation strategies section, we describe all relevant activities related to public outreach campaigns, water user fees and watershed management policies and, if appropriate, how these activities have contributed to increased use of best management practices. We then describe any monitoring that partner organizations are undertaking to measure the effectiveness of watershed valuation work. Finally, we describe the principal lessons learned and provide concluding remarks.

1.4 Overview of this site project

Watershed valuation work in Tarija, Bolivia has progressed significantly over the past four years. PROMETA and its local partners have completed all of Phase I (Initial Capacity Development, Planning, and Alliance Building) and are now in the midst of Phase II (Implementation of Conservation Strategies or Tools). Of the conservation strategies shown in Figure 1 (public outreach and awareness building, design of water user fees, engagement of policymakers, and the promotion of best management practices), they have focused primarily on public outreach and policy – specifically, the development of a governance structure for watershed conservation.

2 Site Description

The Sama Range Biological Reserve is located in the western part of the Department of Tarija, in southern Bolivia. The reserve covers 108,500 hectares of mountainous terrain that extends from 2,020 to 4,706 m. The higher altitude (3,600-4,700 m.) portion of the reserve includes part of the High Andes Ecoregion, Puna Ecoregion and Prepuna Ecoregion and the lower portion (2,000-3,600 m.) includes part of the Inter-Andean Dry Valleys Ecoregion and the Bolivian Tucuman Forest Ecoregion (Ayala, February 2004, pp. 88-95).

The reserve was created in 1991 to protect the principal sources of water for the city of Tarija and nearby communities, to conserve the biodiversity of the area and to protect valuable archaeological sites. Important biological assets include the Tajzara wetlands, a group of a seasonal, semi-permanent and permanent lakes, high-altitude streams, marshes, and high Andean pastures declared a RAMSAR Site in 2000. These wetlands provide habitat for 40 species of birds indigenous to high Andean aquatic systems. The wetlands are also important for migratory shorebirds, including three of the world's six flamingo species: the Chilean flamingo (*Phoenicopterus chilensis*), the Andean flamingo (*P. andinus*) and the James flamingo (*P. jamesi*). Other species of particular importance to conservation include the condor (*Vultur gryphus*), the Andean goose (*Chloephaga melanoptera*), numerous species of ducks, mountain lion or puma (*Felis concolor*), Andean cat (*F. jacobita*), vicuna (*Vicugna vicugna*), Andean deer (*Hippocamelus antisensis*) and Andean fox (*Pseudalopex culpaeus*).

Arqueologists have documented over 80 archaeological sites in Sama, including three Incan roads that lead from the basin to the valley, pre-Incan hydraulic constructions, cave paintings

illustrating aquatic birds, and even vestiges of primitive hunter-gatherers. Some archaeological remains date as far back as 9,000-12,000 B.C., while others correspond to the Archaic Period (9,000 – 2,000 B.C.), the Formative Period (2,000 B.C. – 500 A.D.), the Tarija-Chicha Culture (500-1400 A.D.) and the Inca Period (1430 – 1532 A.D.) (Ayala, February 2004, p.111).

As mentioned above, Sama provides water to the city of Tarija and nearby communities. Tarija has a population of 145,000 and the city is located in a valley that receives only approximately 620 mm. of precipitation annually. Approximately 85% of this precipitation falls during the 6-month rainy season, between November and April. During the dry season, water is a scarce and particularly valuable resource.

The city's water comes from the La Vitoria and Tolomosa watersheds (see Figure 2), which cover 6,071 and 43,651 hectares, respectively. The upper portions of these watershed, included in the reserve, receive more precipitation than the valley because predominant winds bring moisture-laden clouds from the south and when these clouds hit the mountains they rise and lose their precipitation. The upper portion of the La Vitoria watershed receives 700-800 mm of precipitation annually, and precipitation can reach 1200 mm. annually in the upper portion of the Tolomosa watershed. During the rainy season, Tarija gets 70% of its potable water from the La Vitoria watershed and 30% from groundwater. During the dry season, approximately 50-60% of the city's water comes from groundwater, 20-30% from the La Vitoria watershed, and a maximum of 10-20% from the San Jacinto reservoir in the Tolomosa watershed. San Jacinto only provides water during 2-3 months of the dry season. Water from the reservoir is also used for irrigation of wine grapes and other crops in the valley.



Figure 2. Tolomosa and La Vitoria Watersheds, Sources of Water for the City of Tarija

Source: Blanco, A. and R. Aguilar. 2004.

Despite their hydrologic value, current land use practices are degrading these watersheds. Deforestation and fires have reduced groundcover and increased soil erosion. Overgrazing of watershed recharge areas (especially in the Tolomosa watershed) has compacted soils and caused soil erosion. Although site managers have not documented changes in the hydrologic regime, they believe that the deforestation, fires and overgrazing have increased runoff and decreased infiltration, thus decreasing dry season flow.

Water quality has also decreased. Inadequate management of agrochemicals and wastewater are the main sources of water pollution.

While the quantity and quality of water available from these watersheds for human use in Tarija have decreased over the last few years, the population has increased dramatically. Between 1992 and 2004 the population increased by over 50%, from 90,000 to 145,000. When demand for water exceeds the capacity of these watersheds, groundwater is exploited. The water company and government authorities have no information about current groundwater reserves or recharge rates. No one knows, therefore, whether current groundwater extraction rates are sustainable.

3 Project Objectives and Strategies

According to a summary document prepared by the Association for the Protection of the Environment of Tarija (PROMETA), the general goal of PROMETA's watershed valuation project for the Sama Reserve is "to develop a strategy that provides the resources necessary to implement conservation, environmental education and watershed management programs that will guarantee the long-term sustainability of the Tolomosa and La Vitoria watersheds' environmental service provision to nearby communities and the city of Tarija." The document also includes the following objectives (stated as activities):

- To conduct economic valuation of environmental service of provision of water that the Sama mountain range provides to the city of Tarija and the communities of the Tolomosa and La Vitoria watersheds.
- To conduct an outreach campaign about the importance of water and its efficient use.
- To support institutional strengthening of COSAALT.
- To conduct activities oriented toward the protection of the springs that provide water to the city of Tarija and nearby communities.

PROMETA has used several strategies to reach its overall goal. First, the organization has conducted an outreach campaign to raise awareness of the importance of watershed conservation. Second, specialists have conducted hydrologic and economic valuation research to help reserve managers determine what actions need to be taken to conserve watersheds and build stakeholder support for those actions. Third, PROMETA has worked with key stakeholder institutions to develop a governance structure for improved watershed management. In the future, they also hope to be able to implement a water user fee.

4 Project History

4.1 Interest in Water Issues

PROMETA and the National Protected Areas Service (SERNAP) have been working in the Sama Reserve and other protected areas in the department of Tarija, in southern Bolivia, since the early 1990s. PROMETA is a private, non-profit conservation organization founded in 1990. Both PROMETA and SERNAP have been TNC partners for many years; they were TNC partners for Parks in Peril work in the Tariquía National Flora and Fauna Reserve between 1994 and 2000.

In 1996, the Bolivian and Argentine governments proposed the construction of 2 hydroelectric dams on the Bermejo River and another dam on the Tarija River. The Tarija River dam would have affected the core zone of the Tariquía Reserve, southeast of the Sama Reserve. PROMETA launched an awareness campaign aimed at decision-makers at the national and local level, emphasizing the environmental damage that these dams would produce. At the same time, PROMETA and TNC considered options for mitigating the environmental impact of the dams, if they were constructed. For the first time, PROMETA and TNC staff began to consider the idea of charging a fee to the hydroelectric companies for watershed environmental services. With the help of a university professor, PROMETA began collecting hydrologic information about the Bermejo River that could help to calculate the value of watershed environmental services. This was PROMETA's first experience conducting hydrologic research. Eventually, due to the opposition of many organizations, the Bolivian and Argentine governments postponed – but did not entirely cancel – the construction of these dams. Recently, the idea of constructing a dam on the Tarija River resurfaced.

In 2000, PROMETA staff attended TNC's Conservation Training Week, where they learned about TNC-Ecuador and the Foundation for the Defense of Nature's (FUDENA's) efforts to establish water funds in Quito, Ecuador and Colombia, respectively. This increased their enthusiasm about applying this innovative conservation finance mechanism in Bolivia.

In 2000, Marlou Church, TNC's Senior Advisor for International Water Policy, began providing technical assistance to PROMETA on watershed valuation. At that time, PROMETA's watershed conservation work had a strong research focus. With the assistance of a university professor, the organization was conducting research on the hydrology of the Bermejo River in the Tariquía Reserve and the Sama Reserve. With Marlou's advice, PROMETA decided that focusing solely on research was not appropriate. To achieve their intended goal – improved management of Sama's valuable watersheds – they realized that they needed to work closely with key institutions such as the municipality, the local water company, SERNAP and others.

To define the focus of the project, Marlou coordinated watershed valuation workshops with these key stakeholders. During the first workshop, stakeholders discussed the idea of charging a fee to hydroelectric companies for watershed environmental services on the Bermejo River, to provide long-term financing for the management of the Tariquía Reserve. After visiting the Sama Reserve, however, Marlou encouraged PROMETA and its partner organizations to focus their watershed valuation work on the watersheds in Sama that provide water to Tarija. She felt that this site had the greatest potential for raising awareness of the value of watershed environmental

services and getting water users to support watershed management activities, because it provides very valuable drinking water to urban residents. After the second watershed valuation workshop, PROMETA and its partners decided to focus on Sama.

In 2001, PROMETA signed an agreement to initiate watershed conservation activities in the Sama Reserve in collaboration with the Municipality of Tarija, the governor's office (Prefectura), the water company (COSAALT), and SERNAP. PROMETA collected hydrologic and geographic data about the Tolomosa and La Vitoria watersheds in the Sama Reserve, organized it into a database and used it to map vegetation cover, current land use, and land use capacity. PROMETA then analyzed the hydrologic value of these watersheds and reported the results back to these agencies. At the same time, they initiated an outreach campaign and an economic valuation study.

In 2002, a fire burned 15,000 hectares of the La Vitoria and Tolomosa watersheds, including the microwatershed that provides water to the city. From the city, people could see the forests burning for several days. This disaster dramatically increased people's concern about their water supply and interest in watershed conservation. PROMETA's educational campaign on watershed management (discussed below in section 6.1), which started in 2001, had made many people aware of the connections between land use and water supply. Suddenly, watershed conservation became a topic that the local media discussed and local policy-makers were expected to address.

Key Dates for this Watershed Valuation Project

1996	Governments of Bolivia and Argentina propose dam on Bermejo River
2000	PROMETA attended Conservation Training Week and learned about other sites' experiences
2001	PROMETA received technical assistance from Marlou and conducted watershed valuation workshops
2001	PROMETA decided to focus on the watersheds in the Sama Reserve and signs a cooperative agreement with the Municipality of Tarija, COSAALT, SERNAP and the Governor's office
2001	PROMETA initiates educational campaign
2002	PROMETA completes hydrologic and economic valuation research
2002	Fire in La Vitoria and Tolomosa watersheds
2003-4	Design and development of PRO-AGUA

4.2 Capacity to Address Water Issues

To facilitate a watershed valuation process, TNC and its partner organizations must have some level of capacity to address water issues. Ideally, an organization should have skills in education and outreach, facilitation of inter-institutional collaborative processes, hydrologic research, and economic valuation. Although PROMETA has been working on protected areas management since the early 1990s, the organization has only a few years of experience in watershed valuation. When they started out, TNC provided inspiration and advice about the direction and focus of the project, and the watershed valuation workshops TNC facilitated built awareness about the value of watersheds. Participation in TNC's Conservation Training Week taught them about other organizations' experiences. PROMETA, nevertheless, has had to gain many skills experientially – learning by doing – and they have hired consultants to provide expertise in specific areas. The organization has learned how to build a constituency for watershed valuation, how to design and supervise technical studies, and how to facilitate the development of a

governance structure for watershed management. They have hired specialists to conduct hydrologic and economic valuation research.

5 Planning and Alliance-building Process

5.1 Project Design and Selection of Key Stakeholders

As described above, PROMETA's initial watershed valuation work involved conducting hydrologic research on the Bermejo River, in the Tariquía Reserve. With guidance from TNC, PROMETA organized a series of four watershed valuation workshops in which key stakeholder groups analyzed water use and threats to water quantity and water quality. After the second watershed valuation workshop, all of the participants determined that PROMETA's watershed valuation work should focus on the Sama Reserve, because of its importance in providing water to the city and surrounding communities.

The watershed valuation workshops helped PROMETA to identify key stakeholder groups. To link water use in and around the city to improved management of the watersheds in the Sama Reserve that provide these valuable water resources, PROMETA determined that it needed to work with the following institutions:

- The Municipality of Tarija;
- COSAALT, a water cooperative that has a concession from the municipality of Tarija to provide the city's drinking water and manage its sewer system;
- The Tarija Departmental Government (or Governor's office), which under the Law of Decentralization has legal responsibility for implementing public investment projects related to development and environmental conservation; and
- The National Protected Areas Service (SERNAP), a dependency of the Ministry of Environment responsible for the management of the Sama Reserve.

In 2001, PROMETA signed an agreement to initiate watershed conservation activities in collaboration with these four institutions. To generate information to inform their work with these key stakeholder groups, in 2001 PROMETA developed a database of biophysical and socioeconomic information to characterize the current situation of the La Vitoria and Tolomosa watersheds.

This database was the first step in PROMETA's approach to watershed valuation that included the following steps:

1. Development of a geographic information system (GIS) database;
2. Use of the information in the database to conduct a hydrologic valuation study including a simulation of the effects of different land uses on peak streamflow, water availability and soil erosion;
3. Undertaking an economic valuation study analyzing (a) willingness to pay for watershed conservation and (b) the opportunity cost of not managing the watersheds.
4. Development of a site conservation plan for the La Vitoria and Tolomosa watersheds; and

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5. Design and implementation of a governance structure for improved watershed management – the Association for the Protection of Tarija’s Water (PRO-AGUA).

As mentioned in step 2 above, in 2001-2002 PROMETA used the information in the database to conduct a hydrologic valuation study that included four components. First, they mapped current land use in the watersheds and modeled future land use scenarios, including a “no protection” and a “protection” scenario. Second, they estimated water availability and demand for water for irrigation. Third, they estimated the effect that changes in land use could have on erosion rates and, fourth, the effect land use changes could have on streamflow.

As shown in Table 1, the simulation results predicted that without protection, dry season flow in the Tolomosa and La Vitoria watersheds would decrease 21% and 28%, respectively. Without protection, peak flows would be higher during the rainy season, due to low high runoff and low infiltration. Under the protection scenario, infiltration would increase during the rainy season, with a consequent increase in dry season flow. The simulation also predicted that without protection erosion rates would double in the Tolomosa watershed and more than triple in the La Vitoria watershed.

Table 1. Projected Changes in Streamflow, Based on Hydrologic Valuation Study Simulations		
	Tolomosa River	La Vitoria River
Current Streamflow		
Rainy season (Oct-April)	77.1 m ³ /sec	10.1 m ³ /sec
Dry season (May-Sept)	4.9 m ³ /sec	0.8 m ³ /sec
Projected Changes Under “No Protection” Scenario		
Rainy season (Oct-April)	+16%	+18%
Dry season (May-Sept)	-21%	-28%
Projected Changes Under “Protection” Scenario		
Rainy season (Oct-April)	-8%	-11.6%
Dry season (May-Sept)	+28%	+7%

While conducting this hydrology research, PROMETA also undertook an economic valuation study of the watershed environmental services that the Sama mountain range provides to the city of Tarija and surrounding communities (step 3 above). This study included two components: first, a contingent valuation study to estimate how much urban and rural residents value these watershed environmental services, and second, an estimate of the costs that the water company and hydroelectric company would incur if the Sama reserve were not protected, based on the results of the hydrology research.

For the contingent valuation study, in 2001 researchers interviewed 147 people in Tarija and 118 in the nearby rural communities. They explained the environmental services provided by the Tolomosa and La Vitoria watersheds and the projected impact of not conserving these watersheds, based on the results of the hydrology research. They then asked the residents how much they would be willing to pay to ensure continuous provision of water from the Sama Reserve for domestic water supply, irrigation, generation of hydropower and industrial

production. Urban residents indicated a willingness to pay a median amount of Bs. 10 (US \$1.47) monthly. In the rural areas, 96% of residents expressed a willingness to work to conserve their water supply. These farmers were willing to work a median number of 2 days per month on watershed protection. The aggregate value of the urban residents' willingness to pay was \$381,026 per year and the value of the work that rural residents were willing to contribute to watershed conservation was \$103,108 annually, for a total value of \$484,134 per year.

To estimate the costs that the water company and hydroelectric company would incur if the Sama Reserve were not protected, the researchers used the results of the hydrologists' simulations under the most extreme "no protection" scenario. According to these projections, the principal hydrologic change would be a reduction in stream flow during the dry season. This would reduce the water available for domestic water supply, costing the water company approximately \$22,283 annually in lost water sales. It would also reduce the electricity generated in the San Jacinto hydropower plant in the Tolomosa watershed, which would cost the electric company approximately \$236,832 per year in lost revenue. Just considering these two changes, the total cost would be \$259,115 per year. These two economic valuation studies demonstrated that people are willing to pay or work to conserve their watersheds and the cost of not conserving the watersheds would be substantial.

PROMETA organized a workshop to share the results of the hydrology and economic valuation research with representatives of the Municipality of Tarija, COSAALT, the Tarija Departmental government, SERNAP and other key stakeholder groups. The presentation of these results coincided with very strong government concern about watershed management, due to the public outcry after the fire in 2002. Government officials expressed concern about these rather alarming hydrologic and financial projections and interest in working on watershed management.

5.2 Project Planning

PROMETA also used the results of the hydrology research as one of the inputs in developing a site conservation plan for the two watersheds (step 4 in the approach described earlier). PROMETA organized a series of three workshops to involve local organizations in the development of the site conservation plan. These organizations included the departmental government, the Municipalities of Tarija and San Lorenzo, COSAALT, SERNAP, the San Jacinto hydroelectric project, and local non-governmental organizations.

The site conservation plan described the site, identified its conservation targets, analyzed the targets' current status, established measurable conservation objectives, analyzed threats, and defined conservation strategies for addressing these threats (Aguilar, R. 2004). The conservation targets included: native forests, rivers and aquatic systems, the upper watersheds, and the Andean deer. With the exception of the Andean deer, all of the other conservation targets are associated with the hydrologic value of the watersheds. The upper watersheds (or headwaters) contribute highly to recharge of groundwater and dry season flow, due to high precipitation and infiltration. Native forests are also valuable for their role in the regulation of hydrologic processes, due to high infiltration and low run-off. The rivers and aquatic systems refer to the

water and its associated biodiversity. The plan concluded that the headwaters and forests are currently in fair condition and the rivers and aquatic systems are in good condition.

The conservation objectives included the following:

- Conservation of 90% of existing forests
- Restoration of 1,000 hectares of native forest over the next 20 years
- Reduction of forest fires by 80%
- Maintenance of the current levels of water quantity and quality
- Conservation of 100% of watershed recharge zones

To achieve these objectives, PROMETA, SERNAP and other organizations working in the Sama Reserve must reduce three major threats: deforestation and the deterioration of vegetative groundcover, forest fires and overgrazing. To address these threats, PROMETA proposed conservation strategies for each of the targets. Some of the strategies include development and implementation of the following:

- an integrated watershed management
- a forest fire prevention and control program
- a sustainable cattle ranching program
- an outreach program for urban and rural areas.

Clearly, these are ambitious strategies. It is worth noting here that SERNAP has signed a co-management agreement with the communities around the reserve. These communities are very involved in forest fire prevention and control, reforestation, sustainable cattle ranching and other activities.

6 Implementation of Conservation Strategies

6.1 Public Outreach Campaigns

Beginning in 2001, PROMETA hired a communications professional to organize an educational campaign about watershed conservation oriented toward secondary school students and adults in the city of Tarija and surrounding communities. The campaign focused initially on helping water users to understand where their water comes from and the need to conserve the watersheds that provide water to the city. PROMETA produced pamphlets, educational games, workbooks, posters, signs, flip charts, educational displays, taped messages for radio and audiovisual presentations. The campaign assumed that by increasing these target populations' awareness of the importance of good watershed management that people would take the actions necessary to use water more efficiently in the city and reduce threats such as overgrazing, forest fires and fuelwood extraction.

Beginning in 2002, the inter-institutional group working to reduce forest fires produced educational materials aimed more specifically at forest fire prevention. For example, they have produced public announcements broadcast on the radio and television during the dry season. The Departmental government and SERNAP have supported the production of these materials.

6.1.1 Enabling Factors

The fire in 2002 raised the profile of watershed management and probably increased the effectiveness of this educational campaign. At the same time, the educational campaign laid the foundation of knowledge necessary for people to understand how the fire threatened their resources.

Although PROMETA has never done a formal evaluation of the effectiveness of their public outreach campaign in influencing knowledge, attitudes or practices, they believe that the campaign contributed significantly to people's response to the 2002 fire and recognition that the fire could damage the city's water sources. They say that when the fire occurred in 2002, activity in the city was paralyzed because so many people left their work to go and try to help extinguish the flames. The fire burned for 3 days. During and after the fire, local radio and television stations and newspapers discussed extensively whether it could have been prevented or better controlled and how to prevent such a disaster from happening again in the future. Even now, the need to protect the city's water sources remains a common topic of discussion.

Currently, there is broad public consensus about the importance of protecting the watersheds that provide water to the city. PROMETA believes that this is the result of the combined impact of the outreach campaign and the fire.

6.2 Watershed Management Policies and Governance Structure

During the hydrology research and the development of the site conservation plan for the Tolomosa and La Vitoria watersheds, it became evident that conserving these watersheds would require a substantial amount of work and collaboration among many actors. No one organization could take on all the necessary tasks, which included prevention and control of forest fires, rehabilitation and restoration of burned areas, reforestation of critical areas, promotion of soil conservation, reduction of firewood use, implementation of more sustainable agricultural practices, and promotion of more efficient water use.

Several institutions had begun to take action independently to improve the management of these watersheds and specifically to prevent disasters such as forest fires. For example, SERNAP's park guards conducted patrols, the Departmental government had recently formed an Emergency Management Center, and the National Army, National Police and others had staff and equipment for fighting forest fires. PROMETA was working to strengthen the capacity of forest fire crews.

The 2002 forest fire demonstrated, nevertheless, that institutions were operating independently, with little or no inter-institutional coordination. The fire provoked a massive response on the part of ordinary citizens, as well as all of these institutions. This resulted in duplication of efforts, inefficient use of existing resources and even increased risk, due to the lack of adequate security measures.

After the fire, several institutions expressed interest in working together and coordinating their individual actions. As a direct result of the disaster, PROMETA facilitated the development of an inter-institutional program for the prevention, detection and control of forest fires in the Central Valley of Tarija.

To address watershed conservation needs in an integrated and coordinated fashion, PROMETA proposed the creation of a coalition that would coordinate all of the efforts of existing institutions – The Association for the Protection of the Water Sources of the City of Tarija and the Communities in the Tolomosa and La Vitoria Watersheds (PRO-AGUA). This coalition would include representatives of both governmental agencies and civil society. It would facilitate fundraising, avoid the duplication of efforts and increase fiscal accountability and transparency. PRO-AGUA would have the following goal: “to stop the deterioration of Tarija’s water sources, through actions undertaken together by all of the institutions to guarantee the sustainability of the environmental service of water provision to Tarija’s population.” (Crespo, C., 2004) PRO-AGUA’s specific objectives are:

- To coordinate the actions of all people and legal organizations involved in the problem, to avoid duplication of efforts and to produce synergies.
- To actively involve the population to guarantee the project’s sustainability.
- To take advantage of the experience and capacity of institutions and people in the region that have worked on any of the tasks necessary for the protection of the water sources.
- To use available resources in the most efficient way possible, assigning specific activities to the institutions that are most appropriate for conducting those activities.

PROMETA met with the executives and technical staff of each key stakeholder organization to present both the results of its hydrologic and economic valuation research and its proposal for the creation of PRO-AGUA. PROMETA then organized a meeting of all of the institutions to discuss the proposal together.

As shown in Figure 3, the proposed structure of PRO-AGUA includes a Board of Representatives, a management group, an internal auditor and an administrative entity. The Board includes representatives from the following institutions:

- COSAALT
- SERNAP
- The Tarija Departmental government
- The Municipalities of Tarija and San Lorenzo, whose jurisdiction includes the sources of water for the city of Tarija and surrounding communities and who have legal responsibility for environmental conservation
- The Civic Committee that represents all non-governmental organizations in the Department of Tarija and has a high level of influence and credibility
- The Tarija Rural Communities Union (*Federación Sindical Unica de Comunidades Campesinas de Tarija*), which represents civil society in the rural areas
- PROMETA

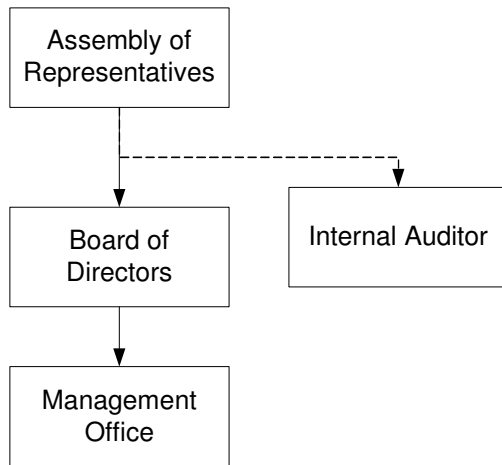


Figure 3. Structure of PRO-AGUA

The Board of Directors will have the responsibility to make decisions related to the implementation of conservation activities. It will include five individuals chosen by the Assembly for their personal qualifications and not as representatives of institutions. The Manager will be chosen by the Board of Directors and will be responsible for carrying out their decisions. The Internal Auditor, chosen by the Assembly, will guarantee compliance with the goals of the institution and fiscal control.

At the moment, PROMETA is in the process of facilitating the formal creation of PRO-AGUA. All of the member institutions must approve the statutes and regulations and sign the agreement that establishes the association. To date, five of the eight founding member organizations have signed. Once all of the organizations have signed, then the papers will be submitted to the Departmental government to obtain the organization's legal status.

Although not yet a legal entity, PRO-AGUA is already operating. During 2004, the Assembly met three times and began facilitating coordination between the member institutions. The member organizations recognize the value of working together and believe that PRO-AGUA increases their collective capacity to manage the watersheds effectively. For example, one representative said that the Departmental government has primary responsibility for the management of water resources but they have little experience or expertise in watershed management. PRO-AGUA members have the needed expertise in watershed management and can help the Departmental government identify priority actions and pressure them to fund them.

PROMETA has proposed a work plan for PRO-AGUA, based on the site conservation plan and the reserve management plan, and the members approved it. Although PRO-AGUA does not have a budget to implement projects – and it cannot receive funds until it is legally established – some of the member institutions have budgets for conservation activities. By developing a joint work plan for PRO-AGUA, PROMETA hoped to catalyze more funding from the Departmental government, Municipalities and other institutions for the conservation of these watersheds. So far, they have had some success.

One of the initial results of PRO-AGUA has been COSAALT's recent decision to dedicate part of its budget to watershed conservation. Until now, COSAALT has interpreted its responsibilities as including the management of the springs and water collection area and the provision of water from the springs to the city, through extensive water infrastructure. The institution has never invested in watershed conservation, which they consider to be the job of foresters and agronomists, not engineers. As of January 2005, however, COSAALT created a Department for the Protection of Water Sources and the Environment, with an annual budget of \$25,000 for watershed conservation activities. This represents a fundamental change in the goals of the institution.

Once PRO-AGUA exists as a legal entity, it could continue to operate solely as a coordinating body or it could also implement projects directly (or hire third parties to implement them). Several of the member institutions believe that PRO-AGUA would be more effective if it operated as both a coordinating and an implementing body. SERNAP has had limited success in raising funds for the Sama Reserve and it believes that PRO-AGUA could increase the protected area's budget. At present, the reserve's annual budget is \$140,000, most of which comes from a Global Environmental Facility (GEF) project that ends in June 2005. While it is likely that there will be a subsequent GEF project, the lack of sustainable long-term funding for the reserve, including local support, concerns SERNAP.

6.2.1 Challenges and Enabling Factors

The formal creation of PRO-AGUA has taken more time than anticipated. By the end of 2004, SERNAP, the Departmental government, and the Rural Workers' Union had not signed the agreement establishing the association. In the case of SERNAP, the regional office supports the creation of PRO-AGUA, but the central office must sign the agreement, and obtaining their approval could take months. The Departmental government has experienced frequent turn-over in leadership and elections have delayed their approval of PRO-AGUA. The Rural Workers' Union is not willing to sign the agreement because they fear that their members will be charged water user fees or that PRO-AGUA may even privatize the water. They do not understand that the purpose of PRO-AGUA is to improve watershed management and that this will not necessarily require increasing rates or privatizing the resource. Water has become a politically sensitive topic throughout Bolivia since 2000, when there were riots in Cochabamba after the government privatized the city's water supply and the new company doubled and tripled water rates for more than half a million people, including many poor families.

One of the biggest challenges that PRO-AGUA faces is the need to establish watershed conservation as a high priority on the agenda of government agencies. One PRO-AGUA representative complained that Tarija's population has grown dramatically over the past two decades, due primarily to development associated with the exploitation of gas reserves (approximately 90% of Bolivia's gas reserves are located in this department). He said that during this period, the Departmental government has received gas royalties and has invested in the construction of roads and irrigation systems, but they have done nothing to ensure the protection of scarce and highly threatened water resources because they do not consider this a top governmental priority. Last year, the Departmental government even returned money to the central government, because it did not have the capacity to spend all of its budget. Meanwhile,

the Sama Reserve did not have adequate staff or resources to adequately protect critical watersheds. PROMETA has asked the Departmental government to include money for PRO-AGUA activities in its 2005 annual operational plan.

One agency that has begun to recognize watershed conservation as a priority is COSAALT. Because of its responsibility for domestic water supply in Tarija, COSAALT is a key member of PRO-AGUA. Despite internal management problems that caused a federal agency to temporarily take over the administration of the cooperative in November 2004, COSAALT is proceeding with its plan to create a department dedicated to watershed conservation. PROMETA has worked to strengthen COSAALT by supporting the development of their strategic plan, which COSAALT staff say contributed to their recognition of watershed conservation as relevant and important for the achievement of their mission.

6.3 Water User Fees

When PROMETA began working on watershed valuation, they were interested in implementing a water user fee as a payment for environmental services. Although the organization is still interested in this innovative conservation tool, they believe that it would not be politically viable at the moment. Their goal is watershed conservation and to achieve this goal they need to increase financial support for watershed conservation activities, but water users are only one potential source of funding. For the immediate future, they are working to convince the institutions that are members of PRO-AGUA to dedicate more of their budget to watershed conservation. Once it is legally established, PRO-AGUA could also raise funds.

PROMETA believes that certain conditions must exist before it proposes a water user fee. First, PRO-AGUA must be legally established and it must develop a positive public image. It should implement some conservation projects successfully, so that the public sees that the organization has the capacity to get things done. Second, Tarija needs to achieve a higher level of political, social, and institutional stability. For example, over the last 3 years, Tarija has had five governors (prefectos). Throughout Bolivia there has also been social tension due to the economic situation, and some regions of the country, such as Cochabamba, have even seen riots caused by fear of privatization of water supply. Relative to other parts of the country, people in Tarija pay a lot for water and electricity, and they complain about these charges, a situation which reduces the feasibility of charging for water use.

6.4 Best Management Practices

6.4.1 Forestry and agricultural best management practices

As shown in the results chain in Figure 1, the three conservation strategies discussed previously (outreach campaigns, watershed management policies and governance structure, and water user fees) are intended to increase the involvement of water users and key stakeholder groups in the application of the best management practices (BMPs) necessary to reduce the principal threats to the relevant watersheds. In this case, forestry and agricultural best management practices are needed to reduce forest fires, deforestation, overgrazing and soil erosion. The site conservation

plan for the La Vitoria and Tolomosa watersheds describes specifically what actions PRO-AGUA could support to conserve these watersheds.

Although PRO-AGUA has not yet been formally established, the member organizations are individually supporting some watershed management actions and they are coordinating some joint actions. For example, PROMETA facilitated the creation of the Inter-institutional Committee for Forest Fire Control, which includes several of the institutions that are members of PRO-AGUA. The committee has developed and is implementing a plan for the prevention and control of forest fires. Since 2001, PROMETA has supported the acquisition of fire fighting equipment and the construction of an observation tower in the reserve. In addition, the Office for Foreign Disaster Assistance (OFDA) of the United States Agency for International Development (USAID) has organized “train the trainer” workshops in forest fire prevention and control. Thirteen participants, including SERNAP park guards and others, completed the program in Tarija and have gone on to train other groups. During 2004, only two small forest fires occurred, which represents an improvement over past years.

Some institutions have collaborated on small-scale watershed management actions. For example, PROMETA, SERNAP and COSAALT have worked together to reforest approximately 13 hectares above the city’s water supply in the La Vitoria watershed with 5,000 native trees. They also provide technical assistance to the community of Rincón La Vitoria in the management of their community tree nursery. PROMETA has also developed organic agricultural demonstration plots in two communities.

6.4.2 Best management practices related to demand reduction

According to representatives of PRO-AGUA, inefficient water use contributes to resource scarcity. For example, some people use municipal water to water their gardens and public plazas. Because there are no water meters, they pay the same fixed monthly water payment as those who use their water efficiently. PRO-AGUA is not addressing this problem yet, because it considers supporting forestry and agricultural BMPs to be a higher priority. Nevertheless, it is clear that work needs to be done to get urban residents to decrease their water use.

7 Monitoring Watershed Valuation Work

7.1 Monitoring of Water Resources

PROMETA and its partners (especially COSAALT) plan to develop a monitoring plan to measure streamflow and water quality, but they have not done this yet. Currently COSAALT does not measure streamflow – they only measure the quantity of water flowing in their water supply canals.

7.2 Monitoring Project Effectiveness

PROMETA has many assumptions about how their activities will lead to more effective watershed conservation and management. For example, they believe that by creating a coalition that coordinates the actions of existing institutions (PRO-AGUA), they will be able to increase

the level of importance of watershed management on the agendas of government agencies, generate more resources for it, and make the actions of member institutions more effective and efficient. They believe that all of these short-term outcomes will lead to greater forest and watershed conservation.

In order to learn what actions do and do not contribute to more effective watershed management, PROMETA and PRO-AGUA should develop results chains defining in explicit terms their theory of change and use these chains to monitor and evaluate the relative effectiveness of different actions. Over time, this would help them learn, for example, under what conditions inter-institutional collaboration contributes to conservation.

8 Lessons Learned

8.1 Watershed valuation projects require inter-institutional collaboration

Watershed valuation projects involve close collaboration with government agencies, water companies, citizens groups and other key stakeholder groups. Conservation organizations cannot implement these projects on their own. Watershed valuation projects are designed to link water users to watershed conservation. They seek to get water users to contribute to conservation either financially (through user fees or increased public financing of conservation activities) or by taking actions directly to reduce threats to water resources. Because of this, conservation organizations must implement these projects in collaboration with the organizations involved in water use, including municipal water companies, local governments, irrigation committees, hydropower companies, and others. PROMETA's Executive Director says that determining who to involve can be challenging. Conservation organizations must collaborate with the most important actors but it is not feasible to work with everyone.

8.2 Technical information is important for building credibility

PROMETA believes that it is essential to generate good information early in the watershed valuation process because this information provides a strong foundation for building consensus about the need for conservation. The hydrologic research and economic valuation studies conducted by PROMETA increased their credibility with the mayors, the governor, the water company and other key actors and allowed them to build a constituency for better watershed management. Having gained credibility with these key actors, PROMETA was then able to facilitate the organization of a formal inter-institutional governance structure for water resources – PRO-AGUA.

While it is valuable, research should nevertheless not be seen as an end in itself. Early in the project, PROMETA was only doing research. They soon recognized that research was only one part of a broader process. To improve management, the organization needed to use other strategies as well, including outreach, constituency-building and direct support for site management through fire prevention and other actions.

8.3 Water valuation is about raising awareness and improving management, not about raising money

PROMETA says that one of the challenges in facilitating a watershed valuation process is overcoming the initial perception that one is trying to charge people for their water. The goal of the project is to conserve the watersheds that provide water for domestic consumption, irrigation, hydropower and other valuable uses. A water user fee may or may not be the best strategy for achieving that goal. For now, PROMETA has decided that water user fees are not politically feasible in Tarija and that they can achieve their goal through other means, such as increasing public agencies' commitment and involvement in watershed management.

8.4 Watershed valuation processes take time

In Bolivia, as in many parts of the world, people are accustomed to using water without paying for it or taking any action to protect it. Watershed valuation projects seek cultural change – change in people's attitudes about water resources and their willingness to support watershed conservation either through a water user fee or direct action. Such cultural change does not come overnight. For example, the creation of PRO-AGUA has taken more than a year, due to changes in government authorities, institutional problems in COSAALT, and distrust on the part of the representatives of rural communities. Getting local governments to dedicate part of their budget to watershed management will also take time. PROMETA and TNC's long-term commitment to the watershed valuation process has been essential to its success.

8.5 TNC and donor agencies should provide consistent support and technical assistance for several years

PROMETA says that TNC and USAID's consistent support for their watershed valuation work over the past four years has been essential to the project. This has included both financial support and guidance and technical assistance. USAID and TNC have financed all of PROMETA's watershed valuation activities, including the outreach campaign, hydrologic research, economic valuation research, coordination with key stakeholders, and the design and formation of PRO-AGUA. TNC's International Water Policy Advisor provided guidance on the initial direction of the project and facilitated watershed valuation workshops designed to build a constituency for watershed management. Participation in TNC's Conservation Training Week allowed PROMETA to learn about other organizations' experiences in watershed valuation.

TNC and USAID representatives identified a few deficiencies in technical assistance, however. For example, technical assistance from TNC was inconsistent and no one was able to assist PROMETA in finding specialists with the necessary expertise to be able to conduct hydrologic and economic valuation studies.

TNC and USAID representatives believe that TNC should currently be providing more guidance and technical assistance to watershed valuation projects. TNC should support the development of model projects and facilitate exchange and networking between partner organizations implementing watershed valuation projects. TNC should also have staff within the South American Region with expertise in valuation of environmental services that can provide technical assistance both in the constituency-building process and economic valuation research. Although partner organizations can hire consultants to conduct hydrologic and economic

valuation studies, TNC specialists should help in the selection of the consultants and review of their work, to ensure quality control. TNC should also help to build the capacity of partner organization staff in resource valuation, so that they are able to supervise these consultants.

8.6 Environmental disasters can create an opportunity for improved management

The fire that burned 15,000 hectares of the Sama Reserve in 2002 increased people's interest in watershed conservation in Tarija, according to PROMETA. Their awareness campaign, which began before the fire, had built a base of awareness about how fire in this region can degrade watersheds and reduce water quality and dry season flow. This allowed people to understand how the fire represented a direct threat to their already scarce water resources. The lesson here for other sites is that if an environmental disaster happens, one can use the disaster to galvanize support for improved management. Since the 2002 fire, Alfonso Blanco, Executive Director of PROMETA, says that everyone in Tarija agrees about the need to conserve their watersheds.

9 Concluding Remarks

The accomplishments that PROMETA and its partners have made in watershed valuation in Tarija, with the support of TNC and USAID, are quite impressive. This project seems to have all of the ingredients needed for successful watershed conservation. PROMETA has gathered an extensive amount of data, produced valuable hydrologic and economic analyses and they have built an inter-institutional, cross-sectoral alliance that should provide a strong foundation for greater investment and stakeholder involvement in BMPs and threat reduction.

It is important to keep in mind, however, that the project cannot be considered a success story until it has produced measurable improvements in forestry and agricultural practices and reductions in the principal threats facing these watersheds. Translating stakeholders' knowledge and concern about their watersheds into increased investment in concrete conservation actions may prove to be the most difficult part of the entire process. The agencies and organizations that compose PRO-AGUA are the right organizations to improve forestry and agricultural practices, but to have an impact on watershed management they will all need to dedicate more staff and resources to this work.

We provide these words of cautionary advice to those who might be tempted to claim success at this point and move on to other projects or sites. Within Bolivia and in other parts of Latin America there are many other sites where governments and conservation organizations would like to develop a watershed valuation project. While we support the replication of this model, our primary concern is that PROMETA have the time and resources needed to complete this process and ensure that the model actually works – that it actually results in improved watershed management. Although it has taken four years to get this far, the next couple of years will probably be critical for achieving success on the ground.

We do, nevertheless, believe that PROMETA's 5-step approach (including the geographic and socioeconomic database, hydrology research, economic valuation research, conservation planning, and development of a governance structure) likely provides a good model for other Latin American cities of a similar size. As mentioned earlier, the database, hydrologic

simulations and economic valuation studies were valuable for building credibility and convincing stakeholders of the importance of taking action. In cases where water user fees will not be used, it may not be necessary to conduct a contingent valuation assessment, which is expensive. An estimate of the cost of watershed degradation under a “no protection” scenario may be sufficiently persuasive.

Before trying to replicate this model, we encourage PROMETA and TNC to think about what conditions should be considered pre-requisites for investing in a site. For example, prerequisites could include the presence of a conservation organization like PROMETA that can facilitate the process, a project leader with good skills in constituency-building on the local level, and a site where water is scarce and thus a valuable resource.

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List of People Interviewed:

1. Alfonso Blanco, Executive Director, PROMETA
2. Ricardo Aguilar, PROMETA
3. Monica Ostria, TNC Bolivia Country Program Director
4. Morris Israel, USAID
5. Roberto Ruiz, President, Tarija Civic Committee
6. Francisco Villaruba, Mayor of San Lorenzo
7. Omar Morales, Technical Manager, COSAALT
8. Andrés Zamora, Director of the Sama Reserve, SERNAP

Case Study of Watershed Valuation in the Condor Bioreserve, Ecuador

Final Report

Based on a September 2004 site visit

Prepared for The Nature Conservancy by
Marcia B. Brown
Foundations of Success

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Acronyms

BMP	best management practice
BRC	Bioreserva del Cóndor (Condor Bioreserve)
CESA	Centro Ecuatoriano de Servicios Agrícolas (Ecuadorian Center for Agricultural Services)
CNP	Cotopaxi National Park
COSUDE	Swiss Agency for Development and Cooperation
EEQ	Empresa Eléctrica de Quito
EMAAP-Q	Empresa Municipal de Agua y Alcantarillado de Quito
FONAG	Fondo Ambiental para la Protección de las Cuencas y Agua (Environmental Fund for the Protection of Watersheds and Water)
FOS	Foundations of Success
REA	Reserva Ecológica Antisana
RECA Y	Reserva Ecológica Cayambe-Coca
TNC	The Nature Conservancy
USAID	United States Agency for International Development

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1. Introduction

1.1 Purpose of case study

For the last few years, The Nature Conservancy (TNC) has supported watershed valuation projects in several countries in Latin America as a strategy for achieving biodiversity conservation. Through the International Water Policy Program, TNC has provided technical assistance to the following countries and sites:

- Mexico: Chiapas (including the El Triunfo and La Encrucijada Biosphere Reserves)
- Mexico: Quintana Roo
- Guatemala: Sierra de las Minas Biosphere Reserve
- Honduras: Yojoa Lake Multi-use Area
- Bolivia: Sama Mountain Range Biological Reserve
- Ecuador: Condor Bioreserve

Watershed valuation projects are designed to link water users to watershed conservation. They seek to get water users to contribute to conservation either financially (through user fees or increased public financing of conservation activities) or by taking actions directly to reduce threats to water resources. Thus, watershed valuation projects involve close collaboration between conservation organizations and government agencies, water companies, citizens groups and other key stakeholder groups.

TNC asked Foundations of Success (FOS) to develop a series of case studies that document the experiences and knowledge that TNC and its partner organizations have gained about watershed valuation projects in these six sites. This document represents one of the six case studies. In addition to the case studies, we have written a cross-site lessons learned document to analyze the use and effectiveness of watershed valuation as a conservation strategy, based on the experiences of all of the sites. The purpose of developing these documents is to facilitate learning among these and other sites that are currently implementing watershed valuation projects or are interested in undertaking these activities.

1.2 Watershed valuation project theory

Many montane protected areas provide abundant, clean water that is valuable for human consumption, irrigation, hydro-electric production, industrial production, ecological processes and other uses. The basic intention of watershed valuation projects is to help local actors recognize the importance of these natural areas and take action to protect them, in order to ensure the integrity of this critical environmental service. Local people may not value the conservation of biological diversity, but they value water. Therefore, the theory is that if they can be motivated to take action to protect their water resources, this action will contribute to biodiversity conservation. It is worth noting that TNC's approach to *watershed valuation* goes far beyond *economic valuation*.

While this basic theory sounds relatively simple, in reality watershed valuation projects are quite complex. Before visiting these watershed valuation projects, we decided to develop a results chain to help clarify TNC's assumptions about how watershed valuation actions should lead to

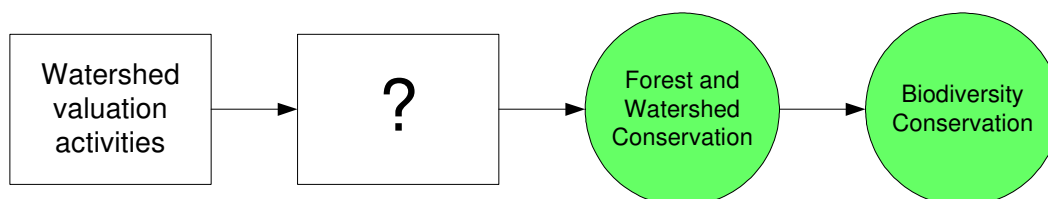
biodiversity conservation – in other words, to define in more detail the project theory and provide a framework for examining each step along the way from intervention to desired impact.

In order for any conservation project to be successful, the implementing organization must develop the project based on sound project theory, and they must execute the project well. Projects can fail to achieve their objectives due to poor theory, poor implementation, or both.

Usually, project theory remains hidden in the minds of the people who design and implement the project. Often, if a group of people is working together to implement a project, they each have different assumptions about how their actions will contribute to achieving their intended impact. Results chains graphically map a series of “if-then” statements that define how a project team believes that a specific conservation action will contribute to achieving a conservation impact. They are a tool used to make the project theory explicit so that it is clear to everyone involved and they can test and refine their assumptions over time.

FOS worked with TNC’s Senior Advisor for International Water Policy to develop the results chain shown in Figure 1. She provided technical assistance to most of these projects for several years. Therefore, her project theory has influenced the approach taken in most (though not all) of the sites. We explain the results chain here, and we use it as a framework for all of the case studies and the cross-site lessons learned document. Within this framework, we describe the actions taken in the sites and analyze the extent to which these projects are achieving their intended objectives.

When we began building the results chain, it looked like this:



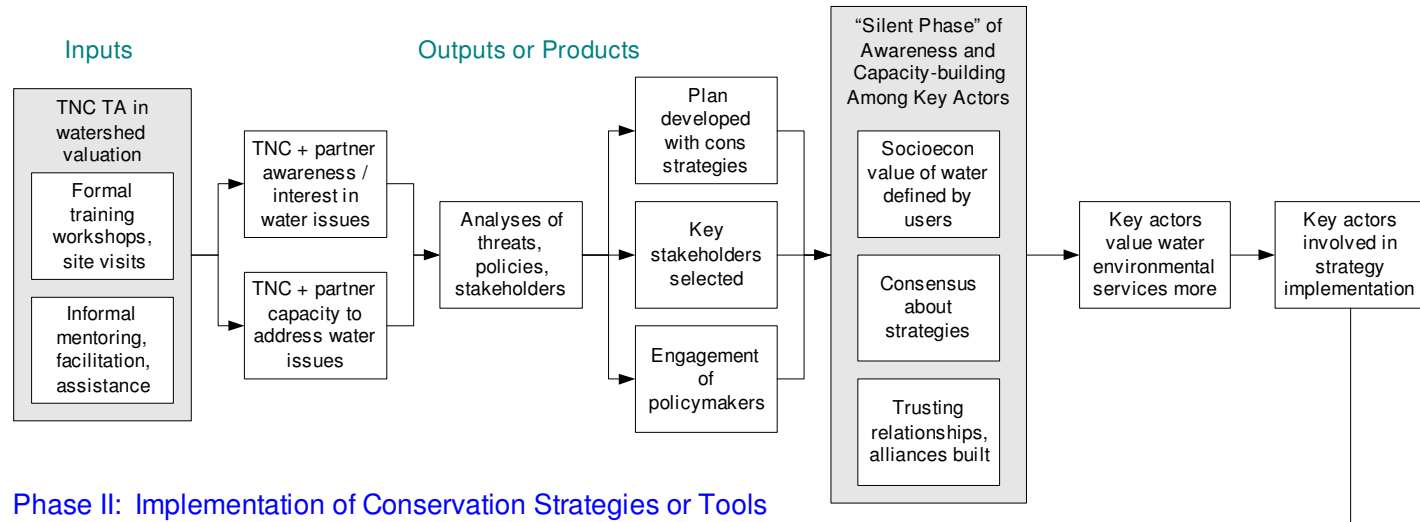
This initial chain says that TNC and its partners are conducting watershed valuation activities to achieve two long-term impacts. The first is an increase in forest and watershed conservation in the specific sites, which TNC believes will contribute to an increase in biodiversity conservation. The difficult part of building the chain is defining the intermediate results needed for the activities to achieve their desired impact.

The complete chain (see Figure 1) includes two project phases. Phase I focuses on initial capacity development, planning and alliance-building. Phase II involves the implementation of specific conservation strategies or tools. TNC’s Senior Advisor for International Water Policy believes that Phase I is a necessary prerequisite to Phase II.

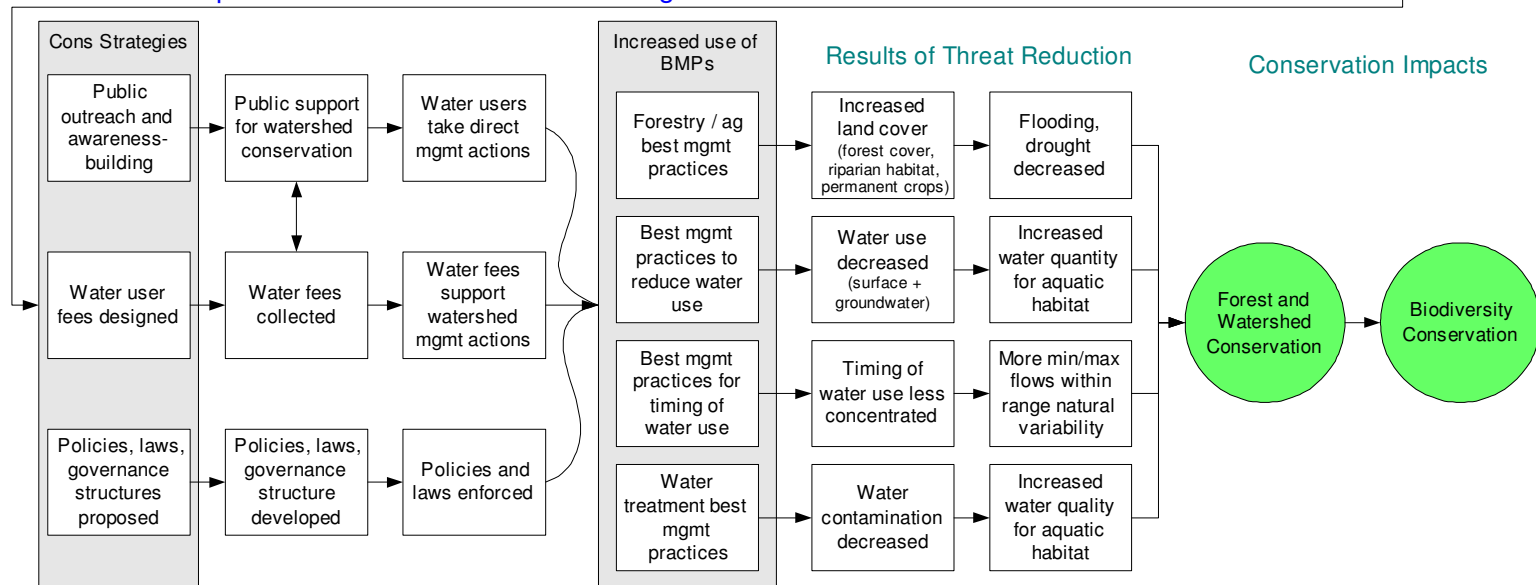
In Phase I, TNC provides technical assistance in watershed valuation, which contributes to building awareness and interest in water issues and capacity to address them. This interest and capacity enable partners to produce initial outputs or products such as analyses of threats,

Figure 1. Causal Chain Defining How TNC Watershed Valuation Projects Are Intended to Contribute to Biodiversity Conservation

Phase I: Initial Capacity Development, Planning and Alliance-building



Phase II: Implementation of Conservation Strategies or Tools



policies and stakeholders, which enable them to develop a watershed valuation action plan and select key stakeholders that need to be involved in implementing the plan. A “silent phase” of information-sharing, awareness and capacity-building among key actors is necessary to achieve consensus about what conservation strategies to undertake and to build trusting relationships among the key actors. TNC calls this the “silent phase” because it may appear to outsiders that little is going on during this phase, but the implementing organizations usually develop important alliances during this period that create the foundation for achieving results during Phase II. During this period, a water valuation process is usually conducted and the key actors may form a watershed group. All of the products of the silent phase contribute to increased recognition by these key actors of the value of watershed environmental services, which contributes to the involvement of these key actors in the implementation of conservation strategies in Phase II.

According to TNC’s program theory, Phase II focuses on the implementation of one or more of the following three conservation strategies: (1) public awareness campaigns, (2) water user fees, and (3) policy development and enforcement. For each of these strategies, a short chain explains expected results. Public outreach and awareness-building increase public support for watershed conservation, which will contribute to water users taking action to improve watershed conservation. The design of a water user fee will result in collection of water fees that are used to support watershed management actions. Engagement of policy-makers will result in the development of new laws, regulations or governance structures that are enforced.

If these conservation strategies are well executed, then they should result in increased adoption of best management practices (BMPs) related to forestry and agricultural activities, reduction of water use, the timing of water use, or water treatment. Which of these best management practices is relevant depends on the conditions in the specific site. For example, forestry and agricultural BMPs may be very important for montane areas, while water pollution reduction is vital to areas such as the Yucatan Peninsula that have complex groundwater systems that influence sensitive marine areas. Where they are relevant, forestry and agricultural best management practices can increase forest cover and other land cover, which will result in decreased flooding and drought. BMPs to reduce water use will reduce surface or groundwater use, which will increase the quantity of water available for aquatic habitat. BMPs related to the timing of water use will result in less concentration in the timing of water use (for example, by hydropower plants), which will increase the number of minimum and maximum river flows within the range of natural hydrologic variability. Water treatment practices will decrease water pollution, thus increasing water quality for aquatic habitat. According to TNC’s theory, all of this will contribute to increased forest and watershed conservation, which will increase forest and freshwater biodiversity conservation.

Although the results chain is presented as a linear sequence of actions and results, we must remember that this is program *theory* – in reality results are often not achieved in the order presented by the chain. For example, some sites have jumped directly to working on the development of water user fees, without an extensive capacity-building, planning and alliance-building phase. These differences help us to learn about the advantages and disadvantages of different approaches and their relative effectiveness under different conditions.

1.3 Case study structure

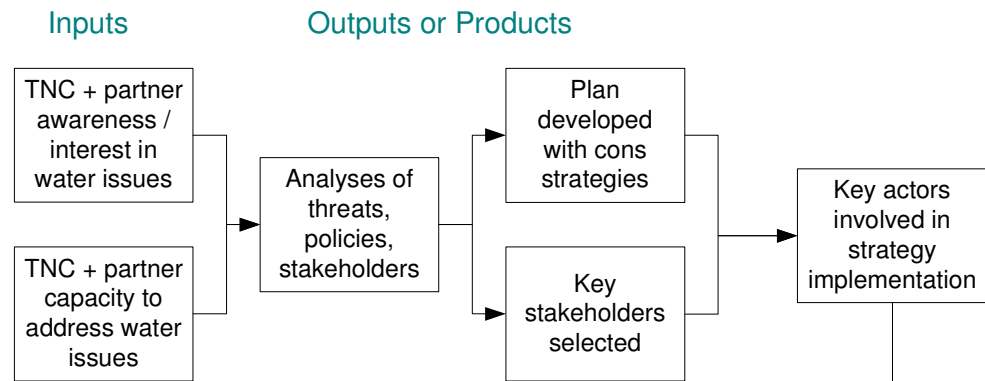
The structure of this document is based on the results chain. We begin by addressing the last two factors at the end (bottom right-hand side) of the chain. In the site description we describe the biodiversity that TNC and its partners are trying to conserve in the protected areas where they are conducting watershed valuation activities and in the project objectives and strategies we describe the project's objectives related to watershed and biodiversity conservation.

We then move to the beginning of the results chain. In the project history and planning and alliance-building process sections, we describe all of the achievements made related to the Phase I portion of the results chain. In the implementation of conservation strategies section, we describe all relevant activities related to public outreach campaigns, water user fees and watershed management policies and, if appropriate, how these activities have contributed to increased use of best management practices. We then describe any monitoring that partner organizations are undertaking to measure the effectiveness of watershed valuation work. Finally, we describe the principal lessons learned and provide concluding remarks.

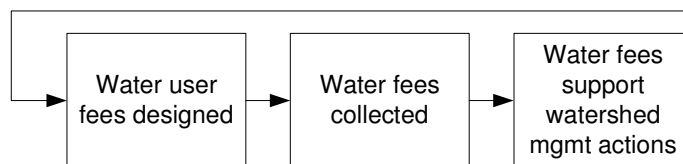
1.4 Overview of this site project

For this site, only part of the results chain shown in Figure 1 applies. TNC conducted research to characterize the watersheds, analyze threats and identify key stakeholders. During the planning and alliance-building phase, TNC chose to work with a select group of high-level decision-makers and concentrate primarily on the design and development of water user fees. The work to date has focused on the following parts of the results chain:

Phase I: Initial Capacity Development, Planning and Alliance-building



Phase II: Implementation of Conservation Strategies or Tools



2 Site Description

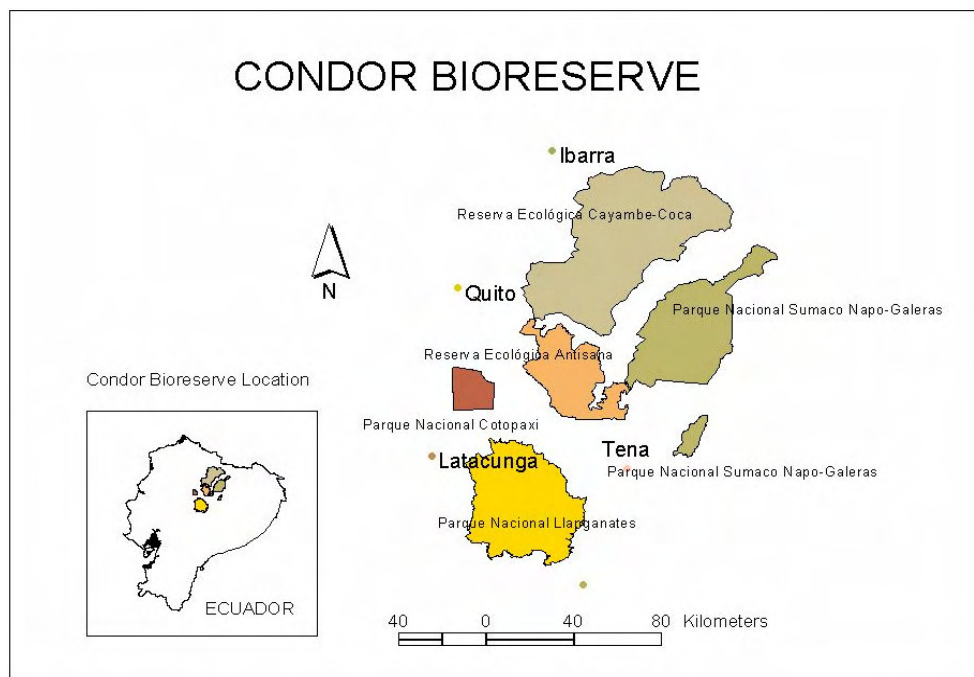
The Condor Bioreserve (CBR), shown in Figure 2, is not one but several protected areas and their areas of influence that together make up an ecologically functional site comprising more than one million hectares. TNC calls the CBR a “management concept” that includes:

- seven protected areas: Cayambe-Coca Ecological Reserve (RECAY), Antisana Ecological Reserve (REA), Sumaco-Napo Galeras National Park, Cotopaxi National Park (CNP), Llanganates National Park, Cofán-Bermejo Ecological Reserve, and Paschoa Wildlife Refuge.
- the areas of influence between these areas (Quijos and Consanga valleys, the buffer zone between Antisana and Cotopaxi, and the buffer zone between Antisana and Llanganates); and
- the northern area of Cayambe-Coca to the border with Colombia.

The CBR is located in the northern part of Ecuador and includes parts of three ecoregions and an exceptional amount of biodiversity. It includes large portions (more than 300,000 hectares) of both Northern Andean Paramo and Eastern Cordillera Real Montane forests and a smaller area (20,000 ha.) of Napo Moist Forests. The CBR includes a variety of habitats that extend from paramo and montane forests to tropical rainforests and also include hundreds of lagoons and wetlands. Conservation of this area will guarantee the conservation of the headwaters and biodiversity of the Napo and Aguarico watersheds, two of the most important Amazon basin watersheds. Scientists have documented more than 760 species of birds, 150 mammals and 110 amphibians in the bioreserve to date, but they consider these numbers to be conservative estimates, since several areas remain unexplored.

Figure 2. Location of Condor Bioreserve

Source: TNC (2001)



The high plateaus of the Condor Bioreserve include the headwaters of more than 20 rivers in 6 large watersheds that provide water for many water uses, including urban and rural drinking water, irrigation, electricity generation, recreational activities such as fishing and hot springs, and other activities such as aquaculture and navigation (Echavarria, 2001). Of all these activities, the ones that use the most water at specific sites and generate the greatest economic value are urban drinking water and electricity generation.

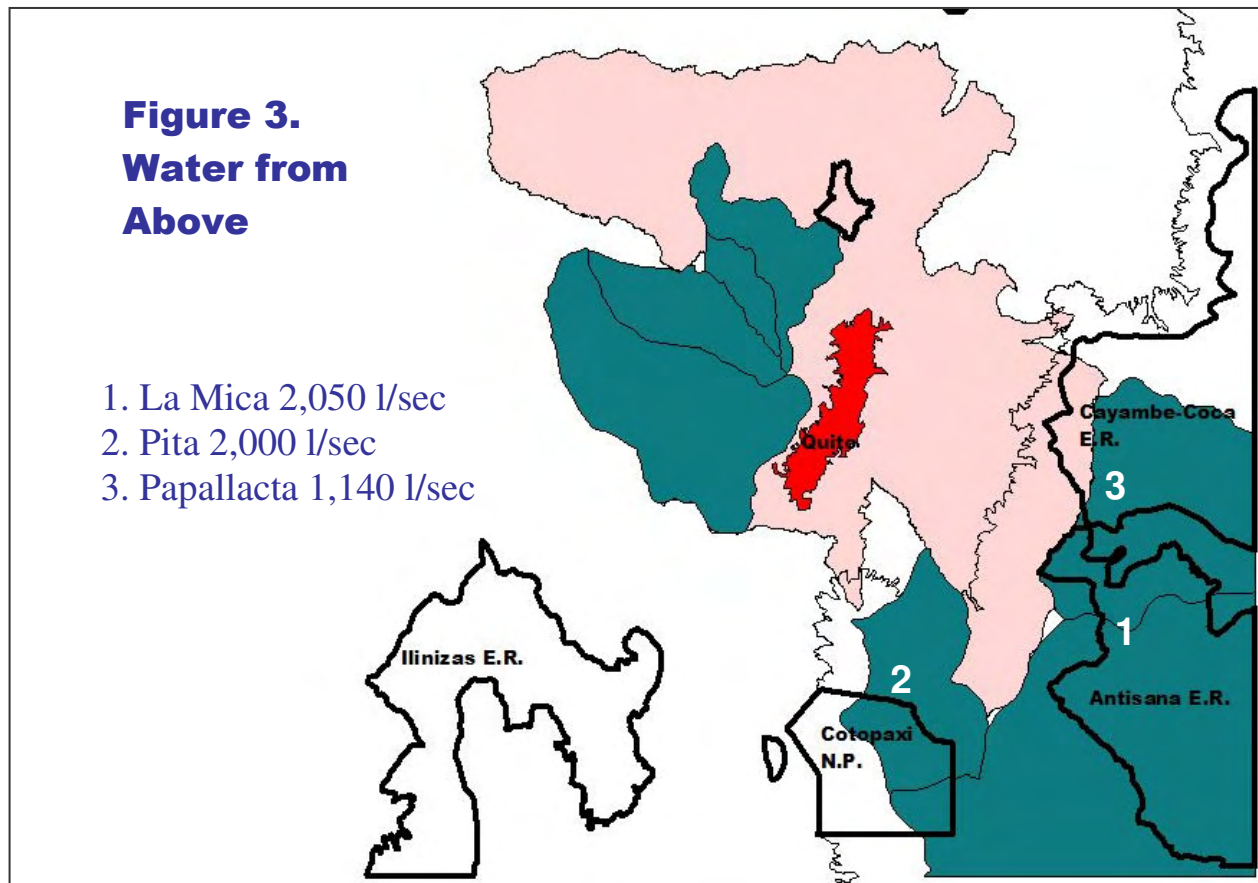
Condor is the source of water for more than 1.8 million people who live in the city of Quito, the capital of Ecuador. The Quito Municipal Water and Sewage Agency (EMAAP-Q) currently manages 7 water projects and has another large project planned. Table 1 lists these projects and describes how much water they produce, where they are located, and whether or not they receive water from the CBR. The table demonstrates that three of EMAAP-Q's current water projects, or approximately 5,190 l/s of the city's drinking water, come from the Condor Bioreserve. These projects, shown in Figure 3, include the Mica – Quito Sur Project that diverts water from a river on the Pacific slope of the Antisana Ecological Reserve, the Pita-Puengasi project that draws water from the Pita watershed in the Cotopaxi National Park, and the Papallacta Project that pumps water over the Continental Divide from the Tumiguina and Blanco Chico rivers in the Cayambe-Coca Ecological Reserve that flow into the Amazon Basin. The table also shows two major water projects planned for the future.

Table 1. Potable Water Systems for the City of Quito Located in the Condor Bioreserve			
Project Name	Water Production (l/s)¹	River (and Watershed) Where Project is Located	Located in These CBR Protected Areas
Mica – Quito Sur	2050 l/s	Antisana and other rivers (Napo watershed)	Antisana Ecological Reserve
Pita-Puengasi	2000 l/s	Pita River	Cotopaxi National Park
Papallacta	1140 l/s	Tuminguina and Blanco Chico Rivers	Cayambe-Coca Ecological Reserve
<i>Total Current Water Production</i>	<i>5190 l/s</i>		
Tambo-Tamboyacu (under construction)	1560 l/s	Tambo y Tamboyacu rivers	Cotopaxi National Park
Ríos Orientales (planned)	16.5 m ³ /s (estimated production)	28 rivers Quijos watersheds)	Antisana and Cayambe-Coca Ecological Reserves and Cotopaxi National Park

Water from rivers in the CBR is also used to generate hydroelectric energy. Quito's Electric Company (EEQ) has the Los Chillos hydroelectric plant on the San Pedro River that receives water from the Pita and San Pedro Watersheds (whose headwaters are located in the Cotopaxi

¹ Carrera, L. 2004.

National Park and the Ilinizas Ecological Reserve, respectively) and generates 1760 kilowatts. EEQ also manages the Paschocha plant in the Antisana Reserve that generates 4500 kw.



Despite their hydrologic value, current land use practices are degrading the watersheds that provide drinking water and generate hydroelectric power for Quito residents. The main threats to these watersheds include advance of the agricultural frontier, inappropriate agricultural practices, and poorly planned infrastructure projects. Rural residents convert paramo and montane forests to cattle and sheep pastures and fields used for subsistence and commercial agriculture. They use poor agricultural practices, such as overgrazing and burning of the paramo, that seriously degrade the high plateaus. The water and electric companies, municipalities and private companies have only taken environmental criteria partially into account when planning and constructing roads, dams, water distribution systems, oil and gas pipes, and other infrastructure projects. As a result, all of these actors are contributing to soil erosion and compaction and there is evidence of reductions in dry season flow and water quality, which may be caused by these factors.

While watershed degradation is occurring on a large scale, evidence of the effects of these land use practices is limited to specific sites. For example, the Quito Electric Company has been monitoring streamflow in the San Pedro River for 40 years and their data show a decrease in dry season flow. EMAAP-Q has been affected by reductions in water quality due to sheep grazing

in the Antisana Ecological Reserve. A few years ago, a break in an oil pipe also contaminated the Papallacta reservoir, forcing EMAAP-Q to construct another dam 10 km upstream and preventing the use of the water of the Papallacta reservoir for at least 10 years due to hydrocarbon contamination in the sediments. There is growing recognition of the part of the public of the pollution problem facing these rivers, which in turn affect water use for productive activities.

As the quantity and quality of water available for human consumption, generation of electricity and other uses is decreasing, demand for water and conflicts between water users are increasing. EMAAP-Q estimates that the population of the Quito metropolitan area will nearly double by 2025, growing from 1.85 to 3.61 million inhabitants and causing maximum daily water demand to rise from 7.67 m³ to 13.33 m³. To meet this demand the company is planning the *Ríos Orientales* Project that will draw drinking water from 28 rivers in the Amazon basin.

A recent analysis of the status of water resource management in the Quito valley (Hoya de Quito) emphasized the urgency of addressing the current mismanagement of water resources. The author stated that “It is essential to immediately design and promote harmonious development of water uses in accordance with the high level of urban growth and demand for water for potable water supply, generation of hydroelectricity and irrigation and to solve current problems of water scarcity, competing uses and pollution.” (Carrera, L. 2004)

3 Project Objectives and Strategies

The Nature Conservancy’s Ecuador office, local partner Fundación Antisana and the United States Agency for International Development (USAID) have worked together for several years with the goal of establishing a water-based finance mechanism as a long-term source of financing for the conservation of the Condor Bioreserve, particularly the Antisana and Cayambe-Coca Ecological Reserves. These two protected areas are the primary source of drinking water for the city of Quito.

Water users do not recognize the social benefits of good water quality and quantity provided by these protected areas. Therefore, the principal objective of the project is to establish an institutional mechanism that encourages water users to recognize the value of these environmental services. With support from USAID, TNC, Fundación Antisana, and others formed the Water Conservation Fund (FONAG) to collect a user fee from those who benefit from the water from the reserves. Their intention was to establish the user fee based on sound economic valuation of the resource. (Echavarria, Nov 2001)

4 Project History

4.1 Interest in Water Issues

Although the protection of Quito’s water supply was one of the justifications for creation of the Antisana Ecological Reserve, construction of water supply infrastructure became a threat to the reserve in the early 90’s, as EMAAP-Q built roads and distribution channels and expanded a natural lagoon through ecologically sensitive paramo for the Mica-Quito Sur water project. A conservation policy staff person from TNC’s headquarters in Virginia, the director of Fundación

Antisana, and TNC's Ecuador Country Program Director spoke about possible ways to address this threat and to get the water company to support the management of the reserve. Their conversations planted the idea of developing a mechanism for payment for watershed environmental services.

In 1997, TNC's Ecuador Director hired an independent consultant to prepare a document explaining the benefits of a water-based finance mechanism, or water fund, and envisioning how it could operate. The consultant had both academic training and professional experience working on water resources management, specifically with water users' associations in Colombia. She wrote *Water: Together We Can Care for It!* – a brief and graphically attractive document – to promote the idea of establishing a water fund. TNC printed the document in 1998 in both English and Spanish.

TNC used the document to begin negotiating with key actors to create a water-based finance mechanism. They approached Patricio Rivaneira, the manager of the water company. He was an advocate of conservation and at the time was a member of Fundación Antisana's Board of Trustees. He supported the idea of creating FONAG and he convinced the Mayor of Quito, Jamil Mahuad, of its importance. A member of the City Council, Roque Sevilla, also a conservationist (who is now a member of the Board of Trustees of World Wildlife Fund) also backed the idea. In April 1998, TNC and the Municipality of Quito signed an agreement to collaborate on the design and development of the Water Conservation Fund (Fondo para la Conservación del Agua – FONAG).

TNC hired the same independent consultant mentioned above to facilitate the process of designing the institutional and financial structure of the water fund. She formed an ad-hoc committee, composed of representatives from Fundación Antisana, TNC, EMAAP-Q and the Mayor's office to oversee implementation of the fund. She drafted a workplan and facilitated regular meetings of the committee to discuss ideas and assign responsibility for specific activities. Each organization carried out activities within their area of expertise and reported back to the group (Echavarria 2001).

TNC's independent consultant helped the committee to define the following criteria for selecting a water-based finance mechanism:

- Ecologically sustainable - promoting long-term watershed conservation
- Legally feasible - based on the local regulatory environment
- Politically viable - likely to be accepted politically
- Multidisciplinary - allow the participation of public and private organizations
- Efficient - should not create more organizations, and no bureaucracy
- Participatory - ensure and promote multi-stakeholder participation, in particular at the community level

She used these criteria to analyze examples of water-based finance mechanisms used in Brazil, Costa Rica, Colombia and other places. She examined both mandatory mechanisms such as taxes or user fees, as well as voluntary ones, such as incentives. At the time, TNC also hired her to provide technical assistance to TNC partner organizations in other South American sites that were beginning to develop water-based finance mechanisms for protected areas.

4.2 Capacity to Address Water Issues

To facilitate a watershed valuation process, TNC and its partner organizations must have some level of capacity to address water issues. Skills in education and outreach, facilitation of inter-institutional collaborative processes, hydrologic research, conservation finance and economic valuation can all be helpful. Roberto Troya believes that the most important skills needed specifically to facilitate the creation of a water fund include:

- Technical capacity in water resources management,
- Knowledge and experience in conservation policy,
- Knowledge of politics, negotiation skills and the ability to develop strategic alliances, and
- Patience and the ability to continue investing in long-term processes.

Together, TNC's Ecuador Country Program Director and the independent consultant have these skills. The consultant has technical capacity in water resources, knowledge and experience in conservation policy and negotiation skills. The Director has strong political skills and experience in negotiation and alliance-building. Both of them have invested part of their time every month, consistently over the past 7 years, to the development of FONAG. When they started, in the late 1990's, TNC's Conservation Finance and Policy program put them in contact with similar projects in the United States, such as New York City's program to conserve and manage the watersheds in the Catskills mountains and the Delaware River that provide about 2 billion gallons of drinking water each day for the city's 9 million inhabitants. TNC gave them access to conservation finance and policy tools and support in negotiation. TNC also helped them to increase the profile of FONAG by documenting their progress and sharing it with other practitioners within TNC's international network. The Condor Bioreserve also entered TNC's Freshwater Initiative as a potential site for replication of the work being developed in several action sites selected in the U.S.

5 Planning and Alliance-building Process

5.1 Project Design and Selection of Key Stakeholders

Water from the Condor Bioreserve is used for many purposes, including irrigation, drinking water, electricity generation, aquaculture and others. Early in the process of developing a water fund, TNC and Fundación Antisana chose to focus on those water users with the greatest economic and political weight. Their approach was top-down, focusing on selling the idea to a select group of leading decision-makers. They chose not to involve a broad array of stakeholders because they did not want to generate unrealistic expectations.

Because the water projects located in the Cayambe-Coca and Antisana reserves provided at the time 5 m³/sec of water that supplied 80% of Quito's residential water, EMAAP-Q was at the top of the list of key actors. Both the water and electric company are city organizations that respond to the Mayor's office, so they presented the idea of a water fund directly to the Mayor, while also lobbying the general managers of EMAAP-Q and EEQ. Because both general managers make decisions with their governing boards, they also provided information to these powerful individuals (Echavarría 2001). As mentioned earlier, TNC and its partners used a short,

attractive document to promote the idea of a water fund. The document presented the problem of water scarcity and watershed degradation, proposed a solution (the water fund), explained what steps needed to be taken to implement this solution, and the benefits of doing this. TNC prepared a video and Powerpoint presentation, based on the document.

When negotiating with leaders in other sectors, it is important for conservation professionals to understand the perspective and interests of these actors. EMAAP-Q's focus is on providing water to urban residents. Urban growth in Quito over the last three decades has created demand for water and the growing supply of untreated wastewater has affected the water quality of local rivers, which prompted water specialists to look beyond the Pacific slope watersheds and existing groundwater resources. This has placed great pressure on the company to expand their service and exploit rivers in the Amazon Basin, with little attention given to the environmental impact of this expansion and in particular of water diversion projects from one watershed to another. The company is composed primarily of engineers and their #1 priority is the design and construction of large water infrastructure projects. They measure their success based on the number of kilometers of drinking water distribution and sewage disposal systems.

Officially, EMAAP-Q reports a loss of 38.5% of its municipal water supply due to unreported sales, illegal connections and leaks in the system. In reality, losses are probably much higher. Rather than addressing this problem, the company proposes to build infrastructure to exploit rivers on the Atlantic slope of the Condor Biosphere Reserve and pump the water across the continental divide, at vast economic and environmental expense.

Although the company is adversely affected by reductions in water quantity and quality due to agricultural activities, EMAAP-Q has limited capacity or little interest in integrated watershed management. Despite passage of the Environmental Management Law and the Water Treatment Law in Ecuador in the 1990s, the water company's Watershed Management Department has few staff or resources. Its importance to the institution is reflected by its location several levels down on their organizational chart – in the Environmental Division of Infrastructure Management.

The Quito Electric Company (EEQ) has been providing electricity generated by hydropower for the past 40 years. The government has given the company concessions to exploit hydropower in specific locations and the company does not pay anything for the right to use the water. EEQ participates in FONAG for three reasons. First, the Mayor asked them to participate. Second, as mentioned earlier, their data show that streamflow has decreased in the San Pedro River over the past 40 years and the company attributes this to poor watershed management. They are interested in working with other institutions to maintain existing streamflow levels, through reforestation and other watershed management activities. Third, EEQ's regulating entity asked all power generators in the country to present environmental management plans for all operations. Therefore, EEQ has sought FONAG's assistance in addressing the issue of minimum base flow. In some locations, EEQ diverts all of the water in the river, leaving stretches of the riverbed completely dry for kilometers at a time. For example, one town's wastewater is deposited into a dry riverbed, causing environmental consequences and threatening human health. Although national regulations require that the company leave enough base flow (*caudal ecológico*) to support ecological processes, the regulations are not enforced. The National Electrification Advisory Council (CONELEC) has nevertheless passed a resolution requiring that

EEQ address base flow needs in the watershed management plans. Therefore, one of EEQ's primary interests is to analyze what level of minimum stream flow is needed in the San Pedro River. Conservation organizations have presented proposals to FONAG to conduct this research.

The beer company is the only member of FONAG from the private sector. The company joined FONAG as part of their environmental management strategy. They have received ISO 9000 certification and they would like to achieve ISO 14000 certification. Like many industrial operations in Quito, they depend on groundwater for their water needs. Their participation in this kind of scheme is voluntary and it sets an excellent precedent for FONAG to involve other industrial water users.

Recently, the Swiss Agency for Development and Cooperation (COSUDE) has become a member of FONAG. This is the first international, bilateral aid agency to join the fund and it represents a very different type of member, because they are not a local water user. The Swiss see their involvement as a long-term commitment which will translate into concrete on-the-ground improvements in watershed management.

In summary, the members of the FONAG Board currently include one representative from each of the following institutions: EMAAP-Q, EEQ, the Andina Beer Company, TNC and COSUDE. TNC was able to involve EMAAP-Q and EEQ in FONAG by taking advantage of conservation-oriented leadership and pressure from the Mayor's office. Because this approach depends on the support of a few leaders, it has required a high level of involvement of TNC staff and cultivation and lobbying of new decision-makers when government leaders change.

Key Dates for the Condor Bioserve Watershed Valuation Project

1997	<i>Water: Together We Can Care for It!</i> developed
1998	TNC and Quito Municipality officially launched the Water Conservation Fund (FONAG) initiative, agreeing to collaborate on the design and development of the water fund.
1999	TNC facilitated an ad-hoc committee to design and develop the water fund.
2000	Development of FONAG bylaws that defined its financial structure (as a trust fund) and governance structure. EMAAP-Q and TNC signed the contract that created the trust fund and defined EMAAP-Q's annual contribution of 1% of drinking water profits.
2001	EEQ signed the FONAG trust fund contract, committing to an annual contribution of 0.5% of profits.
2002	FONAG developed a process for presentation and review of proposals and approved its first proposal.
2003	Quito Mayor pressured FONAG to finance more projects.
2004	FONAG hired a new Technical Secretary with strong capacity in watershed management. FONAG Board approved new policies, procedures and criteria for project selection. TNC and FONAG conducted a general technical analysis of the river basins and water demand in Quito's area of influence (<i>Hoja de Quito</i>).

5.2 Economic Valuation and Hydrologic Research

When developing FONAG, TNC and its partners did not consider valuation research a high priority. They believed that getting key actors to make long-term financial commitments to the

water fund depended more on lobbying than on the results of economic research. Because of this, they made only a small investment in economic valuation research.

In the late 1990s, during the start-up phase of FONAG, Fundación Antisana conducted a simple economic valuation study in the Cayambe-Coca Ecological Reserve. They estimated the cost of maintaining park guards to effectively patrol the upper parts of the Papallacta, Chalpi Grande and Oyacachi watersheds and they divided this cost by the amount of water extracted from the area for urban water supply. The study concluded that the area could be effectively protected by charging a user fee of US\$0.04 per household in Quito. Several years later, the German development agency GTZ conducted similar research in the Antisana Reserve that estimated two costs: (1) the cost of patrolling the upper Antisana watershed and (2) the opportunity cost to landowners for not being able to graze their cattle and sheep in the protected area. They proposed a US\$0.07 monthly user fee for each of the households that receive water from the La Mica – Quito Sur project to cover both of these costs (Echavarria 2001).

While these studies provide a preliminary estimate of the level of a user fee that could be considered, FONAG is focusing on developing the political support necessary to charge a user fee. Efforts are also underway to formalize the water company's current support for FONAG through a city ordinance.

Although it is not clear whether consumers would be willing to pay \$0.04 or \$0.07 per month to ensure conservation of their source of drinking water, there is a perception that people are concerned about the state of their water sources. It is also not clear that these amounts would be sufficient to ensure watershed conservation, since they include only patrols and, in the Antisana Reserve, payments to landowners to compensate them for not grazing their livestock. The studies do not take into account other current or future threats to water quality and the regulation of streamflow.

FONAG and TNC have also supported hydrologic research and research on aquatic biodiversity that has provided baseline information about certain watersheds, especially the Pita and San Pedro Rivers. With support from FONAG and the Corporación Vida para Quito, an Ecuadorian student studying in Barcelona, Spain conducted hydrologic research on the Pita and San Pedro Rivers, two of the three rivers that flow through Quito. TNC conducted a hydrologic characterization of the watersheds based on the Forest Service method. TNC's Freshwater Initiative (now called Sustainable Rivers) also provided technical assistance in the study of aquatic biodiversity, wetland mapping, and ecological classification of rivers. They also funded the design of a meteorologic and hydrologic monitoring network with the minimum number of necessary data collection stations to provide scientifically sound data. FONAG has received support from the Spanish government to study ecological baseflows in the Pita and San Pedro rivers, as a first study which could continue into more comprehensive technical research.

6 Implementation of Conservation Strategies

6.1 Water User Fees

6.1.1 Design of water user fees

In 2000, a new Ecuadorian finance law allowed companies that handle public funds to put money into a trust fund designated for a specific purpose. The Ad-hoc Committee created to facilitate the creation of FONAG decided that this mechanism would meet their criteria (described earlier). They developed the bylaws and defined FONAG's financial and governance structure. The Environmental Management Unit of EMAAP-Q worked with TNC's consultant to choose a socially responsible financial institution, Enlace Fondos, to manage the trust fund. In January 2000 EMAAP-Q signed the contract creating FONAG as a trust fund. Once FONAG was created, the Board of Directors chose a Technical Secretary.

The creation of FONAG was delayed by political circumstances. When Jamil Mahuad left the Mayor's office to become President, Roque Sevilla became Mayor of Quito and he appointed a new EMAAP-Q manager. TNC had to build alliances with these new officials. FONAG was signed under the leadership of Sevilla. Because the FONAG contract allowed the addition of other members at a later date, in 2001 Roque Sevilla convinced EEQ to join the trust fund. In 2003, the FONAG Secretary also convinced the beer company, Cervecería Andina, to join. The FONAG contract defined that the funds could be used for activities in the following areas:

- Legalization of land tenure and land acquisition,
- A system of patrols to control illegal activities such as fires, fishing and hunting,
- Hydrologic protection measures such as installing fencing around springs and erosion control,
- Promotion of sustainable agricultural production systems, and
- Monitoring and evaluation of project results.

Under the contract, EMAAP-Q agreed to contribute \$50,000 in seed capital and 1% of drinking water profits (initially approximately \$15,000 per month) to the trust fund for watershed management. According to TNC's consultant, they reached the decision to commit 1% of their profits by considering that a commonly accepted standard investment for good environmental management is 5% of a company's sales and FONAG represents only about one fifth of the company's environmental management responsibilities. EEQ considered 1% of their sales too much money to commit to FONAG, especially because their use of water is non-consumptive. They agreed to commit 0.5% of their profits, or about \$45,000 a year, to FONAG.

As shown in Table 2, FONAG had received a total of \$1,718,000 in contributions by the end of December 2004, 88% of which have been provided by EMAAP-Q. FONAG's total capital at the end of 2004 was \$2,112,000. FONAG uses only the interest generated from the trust fund to finance watershed management projects. In 2004, FONAG committed \$140,492 to projects.

TNC provided a symbolic contribution to FONAG but they are not a major contributor because they are not a water-using industry. Their contribution to FONAG appears to be quite small in Table 2, but in fact TNC has provided substantial technical assistance to FONAG for the past 7 years. Although TNC has not kept a detailed record of these in-kind contributions, they estimate

that they have spent approximately \$40,000 per year on technical assistance, financed through USAID and in-kind TNC contributions, all designed to strengthen the institutional capacity of FONAG. In addition to the technical assistance provided each year, in 2004 TNC decided to begin providing project support as a counterpart to FONAG in the Antisana and Oyacachi watersheds, critical to the Condor Bioserve Project.

Table 2. Contributions to FONAG Through December 2004						
Contributors	2000	2001	2002	2003	2004	Total Through Dec 04
EMAAP-Q	\$160,000	\$240,000	\$360,000	\$360,000	\$400,000	\$1,520,000
EEQ		\$45,000	\$45,000	\$45,000	\$50,000	\$185,000
TNC	\$1,000					\$1,000
Cervecería Andina				\$6,000	\$6,000	\$12,000
						\$1,718,000

The FONAG Board is interested in increasing the operating budget of FONAG, either by increasing membership, developing strategic alliances that generate matching funds, or fundraising. Of these three options, matching funds have the greatest potential to increase the money available for watershed management projects over the short term. Beginning in 2004, TNC has provided matching funds to co-financed projects with FONAG, increasing the fund's operating budget by 18%.

FONAG has also begun to collaborate with the Corporación Vida para Quito, an initiative of the Quito Municipality. In Ecuador, all taxpayers can decide to dedicate 25% of their income tax to a specific cause of a public entity. Under this program, the Quito Municipality formed this corporation to address pressing environmental and social needs. Quito could receive approximately \$100 million through this program over the next 5 years. Currently, the corporation is focusing on the restoration of the three rivers that flow through the city. Because FONAG's priority areas include two of these rivers, the San Pedro and Pita rivers, the objectives of the two organizations overlap and they have both supported small hydrologic research and reforestation projects. Although the city has many needs, including the need to invest a substantial amount in sewage treatment, this municipal corporation has the potential to be a huge partner for FONAG.

Increasing FONAG membership will require a substantial investment of time to cultivate potential members. OIKOS, a communications firm, funded by USAID, is designing a communications strategy for FONAG to increase awareness among key groups about Quito's water problems and how FONAG contributes to addressing these problems. OIKOS also plans to cultivate potential new members. They have chosen to target potential contributors in the following sectors: flower growers, the beverage industry, the food industry, hotels, textile manufacturers, and other municipalities.

Fundraising for FONAG is complicated by the fact that FONAG is a trust fund and not a non-profit organization. Under Ecuadorian law, only non-profit organizations with legal status (*personería jurídica*) can receive donations and grants. Banks, not non-profit organizations,

manage trust funds. Therefore, FONAG would need to create a non-profit organization before being able to fundraise.

6.1.2 Use of funds to support watershed management projects

Between 1997 and 2000, TNC and its partner organizations focused on designed and establishing FONAG. Although the first funds were contributed in 2000, it was necessary to capitalize the fund and for FONAG to undergo a lengthy strategic planning process in 2001 to define their investment priorities, before supporting any projects. Because FONAG members represent different sectors with very distinct interests, this process took several months. TNC's consultant did work behind the scenes documenting the thematic interests and geographic priorities of each FONAG member institution and structuring the priority-setting process. The FONAG members defined 5 priority geographic areas or micro-watersheds: (1) the San Pedro – Pita, (2) Papallacta, (3) Chalpi, (4) Oyacachi, and (5) Antisana. Several members wanted FONAG's initial investments to be visible to city water users, so the priority areas included the San Pedro and Pita rivers, which are close to the city. TNC's consultant worked with representatives of the member organizations to analyze each watershed's current condition and needs.

Beginning in 2002, FONAG faced increasing pressure – especially from the Municipality and USAID – to begin showing results. An important political transition occurred this year, when the Mayor of Quito changed for the third time in FONAG's short history. Once again, TNC and its partners provided information to the Mayor, the EMAAP-Q Manager and other high-level decision-makers and worked to build their support for FONAG. Over time, the Mayor came to recognize the value of FONAG and support it, but he insisted that it begin to show results on the ground.

During 2002, the consultant and the Technical Secretariat of FONAG designed a process for presentation and review of proposals. FONAG distributed a public Request for Proposals focusing on an environmental evaluation and action plan for the San Pedro and Pita rivers and received its first project proposals (5 qualified). A review committee evaluated them anonymously (without knowledge of the proponent organizations) and selected the strongest proposal. FONAG gave Fundación Natura \$40,000 to analyze current land use, problems and conflicts over water resources, and quantify potential solutions in the San Pedro and Pita watersheds. Fundación Natura's findings helped FONAG define specific needs to which it could respond over the next few years.

As FONAG began supporting projects, TNC recognized the need for a Technical Secretary with training and experience in watershed management. At the time, the FONAG Secretary had training in economic and financial analysis. His skills had been valuable during the design and creation of FONAG, but they did not match current needs. An external evaluation of FONAG recommended that FONAG develop a job description for this position. It suggested that the Technical Secretary have skills in the management of a non-profit organization, including: management of the Board and personnel; the design, management and monitoring and evaluation of a small grants program; experience in fundraising and co-financing at the national and international levels; and good speaking and writing skills in English and Spanish.

Based on the recommendations of the external evaluation, TNC presented an action plan to the FONAG Board in January 2003. The action plan recommended specific points to strengthen the Board and the Technical Secretariat, to create Financial and Technical Advisory Boards, to develop a strategic plan to guide investments, to refine the list of priority watersheds based on an analysis of the threats facing each basin, to determine the cost of conservation of each basin (under minimum, intermediate and optimal management scenarios), to increase FONAG's capital and operational funds and to implement a communications strategy about FONAG. Initially, FONAG Board members rejected this action plan, because they felt the results of the evaluation did not warrant changing the profile of the Technical Secretary, as suggested in the plan. At the time, the Board was not prepared to consider drastic changes in the structure and functioning of the Fund, despite the fact that the Fund's progress had been slow until that point.

Pressure mounted in 2003 for FONAG to do more. The Mayor of Quito publicly criticized FONAG for accumulating money and not spending it. At the same time, USAID and TNC, through their Parks in Peril Program in the Condor Bioreserve, offered to co-finance FONAG projects. Eventually, the Board accepted the need to change the profile of the Technical Secretary and to hire a person to meet this profile. A formal search process was developed and FONAG was fortunate to find a very capable person who had several years of experience working for the water company in Cuenca, Ecuador on watershed management. Pablo Lloret began working as the FONAG Technical Secretary in May 2004.

The new Technical Secretary has been working to formalize FONAG's grant-making process. With TNC's technical support, he proposed policies, procedures and criteria for the project selection process, which the FONAG Board approved in August 2004. All proposals must contribute to the fulfillment of FONAG's annual plan, which is developed each year within the framework of the strategic plan. FONAG has distinctive policies and procedures for small, medium and large projects. For small projects (under \$20,000), the Technical Secretary has the discretion to commit funds at any time. Proposals for medium and large projects must be submitted in October for project implementation the following year. The Technical Advisory Committee or an Evaluation Committee selects the strongest medium-sized projects (\$20,000-\$50,000) and the Technical Advisory Committee and two additional people select the large projects (over \$50,000).

In September 2004, TNC and FONAG completed a general technical analysis of the river basins and water demand in Quito's area of influence (*Hoya de Quito*). This study represents the largest effort to date to consolidate information about these watersheds and provide a strong technical basis for management. FONAG is conducting a series of workshops to share the findings with key actors and create a common understanding of the critical situation of these watersheds and facilitate collaboration on watershed management.

6.1.3 Challenges

FONAG has faced several challenges at different points during the development of the fund. We discuss the major challenges here.

6.1.3.1 Creating a culture of integrated watershed management

The ultimate goal of FONAG is the conservation and management of the watersheds that provide water to Quito, not just the creation of a water fund. This requires, however, a fundamental cultural change in key agencies such as EMAAP-Q, EEQ and the Municipality of Quito. The city of Cuenca provides an example of what TNC and its partners would like to achieve in Quito. In Cuenca the water and electricity company (ETAPA) has environmental education programs and uses conservation easements and other incentives to improve the land management practices of private landowners. ETAPA does not have a water fund, but it directly invests a large amount of its resources into integrated watershed management. ETAPA and the Ministry of the Environment co-manage the protected area that provides water to the city.

According to several people involved in the development of FONAG, one of the biggest challenges in this project is to create a culture of integrated watershed management (IWM) and improve the environmental practices of the principal water-using agencies and industries in Quito. Decision-makers in these agencies recognize that there is growing demand for drinking water and other water uses. Their investment in FONAG demonstrates that they also recognize the need to address threats such as overgrazing and deforestation. They have not, however, recognized the need for integrated watershed management – i.e., for integrated planning and management of all activities that affect water resources within each watershed. Gradually, they have come to recognize how the actions of their agencies contribute to watershed degradation. For example, EEQ drains the San Pedro river completely and leaves the river bed dry for several kilometers. Although EMAAP-Q contributes to FONAG, the construction of its water infrastructure continues to represent one of the biggest threats to biodiversity conservation and a major threat to watersheds in the Condor Bioreserve. Although the company wants to apply environmental best practices in its planning and construction, EMAAP-Q and the Municipality of Quito promote large infrastructure projects such as *Ríos Orientales* as the only way to meet the city's growing demand for water. Demand management practices are overlooked even though significant water savings could be achieved by fixing leaks, controlling illegal connections and charging unpaid connections in the city's water system.

Creating such a cultural change requires pressure from inside or outside of these agencies. By bringing together key decision-makers representing the municipal water and electric companies and a conservation organization, FONAG is working to build a common agenda for improved watershed management and trying to increase pressure for change from within the agencies. This process takes time, due in part to the general lack of communication between the municipal water and conservation sectors. Fortunately, the winds are changing and FONAG is playing an important role in modifying the situation.

Pushing for this cultural change from outside would require a different (but probably complementary) approach. A multilateral lending agency could press for or even require policy changes. For example, the International Development Bank (IDB), which finances many of EMAAP-Q's water projects, has strong institutional policies on integrated watershed management (IWM) and it could require that the water company adopt IWM. Unfortunately, however, these policies are not applied in Ecuador and IDB does not integrate its water and environmental activities in this country. TNC's consultant believes that TNC could achieve a higher level of conservation impact in Ecuador and other countries by identifying channels

within IDB and other multilateral organizations for integrating watershed conservation into water infrastructure projects. TNC Conservation Finance and Policy staff tried to make this link in the late 1990s and she feels that there is a need to revisit their efforts.

High-level international events can also influence culture change. In 2004 the Andean multilateral bank, the Corporación Andina de Fomento (CAF), the Municipality of Quito, TNC and EMAAP-Q highlighted FONAG in an international forum called “Water: Source of Life, Development and Peace.” The event produced the Quito Declaration – a mandate for investing in watershed conservation. This event focused on trying to shift the agenda of EMAAP-Q from just providing water to managing the resource better over the long term through IWM. TNC is working to make the Quito Declaration a reality and not just a piece of paper.

6.1.3.2 Building a Sense of Shared Ownership

FONAG was created to facilitate collaboration between the city’s principal water users and conservation organizations to improve watershed management. According to the contract, all FONAG members have the same level of participation in decision-making, irrespective of their financial contribution to the water fund. Nevertheless, EMAAP-Q representatives say that almost all of FONAG’s funds are from EMAAP-Q and imply that this gives EMAAP-Q ownership over the fund. Frequently, they refer to FONAG as “an appendix of EMAAP-Q” or “an initiative of the Municipality of Quito and EMAAP-Q to conserve the watersheds that provide water to the city.” Other people share this perception of FONAG. For example, a representative of EEQ called FONAG “a trust fund for potable water supply.”

This perception may have hindered recruitment of new members. Capitalizing the fund at the necessary level will require the investment of other companies. These companies will only join if they perceive FONAG as a multi-sectoral initiative in which all members have equal weight in decision-making, no matter what their financial contribution to the fund. With the membership of the Swiss cooperation and the continued and strengthened support of the Andean Beer Company and other industrial users, there is the expectation that new members will be integrated in the short term.

6.1.3.3 Building the Capacity of FONAG

The institutions that compose FONAG have little experience and technical capacity in watershed management. By providing advice and technical information to guide decision-making, TNC has tried to gradually build the capacity of FONAG to make decisions and support programs that improve the condition of the watersheds that provide water to the city. While TNC could have accomplished more by doing certain things directly (such as cultivating new members), they felt that it was more important to build the capacity of FONAG to do things themselves. Building this capacity was a slow process and it took a particularly long time for FONAG to begin supporting projects in the field. Many people agree that hiring a new Technical Secretary with experience and expertise in watershed management has been essential to strengthening FONAG’s institutional capacity. Now that FONAG has skilled personnel, it is likely that TNC will only continue providing technical assistance to the fund for about one more year.

6.1.3.4 Need to Institutionalize FONAG

FONAG was created by an 80-year contract signed initially between TNC and EMAAP-Q and later by EEQ and the Andean Beer Company, and recently the Swiss Agency for Development and Cooperation. Because EEQ and EMAAP-Q are municipal companies, on three different occasions over the past eight years changes in city leadership have required TNC to invest in lobbying the new mayor, so that he will continue honoring this contract. TNC and the FONAG Technical Secretary say that it is essential to institutionalize FONAG through a municipal ordinance. This process is currently underway and it is expected to bear fruit this year since the political climate is conducive to a quick approval of the ordinance.

6.1.3.5 Meeting High Expectations with a Relatively Small Operating Budget

Initially, FONAG was designed to be a major source of funding for the Condor Bioreserve. Promotion of the fund within Ecuador and internationally raised high expectations of what this innovative source of funding could accomplish. Currently, there is an imbalance between the large expectations of FONAG and the small level of financial resources available for watershed management projects. Because FONAG is a trust fund, it can only spend the interest generated from the fund. At the end of 2004, FONAG had received \$2,112,000 in capital and it had \$140,492 for projects. Because of this, to date FONAG has only been able to finance small projects, around \$50,000 per project, covering a wide range of topics such as reforestation, removal of illegal dumps, building a small river park, best management practices to reduce soil erosion and sustainable production activities for local communities.

To address this challenge, outside consultants recommended in 2002 that the Board modify the trust fund's legal requirements (*escritura*) to allow the use of not only interest payments but also 50% of annual contributions for watershed management projects. They projected that this would dramatically increase the amount of funding available for projects in the short term. For example, it would have made \$221,825 available for projects in 2002, as opposed to just \$30,650, as shown in Table 3. It would slow the capitalization of the fund – for example, FONAG's projected capital in 2008 would be \$2.4 million, as opposed to \$3.8 million. This change, however, would have increased the fund's impact at a time when it was also trying to gain credibility and attract new members.

FONAG has chosen not to spend half of its annual contributions on watershed management projects, as the consultants recommended, because they feel that modifying the trust fund's *escritura* could “open Pandora's box,” leading to undesirable changes in the legal agreement between all members. Instead, as discussed earlier, FONAG is seeking co-financing. In 2004, TNC began providing matching funds from the USAID Condor Bioreserve project. In addition, the Technical Secretary has negotiated matching funds from a variety of organizations, such as Corporación Vida para Quito, Swiss cooperation and the Spanish government.

Table 3. Projected Financial Impact of Using 50% of Annual Capital Contributions to FONAG

Source: Oleas and Kloss (2002)

	Actual Contributions			Projected Contributions					
	2000	2001	2002	2003	2004	2005	2006	2007	2008
EMAAP Annual Contribution	160,000	240,000	360,000	360,000	400,000	450,000	450,000	450,000	500,000
EEQ Annual Contribution		45,000	45,000	45,000	50,000	50,000	50,000	50,000	60,000
Contributions from new members (a conservative estimate)				1,000	2,000	3,000	4,000	5,000	6,000
Interest generated from the previous year (5%)		8,000	22,650	42,900	63,200	85,800	110,950	136,150	161,400
Scenario 1: End of year capital assuming capitalization of all contributions	160,000	453,000	858,000	1,264,000	1,716,000	2,219,000	2,723,000	3,228,000	3,794,000
Scenario 2: End of year capital assuming capitalization of 50% of contributions	160,000	453,000	666,825	891,275	1,148,875	1,443,275	1,750,000	2,071,325	2,435,025
Withdrawals for investment in projects:									
Scenario 1: Interest generated	No projects		30,650	42,900	63,200	85,800	110,950	136,150	161,400
Scenario 2: 50% of contributions and interest generated	No projects		221,825	224,450	257,600	294,400	307,475	320,575	363,700
			(included interest 2000-02)						

6.1.4 Enabling Factors

6.1.4.1 Long-term Commitment to the Process

With financial support from USAID, TNC has consistently provided technical advice and guidance to FONAG for over eight years. Developing a water-based finance mechanism such as FONAG takes several years. As TNC's consultant says, "You have to have a motor that keeps things going." TNC's Country Program Director and watershed valuation consultant were that motor. Since the creation of FONAG, Quito has seen three new mayors and three new directors of EMAAP-Q. TNC has invested a significant amount of time into cultivating new political leaders and helping FONAG weather these political changes, as well as times of financial crisis. TNC has also invested significantly in building the institutional capacity of FONAG.

6.1.4.2 A Clear Proposal

One factor that facilitated the creation of FONAG was the development of a clear, user-friendly proposal that presented complex concepts such as environmental services in straightforward and accessible language. The production of *Water: Together We Can Care For It!* and an accompanying video and Powerpoint presentation facilitated communication with key decision-makers. Depending on the audience, TNC and its partners could present the ideas in simple terms or share the full complexity of the problem and proposed solution.

6.1.4.3 Vision of High-level Decision-makers

Without the vision of a few key decision-makers, it never would have been possible to create FONAG. Because of interest in conservation and openness to new ideas, Patricio Rivaneira (the manager of the water company in 1997-98), Jamil Mahuad (Mayor of Quito) and Roque Sevilla (a member of the City Council and then Mayor of Quito) made it possible for TNC and the

Municipality of Quito to formally launch this initiative in 1998 and then sign the trust fund contract with EMAAP-Q in 2000 in which the water company committed 1% of drinking water sales to the fund. At the same time, the generosity of Paco Moncayo (Mayor of Quito in 2000-present) and Juan Neira (the manager of the water company in 2000-present) insured that the effort could be effectively implemented.

6.2 Public Outreach Campaigns

6.2.1 Public Outreach Activities

Because FONAG was created by a small group of visionary, high-level decision-makers, most people in Quito don't know about it. TNC intentionally chose to keep a low profile while developing the fund, so that other institutions would not try to steal the funds dedicated to FONAG. They felt it would be better to invest in building public awareness once the fund was built and was financing some projects.

People in the conservation community and water sector know about FONAG, because the water fund gets some visibility in water-related events such as the National Meeting of the Water Forum held every year, which usually attracts about 800 people representing 300 organizations. Internationally, TNC has insured that FONAG is well publicized within the conservation community. Residents of the rural communities where FONAG has implemented projects may also have some knowledge of the fund. Beyond these specific groups, however, few people know about FONAG because the water fund has not yet invested in public outreach activities.

Most people in Quito don't know where their water comes from, nor do they understand how agricultural activities and infrastructure projects are degrading the watersheds that provide water for the city, or the importance of conserving the Antisana and Cayambe-Coca Ecological Reserves to ensure future water supply. Thus, they cannot understand the value of a water fund such as FONAG and they cannot provide political support for it. The lack of political support for FONAG leaves the fund vulnerable when political leaders change.

To address this problem, the USAID Mission in Ecuador has given a 2-year grant to OIKOS, an Ecuadorian NGO that works in environmental education and communications, to develop a communications strategy for FONAG, as part of a communications strategy for the Condor Bioserve. OIKOS will analyze current awareness and attitudes about FONAG and design a communications strategy oriented towards increasing public awareness about FONAG and increasing contributions to the fund from the private sector and other municipalities.

6.2.2 Challenges and Enabling Factors

Unfortunately, the Municipality and private companies have not recognized the public relations value of FONAG. The Mayor of Quito could use FONAG to show how he is working to protect the city's water supply. Instead, he promotes the *Ríos Orientales* project. None of the members of FONAG – EMMAP-Q, EEQ or the Andean Beer Company – have produced publicity materials to show the public the important work they are doing. They do not recognize how their involvement in FONAG could improve their public image. FONAG is working to change this

and use the results of the projects they funded in 2004 (watershed management projects in the San Pedro and Pita watersheds) to raise the public's awareness of FONAG and the companies that contribute to it.

6.3 Best Management Practices

6.3.1 Forestry and agricultural best management practices

Because FONAG just began financing projects in 2003, it is too early to evaluate the impact of these projects in terms of improving watershed management. To give a sense of FONAG's geographic and thematic priorities, we provide here a brief description of some of the projects funded to date:

- To contribute to the recuperation of the lower parts of the San Pedro and Pita watersheds, FONAG supported a study of hydrologic resources, forestry planning, reforestation and river cleaning.
- FONAG has supported the clean-up of clandestine solid waste dumps and the recuperation of the river banks in the San Pedro and Pita basins.
- The Páramo Foundation conducted an environmental education and restoration project in the Pita watershed.
- In collaboration with Vida para Quito, FONAG is supporting reforestation in critical zones.
- The Ecuadorian Center for Agricultural Services (CESA) has worked with cattle ranchers in the Cayambe-Coca Ecological Reserve, in the Papallacta and Oyacachi watersheds, to improve cattle ranching practices, reduce conflicts between cattle and the Andean bear, and reduce the environmental impact of cattle ranching on the watersheds.
- FONAG pays the salary and expenses of one of the 34 park guards in Cayambe-Coca.

7 Monitoring Watershed Valuation Work

Measuring success, particularly in relation to water flows and quality is FONAG's aim.

However, the process has been difficult since the information available is limited in scope, of variable quality and is not obtained at regular time intervals. Therefore, TNC tried in 2000 to promote a proposal for a network of monitoring stations, but unfortunately it was not possible to mobilize the institutions that needed to be involved. Now, with the results of the monitoring done with the University of Barcelona, questions have arisen that will generate further work in this area. The new Technical Secretary is aware of the importance of this area of work and is working to get the necessary funding and institutional commitment to create a network of stations.

8 Lessons Learned

8.1 Conserving watersheds only achieves part of what is necessary to conserve biodiversity

The early literature about FONAG envisioned the fund as a finance mechanism for the Antisana Ecological Reserve (120,000) and the Cayambe-Coca Ecological Reserve (400,000 hectares), or even potentially the entire Condor Bioreserve, which includes more than one million hectares. The watersheds of interest to EMAAP-Q and EEQ, however, include a smaller area – portions of the San Pedro-Pita, Papallacta, Chalpi, Oyacachi and Antisana basins. The headwaters of these watersheds encompass the higher altitude parts of Condor. It is logical to believe that FONAG will continue to fund projects only in the areas of geographic interest to its members. While these areas are important, some people say that these are not the areas of greatest biodiversity value within Condor. Thus, conserving the watersheds that provide water for Quito will only achieve a small part of what is necessary to conserve the biodiversity of Condor. While this may seem obvious – a water fund cannot be the sole source of funding for such a large area – we mention this lesson so that other sites will be realistic when projecting the geographic area that could potentially benefit from a water-based finance mechanism. Water users are likely to want their money spent only on the watersheds that supply their water and not entire reserves or ecologically functional sites.

8.2 Long-term commitment to the process is vital

It is essential to have a person with the right skills facilitating the process of developing the water fund. This includes both technical skills in integrated watershed management and also an ability to work with the major players (in this case, primarily the water company) and get things done. Roberto Troya advises organizations not to undertake the development of a water-based finance mechanism unless they can dedicate the necessary resources to facilitate the process over several years and they have the commitment of key actors.

8.3 Account for in-kind contributions to the process

TNC has contributed approximately \$20,000 per year in technical assistance to FONAG over the past eight years. Since they are not a water-using industry, TNC chose to only give a symbolic contribution of \$1,000 to the FONAG trust fund. Because of this, some people in EMAAP-Q believe that TNC has not contributed much to FONAG. One of the people most closely involved in the process suggested that TNC should have been more explicit about the role they felt was appropriate for them to play – as a facilitator and technical advisor, rather than a financial contributor. They also should have accounted for the money they spent on technical assistance as in-kind contributions to the fund.

8.4 Endowment funds have some limitations

If a water fund is established as an endowment fund that local agencies capitalize gradually over time, then the interest available for supporting projects is quite limited during the first few years – which is a time when the fund needs to demonstrate its effectiveness to potential donors or investors. A combination trust fund / sinking fund can provide the long-term benefits of an endowment fund, combined with a larger budget for projects in the early years. Another alternative is to co-finance projects with other organizations, as FONAG is doing with TNC now.

8.5 Invest in visible projects at the beginning

Because it is important to gain recognition and credibility in the early years, the first few projects funded by FONAG should have been visible projects that the Mayor, EMAAP-Q and EEQ could have used for publicity. For example, FONAG would have benefited from newspaper articles showing the Mayor inaugurating a reforestation project, showing the Quito public his commitment to the protection and management of their water resources. Instead, FONAG supported feasibility studies and did not try to produce publicity about the fund. A small investment in communications could have increased public support for FONAG as it began financing projects.

8.6 It is important to have a solid plan

Because FONAG members represent sectors with very distinct interests, it has been very important to develop a solid work plan, as a way to avoid having the agenda of any one member institution unduly influence decisions. Since 2001, TNC has worked to develop such plans through strategic planning and an outside consultancy to review draft plans. During 2004, TNC facilitated the development of a 10-year investment plan defining what kinds of projects FONAG plans to support. TNC also conducted a technical study of the water resources of the Quito basin, to strengthen the scientific information available to inform decision-making by the Municipality, conservation organizations and other actors.

9 Concluding Remarks

TNC, the Municipality of Quito, EMAAP-Q, EEQ and the Andean Beer Company have achieved impressive results in the design and development of a water fund financed solely by local Ecuadorian institutions. As of the end of 2004, FONAG had \$2,112,000 in capital, which provided a budget of \$301,000 for projects in 2005. The design of the fund allows the capital and funds available for projects to increase each year and by 2011 it is projected to have over \$5.5 million in capital and generate over \$250,000 for projects each year. FONAG has also negotiated co-financing with other institutions and is working to attract more matching funds as well as donations. This will provide a strong and solid base of sustainable financing for these watersheds over the long term.

It is important to remember, however, that the ultimate goal of FONAG is the improved management of the watersheds that provide water to Quito and conservation of the biodiversity in these watersheds. A conservation finance mechanism contributes to this goal but is not sufficient to achieve it. This goal will not be achieved unless EMAAP-Q, EEQ and other institutions adopt a culture of integrated watershed management. As discussed earlier, construction of large infrastructure by the Municipality, EMAAP-Q and others represents one of the biggest threats to biodiversity conservation and a major threat to the watersheds of the Condor Bioreserve, because these institutions do not apply environmental best management practices in their planning and construction. The Municipality and EMAAP-Q promote projects such as *Ríos Orientales* as the only way to meet the city's growing demand for water and they do not plan or construct these infrastructure projects in a way that would minimize their environmental damage. As currently planned, the *Ríos Orientales* project will provide 17 m³/sec to Quito by diverting water from 28 rivers in the Amazon basin, constructing 67 kilometers of

tubing and 42 kilometers of tunnels, three reservoirs, two treatment plants and four hydroelectric plants. The ecological impact of this project on Condor would likely include widespread habitat destruction and fragmentation, alteration of hydrologic processes and water pollution.

To conserve the Condor Bioreserve, TNC is developing a strategy for building support for integrated watershed management in key institutions such as EMAAP-Q and the Municipality. In the long run, this would reduce the threats facing the Condor Bioreserve that FONAG is designed to address, but it is not enough. A multi-faceted strategy is necessary, which includes the FONAG but is not solely dependent on it. Conservation work in such a large area needs to work with different strategies, including a water-based financial institution, but also private lands conservation, collaboration with indigenous communities, and others.

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List of People Interviewed

1. Marta Echavarria, Independent Consultant, Ecodecisión
2. Roberto Troya, TNC Ecuador Country Program Director
3. Pablo Lloret, FONAG Technical Secretary
4. Efraín Andrade, Quito Municipal Water and Sewage Company (EMAAP-Q)
5. Raul Cubillos, Quito Electric Company (EEQ)
6. Doug Mason, USAID
7. Marco Encalada, OIKOS

Motagua-Polochic Water Fund.

The main objective of the Defensores de la Naturaleza Foundation's Motagua Polochic Water Fund (WF) is to guarantee the conservation and sustainable management of two of the protected areas that Defensores co-manages. These protected areas are the Biosphere Reserve Sierra de las Minas and the Bocas del Polochic Wildlife Reserve.

The WF is a sustainable and independent mechanism of payment for environmental services that guarantees, in a flexible and effective way, the sustainable use of the hydrological resources as well as the conservation and mitigation of threats to the biodiversity in the Motagua Polochic system. The funds provided by the WF will be used to promote the effective management of the protected areas, integrated management of the water basins, ensure better productive practices among the different local users, create environmental awareness, conduct scientific research, and to design and implement local and regional policy. The final goal of these actions is to contribute to the conservation of natural resources in the core zone of the Sierra de las Minas and Bocas de Polochic protected areas and to promote the socio economic welfare of the local communities.

The following case study is a brief summary of our accomplishments to date. The Nature Conservancy was indispensable in its support for studies done at the Pasabien River basin. The studies mainly were on the economical valuation and environmental education.

It is important to emphasize that the WF has a series of results and accomplishments in other areas of work that are not detailed in this case study, such as the municipal support industries, social organization, policy and strategies, environmental education, research and the *per se* design of the water fund initiative. The full results can be found at the Defensores de la Naturalez web site, www.defensores.org.gt or by sending your questions to our WF executive director Licda. Lorena Calvo. lcavlo@defensores.org.gt

The Water Fund wishes to acknowledge all its partners and founders that have supported the initiative and the Project. They are: The British Embassy Guatemala City, Centro Guatemalteco de Producción + Limpia, Consejo Nacional de Áreas Protegidas (CONAP), Corredor Biológico Mesoamericano, Critical Ecosystem Parternership Fund, FIPA/USAID, Fundación AVINA, Gobierno Real de los Países Bajos, PROARCA/PRODOMA, Proyecto JADE, SwissRE, The Nature Conservancy, Universidad del Valle de Guatemala, Universidad Rafael Landívar, US Forest Service, Agencia Internacional para el Desarrollo (AID), y World Wildlife Fund (WWF)

Thanks for your support!

“POR AMOR Y RESPETO A LA VIDA”

Ing. Oscar Manuel Núñez S.
Director
Defensores de la Naturaleza

Licda. Lorena Calvo Executive
Executive Director Fundación
Water Fund

Fondo del Agua del Sistema Motagua Polochic

El Fondo del Agua (FA) del Sistema Motagua Polochic es una iniciativa de Fundación Defensores de la Naturaleza que tiene como objetivo primordial garantizar la conservación y el manejo sostenible de la Reserva de la Biosfera Sierra de las Minas y el Refugio de Vida Silvestre Bocas del Polochic, áreas protegidas que coadministra legalmente.

El FA es un mecanismo de pago por servicios ambientales independiente y financieramente sostenible que busca garantizar, de manera flexible y efectiva, un uso sostenible de los recursos hídricos, así como la conservación y mitigación de amenazas a la biodiversidad en el Sistema Motagua-Polochic. Los ingresos provenientes del Fondo se utilizan para promover el manejo efectivo de las áreas protegidas, realizar un manejo integrado de cuencas, asegurar mejores prácticas productivas entre usuarios locales, crear conciencia ambiental en grupos metas, realizar estudios científicos para la conservación y diseñar e implementar políticas locales y regionales de agua. La meta final de estas acciones es poder contribuir a la conservación de los recursos y ecosistemas forestales de la Zona Núcleo de Sierra de las Minas y Bocas del Polochic, mantener sus bienes y servicios hídricos y ambientales, así como promover el bienestar socio-económico de las poblaciones locales.

El estudio de caso que se presenta a continuación es un breve resumen de los logros efectuados hasta el momento, siendo The Nature Conservancy indispensable en el apoyo para la elaboración de varios estudios efectuados en la microcuenca del Río Pasabién; principalmente en el área de valoración económica y educación ambiental.

Es importante resaltar que el FA cuenta ya con una serie de resultados y logros adicionales en otras esferas de trabajo que no están reportadas en este estudio de caso; tales como el fortalecimiento municipal, fortalecimiento a las industrias, organización social, normas - políticas y estrategias, educación ambiental, investigación y diseño *per se* del concepto del FA. Los avances pueden ser consultados al visitar nuestra pagina Web de Defensores de la Naturaleza, www.defensores.org.gt o con consultas directas con la Dirección ejecutiva del Fondo del Agua, Licda. Lorena Calvo. lcavo@defensores.org.gt

El Fondo del Agua agradece a todos aquellos socios y donantes que han confiado en la iniciativa y que se mencionan a continuación: British Embassy Guatemala City, Centro Guatemalteco de Producción + Limpia, Consejo Nacional de Áreas Protegidas (CONAP), Corredor Biológico Mesoamericano, Critical Ecosystem Partnership Fund, FIPA/USAID, Fundación AVINA, Gobierno Real de los Países Bajos, PROARCA/PRODOMA, Proyecto JADE, SwissRE, The Nature Conservancy, Universidad del Valle de Guatemala, Universidad Rafael Landívar, US Forest Service, Agencia Internacional para el Desarrollo (AID), y World Wildlife Fund (WWF)
¡Gracias por su apoyo!

“POR AMOR Y RESPETO A LA VIDA”

Ing. Oscar Manuel Núñez S.
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Fondo del Agua

Case Study of Watershed Valuation in the Sierra de las Minas Biosphere Reserve, Guatemala

Final Report

Based on a September 2004 site visit

Prepared for The Nature Conservancy by
Marcia B. Brown
Foundations of Success

August 2005



Acronyms

AURSA	Association of Irrigation Users of San Jerónimo
BMP	best management practice
COCODES	Community Development Council (Consejo Comunitario de Desarrollo)
COMUDES	Municipal Development Council (Consejo Municipal de Desarrollo)
CONAP	National Council for Protected Areas
FDN	Defenders of Nature Foundation (Fundación Defensores de la Naturaleza)
FOS	Foundations of Success
GTZ	German Development Agency
MARN	Ministry of Environment and Natural Resources
SMBR	Sierra de las Minas Biosphere Reserve
TNC	The Nature Conservancy
USAID	United States Agency for International Development
WWF-CA	World Wildlife Fund – Central America

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1 Introduction

1.1 Purpose of case study

For the last few years, The Nature Conservancy (TNC) has supported watershed valuation projects in several countries in Latin America as a strategy for achieving biodiversity conservation. Through the International Water Policy Program, TNC has provided technical assistance to the following countries and sites:

- Mexico: Chiapas (including the El Triunfo and La Encrucijada Biosphere Reserves)
- Mexico: Quintana Roo
- Guatemala: Sierra de las Minas Biosphere Reserve
- Honduras: Yojoa Lake Multi-use Area
- Bolivia: Sama Mountain Range Biological Reserve
- Ecuador: Condor Bioreserve

Watershed valuation projects are designed to link water users to watershed conservation. They seek to get water users to contribute to conservation either financially (through user fees or increased public financing of conservation activities) or by taking actions directly to reduce threats to water resources. Thus, watershed valuation projects involve close collaboration between conservation organizations and government agencies, water companies, citizens groups and other key stakeholder groups.

TNC asked Foundations of Success (FOS) to develop a series of case studies that document the experiences and knowledge that TNC and its partner organizations have gained about watershed valuation projects in these six sites. This document represents one of the six case studies. In addition to the case studies, we have written a cross-site lessons learned document to analyze the use and effectiveness of watershed valuation as a conservation strategy, based on the experiences of all of the sites. The purpose of developing these documents is to facilitate learning among these and other sites that are currently implementing watershed valuation projects or are interested in undertaking these activities.

1.2 Watershed valuation project theory

Many montane protected areas provide abundant, clean water that is valuable for human consumption, irrigation, hydro-electric production, industrial production, ecological processes and other uses. The basic intention of watershed valuation projects is to help local actors recognize the importance of these natural areas and take action to protect them, in order to ensure the integrity of this critical environmental service. Local people may not value the conservation of biological diversity, but they value water. Therefore, the theory is that if they can be motivated to take action to protect their water resources, this action will contribute to biodiversity conservation.

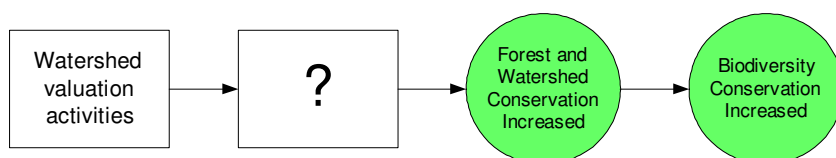
While this basic theory sounds relatively simple, in reality watershed valuation projects are quite complex. Before visiting these watershed valuation projects, we decided to develop a results chain to help clarify TNC's assumptions about how watershed valuation actions should lead to biodiversity conservation – in other words, to define in more detail the project theory and provide a framework for examining each step along the way from intervention to desired impact.

In order for any conservation project to be successful, the implementing organization must develop the project based on sound project theory, and they must execute the project well. Projects can fail to achieve their objectives due to poor theory, poor implementation, or both.

Usually, project theory remains hidden in the minds of the people who design and implement the project. Often, if a group of people is working together to implement a project, they each have different assumptions about how their actions will contribute to achieving their intended impact. Results chains graphically map a series of “if-then” statements that define how a project team believes that a specific conservation action will contribute to achieving a conservation impact. They are a tool used to make the project theory explicit so that it is clear to everyone involved and they can test and refine their assumptions over time.

FOS worked with TNC’s Senior Advisor for International Water Policy to develop the results chain shown in Figure 1. She provided technical assistance to most of these projects for several years. Therefore, her project theory has influenced the approach taken in most (though not all) of the sites. We explain the results chain here, and we use it as a framework for all of the case studies and the cross-site lessons learned document. Within this framework, we describe the actions taken in the sites and analyze the extent to which these projects are achieving their intended objectives.

When we began building the results chain, it looked like this:



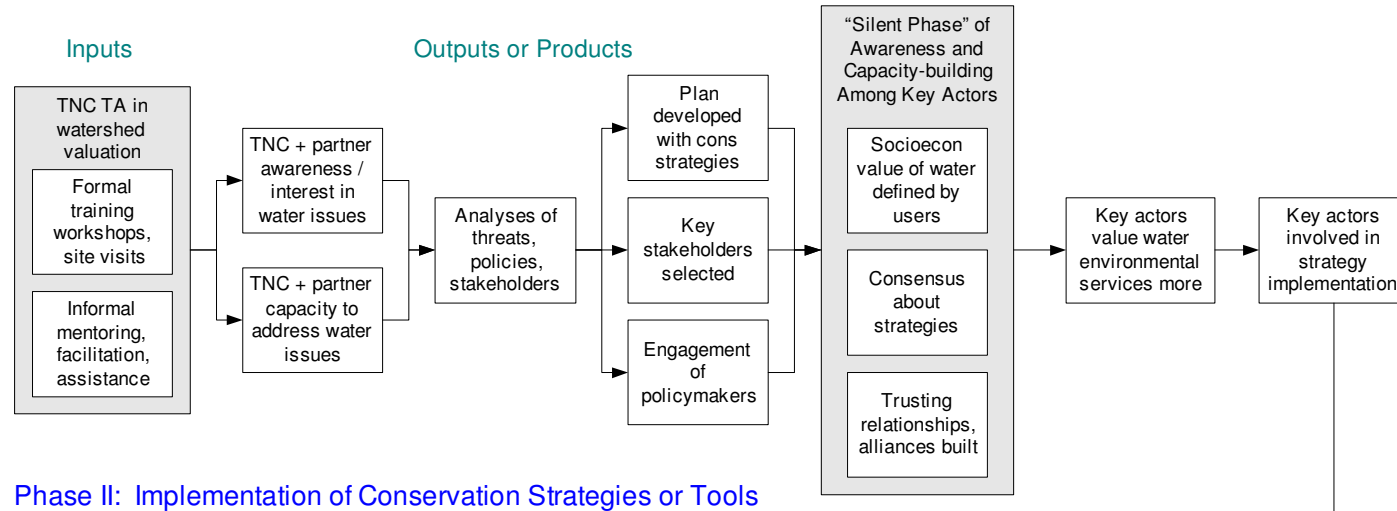
This initial chain says that TNC and its partners are conducting watershed valuation activities to achieve two long-term impacts. The first is an increase in forest and watershed conservation in the specific sites, which TNC believes will contribute to an increase in biodiversity conservation. The difficult part of building the chain is defining the intermediate results needed for the activities to achieve their desired impact.

The complete chain (see Figure 1) includes two project phases. Phase I focuses on initial capacity development, planning and alliance-building. Phase II involves the implementation of specific conservation strategies or tools. TNC’s Senior Advisor for International Water Policy believes that Phase I is a necessary prerequisite to Phase II.

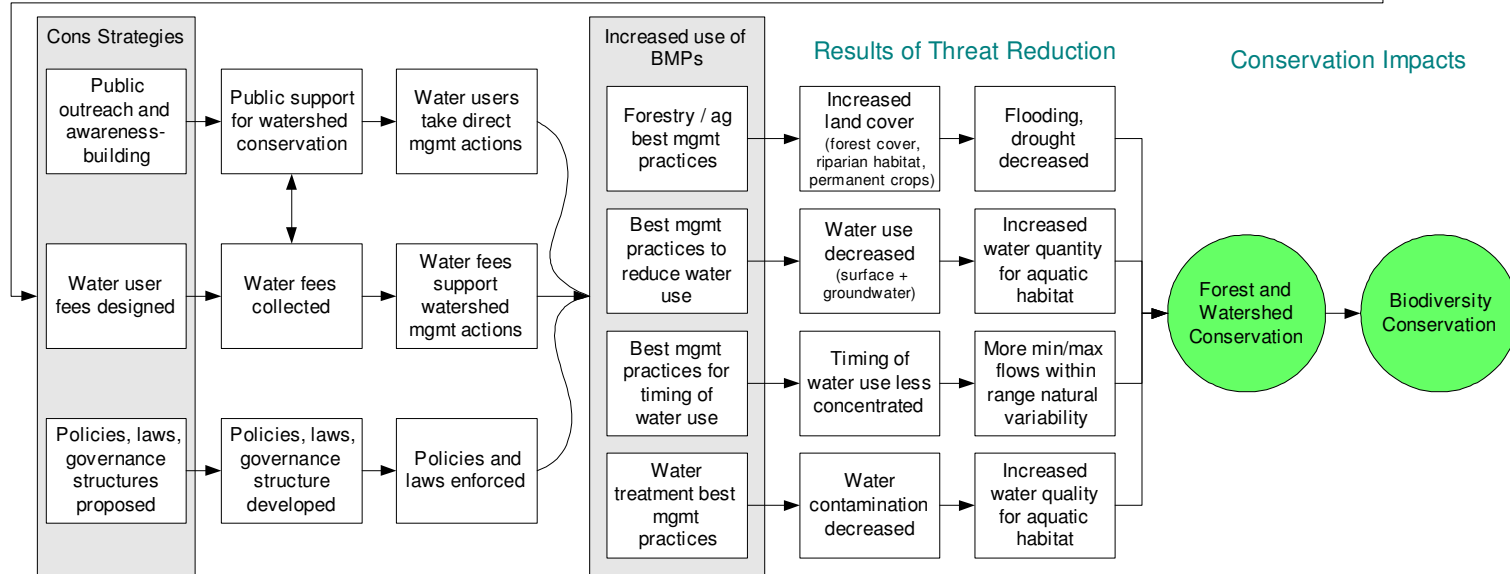
In Phase I, TNC provides technical assistance in watershed valuation, which contributes to building awareness and interest in water issues and capacity to address them. This interest and capacity enable partners to produce initial outputs or products such as analyses of threats, policies and stakeholders, which enable them to develop a watershed valuation action plan and select key stakeholders that need to be involved in implementing the plan. A “silent phase” of

Figure 1. Causal Chain Defining How TNC Watershed Valuation Projects Are Intended to Contribute to Biodiversity Conservation

Phase I: Initial Capacity Development, Planning and Alliance-building



Phase II: Implementation of Conservation Strategies or Tools



information-sharing, awareness and capacity-building among key actors is necessary to achieve consensus about what conservation strategies to undertake and to build trusting relationships among the key actors. TNC calls this the “silent phase” because it may appear to outsiders that little is going on during this phase, but the implementing organizations usually develop important alliances during this period that create the foundation for achieving results during Phase II. During this period, a water valuation process is usually conducted and the key actors may form a watershed group. All of the products of the silent phase contribute to increased recognition by these key actors of the value of watershed environmental services, which contributes to the involvement of these key actors in the implementation of conservation strategies in Phase II.

According to TNC’s program theory, Phase II focuses on the implementation of one or more of the following three conservation strategies: (1) public awareness campaigns, (2) water user fees, and (3) policy development and enforcement. For each of these strategies, a short chain explains expected results. Public outreach and awareness-building increase public support for watershed conservation, which will contribute to water users taking action to improve watershed conservation. The design of a water user fee will result in collection of water fees that are used to support watershed management actions. Engagement of policy-makers will result in the development of new laws, regulations or governance structures that are enforced.

If these conservation strategies are well executed, then they should result in increased adoption of best management practices (BMPs) related to forestry and agricultural activities, reduction of water use, the timing of water use, or water treatment. Which of these best management practices is relevant depends on the conditions in the specific site. For example, forestry and agricultural BMPs may be very important for montane areas, while water pollution reduction is vital to areas such as the Yucatan Peninsula that have complex groundwater systems that influence sensitive marine areas. Where they are relevant, forestry and agricultural best management practices can increase forest cover and other land cover, which will result in decreased flooding and drought. BMPs to reduce water use will reduce surface or groundwater use, which will increase the quantity of water available for aquatic habitat. BMPs related to the timing of water use will result in less concentration in the timing of water use (for example, by hydropower plants), which will increase the number of minimum and maximum river flows within the range of natural hydrologic variability. Water treatment practices will decrease water pollution, thus increasing water quality for aquatic habitat. According to TNC’s theory, all of this will contribute to increased forest and watershed conservation, which will increase forest and freshwater biodiversity conservation.

Although the results chain is presented as a linear sequence of actions and results, we must remember that this is program *theory* – in reality results are often not achieved in the order presented by the chain. For example, some sites have jumped directly to working on the development of water user fees, without an extensive capacity-building, planning and alliance-building phase. These differences help us to learn about the advantages and disadvantages of different approaches and their relative effectiveness under different conditions.

1.3 Case study structure

The structure of this document is based on the results chain. We begin by addressing the last two factors at the end (bottom right-hand side) of the chain. In the site description we describe the

biodiversity that TNC and its partners are trying to conserve in the protected areas where they are conducting watershed valuation activities and in the project objectives and strategies we describe the project's objectives related to watershed and biodiversity conservation.

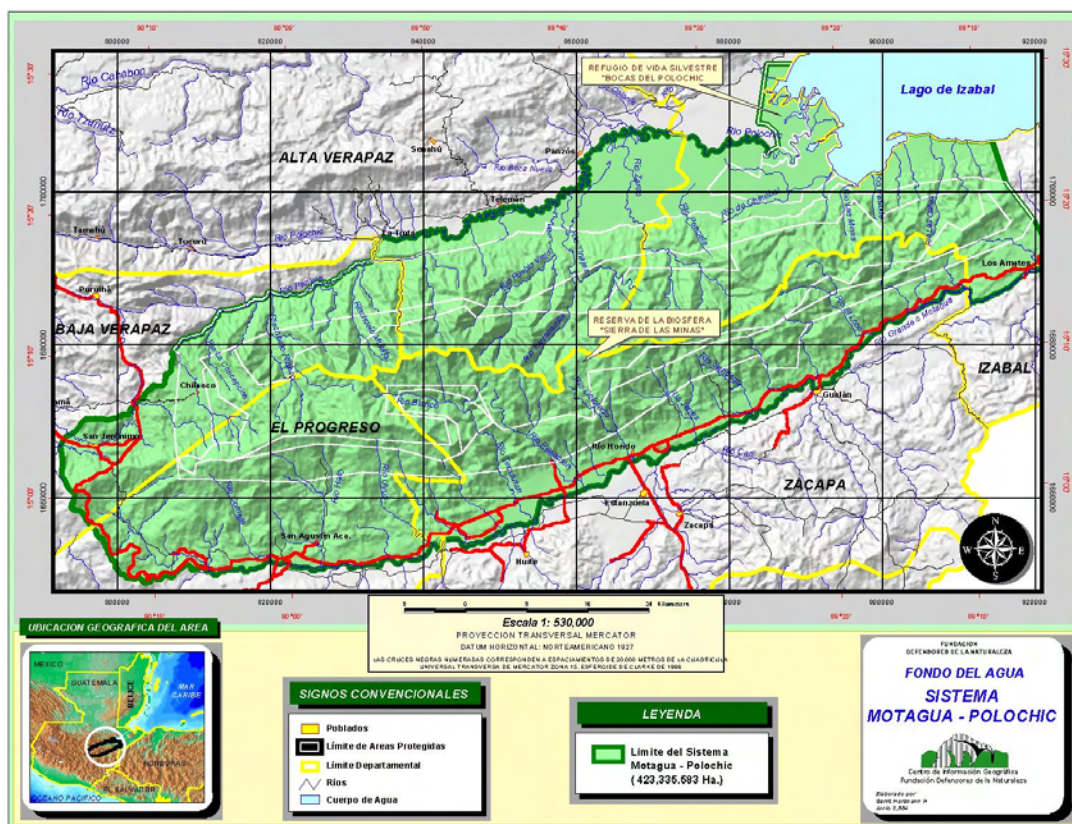
1.4 Overview of this site project

Although Defensores has had the idea of creating a water fund for the Sierra de las Minas Biosphere Reserve for many years, the organization has only been working on its creation for less than three years, since August 2002. During this time, their focus has been primarily on the Phase I portion of the results chain, which includes planning and alliance-building. They have conducted studies and consulted with key stakeholders to analyze the legal and institutional context for water resource management, to understand current water use and the motivations of different water user groups, and to estimate consumers' willingness to pay and the value of water for specific activities. They used this information to propose an institutional and financial structure for the Motagua-Polochic System Water Foundation and a process for creating local watershed committees. They are now in Phase II (Implementation of Conservation Strategies or Tools). Of the conservation strategies shown in Figure 1 (public outreach, water user fees, policies and governance structures, and best management practices), they have focused primarily on public outreach and the development of governance structures for watershed conservation that are designed to lead to the eventual application of water user fees.

2 Site Description

The Sierra de las Minas Biosphere Reserve (SMBR) is located in eastern Guatemala, in one of Central America's oldest and most biologically diverse mountain ranges. The reserve covers approximately 240,000 hectares and extends altitudinally from close to sea level to over 3,000 meters. This altitudinal gradient creates a large variety of ecosystems that provide habitat for over two thirds of all mammal and reptile species registered in Guatemala and Belize, including endangered species such as the resplendent quetzal, yellow-cheeked warbler, jaguar, ocelot, tapir, and others. The SMBR is also considered a very important "gene bank" for economically important coniferous species.

Sixty-three permanent rivers originate in the dense cloud forest of the core zone of the reserve. The socioeconomic value of these water resources strongly influenced the decision to establish the reserve in 1990. Due to the rain shadow effect of the Sierra, the Motagua and San Jerónimo valleys (south and west of the Sierra) receive annual precipitation as low as 500 mm. and are characterized by naturally dry forest and thorny scrub vegetation, as shown in Figure 1.1. In these valleys, access to surface water determines economic relations, settlement patterns, land use, and agricultural productivity, particularly in the Motagua Valley, which is one of Central America's most arid zones.



The rivers that flow out of the reserve are tapped to supply domestic water to over 500 impoverished rural communities (approximately 400,000 people), to irrigate subsistence crops and small-scale cattle pastures through numerous artesanal irrigation systems built by local residents, for small-scale coffee and cardamom processing, drip irrigation systems constructed by agro-industrial companies that grow and export melons, mangos and other fruits, and to produce energy by different scale hydroelectric plants. In the Motagua Valley, several businesses and industries depend on groundwater resources, including 3 bottling companies (soft drinks, beer and rum) and a paper mill.

Despite the socioeconomic and financial value of these water resources, current land use practices are degrading the watersheds of the SMBR. On the northern side of the reserve, poor Q'eqchí and Pocomchí residents cut down the forest to expand their subsistence agricultural areas. On the southern side, inappropriate agricultural and cattle ranching practices cause forest fires that reduce forest cover and contribute to soil erosion. Forest disease outbreaks have also contributed to deforestation. Over the last few years, several land invasions have occurred that have resulted in deforestation in the core zone and buffer zone of the reserve. Deforestation, forest fragmentation, soil erosion and soil compaction all have an impact on water supply and water quality. Residents throughout the area complain that deforestation has led to a decrease in water supply, particularly during the dry season. Many water users also complain of conflicts over increasingly scarce water resources.

Working closely with the local communities, the Fundación Defensores de la Naturaleza (FDN) has made very significant progress in reducing the principal threats to the reserve. For example,

Defensores staff estimate that between 1991 and 2004, they reduced agricultural encroachment by 80%, eliminated illegal timber extraction, reduced the impact of forest disease outbreaks by 80%, and reduced forest fires caused by agricultural and cattle ranching practices by 85% and 70%, respectively.² More progress is needed, nevertheless, to both eliminate these threats and reforest and restore degraded areas with high hydrologic value. Defensores believes that the best long-term approach to reducing threats to the reserve and its watersheds is to involve downstream water users in supporting upstream forest conservation.

3 Project Objectives and Strategies

Since 2002, Defensores has worked to design a water-based finance mechanism, or “water fund,” that would effectively link downstream water users with upstream forest conservation in the Sierra de las Minas Biosphere Reserve. There are currently no financial mechanisms in place to charge water users for watershed environmental services, channel user fees to the managers of the SMBR or compensate private forest owners for protecting their forests and providing valuable environmental services. A few municipalities and towns have water fees that cover the maintenance costs of surface water distribution systems, but in most cases consumers do not even pay for maintenance. Where they exist, water fees do not vary according to consumption levels. For example, domestic water users and members of some irrigation systems pay fixed monthly maintenance fees. Users of surface water and groundwater pay nothing for the right to use the resource or the protection and management of the watersheds and aquifers that provide it.

Defensores documents state that the intermediate, 5-year goals of the organization’s water initiative include:

- 1) Design & capitalize the Water Fund with at least US \$8 million by 2008 to initially ensure the long term financial sustainability for priority freshwater conservation and sustainable resource management identified within the Motagua-Polochic System.
- 2) Conduct scientific research, water valuation and monitoring & evaluation activities within the Motagua-Polochic System that permit adaptive project management, fair payments for environmental services and project accountability.
- 3) Strengthen local organizational capacity through the establishment of representative river basin committees in order to ensure integrated river basin management and address local and regional water-related conflicts.
- 4) Strengthen local technical and financial capacity among resource users, including municipalities, industry, agro-industry and hydro-electric plants to ensure best water and land use practices within the project focal area.
- 5) Raise awareness regarding the importance of freshwater biodiversity and sustainable resource management in the Motagua-Polochic System through formal and informal environmental education among regional target groups in order to ensure a stronger environmental ethic and practices.
- 6) Design and implement local and national water policy tools to influence behavior and provide a framework for local stakeholders with rights, obligations and incentives to

² These results were obtained from an informal, unpublished Threat Reduction Assessment conducted by Defensores staff in April 2004.

improve currently unsustainable practices and technologies that degrade aquatic ecosystems and water resources in the Region.

4 Project History

Defensores has a long history of interest in the valuation of water resources in the Sierra de las Minas, as demonstrated by the following examples:

- 1994-96 hydrologic and socioeconomic research to estimate the value of cloud forests to downstream communities (Brown et al. 1996)
- 2000 study of the economic value of the impacts of Hurricane Mitch in the Motagua and Polochic watersheds (Méndez, J.C. 2000)
- 2001 study of the economic value of water in the Jones watershed (Hernández, O. 2001)
- 2002 study of the economic value the environmental service of hydrologic regulation on the southern side of the Sierra de las Minas (Hernández, Cobos y Ortiz 2002)

In addition to its work on watershed valuation, Defensores has also invested in meteorologic and hydrologic research and environmental education programs that focus on water.

In 2002, the Executive Director of Defensores decided to focus specifically on the creation of a water-based finance mechanism for the Sierra de las Minas, during his sabbatical. He received financial assistance from many different organizations. He also received technical assistance, especially from TNC, World Wildlife Fund –Central America (WWF-CA), and a Costa Rican graduate student in resource economics. TNC’s Senior Advisor for International Water Policy emphasized the importance of building a constituency for good management of water resources, rather than focusing on water fees. She assisted Defensores in organizing watershed valuation workshops with key stakeholders that led to the creation of local watershed committees. WWF-CA and the graduate student were both more interested in payments for environmental services. WWF-CA developed a strategy to increase industrial companies’ interest in payments for watershed services and the graduate student conducted research on water valuation for industry.

5 Planning and Alliance-building Process

5.1 Studies of Water Legislation , Water Use and Economic Valuation

Between August 2002 and May 2004, the Executive Director of Defensores took a sabbatical and chose to focus the majority of his time on the design, negotiation and implementation of a water fund for the SMBR.³ During the first few months of the sabbatical, he and a new field coordinator focused on gathering information and users’ perceptions needed to support the design and development of the water fund. They determined that it was necessary to understand Guatemalan legislation related to water resources and to assess water use and valuation of watershed services by major water users. The principal water users around the reserve – all of whom were considered important stakeholder groups for the water fund – include:

- Municipalities and comunitary committees responsible for domestic water supply

³ Personal communication from Oscar Nuñez, August 7, 2002.

- Farmers who use artesanal irrigation systems
- Agroindustrial companies that use more complex drip irrigation systems, some of which draw on groundwater and others surface water
- Small-scale hydroelectric companies that operate or plan to operate in one of the RBSM watersheds
- Beverage companies and other industries that use groundwater and surface water

5.1.1 Water Legislation

The analysis of Guatemalan legislation related to water resources determined that the country's legislation is inadequate. While the nation's Constitution states that "all waters are public goods" and water use is to be regulated by a national water law, this law has never been developed. While the Congress has received and considered several proposed versions of a water law, it has never passed any of them. Several different laws, therefore, regulate different aspects of water use, resulting in legal gaps and inconsistencies. The laws and regulations that could help or hinder the development of a water-based finance mechanism, or water fund, include the following⁴:

- Under the Municipal Code, Municipalities have the legal responsibility to provide potable water and sewer systems to their residents and they have the right to charge fees for these services, based on the costs of operation and maintenance. Thus, Municipalities could charge a fee that includes the cost of water production, or watershed environmental services.
- Municipalities also have the legal responsibility to manage the natural resources (including water resources) in their municipality. Although few municipalities exercise these rights, they could dictate water use rights, prioritize between different types of users, establish water use fees, regulate the extraction of groundwater, and require maintenance of minimum ecological flows in rivers.
- Through the General Electric Law, it is possible to place a value on the water used to generate hydropower and charge for this service. The regulations specify what variables can be used in valuation studies to determine a fee. It is essentially a matter of convincing the National Electricity Commission to include environmental services in the calculations of production costs.
- The Civil Code gives property owners the right to extract groundwater and declares that all groundwater pumped to the surface is the property of the landowner. Until this changes (for example, through the approval of a national water law), it will only be possible to request voluntary contributions from the industries and agroindustries that extract and use groundwater in the Motagua Valley.

In addition to these legal deficiencies, there are institutional gaps. Although the Ministry of Environment and Natural Resources (MARN) has the responsibility to oversee the management of the nation's water resources, it has limited capacity to exercise this authority and thus different aspects of water use are overseen by different sectors, resulting in overlaps and conflicts between different water uses. For example, concessions for hydroelectric companies are given with no coordination with other sectors, such as local irrigation and domestic systems, generally creating conflicts between these users. More generally, no mechanism exists to prioritize different water

⁴ Nuñez, O., Octubre 2003.

uses based on their relative socioeconomic value. The result is that water uses by those with stronger political and economic power take precedence over the needs of poor communities. Recently, the government adopted a water policy that MARN coordinates. This should help to address some of these institutional gaps and overlaps and conflicts between water uses.

5.1.2 Domestic Water Supply

Because one of the water fund project's objectives is to strengthen the capacity of municipalities to manage water resources, the water fund field coordinator conducted an assessment of domestic water supply systems in the ten municipalities in and around the SMBR in the departments of El Progreso, Zacapa and Baja Verapaz⁵. She found that although the municipalities are legally responsible for providing potable water to all of their residents, few have the capacity to do this. Only one of the ten municipalities is directly responsible for supplying potable water to all of the towns within its jurisdiction. Eight municipalities supply potable water only to the residents of the municipal center but not the other towns within their jurisdiction. Finally, one municipality does not even meet the water needs of the residents of the municipal center. When the municipality does not act, residents install communal water systems or local private companies provide the service.

Residents' demand for potable water often exceeds the supply. Water supply is intermittent or irregular during the dry season in half of the municipal water systems and most of the communal and private systems. Local explanations for disruptions in water supply included increasing local populations (that exceed the capacity of the water distribution system), excessive and wasteful water use, deforestation and changes in the precipitation regime in the region.

Although many water users do pay a monthly fee for their water, it is quite low – generally between Q.1 and Q.12 – and usually is not sufficient to cover even the costs of operating and maintaining their water systems, much less the cost of watershed conservation. Very few communities have water meters and some that do have them do not read them. Thus, in almost all cases, payments are not based on consumption levels and no incentive exists to conserve water.

5.1.3 Economic Valuation of Water for Domestic Supply and Irrigation

The water fund coordinator also conducted a contingent valuation study to analyze the economic value that local residents give to watershed environmental services. She conducted focal groups in all of the towns in the Lato watershed and assessed attitudes related to water use for domestic water supply and small-scale irrigation⁶. She found that most residents understand the role that the cloud forest at the top of the watershed plays capturing water through fog drip and regulating streamflow. They do not, however, consider forest cover to be the only or most important factor influencing how much water is available for domestic use and irrigation – their proximity to water sources, the number of other water users, the quality of the water system and other factors affect their water availability. Only those who live at the top of the watershed are satisfied with the amount of water available to them for domestic use and irrigation. It is clear that those at the

⁵ Alvarado, S. 2003a.

⁶ Alvarado, S. 2003b.

top of the watershed have access to more water and higher quality water, due to their proximity to springs and because there are not many water users above them.

In most of these towns, residents pay between Q1.5 and Q5 per month for their domestic water. When asked about their willingness to pay for watershed protection, in almost all of the towns the women agreed that they should only be paying half of what they currently pay for their domestic water supply – in most cases, between Q0.80 and Q4 per month, and in some cases they believe they should not have to pay anything. When Defensores asked irrigation users about their willingness to pay for irrigation water, all of the men (most of whom do not currently pay anything for irrigation water) expressed no willingness to pay for it.

Several factors contribute to these results. Perhaps the most important is that these residents see no immediate benefit to paying for watershed environmental services. Many of them are dissatisfied with the amount of water available to them and the inequitable access to the resource. At the same time, they perceive of themselves as poor and unable to pay for watershed conservation. The study notes that most of these households pay Q20 to Q40 per month for electricity. Their willingness to pay much more for electricity than for water may be due to a perception that water has always been and should be a free resource, as well as their higher level of satisfaction with the electric service and their perception of equitable access to the service.

5.1.4 Economic Valuation of Water for Industrial Use

In 2003, a Costa Rican graduate student conducted an economic valuation study of water used by industries in the Pasabien watershed, on the southern side of the Sierra de las Minas. She used four different methods to estimate the value of water for different industries, including hydroelectric companies, bottling companies, and a paper company.⁷

Hydroelectric companies use surface water to generate electricity. Their use is non-consumptive, because the water is returned to the stream after passing through the turbines. Conserving forest cover in the upper watershed protects the water quality and quantity necessary to maintain hydropower production levels. The student estimated the cost of maintaining forest cover in the portion of the upper Pasabien watershed that lies within the core zone of the reserve, where a hydropower company is producing 12 MW. She estimated that the cost would be \$168,162 (Q. 1,345,298) per year, or US \$28 (Q224) per hectare per year. This cost is based on Defensores' estimates of the cost of park guards' patrols, land management, forest fire prevention and control, infrastructure protection, control of illegal logging, and reforestation of critical areas.

Fortunately, some hydroelectric companies recognize the importance of investing in watershed conservation. One representative of a hydroelectric company said that, "For our company, protection of upper watersheds is an investment rather than a cost. Without a healthy watershed, you don't have hydroelectric company."

Several bottling companies operate in the Motagua Valley, producing soft drinks, bottled water, beer and rum. The most important input into their production system is the groundwater that they extract from the valley's aquifers. In examining one of these companies, the student

⁷ Reyes, V. 2004.

estimated that the company uses 4-5 bottles of water to produce each bottle of their final product. Because it was not feasible to estimate the value of this groundwater by calculating the incremental cost to the company of changes in water quality and quantity, the student estimated the cost that the company would have to incur to maximize efficiency in water use and reduce or mitigate the cost of changes in water quality within and outside of the company. This included the costs of water extraction, chlorination and potabilization, and the cost of wastewater treatment. The student estimated the value of the approximately 130,000 m³ of water the company uses each year to be at least US \$52,000 (Q. 416,000).

A paper company is also located in the Pasabien watershed. The company uses 860,000 m³ of water per year, including both groundwater and surface water. Increasing the efficiency of water use and reducing the company's wastewater pollution would require an annual investment of \$326,800 (Q2.6 million) per year, which the student considered an estimate of water valuation.

The final estimate of water valuation for industrial use was based on the shadow price of water – the average market price of water, per cubic meter, which these companies would have to pay if their surface and groundwater supplies dried up and it was necessary for them to purchase water to continue operating. Based on consultations with the six largest companies that sell water by the barrel or cistern truckload, the market value of water is US \$1.99 (Q15.98) per m³. The bottling company would have to pay US \$258,700 (over Q2 million) and the paper company would have to pay US \$1.7 million (Q13.7 million) per year to purchase water and the hydroelectric company would have to pay US \$3.98 million (Q31.8 million) per year.

The author provided this range of valuation estimates – from US \$0.38 to US \$1.99 per m³ – that she believed Defensores could use to begin negotiating with the companies located in the Motagua Valley and establish voluntary agreements on payments for watershed services. These agreements could focus on payments or in-kind support for conservation of the aquifer recharge zone and watershed management.

5.2 Project Design and Selection of Key Stakeholders

Defensores is working to organize key stakeholders at two different levels. First, they are working to create a Motagua-Polochic System Water Foundation that would include representatives from all the different water user groups in and around the Sierra de las Minas Biosphere Reserve and the Bocas del Polochic Wildlife Refuge. Second, they have created local watershed committees in key micro-watersheds, as models of local level decision-making and collaboration between sectors.

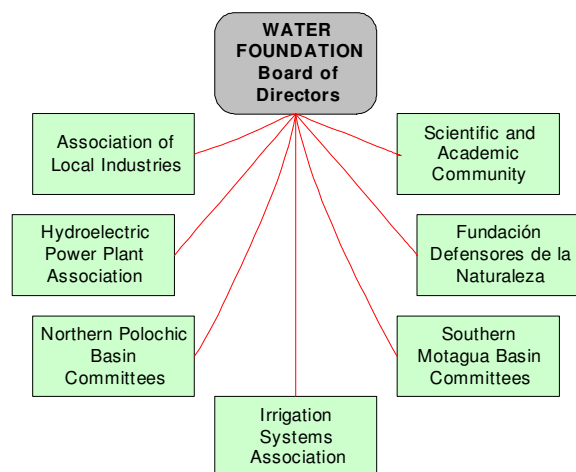
5.2.1 Proposed Structure of the Water Foundation

The Executive Director of Defensores de la Naturaleza wrote a paper in December 2003 that outlines a proposed institutional and financial structure for the Motagua-Polochic System Water Foundation, to serve as a basis for discussion and revision with key stakeholders⁸. He proposed that the Water Foundation be a non-profit second level entity founded by a series of first level associations or entities. As shown in Figure 2, the Water Foundation Board of Directors would be composed of representatives of an association of local industries, an association of

⁸ Nuñez, O. December 2003.

hydroelectric companies, an irrigation systems association, the scientific and academic community, Defensores, and the watershed committees in the Polochic Basin and watershed committees in the Motagua Basin. Many of these first level entities do not currently exist. Defensores is facilitating the creation of the watershed committees, irrigation systems association, the hydroelectric association and the association of local industries.

Figure 2. Proposed Structure for the Motagua-Polochic System Water Foundation



5.2.2 Fundraising Strategy for the Water Foundation

Although potential sources of funding for the Water Foundation include both national and international organizations, Defensores proposes that the Foundation's primary focus over the short term be to develop local sources of support. During its first few years, the Foundation will focus on getting local water users to recognize the value of water and to begin to either pay voluntary fees or (in the case of extremely poor water user groups) provide in-kind contributions to improve watershed management. Priority target groups include industry, hydroelectric power companies, agro-industry, and municipalities and domestic water users. Of these groups, the first two have the highest capacity to pay for water.

To engage industry, Defensores and World Wildlife Fund – Central America have developed a strategy that focuses on providing technical assistance to help companies reduce their industrial production costs through implementing cleaner production practices and encouraging them to invest the savings into the Water Foundation. Getting companies to pay for a resource that has always been free requires a significant shift in attitudes and practices. Because of this, initially Defensores will encourage even symbolic contributions from this sector. Eventually, however, Defensores plans to negotiate fees based on the study of water valuation for industrial use, water consumption levels and possibly protected area management costs.

Defensores plans to negotiate with hydroelectric companies about the potential to minimize the operational costs of dredging and turbine maintenance by investing in watershed conservation and management. Defensores also believes that it could help some hydroelectric companies improve their image with local communities in cases where conflicts have developed based on misinformation, lack of coordination, false perceptions of the potential environmental and socioeconomic impact of the plants, and poor management of community relations.

Defensores would also like to develop a voluntary payment for water used for irrigation. This sector includes both individual farmers and agro-industry. The agro-industrial sector includes primarily melon exporters located along the floodplains of the Motagua River, who use drip irrigation systems. Most individual farmers, on the other hand, rely on simple, open channel irrigation systems. If they pay anything for their irrigation water, farmers and agro-industrial producers pay only for infrastructure maintenance and the salary of a “water judge,” who is responsible for enforcing legal rights to water use and resolving conflicts between water users. Defensores plans to negotiate with the municipalities who manage these water fees to incorporate watershed conservation costs into the fees.

As discussed earlier, municipalities have the legal responsibility to provide potable water to their residents and they have the authority to charge water fees to cover maintenance costs. Although Defensores would like to negotiate the incorporation of watershed conservation costs into these fees, this is the poorest water user group and the valuation study of domestic water use demonstrated that residents are not willing to pay more for their water, because they are not satisfied with the service they receive and they do not see a relationship between watershed conservation and better water supply. Also, residents describe themselves as very impoverished and thus unable to pay more for domestic water supply.

The Water Foundation also plans to seek donations and loans from national governmental and non-governmental funding sources, including national conservation funds, government councils on science and technology, a governmental forest incentives program, and a private non-profit trust fund for conservation. All of these sources have supported Defensores’ research and management activities in the Sierra de las Minas Biosphere Reserve in the past. Defensores envisions the Water Foundation becoming an important partner or sister organization that shares the responsibility for fundraising, managing and implementing activities funded by grants and loans from these institutions and coordinates closely with Defensores.

The Water Foundation will also launch an international capital campaign, with the goal of raising a large enough endowment to cover the management costs of the Sierra de las Minas Biosphere Reserve’s core zone. Oscar Núñez estimates that covering the annual management costs of the core zone of the Sierra would require an endowment fund of \$8 million.

Finally, potential international funding mechanisms also include private foundations and donor agencies that support projects but do not provide endowment funding or seed funding. The Water Foundation would present project proposals to these organizations based on the Foundation’s 5-year Strategic Plan. Once again, many international donors have supported Defensores’ management activities in the Sierra de las Minas in the past and the Water Foundation and Defensores would work together to raise funds from these organizations, manage the grants and implement the activities under these grants.

5.2.3 Proposed Programmatic Areas of the Water Foundation

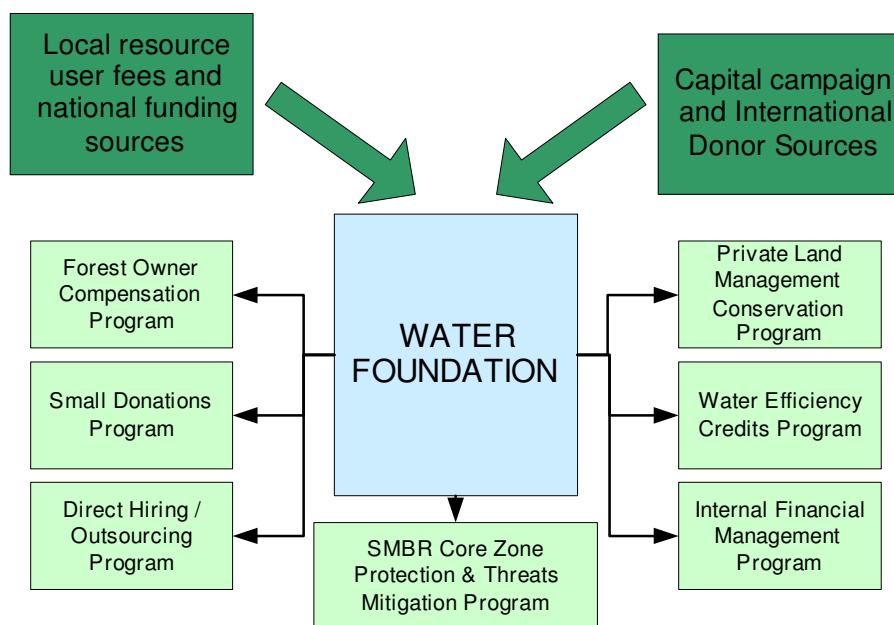
As shown in Figure 3, Defensores has proposed that the Water Foundation utilize water user fees and other sources of funding to finance the following:

- **A SMBR Core Zone Protection and Threats Mitigation Program** that covers basic management activities such as park guard patrols to halt agricultural encroachment,

control illegal logging and hunting, and prevent and control forest fires. The program will also include scientific research, biological and hydrological monitoring, and educational activities to build awareness among water users.

- A **Forest Owner Compensation Program** that compensates private landowners for maintenance, reforestation and regeneration of forest cover in the SMBR multiple use zone (bordering the core zone) and in other critical freshwater recharge sites.
- A **Private Land Management Conservation Program** that promotes private land stewardship practices and facilitates the purchase of land and water rights that contribute to increased water production and improvements in water quality.
- A **Small Grants Program** to support communities, municipalities and groups of farmers in improving resource management and contributing to watershed conservation. Small grants may also be given to researchers associated with one of the Water Foundation partner universities.
- An **Efficient Water Users Credit Program** that would provide micro-credits to small farmers and communities who wish to make their irrigation and water supply systems more efficient, develop environmental education programs or establish small municipal water management projects. In collaboration with interested donors, the program could also offer larger credits to support improved production practices in industry.
- A **Direct Hiring / Outsourcing Program** that keeps the Water Foundation staff at a minimum by contracting consultants to conduct resource management activities such as reforestation and environmental education campaigns, construction of infrastructure for protection and threat mitigation, and environmental monitoring.
- An **Internal Financial Management Program** that studies investment options and provides solid financial advice to the Foundation's Board of Directors.

Figure 3. Proposed Funding and Disbursement Scheme



Adapted from Nuñez (2003).

5.2.4 Creation of Local Watershed Committees

As mentioned above, Defensores is working to organize stakeholders at two levels – to create a Water Foundation for the entire area and to form local watershed committees. For many years, Defensores has planned and implemented activities at the scale of the sub-watersheds of the Motagua-Polochic system. According to Defensores, “the primary goal of the watershed committees or associations is to serve as a place for discussion of the current water situation or conflicts and the need for watershed conservation, to propose integrated solutions, and to distribute information about water to the public.”⁹ The committees will be composed of representatives of the following local groups and water-using sectors, that varies from watershed to watershed:

- Community Development Council (COCODES) for each community in the watershed
- Municipal Development Councils (COMUDES)
- Irrigation systems (water judges or other representatives)
- Industrial sector (in cases where the watershed encompasses industrial activities)
- Commercial sector

Defensores is using the following process to facilitate the creation of these committees¹⁰:

- 1) Conducting a **participatory assessment** of water use, land use, forest cover, and land ownership,
- 2) Forming an **initial committee** that works to develop a draft 5-year **action plan** for the watershed, based on a threat assessment, identification of critical management areas, a stakeholder assessment, and an analysis of the ideal **structure of the watershed committee**,
- 3) **Validating** the **action plan** and the proposed **committee structure** with user groups and finalizing both the action plan and the structure,
- 4) **Forming** the local watershed **committee**, and
- 5) **Implementing** the watershed **action plan**.

In the next section, we describe some of the progress made toward the creation of these local watershed committees.

6 Implementation of Conservation Strategies

6.1 *Public Outreach and Development of Local Governance Structures*

6.1.1 Local Water Committees in San Jerónimo and Teculután

Since the end of 2003, Defensores has worked to form pilot watershed committees in three of the largest and most critical watersheds: San Jerónimo, Teculután and Lato,. In these watersheds, demand for water is high and, in some cases, tension exists between different user groups and between users in the upper and lower parts of the basins. Also, different approaches have been conducted to form committees in other critical watersheds.

⁹ Fondo del Agua Sistema Motagua-Polochic. Marzo 2004.

¹⁰ Ibid.

To illustrate what this work involves, we will describe here some of the challenges and progress made in the San Jerónimo and Teculután watersheds. The San Jerónimo watershed, which originates on the western slopes of the SMBR, provides water for domestic water supply, irrigation, hydropower generation, and tourism. Water users complain of reductions in water supply and conflicts between user groups.

Almost all of the communities have water systems administered by the communities themselves. They do not, however, have the technical capacity or financial resources to provide adequate maintenance to the systems. As a result, there are leaks in many of the systems, the tubes get clogged, water gets contaminated, and some families' water gets cut off for several hours at a time. The municipality also complains of inefficient and inequitable water use – for example, some people waste water and in some cases small businesses use much more water than households but pay the same flat monthly fee. The municipality and the communities are not able to manage competing demands for water, nor do they have the technical information necessary to determine how large a watershed recharge area they need to protect to maintain their water supply. The municipality believes that protecting their water source requires only fencing and protecting a 20 x 20 meter area around the spring.

Farmers in the San Jerónimo and Salamá valleys grow sweet corn, tomatoes, leather leaf, and other valuable export crops on irrigated land. The irrigation system used to be administered by the government, but when the government decided to privatize it the farmers formed the Association of Irrigation Users of San Jerónimo (AURSA) to maintain control over this vital resource. AURSA now manages the system, under a government concession. Each farmer pays Q250 (\$33) per hectare per year to cover the cost of the concession and maintenance of the system.

The farmers have a serious conflict with the San Isidro – Matanzas hydroelectric company, because the company cleans out its turbines twice per year, opening its dam for 4 days and sending a major sediment load downstream. It usually takes an additional 9-15 days for the streamflow to become clear again and during most of this time AURSA has to close off its canals and can't irrigate. Obviously, not being able to irrigate for over two weeks seriously affects their crop production. On a daily basis, the operation of the hydropower plant also reduces the water available for irrigation. The dam is closed from 9 pm to 6 pm and then open to generate electricity during the period of peak demand, from 6 to 9 pm. This means that while the farmers are irrigating (5 am to 6 pm) the flow is low, because the dam is closed. One AURSA representative said that the company has agreed to maintain a minimum level of streamflow (baseflow), but the flow level is often 20% lower than this level.

In September of 2003, Defensores presented the water fund project to representatives of the COCODES, the municipality, national government agencies, the hydroelectric company, AURSA and agroexport companies. Stakeholders expressed interest in forming a local watershed committee to address the problem of increased water scarcity and to provide a forum for discussion and resolution of conflicts between water users. Under the leadership of a new mayor, the Municipal Water Committee was formally created in March 2004. During the first few months, Defensores and GTZ worked together to strengthen the institutional capacity of the

committee by helping the members define their goal and objectives, roles and responsibilities, and relationship to other institutions. Defensores also provided financial support for the legal inscription of the committee, so that the group can receive small donations.

Although Defensores is primarily interested in raising awareness of the value of water and the need to protect and reforest upper watershed areas, they recognize that water users are more concerned with increasing their water supply and resolving conflicts. For this reason, Defensores has analyzed the status of the domestic water supply systems in the San Jerónimo watershed and provided training to representatives of the communities and municipality to help them improve and maintain their water systems. By helping the communities to resolve their immediate concerns about water supply, Defensores hopes to increase community awareness, interest and involvement in reforestation and forest protection.

Fortunately, one small example of a payment for watershed services already exists in the San Jerónimo watershed. Since 1997, AURSA members' annual fees of Q250/ha for the right to use the AURSA irrigation channels have included Q10 (\$1.30) for maintenance of the upper watershed – essentially, for reforestation. In 2003, AURSA was looking for an area to reforest and they wanted to ensure that the trees would be protected once they were planted. Defensores gave them a presentation about plans to reforest Vega Larga, an area within the core zone of the SMBR where a community used to be located. The AURSA Board of Directors voted to give Defensores Q44,000 (over \$5,000) to reforest 10 hectares in Vega Larga. AURSA is happy with the project, because it produced a concrete result that their members can see. As a result of the project, all AURSA members now support the Q10/ha annual fee for upper watershed protection.

The Teculután watershed is the largest watershed on the southern side of the Sierra de las Minas. All of the towns, villages and isolated settlements are located in the lower portion of the watershed (the valley). The upper watershed has been heavily logged by timber companies for several decades and it is currently classified as a recuperation zone within the Sierra de las Minas Biosphere Reserve. In the valley, water is used for domestic water supply and large-scale irrigation. On the highest quality agricultural land, farmers grow large quantities of melons for export, using drip and aspersion irrigation systems.

In 2002, 88 families invaded the upper Teculután watershed and 12 of them settled there. In response, the mayor of Teculután worked with several large-scale farmers in the valley to form the Río Teculután Sierra de las Minas Committee with the goal to “defend and develop the renewable and non-renewable natural resources of the Sierra de las Minas Biosphere Reserve” in the municipal jurisdiction of Teculután. Many of the members of the committee had worked together previously on the Potable Water Committee and to manage 20 irrigation channels. As one member said, “We have always depended on the river to live.” Soon after the creation of the committee, in July 2003, Defensores invited members of the committee to a watershed valuation workshop.

In March 2004, coordinating closely with the new mayor of Teculután, Defensores organized a workshop to propose the creation of a multi-sectoral watershed association that would include a broader group of actors. Defensores has provided financial support for the creation of this association, which includes representatives of the COCODES, the Municipality of Teculután,

owners of irrigation systems and members of the Río Teculután Sierra de las Minas Committee. The Pro-Teculután River Sierra de las Minas Association has developed a watershed management plan to guide land use planning and define priorities related to water use, reforestation, environmental education and productive agricultural activities. They have supported the establishment of a municipal forest office and collaborated on municipal reforestation projects.

Over the past year, one of the highest priorities of the association was the resolution of the land invasion, which members say caused the deforestation of 200 hectares between 2002 and 2004. Fortunately, through dialogue, they succeeded in finding a solution that met the needs of the landowner, the squatters, the municipalities, and the association. With help from the Fundación Turcios Lima, the timber company that owns the land (Maderas El Alto) agreed to sell the land to the squatters (a small group of former combatants in the civil war) and in return the settlers agreed not to clear any more land for agriculture and to devote their time to reforestation, forest management, ecotourism and forest protection. The organizations involved in this agreement included the Asociación Agrícola (the ex-combatants or squatters), the Fundación Turcios Lima, the Pro-Teculután River Sierra de las Minas Association, and the Municipalities of Teculután and Usumatlán.

6.1.2 Public Outreach Activities

Throughout the process of establishing these and other local watershed committees, Defensores has worked to raise awareness regarding the importance of water, freshwater biodiversity and sustainable resource management in the Motagua-Polochic System, through formal and informal education programs. Defensores has presented short presentations and videos about the reserve, the role of watersheds, the water cycle, the value of water, and threats such as forest fires. Defensores prepares conservation-oriented public service messages for local radio stations and it has prepared an educational guide for primary school teachers that can be adapted for each watershed. After the change in government at the beginning of 2004, Defensores visited all of the mayors and gave presentations about forest fires and their impact on watersheds, which increased municipal involvement in basic protection activities.

Some communities have asked Defensores to help them understand the Forestry Law and legislation related to decentralization and natural resource management. Defensores has helped them to understand the role and responsibilities of the COCODE and COMUDE in relation to natural resource management. Defensores' central message is that everyone has the right to use water resources, but with that right comes the responsibility to care for them. Protecting water resources is not just the responsibility of Defensores – it is everyone's responsibility.

When asked if their public outreach activities have contributed to increasing awareness, changing attitudes or practices, Defensores says that many mayors have asked development organizations and donor agencies to support water-related projects. In addition, during the 2004 dry season, many mayors expressed concern about forest fires and their potential impact on watersheds and 14 municipalities provided a total of 15 municipal park guards to work with Defensores staff and the Guatemala Protected Areas Council (CONAP) park guards to address forest fires and other threats in the SMBR. In 2005, they increased their support to include 30

municipal park guards and 6 municipal fire brigades. In addition, several municipalities opened Technical Units on Environmental Management.

Defensores would *like* to see the following additional evidence of key stakeholder groups' changing attitudes and practices:

- Mayors who improve the management of domestic water systems by organizing the maintenance of the system and recognizing watershed conservation as a part of the expense of water supply.
- Mayors who take on a leadership role in addressing water issues and who provide political support for a National Water Law
- Communities that either understand that water resources are best managed through centralized municipal service or develop the capacity to manage their water resources adequately themselves. Adequate water resource management should not only include improving water distribution and supply, but also participating in addressing threats to water resources, such as forest fires.
- Groups of farmers who form irrigation committees to organize their collective use of the resource and who invest in more efficient drip or aspersion irrigation systems.
- Hydroelectric companies and industries that feel a responsibility to contribute to the protection of upper watershed areas and who take on a leadership role in sectoral organizations such as the Chamber of Commerce.

6.1.3 Collaboration with Industry in the Motagua Valley

In 2003, Defensores began collaborating with WWF-CA to make industrial water use in the Motagua Valley more efficient and reduce water pollution. The project was designed to persuade companies to become involved in the water fund. The project's strategy was to help companies that use water on the southern side of the SMBR to reduce their costs and improve their environmental quality, as an incentive to support the water fund. Defensores and WWF-CA hoped that the companies would invest the money they saved in the water fund.

WWF-CA contracted the Guatemalan Center for Cleaner Production to provide training in water resources to personnel working at the plants of two beverage companies (Coca Cola and the Zacapaneca Liquor Company) and an international paper company (Papelera Internacional, PAINSA). The training focused on the following topics: water resources and the SMBR, environmental management systems, environmental strategies, cleaner production techniques and management of solid waste and wastewater, environmental services, and business sustainability and environmental risk.

The Guatemalan Center for Cleaner Production and Defensores worked with the industries to develop a plan for industry participation in the Motagua-Polochic System Water Fund, based on voluntary payments for environmental services. They also wrote a document describing the design of a financial mechanism for the industrial sector. They used these documents to begin negotiating with the top executives of several companies. Defensores is currently in the process of meeting with executives to present the financial mechanism and invite them to be founding members of the Water Fund.

6.1.4 Challenges and Enabling Factors

One of the biggest challenges that Defensores faces as it works to build one regional and many local governance structures for water resources (the Water Foundation and local watershed committees) is the inadequate legal and institutional framework for water resource management in Guatemala. As discussed earlier, Guatemala does not have a water law or one institution responsible for water resource management. Different aspects of water use are overseen by different sectors and there is no recognition of the concept of watersheds as the natural management unit for the resource.

These legal and institutional deficiencies affect Defensores in many ways. First, the legal framework for establishing mandatory water user fees only exists for some sectors. Legally, it is possible to establish environmental service payments for hydroelectric companies, although there is no precedent for this. Legally, it is also possible to incorporate the cost of upper watershed conservation into municipal water fees, although there is also no precedent or political support for this. However, it is not possible to charge industry a water user fee, because groundwater pumped to the surface is considered the property of the landowner.

Second, the sectoral management of water resources results in overlaps and conflicts between users such as the conflict between AURSA and the San Isidro – Matanzas Hydroelectric Company. Stakeholders are logically more interested in resolving these conflicts than in contributing to overall watershed conservation and management. This means that local watershed committees may end up dedicating most of their energy to trying to develop case-by-case local solutions to these problems, which should be addressed through a national water policy, law and regulations.

6.2 Watershed Management Policies

The Guatemalan Congress is currently considering a proposed water law. To support this process, Defensores organized the First National Conference on Water Resources in Guatemala at the end of 2004. Approximately 250 Guatemalan professionals participated. Defensores shared the conclusions and recommendations of the conference with the members of the National Congress' Environment Commission. Defensores has also established and participates in a group of water experts with diverse technical backgrounds. The group conducts analyses and provides advice to Congress. In July 2005 the group conducted an analysis of the proposed water law and submitted its conclusions and recommendations to the Environment Commission.

7 Monitoring watershed valuation work

7.1 Monitoring of Water Resources

Defensores has designed a Water Resources Research and Monitoring Program to provide information to support decision-making for the Motagua-Polochic System. The program includes a basic research sub-program, an applied research sub-program and a scientific monitoring sub-program. Defensores has developed strategic alliances with universities,

research centers, governmental agencies and local governments to support the implementation of the program.

The goal of the program is “to design, develop, implement and publicize a research program in water resources in the region called the Motagua-Polochic System and fundamentally in the Sierra de las Minas Biosphere Reserve and the Bocas del Polochic Wildlife Refuge.” The program’s specific objectives include:

1. To design and implement a scientific database for water resources, based on historic data and current information.
2. To design, develop and implement a sub-program in applied research and monitoring that helps to guide decisions about the management of water resources and the elements necessary for long-term planning on the part of resource users and local governments.
3. To design, develop and implement a sub-program in basic research that provides knowledge about the relationships between forests, water production and wildlife and strengthens the programs to conserve the core zone of the Sierra de las Minas Biosphere Reserve and the intangible zone of the Bocas del Polochic Wildlife Refuge.¹¹

Within this program, Defensores is monitoring water quality and streamflow monthly at approximately 45 sites throughout the Motagua-Polochic System. Water quality measures include pH, total dissolved solids (TDS), conductivity, dissolved oxygen, temperature, phosphorus and nitrogen. Defensores also takes meteorological data monthly and monitors changes in forest cover every 5 years.

7.2 Monitoring Project Effectiveness

Defensores has many assumptions about how their activities will lead to more effective watershed conservation and management. For example, they believe that if they help municipalities strengthen their capacity to manage domestic water supply systems, then the municipalities will be more concerned about conservation and will provide more support for watershed management. They also assume that if they help industries use water more efficiently and adopt cleaner technologies that reduce their production costs, then these industries will participate in the FONAGUA and provide voluntary contributions to the water fund.

In order to learn what actions do and do not contribute to more effective watershed management, Defensores should develop results chains defining in explicit terms their theory of change and use these chains to monitor and evaluate the relative effectiveness of different actions. Over time, this would help Defensores learn, for example, under what conditions local watershed committees contribute to conservation.

¹¹ Fundación Defensores de la Naturaleza. Junio 2003.

8 Lessons Learned

8.1 Watershed valuation projects require inter-institutional collaboration

Watershed valuation projects involve close collaboration with government agencies (especially municipalities), community leaders, hydroelectric companies, industries, farmers and other key stakeholder groups. Conservation organizations cannot implement these projects on their own. Watershed valuation projects are designed to link water users to watershed conservation. They seek to get water users to contribute to conservation either financially (through user fees or increased public financing of conservation activities) or by taking actions directly to reduce threats to water resources. Because of this, conservation organizations must implement these projects in collaboration with the organizations involved in water use, including municipalities, irrigation committees, hydropower companies, and others. Defensores' Executive Director says that organizing an inter-institutional water foundation is very challenging, because one is bringing together stakeholders who have some common interests but also diverse and sometimes conflicting interests.

8.2 Watershed valuation is about developing a governance structure for watershed management, not simply a finance mechanism

Defensores originally envisioned the water fund purely as a finance mechanism in which water user fees and voluntary contributions would be used to cover most or all of the basic ongoing expenses of conservation and management of the core zone of the Sierra de las Minas. In meeting with representatives of important stakeholder groups, however, Defensores found that they wanted to be involved in deciding how that money would be used. For this reason, the original idea of a water fund evolved into the creation of a water foundation and local watershed committees with representation from all major user groups. As different user groups participate in the water foundation, Defensores believes that transparency in decision-making and financial management will build trust and increase contributions. The focus, nevertheless, is on the development of a governance structure in which all water user groups participate in decision-making.

Defensores also recognizes that actors can participate in many different ways - not just by giving money. Rather than focusing purely on payments, Defensores recognizes that some actors will participate directly in management activities by, for example, helping to prevent and control forest fires, implementing soil conservation measures, or planting trees.

8.3 Reliable and high quality water service is a prerequisite for implementing a water user fee system

The economic valuation study for domestic supply and irrigation demonstrated very low willingness to pay for watershed environmental services, in large part because water users are dissatisfied with their water service. Most residents understand the role that the cloud forest at the top of the watershed plays in capturing water through fog drip and regulating streamflow. They do not, however, consider forest cover to be the most important factor influencing how much water is available for domestic use and irrigation - the quality of the water system, the

number of water users, their proximity to water sources, and other factors more directly affect their water availability. Thus, they see no immediate benefit to paying for watershed environmental services. The study notes that most of these households pay Q20 to Q40 per month for electricity. Their willingness to pay much more for electricity than for water can be attributed in part to their higher level of satisfaction with the electric service and their perception of equitable access to the service.

8.4 Working with stakeholders requires balancing your conservation goals with their development and conflict-resolution goals

One of the biggest challenges that Defensores faces in working with local water committees is to stay on mission and maintain the focus of their work on the protection and sustainable management of upper watershed areas. In creating these committees, Defensores brings together stakeholders with diverse and often very strong water-related interests. The Municipalities would like Defensores to help them strengthen their capacity to manage domestic water supply systems. AURSA members in San Jerónimo would like help resolving their conflict with the San Isidro – Matanzas hydroelectric company so that they will have more water available for irrigation. Other groups of farmers would like help in developing more efficient irrigation systems. Hydroelectric companies would like help in improving their relations with local communities. Industrial companies would like help in reducing their water use, adopting cleaner technologies and meeting the requirements of new regulations and market trends.

Sometimes, working with stakeholders to meet their objectives can directly benefit conservation. For example, working with the Pro-Teculután River Association to resolve the illegal land invasion in the upper Teculután watershed is clearly a win-win situation. At other times, helping stakeholder groups meet their objectives can be a buy-in strategy – it *may* increase their involvement in watershed conservation activities or their willingness to pay for watershed environmental services. However, it is also possible to improve domestic water supply or facilitate the donation of more efficient irrigation systems without having any direct or indirect impact on upper watershed conservation. More efficient water use will benefit downstream water users but it will not directly benefit the core zone of the Sierra de las Minas and it may not even change the attitudes and actions of the stakeholders. The challenge here is to determine to what extent Defensores needs to help specific stakeholder groups to resolve their problems in order for those groups to contribute to watershed conservation.

8.5 Actors want to invest in visible, local watershed management projects

One representative of industry said that, “Companies would be more open to the idea of a water fund if they could support specific, concrete products, such as reforestation, and get credit for it. Industry prefers to support projects that they can put their name on, near their headquarters. They need to be able to sell the projects to their investors.” Other sectors may share this need or desire to receive credit for specific, tangible results. For example, AURSA members are happy with their product – the reforestation of 10 hectares in Vega Larga. However, many of the real costs of conservation and management of the core zone of the Sierra de las Minas are not visible. They involve park guards’ salaries, ongoing patrols, participatory planning processes with local

stakeholders, inter-institutional collaboration to resolve problems such as illegal land invasions, and others. Within its training and education component, the water fund constantly reinforces the importance of conserving the SMBR core zone. In moving forward, one of the challenges will be to get water users to not only support concrete, visible projects, but also essential, less visible management actions.

8.6 Water valuation is about raising awareness and improving management, not about raising money

The goal of watershed valuation projects is to involve water users in conservation. Water users can contribute to conservation either by paying a user fee or by taking actions directly to reduce threats to water resources. Defensores has learned that what is important is not the amount paid, but rather changing the attitudes and actions of water users. Although Defensores began working on this project fairly recently (August 2002), several groups are already demonstrating a willingness to provide in-kind contributions to watershed management. For example, the municipalities are currently supporting 30 full-time park guards, industries are supporting 8 fire brigades (to prevent and control forest fires), communities in more than five watersheds have organized community patrols, and local actors are participating in watershed committees in six watersheds.

Eventually, Defensores would like to develop some water user fees, but they recognize that this will take time. Financial payments for watershed environmental services are a very new idea. There is one precedent in the region - an example of a successful water user fee that includes a payment for watershed environmental services. AURSA is successfully charging farmers who use water for irrigation in the San Jerónimo watershed and part of the fee is designated for watershed conservation. Recently, AURSA gave Defensores over \$5,000 to reforest 10 hectares in the headwaters of their watershed. It may take several more years to develop water user fees with other user groups. In the meantime, Defensores is focusing on getting water users to contribute to watershed conservation however they feel most comfortable.

9 Concluding Remarks

The amount of work that Defensores has done in less than three years on this project is quite impressive. Defensores has conducted important research to understand the current situation and it has begun to develop governance structures and explore the possibility of developing finance mechanisms for watershed management. Their work will certainly contribute to greater awareness of the value of conservation and greater stakeholder involvement in watershed management activities.

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People Interviewed

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2. Susana Alvarado, Water Fund Field Project Coordinator, Defensores de la Naturaleza
3. Marta de Rivera, Hydrowest (hydroelectric company)
4. Maria Amalia Porta, Guatemalan Center for Cleaner Production
5. Victor Manuel Martínez, Association of Irrigation Users of San Jerónimo (AURSA)
6. Cesar Reyes and Fernando Flores, San Jerónimo Municipality
7. Juan Francisco Lanza Lara, San Jerónimo Water Committee
8. Cesar Tot, Director of the Sierra de las Minas Biosphere Reserve, Defensores de la Naturaleza
9. Members of the Chanrayo Irrigation Committee
10. Hector Guillermo Castañeda Flores and Martin Morales Gutiérrez, Pro-Teculután River Association
11. Andreas Lehnhoff, Guatemala Country Program Director, The Nature Conservancy.

Case Study of Watershed Valuation in the Lake Yojoa Multi-use Area

Final Report

Based on a September 2004 site visit

Prepared for The Nature Conservancy by
Marcia B. Brown
Foundations of Success

August 2005



Acronyms

ASDI	Agencia Sueca de Desarrollo Internacional (Swedish International Development Agency)
AMUPROLAGO	Asociación de Municipios para la Protección del Lago de Yojoa y sus Zonas de Influencia (Association of Municipalities for the Protection of Lake Yojoa and its Areas of Influence)
BMP	best management practice
DINADERS	Dirección Nacional de Desarrollo Rural Sostenible (National Office for Sustainable Rural Development)
ENEE	Empresa Nacional de Energía Eléctrica (National Electricity Company)
FOS	Foundations of Success
KFW	German Development Bank
PANACAM	Parque Nacional Cerro Azul Meambar (Cerro Azul Meambar National Park)
PANAMOSAB	Parque Nacional Montaña Santa Bárbara (Santa Bárbara National Park)
TNC	The Nature Conservancy

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Foreword

TNC supported the development of this case study to promote the sharing of experiences and lessons learned across sites that are doing similar work. It is important to note, however, that many organizations have contributed to the watershed valuation work in Lake Yojoa (or supported complementary activities) in Lake Yojoa, including: the Honduran Forestry Agency (AFE-COHDEFOR), the U.S. Agency for International Development (USAID), the Summit Foundation, the United Nations Development Program (UNDP), Fundación VIDA, Strategies for Urban Quality (EQU), the Swedish International Development Agency (ASDI), the National

Office for Sustainable Rural Development (DINADERS), the German Development Bank (KFW), the Honduran Congress, and community organizations. The work to revise the National Water Use Law in Honduras was supported by the United Nations Development Program (UNDP). Several people provided technical assistance to the process. One of them was Marlou Church, who gave technical input and advice both as TNC's Senior Advisor for International Water Policy and as an independent consultant.

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1 Introduction

1.1 Purpose of case study

For the last few years, The Nature Conservancy (TNC) has supported watershed valuation projects in several countries in Latin America as a strategy for achieving biodiversity conservation. Through the International Water Policy Program, TNC has provided technical assistance to the following countries and sites:

- Mexico: Chiapas (including the El Triunfo and La Encrucijada Biosphere Reserves)
- Mexico: Quintana Roo
- Guatemala: Sierra de las Minas Biosphere Reserve
- Honduras: Yojoa Lake Multi-use Area
- Bolivia: Sama Mountain Range Biological Reserve
- Ecuador: Condor Bioreserve

Watershed valuation projects are designed to link water users to watershed conservation. They seek to get water users to contribute to conservation either financially (through user fees or increased public financing of conservation activities) or by taking actions directly to reduce threats to water resources. Thus, watershed valuation projects involve close collaboration between conservation organizations and government agencies, water companies, citizens groups and other key stakeholder groups.

TNC asked Foundations of Success (FOS) to develop a series of case studies that document the experiences and knowledge that TNC and its partner organizations have gained about watershed valuation projects in these six sites. This document represents one of the six case studies. In addition to the case studies, we have written a cross-site lessons learned document to analyze the use and effectiveness of watershed valuation as a conservation strategy, based on the experiences of all of the sites. The purpose of developing these documents is to facilitate learning among these and other sites that are currently implementing watershed valuation projects or are interested in undertaking these activities.

1.2 Watershed valuation project theory

Many montane protected areas provide abundant, clean water that is valuable for human consumption, irrigation, hydro-electric production, industrial production, ecological processes and other uses. The basic intention of watershed valuation projects is to help local actors recognize the importance of these natural areas and take action to protect them, in order to ensure the integrity of this critical environmental service. Local people may not value the conservation of biological diversity, but they value water. Therefore, the theory is that if they can be motivated to take action to protect their water resources, this action will contribute to biodiversity conservation.

While this basic theory sounds relatively simple, in reality watershed valuation projects are quite complex. Before visiting these watershed valuation projects, we decided to develop a results chain to help clarify TNC's assumptions about how watershed valuation actions should lead to

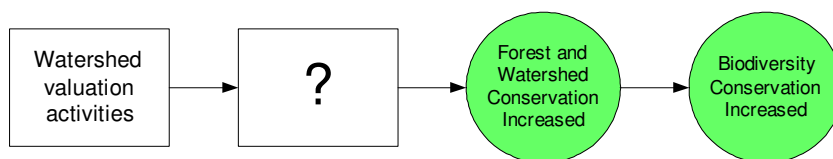
biodiversity conservation – in other words, to define in more detail the project theory and provide a framework for examining each step along the way from intervention to desired impact.

In order for any conservation project to be successful, the implementing organization must develop the project based on sound project theory, and they must execute the project well. Projects can fail to achieve their objectives due to poor theory, poor implementation, or both.

Usually, project theory remains hidden in the minds of the people who design and implement the project. Often, if a group of people is working together to implement a project, they each have different assumptions about how their actions will contribute to achieving their intended impact. Results chains graphically map a series of “if-then” statements that define how a project team believes that a specific conservation action will contribute to achieving a conservation impact. They are a tool used to make the project theory explicit so that it is clear to everyone involved and they can test and refine their assumptions over time.

FOS worked with TNC’s Senior Advisor for International Water Policy to develop the results chain shown in Figure 1. She provided technical assistance to most of these projects for several years. Therefore, her project theory has influenced the approach taken in most (though not all) of the sites. We explain the results chain here, and we use it as a framework for all of the case studies and the cross-site lessons learned document. Within this framework, we describe the actions taken in the sites and analyze the extent to which these projects are achieving their intended objectives.

When we began building the results chain, it looked like this:



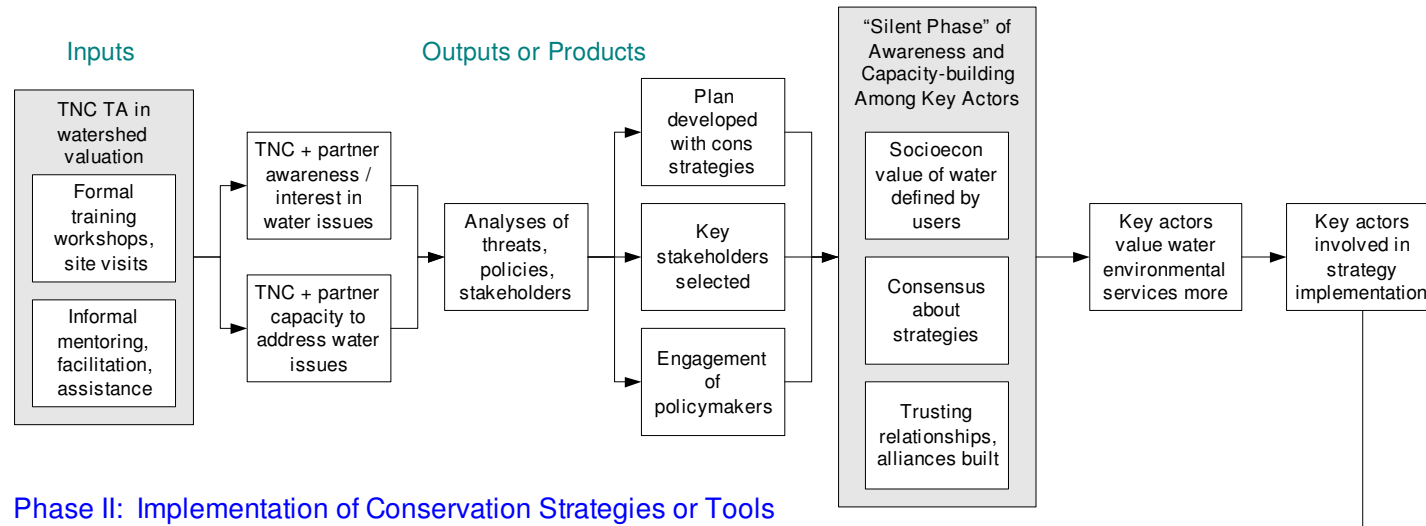
This initial chain says that TNC and its partners are conducting watershed valuation activities to achieve two long-term impacts. The first is an increase in forest and watershed conservation in the specific sites, which TNC believes will contribute to an increase in biodiversity conservation. The difficult part of building the chain is defining the intermediate results needed for the activities to achieve their desired impact.

The complete chain (see Figure 1) includes two project phases. Phase I focuses on initial capacity development, planning and alliance-building. Phase II involves the implementation of specific conservation strategies or tools. TNC’s Senior Advisor for International Water Policy believes that Phase I is a necessary prerequisite to Phase II.

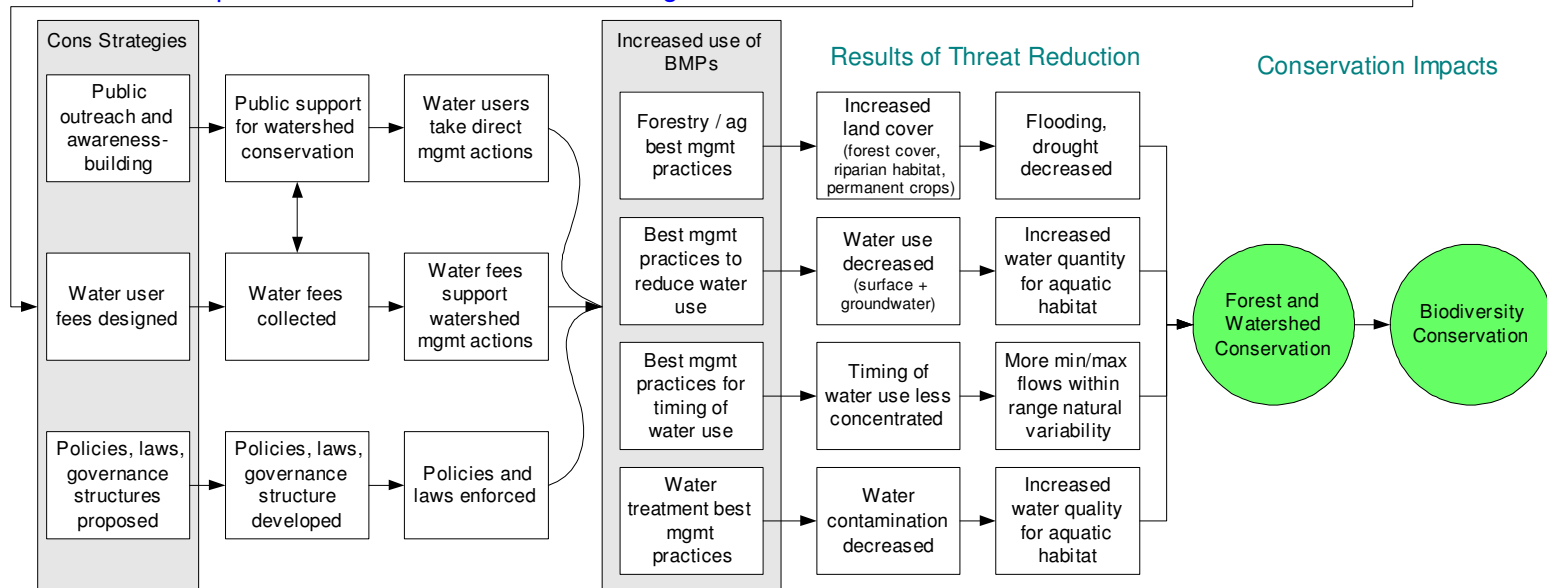
In Phase I, TNC provides technical assistance in watershed valuation, which contributes to building awareness and interest in water issues and capacity to address them. This interest and capacity enable partners to produce initial outputs or products such as analyses of threats, policies and stakeholders, which enable them to develop a watershed valuation action plan and select key stakeholders that need to be involved in implementing the plan. A “silent phase” of

Figure 1. Causal Chain Defining How TNC Watershed Valuation Projects Are Intended to Contribute to Biodiversity Conservation

Phase I: Initial Capacity Development, Planning and Alliance-building



Phase II: Implementation of Conservation Strategies or Tools



information-sharing, awareness and capacity-building among key actors is necessary to achieve consensus about what conservation strategies to undertake and to build trusting relationships among the key actors. TNC calls this the “silent phase” because it may appear to outsiders that little is going on during this phase, but the implementing organizations usually develop important alliances during this period that create the foundation for achieving results during Phase II. During this period, a water valuation process is usually conducted and the key actors may form a watershed group. All of the products of the silent phase contribute to increased recognition by these key actors of the value of watershed environmental services, which contributes to the involvement of these key actors in the implementation of conservation strategies in Phase II.

According to TNC’s program theory, Phase II focuses on the implementation of one or more of the following three conservation strategies: (1) public awareness campaigns, (2) water user fees, and (3) policy development and enforcement. For each of these strategies, a short chain explains expected results. Public outreach and awareness-building increase public support for watershed conservation, which will contribute to water users taking action to improve watershed conservation. The design of a water user fee will result in collection of water fees that are used to support watershed management actions. Engagement of policy-makers will result in the development of new laws, regulations or governance structures that are enforced.

If these conservation strategies are well executed, then they should result in increased adoption of best management practices (BMPs) related to forestry and agricultural activities, reduction of water use, the timing of water use, or water treatment. Which of these best management practices is relevant depends on the conditions in the specific site. For example, forestry and agricultural BMPs may be very important for montane areas, while water pollution reduction is vital to areas such as the Yucatan Peninsula that have complex groundwater systems that influence sensitive marine areas. Where they are relevant, forestry and agricultural best management practices can increase forest cover and other land cover, which will result in decreased flooding and drought. BMPs to reduce water use will reduce surface or groundwater use, which will increase the quantity of water available for aquatic habitat. BMPs related to the timing of water use will result in less concentration in the timing of water use (for example, by hydropower plants), which will increase the number of minimum and maximum river flows within the range of natural hydrologic variability. Water treatment practices will decrease water pollution, thus increasing water quality for aquatic habitat. According to TNC’s theory, all of this will contribute to increased forest and watershed conservation, which will increase forest and freshwater biodiversity conservation.

Although the results chain is presented as a linear sequence of actions and results, we must remember that this is program *theory* – in reality results are often not achieved in the order presented by the chain. For example, some sites have jumped directly to working on the development of water user fees, without an extensive capacity-building, planning and alliance-building phase. These differences help us to learn about the advantages and disadvantages of different approaches and their relative effectiveness under different conditions.

1.3 Case study structure

The structure of this document is based on the results chain. We begin by addressing the last two factors at the end (bottom right-hand side) of the chain. In the site description we describe the

biodiversity that TNC and its partners are trying to conserve in the protected areas where they are conducting watershed valuation activities and in the project objectives and strategies we describe the project's objectives related to watershed and biodiversity conservation.

We then move to the beginning of the results chain. In the project history and planning and alliance-building process sections, we describe all of the achievements made related to the Phase I portion of the results chain. In the implementation of conservation strategies section, we describe all relevant activities related to public outreach campaigns, water user fees and watershed management policies and, if appropriate, how these activities have contributed to increased use of best management practices. We then describe any monitoring that partner organizations are undertaking to measure the effectiveness of watershed valuation work. Finally, we describe the principal lessons learned and provide concluding remarks.

1.4 Overview of this site project

This case study describes two different watershed valuation processes. First, it describes AMUPROLAGO's efforts to involve municipalities and local stakeholders in the conservation of upper watershed areas that provide drinking water to local communities. Second, it includes a brief description of a recent effort to revise Honduras' national water law. Although TNC was not involved in the latter, the person who led the efforts in Lake Yojoa (with technical assistance from TNC) left AMUPROLAGO and went on to coordinate the proposal of a new law at the national level. Because the new law would provide an enabling environment for watershed conservation and the application of innovative tools such as payments for watershed services, we felt it was important to describe the process.

2 Site Description

Lake Yojoa is located in central-western Honduras, approximately 125 km. northwest of the capital city, Tegucigalpa, and 75 km. south of the city of San Pedro Sula. It is Honduras' only natural lake and it covers about 79 km².

In 1971, the Honduran Congress declared Lake Yojoa and its watershed as a protected area. In 1975 the government developed a "multiple use plan" for the area. Since then, Hondurans have considered the lake and its watershed to be a multiple use area, although this management category has no legal basis in Honduras. The 1971 legal decree defined the boundaries of the protected area, but to date the area has no zoning. This means that the area does not have (as most protected areas do) a "core zone" that defines and protects the most intact and ecologically significant areas.

As shown in Figure 2, the lake is located between two other protected areas, established in 1987, when Honduran Decree 87-87 gave legal protection to all montane areas above 1800 m. On the western side of the lake is the Santa Bárbara National Park (PANAMOSAB) and on the eastern side is Cerro Azul Meambar National Park (PANACAM). Together, these three protected areas cover 635 km².

The Lake Yojoa area contains diverse ecosystems that House et al. (2003) categorized into the following four groups:

1. the lake ecosystems, including wetlands and flooded forests,
2. the submontane, broadleaf forests around the lake,
3. the montane forests of Santa Bárbara and Cerro Azúl Meambar and lower, surrounding areas, and
4. the dry forests of the Zacapa and Ulúa river valleys.

The authors describe the Lake Yojoa region as an area with many distinct types of broadleaf forest and high biological diversity, due to high precipitation, the range in altitude and geologic diversity. Some parts of the region receive over 3,200 mm. of rain annually, the highest precipitation in the country. The large range in altitude is demonstrated by the fact that the lake is located at approximately 635 m., while the surrounding mountains of Santa Bárbara and Cerro Azúl Meambar rise to 2,744 and 2,000 m., respectively. Santa Bárbara is the second highest mountain in Honduras.

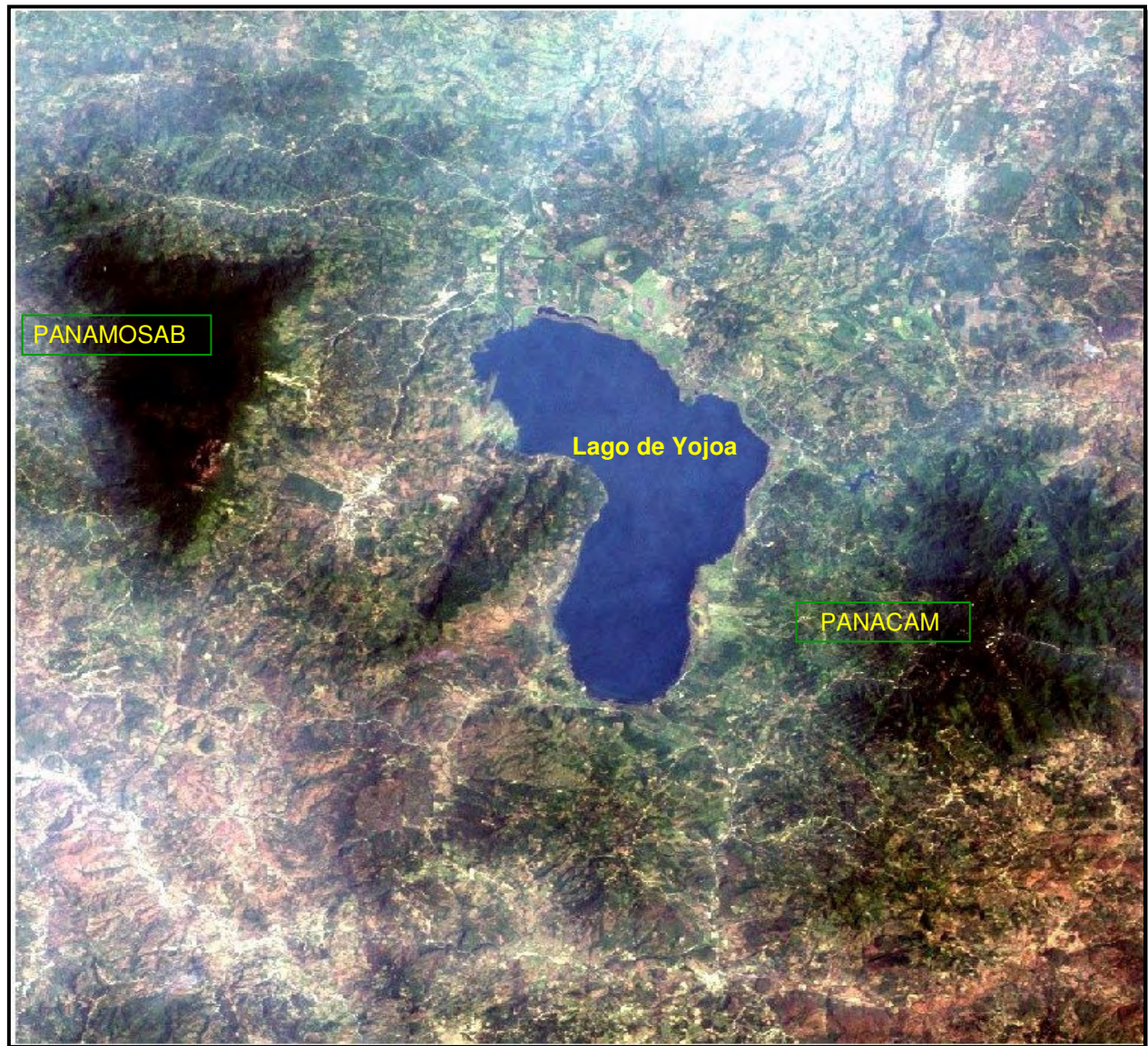
A few examples of the region's high biological diversity include the following:

- The Lake Yojoa region has the highest diversity of plants of any region in the country (802 species or 10.6% of the national flora), most of which is concentrated in the submontane zone around the lake. This floral diversity includes all of the Honduran plants on the CITES 1 list, 15 endemic plants, and 86.5% of the aquatic plants reported in the country.
- The 407 species of birds in this region represent 55% of Honduran bird species and 88% of the country's freshwater birds.
- The 31 species of amphibians and 72 species of reptiles represent 44.2% of the amphibian and 43.6% of the reptile species in the country.
- Scientists have reported 54 species of mammals, including endangered species such as the tapir, jaguar, giant anteater, spider monkey, white-faced monkey, and howler monkey. Some of these species may have gone extinct in the region, however, due to habitat destruction and fragmentation.

A recent analysis of the comparative value of Honduras' protected areas for biodiversity conservation concluded that Lake Yojoa is the fourth most important of the country's 98 protected areas, due to its high biodiversity, the presence of unique or uncommon ecosystems and rare and endemic species. Because Santa Bárbara has unique ecosystems that make it another high priority area, if one analyzed the three protected areas together, they would constitute the second most important conservation area in the country, after the Río Plátano Biosphere Reserve (House et al. 2003).

In addition to its biological value, the lake and its associated watersheds have high hydrologic value. Several economic activities depend directly on the lake. For example, the national government manages two hydroelectric plants located on tributaries of the lake. The beauty of the lake and sportfishing opportunities attract both international and national tourists. Residents have constructed aquaculture ponds around the lake, while a foreign-owned company cultivates tilapia in cages in the lake. In addition to these economic activities, the lake's watersheds provide drinking water to approximately 200 communities with over 36,000 residents.

Figure 2. Aerial Photograph of the Lake Yojoa Region



Despite the region's value for biodiversity conservation and the socioeconomic value of its water resources, land use practices have resulted in loss of biodiversity and watershed degradation. Other economic activities have caused water pollution, altered hydrologic flow patterns and contributed to the loss of native species.

Between 1986 and 2000, land use maps prepared by P. R. House show that almost all of the primary forests and pine forests in the Lake Yojoa Multiple Use Area were converted to agricultural lands. Forest cover also diminished dramatically in the Santa Bárbara and Cerro Azul Meambar National Parks, but to a lesser degree, due to the rough terrain and inaccessibility of much of the two parks' primary forests (especially in the core zones). Because floral biodiversity is higher in the submontane region around the lake than in the two parks' montane forests, conversion of the forests in the Multiple Use Area has probably caused significant biodiversity loss.

As shown in Table 1, the predominant land uses in the three protected areas in 2000 were annual and perennial agriculture. Together these activities covered 63% of the area, while natural forest covered only 33%.

Table 1. Land Uses in the Three Protected Areas in 2000		
Land Use	Area (ha.)	%
Broadleaf Forest	15,981	8
Pine Forest	51,081	25
Water	8,549	4
Coffee and Fallow Areas (with secondary vegetation)	65,521	32
Agriculture	61,616	31
<i>TOTAL</i>	<i>202,748</i>	<i>100</i>

Hydropower generation has altered the lake's hydrologic flow patterns. In the 1970s, the Honduran government constructed a canal in the northwest part of the lake to divert water for hydropower generation in two hydroelectric plants (Cañaveral and Río Lindo). The government also constructed a dike that blocked natural drainage into the lake in the southwestern part of the lake. To make up for water diverted from the lake's watersheds, the National Electric Energy Company (ENEE) diverts two rivers from other watersheds into the lake. Because these rivers are polluted, some people believe that they have contributed to increased eutrophication in the lake (Monterroso, 2003). The lake level is now controlled by the demand for hydropower production. This has lowered the level of the lake and affected wetlands that are ecologically adapted to the natural fluctuations of the lake.

Other sources of organic pollution that contribute to eutrophication include municipal sewage and floating aquaculture tanks. Most of the towns in the lake's watershed do not have sewage treatment plants. Aquaculture tanks cover 2.6 hectares of the lake, where 4,500 tilapia are grown each year. The food given to the fish every day is a constant source of organic pollution that contributes to eutrophication.

Heavy metals contaminate the lake's sediments and have been found in lower concentrations in the fish. Mining of gold, zinc, silver and lead in the lake's watershed caused heavy metal contamination beginning in the late 1940s. Wastewater from the mines and the processing areas (where chemicals are used to separate the minerals) used to flow directly into the lake, but the owners of the mining company constructed a settling pond in 1971 to minimize the flow of pollutants into the lake.

Agrochemicals are also a major source of water pollution. Ornamental plant nurseries, pineapple plantations and coffee plantations all contribute to this problem.

In 1954 black bass was introduced into the lake and in 1964 tilapia was introduced. Both of these exotic species have displaced native fish species. Before the introduction of these species, fishermen caught native fish, primarily *guapote* (rainbow bass) and *bagres* (catfish).

3 Project History and Objectives

In 1995, a group of mayors from municipalities around the lake (both within and outside of the lake's watershed) got together to analyze the problems facing the lake and to discuss common social and economic problems that they all faced. They formed the Association of Municipalities for the Protection of Lake Yojoa and its Areas of Influence (AMUPROLAGO), with representation from 10 municipalities. AMUPROLAGO now includes representatives from 14 municipalities.

In 1999, AMUPROLAGO hired its first Executive Director, Tulio Monterroso. The Executive Director invited a Spanish specialist in municipalities and *mancomunidades* (organizations formed to act on behalf of a community of municipalities) to help AMUPROLAGO define the organizational structure of their *mancomunidad*. She helped them to develop their articles of association and apply for legal recognition of the association under Honduran law (their *personería jurídica*), which eventually gave the organization the ability to receive financial contributions.

During these early years, AMUPROLAGO needed to define its programmatic priorities. The members wanted to assure broad participation and transparency in their decision-making and avoid politicizing their priority-setting process. Responding to their expectations, the Executive Director of AMUPROLAGO proposed that the organization undertake three inter-related, participatory planning processes: (1) strategic planning with the municipalities in the Lake Yojoa watershed, (2) a site conservation plan for the Lake Yojoa Multi-use Area and the two surrounding protected areas, and (3) a watershed valuation process. Although each process used a different methodology, the results of the municipal strategic planning process and the watershed valuation process were quite similar and reinforced one another. TNC's Senior Advisor for International Water Policy, Marlou Church, worked to build AMUPROLAGO staff's technical capacity in water resources (especially watershed valuation) and provided technical assistance for the second and third process. TNC's Director of the Gulf of Mexico Initiative, Rafael Calderon, worked to develop the site conservation plans. Other organizations and projects that contributed to one or more of these processes include: the Honduran Forestry Agency (AFE-COHDEFOR), the U.S. Agency for International Development (USAID), the Summit Foundation, the United Nations Development Program (UNDP), Fundación VIDA, Strategies for Urban Quality (EQU), the Swedish International Development Agency (ASDI), the National Office for Sustainable Rural Development (DINADERS), the German Development Bank (KFW), the Honduran Congress, and community organizations.

The Lake Yojoa watershed strategic planning process brought together representatives of the municipalities and other stakeholders in the Lake Yojoa watershed. With financial support from Fundación VIDA and technical assistance from various sources, AMUPROLAGO invested significant time in facilitating a series of participatory workshops in 62 communities around the lake. Participants analyzed socioeconomic and environmental problems and needs in relation to infrastructure and services. As a result of the process, AMUPROLAGO produced strategic plan documents and maps for each municipality and a strategic plan for Lake Yojoa. The more important product that resulted from this process, however, was the engagement of local stakeholders.

In February 2002, AMUPROLAGO and The Nature Conservancy (TNC) collaborated in organizing a site conservation planning workshop for the area encompassing all three protected areas (Lake Yojoa, Santa Bárbara and Cerro Azul Meambar). The purpose of this workshop was to bring together scientists, managers and key stakeholders to identify the most important ecosystems and species (the site's conservation targets), analyze the viability of each target, analyze the threats facing each target, and define indicators to measure success in reducing those threats and conserving the site targets.

Finally, with technical assistance from TNC's Senior Advisor for International Water Policy, AMUPROLAGO initiated a watershed valuation process. As we will discuss in the next section, AMUPROLAGO organized watershed valuation workshops that brought together major water users, those who benefit most from the lake (including representatives from the electric company, hotels, and an aquaculture company) and those with the capacity to either pay for watershed environmental services or otherwise contribute to the management of the lake.

As a result of these planning processes, AMUPROLAGO defined its mission and programmatic priorities. The mission of AMUPROLAGO is "to promote the sustainable development of the AMUPROLAGO region through the joint effort of the 14 member municipalities." The organization has four programmatic priorities, one of which is the conservation, protection and valuation of Lake Yojoa and its watershed. Within this programmatic area, the organization has chosen to focus on reducing water pollution, conserving priority ecosystems (such as the lake's wetlands), and involving the municipalities in natural resource management.

4 Planning and Alliance-building Process

The watershed valuation process developed by TNC's Senior Advisor for International Water Policy brings together the site's major water users and those who benefit the most from the lake and its watershed and leads them through a qualitative valuation process. The objectives of the process are to get the participants to recognize the true value of water and to realize that they need to contribute to watershed management either by paying a water user fee or by participating directly in management actions. The subsequent step in the process is to develop mechanisms such as user fees, policies, private land conservation tools, zoning and others that link water users with sustainable management.

To carry out the watershed valuation process, AMUPROLAGO and TNC identified all of the stakeholders that needed to be involved in the process. The most important stakeholders included the electric company, an aquaculture company that produces tilapia in cages in the lake, hotel owners, fishermen, people who sell fish, the owners of restaurants that sell fried fish, the mining company, municipalities and community groups that manage potable water systems. They also invited other groups, including international and national donors, representatives of relevant government agencies and watershed management projects from other regions, local leaders and other members of civil society. AMUPROLAGO contacted most of these stakeholders individually, to explain the watershed valuation process and the importance of their participation. AMUPROLAGO also took advantage of other events to promote the watershed valuation process as the first process of its kind to take place in Honduras.

AMUPROLAGO and TNC organized a series of watershed valuation workshops with representation from all of the major stakeholder groups. The workshops consisted of both presentations and working group exercises. Participants worked together to define all of the valuable services that the water from Lake Yojoa and its watershed provide and to identify water users and beneficiaries. They also defined the threats to the lake and its watershed. Finally, they defined management objectives and identified audiences that would need to be involved in order to achieve each objective.

According to the Executive Director of AMUPROLAGO, the process produced several very significant results. First and foremost, it brought together a diverse group of stakeholders with different perspectives and a history of conflicts and got them to think beyond their own interests and recognize the collective value of the lake and its watershed. It enabled participants to recognize the value of water and even succeeded in convincing them of the need to pay more to protect their water resources; surprisingly, participants recognized that they do not currently pay enough to ensure the conservation and management of this vital resource. Second, as a result of the workshop, two municipalities initiated processes to protect springs that provide drinking water to their communities. Finally, participants proposed the creation of a Watershed Advisory Committee, a multisectoral group with 24 members from different sectors. The proposed role of this committee was to assure that AMUPROLAGO's priorities and projects respond to the needs of all the stakeholders in the watershed.

When it undertook the watershed valuation process, AMUPROLAGO was particularly interested in developing a mechanism to charge companies such as ENEE for watershed environmental services and using this money to improve the management of the lake's watersheds. ENEE is clearly one of the most important water users in the lake. The Cañaveral and Río Lindo plants, both of which use water from the lake's watershed to generate electricity, produce the cheapest energy in the country. The Cañaveral Plant Manager says that during the month of August 2004, the two plants together produced 42,091,000 kilowatt-hours (KWH) worth approximately \$0.08 per KWH, or a total of \$3,367,280. Annually, they generate about 800 million KWH worth approximately \$64 million.

As mentioned earlier, the lake's water level has decreased in recent decades. Some people attribute the decrease to the water that ENEE diverts out of the watershed. Others, including ENEE managers, say that deforestation has decreased precipitation and thus decreased streamflow into the lake. ENEE's turbines operate when the lake level is between 631.5 and 637.5 m. in altitude; when the lake level drops below 631.5, the plants are shut down. During the drought of 1995, Honduras suffered an energy crisis because of the time that these plants and others around the country could not operate. Since then, ENEE has invested in the management of the El Cajón watershed, where the country's largest hydropower plant is located. ENEE dedicates very few resources to watershed management in Yojoa Lake, however. The company has only two staff members who work on reforestation and promotion of energy efficient stoves (to reduce fuelwood harvesting). The Cañaveral Plant Manager believes that the company ought to develop a watershed management plan for the Lake Yojoa watershed and dedicate significantly more resources to management activities.

Getting ENEE to either adequately finance its own watershed management activities or pay an environmental service payment to another organization (such as AMUPROLAGO) would require the support of ENEE's Executive Board. The Board includes the Director of the Ministry of Natural Resources and Environment (SERNA), the General Manager of ENEE, the President of the Honduran Congress, and other high level officials. ENEE's Cañaveral Plant Manager believes that AMUPROLAGO would need to conduct an economic valuation study to define how much to charge the company.

Another company whose business depends directly on the lake is Aquafinca Saint Peter Fish, an aquaculture company that produces tilapia in cages in the lake. As mentioned earlier, the company has 2.6 hectares of fish tanks and produces 4,500 fish per year. Some people claim that the fish meal fed to the tilapia each day contributes significantly to the eutrophication of the lake. The company believes that other sources of organic pollution, such as fertilizers and sewage, are the primary causes of the eutrophication. SERNA did not require that the company conduct an environmental impact assessment. In September 2004, the company agreed to pay a voluntary water use fee of L. 0.0025/m³ of water, or L. 876,000 (approximately \$47,609) per year to SERNA. It is not clear how SERNA will use these funds or if they will benefit the lake.

Arnold Sánchez, a Congressman and Founder of AMUPROLAGO, believes that both stronger legal instruments and more technical information are needed before AMUPROLAGO could apply user fees to companies like ENEE and Aqua Finca Saint Peter Fish. He points out that even when water users are aware of the value of water and the need to support watershed management, there is currently no legal basis for water fees that include environmental service payments. AMUPROLAGO is not the *Autoridad del Lago*, the government agency responsible for overseeing the management of the lake. AMUPROLAGO would either need to be named the *Autoridad del Lago* or it would need to work with all eight of the municipalities in the lake watershed to develop municipal regulations that would allow each municipality to charge water user fees to be used for management of the overall watershed.

Sánchez also believes that AMUPROLAGO, SERNA and others involved in the management of the lake need more technical information about its hydrology and water quality. For example, they need a water balance study to determine why the lake level has decreased. They need maps of critical habitats such as wetlands, so that they can protect them. They need more information about current water quality and the relative contribution of different sources of pollution, so that they can direct their actions toward decreasing the most significant sources. Finally, he suggests conducting a study of the carrying capacity of the lake and using this information to regulate aquaculture and other activities that directly affect water quality. Managing the lake requires regulating the various uses of the resources and resolving conflicts between user groups. Resolving conflicts in a fair and transparent way requires a good base of technical information.

5 Implementation of Conservation Strategies

5.1 Upper Watershed Protection in Yojoa Lake (Forestry Best Management Practices)

During both the strategic planning process and the watershed valuation process, participants identified the need to protect microwatersheds -- especially upper watershed areas that provide drinking water to communities. For example, the Municipality of Santa Bárbara decided to purchase the land where its water sources are located. The Municipality of Santa Cruz de Laguna included in its strategic plan actions “to protect microwatersheds and improve water quality for human consumption.”

TNC introduced AMUPROLAGO to an innovative legal tool, the conservation easement, to protect patches of primary forest of ecological and socioeconomic value. A conservation easement is a legal agreement between two pieces of property in which the “dominant property” acquires certain rights from the “subservient property.” It is similar to a legal agreement that gives one property owner a right-of-way on another property owner’s land. In this case, however, the rights given up by the subservient property are development rights. In some cases, the landowner of the subservient property may agree not to cut any of the forest cover in a certain part of his or her property. In other cases, he or she may agree to restrict the use of part of the land. Because the conservation easement is registered with the title to the property, when the property is sold, the restrictions on resource use are transferred to the new owner.

Conservation organizations in the United States have used conservation easements for many years, because they consider them a cost-effective tool for land protection. Establishing an easement is generally much cheaper than land acquisition, in the short term and over the long term. The initial cost of the legal agreement is generally a fraction of the market value of the property. Over the long term, the landowner continues to shoulder the cost of land management and the conservation organization is responsible only for monitoring the easement and legally upholding it, if necessary.

There are several incentives for landowners to place a conservation easement on their property. The Honduran government has made all land included in a conservation easement exempt from property taxes and it has committed to giving the landowner help in fighting forest fires, if necessary. In this case, AMUPROLAGO also provided legal assistance to help the private landowners obtain legal rights or official title to their land. In one case, a member of the AMUPROLAGO Board also paid for the construction of a road to the property.

With technical assistance from TNC staff with expertise in conservation easements, AMUPROLAGO invested a significant amount of time in negotiating, developing and then signing five conservation easements. AMUPROLAGO owned a piece of property that represented the “dominant property” in the legal agreements. As shown in Table 2, AMUPROLAGO signed two easements with private landowners and three with the Municipality of Santa Cruz de Yojoa. The Municipality of Santa Cruz de Yojoa wanted to protect its drinking water sources. It decided that purchasing the land would not ensure permanent protection --

signing an easement would give the municipality the obligation to protect the land in perpetuity, irrespective of changes in municipal leadership.

Together the private and municipal easements protected almost 60 hectares of forest. Surprisingly, the legal cost of establishing the easements was only about \$4,000, or \$68 per hectare.

Table 2. Current Status of the Conservation Easements Established in Lake Yojoa (adapted from AMUPROLAGO. Septiembre 2004)				
Property Owner	Property Name	Size (ha.)	Location (Town, Municipality)	Current Status of Conservation Easement
Private landowner	Finca Bahr	2.68 ha.	Monte Verde, Santa Cruz de Yojoa	<ul style="list-style-type: none"> • conditions of contract not upheld by either party • wetland filled in (0.5 km. inside of wetland) • grazing in wetland • no monitoring • no technical assistance
Sr. José A. Zuniga, private landowner	Finca “El Crater”	25.91 ha.	Los Coquitos, Santa Cruz de Yojoa	<ul style="list-style-type: none"> • legal dispute over property • no monitoring • no technical assistance
Municipalidad de Santa Cruz de Yojoa	“El Sinai”	12.3 ha.	Meámbar, Santa Cruz de Yojoa	<ul style="list-style-type: none"> • no monitoring • no technical assistance
Municipalidad de Santa Cruz de Yojoa	“Yojoa”	15.5 ha.	El Crique de Yojoa, Santa Cruz de Yojoa	<ul style="list-style-type: none"> • no monitoring • no technical assistance
Municipalidad de Santa Cruz de Yojoa	“La Cusumba”	2.8 ha.	Santa Cruz de Yojoa	<ul style="list-style-type: none"> • no monitoring • no technical assistance
TOTAL HECTARES		59.2 ha.		

When AMUPROLAGO signed these conservation easements in 2000-2001, they represented a major step forward in the use of this conservation tool. At the time, conservation easements had been used extensively in North America, but their application in Latin America was quite limited. In North America, landowners who put a conservation easement on their land receive significant reductions in their property taxes. In some cases, this makes it financially possible for the landowner to keep the land. In contrast, incentives for the use of conservation easements in Latin America are usually not sufficiently attractive to offset the loss of development and resource use rights and the decrease in market value of the property. AMUPROLAGO proved that it was possible to sign conservation easements with local landowners and municipalities.

Since 2001, however, AMUPROLAGO has faced many challenges in upholding these conservation easements. On one of the pieces of private property, another landowner appeared who claimed that he was the rightful owner of the property. A legal dispute over the property has ensued. On the other piece of private property, the owners have not upheld the obligations of the easement. In 2002, a new mayor was elected in Santa Cruz de Yojoa and the new mayor does not support many of the initiatives of the previous mayor (including this one). In all 5 cases, AMUPROLAGO has not monitored compliance of the easement, nor has it provided

technical assistance as agreed in the easement. AMUPROLAGO has also not taken legal action in cases of incompliance. The Director of AMUPROLAGO left the organization in 2002 and a new Director was hired in May 2003. The new Director does not consider these easements to be a high priority for the organization and he does not believe that the organization has the capacity to ensure their enforcement.

5.1.1 Challenges and Enabling Factors

This experience demonstrates some of the challenges of using conservation easements in Latin America. Conservation organizations across the region could learn from this experience. The first challenge is that overlapping claims to land are common in the region and many people do not have legal title to their land; thus, conservation organizations run the risk of getting involved in land disputes, unless they conduct thorough background research on the property before signing the easement. Second, monitoring easement compliance requires an investment of staff time over the long term. Third, ensuring the legal enforcement of the easement can potentially be very expensive; conservation organizations do not generally have the resources needed to take legal action in cases of incompliance. Finally, because there is no legal precedent, it is not clear whether the Honduran courts would uphold a conservation easement.

5.2 *National Watershed Management Policies and Governance Structure*

Like many Latin American countries, Honduras' water legislation is outdated and inadequate to meet modern needs. The National Water Use Law was developed in 1927 and reflects the priorities of sectors that had strong political power at that time, such as the banana companies, the railroad and cattle ranchers. One of the weaknesses of the law is that it regulates certain water uses such as domestic water supply, irrigation, navigation, and industrial use individually (sector by sector), without considering overlaps and conflicts and the need for integrated watershed management. Another is that although groundwater is a finite resource that can be overexploited, the law allows landowners to freely drill wells and it considers groundwater as private property once it has been extracted by the landowner.

In recent years, the Honduran Congress has received and considered several proposals for a new water law, but it has never passed any of them. Several different laws, therefore, regulate different aspects of water use, resulting in legal gaps and inconsistencies, as well as overlapping institutional responsibilities and institutional gaps. Although the Ministry of Natural Resources and Environment (SERNA) has the responsibility to oversee the management of the nation's water resources, it does not have the capacity to exercise this authority and thus different aspects of water use are overseen by different sectors, resulting in overlaps and conflicts between different water uses.

Honduras needs a new water law that will help the country address many modern problems. For example, widespread watershed degradation has made the country vulnerable to flooding during extreme weather events such as the heavy rains that occurred during Hurricane Mitch in 1998. The country is also vulnerable to drought caused by "el Niño." Some regions of the country have inadequate water supply, due to limited surface and groundwater sources, and many

municipalities do not have the resources or qualified personnel to adequately maintain their water systems. Groundwater resources are not managed in most of the country. Water pollution regulations are not enforced, resulting in contamination of rivers and coastal areas (Monterroso 2004). Legislation that establishes a strong governance structure for water resources would help the country address many of these problems.

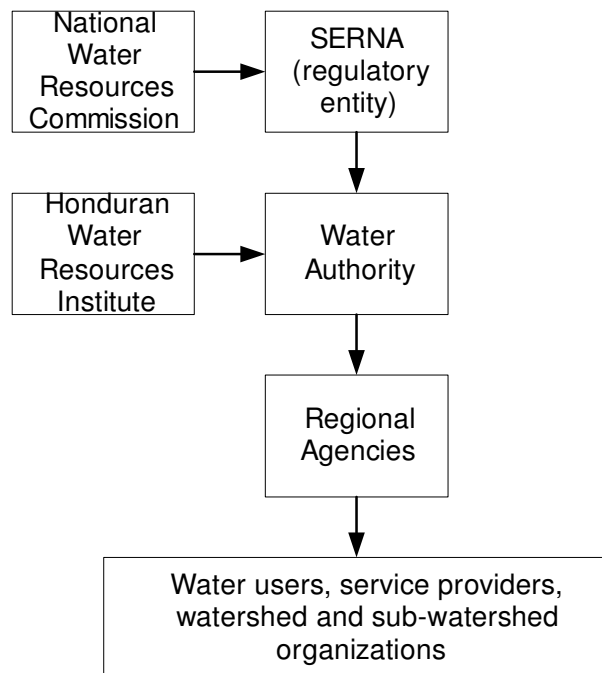
As mentioned earlier, Tulio Monterroso left AMUPROLAGO in 2002. He continued to work on water issues at the national level and within months he was involved in an initiative to propose a new water law, based on extensive technical input and a broad process of consultation with all relevant sectors throughout the country. We describe the process here, because it provides important lessons for people working in other countries that have weak water legislation. The process was supported by the United Nations Development Program (UNDP). Several people provided technical assistance to the process. One of them was Marlou Church, who gave technical input and advice both as TNC's Senior Advisor for International Water Policy and as an independent consultant.

In early 2003, the Environment Commission of the National Congress decided to reactivate the process of approval of a new water law by dusting off a proposed law introduced in 1998. The Commission asked a multi-sectoral group called the Honduran Water Platform (Plataforma de Agua de Honduras) to provide the technical assistance necessary to update and revise the proposed law. According to Tulio Monterroso, who coordinates the group, the Honduran Water Platform included 12 professionals with technical experience in different aspects of water resources, including potable water supply and wastewater management, irrigation, vulnerability to natural disasters, hydropower generation, and municipal and community interests related to the management of water resources. The group was created to promote the integrated management of water resources and capacity building in the water sector and to influence water policy development -- specifically, the development of a new water law.

Platform members spent several months conducting a technical review of the proposed law and developing a revised version that incorporated elements essential to integrated management of water resources and Honduran policies on decentralization, sectoral planning, public and private participation, regulation, and modernization of the state. They also ensured that the draft document incorporated government priorities related to conservation, sustainability, vulnerability, valuation, equity and gender. The group facilitated three working sessions to present this draft to the Environment Commission of the National Congress and make changes based on their feedback. They then sought input from at least five other Congressional commissions, party leaders and members of the Executive Board of the Congress. At this point, they produced their final draft (*dictamen final*).

According to Monterroso (2004), the proposed law both simplifies and strengthens the governance structure for water resources management by creating clearly defined, distinctive roles for different institutions. SERNA would continue to have responsibility for water policy and a National Water Authority with regional offices would implement the water policy and have responsibility for planning, regulation, research and promotion of integrated watershed management. Finally, a Water Resources Institute would be responsible for research and monitoring. The governance structure would include the following:

Figure 3. Governance Structure Included in the Proposed Honduran Water Law



Some of the other improvements in the law mentioned by Monterroso (2004) include:

- Establishment of ecologically and socioeconomically significant areas such as cloud forests, watershed recharge areas and sources of water for human consumption, wetlands, coral reefs and others as conservation areas
- Recognition of the economic, environmental and social value of water
- Establishment of fees for water use, incentives for conservation, and fines for water pollution
- Development of mechanisms for public participation in integrated water resources management

Beginning around September 2004, Platform members facilitated a series of workshops around the country to present the proposed law to representatives of all relevant sectors and get feedback about it. They also organized meetings to discuss the proposed legislation with groups that they considered likely to oppose it.

5.2.1 Challenges and Enabling Factors

The existence of the Honduran Water Platform was essential to the success of the process of technical review and public consultation about the proposed water law. The Water Commission of the National Congress trusted the group in part because it represented many different sectors and had different technical backgrounds and interests related to water resources. The diversity of perspectives within the group gave it credibility. The group also played an essential role in keeping the process moving by raising the necessary funds and bringing in outside technical expertise when needed.

6 Lessons Learned

6.1 Lessons Learned From Yojoa Lake

6.1.1 Watershed valuation processes take time and require continuity in leadership

Because watershed valuation processes require a long process of outreach, consultation and capacity-building of key actors, it generally takes several years for them to produce concrete results such as stronger local or national policies, water user fees, and more sustainable resource use. In this case, AMUPROLAGO succeeded in raising awareness and getting local stakeholders to work together to analyze problems and propose solutions. Because of a change in leadership in AMUPROLAGO, however, the process came to a halt. Because the new director of AMUPROLAGO has other priorities, the organization has not provided follow-up and the process has not achieved the on-the-ground results that it intended to achieve.

6.1.2 Conservation easements are only effective if they can be enforced

Conservation easements are an innovative legal tool for land conservation that may have great potential in Honduras and other Latin American countries. They will only be effective, however, in cases where the institutional and legal framework exists to enforce them. In this case, there was not sufficient capacity to enforce the easements. When the leadership of AMUPROLAGO changed, the monitoring of the organization's five conservation easements ceased to be a priority. The organization took no action to stop one private landowner from filling in wetland, nor did it get involved in the legal dispute over the other private property. If AMUPROLAGO had taken legal action, it is also not clear whether Honduran courts would have upheld the easements. Conservation easements are such a new tool that the country's judicial system does not have experience with them.

6.1.3 Good technical information is needed to resolve conflicts between user groups

In Lake Yojoa, many people blame ENEE for lowering the lake level, but ENEE claims that lower precipitation and deforestation are responsible for the low level of the lake. Some people believe that Aqua Finca Saint Peter Fish is contributing significantly to the eutrophication of the lake, but the company blames municipal sewage and agricultural runoff for the eutrophication. In both cases, it is the word of one group against another and there is not sufficient technical information to understand the root of the problem. As Arnold Sánchez, a Congressman and Founder of AMUPROLAGO, points out, SERNA, AMUPROLAGO and others involved in the management of the lake need more technical information. Managing the lake requires regulating resource uses and resolving conflicts between user groups. This can only be done in a fair and transparent way with a good base of technical information.

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TNC and Partner Experiences with Watershed Valuation Activities In the State of Chiapas, Mexico

Final Report

Based on September 2004 site visits

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Foundations of Success

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List of Acronyms

CCMSS	Consejo Civil Mexicano para la Silvicultura Sostenible
CFE	Comisión Federal de Electricidad
CI	Conservation International
CNA	Comisión Nacional del Agua
CONAFOR	Comisión Nacional Forestal
CONANP	Comisión Nacional de Áreas Naturales Protegidas
ECOSUR	El Colegio de la Frontera Sur
FANP	Fondo para Áreas Naturales Protegidas del Fondo Mexicano para la Conservación de la Naturaleza (FMCN).
FGRA	Fundación Gonzalo Río Arronte
FIRCO	Fideicomiso de Riesgo Compartido
FMCN	Fondo Mexicano para la Conservación de la Naturaleza
FONCET	Fondo de Conservación El Triunfo
IDESMAC	Instituto para el Desarrollo Sustentable en Mesoamérica, A.C.
IHNE	Instituto de Historia Natural y Ecología de Chiapas
JICA	Japanese International Cooperation Agency
PiP	Parks in Peril Program de The Nature Conservancy
SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales
SMAPA	Sistema de Agua Potable y Alcantarillado
TNC	The Nature Conservancy
UNACH	Universidad Autónoma de Chiapas

1 Introduction

1.1 Purpose of case study

For the last few years, The Nature Conservancy has supported watershed valuation projects in several countries in Latin America as a strategy for achieving biodiversity conservation. Through the International Water Policy Program, TNC has provided technical assistance to the following countries and sites:

- Mexico: Chiapas (including the El Triunfo and La Encrucijada Biosphere Reserves)
- Mexico: Quintana Roo
- Guatemala: Sierra de las Minas Biosphere Reserve
- Honduras: Yojoa Lake Multi-use Area
- Bolivia: Sama National Park
- Ecuador: Condor Bioreserve

Watershed valuation projects are designed to link water users to watershed conservation. They seek to get water users to contribute to conservation either financially (through user fees or increased public financing of conservation activities) or by taking actions directly to reduce threats to water resources. Thus, watershed valuation projects involve close collaboration between conservation organizations and government agencies, water companies, citizens groups and other key stakeholder groups.

TNC asked Foundations of Success to develop a series of case studies that document the experiences and knowledge that TNC and its partner organizations have gained about watershed valuation projects in these six sites. This document represents one of the six case studies. In addition to the case studies, we have written a cross-site lessons learned document to analyze the use and effectiveness of watershed valuation as a conservation strategy, based on the experiences of all of the sites. The purpose of developing these documents is to facilitate learning among these and other sites that are currently implementing watershed valuation projects or are interested in undertaking these activities.

1.2 Watershed valuation project theory

Many montane protected areas provide abundant, clean water that is valuable for human consumption, irrigation, hydro-electric production, industrial production, ecological processes and other uses. The basic intention of watershed valuation projects is to help local actors recognize the importance of these natural areas and take action to protect them, in order to ensure the integrity of this critical environmental service. Local people may not value the conservation of biological diversity, but they value water. Therefore, the theory is that if they can be motivated to take action to protect their water resources, this action will contribute to biodiversity conservation.

While this basic theory sounds relatively simple, in reality watershed valuation projects are quite complex. Before visiting these watershed valuation projects, we decided to develop a results chain to help clarify TNC's assumptions about how watershed valuation actions should lead to

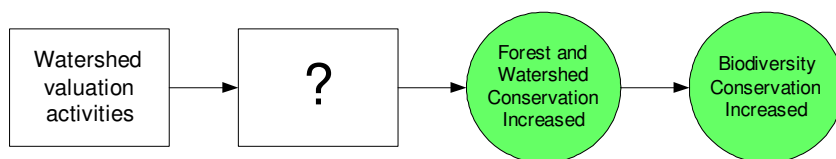
biodiversity conservation – in other words, to define in more detail the project theory and provide a framework for examining each step along the way from intervention to desired impact.

In order for any conservation project to be successful, the implementing organization must develop the project based on sound project theory, and they must execute the project well. Projects can fail to achieve their objectives due to poor theory, poor implementation, or both.

Usually, project theory remains hidden in the minds of the people who design and implement the project. Often, if a group of people is working together to implement a project, they each have different assumptions about how their actions will contribute to achieving their intended impact. Results chains graphically map a series of “if-then” statements that define how a project team believes that a specific conservation action will contribute to achieving a conservation impact. They are a tool used to make the project theory explicit so that it is clear to everyone involved and they can test and refine their assumptions over time.

FOS worked with TNC’s Senior Advisor for International Water Policy to develop the results chain shown in Figure 1. She provided technical assistance to most of these projects for several years. Therefore, her project theory has influenced the approach taken in most (though not all) of the sites. We explain the results chain here, and we use it as a framework for all of the case studies and the cross-site lessons learned document. Within this framework, we describe the actions taken in the sites and analyze the extent to which these projects are achieving their intended objectives.

When we began building the results chain, it looked like this:



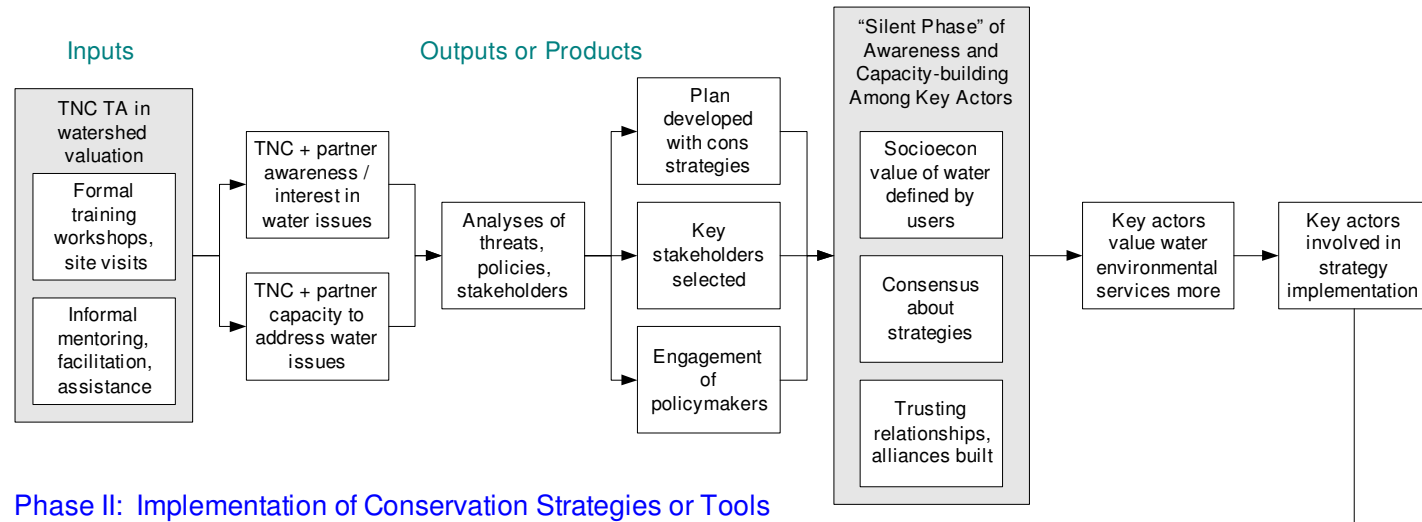
This initial chain says that TNC and its partners are conducting watershed valuation activities to achieve two long-term impacts. The first is an increase in forest and watershed conservation in the specific sites, which TNC believes will contribute to an increase in biodiversity conservation. The difficult part of building the chain is defining the intermediate results needed for the activities to achieve their desired impact.

The complete chain (see Figure 1) includes two project phases. Phase I focuses on initial capacity development, planning and alliance-building. Phase II involves the implementation of specific conservation strategies or tools. TNC’s Senior Advisor for International Water Policy believes that Phase I is a necessary prerequisite to Phase II.

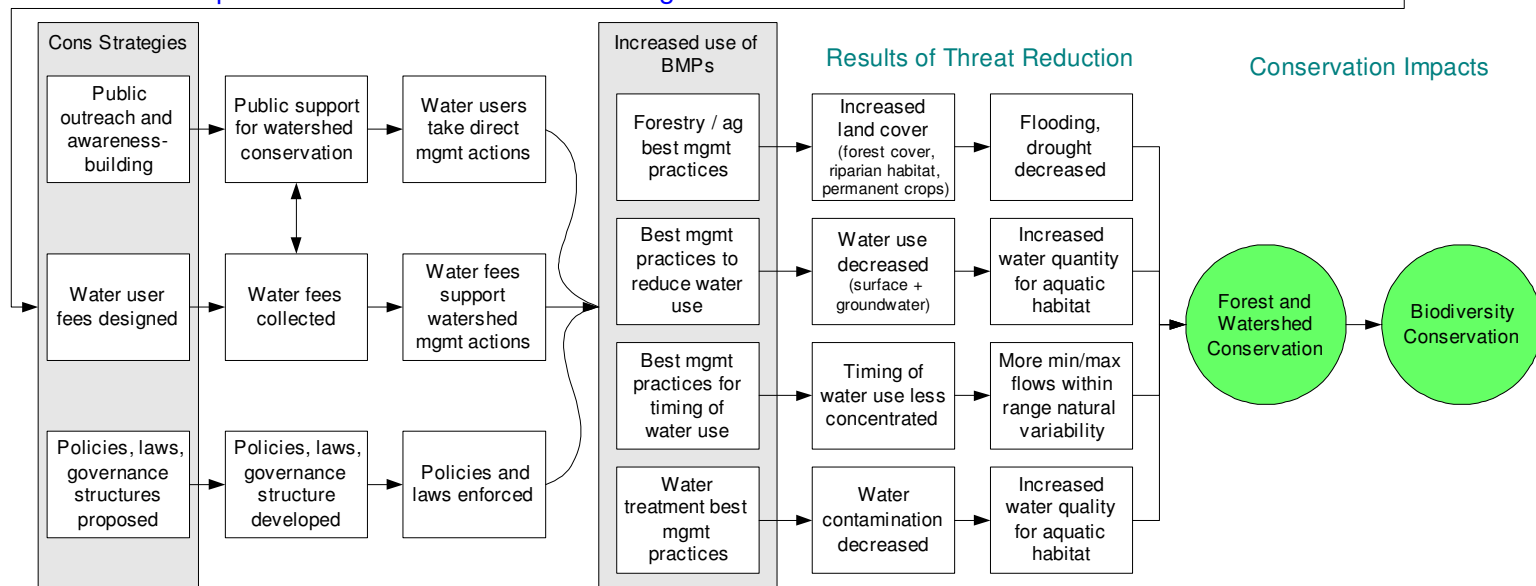
In Phase I, TNC provides technical assistance in watershed valuation, which contributes to building awareness and interest in water issues and capacity to address them. This interest and capacity enable partners to produce initial outputs or products such as analyses of threats, policies and stakeholders, which enable them to develop a watershed valuation action plan and select key stakeholders that need to be involved in implementing the plan. A “silent phase” of

Figure 1. Causal Chain Defining How TNC Watershed Valuation Projects Are Intended to Contribute to Biodiversity Conservation

Phase I: Initial Capacity Development, Planning and Alliance-building



Phase II: Implementation of Conservation Strategies or Tools



information-sharing, awareness and capacity-building among key actors is necessary to achieve consensus about what conservation strategies to undertake and to build trusting relationships among the key actors. TNC calls this the “silent phase” because it may appear to outsiders that little is going on during this phase, but the implementing organizations usually develop important alliances during this period that create the foundation for achieving results during Phase II. During this period, a water valuation process is usually conducted and the key actors may form a watershed group. All of the products of the silent phase contribute to increased recognition by these key actors of the value of watershed environmental services, which contributes to the involvement of these key actors in the implementation of conservation strategies in Phase II.

According to TNC’s program theory, Phase II focuses on the implementation of one or more of the following three conservation strategies: (1) public awareness campaigns, (2) water user fees, and (3) policy development and enforcement. For each of these strategies, a short chain explains expected results. Public outreach and awareness-building increase public support for watershed conservation, which will contribute to water users taking action to improve watershed conservation. The design of a water user fee will result in collection of water fees that are used to support watershed management actions. Engagement of policy-makers will result in the development of new laws, regulations or governance structures that are enforced.

If these conservation strategies are well executed, then they should result in increased adoption of best management practices (BMPs) related to forestry and agricultural activities, reduction of water use, the timing of water use, or water treatment. Which of these best management practices is relevant depends on the conditions in the specific site. For example, forestry and agricultural BMPs may be very important for montane areas, while water pollution reduction is vital to areas such as the Yucatan Peninsula that have complex groundwater systems that influence sensitive marine areas. Where they are relevant, forestry and agricultural best management practices can increase forest cover and other land cover, which will result in decreased flooding and drought. BMPs to reduce water use will reduce surface or groundwater use, which will increase the quantity of water available for aquatic habitat. BMPs related to the timing of water use will result in less concentration in the timing of water use (for example, by hydropower plants), which will increase the number of minimum and maximum river flows within the range of natural hydrologic variability. Water treatment practices will decrease water pollution, thus increasing water quality for aquatic habitat. According to TNC’s theory, all of this will contribute to increased forest and watershed conservation, which will increase forest and freshwater biodiversity conservation.

Although the results chain is presented as a linear sequence of actions and results, we must remember that this is program *theory* – in reality results are often not achieved in the order presented by the chain. For example, some sites have jumped directly to working on the development of water user fees, without an extensive capacity-building, planning and alliance-building phase. These differences help us to learn about the advantages and disadvantages of different approaches and their relative effectiveness under different conditions.

1.3 Case study structure

The structure of this document is based on the results chain. We begin by addressing the last two factors at the end (bottom right-hand side) of the chain. In the site description we describe the biodiversity that TNC and its partners are trying to conserve in the protected areas where they are conducting watershed valuation activities and in the project objectives and strategies we describe the project's objectives related to watershed and biodiversity conservation.

We then move to the beginning of the results chain. In the project history and planning and alliance-building process sections, we describe all of the achievements made related to the Phase I portion of the results chain. In the implementation of conservation strategies section, we describe all relevant activities related to public outreach campaigns, water user fees and watershed management policies and, if appropriate, how these activities have contributed to increased use of best management practices. We then describe any monitoring that partner organizations are undertaking to measure the effectiveness of watershed valuation work. Finally, we describe the principal lessons learned and provide concluding remarks.

1.4 Overview of Chiapas Project

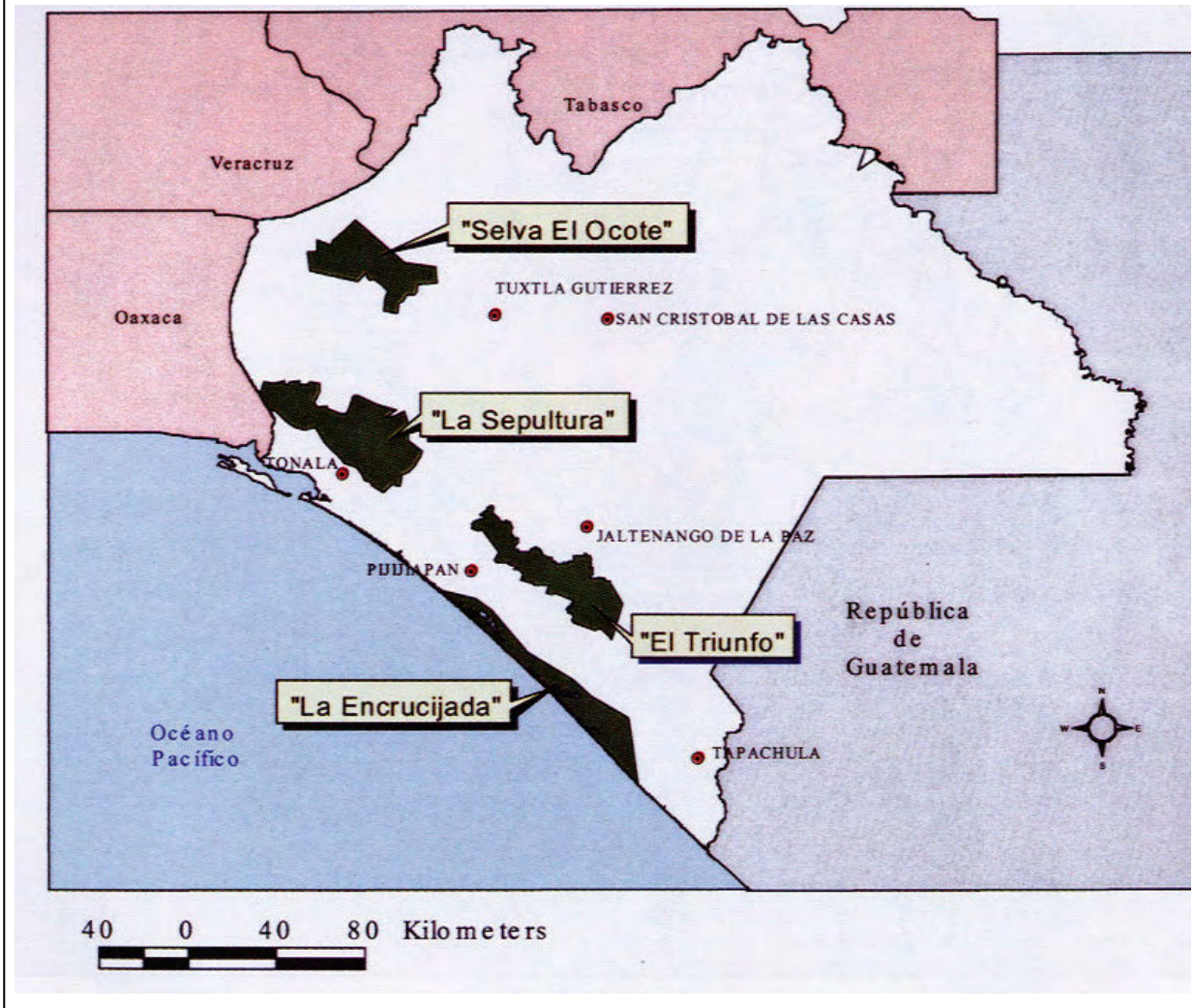
Watershed valuation work in Chiapas has progressed significantly in the past five years. TNC, its main partners (IHNE, Pronatura, and CONANP) and collaborating institutions have passed through most of the steps associated with Phase I (Initial Capacity Development, Planning, and Alliance Building) and are now in the midst of Phase II (Implementation of Conservation Strategies or Tools). To a large degree, TNC, its partners, and its collaborators have touched upon the four main implementation strategies in Figure 1 (public outreach and awareness building, design of water user fees, engagement of policymakers, and the promotion of best management practices). The case in Chiapas, however, is very complex with numerous actors in several different watersheds. This sometimes makes it difficult to distinguish between what is a coordinated, strategic watershed valuation process and what is a group of disparate activities which all seem to complement one another and help contribute to broader watershed goals. We have done our best to represent the activities that are currently underway in Chiapas and to distinguish between isolated activities and those that are part of a more strategic effort to improve watershed management in the state of Chiapas.

2 Site Description

The state of Chiapas, located in southwestern Mexico is just one-third the size of California, but is home to over 640 bird species, more than 1,200 butterfly species, and 17 natural plant communities. Chiapa's Sierra Madre mountain range resides in a transition zone between the the Neotropical and Neotropical biogeographical regions and, as such, is host to flora and fauna at the northernmost and southernmost extension of their range. Over the past decade, TNC Mexico has worked with the Instituto de Historia Natural y Ecología (IHNE) and, more recently, the Comisión Nacional de Áreas Naturales Protegidas (CONANP) to protect biological diversity at a site level in several areas in Chiapas. This includes El Triunfo, La Encrucijada, La Sepultura Biosphere, and El Ocoteo Reserves, shown in Figure 2.

Watershed valuation activities originally focused on El Triunfo Biosphere Reserve and the Cuxtepec watershed that flows down the eastern slopes of the Sierra Madre. Activities soon

Figure 2. Location of Biosphere Reserves in Chiapas, Mexico



Source: The Nature Conservancy (2003) *Community-based Conservation. Participatory conservation in buffer zone communities of the Natural Protected Areas of Chiapas, Mexico.*

expanded to include La Encrucijada Biosphere Reserve on the Pacific coast and the Coapa watershed that connects the two. This was, in part, a reflection of TNC's shift to platform sites (larger landscape units) that could serve as mechanisms for increasing the depth and coverage of conservation efforts. The decision also reflects a recognition of the interdependence of the two sites and the watershed that connects them. Known as the Chiapas Coastal Watershed Platform Site, the region has since expanded to include work in La Sepultura Biosphere Reserve and the watersheds of Lagartero, Zanateco, and Pijijiapan. Each watershed experiences threats unique to its region, but some of the general threats to the platform site include: high population density, slash and burn agriculture, cattle ranching, coffee production, logging, deforestation associated with these productive activities, heavy sedimentation, and forest fires. Social and political strife, including conflicts over land, have also led to violent clashes in the area. In the following paragraphs, we provide brief descriptions of each biosphere reserve.

Nestled in the Sierra Madre mountain range, El Triunfo is one of the most biodiverse forest reserves in Mexico and worldwide, protecting cloud forest, tropical forests, oak-pine forest and hydrologic systems in its nearly 120,000 hectare expanse. The Chiapas government first decreed El Triunfo as a state park in 1972, while the Mexican government later declared it a federal protected area in 1990. In 1993 the reserve became a UNESCO Man and the Biosphere site. El Triunfo's importance to watershed conservation is undisputable. Its drainage captures 10% of Mexico's rainfall, providing water to all of the state's economically important regions, including the fertile Soconusco plain. It also provides water to the Rio Grijalva in the Cuxtepec watershed, a river that is an important source of hydroelectric energy for Mexico. There are several primary threats in El Triunfo, most of which relate to development demands from the area's growing population. The threats include: 1) deforestation from expanding coffee plantations, subsistence agriculture, cattle ranching and forest fires; 2) soil and water contamination from agrochemicals and coffee pulp; and 3) increasing pressure on surrounding natural resources as a result of social-agrarian problems, such as poverty, marginalization, scarce agricultural resources, and high population growth.

Located on Chiapas' southern Pacific coast, La Encrucijada Biosphere spans over 144,000 hectares and includes mangrove estuaries, semi-deciduous tropical forest, and seasonally-flooded coastal forest. The reserve forms one of the largest marine fishery spawning areas on Mexico's western coast and provides critical wintering habitat for migratory waterfowl, pelicans, wading birds, and shore birds. Established as a state park in 1972 and later as a federally protected biosphere reserve in 1995, La Encrucijada is one of Mexico's most important wetlands, from a conservation standpoint. Of particular importance are the unique *zapotonal* (*pachira aquatica*) forests and spectacular stands of mangroves that can reach over 25 meters in height. The reserve is also key to the local economy, primarily because of its fishery habitat. Most of the major threats to La Encrucijada occur outside the reserve's boundaries and include: 1) deforestation in the upper and middle watershed, which causes erosion upstream and sedimentation downstream; 2) hydrologic alteration to increase cultivatable land for farmers and migrants upstream, which also increases sedimentation downstream; and 3) water contamination from heavy use of agrochemicals. The fact that most of the major threats to La Encrucijada come from outside of the reserve has been one of the big motivators for reserve management to adopt a watershed approach to conservation. Threats within La Encrucijada include the conversion of forested areas, mangroves, and cattail marshes for grazing and agriculture, illegal timber harvesting,

wildlife poaching, canal and coastal lagoon contamination, land ownership conflicts, and a sharp increase in shrimp farming along the Pacific coast.

The third biosphere reserve in the Chiapas Coastal Watershed Platform Site, La Sepultura was declared a reserve in 1995. Just over 167,000 hectares in size, the reserve boundaries span 5 municipalities: Arriaga, Tonalá, Cintalapa, Jiquipilas, Villacorzo and Villaflores. With elevations ranging from 40 to 2550 meters above sea levels and some gradients as steep as 45 degrees, La Sepultura provides varied habitat that supports a wide range of plant and animal species. Its ecological zones are equally diverse and include semi-arid, humid, tropical, and temperate regions. One of the main threats to the area – and to watershed conservation in particular – is that the city of Tonalá extracts much more water than it returns, causing the downstream lagoons to become more salty and reducing fish and shrimp catches. Other threats to La Sepultura and neighboring regions include extensive ranching, slash and burn agriculture, and clearing for logging. These threats have reduced downstream water flows, resulting in heavy eutrophication and sedimentation.

Through the Site Conservation Planning process, TNC and its partners have identified the following eight conservation targets for El Triunfo and La Encrucijada: 1) cloud forests; 2) temperate forests (including pine and tropical cedar forests); 3) riparian forests and rivers; 4) tropical forests; 5) floodplains; 6) coastal lagoons; 7) mangroves; and 8) coast line. According to TNC Chiapas representative Alejandro Hernandez, conservation targets for La Sepultura are: 1) deciduous temperate forests; 2) cloud forests; and 3) tropical forests and hydrological systems. While the conservation targets are in the mountain and coastal areas, TNC and its partners recognize that, in order to attain them, it is necessary to work in the middle watershed where most of the threats occur. In choosing the specific areas in which to work, they applied three criteria: 1) representative, from a biological standpoint, of what the area has to offer; 2) serves as a biological corridor; and 3) highly degraded but an important area to recuperate.

3 Project Objectives and Strategies

Work in the Chiapas Coastal Watersheds has evolved very dynamically over the past few years. The area encompassed by these watersheds is immense, as is the number of actors and stakeholders, each of whom has their own set of projects or initiatives. Although specific objectives for the El Triunfo and La Encrucijada platform site exist, we found it difficult to readily distinguish the specific water valuation objectives and the boundaries of the watershed valuation work.

In terms of what TNC is actively facilitating, staff identified three main long-term goals or focus areas: 1) Determine the value of watershed services in the Chiapas Coastal Watersheds and provide the tools needed to secure long-term financing for those services; 2) Build institutional and technical capacity for watershed management; and 3) Inform and create awareness among society members about the value of water so that people feel a commitment to watershed conservation. Shorter term goals for each of these long-term goals are as follows:

Long-term goals	Short-term goals
1. Secure long-term financing for watershed	• Establish agreements with institutions like

Long-term goals	Short-term goals
management	CFE and CNA so that they provide financial support for watershed restoration projects <ul style="list-style-type: none"> • One municipality implements an environmental services fee mechanism
2. Build institutional and technical capacity (including governmental policies and programs) for watershed management	<ul style="list-style-type: none"> • Watershed councils incorporate guidelines established in watershed zoning plans in their decision making
3. Inform and create awareness among society members about the value of water	<ul style="list-style-type: none"> • 30% of the watershed users use water and soil conservation technologies

To achieve the first long-term goal, TNC and its partners have undertaken or are in the process of implementing studies on three main themes: a) Economic and biological feasibility of charging users for environmental services in order to generate funds for long-term watershed management (studies carried out by IHNE and Pronatura Chiapas); b) Legal opportunities for an environmental services payment mechanism at a national level (study carried out by Consejo Civil Mexicano para la Silvicultura Sostenible; and c) Model development to demonstrate the importance of forests and wetlands for providing environmental services (models being developed by IHNE, ECOSUR, Conservation International, and UNACH). These models will be particularly important to show to the Comisión Federal de Electricidad (CFE), the country's main provider of electricity, the critical role that watershed management and conservation play in supplying water for hydroelectricity. According to a draft study by IHNE, CFE is able to meet 23% of the entire country's hydroelectric needs with the energy generated, in large part, by water from the Cuxtepec watershed.¹² As such, TNC and its partners hope to convince CFE that its hydroelectric profits are dependent upon sound watershed management and, thus, it should be contributing substantially to a watershed conservation fund. CFE has provided some minimal support to watershed conservation initiatives, but contributions have not been as great as TNC would like to see.

At the time of this case study, TNC and its partners had not yet achieved the long-term and short-term goals listed above, but they were undertaking several key activities designed to help achieve them. Moreover, some anecdotal evidence suggested that they were on the right track. Later sections provide more specific detail about these key actions and the results they have produced.

4 Project History

4.1 Interest in Water Issues

TNC's interest in water issues in Chiapas came about as a result of its Parks in Peril work. Through the site consolidation process, TNC and its partners realized they needed to secure long-term funding for the reserves in which they work. Funding from shorter-term projects and from

¹² According to follow-up correspondence with Alejandro Hernandez in July 2005, IHNE, with support from Ecosur, had prepared a model and is now testing it over the next six months. This model, however, does not seem that it will fulfill the purposes that TNC had hoped it would.

government sources was too unstable to be relied upon for the future. PiP partners also wanted to provide a long-term structure for the parks systems that would carry them through governmental changes and funding shortages.

TNC Chiapas staff feel it has been less difficult to secure funding for El Triunfo Biosphere Reserve than other sites because this cloud forest is internationally-recognized for its high biodiversity, which provides habitat for 40% of the birds in Mexico, including the charismatic Quetzal. The challenge, however, has been to figure out how to secure funding for other conservation activities throughout the state. Given that Chiapas is one of the most rainy areas in Mexico, it became apparent that Chiapas' forests and other ecosystems were providing a vital resource to farmers, coffee growers, ranchers, and hydro-electric power plants, among others. Water sustained the state's economy; "water was the common link," as TNC Chiapas representative Alejandro Hernandez stated. The key to ensuring the long-term conservation of Chiapas' reserves lay in getting people to understand and value the connection between their economic activities and ecosystem services related to water.

Originally, TNC and its partners had planned to start watershed valuation work in El Triunfo Biosphere Reserve, an area that protects headwaters for both the Coapa and Cuxtepec watersheds. Cuxtepec, in particular, seemed to hold promise because TNC and its partners hoped to be able to collect funds from CFE, given that 1/3 of the water they receive for producing hydroelectricity comes directly from El Triunfo. Over time, and with internal shifts within TNC to focus on platform sites rather than individual sites, the watershed valuation process expanded to include La Encrucijada Biosphere Reserve and the Coapa watershed that connects it to El Triunfo. Staff realized that the best way to maintain water resources was to work in the entire watershed – from the headwaters in El Triunfo through the agricultural mid-section that depends on those waters down to the lowland mangroves that filter the water before it enters the ocean. Roberto Escalante, El Triunfo's Director, feels it is very important to approach watershed management with the participation of all sectors from the upper, mid, and lower watershed – especially to create awareness of the inter-connectivity of the watershed. As he said, "We hardly ever look below us, and those who are down below hardly look up above...they do not realize that the upstream forests provide a benefit to them...They say, 'They are not even mine – those who are up above should take care of them.' Meanwhile, those above say, 'I don't live down there, I have water, forests – I don't have any problems.'"

As TNC has tried to piece together a watershed valuation model, it has expanded its activities even further to other watersheds and reserves where different components of a watershed valuation model were more likely to be successful. At present, TNC and its partners are undertaking watershed valuation activities in El Triunfo, La Encrucijada, and La Sepultura Biosphere Reserves and the watersheds of Cuxtepec, Coapa, Lagartero, and Zanantenco.

4.2 Capacity to Address Water Issues

TNC has helped build a lot of general capacity and management skills through its ongoing work with the Parks in Peril program, which began in 1990 in Chiapas. In terms of capacity to address water issues, TNC provided an initial introduction to its watershed valuation process through its Freshwater Initiative.

According to a proposal submitted to the Packard Foundation in 2000, TNC had three capacity building objectives for the period from 2001 to 2004: 1) Build institutional capacities in Chiapas through strengthening a multi-institutional watershed planning committee; 2) Strengthen technical capacity through on-site technical assistance, training, exchanges, and guidance; and 3) Provide the groundwork for a Mexico-wide initiative by sharing results through publications and workshops. A draft follow-up report indicates that support provided via TNC has helped IHNE establish its own environmental services office within the Department of Natural Areas and hire a full-time investigator dedicated to this area. The report also notes that the Fondo de Conservación El Triunfo (FONCET), a new NGO that will help manage conservation funds for El Triunfo, had developed a strategic plan, was in the process of designing a business plan, and had achieved tax-deduction status.

TNC has also helped support technical exchange trips between key watershed leaders and policymakers in Chiapas and those working in Lago Yojoa in Honduras. Those participating from Chiapas included the coordinator from the Comité Pigua (an alliance of conservation organizations working in Chiapas), the Pijijiapan (Coapa Watershed) municipal president, the Natural Areas Director from IHNE, and TNC's representative. TNC has also hosted workshops and training events on watershed management, project planning, and other relevant issues for watershed conservation in Chiapas. These events have included participation from many of the actors already mentioned, as well as several local and national governmental and non-governmental organizations (e.g., CONANP, IDESMAC, IHNE, Pronatura, ECOSUR, SEMARNAT, watershed managers, etc.). According to TNC representative Alejandro Hernandez, TNC has provided many opportunities for training and, over the past few years, has taken on a leadership role to facilitate relationships. He feels they have been very open, providing training to whoever wants it, and that openness has helped TNC develop a reputation as a neutral organization.

Financially, TNC and its partners seem to be moving in the right direction. They have received nearly \$6 million in funds (primarily from TNC, USAID, and the Packard Foundation) to implement their watershed valuation activities. They have also been able to secure \$2 million which has gone into an endowment fund for El Triunfo that is managed by a branch of the Fondo Mexicano para la Conservación de la Naturaleza (FMCN). The Fondo de Conservación El Triunfo (FONCET) and CONANP's El Triunfo Biosphere Department receive the interest from this \$2 million for management activities at El Triunfo. TNC and partners plan that the \$2 million will eventually be transferred to FONCET, a new NGO established by a committee led by CONANP and with participation from TNC, FMCN, Pronatura, IDESMAC, and IHNE. Because FONCET was created as a result of collaboration between various institutes, it is seen as a neutral party that could manage reserve funds and, if a water fund were instituted in the future, FONCET might be the appropriate institution to manage those funds as well. FONCET has already raised a small amount of money for watershed activities in El Triunfo (\$200,000 from a migratory birds project and \$70,000 from proceeds for a premier showing of the latest Harry Potter film) and will also be focusing on raising funds for watershed work in central and southern Chiapas.

TNC and its partners have also worked extensively with various partners in the Chiapas Coastal Watersheds to build alliances and coordinate work. We discuss these relationships in greater detail in the following section.

5 Planning and Alliance-building Process

5.1 Project Design

As discussed earlier, TNC has expanded the geographic scope of its watershed valuation activities over time. Initially, the focus was on El Triunfo and the Cuxtepec watershed. As TNC started working more with platform sites, La Encrucijada and the connecting Coapa watershed were added. Presently, watershed valuation activities cover three reserves (El Triunfo, La Encrucijada, and La Sepultura) and five watersheds found in those reserves (Cuxtepec, Coapa, Lagartero, Zanateco, and Pijijiapan).

While some of the shift in geographic focus has been related to TNC's institutional shift to platform sites, part of the broadening focus was also the result of various studies that have helped TNC determine where ideal circumstances exist to pilot different watershed valuation components. The main studies TNC and its partners have conducted are economic and biological feasibility studies to determine the value of environmental services provided by the watersheds and the willingness of local users to pay for those services. IHNE carried out these studies in the rural areas of Coapa and Cuxtepec, while Pronatura carried out studies in the urban areas of Tuxtla Gutierrez, San Cristobal de las Casas, Arriaga, Pijijiapan, La Concordia, and Tonalá (covered in the second phase, not the first).

Based on the results of these studies, TNC and its partners have identified the municipalities of Arriaga and Pijijiapan as the places where water user fees might be most feasible. The municipality of Arriaga has a municipal president who is supportive of a water user fee scheme, and people expressed some willingness to pay for environmental services, if their service were acceptable. In Arriaga, this is a big "if," since the municipality has had difficulty providing reliable service. In fact, just recently, a newly built system was destroyed when construction runoff and debris blocked the water intake source. Plans are underway to construct another new system within the next six months. Pijijiapan emerged as another favorable municipality for water use fees because the system there is reliable, and people are pleased with and proud of how they have been able to improve their service. Studies conducted by Pronatura also revealed that the local population would likely be willing to pay some fees for ecosystem services. Because conditions are most favorable in Pijijiapan, this municipality was chosen for the first pilot water user fee system.

TNC, together with WWF and the Consejo Civil Mexicano para la Silvicultura Sostenible (CCMSS), undertook a study of the legal environment for establishing a water use fee system. This study did not prove very useful for informing project design because it was very general and focused on national level policies. As a result, TNC has decided to conduct a legal study at a more local level in the municipalities of Arriaga (Lagartero watershed) and Tonalá (Zanateco watershed). The current municipal presidents have been supportive of watershed work, but TNC and its partners are concerned because the presidents and the municipal policies are likely to

change with the upcoming October elections. Consequently, TNC wants to undertake a legal analysis that will help them ensure that watershed management is a longer term process in which local governments actively participate but changes in governing administrations do not cause drastic negative impacts to ongoing watershed valuation work.

Practical matters have also influenced where TNC and its partners have chosen to work. For example, La Encrucijada's Director, Javier Jimenez, explained that twelve watersheds feed into La Encrucijada Biosphere Reserve, but CONANP and TNC decided to initially work only in the Coapa watershed. The decision to limit activities to Coapa was driven by several practical concerns, including limited time and money and the realization that the work was so extensive, it would be impossible to work in all twelve. CONANP and its partners undertook some studies and determined that the watersheds of Coapa and Margaritas would be the most feasible because each was located in just one municipality (some watersheds crossed multiple municipality borders), they had few communities, they were typical watersheds, and the watersheds were connected to the core zones of both El Triunfo and La Encrucijada. Finally, the watersheds were highly threatened, yet did not have a lot of institutional presence. In the end, CONANP and TNC narrowed the decision to Coapa.

5.2 Project Planning

El Triunfo, La Encrucijada, and La Sepultura have all used TNC's Site Conservation Planning process at the reserve level through their activities with PiP. TNC and its partners also developed a draft site conservation plan for the Coastal Watersheds of Chiapas – a platform site that includes all three reserves and several watersheds. These site conservation plans all included analyses of threats, which have helped inform where TNC and its partners work and which interventions they choose. The plan for the Coastal Watersheds of Chiapas was developed with participation from several actors in the area, including TNC, Conservation International, CONANP, IHNE, IDESMAC, and Pronatura. The plan has remained in draft form, but TNC feels it serves effectively as a frame of reference and a guide for the work that they and several partners are carrying out in the watersheds.

One interesting and positive outcome of many of the concerted efforts TNC and its partners to bring together diverse institutional efforts has been the diffusion and adoption of various planning and management methodologies and tools among organizations, such as CONANP, IHNE, watershed committees, and municipalities. For example, the Municipality of Arriaga began a site conservation planning process for the Lagartero watershed in March 2004. Those who have helped develop the plan include CONANP, personnel from La Sepultura Biosphere Reserve, and local residents. Arriaga municipality representatives see the local participation as critical because “they are the ones who know the work best.” The plan, which municipal authorities see as a critical step for watershed management, is scheduled to be completed in November 2004.¹³

In addition to these plans, CONANP helped facilitate a participatory planning process in the Coapa watershed that connects El Triunfo and La Encrucijada. The planning process involved

¹³ This process was indeed completed in November 2004. Groups working in the Zanateco watershed also completed a site conservation plan around the same time.

numerous stakeholders, including upland residents, fishermen from down below, government organizations, NGOs, and researchers. One key product of this process was an ecological land zoning plan, which now officially governs land use in the watershed. The Coapa Watershed Community Committee formed as part of this participatory planning process. TNC and its partners realized, however, that the watershed needed a stronger force, and so they helped form the Pigua (Crawdad) Committee, an inter-institutional committee with representatives from TNC, IHNE, CONANP and IDESMAC. The objective of the Pigua Committee was to consolidate Coapa's watershed management. As discussed below, this group is presently in a transition phase and may expand its membership and focus to the Coastal Watersheds of Chiapas.

A key force in watershed planning and management has been the Consejos de Cuenca, or Watershed Councils, and the Watershed Committees within them that represent the individual watersheds. The Comisión Nacional de Aguas (CNA), the state organization in charge of administering and preserving Mexico's water sources, established the watershed councils and watershed committees structure as a way to get greater local participation from various sectors of society in watershed management. This was in response to a federal policy, re-established in 2000, to place greater emphasis on watershed management. The Consejo de Cuenca para la Costa de Chiapas (Chiapas Coastal Watershed Council), also established in 2000, has various committees within it at the individual watershed level. These committees provide an important opportunity for different organizations and local user groups (e.g., agriculture, urban, livestock, fishing, etc.) to have a say in watershed planning. These councils and committees are still relatively new, and, according to TNC Chiapas staff, it will take some time for them to be truly participatory, representative, democratic, and transparent.

With all the different actors, research studies, plans, etc., have come different ways of approaching watershed management. According to IHNE's representative, SEMARNAT (the government's umbrella environment agency) is now trying to standardize these approaches into one watershed management model. At the time of this case study, this idea was relatively new, and no concrete activities or guidelines had yet been implemented.

5.3 Selection of Key Stakeholders

TNC's primary partners in Chiapas have been the Instituto de Historia Natural y Ecología (IHNE) and, more recently, the Comisión Nacional de Áreas Naturales Protegidas (CONANP). IHNE is a semi-autonomous branch of the state government that was founded in the 1950s and has continued to be a key player in protected area management over the years. CONANP, a decentralized arm of the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT), is directly responsible for managing the reserves and maintaining relationships with local communities and public institutions. TNC chose to expand its partnership to CONANP because its experience with PiP had indicated that different partners bring different strengths, and it was more advantageous to work through a couple of key partners, rather than just one. Most of the funding for watershed activities is channeled through IHNE but is used for CONANP implementation activities.

To choose the broader group of stakeholders with which they would work on watershed valuation activities, TNC, CONANP, and IHNE met with Marlou Church from TNC Arlington. They agreed they wanted to achieve the following with their watershed valuation work: 1) generate instruments for long-term funding; 2) develop long-term policy instruments; and 3) define the value of wetlands as providers of environmental services. Based on this, they chose to work in the Cuxtepec and Coapa watersheds. They then listed the stakeholders for each objective and narrowed them down to the most important stakeholders. A smaller group that included TNC, CONANP, IDESMAC, IHNE, and Pronatura analyzed what they wanted to achieve and came to agreement on what they meant by a financial mechanism.

With this initial thought and planning done, the small group was able to present its ideas to 15 organizations in Chiapas. The smaller group has worked more closely together, but it has maintained communication and coordination with the broader stakeholder group. TNC and its partners have collaborated with a number of these organizations and have helped set up various alliances to move the watershed work forward. These types of initiatives are discussed in more detail in this section under Alliance Building.

While it seems that TNC has been quite exhaustive in identifying and working with stakeholders, one partner felt that some groups were absent. Because the watershed valuation work involves working on social and development issues in the middle watershed, he felt it was important to get greater stakeholder involvement from municipalities and local development organizations. In addition, it seems like there may be opportunities to encourage greater community participation, especially in the Coapa watershed, where a community committee exists in name but is not functioning in practice.

5.4 Watershed Valuation Process

TNC and its partners have three main goals with their watershed valuation studies: 1) identify ways to raise money for watershed conservation (primary objective with El Triunfo); 2) identify policy instruments to promote long-term watershed management; and 3) help people understand and recognize the value of wetlands as providers of environmental services (primary objective with la Encrucijada).

As discussed under the Project Design section above, TNC and its partners have undertaken various studies to help them design their watershed work and also to give them a clearer idea of the actual value of the watershed services and how people perceive those values. IHNE has been responsible for carrying out these studies in the rural areas of Cuxtepec and Coapa, while Pronatura has carried out the studies in the urban towns of Tuxtla Gutierrez, San Cristobal de las Casas, Arriaga, Pijijiapan, and La Concordia. Pronatura will also include the town of Tonalá in a second phase. Pronatura used surveys and a series of focus groups, divided into older and younger groups, to determine how people value water. They used both questions and visuals to get at values, as well as willingness to pay for environmental services. Pronatura also interviewed key actors, such as municipal presidents, watershed managers, water and sanitation directors, etc. to determine what they know about environmental services. Pronatura's study results were released in June 2004, just three months before the interviews for these case studies. The results helped TNC and its partners determine the most feasible places for implementing a water user fee mechanism – Arriaga and Pijijiapan. Results showed that, if water delivery was

regular and water quality was sufficiently high, then users in these municipalities would be willing to pay a small fee toward conservation of water sources. Pijijiapan appears to be more feasible at this point, as they currently have a functioning system, while Arriaga is still trying to build a more reliable system.

IHNE's approach to the valuation study appears to have been mostly quantitative and less participatory, drawing upon existing institutional information and household surveys. The main focus was on quantifying the ecological and economic value of watershed services, taking into account both direct and indirect uses. Values were determined based on costs of substitution, net income from the sale of products provided by the watershed, and willingness to pay. The results from IHNE's study were released at the end of July and were still in draft form at the time of this case study. The IHNE study provided a great amount of detail about how the Cuxtepec watershed is used, its biological value, and the economic value of its services (much of which is not recognized in economic markets). The study found that the rates charged to users were much lower than the costs of providing or maintaining water service. Moreover, the fees were so low that they did not encourage rational water use. The study suggested that a fee system should charge people by the quantity of water they use, rather than a flat fee and that cost increments should roughly correspond with use increments. The study also determined that, before a conservation fund could even be considered, CNA needs to implement a system to measure actual use. Aside from these suggestions, however, the draft we reviewed for this case study seemed very weak and did not provide much concrete guidance about how this information should inform the development of water user fees. This may be a next step for finalizing this report, as TNC informed us that the report was missing some important information.

Another valuation activity that TNC partners are carrying out is the previously-mentioned study to develop ecological models of the Cuxtepec watershed. TNC, IHNE, CNA, ECOSUR, and Conservation International are working together to identify the information and studies needed to design a watershed model that will demonstrate to the Comisión Federal de Electricidad (CFE) how water flows affect the amount of hydroelectricity CFE is able to produce. There will be two models with different scenarios based on forest cover. The objective is to use these models as a point to begin discussions with CFE about the importance of environmental service payments and, eventually, to have CFE as a major contributor to a water fund for the Cuxtepec watershed. The first model is scheduled to be delivered to CFE in January 2005.

One challenge in the watershed valuation studies has been the limited inter-institutional coordination in carrying them out. As one Pronatura staff person reflected, "They are related in their objectives, but their implementation has been isolated." IHNE and Pronatura have been the two lead organizations for the economic valuation studies, but they did not coordinate the methodology used or the timing of the results. Results from both of the studies should have informed the communications strategy, which Pronatura developed. In reality, the timing of the reports and a lack of collaboration and coordination between Pronatura and IHNE, resulted in Pronatura not considering IHNE's results in the communication strategy. The legal study implemented by the Consejo Civil Mexicano para la Silvicultura Sostenible (CCMSS) ideally should have helped inform the communications strategy, as well. That study, however, was too general to be of use for planning purposes. A few people mentioned that one of the greatest lessons learned from this experience was that, in the future, it was necessary to coordinate related

activities much more closely. Pronatura mentioned that they would like to form a coordinating committee for future studies that will be able to give continuous follow-up to ensure that the studies are better coordinated.

Pronatura is going to undertake a second phase for this work that will focus on identifying the socio-economic actors who have the potential to pay for environmental services. This study is scheduled to be completed in December 2004. The next step will then be to bring together the political actors to discuss criteria for implementing an environmental services payment mechanism in Arriaga and Tonalá. The original idea was to focus on Arriaga, but, because the two watersheds are directly adjacent, Pronatura and the other watershed partners felt it would be feasible to do the two together.

5.5 Alliance-building

Quite a few alliance building activities have already been detailed extensively throughout this document. The watershed work in Chiapas has involved an immense number of actors and an equally immense number of activities. In the following paragraphs, we detail some of the alliance building activities TNC or its partners have helped facilitate in the Coastal Watersheds of Chiapas. Much of this alliance building has been for the purposes of engaging policy makers and influencing policy. Thus, there is a lot of overlap between this section and the Watershed Management Policies and Governance Structure section that follows.

Clearly, TNC and its partners have done an impressive job of communicating and coordinating work with a wide variety of actors. One of the tightest alliances TNC has helped facilitate is the Pigua (Crawdad) Committee. This committee was established to help give greater strength to the participatory watershed planning process in the Coapa watershed. Members of the Pigua Committee include TNC, CONANP, IHNE, and IDESMAC. This committee initially focused on the Coapa watershed but has since broadened its scope to the Coastal Watersheds of Chiapas. Members of these four organizations work together and coordinate their work to avoid duplication of efforts. One of its major accomplishments has been the development of a common vision concerning water conservation, watershed management, and environmental services. Under this common vision, Pigua Committee members submitted a proposal to Fundacion Gonzalo Rio Arronte (FGRA) for work in the Cuxtepec, Coapa, and Lagartero watersheds. At the time of this case study, the proposal was still under evaluation, but members anticipated a positive response from FGRA. The Pigua Committee is currently undergoing a self-evaluation and may reconstitute itself in a broader, more formal alliance (Alliance for Chiapas' Highlands and Coast)¹⁴ with clear collaborative regulations, policies, and procedures. This committee facilitates inter-institutional collaboration, but it does not represent the interests of many stakeholders, especially local populations.

Another major alliance building process has been promoted on the initiative of the Mexican government. This is the establishment of watershed councils and committees by the Comisión Nacional del Agua (CNA). These councils and committees help facilitate coordination and understanding among CNA, federal, state, and municipal institutions, and user groups.

¹⁴ Since the original drafting of this report, the Pigua Committee has disbanded and the Alliance for Chiapas' Highlands and Coast has formed in its place. This alliance includes participation from CI, TNC, IHNE, CONANP, Pronatura and IDESMAC

In addition to these more formal alliances, TNC and its watershed partners maintain communication and coordinate various aspects of their work with a variety of other important actors, including watershed committees and councils and government organizations like SEMARNAT, CONAFOR (Comisión Nacional Forestal), FIRCO (Fideicomiso de Riesgo Compartido) and CNA (Comisión Nacional del Agua). TNC has also helped facilitate events that bring together key stakeholders, such as a two day event in which CNA, IHNE, and federal reserves participated to jointly determine what type of valuation interventions were most appropriate and for what target audience. This and other workshops and trainings have helped build at least an informal network of actors in the Chiapas watershed. Although there seems to be a high level of formal and informal coordination in Chiapas, we cannot reliably comment on the effectiveness of these alliances because the site visit did not include interviews with community members or many of the actors involved in the less formal alliances.

In addition to alliance building, TNC and its partners have tried to facilitate greater communication and understanding among groups that have either not communicated with one another or have been traditionally opposed. For example, CONANP's Director of La Encrucijada, Javier Jimenez, talked about the process of bringing together fishermen from the coastal lowlands and upstream farmers: "At first, they clashed. People below felt affected by those above. People above didn't know that their actions were affecting people below. So, we helped facilitate exchanges." From those exchanges, Jimenez indicated that the two groups developed a better understanding of one another's needs and how the actions of one group affect those of the other.

One specific outcome of the efforts to create regional alliances in the Chiapas Coastal Watershed is the improved leverage such alliances bring. For example, the site conservation plan for the Chiapas Coastal Watershed, developed by an inter-institutional planning group (including participation from the Pigua Committee), served as the base document for a five year, \$4 million proposal approved by USAID. This grant, combined with an additional \$500,000 provided by TNC, follows up on watershed work initiated by TNC under a Packard Foundation grant. Specifically, the project seeks to maintain and improve biodiversity, improve productive activities to reduce threats to biodiversity, and create long-term watershed management capacity. TNC representative Alejandro Hernandez felt that it would have been difficult to achieve this financial leverage without the strong regional alliances they have helped develop.

6 Implementation of Conservation Strategies

As already mentioned, the watershed work in Chiapas has involved an immense number of actors and activities. It is not possible here to document all the worthwhile efforts taking place. Instead, we have highlighted some main activities or examples of particularly successful initiatives.

6.1 Public Outreach Campaigns

The main water valuation public outreach activity TNC and its partners are launching is the communications strategy just recently developed by Pronatura. The strategy is based on results from public opinion surveys and focus group interviews conducted by Pronatura staff in the urban areas of Tuxtla Gutierrez, Arriaga, Pijijiapan, and La Concordia (see Project Design

section under Planning and Alliance-building Process above). One aim of these studies was to identify barriers for implementing an environmental services payment mechanism. Similar studies conducted by IHNE in the rural areas of Coapa and Cuxtepec watersheds were also intended to help inform the communications strategy, but the results from that work were not directly used, due to delays in the timing of their release. Based on these studies, Pronatura, CONANP, IHNE, and TNC have identified the municipality of Pijijiapan as the most feasible location for launching the communications strategy. The general objective of the strategy is to generate support for a water user fee mechanism to fund watershed conservation. TNC documentation also mentions the following additional objectives: increase partners' knowledge of the public's awareness about water issues; increase the level of understanding of water issues among key audiences through a promotional campaign; promote rational use and best water and watershed management practices; and evaluate the results and integrate them into the long-term financing agenda. The strategy, to be implemented over the next three years, will be tied to the Quetzal Campaign of El Triunfo (see below) and CNA's communication efforts.

TNC reports indicate difficulties in achieving public outreach objectives. By 2004, TNC and its partners had originally anticipated its public outreach campaign would be fully implemented and would be entering an evaluation phase. In reality, at the time of these case studies, the campaign had only just been developed. As already mentioned, part of the delay was due to the limited coordination among the various studies designed to inform the outreach campaign. Pronatura and IHNE were both conducting research to understand how communities value water resources and what the actual economic benefits watershed services provided. Communication between the two organizations, however, was limited. Moreover, the methodologies used varied widely, and the timing of the release of the results did not coincide sufficiently for Pronatura to be able to use all of the information both groups collected. The difficulties experienced with this component of the water valuation process helped TNC and its partners learn the importance of involving key public stakeholders from the start and of clearly defining objectives prior to developing a communications strategy. TNC and its partners also learned that they needed to secure minimum financial resources prior to being able to launch a three year campaign.

Although the official public outreach campaign is just getting started, TNC and its partners have been informally raising public awareness through the various water valuation-related meetings, workshops, and activities they have implemented. Anecdotally, TNC staff report changes such as: a deeper understanding among project partners and regional practitioners regarding environmental services, water valuation, and the issues surrounding watershed conservation; increased awareness among communities and local stakeholders regarding the value of water resources and strengthened participation in watershed conservation activities; and new funding and leveraging opportunities through US Agency for International Development, the National Forestry Commission's environmental services fund, and the Conservation Fund for El Triunfo.

In Chiapas, there are several more targeted outreach activities occurring throughout the watersheds that form the larger Chiapas Coastal Watershed. The distinction between public outreach undertaken as part of a formal water valuation process and more isolated public outreach activities that are part of organizations' individual projects, however, is not very clear-cut. Undoubtedly, the more isolated activities contribute to a broader valuation strategy, but they are not necessarily designed as strategic components of that valuation process. It is beyond the

scope of this case study though to document all of these notable, individual activities. Instead, we have highlighted a few discrete, illustrative activities.

The Quetzal Campaign that CONANP is implementing is an example of a more localized public outreach activity that has been an important force in raising environmental awareness and pride in communities surrounding El Triunfo. Using a methodology promoted by RARE (a US-based conservation organization), CONANP has launched this participatory “Pride” campaign in which community members choose their conservation mascot (the quetzal, in this case) and CONANP helps develop and deliver messages regarding important conservation topics under the “umbrella” of the chosen mascot. According to Roberto Escalante, El Triunfo’s Director, “The campaign helps people feel proud to live in a protected area and that they are doing their part to conserve nature and that they value what they have.” An early campaign helped raise awareness about the existence of the El Triunfo Biosphere Reserve. At the start of the campaign, only 25% of surrounding community members knew the reserve existed – even though it had been there for eight or nine years. By the end of the campaign, that number had jumped to 75%. Currently, CONANP is implementing a campaign on valuing water. Escalante maintains that people valued water for its domestic use, but they could not identify where it came from, and they did not understand why it was important to conserve not just the quantity of water but also the quality of water. Initial survey results indicate that the first year of the water campaign has not been as effective as originally anticipated. Based on these results, CONANP will continue the campaign for another year, modifying it as necessary to help improve its effectiveness.

IHNE has also carried out some public outreach activities on watershed management. For example, they have held a series of awareness raising workshops – three in the Coapa watershed and nine in the Cuxtepec watershed. Within the watersheds, IHNE always makes sure to work with groups from the upper, middle, and lower sections of the watershed. IHNE, CONANP, and TNC staff interviewed all recognized the importance of working with each group because each tends to use and value water resources differently. El Triunfo’s director, Roberto Escalante, noted that those in the lower parts of the watershed tend to value the water more because less arrives to them, while those in the upper watershed tend to have water in excess. The workshops IHNE has facilitated have addressed such issues as soil restoration and water management, with the intention of helping people to see cause and effect relationships and how their actions affect them and the people downstream. IHNE staff felt they have not been able to take these awareness raising workshops very far because they do not have the resources to maintain constant contact with the communities, except through watershed committees.

6.2 Water User Fees

Much of the watershed work TNC and its partners have undertaken to date is to help them determine the feasibility of developing a water user fee system. This system is not yet in place, but there has been progress toward establishing this system. The studies conducted by Pronatura and IHNE have helped TNC and its partners determine the most feasible watershed in which to pilot a fee system. They identified the municipality of Pijijiapan because the water service and quality were good, and the residents were happy with and proud of their newly-improved system - characteristics seen as important for establishing willingness to pay. In addition, the municipal president is supportive of a fee system. TNC and its partners also hope eventually to establish a fee system in the municipality of Arriaga, where the political will for such a system is also

favorable. The water service, however, is currently too deficient and unreliable to expect users to be amenable to paying additional fees. If TNC and its partners were indeed establish a fee system, they envision that funds would be used to support watershed management, which could include restoration, protection, reforestation, projects to improve soil management, training for technicians and watershed committees, etc.

TNC also supported a study undertaken by Consejo Civil Mexicano para la Silvicultura Sostenible (CCMSS) to determine the legal opportunities for establishing a water user fee system. The study identified some possibilities for environmental services payments, but, the study was too general and failed to identify mechanisms for how to establish payments. Consequently, TNC decided to conduct another legal study at a more local level in the municipalities of Arriaga (Lagarero watershed) and Tonalá (Zanateco watershed).

Finally, TNC, IHNE, CNA, ECOSUR, and Conservation International are collectively working to help design a watershed model to demonstrate to the Comisión Federal de Electricidad (CFE) how water flows affect the amount of hydroelectricity CFE can produce. The objective is to use these models to begin discussions with CFE about the importance of environmental service payments and, eventually, to have CFE become a major contributor to a water fund for the Cuxtepec watershed. The first model is scheduled to be delivered to CFE in January 2005. According to Roberto Escalante, CONANP's Director of El Triunfo, the Cuxtepec watershed offers some favorable conditions for implementing an environmental service payment mechanism. CFE would obviously be a significant contributor. In addition, agricultural users in the area – especially coffee farmers – are heavily dependent upon water for their crops and have a greater ability to pay than the average rural landowner. Thus, the Cuxtepec watershed may become one of the early pilot watersheds for a water user fee system.

A lesson that has emerged from the early water valuation work and that was mentioned by several partners is the importance of negotiating with water users in terms of issues that are most important to them. For example, it is important to show CFE that the water flows they need to generate electricity are dependent upon sound watershed conservation and that they could save money and guarantee sufficient water flows by investing in watershed conservation. Likewise, fishermen near La Encrucijada could be convinced that they would spend less time and money on dredging if they were to invest in watershed conservation that would ultimately reduce sedimentation flows.

6.2.1 Challenges and Enabling Factors

One issue with which TNC and its partners have struggled is identifying how the funds from the user fees would be managed and who would manage them. Most partners agree that funds would need to go to a trust fund, but options of who might be the most appropriate entity to manage that account include: 1) Fondo Mexicano para la Conservación de la Naturaleza; 2) a private bank; 3) the recently created NGO, Fondo de Conservación El Triunfo (FONCET); or 4) Sistema de Agua Potable y Alcantarillado (SMAPA). Each has its benefits and drawbacks, and opinions vary somewhat on which would be the best option. Most partners agree that important characteristics of the managing entity are that it is secure, transparent, and trusted and that it offers a permanent structure over the long-term. Recommendations for the most appropriate entity are expected to come from the legal study TNC is now funding. In terms of how the funds

are used, partners felt that this should be determined by representatives of key stakeholder groups that would include but are not limited to CONANP, the municipal water distribution systems, and local users.

Another challenge for water user fee systems in Chiapas is the very limited ability of rural people to pay. Chiapas is one of the poorest states in Mexico, and many of its residents live a subsistence lifestyle with little, if any, disposable income. Some residents would have greater ability to pay than others (e.g., urban dwellers, fishermen, coffee farmers), but their incomes are still modest, and it is unlikely that an environmental services payment mechanism could ever generate enough funds to fully support watershed conservation activities – even if industrial users were paying a higher share of the costs. In response to this issue, one interviewee clarified that the idea behind a water user fee is not only to generate money. It is also to create greater awareness so that landowners will manage water and forest resources more effectively from a conservation standpoint. Incomes aside, there will also be psychological obstacles to overcome. People are often resistant to pay for something – especially if they see it as a free or common good. El Triunfo's Director, Roberto Escalante, feels it is necessary to move forward with these fee mechanisms, but he noted, "People in Chiapas are not ready for this. It is hard to get them to pay one peso (less than US\$0.10) for fire fighters. Some people go the municipality and demand why they have to pay an extra peso." He sees establishing the willingness to pay as continuous work that starts with helping people value their resources.

Another potential challenge interviewees mentioned relates to CONAFOR's National Forestry Fund – a program that is officially billed as an environmental services payment program and that is funded through water fees collected by CNA. Under this program, landowners with cloud forests are paid 400 pesos (approximately US\$35) per hectare per year (less, if the forest is not cloud forest) to keep their land in forest. While people appreciate the short-term benefit that the program offers, those interviewed for this case study expressed concern about its longer-term implications for a couple of reasons. First, they feel that CONAFOR has not strategically chosen the areas to include in the program. They have chosen forested areas without considering whether they are important water catchment areas. In addition, they do not see this type of fund as being mentally compatible with the water user fee system they hope to implement. A water user fee system helps to raise awareness about important environmental services provided by watersheds and requires users to pay for those services. CONAFOR's program pays landowners not to cut their forests, without making a direct connection to the environmental services they provide. Landowners do not learn to value the forests' or water's environmental services, and they receive money rather than pay money for services. This may make it difficult to later ask landowners to pay environmental service fees. One interviewee faulted the system because he said people were being paid just because they had forests – not because they were pro-actively managing or protecting them. A third concern is that CONAFOR's program is only scheduled to last for five years and does not include provisions for developing an environmental services payment mechanism beyond the five years. TNC and its partners are worried about what will happen once that time period expires and people no longer have the economic incentive to stop them from cutting down their forests. Conservation organizations are worried about the longer-term, but, at the same time, they are trying to take advantage of the short-term environmental benefits the program offers and hoping that they will be able to develop an effective strategy by the time the five-year contracts expire.

Although the challenges are significant, there are also important factors that have helped advance watershed valuation work in Chiapas. The positive political will in municipalities like Pijijiapan and Arriaga has been key to introducing and advancing the concept of a water user fee system. In the Cuxtepec watershed, many of the social and economic conditions are favorable, but the limited political will has hindered progress there. Another enabling factor several partners mentioned was TNC's interest in facilitating synergies and coordination among institutions. IHNE's representative, Edith Orihuela, was grateful TNC has helped play this role and remarked, "We have good ideas, but we cannot do them without the resources. TNC has helped a lot with the resources and the contacts."

6.3 Watershed Management Policies and Governance Structure

The main actors in the Chiapas Coastal Watersheds have been mentioned several times throughout this document. Much of the alliance and capacity building work carried out by TNC and its partners has been with the implicit or explicit purpose of creating stronger governance structures and influencing watershed management policies. For simplicity's sake, much of the information we present here is a short summary of points already discussed. For more details, we suggest reviewing the Alliance Building section in particular.

Many of the actors in the Chiapas Coastal Watersheds have experience in developing policy agendas, primarily due to their extensive involvement in the Parks in Peril Program, from 1990 to 2003. These actors include IHNE staff and reserve personnel from El Triunfo, La Encrucijada, and La Sepultra Reserves. Nevertheless, TNC representative Alejandro Hernandez feels policy development and implementation is an area where TNC partners could use additional support – an issue TNC hopes to address through a policy management training workshop planned for the beginning of 2005. In addition, according to a TNC report, the scope of the policy agenda needs to be widened to include regional and national policies that affect watershed resource conservation. Results from the water valuation and legal studies were to be used to help form that agenda. Those studies were still in progress or just recently completed at the time of this case study. Nevertheless, TNC and its partners were already using some of the results to identify appropriate municipalities for piloting a user fee system and were already working closely with municipalities and watershed committees in those regions.

The most important alliances for watershed policies and governance in Chiapas are the watershed councils and their associated committees and the inter-institutional Pigua Committee. TNC and many of its partners are closely involved with each of these groups. Officially, the watershed committees and councils are governmental entities, established by the Comisión Nacional del Agua (CNA), that are in charge of coordinating watershed conservation programs, projects, and activities within their respective watersheds. These councils and committees help facilitate coordination and understanding among CNA, federal, state, and municipal institutions, and user groups. Universities, NGOs, civil associations, and governmental organizations also participate in watershed committees as invited members without formal voting power. The objective of the watershed councils and committees is to formulate and implement programs and actions to improve water administration, hydraulic infrastructure development and service, and water resource preservation. Generally, watershed councils span several watersheds and include

watershed committees and subcommittees that cover a single watershed or portion of a watershed.

Watershed councils receive funding from the federal and state government, as well as some support from NGOs. The municipalities take on the coordination role for the watershed committees and also provide logistical assistance and some financial support,. In Chiapas, these watershed committees have played an important role in watershed conservation and valuation, especially in the Arriaga, Tonalá, Cuxtepec, Pijijiapan, and Tacana watersheds, where the municipal presidents are supportive of valuation activities. The municipal president usually serves as the watershed committee president, while the secretary is a CNA representative. The secretary's salary is generally paid by the municipality (50%) and FIRCO (50%). As such, the municipalities are critical actors in watershed management, and having their support is key for watershed conservation within that municipality. That support can also influence the interest of other municipalities. For example, the Arriaga municipality and CONANP hosted the "Workshop for the Exchange of Municipal Experiences in Forest Management and Financial Mechanisms for Watershed Management on a Larger Scale" to discuss the Lagartero and other watersheds. Five municipalities in the region and various representatives from governmental organizations and NGOs participated. The community of Coatepec, Veracruz was invited to share the experiences as the first case (FIDECOAGUA) in Mexico where an environmental service payment was established by a municipality. This meeting awakened the interest of various municipalities to design long term mechanisms that will ensure funding for watershed restoration and management. TNC mentioned that they hope to help facilitate a similar workshop in November 2004 to discuss what the different actors have learned in their experiences to date.¹⁵

The Pigua Committee, formed by TNC, IHNE, CONANP, and IDESMAC, is recognized as an important inter-institutional alliance that actively promotes watershed conservation and environmental service payment mechanisms. TNC and members from the Pigua Committee have worked closely with municipalities (especially Arriaga and Pijijiapan) and have established closer ties with governmental organizations like CONAFOR, CNA, FIRCO, SEMARNAT and with the watershed committees and councils. This alliance is currently considering expanding its membership and geographic scope and reforming itself as the Alianza para la Conservación de la Sierra y Costa de Chiapas (ACCSCh).

One of the major political accomplishments is a proposal that IHNE presented in January 2004 to the Chiapas government to modify the state's Environment and Biodiversity Conservation Law. The proposal, currently under review, was developed with support from TNC and is recognized as one of the most advanced laws in the country. It includes a chapter on environmental services, which would be particularly relevant to establishing policies to support water valuation work.

¹⁵ In follow-up conversations with TNC Chiapas staff, we confirmed that this meeting did take place. In the meeting, participants worked on various watershed models – including identifying the long-term vision, how landowners were managing the land (presumably, threats), and what interventions they could take to encourage landowners to use good land/watershed management techniques. They also developed a Scorecard for watershed management.

Several interviewees mentioned the Coapa watershed's ecological zoning plan as an example of a significant political accomplishment. IDESMAC has helped Pijijiapan municipality and CONANP to develop this ecological zoning plan, which limits the type and extent of productive activities that can occur in the Coapa watershed. At present, this ecological zoning plan exists and was approved by Chiapas State Congress and published as a decree by the Chiapas Government. IDESMAC and CONANP are trying to get the organizations that work there to become familiar with the plan and adopt it.

One of TNC's primary roles in conservation in Chiapas is to build and strengthen local capacity for protected area and natural resource management. This is a role that dates back to its Parks in Peril work. For watershed management, TNC has continued this capacity building role, facilitating training opportunities for many members from the watershed committees and the Pigua Committee. For example, they have brought people to Lago Yajoa in Honduras to learn about water valuation experiences there. Partner participants from Chiapas included the Pigua Committee coordinator, Pijijiapan's municipal president, and IHNE's Director of Natural Areas. Pijijiapan's municipal president returned from the trip very motivated to try something similar in his municipality. TNC has also provided training opportunities for watershed partners in project planning, strategic planning, and monitoring and evaluation. In general, TNC's representative, Alejandro Hernandez feels that this type of support has helped TNC to be recognized as a neutral organization and open facilitator. This viewpoint was echoed in other interviews for this case study.

6.3.1 Challenges

A common challenge to all watershed valuation work is securing political will over the longer-term. TNC and its partners have found that they are more likely to succeed only in those municipalities where the political environment is supportive of watershed conservation. It's a long process to create awareness and engage policymakers, and hard-won political support can quickly dissipate with each change in administration. At the time of the site visit for this case study, TNC and partners were grappling with this issue, as municipal elections were set to occur in Arriaga, Tonalá, and Pijijiapan in October 2004. With each new administration, the governmental composition of the watershed councils and committees change. As a result, hard-won advances can be easily erased if a new municipal president (who then becomes the watershed committee president) and his/her administration is not interested in watershed conservation. As one concerned IHNE representative expressed, "Without political interest, we cannot achieve anything." This situation has taught conservation organizations working on water valuation that they need to work early on to keep candidates informed and gain their support and then work with the elected person to continue to foster that support. Still, they see a need for a more permanent structure that is more firmly embedded within society and is not susceptible to political changes. As one representative from the Arriaga municipality remarked, "We want people to own the program, not the administrations. We don't want the administrations to decide whether to support the program or not – we want society to demand it." Conservation organizations working on watershed issues are hoping the new legal study TNC is financing will provide guidance on maintaining political support over time.

6.4 Best Management Practices

Although TNC has certainly placed a strong emphasis on water issues in the past few years, staff see all their conservation activities in the watershed as interconnected. They are still carrying out some PiP activities related to best management practices, for example, but anything that improves land or forest use will have a positive impact on the watershed. For this reason, it was sometimes difficult to tease apart watershed activities versus general activities in the name of regional conservation. Thus, this distinction is somewhat blurred in the following paragraphs.

6.4.1 Forestry and agricultural best management practices

IHNE, CONANP, IDESMAC, Conservation International, TNC, and other major players in the Chiapas watersheds have all been involved, to a certain degree, in promoting best management practices for forestry and agriculture. Examples of activities promoted include organic agriculture, sustainable livestock management, community gardens, tree nurseries, soil conservation, reforestation, riparian restoration, and certification of private land conservation. Many of these projects initiated as a result of the site conservation planning process, although their impacts extend to watershed conservation. Here we provided examples of just a few of the many activities underway.

One new activity CONANP has been promoting in the Cuxtepec watershed is the restoration of the Rio Grijalva's riparian vegetation. The agency has helped people establish community nurseries with fruit and ornamental plants and trees. Because the plants and trees hold economic value, they have served the dual purposes of helping to restore riparian vegetation and providing people with additional food and income. CONANP has also promoted restoration work in other regions, such as the watershed feeding into La Encrucijada. Prior to this work, the high levels of sediment and the heat due to lack of vegetative cover prevented shrimp from inhabiting the lowland fishing areas. Now, shrimp catches have increased, and, according to Javier Jimenez, La Encrucijada's Director, fishermen have noticed the change. He does not think they are yet willing to pay for environmental services partially because they feel the change is due to the restoration work they are doing themselves. He, however, does believe that they are starting to realize the importance of conserving the mangroves and watershed. The fishermen are now working with IDESMAC (Instituto para el Desarrollo Sustentable en Mesoamérica, A.C.) and ISMAC (Instituto Superior Mexicano-Alemán de Capacitación) to certify their fishing practice as fair trade. Jimenez hopes that, with the financial benefits from this certification, the fishermen will be willing to put money into an environmental fund.

CONANP is also working with farmers in the Chiapas' watersheds. Roberto Escalante, Director of El Triunfo, has a practical approach to the work they do. For example, CONANP has been working with corn producers who have settled in the steep hillsides near El Triunfo. According to Escalante, because the producers have come from other areas, they do not know the local conditions very well and are trying to use methods like slash and burn that are not appropriate in this area. Escalante acknowledges they will probably always plant corn, but CONANP is working with them to find ways to prevent them from clearing and abandoning land. One strategy has been to encourage them to plant avocado trees among their crops. Now they will not burn the land because they do not want to lose the valuable avocado trees. CONANP is also promoting agroforestry techniques designed to improve soil quality and extend the land's cultivation life. CONANP is approaching this project systematically, piloting it in six

communities and examining how well it has worked there. Results from this work will help them develop a model for other areas.

IHNE has also been involved in promoting forestry and agricultural best management practices. One activity they believe has been particularly successful is the promotion of organic agriculture in Nuevo Paraíso. Community members became interested in organic agriculture after participating in an awareness raising workshop IHNE hosted. Fifteen landowners participated in the program and were able to see a marked improvement in production and in soil quality. These farmers have adopted the organic methods and have ceased destructive practices, like burning the land to prepare it for cultivation. This reduction in burning should decrease sedimentation entering local waters, thus improving water quality for downstream users. Most of the community members who did not initially participate were impressed with the results and planned to also use organic methods this coming year. TNC provided funds for the awareness-raising workshop, while the Mexican Secretary of Social Development provided technical support for the organic agriculture trainings. IHNE also told the farmers they could organize themselves to sell their organic crops for premium prices, but IHNE does not currently have the funding to follow up on this work. IHNE has run into similar problems in other communities where they have tried to encourage income generation activities like jam production. People have a hard time getting to the cities to sell their products and also do not know where to try to sell them. If IHNE wants its income generation activities to be successful, it will be important for them to find the resources to provide technical assistance not only in agricultural management but also in small business development.

The Lagartero watershed committee works with local communities on conservation, as well as social issues. Although they have had limited funds for their work, municipality representatives feel this has been one of the keys to their success. They did not want to be viewed as a program that brought people money to do things. Instead, they were able to work with the communities to identify together what they needed. This has included housing construction, education, and health services. The watershed committee's manager described a silvopastoral project as one of their conservation successes, claiming the project has helped halt clearing of land for cattle grazing. They have been able to show farmers that raising livestock does not mean clearing more land. The project involves the use of electric fences, reforestation with native species, awareness-raising workshops, and a focus on improving the health and sustenance of the producer. Municipal representatives noted that it was difficult to get people to change at first, but they were able to interest a small group and convince them that it a silvopastoral system was not more expensive or resource intensive than previous methods. The project is currently in its first of three phases.

6.4.2 Timing of water use and demand reduction

Conservation actors in the Chiapas watersheds, for the most part, have not addressed best management practices related to the timing of water use or reducing the demand for water. Because Chiapas is one of the wettest states in Mexico, quantity of water is not an issue for most users within the state's watersheds. It may be a concern for Lagartero and Zanateco watersheds and the urban area of Tuxtla Gutierrez, but most people seemed to see this issue as minor compared to others. They remarked that the greater concern was water pollution.

6.4.3 Water treatment best management practices

According to Roberto Escalante, Director of El Triunfo Biosphere Reserve, coffee is the greatest pollutant in the region surrounding the reserve. To address this issue, CI and IDESMAC have been working with coffee producers in an area covering 3,000 hectares to certify their coffee production process. To achieve certification, a grower cannot contaminate rivers with coffee processing wastes, and he/she needs to manage the land in a biodiversity-friendly way. This might include reforesting degraded lands with native forest species (not *Inga*, a common non-native species used in agroforestry) and implementing soil conservation and erosion prevention techniques. Escalante mentioned that some people were initially resistant but they now see the ecological and economic benefits and want to participate in this program.

Another water treatment initiative still in the initial stages is TNC's work with USAID's renewable clean energy program. TNC is talking with USAID representatives about opportunities to get technical support for wastewater treatment, including industrial wastes and coffee processing wastes. TNC is also hoping to get support to improve municipal water systems.

6.4.4 General Challenges and Enabling Factors for BMPs

One challenge to promoting the types of best management practices above is the continued existence of governmental policies that are entirely inconsistent with conservation. For example, one interviewee mentioned government subsidies provided by the ProCampo program that encourage people to deforest lands and turn them over to "productive" use. In the last year, Mexico initiated ProCampo Ecológico which is essentially the same program but CONANP must now be consulted on where the government should promote the ProCampo program. Still, the interviewee felt the incentives should encourage restoration of degraded lands rather than turning them over to pasture for livestock grazing.

Some organizations have felt constrained in what they could do by their limited financial resources. IHNE, for example, has initiated some interesting organic agriculture and income generation activities, but they have not provided the follow-through needed for those activities to be fully successful.

Another challenge that was implicit in remarks from interviewees is establishing interest on the part of communities to participate in projects. Many community members are skeptical of the benefits until they are able to see the results for themselves. That said, some interviewees also felt that many communities have been very open to exploring alternative ways of managing their resources. They are under a lot of pressure to meet their basic needs, and, as such, are willing to try new methods that might help them. In addition, the rural communities in Chiapas tend to be so remote and marginalized that they are appreciative of an institutional presence in their communities. According to a CONANP representative, support from institutions like TNC has helped them establish a presence that has generated confidence from the local people. They see that CONANP is there to help them with their problems and that they are there to stay.

7 Monitoring Watershed Valuation Work

Actors in Chiapas implemented a number of watershed valuation projects and activities in Chiapas, but, for the most part, evidence of any impact has been primarily anecdotal. TNC has

monitoring plans for individual projects under different donors. In general, indicators are output-oriented. In addition, staff collect information on the status of conservation targets, but they are still struggling with how to establish a link between output indicators and changes in higher-level watershed conservation targets. More concretely, they struggle with how to show their specific valuation interventions are influencing watershed conservation. Recently, TNC staff participated in a planning workshop which explained how activities should feed into objectives, which should, in turn, feed into goals. It also helped clarify the numerous terms different organizations use for similar planning concepts.

One tool TNC is developing in collaboration with CONANP, is a watershed scorecard modeled off the Parks in Peril scorecard, the latter of which measures progress made toward achieving critical capacities, infrastructure, and policies needed for protected area management. The current draft version of the watershed scorecard is separated into four main categories: planning, environmental capacities, conservation and management actions, and learning. Within these categories are lists of various skills or products that should be present (e.g., site conservation plan, monitoring plan, scientific research, regional planning committee, ecological zoning, financing, etc.). TNC and CONANP intend to continue refining the scorecard, incorporating input from watershed experts, Pigua Committee members, and other actors, such as FIRCO, SEMARNAT, and the World Conservation Union (IUCN).

TNC is now trying to develop a monitoring plan that will integrate several monitoring efforts – TNC’s Measures of Success, the watershed scorecard, and their monitoring plan for their USAID project. As a first step, they plan to finish the site conservation plan for the Coastal Watersheds of Chiapas. At the time of the interviews, TNC staff were still trying to figure out how they would bring all of these different pieces together into one coherent monitoring plan.

8 Lessons Learned

TNC and its partners have made significant progress in establishing a watershed valuation process in Chiapas. The task has not been an easy one though. Interviewees brought up numerous challenges they have faced, including limited resources, loss of hard-earned political will with changing administrations, and project delays due to lack of inter-institutional coordination. Most people interviewed identified important lessons learned that have resulted from these challenges. Here, we present the major lessons learned for water valuation work in Phase One (Capacity-building, Planning, and Alliance-building) and Phase Two (Implementation of Conservation Strategies).

8.1 Political will is one of the most important elements

Watershed conservation actors have found that gaining political support is one of the most important keys to moving water valuation activities forward. Even though the legal mechanisms for implementing a water user fee are not clearly defined, TNC and its partners have found that the political support they have has been sufficient to move long-term financing mechanisms forward. Coapa had many of the desirable characteristics for launching a pilot watershed valuation project, but has lacked the political will. In contrast, the municipality of Arriaga lacks some key characteristics (mainly, good, reliable water service), but the municipality’s president and administration strongly support watershed conservation and environmental services

payments. As a result, Arriaga is one of the two main areas under consideration for a pilot water user fee mechanism.

8.2 Key state and federal actors should be closely involved

Another related lesson learned is the importance of working closely with state and federal actors. For example, the Coapa Watershed Committee was established well before the Zanatenco, Lagartero, and Cuxtepec Watershed Committees. There was also institutional interest in working in Coapa. Nevertheless, progress there has been slow, while in Zanatenco, Lagartero, and Cuxtepec progress has occurred much more quickly. One reason the work in the Coapa watershed has not moved along as quickly as expected is because SEMARNAT, the Secretary for Environment and Natural Resources, was not involved with the work there. SEMARNAT, however, was working in Cuxtepec, and, as a result, watershed valuation work progressed more rapidly there. SEMARNAT's presence in Cuxtepec has provided both political will and financial resources – two key variables that conservation actors have learned are necessary for a successful watershed valuation process.

8.3 It is necessary to create a long-term structure independent of changeovers in political administrations

TNC and its partners have done a tremendous amount of work to build alliances and secure political will throughout the various municipalities, watersheds, and sub-watersheds that make up the Chiapas Coastal Watersheds. As mentioned above, this political support has been instrumental. With municipal elections occurring every three years though, various people expressed concern about losing hard-won support with each change in administration. The major lesson they have taken from this experience is that it is critical to create a longer-term structure that is more immune to political turnover. In the short term, organizations believe it is important to work with candidates and elected representatives to inform them early on and gain their support. Over the longer-term, however, they would like to develop a more permanent structure. This is something that TNC hopes to address with the legal study it is financing in the Lagartero and Zanateco watersheds.

8.4 Active coordination of design and planning activities is critical

A key lesson learned from the first phase in the watershed valuation process is the importance of active coordination and communication between organizations. TNC and its partners encountered some difficulties in developing its communications strategy, which led to a delay of nearly three years in getting the strategy up and running. Part of the problem was that the communications strategy was to be informed by several different studies, yet the institutions undertaking those studies did not coordinate or communicate with one another. As a result, methodologies used for similar studies were inconsistent, and the timing of the results did not coincide with the communications strategy development. Those involved with the communications strategy learned the need for stronger inter-institutional coordination and clearer agreement on strategy objectives.

8.5 Watershed valuation and management requires long-term monitoring and adaptation

TNC Chiapas staff recognize that watershed management and the implementation of an environmental services payment mechanism are relatively new concepts that involve long-term processes and long-term commitments. To ensure they are successful, they need a lot of attention, constant supervision, and ongoing monitoring to determine if initiatives are making progress toward their goals and objectives. This ongoing monitoring should be used to help watershed managers and stakeholders make necessary adjustments to adapt and improve their actions. While this type of adaptive management is always good practice, it is especially important with relatively unknown tools and strategies, such as those used for water valuation work.

8.6 Reliable and high quality water service is a prerequisite for implementing a water user fee system

Chiapas is a difficult area to try to implement an environmental services payment mechanism. As one of the poorest states in Mexico, its inhabitants (especially those in rural areas) have great difficulties making ends meet and would likely have financial difficulties making payments for watershed conservation. Still, surveys have found that people would be willing to pay at least a small fee if they could be guaranteed reliable service and clean, potable water – something most residents lack. While this fee might not be sufficient to pay for watershed conservation, it does help instill in people an awareness of the value of water resources and their conservation.

8.7 Industries can be important political and financial contributors to watershed conservation

Many interviewees acknowledged that local industries should pay significant fees because they reap large economic benefits from the water, they use large quantities of water, and they are responsible for much of its contamination. For example, an IHNE study found that the Comisión Federal de Electricidad (CFE) can meet 23% of Mexico's hydroelectric needs with energy generated from the Cuxtepec watershed. In Arriaga, industries depend upon water from the Lagartero watershed for their production processes. In both the Cuxtepec and the Lagartero watersheds, these industries are powerful economic forces that could more easily pay for the environmental services that help sustain them. Some interviewees thought that the industries could serve as examples for others and set the stage for a broader fee mechanism. People also identified more economically secure groups such as coffee growers (in particular, the large-scale growers who are generally quite wealthy) and fishermen as users who could afford to pay an environmental service fee, especially if they were to understand the economic benefits to them of watershed conservation.

8.8 Watershed conservation and environmental service fees should be framed in terms that are relevant to the different user groups

A related general lesson espoused by nearly everyone was the need to present watershed conservation and environmental services fees in terms that are relevant to those user groups. Different user groups will require different outreach strategies and interventions. Only when they can understand the benefit in a concrete, relevant fashion will they be willing to support a fee mechanism.

Similarly, many people mentioned the importance of working with groups from the upper, middle, and lower sections of a watershed because each group tends to value and use water resources differently. Those in the lower watersheds will typically place a higher value on water than will upstream users because they receive less water or water already contaminated from upstream uses. TNC and its partners have found it effective to use workshops and exchanges to help people from different parts of the watershed understand how their actions impact other users.

8.9 Engage with communities in a collaborative, rather than paternalistic, way leads to greater support

A few different organizations mentioned that their lack of funding had actually been an important opportunity for them. They were able to go to communities and talk openly with them about their needs and figure out together how to address those needs, as well as watershed conservation. The lack of resources prevented organizations from raising false expectations and from drawing in people interested primarily in financial assistance. It allowed them to engage in a more collaborative, rather than paternalistic fashion. Clearly, these organizations would not suggest that they prefer to be without resources for their projects. What they have learned though is the importance of going into communities without a set agenda or plan. This establishes a level playing field and allows them to be more open to community needs they may not have considered on their own. The general manager for the Lagartero Watershed Committee, Martin Rodriguez, emphasized the importance of social engagement, noting “Something we’ve seen in Mexico is that all projects that we develop outside of the field are not successful because they do not address the communities’ needs.” While it is important to be open to those needs, Rodriguez also pointed out the value of having a structure that gives a group credibility and trust.

8.10 Water valuation is about raising awareness, not just about raising money

Although there has been a lot of emphasis on the financial aspects of water valuation, several interviewees stressed that the process was not just about raising money. Water valuation also involves raising awareness about the value of water and environmental services and encouraging wise use. So, while some residents may not be able to pay even modest fees, TNC and its partners hope to reach them through promoting improved management practices.

9 Concluding Remarks

The water valuation work carried out by TNC and its partners in the Chiapas Coastal Watershed is impressive – from the social, economic, and legal background studies to the inter-institutional and inter-sectoral alliances to the promotion of best management practices. In general, it seems this watershed valuation model contains many, if not all, of the key elements for successful watershed conservation. Because different components are being implemented in different watersheds, however, it is difficult to assess the valuation process as a unified whole. Given the newness of this approach though, it seems appropriate that TNC would try to choose the most feasible areas to pilot different parts of the model. To be able to truly assess progress and the effectiveness of the water valuation process, it will be important for TNC to finalize its overall monitoring plan and begin to implement it sooner rather than later.

Conservation under challenging circumstances like those in Chiapas is a difficult undertaking that requires hard work, dedication, and a true commitment. These elements are clearly present among the various conservation organizations working on watershed valuation in Chiapas. Despite the many challenges, it seems that the future of Chiapa's watershed is in capable hands, and we hope the future will provide the circumstances and resources needed to ensure their conservation.

Finally, we wish to thank TNC Chiapas and its partners for their contributions to these case studies and for the gracious hospitality.

List of People Interviewed:

1. Alejandro Hernandez, Chiapas Program Manager, The Nature Conservancy-Chiapas
2. Edith Orihuela, Coordinadora de Proyecto Conservacion y Manejo de Sistemas Dulce Acuicolas en el Estado de Chiapas, Instituto de Historia Natural y Ecologia
3. Javier Jimenez Gonzalez, Director, Reserva de la Biosfera de la Encrucijada, Comision Nacional de Areas Naturales Protegidas (CONANP)
4. Israel Amescua, Asistente de planeacion, Centro Pronatura de Informacion para la conservacion, Pronatura Chiapas
5. Nestor Camacho Egrimy, Presidente, Municipio de Arriaga; Presidente, Cuenca de Largartero
6. Martin Rodriguez, Gerente, Cuenca de Largartero
7. Roberto Escalante, Director, El Triunfo Biosphere Reserve, Comision Nacional de Areas Naturales Protegidas (CONANP)
8. Jorge Canela, Coordinador de los Planes de Sitio de CCCH-Sepultura, IHNE/CONANP, La Sepultura Biosphere Reserve

TNC and Partner Experiences with Watershed Valuation Activities In the State of Quintana Roo, Mexico

Final Report

Based on September 2004 site visits

Prepared by
Caroline Stem
Foundations of Success

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List of Acronyms:

ASK	Amigos de Sian Ka'an
BMP	Best Management Practice
CEA	Centro Ecológico Akumal
CEMDA	Centro Mexicano de Derechos Ambientales
CICY	Centro de Investigación Científica de Yucatán A.C.
CINDAQ	Centro de Investigaciones del Sistema Acuífero de Quintana Roo
CNA	Comisión Nacional de Agua
CONAFOR	Comisión Nacional Forestal
CONANP	Comisión Nacional de Áreas Naturales Protegidas
JICA	Japanese International Cooperation Agency
SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales
SKBR	Sian Ka'an Biosphere Reserve
TNC	The Nature Conservancy
UNAM	Universidad Nacional Autónoma de México
UNESCO	United Nations Educational, Scientific and Cultural Organization

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1 Introduction

1.1 Purpose of case study

For the last few years, The Nature Conservancy has supported watershed valuation projects in several countries in Latin America as a strategy for achieving biodiversity conservation. Through the International Water Policy Program, TNC has provided technical assistance to the following countries and sites:

- Mexico: Chiapas (including the El Triunfo and La Encrucijada Biosphere Reserves)
- Mexico: Quintana Roo
- Guatemala: Sierra de las Minas Biosphere Reserve
- Honduras: Yojoa Lake Multi-use Area
- Bolivia: Sama National Park
- Ecuador: Condor Bioreserve

Watershed valuation projects are designed to link water users to watershed conservation. They seek to get water users to contribute to conservation either financially (through user fees or increased public financing of conservation activities) or by taking actions directly to reduce threats to water resources. Thus, watershed valuation projects involve close collaboration between conservation organizations and government agencies, water companies, citizens groups and other key stakeholder groups.

TNC asked Foundations of Success to develop a series of case studies that document the experiences and knowledge that TNC and its partner organizations have gained about watershed valuation projects in these six sites. This document represents one of the six case studies. In addition to the case studies, we have written a cross-site lessons learned document to analyze the use and effectiveness of watershed valuation as a conservation strategy, based on the experiences of all of the sites. The purpose of developing these documents is to facilitate learning among these and other sites that are currently implementing watershed valuation projects or are interested in undertaking these activities.

1.2 Watershed valuation project theory

Many montane protected areas provide abundant, clean water that is valuable for human consumption, irrigation, hydro-electric production, industrial production, ecological processes and other uses. The basic intention of watershed valuation projects is to help local actors recognize the importance of these natural areas and take action to protect them, in order to ensure the integrity of this critical environmental service. Local people may not value the conservation of biological diversity, but they value water. Therefore, the theory is that if they can be motivated to take action to protect their water resources, this action will contribute to biodiversity conservation.

While this basic theory sounds relatively simple, in reality watershed valuation projects are quite complex. Before visiting these watershed valuation projects, we decided to develop a results chain to help clarify TNC's assumptions about how watershed valuation actions should lead to

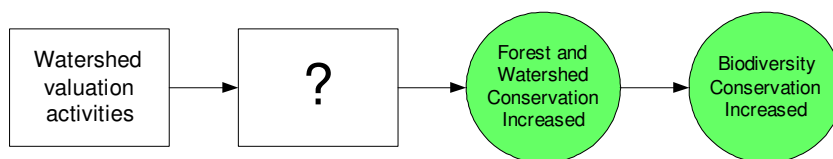
biodiversity conservation – in other words, to define in more detail the project theory and provide a framework for examining each step along the way from intervention to desired impact.

In order for any conservation project to be successful, the implementing organization must develop the project based on sound project theory, and they must execute the project well. Projects can fail to achieve their objectives due to poor theory, poor implementation, or both.

Usually, project theory remains hidden in the minds of the people who design and implement the project. Often, if a group of people is working together to implement a project, they each have different assumptions about how their actions will contribute to achieving their intended impact. Results chains graphically map a series of “if-then” statements that define how a project team believes that a specific conservation action will contribute to achieving a conservation impact. They are a tool used to make the project theory explicit so that it is clear to everyone involved and they can test and refine their assumptions over time.

FOS worked with TNC’s Senior Advisor for International Water Policy to develop the results chain shown in Figure 1. She provided technical assistance to most of these projects for several years. Therefore, her project theory has influenced the approach taken in most (though not all) of the sites. We explain the results chain here, and we use it as a framework for all of the case studies and the cross-site lessons learned document. Within this framework, we describe the actions taken in the sites and analyze the extent to which these projects are achieving their intended objectives.

When we began building the results chain, it looked like this:



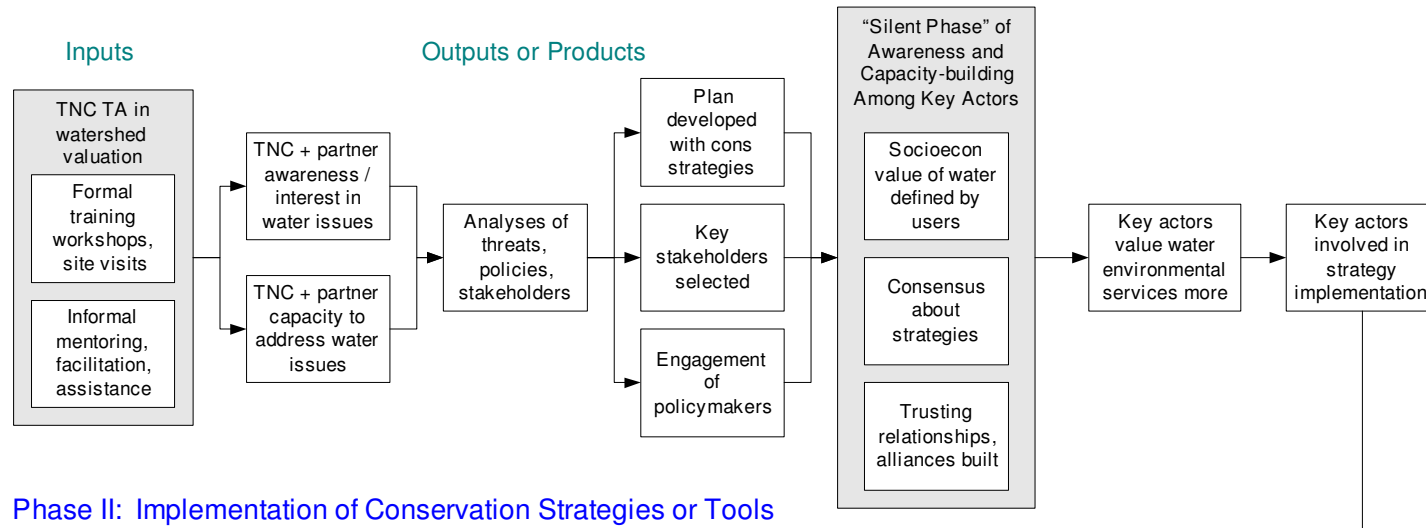
This initial chain says that TNC and its partners are conducting watershed valuation activities to achieve two long-term impacts. The first is an increase in forest and watershed conservation in the specific sites, which TNC believes will contribute to an increase in biodiversity conservation. The difficult part of building the chain is defining the intermediate results needed for the activities to achieve their desired impact.

The complete chain (see Figure 1) includes two project phases. Phase I focuses on initial capacity development, planning and alliance-building. Phase II involves the implementation of specific conservation strategies or tools. TNC’s Senior Advisor for International Water Policy believes that Phase I is a necessary prerequisite to Phase II.

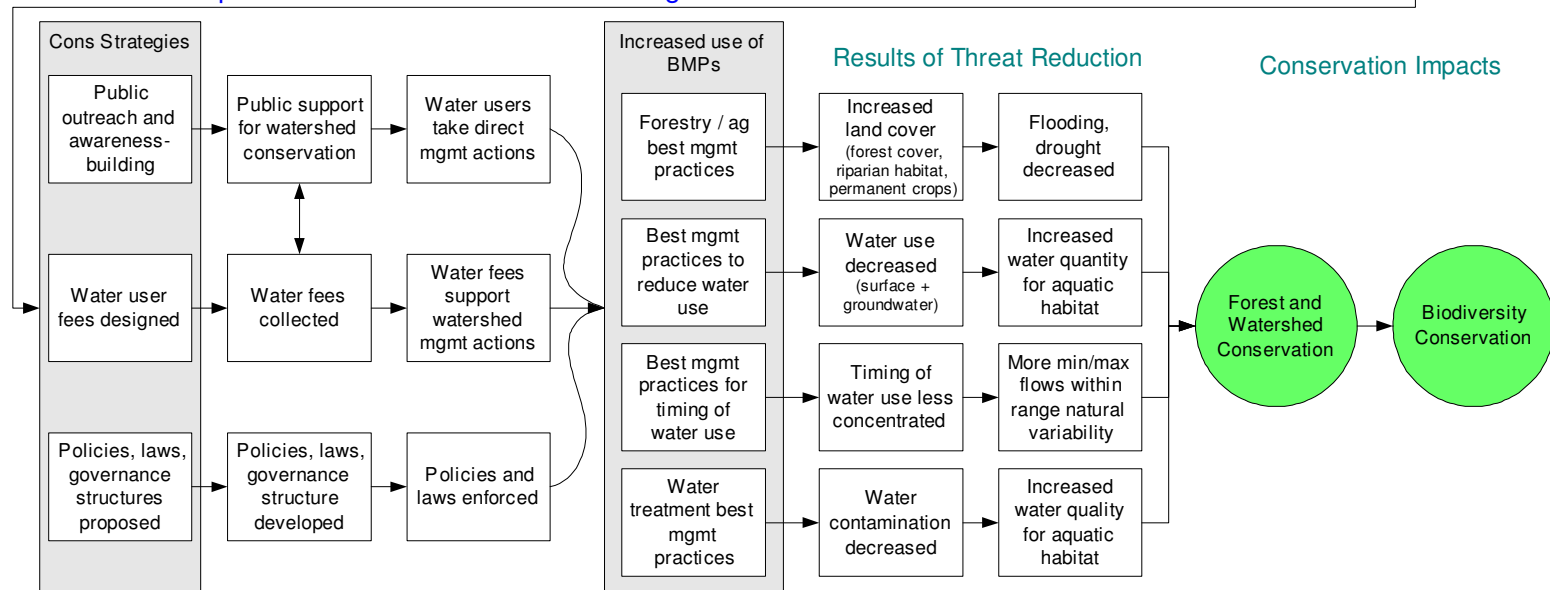
In Phase I, TNC provides technical assistance in watershed valuation, which contributes to building awareness and interest in water issues and capacity to address them. This interest and capacity enable partners to produce initial outputs or products such as analyses of threats, policies and stakeholders, which enable them to develop a watershed valuation action plan and select key stakeholders that need to be involved in implementing the plan. A “silent phase” of

Figure 1. Causal Chain Defining How TNC Watershed Valuation Projects Are Intended to Contribute to Biodiversity Conservation

Phase I: Initial Capacity Development, Planning and Alliance-building



Phase II: Implementation of Conservation Strategies or Tools



information-sharing, awareness and capacity-building among key actors is necessary to achieve consensus about what conservation strategies to undertake and to build trusting relationships among the key actors. TNC calls this the “silent phase” because it may appear to outsiders that little is going on during this phase, but the implementing organizations usually develop important alliances during this period that create the foundation for achieving results during Phase II. During this period, a water valuation process is usually conducted and the key actors may form a watershed group. All of the products of the silent phase contribute to increased recognition by these key actors of the value of watershed environmental services, which contributes to the involvement of these key actors in the implementation of conservation strategies in Phase II.

According to TNC’s program theory, Phase II focuses on the implementation of one or more of the following three conservation strategies: (1) public awareness campaigns, (2) water user fees, and (3) policy development and enforcement. For each of these strategies, a short chain explains expected results. Public outreach and awareness-building increase public support for watershed conservation, which will contribute to water users taking action to improve watershed conservation. The design of a water user fee will result in collection of water fees that are used to support watershed management actions. Engagement of policy-makers will result in the development of new laws, regulations or governance structures that are enforced.

If these conservation strategies are well executed, then they should result in increased adoption of best management practices (BMPs) related to forestry and agricultural activities, reduction of water use, the timing of water use, or water treatment. Which of these best management practices is relevant depends on the conditions in the specific site. For example, forestry and agricultural BMPs may be very important for montane areas, while water pollution reduction is vital to areas such as the Yucatan Peninsula that have complex groundwater systems that influence sensitive marine areas. Where they are relevant, forestry and agricultural best management practices can increase forest cover and other land cover, which will result in decreased flooding and drought. BMPs to reduce water use will reduce surface or groundwater use, which will increase the quantity of water available for aquatic habitat. BMPs related to the timing of water use will result in less concentration in the timing of water use (for example, by hydropower plants), which will increase the number of minimum and maximum river flows within the range of natural hydrologic variability. Water treatment practices will decrease water pollution, thus increasing water quality for aquatic habitat. According to TNC’s theory, all of this will contribute to increased forest and watershed conservation, which will increase forest and freshwater biodiversity conservation.

Although the results chain is presented as a linear sequence of actions and results, we must remember that this is program *theory* – in reality results are often not achieved in the order presented by the chain. For example, some sites have jumped directly to working on the development of water user fees, without an extensive capacity-building, planning and alliance-building phase. These differences help us to learn about the advantages and disadvantages of different approaches and their relative effectiveness under different conditions.

1.3 Case study structure

The structure of this document is based on the results chain. We begin by addressing the last two factors at the end (bottom right-hand side) of the chain. In the site description we describe the biodiversity that TNC and its partners are trying to conserve in the protected areas where they are conducting watershed valuation activities and in the project objectives and strategies we describe the project's objectives related to watershed and biodiversity conservation.

We then move to the beginning of the results chain. In the project history and planning and alliance-building process sections, we describe all of the achievements made related to the Phase I portion of the results chain. In the implementation of conservation strategies section, we describe all relevant activities related to public outreach campaigns, water user fees and watershed management policies and, if appropriate, how these activities have contributed to increased use of best management practices. We then describe any monitoring that partner organizations are undertaking to measure the effectiveness of watershed valuation work. Finally, we describe the principal lessons learned and provide concluding remarks.

1.4 Overview of Quintana Roo Project

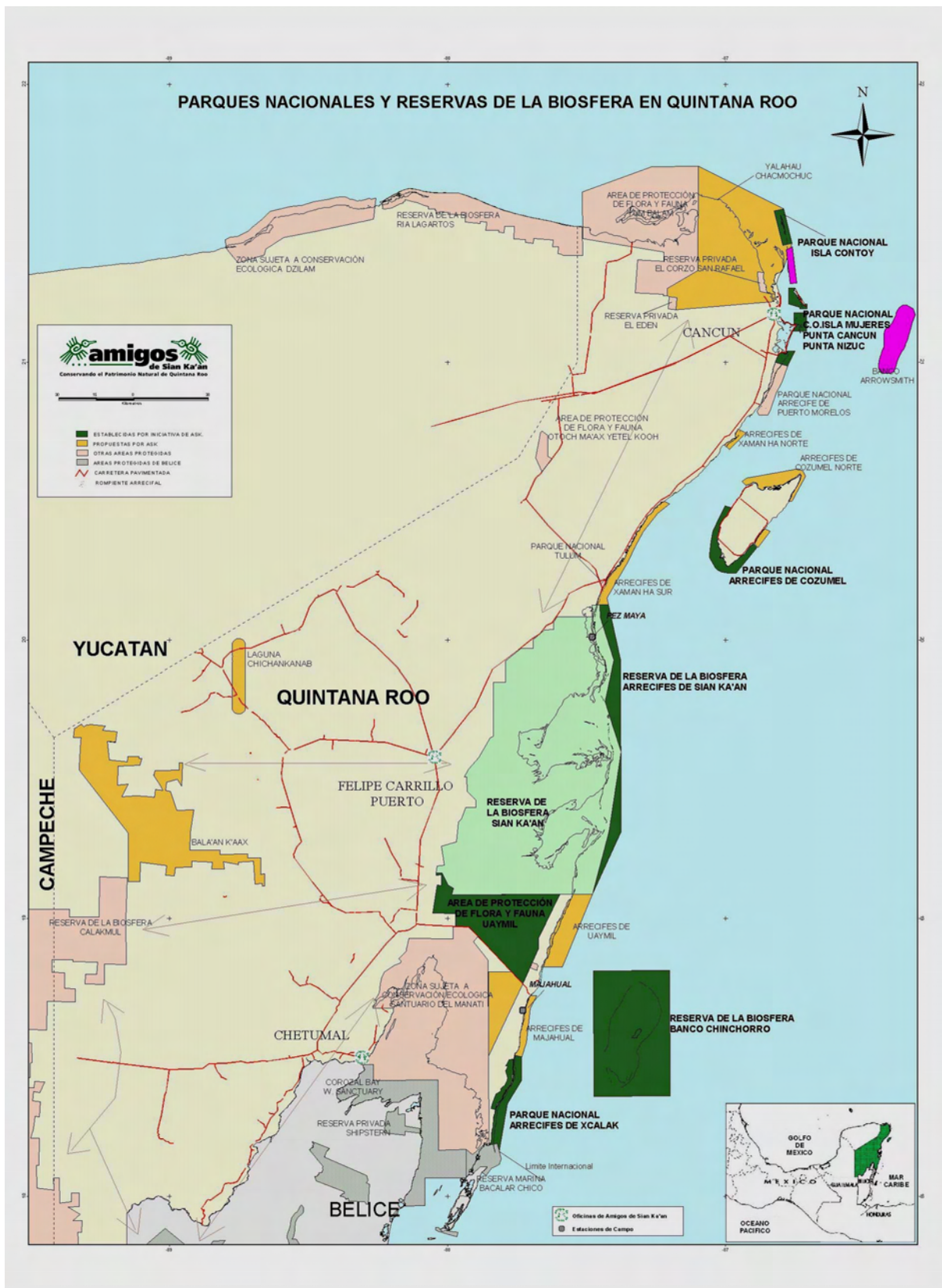
TNC partners and collaborators in Mexico's State of Quintana Roo are in the preliminary phase of implementing a watershed valuation project. TNC's main partner, Amigos de Sian Ka'an (ASK) has been working with the Sian Ka'an Biosphere Reserve for 18 years, but ASK and other actors in the area have only recently come together to try to understand what one another is doing and how they might work together to better influence watershed conservation in Quintana Roo and the larger Yucatan Peninsula. Given this situation, this report focuses primarily on portions of the causal chain found in Phase 1 (Initial Capacity Development, Planning, and Alliance-building). Nevertheless, where relevant, we have highlighted some individual conservation interventions which actors feel have been particularly important for their watershed conservation work.

2 Site Description

Located along the Caribbean coast in the State of Quintana Roo, the Sian Ka'an Biosphere Reserve is a UNESCO World Heritage Site covering 617,265 hectares and containing one third lowland tropical forest, one third wetlands (marshes, flooded savannahs and mangrove forests), and one third coastal and marine habitats (lagoons, bays, and coral reefs). Reserve boundaries encompass 68 miles of the Mesoamerican Reef, the world's second largest barrier reef, and protect unique features including sinkholes, hummocks, lagoons, and freshwater springs. Figure 2 shows the location of Sian Ka'an and other protected areas in Quintana Roo.

SKBR harbors old growth and seasonally flooded lowland forests, as well as grasslands and sandy beaches, each of which provides important habitat to species that include jaguars, pumas, tapirs, marsh and river crocodiles, turtles (loggerhead, leatherback, hawksbill, and green), and more than 330 species of birds, including large numbers of wintering neotropical songbirds. This tropical forest represents one of the last secure sites for these endangered species. Moreover, according to SKBR's site conservation plan, the reserve's wetlands, estuaries, and bays are critical for nutrient recycling and reproduction phases of marine resources, and its mangroves and reef systems are among the most productive systems in the world.

Figure 2. Location of Sian Ka'an Biosphere Reserve and Other Protected Areas in Quintana Roo, Mexico



With assistance from TNC personnel, Amigos de Sian Ka'an (ASK) and Comisión Nacional de Áreas Naturales Protegidas (CONANP) have applied the Site Conservation Planning methodology to the Sian Ka'an Platform Site to identify several priority conservation targets and associated threats. Given the nature of the SKBR site, all of the conservation targets identified are also important watershed conservation targets. These include: coral reefs, saltwater wetlands, freshwater wetlands, low non-inundated forests, beaches and coastal dunes, bays and sea grasses, and puma and jaguar (two wide-ranging species whose presence would indicate connectivity to the Mayan Forest). The Sian Ka'an Platform Site is unique in that its watersheds include the Caribbean Sea and an inter-connected network of surface and underground freshwater flows. In fact, much of the watershed remains unknown and unexplored, due to the "hidden" nature of the largely underground network of water systems.

In the past 30 years, Cancun has grown from a sleepy fishing village to the largest resort destination in Mexico. Tourism has spread south down the Quintana Roo coast, with some communities, such as Playa del Carmen reaching annual growth rates well over 20%. This rapid pace of development has brought numerous threats to SKBR and the region, including unregulated tourism development, associated water pollution and hydrologic alteration, overfishing, forest fires, and uncontrolled resource extraction.

According to the Sian Ka'an site conservation plan, main threats to the site's priority animal species (puma and jaguar) include tourism development, agro-chemical and heavy metal contamination of water sources, and global warming. In addition, local organizations note threats related to lack of adequate sanitation infrastructure and waste disposal services, the rapid pace of development (especially of the tourism sector), and poorly managed solid waste disposal throughout the area. Although most organizations interviewed for this case study did not feel that water quantity was currently an issue, many recognized that it may become an issue for the future, especially given the vast amount of water used by the hotel industry. One ASK employee indicated this may already be a concern, as some aquifers are showing evidence of increasing salinization.

The exact site area for the watershed valuation work is not clearly defined yet. ASK had originally considered SKBR and the watersheds that feed into it or are affected by it. They have also considered working more broadly in the state of Quintana Roo. The initial workshops they and the Centro Ecológico Akumal (CEA) have facilitated have included the much larger area of the Yucatan Peninsula, which includes the states of Quintana Roo, Yucatan, and Campeche. They cast this wider net because they were not certain where the watershed valuation work would go, and they did not want to create false expectations.

3 Project History

Amigos de Sian Ka'an and the Comisión Nacional de Areas Naturales Protegidas (CONANP), as well as numerous other organizations, have been working in the Sian Ka'an area and the State of Quintana Roo for numerous years. Both ASK and CONANP have been key TNC partners for many years; they were TNC partners for Parks in Peril work in the Sian Ka'an Biosphere Reserve, and later the Sian Ka'an Platform Site, between 1992 and 1998. Thus, these two partners and the many organizations with whom they collaborate or communicate have been working on watershed conservation for several years.

Nevertheless, in terms of a more strategic, focused watershed valuation process, work is still very much in the start-up phase. To date, there has been some communication between key actors, and ASK and the Centro Ecológico Akumal (CEA) have coordinated two workshops to bring together key stakeholders, discuss a watershed valuation process, and identify next steps. The impetus for the first workshop (“Building the Bases for Water Conservation and Its Associated Biodiversity in the Yucatan Peninsula”), held in November 2003, came from ASK’s work with the Parks in Peril Program. The workshop was designed to help them answer some questions that had arisen during the site conservation process. For example, ASK and CONANP felt it was important to know what direction the underground water flowed so that they could understand how groundwater contamination might influence the Sian Ka’an area and make appropriate decisions to avoid contamination of the biosphere reserve. They knew a lot of information existed about the area, and the November workshop provided them with a way of bringing together and sharing information among dispersed groups that do not normally interact together. The primary product of this workshop was a publicly-available CD that pulled together studies, reports, and maps from numerous organizations working in the Yucatan Peninsula. The idea was to make an enormous amount of water-related information centrally available, thus setting the stage for stronger institutional coordination and greater awareness of what others were doing in the Yucatan’s watersheds. Access to this information has helped ASK and other collaborators to learn more about how watersheds in the Peninsula function.

The April 2004 meeting in Akumal (“Integrated Coastal Watershed Management”), facilitated by ASK and CEA, provided an avenue for sharing the results from the November workshop and taking some early steps in the watershed valuation process (i.e., identifying uses, actors, and threats affecting the watersheds). The most significant outcome of this meeting was the decision by all participants to establish the Mayab Clean Water Network. All those present at the meeting are considered founding members and include government and non-governmental organizations, research institutes, businesses, and a couple of community-based organizations. A CEA proposal indicates the following key areas in which Network members propose to work: education, communication, and training; research and monitoring; community participation; waste management; economics (e.g., true costs of water pollution); advocacy; sustainable development planning; and conservation and protection. The next major step to move the watershed valuation process forward is to launch the Mayab Clean Water Network and begin work on the identified tasks.

Both ASK and CEA, TNC’s primary watershed valuation partners in Quintana Roo, are enthusiastic about the watershed valuation process. CEA’s director, Paul Sanchez Navarro, explained that water is the main conservation issue in the region, even though watershed matters receive very little attention, in large part because the watersheds are all underground. He and other partners were pleased that TNC had begun a process to foster greater interest in watershed issues.

A key criterion to be able to implement a watershed valuation process is the presence of the capacity to address water issues. Because of the location of Quintana Roo, most conservation organizations deal with water issues at one level or another. Thus, the institutional capacity to address water issues is fairly strong. Capacity in terms of watershed valuation, however, is less

developed. The two workshops TNC partners have facilitated were aimed primarily at building awareness and, to a lesser extent, capacity in watershed valuation. Capacity building in watershed valuation is a process that will take much more time and is one that is just beginning in Quintana Roo. Jorge Luis Basave, an ASK staff person, has been able to receive some more in-depth training through TNC. For example, he has participated in a watershed management congress and attended a TNC-run watershed valuation workshop in Guatemala. He feels that the training he has received seems to be sufficient for him for the time being.

4 Project Objectives and Strategies

TNC's main partner in the area is the well-recognized NGO, Amigos de Sian Ka'an, that has had nearly two decades of experience working in the state of Quintana Roo, with particular emphasis on the Sian Ka'an Biosphere Reserve (SKBR). TNC has also supported the work of CONANP through its PiP activities. For the recently-initiated watershed valuation process, TNC has worked primarily with ASK and, to a lesser extent, CEA.

Because ASK and CEA are in the early stages of Phase 1 (Initial Capacity Development, Planning, and Alliance Building), they have not set concrete objectives or strategies for the watershed valuation work. There have been specific objectives for the two workshops the groups have hosted. For example, the November 2003 workshop that ASK organized had the broad objective of helping the main actors in the Yucatán Peninsula get to know one another's work and to compile in one place all the studies and information that existed regarding the peninsula's watersheds. The meeting also introduced participants to the idea of a watershed valuation process. The second meeting, held in April 2004 and hosted by CEA followed up on the November workshop with some initial steps to help develop a more concrete strategy (identification of water users and an analysis of threats) and to share the CD that contained the results from the November workshop (an extensive compilation of existing studies and work on the Yucatán's watersheds).

One of the most important outcomes of the April 2004 meeting was the establishment of the Mayab Clean Water Network. At the time of the case study, the network existed primarily in name. CEA had been tasked with heading up the network,¹⁶ but limited funding and staffing had prevented the organization from being able to take the necessary steps to fully launch the network. CEA currently has a proposal under review with Swiss Re that, if funded, would help them do just that. First year objectives for the Network, as described in the Swiss Re proposal, are to: 1) Define and consolidate the Network's internal structure, functional organization, and strategy (including the establishment of an institutional charter and the definition of projects and allocation of partners' responsibilities); and 2) Successfully launch the Network's public activities and advocacy efforts (including education and awareness raising activities, as well as the identification of sustainability criteria for Akumal's development). Many of the activities defined under the second objective are critical activities for the water valuation process (e.g., awareness raising, policy advocacy and development, and ecological, social, and legal background studies).

¹⁶ Since the drafting of this case study, CEMDA (Centro Mexicano de Derechos Ambientales) and Grupo Xcaret have also been playing an active role with the Mayab Network.

ASK has also submitted proposals to continue its watershed work and to operationalize some of the ideas that emerged from the two workshops. They have recently received funding from UNESCO that will, among other things, help them analyze information compiled from various organizations on the CD that came out of the November meeting. Right now, the CD is a vast library of studies and institutional documents. ASK personnel feel it is important to take it the next step and analyze the documents, so as to be better able to use the information for watershed management. The UNESCO project also sets forth several objectives which are relevant for watershed valuation work. These include, for example: 1) Promote the implementation of the SKBR land use and ecological zoning plan with landowners and government agencies; 2) Implement an easement and conservation buyer program on SKBR's coast; 3) Use technical expertise to gather and analyze hydrological information on freshwater catchment areas and contamination sources; 4) Promote best practices for wastewater management among communities, local hotels and property owners; 5) Work towards developing a common vision of conservation success for the coastal and marine environments of Sian Ka'an, including the Mesoamerican Barrier Reef System (stated as a goal, not objective); 6) Provide training and capacity building opportunities for local practitioners; and 7) Monitor changes in coastal development and wetland viability (stated as a goal).

5 Planning and Alliance-building Process

These early workshops that ASK and CEA have facilitated with assistance from TNC have provided the building blocks for the planning and alliance building that happens under Phase 1 of TNC's watershed valuation methodology (see Figure 1). In many cases, the actors participating in these workshops have the knowledge and capacity to address water conservation in the work they are undertaking, but they do not have the broader perspective or strategic alliances to be able to address conservation at the watershed level.

5.1 Project Design

The workshops and follow-up have led to some preliminary progress in the design of the watershed valuation process. A key step in the process is to identify and assess the stakeholders and threats that are affecting watershed conservation. This was one of the outputs of the April 2004 workshop. Based on the minutes from the meeting, it appears groups discussed the different water users and uses and listed the primary threats to and associated impacts on the Yucatan Peninsula's watersheds. They also listed and prioritized goals for what needed to happen to improve the watershed situation. The groups then came to a general consensus on what goals they thought should come out of the workshop. These formed the basis for the direction of the Mayab Clean Water Network. Clearly, this was an important achievement, although some workshop participants felt the level of analysis was cursory.

ASK, CEA, Grupo XCaret (a watershed partner from the tourism sector), CINDAQ, and other actors have also helped facilitate various studies that provide a better understanding of the actual situation in some of the region's key watersheds. For example, Grupo XCaret has provided funding for a portion of a peninsula-wide hydrologic study conducted by the Universidad Nacional Autónoma de México (UNAM). Grupo XCaret is particularly interested in the results related to rivers that feed into XCaret and Xelha nature reserves, two areas the company manages for conservation and nature tourism. Similarly, ASK has used funds from a Summit Foundation

grant to contract CINDAQ (Centro de Investigaciones del Sistema Acuífero de Quintana Roo) to map some of the subterranean waterways adjacent to the Sian Ka'an Biosphere Reserve (see Figure 3). ASK saw this as crucial information to be able to understand water flows affecting the reserve and to make well-informed management decisions. For instance, if links to Sian Ka'an existed, then inappropriate development elsewhere could lead to contamination of the SKBR, the adjacent Ox Bel Ha underground aquifer, and the Mesoamerican Barrier Reef. Results from this study revealed that water flows vary, but much of the water in the mapped areas flows from the northwest to the northeast and south. This southerly flow is what could be of concern for the reserve, as contaminants in the underground aquifers could make it to SKBR. As Sam Meacham of CINDAQ put it, "A diver can enter the water in a sink hole and go 8.5 kilometers west through caves to the beach. If a diver can make that voyage, so too can contamination." ASK intends to use the results of this work to help inform decisions made by the Ecological Land Zoning Committee (of which ASK is a member) for the Solidaridad and Benito Juárez Municipalities.

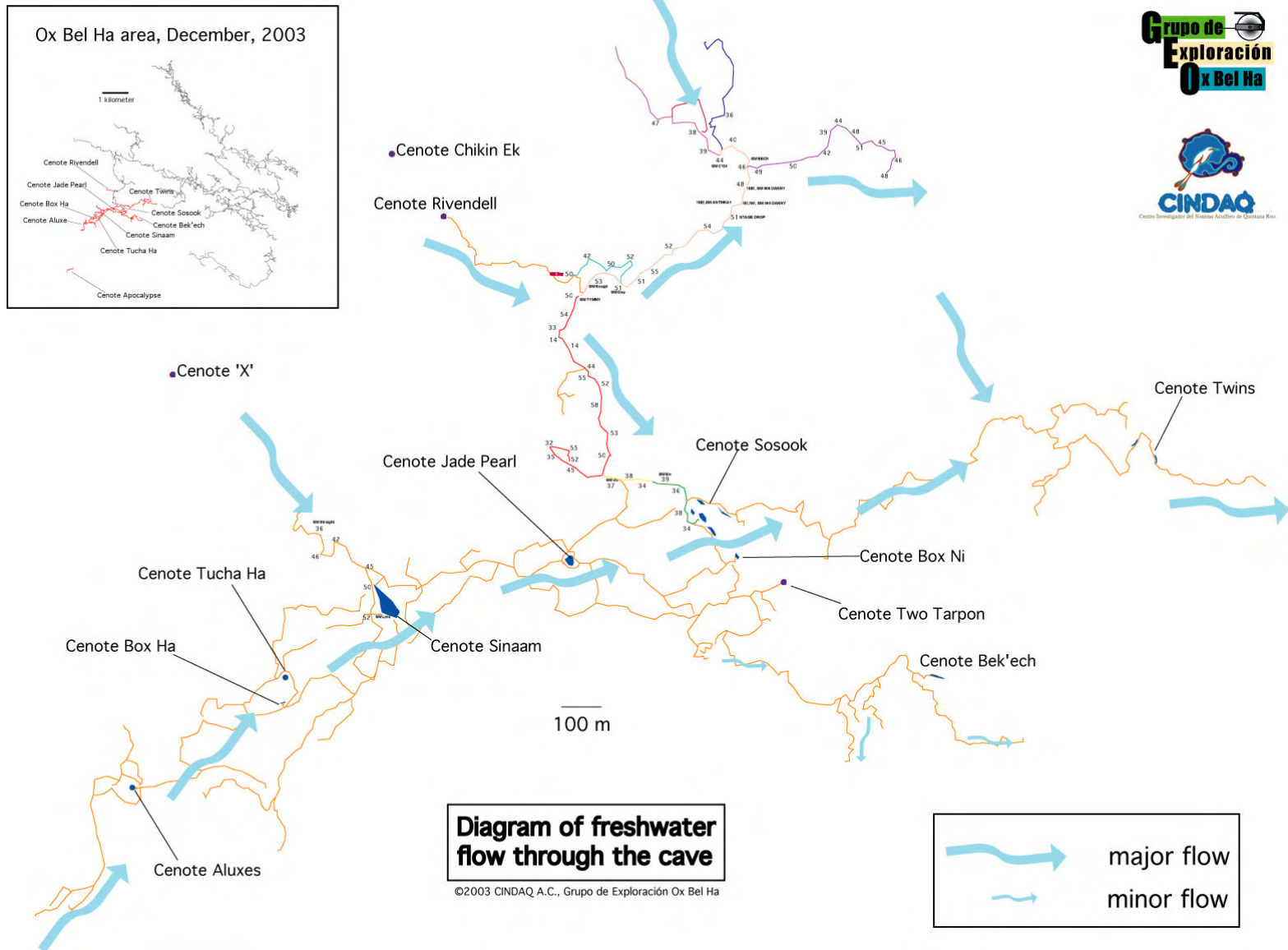
These types of studies various actors are undertaking and supporting will provide key inputs to the watershed conservation planning process, should the watershed valuation project take off. Still, there is likely a need for more studies specific to water valuation. Also, one partner expressed concern that greater scientific research and understanding of the Yucatan Peninsula's geo-hydrology is needed in order to make strong arguments for taking immediate actions to stop the degradation of the Peninsula's watersheds.

5.2 Project Planning

Because the watershed valuation process is in its early stages, no formal planning had occurred as of the time of the interviews. Nevertheless, there had been some informal planning. For example, the April 2004 meeting identified a series of next steps, one of which was the establishment of the Mayab Clean Water Network. According to a CEA report, members agreed that the network should take on the following ambitious activities:

- Education, communication and training of various stakeholders to raise awareness of the watershed's uniqueness, threats to its integrity, and how it should be properly managed;
- Research and monitoring, including compiling and sharing existing data as well as conducting new research, especially related to water contamination;
- Promotion of civic participation in decision making;
- Improved waste management, including recycling and waste reduction;
- Debate on the economics of water pollution, including an evaluation of different schemes to pay for integrated watershed management;
- Advocacy to support legislation that bans the use of deep-wells and provides incentives for low cost, low energy, and effective waste management; Advocacy to promote better coordination of government agencies dealing with water, at the federal, state and municipal levels; and Advocacy to revise regional development plans to reflect the watershed's capacity.
- Sustainable development planning, including identifying criteria that take into account the unique hydrology of the region; and
- Conservation and protection – including the promotion and enforcement of sound policies and strategies.

Figure 3. Map of Subterranean Waterways Adjacent to the Sian Ka'an Biosphere Reserve



Participants in this meeting also outlined a series of next steps, such as sharing workshop results with their organizations and the broader group of stakeholders who live or work in the region and establishing small working groups that coordinate with the larger group.

Since the drafting of this case study, the group has worked to better define its goals and is currently in an ongoing discussion about to define potential group projects and participant roles.

5.3 Selection of Key Stakeholders

ASK and CEA have cast a fairly wide net to identify and include stakeholders in initial watershed valuation activities. According to an ASK representative, the main area on which ASK wanted to focus was the Ox Bel Ha watershed that feeds into the Sian Ka'an Biosphere Reserve. The original idea had been to orient the workshops toward stakeholders specific to this region. Because ASK was not certain what the next step would be, however, they decided to facilitate a much more general workshop and avoid the possibility of raising false expectations among a more narrow group. Both workshops involved a wide range of participants from government, NGOs, academia/research institutes, tourism industries, and one ejido. A few interviewees, however, did comment that the second workshop had failed to get adequate participation from the government sector. One person also noted that the workshops seem directed to the "already converted" – or those who were already interested in watershed valuation and conservation prior to the workshop.

While ASK and CEA have taken a leading role in initiating the inter-institutional coordination, there are several key actors in the watershed – some of whom have closely worked with ASK and CEA to move the valuation work forward. A key ally in the tourism sector has been Grupo Xcaret, a tourism company that works in and manages the reserves of Xel-Há, Garrafón, and Xcaret, the last of which is owned by the company. According to Ana Lillia Córdova, Grupo Xcaret's sustainable development coordinator, Xcaret has taken a strong interest in watershed valuation because "we see the relevance of the threats to our parks. Our vision is to be one of a kind in sustainable tourism... We became involved when we realized that it did not do us any good to work only within our reserves if everything outside of us is in chaos." Grupo Xcaret has won numerous environmental awards and serves as a strong lobbying partner from a sector that is typically less concerned with the environment. According to Sam Meacham of CINDAQ, it has been very important to have Grupo Xcaret participate in the watershed valuation process because of their commitment to conservation and because they "boost our credibility and provide us a link to the tourism sector."

In Mexico, a key force in watershed planning and management has been the Consejos de Cuenca, or Watershed Councils, and the individual watershed committees and technical advisory groups within them. The Comisión Nacional de Aguas (CNA), the state organization in charge of administering and preserving Mexico's water sources, established the watershed councils and committees structure as a way to get greater local participation from various sectors of society in watershed management. The structure helps facilitate coordination and understanding among CNA, federal, state, and municipal institutions, and user groups. It also provides an important opportunity for different organizations and local user groups (e.g., agriculture, urban, livestock,

fishing, etc.) to have a say in watershed planning. The objective of the councils and committees is to formulate and implement programs and actions to improve water administration, hydraulic infrastructure development and service, and water resource preservation. CNA's establishment of watershed councils and committees was in response to a federal policy, re-established in 2000, to place greater emphasis on watershed management. Generally, the watershed councils span several watersheds and include watershed committees and subcommittees that cover a single watershed or portion of a watershed. The Yucatan Peninsula Watershed Council includes the states of Campeche, Yucatan, and Quintana Roo. The Yucatan Peninsula Watershed Council includes water users organized by sectors of use (e.g., industry, urban public, agriculture, and livestock) and two scientific groups that help the Council make informed decisions – the Specialized Group on Sanitation (a committee for the northern zone and another for the southern zone) and the Clean Beaches Committee. ASK staff serve on both of these committees, as well as the Watershed Council itself.

In general, it seems the stakeholder selection process has involved inviting all groups known to have an interest in the development or conservation of the area to participate. This has drawn in the organizations mentioned above, as well as representatives from various other organizations and sectors, such as the Centro de Investigaciones del sistema Acuifero de Quintana Roo (CINDAQ), Comisión de Agua Potable y Alcantarillado (CAPA), Alcaldía de Tulum, Ejido José María Morelos, Universidad de Quintana Roo, Conservation International, and Sian Ka'an Real Estate. Still, this broad approach has failed to capture some of the key stakeholders. A few interviewees felt like the April 2004 meeting had not been able to draw in as many people as anticipated, especially from the governmental sector. Some interviewees felt this might be due to a variety of factors, including a lack of vision, commitment, and training. Moreover, some government agencies do not provide their employees with funding or encouragement to participate in such workshops. One interviewee put it this way, "The problem with all these meetings is that participation is voluntary. Those who want to participate will pay their own way. But, you can get to a point where they will not be able to participate [because they do not have the institutional support to do so]."

When asked if any stakeholder groups had been missing from the workshops, CEA's director noted a few additional groups that should be involved. Specifically, the Japanese International Cooperation Agency (JICA) has invested a lot of money in water treatment plants in the Peninsula and has also conducted studies all along the coast. CEA and others would like to get access to those studies but have not been able to do so. Sanchez Navarro also mentioned that it would be useful to have greater involvement from the diving community (one of the greatest supporters of watershed conservation work in the area), hotels, developers, construction companies, the Comisión Nacional de Agua (CNA),¹⁷ and the health sector. He thought it was particularly important to involve the hotel sector, especially large hotels, because they would see the benefit of improving the water quality for their customers, and they would have the resources to be able to make the necessary changes.

¹⁷ CNA has participated in the workshops, but often they are not able to participate for an entire day and, therefore, may not have the opportunity to fully benefit from or contribute to the workshop.

5.4 Watershed Valuation Process

At the time of this case study, partners in Quintana Roo had not carried out any studies to determine the feasibility of a water use fee system. Several isolated studies exist that detail the hydrology, conservation status, and/or threats present, but a systematic valuation study does not yet exist. Nevertheless, this is something that partners see as very important. Some partners mentioned that a water valuation study would be a very useful tool to have when talking with developers or businesses. If they are able to demonstrate to these actors that more money can be made from the coral reefs than a proposed golf course, for example, then they would have a chance of stopping such detrimental development activities. Moreover, a water valuation study could help determine a price for water that more adequately reflects its real costs, as one person from the CNA pointed out.

5.5 Alliance-building

One of the key outcomes of the two workshops was the decision by participants to form the Mayab Clean Water Network. At the time of this case study, the network existed primarily in name, as there was no funding available, and little had happened since the April 2004 meeting. Still, participants saw the establishment of the network as a key step. As CEA's Director commented, "The workshop and the decision to create a network gave us more structure and a clearer role. We know that if CEA is going to be the coordinator, we need to be out there, doing our own fundraising to get this up and going." Ana Lillia Córdova, Grupo Xcaret's sustainable development coordinator, sees the workshops as important steps for bringing people together and creating alliances because they can now demand more as a group than they can as individual actors. It also helps them become more professional. She remarked, "Some of us act from the heart, but this helps us become more professional. We can unify our visions for the watershed." The diverse nature of the group could become a key strength in helping the unified agenda they develop to effectively reach several different sectors, including the conservation community, tourism industry, academia, government policymakers, and local communities alike.

Alliance building is also occurring through interactions among members and committees within the Yucatan Peninsula Watershed Council. For example, ASK has been involved with the Watershed Council primarily through participation in two of its technical committees: the Specialized Group on Sanitation for the Northern Zone of Quintana Roo and the Playas Limpias (Clean Beaches) Committee. ASK staff feel the water valuation meetings were instrumental in helping them secure their own participation in the Yucatan Peninsula Watershed Council. Given the central role of watershed councils to water resource planning, use, and preservation, it is key to have those promoting a watershed valuation process participating in the watershed councils and their committees.

One ASK representative felt that there was an opportunity for stronger coordination among the Yucatan Peninsula Watershed Council members who are focused on water for human uses and the municipal ecological land use zoning committees which are focused on water conservation and preservation. The groups are interested in water resource use, but they do not coordinate their work. ASK is a member of the Watershed Council and the Ecological Land Use Zoning Committee for the Solidaridad and Benito Juárez municipalities (CEA is also a member of the latter committee). ASK hopes that its dual membership in these two groups will help improve the coordination and collaboration between them. They also hope to encourage the Watershed

Council to take a broader perspective and consider water not just in terms of human uses but also in terms of its biological and conservation importance.

5.6 Achievements in the Planning and Alliance-building Process

Interviews reveal that the biggest achievement to date has been the ability to bring disperse groups together to work on watershed matters relevant to all. Stakeholders now have a stronger sense of what is happening in the watershed, and they know who is doing what. They also have access to various studies and reports compiled on a CD that was a product of the November 2003 workshop. One respondent indicated that “the information on the CD is very broad and very serious [meaningful], and it represents a very useful compilation for awareness raising, training, education, communication and research. Furthermore, it sets an important precedent of collaboration among social and government institutions on the issue of water.”

The participants in the April workshop, which included more than 20 representatives from NGOs, government agencies, businesses, and research institutions, also agreed to form a watershed network known as the Mayab Clean Water Network (Red de Agua Limpia del Mayab). According to CEA, the network’s goal is to protect and restore regional watersheds through advocacy, sustainable development planning, education and outreach, community participation, nature conservation and protection, and research – all with a focus on proper waste management to prevent point source pollution. CEA has assumed a coordination role for this network. At the time of the case studies, the network had not initiated any activities, but it had submitted a proposal to Swiss agencies to help support the network. Since this time, there has been some greater activity within the Network, including the establishment of an Internet-based discussion group, the involvement of new actors and the definition of clearer goals. One new actor, CEMDA (Centro Mexicano de Derechos Ambientales) has become actively involved in the Network coordination, designating a staff person to take on responsibility for coordinating meetings.

5.7 Challenges in the Planning and Alliance-building Process

5.7.1 Lack of clarity regarding roles

While the workshops created a lot of enthusiasm and most actors felt they had been a very important step, they also brought some uncertainties and lack of clarity. One person mentioned that the April 2004 workshop was essentially a repeat of the November workshop and that it should have gone further to prepare stakeholders to more fully engage in the watershed valuation process. Another person remarked that they had high hopes for the watershed valuation work but they felt that TNC had not provided adequate follow-up support to keep the momentum going. “There was a lot of stirring things up, but then there was not a decision of what should be done next.” Moreover, it was not really clear to them what the role of TNC in Arlington was versus the role of TNC in Merida or whether TNC was committed to continuing this watershed valuation work in the future. A few people mentioned they were disappointed that TNC had cancelled its water valuation activities and were confused as to what TNC’s role in water valuation would be in the future. One person also acknowledged that their organization, as well as others involved had not fulfilled their roles either, for a variety of reasons (e.g., lack of funds, limited staff, work overload, etc.). In general, it seems that the workshops provoked some

interesting discussions, but, in the end, each organization returned to doing its own thing. Although next steps were identified in the last meeting, it is not clear where the watershed valuation process is going in the future.

A somewhat similar issue is the lack of clarity about the roles and the objectives of the many different governmental groups working on water issues (SEMARNAT, CNA, municipalities, etc.). One interviewee mentioned that no one really knows what their different functions are, and this is something that they need to clarify in order to be able to most effectively interact with these stakeholder groups.

5.7.2 Limited resources

Several people noted that one of the biggest obstacles to moving the watershed valuation process forward was the lack of funding. One person felt the workshops were helpful in building capacity in watershed valuation methodologies and in sharing information and jointly prioritizing problems, but he also acknowledged that, “The majority of actors need logistical and operational capacities, which implies teams, infrastructure, and financing.” CEA and ASK had both prepared and submitted proposals that would help provide greater logistical support for watershed valuation activities, but, at the time of the drafting of this case study, the proposals were still in the review stages. ASK has since received support from UNESCO to sort through and organize the information on the CD from the November 2003 workshop, to continue work with the Mayab Clean Water Network, and to push integrated watershed management and water conservation issues in private and government sectors.

While the establishment of the Mayab Clean Water Network was an important symbolic step, virtually no action has happened since to operationalize this network. As mentioned above, funding has been a key limitation and is something that CEA is currently trying to resolve with its proposal to Swiss Re (see Project Objectives and Strategies section). A related challenge is the limited staffing available to CEA. Coordination of this network requires at least 30% of someone’s time – a resource CEA cannot afford to dedicate toward the network without additional financial support.

Limited resources – including staff time and funding – are a common constraint to the involvement of any of the actors in the watershed valuation process. Those involved in the watershed valuation process in Quintana Roo are also committed to several other activities. Their agendas are completely full. As one interviewee put it, “We’re all over-worked.” The watershed valuation process is just one of many priorities, and given it is currently an unfunded mandate, it is not something to which TNC partners can presently dedicate the staff needed.

Despite these challenges, there have been some promising signs since the case study visits. As mentioned above, ASK received UNESCO funding which will be critical to supporting work in the watershed. Moreover, CEA and Grupo Xcaret have continued their commitment to the Mayab Network, while other actors such as CICY (Centro de Investigación Científica de Yucatán, A.C and CEMDA (Centro Mexicano de Derechos Ambientales) have become active and enthusiastic participants. Since April or May of this year, the Network members have started meeting more regularly, better defined the Network’s goals, and are currently working to define potential group projects and participant roles.

5.7.3 Diversity of actors

Another potential limitation that was not directly raised in most interviews is the diverse nature of the network. This network was formed by all participants in the April meeting with the agreement that all would be equal members. Although it is ideal to have representation from various sectors, it seems the network might be so large and diverse as to make it very difficult to move watershed conservation forward, unless all actors share a clear and common vision. Even with that vision, the sheer logistics of coordinating this network may prove to be an obstacle for moving forward. As one partner remarked, “The more cooks there are, the harder it is to cook.” On the other hand, the diversity of actors could end up being a strength of the network, especially if they are able to use network members to channel their watershed conservation messages out to their respective industries or sectors.

6 Implementation of Conservation Strategies

Watershed valuation activities are still in their infancy in Quintana Roo. Each organization or actor is doing their own thing, and only recently have they come together to learn more about what one another is doing. As such, the group has not implemented conservation strategies as part of a broader watershed management initiative. Still, each group has had some experiences in different areas that are key to TNC’s watershed valuation process (public outreach campaigns, water user fees, watershed management policy, and best management practices). Here, we have summarized some of those experiences and lessons, but, again, it is important to stress that these are separate activities undertaken by different actors and are not currently part of a strategic, collaborative effort.

6.1 Public Outreach Campaigns

6.1.1 Public Outreach Activities

Conservation actors in the state of Quintana Roo are doing a lot of work in public outreach, although most of this is done at an institutional level rather than as part of the watershed valuation process. For example, ASK has its own environmental education department and has done environmental education in Quintana Roo. They are also presently working closely with landowners to implement the Sian Ka’an Biosphere Reserve’s ecological zoning plan and to inform them of private land conservation tools like conservation easements and the conservation buyers program. Likewise, Xcaret has helped raise awareness among its workers, tourists, and schoolchildren by using the reserves it manages as teaching centers.

Along with ASK, CEA has been working with fishermen in Playa del Carmen to talk to them about the importance of SKBR for reef conservation, management of fish stocks, and mangrove management. Both organizations are working together to help them understand that tourism impacts fish stocks through its effect on the demand for fish. CEA also does some minimal outreach with hotels, tourists, and local schools and would like to start playing a stronger role in environmental education and working more with tourists in particular. As CEA’s representative stated, “Everything here is done for the tourist.” Tourists, therefore, need to become more aware of their impacts so they can have the option of making more responsible choices.

The Comisión Nacional de Agua sponsors a Mexico-wide environmental education program that is specific to water issues. The program is known as Cultura de Agua (Water Culture) is

implemented at the municipality level and is available to anyone who is interested. The overall objective is to help people understand the services that watersheds provide, to instill a greater sense of value for these watersheds, and to encourage wiser use of water. One of the big problems CNA sees is that the price of water does not correspond at all to its true price and value. Thus, they hope that their awareness raising programs can help people begin to appreciate the true value of water.

6.1.2 Effectiveness of Public Outreach

For the most part, those interviewed were not able to provide concrete evidence of the effectiveness of their public outreach. ASK and CEA personnel mentioned they had seen increasing interest in watershed management issues, and that the momentum seems to be growing. This is not necessarily a direct result of the workshops they have hosted, but they feel the workshops do add to the momentum. Xcaret felt the impact from their environmental education activities was evident in the projects that schoolchildren undertake while visiting their reserves. CNA's representative stated they have not been able to develop an adequate evaluation method to see if the people they reach have changed their attitude as a result of their Cultura de Agua or other outreach activities.

One of the greatest challenges to watershed public outreach in the Yucatan Peninsula and Quintana Roo is the nature of the watershed itself. People cannot see the water. Even if they know there is subterranean water, they are not aware of the intricate networks, how they flow, and how they influence water quality or are affected by water contamination.

6.1 Water User Fees

At present, there is not a water user fee system in the Yucatan Peninsula or Quintana Roo. To date, the issue of water payments has not been a central emphasis of the groups involved in water valuation activities in the region. Instead, the actors have focused on a more general approach to water conservation that has included addressing scientific, legal, political, and educational matters.

For the most part, however, those interviewed were interested in the potential for an environmental services payment mechanism. They see it as a good opportunity to raise awareness about the true costs and value of water and to generate funds for important conservation areas. This, however, was still in a very exploratory phase, with organizations considering where it might be feasible to implement such a system. One potential area is in the north of Quintana Roo, an area that is an important water source for Cancun. ASK hopes they might be able to work with the North American Wetland Conservation Council on this. One interviewee did express skepticism about the potential for establishing a water user fee mechanism. He felt the idea was good in theory, but "it could take years to implement something like that. By that time, the whole coast would be developed...It's noble, but anytime they raise the water prices here, they create waves...Water is so tough because everyone feels it's their God-given right to have water."

According to Jorge Luis Basave, an ASK representative, they are not considering the area surround Sian Ka'an because the government already has an environmental services fee program just north of Sian Ka'an. With funds collected for water fees by CNA, the Comisión Nacional

Forestal (CONAFOR) is paying landowners with forest cover 400 pesos (approximately US\$35) per hectare per year to keep their land in forest.¹⁸ People interviewed for this case study saw this program as providing subsidies, not environmental service payments. There is no awareness raising, and there is no connection between the water user and the beneficiary. As one person remarked, “CONAFOR does not understand the fundamental logic behind environmental services payments.” People in Chiapas, the site of a separate case study, expressed similar concerns with the CONAFOR payment scheme. They felt CONAFOR had not strategically chosen the areas to include in the program. They chose forested areas without considering whether they are important water catchment areas. Like those in the Yucatan, the Chiapas interviewees did not see this type of fund as being mentally compatible with a water user fee system, which should help raise awareness about important environmental services provided by watersheds and require users to pay for those services. CONAFOR’s program pays landowners not to cut their forests, without making a direct connection to the environmental services they provide. Landowners do not learn to value the forests’ or water’s environmental services, and they receive money rather than pay money for services. This may make it difficult to later ask landowners to pay environmental service fees. One interviewee faulted the system because he said people were being paid just because they had forests – not because they were pro-actively managing or protecting them. A further concern was that CONAFOR’s program is only scheduled to last for five years and does not include provisions for developing an environmental services payment mechanism beyond the five years. TNC and its partners working in Chiapas are worried about what will happen once that time period expires and people no longer have the economic incentive to stop them from cutting down their forests.

Although a water user fee system does not yet exist in Quintana Roo, people have some ideas about how it should be managed if one were established. One person felt that any environmental services payment scheme should begin as a small pilot project to test its feasibility. In terms of who should pay for water services, some people thought the most feasible and profitable option would be to direct the fees to the tourism sector. Tourism industries benefit enormously from watershed services, and it is in their direct self interest to maintain high quality water in sufficient quantity. One respondent suggested that the costs could easily be passed off to tourists as part of a tourism tax. Another thought that, if tourism industries were to pay into such a fund, it was more likely that the money would go to treat water (the greatest threat to the area is contamination) rather than to protected area management. Some people thought it would also be feasible to charge local populations, but first they must have good quality water service and sanitation. There also would need to be education so that they understand why water costs so much. One interviewee found what they pay for water as “scandalous,” but acknowledged that many people would be initially reluctant to pay more than they already do. Finally, another person took a much broader view, suggesting that, in addition to users (including industries and local populations), institutions like CNA, CAPA, the Mexican government, the United Nations Development Program, and the Global Environment Fund should pay into the fund. If this were the case, it would be more of a water conservation fund to which water user fees would only contribute a small portion.

¹⁸ Since the original draft of this case study, CONAFOR has also started paying landowners for biodiversity conservation and carbon sequestration, under a similar payment scheme.

In terms of who should manage the funds, one interviewee felt that there should be a decision making process with all the major stakeholders involved. They remarked, “Everyone should realize the importance of conserving the aquifer. If everyone is in agreement, great, we can move forward. But, we should not impose a mechanism. Without a debate or the inclusion of everyone, we are going to create chaos.” One respondent felt that the Yucatan Peninsula Watershed Council should establish a technical group to manage the fund but that decisions should be made within the Council. He, however, felt that, under this scenario, the Council should truly represent various sectors, including businesses, government, academia, NGOs, social organizations, farmers, women, indigenous groups, etc. Another person felt the money should go into a trust fund, but it should be set up at the local level, not the state level. He felt that there would be no trust if the money went out of the state. He also felt it would be important to clearly identify where the money was going.

6.3 Watershed Management Policies and Governance Structure

Much of what ASK, CEA, Grupo Xcaret, and other conservation actors have been promoting to date is with the implicit goal of engaging policymakers and influencing watershed management policies and governance. The Alliance Building section under Planning and Alliance Building Process discusses progress in forming the critical alliances to more effectively influence policies. Here, we highlight some specific activities, achievements, and challenges in engaging policymakers and developing policies and a governance structure. For more details on specific alliances, please refer to the earlier Alliance Building section. It is important to clarify that not much of this policy work is the result of individual organizations or collaborating organizations that are trying to influence watershed conservation on their own. In many cases, these actions are not necessarily part of a strategically crafted water valuation process.

6.3.1 Engagement of policy-makers

Conservation actors in Quintana Roo have a few primary avenues through which to engage and influence policymakers, the most important of which include: the nascent inter-institutional and inter-sectoral alliance formed through the Mayab Clean Water Network; the technical committees that help inform the Yucatan Peninsula Watershed Council’s decision making process; and the ecological land use zoning committees.

According to a couple of interviewees, a key factor to the successful engagement of policy-makers has been having the TNC name behind the water valuation work. One interviewee stated, “We need to have TNC involved, it’s so important. We’re up against multi-national hotel chains. They can hire a biologist to do an EIA [environmental impact assessment] to say whatever they want it to say. We cannot react quickly enough. TNC’s credibility boosts our credibility.” This person felt TNC’s name was critical to helping organizations like ASK, CEA, and CINDAQ secure advisory or membership positions with the SEMARNAT’s consultative council, as well as the Yucatan Peninsula’s Watershed Council.

One factor that conservation actors in Quintana Roo hope will help them influence policy is the overlap in membership among several committees. For example, ASK is part of the Yucatan Peninsula’s Watershed Council, participates in two of its technical committees (the Clean Beaches Committee and the Specialized Group on Sanitation for the Northern Zone of Quintana Roo), and also is a member of the ecological land use zoning committees for the municipalities

of Solidaridad and Benito Juárez. This breadth of participation, combined with the potential power behind the Mayab Clean Water Network, will likely put ASK and other conservation partners in a strong position for influencing policy.

Already, there has been some diffusion of information. Representatives from ASK and CEA have presented results from the November and April workshops to the Yucatan Peninsula Watershed Council. ASK and CEA also intend to present the workshop results to the Ecological Land Use Zoning Committee for the Solidaridad and Benito Juárez municipalities. At the time of this case study, Grupo Xcaret, ASK, CINDAQ, and CEA were preparing for a meeting with the Solidaridad municipality, which had developed a city plan for Tulum without taking into consideration any of the existing ecological information about the area. This situation motivated Grupo Xcaret to set up a meeting with the municipality to inform them of all the watershed studies and information available, with the hopes that they would reconsider their city plan to make it more ecologically compatible. The meeting, as well as the change in administrations from the October 2004 elections, led to a pause in Tulum's urban development plan. The plan is currently under revision. ASK, CEA, and other groups such as CEMDA continue to be involved in the revision of this plan and have met with new state authorities to discuss the plan and provide technical information related to the watershed.

Because the representatives participating in the Mayab Clean Water Network come from a variety of sectors, there are unique opportunities to influence policies and actions beyond the governmental realm. The most obvious example is the potential to lobby the tourism industry and influence the way that tourism happens. Right now, one of the greatest threats to Quintana Roo's watershed is the exponential growth of mass tourism that pays little regard to environmental impacts. One of the most active and passionate members of the Mayab Network is Grupo Xcaret, a sustainable tourism operator. Grupo Xcaret has tried to be a model for socially and ecologically responsible tourism. Xcaret's involvement in water and environmental issues in general is extensive. Aside from their institutional commitment to ecological tourism, they have also tried to bring in other groups by hosting meetings on social and environmental responsibility for tourism operators, participating in the Solidaridad's Solid Waste Committee, and actively lobbying municipal governments to consider ecological issues in their planning. Ana Lillia Córdova, Grupo Xcaret's sustainable development coordinator, hopes that some of their activities will motivate other tourism operators to partake. Currently, she sees the most interest coming from Mexican hotel owners because they realize the rapid pace of mass tourism development is a long-term problem. In contrast, most of the hotel chains simply comply with the basic restrictions of Mexico's Secretary of Environment and Natural Resources (SEMARNAT). One national chain, Cadena Palas, has realized their investments are at risk and is trying to create their own environmental monitoring systems. The owner of the Cadena Palas is also the president of the hotel association so Ana Lillia Córdova hopes the interest in environmental conservation and social responsibility will spread. She also hopes that pressure from business interests overseas will help persuade tourism operators to make their businesses more environmentally and socially responsible. For example, the Travel Foundation, a partnership between the UK outbound tourism industry, NGOs, and the UK government, has recently decided they want to be involved only with sustainable tourism in Mexico.

One challenge related to policymaker engagement has been getting key authorities and decision makers to attend workshops. The November workshop had fairly good representation from such authorities, while participation in the second workshops was limited. According to a couple of interviewees, those authorities who do come do so because of personal interest rather than an institutional commitment. Those interviewees see this lack of participation as stemming from a lack of vision, commitment, and training. They hope to try to attract one key person (UNAM's rector was mentioned as a possibility) who would be able to bring others on board.

Another potential challenge is the October 2004 elections. Mayab Network members and other conservation actors need to consider how they will approach the new government on watershed management. As Paul Sanchez Navarro commented, "There will be all new employees. We need to have a strategy ready for them – a sales pitch to get them on board." Other interviewees recognize this will be a recurring issue, as municipal elections are held every three years and federal elections every six. Because the watershed valuation work is in its nascent stage, the change in government may not have a dramatic impact on efforts to date. In fact, Sanchez Navarro sees it as a potential opportunity because they will have time to work with the incoming administration before they take office.

6.3.2 Development and enforcement of laws/policies

ASK's main area of progress on the development and enforcement of laws and policies is with the ecological zoning plan for Sian Ka'an Biosphere Reserve. In Mexico, an ecological zoning plan involves the evaluation, programming, and legislation of land use and natural resource management in order to promote sustainable use and to optimize how land is used for agriculture, cattle ranching, forestry, fishery, tourism, urban and industrial purposes, and resource conservation and preservation. According to an ASK report, the ecological zoning plan is one of the most important policy tools in Mexico, and the progress they have made will help them implement private lands conservation strategies for SKBR's coastal zone, an area that faces heavy development pressure. Although they have made progress with this legislation, ASK must continue to stay involved and provide information for informed decision making. ASK also reports that they need to clarify the roles and responsibilities of public institutions that will implement the ecological zoning plan and train staff in governmental agencies to apply the plan for SKBR. They plan to use funding from the UNESCO project to help them establish a committee for follow-up and enforcement of the plan and to help publicize the plan to those living or working in the area.

ASK and other NGOs, governmental organizations (from the 3 levels of government), state colleges, and private developers have also been involved in the ecological zoning plan for the Cancun-Tulum corridor, an area also known as the Mayan Riviera which runs north of the Sian Ka'an Biosphere Reserve up to the city of Cancun. The area had a plan approved in 1994 that was so problematic in its implementation that, in 1996, various parties requested it be revised. It is still currently in the revision process. Although this process involves participation from municipal, state, and federal government agencies, NGOs, academics, and landowners, it has been subject to intense pressure from developers who want to maximize the number of hotels and rooms that can be built. As discussed earlier, ASK sees an opportunity in the revision process to present information they have compiled through the two workshops and that has come from studies by the Centro de Investigaciones del Sistema Acuifero de Quintana Roo (CINDAQ)

to map subterranean waterways neighboring Sian Ka'an Biosphere Reserve. They hope this information will help convince others of the need to limit tourism development in the Mayan Riviera. According to CEA, however, watershed conservation actors have faced a huge struggle to maintain the protection this ecological zoning plan affords for watershed management, much less defend any increased protection the conservation community would like to see.

Finally, CEA has been working with water authorities on water and sanitation issues. They hosted a seminar in which they presented several recommendations that will serve as the basis for a formal legislation proposal. Since the seminar, CEA has been working closely with water authorities on tertiary treatment to reduce the nutrient levels which are currently suffocating the reef outside of Akumal (a town just north of Sian Ka'an, along the Mayan Riviera). CEA's Director mentioned several elements he felt were critical to address in local water policies: 1) Tertiary treatment that goes beyond just treating pathogens; 2) Norms that would prohibit deep injection wells; 3) Transparency on water quality so that the general public can have access to information on the quality of their water; and 4) Larger budgets for state implementing organizations like PROFEPA (Procuraduría Federal de Protección al Ambiente), which is in charge of enforcing environmental regulations.

The actions described above are limited to the main actors in the Quintana Roo watershed valuation process. It is highly likely, however, that many other groups are working on water laws and policy development. At some point, the Mayab Network may want to identify what efforts are already underway and identify gaps to help prioritize work for the future.

6.3.3 Development of governance structure

At present, the official governance structure for watersheds in Mexico are the watershed councils, which may cover several watersheds, and the watershed committees, which may focus on one watershed or sub-watershed or a specific technical issue. Earlier sections have more detailed information on the role of the watershed councils and committees. Some of those interviewed thought it was important to have these bodies, although some people did not feel they were as effective as they could be. One person felt the councils and committees needed more institutional strengthening and that they should be more involved in awareness raising among users. Another person felt it was important that there should be an interdisciplinary technical committee that interacts closely with the Yucatan Peninsula Watershed Council and helps them generate and apply watershed conservation activities.

Since this case study was developed, Mexico's Federal Water Law changed, and according to Jorge Luis Basave (ASK), the new definition and roles for the watershed councils are still not very clear, since the operational rules have not yet been published. Nonetheless, he feels the civil society is likely to have a greater role in decision-making processes under the revised law.

6.3.4 Effectiveness of laws, policies and governance structure

According to a couple of interviewees, Mexico already has the strong laws and policies it needs to effectively manage its watersheds, but no one obeys them. Part of the problem, one respondent claimed, was due to Mexico's restructuring of its public administration offices and its subsequent personnel reduction – a cutback so severe that many organizations are unable to comply with their mandates. Moreover, Mexican law does not provide adequate conditions for

strong enforcement. There are so many different authorities with narrowly defined jurisdictions that, if there is an infraction against an environmental law, for example, local authorities or police officers are unable to enforce the law because it is outside of their legal jurisdiction. Those with the authority though, are unlikely to be present at the necessary time to enforce the law. Despite the strong laws and policies, one person felt that a major flaw with the legal system is that it does not offer incentives to encourage innovative or improved water and wastewater management, but rather it supports traditional chemical-based treatment methods that are often not appropriate for shallow aquifer ecosystems.

Conservation actors in Quintana Roo and the Yucatan face another unique challenge in terms of law and policy effectiveness. Although Mexican water laws and regulations are fairly strong, they are generally not relevant for the Yucatan's watershed because of their unique underground nature. Mexican standards are developed for conditions in the middle of the country, not for coastal areas with subterranean watersheds. The unique ecological conditions also make it difficult to effectively communicate with policymakers. For example, according to CEA's Director, most authorities do not agree on how saltwater intrusions happen or when they happen. They do not have a full understanding for how dynamic the system is. He feels it is important to increase efforts to educate government officials on the hydrology of the area so that they are better prepared to make informed decisions. A priority for the region, according to ASK personnel, is to make the official water quality norms stricter or, at a minimum, acceptable for the local conditions.

6.4 Best Management Practices

Given the nascent nature of the watershed valuation process in Quintana Roo, we did not explore in depth best management practices they were implementing as part of that process. Partners did, however, mention a few select activities in which they were involved. In the following paragraphs, we provide brief summaries of these for illustrative purposes.

6.4.1 Demand reduction best management practices

For the most part, organizations in Quintana Roo are not focusing on demand reduction best management practices. The overall perception is that water quantity is not a major concern right now. The bigger concern is water quality. Still, those interviewed recognized that hotels use a massive amount of water and that there is an opportunity they may be missing. One ASK employee indicated water quantity may already be a concern, as some aquifers are showing evidence of increasing salinization. Another respondent felt they needed to get a better understanding of how much water is used to understand if it should be a concern.

Grupo Xcaret and the Comisión Nacional del Agua do some work on water and energy efficiency. For example, Grupo Xcaret uses its environmental education programs to get out messages to tourists, school children, and other visitors about the importance of caring for and using water wisely. The Comisión Nacional del Agua provides financial support for a program that promotes water saving practices and improved irrigation systems. Companies that offer energy or water efficient technologies can apply to CNA for financial support. CNA also provides subsidies to producers who use these technologies.

6.4.2 Water treatment best management practices

One of the greatest threats to Quintana Roo's watersheds is the completely inadequate sanitation system. According to CEA's Director, there is no proper infrastructure to deal with wastes. Instead, pollutants directly enter the waste stream. This, combined with the rapid pace of development, is causing much concern among conservation organizations. Again, conservation actors are taking some discrete actions, but there is not, as of yet, a strategy that has been put forward as part of the watershed valuation process.

The Comisión Nacional de Agua works with hotels and industries to monitor their wastes. Every three months, the companies must do a groundwater analysis and present it to CNA. They are fined if they do not respect the norms. If needed, CNA will also work with them to change their treatment systems to be able to meet CNA standards. According to one interviewee, CNA and CAPA (another governmental water agency) are quick to work with the private sector, but their work to ensure adequate wastewater infrastructure for local communities or poorer neighborhoods is lacking.

As part of their sustainable tourism operations, Grupo Xcaret has been working on reducing, recycling, and/or treating the solid and liquid wastes it generates. For example, the Xel-Há reserve it manages has three water treatment plants that effectively treat water without the use of chemicals. They use the treated water for irrigation and watering greenhouse plants. Likewise, both Xel-Há and Garrafón reserves have solid waste management programs and recycling centers.

Finally, CEA has been working with local government authorities to improve sanitation laws and policies. As previously mentioned, they hosted a seminar in which several recommendations emerged that are to be included in formal legislation. They have also been working with water authorities on tertiary treatment to reduce the nutrient levels which are currently suffocating the reef outside of Akumal. In addition, they have promoted alternative wastewater treatment and composting to reduce groundwater contamination. CEA feels it is very important to work with policymakers to help them understand how dynamic the watersheds in Quintana Roo are and that the Mexican norms for hydrology are not appropriate for the region's ecology. CEA's director feels it is important to look at the sanitation problem from a human health perspective as well. People are not thinking about water issues in terms of human health costs and increased diseases, but this is ultimately going to have an important economic impact on the region.

7 Lessons Learned

TNC partners and collaborators working in Quintana Roo have made important progress in the initial watershed valuation process. They have brought together a diverse range of actors and facilitated agreement on a common vision for the Yucatan Peninsula's watershed. This is no small task. It is still too early to determine where the watershed valuation process will go, but if the partners are able to secure financing for key initiatives like the Mayab Clean Water Network, they will be off to a good start.

In this section, we summarize the main lessons learned that people identified – explicitly and implicitly – from the process to date.

7.1 Greater clarity on roles and next steps is needed

Organizations participating in the November 2003 and April 2004 workshops were very enthusiastic about the possibilities of starting a watershed valuation process. They felt that water was the key issue in the Yucatan Peninsula, yet so little was known about the region's hydrology, and the policies and laws were inadequate for the local situation. The workshops helped various actors learn about what was going on in the Yucatan's watersheds and agree on a common vision for the peninsula. People were eager to dive into a water valuation process and were excited to have the TNC name behind the initiative. A common complaint voiced about the process, however, was the lack of clarity regarding institutional roles and next steps. Some people had hoped TNC would play a stronger role in helping get the process off the ground. Follow up since the meeting among TNC and its partners, as well as among the meeting organizers and workshop participants, has been negligible. A lesson one interviewee took away from this experience is that the main actors (TNC, ASK, and CEA) should have met immediately after the workshops to concretely identify how they would move the project forward and to jointly develop a proposal. This would have included clearly identifying roles and expected dates for completing specified activities.

7.2 Use the power of large, international NGOs like TNC to influence policy decisions and engage key groups

A couple of interviewees mentioned that having the TNC name behind the watershed valuation work was a key factor to successfully engaging policymakers: "TNC's credibility boosts our credibility." Moving forward, Quintana Roo partners should work closely with TNC representatives to identify how to use TNC's reputation and resources to help them keep key groups engaged. This could be one of the outputs related to the first recommendation above.

7.3 Financial and staff resources are needed to sustain momentum early on

One of the main obstacles to following up on the two workshops has been the lack of available funding and staff time. The organizations participating in the workshops are already overloaded with work and, while they might fully believe in and support a watershed valuation process, practical realities do not allow them to dedicate time to this unfunded mandate. The continuity of follow up is also disrupted by project funding cycles. For example, ASK had some funding to initiate the watershed valuation process, but that funding ran out before they were able to secure additional funding. Consequently, watershed valuation work came to a halt between the cycles. Fortunately, since the case study visits, ASK has received UNESCO funds to help support work in the watershed.

There are also funding concerns for collaborating organizations who participate in workshops but may not be part of a specific project. One interviewee pointed out that, for some organizations, those who participate go because of their own interest and will finance their own participation. That person cautioned that the time may arrive when these participants will not be able to do this any more.

Finally, funding is a concern in broader terms. According to one respondent, “Funding is critical to stay ahead of the game. We are small NGOs up against tons of money and tons of political interest... We need to overcome the fears of developers and their perceived idea that we want to kick everyone off of the Yucatan Peninsula. We need to make sure we have a voice, it’s listened to, and we’re not marginalized. We have to be credible, respected.”

7.4 It is necessary to work with various sectors and stakeholders

Participants in the November and April workshops represented a wide variety of sectors and stakeholders, including representatives from conservation organizations, government water agencies, the tourism industry, community ejidos, academia, and real estate agencies. Most people interviewed felt it was important to cast a wide net and take into account the opinion of all stakeholders. By working with a wide range of actors, people felt it would make it easier to achieve consensus – or, at the least, develop a vision that is closer to reality. They also felt the wide participation provided credibility to the process. For example, Grupo Xcaret’s involvement boosts the credibility of the watershed valuation process and its partners and provides a direct link to the tourism sector. Likewise, TNC’s support of the work has provided legitimacy and credibility that has helped organizations secure key advisory positions with boards and councils concerned with watershed management.

Although most people felt it was important to have a diverse set of actors, some recognized that this diversity makes it more difficult to manage the group. Sam Meacham of CINDAQ suggested that the group might want to consider having various sub-committees that would meet on a more frequent basis rather than trying to regularly convene the group as a whole. He also suggested it may be necessary to narrow down the many interests to a common interest in order to achieve tangible goals.

A few interviewees were also cautious about raising expectations. They said there is always the risk that you hold a couple of meetings, tell people you are going to do all these great things, and then the process ends with the two meetings. In order to avoid this situation, they felt it was important to present very clear objectives to all those involved.

7.5 The tourism industry should be a key target of watershed conservation and valuation activities

The growth of tourism and the development associated with it has been one of the gravest threats to Quintana Roo’s watersheds. Hotel operators and tourists use the greatest amount of water and also are generating a lot of wastes that are contaminating the subterranean waterways. At the same time, the tourism industry represents one of the most – if not the most – powerful political interests in the state and has vast financial resources available to it. Many people suggested it is important to work with tourism operators for several reasons. As just mentioned, they are the biggest users and one of the biggest contaminators. They also should have a strong interest in water conservation, as their tourism depends on clean, plentiful water. Watershed valuation activities people mentioned as important to pursue with the tourism sector include water user fees, watershed conservation awareness and education, and policy influencing.

Through alliances established with Grupo Xcaret, watershed conservation actors already have inroads into the tourism sector. Some respondents recognize the importance of that alliance, but, to have a broader influence, it may also be necessary to reach out to tourism businesses that are more skeptical or less actively interested in watershed conservation, as these represent the vast majority of tourism operators in Quintana Roo.

One interviewee felt it was also important to develop stronger ties with the diving community. This person sees this group as one of the strongest conservation advocates within the tourism sector. Dive companies need healthy waters, coral reefs, and aquatic life to keep tourists coming to Quintana Roo. The respondent felt there was some important political potential within this community that was currently untapped.

7.6 Watershed conservation and valuation require a different approach in unique coastal watersheds like those in Quintana Roo

The subterranean nature of Quintana Roo's watersheds poses a unique challenge. Those living in the watershed and using its resources cannot see the waters that sustain the watershed. If they even know it exists, they do not understand how it operates. This situation makes it difficult to reach policymakers and users alike. Those working in watershed conservation in Quintana Roo have learned that the laws and policies are not adequate for their local situation and that education and awareness raising are key to helping policymakers make informed decisions. Likewise, they have learned that they need to work with local users to help them understand what a subterranean watershed is, how it functions, and how their actions impact it.

7.7 Watershed conservation and environmental service fees should be framed in terms that are relevant to the different user groups

In order to gain support for watershed conservation and, more specifically watershed valuation, CNA's representative, Catherine Magnon, felt it was important to frame watershed issues in a way that is relevant to the user. How a hotel owner, industry owner, and local farmer use and interact with water varies vastly and, consequently, so do their perceptions on water issues. To be most effective, it will be necessary to use different outreach strategies and interventions to reach those groups. This lesson was also identified by many interviewees in a case study on the watershed valuation process in Chiapas.

7.8 Reliable and high quality water service is a prerequisite for implementing a water user fee system

Several people felt that a water user fee system was most likely to work if it targeted the tourism sector. This sector uses the most water and has the greatest resources to be able to pay a water user fee. Some people felt it would also be feasible to charge local populations, but they stressed that these populations must have consistent access to a high quality service. There also would need to be education so that they understand why water costs so much.

7.9 Feasibility studies will be needed if Quintana Roo actors wish to develop a water user fee system

At the time of this case study, there was interest in exploring the option of establishing a water user fee system for the northern part of Quintana Roo. Several isolated studies exist that detail the hydrology, conservation status, and/or threats present, but a systematic feasibility study does not yet exist. If partners want to develop a water user fee system, they will need to know how different stakeholders, especially the general public and tourism industries, would react to the fee system, as well as what would be a reasonable price to charge for water provision. They will also need to be able to demonstrate to these stakeholders the economic and ecosystem benefits associated with watershed conservation to provide incentives for people to willingly participate in a user fee system.

8 Concluding Remarks

Although TNC partners and collaborators in Quintana Roo are just in the early stages of the watershed valuation process, they have made some important progress, especially in developing alliances and in engaging policymakers. They created momentum with the two workshops, which they will hopefully be able to keep going with additional funding received from UNESCO. According to CEA, some short-term funding from TNC is expected by the end of December, which will help to keep the process moving forward. A critical step to maintaining the momentum in Quintana Roo is the launching, in practice, of the Mayab Clean Water Network.

Conservation in general is a difficult undertaking and even more complicated in circumstances like those in Quintana Roo. The rapid pace of growth, the powerful influence of the development sector, and the lack of adequate legislation for the region's ecological conditions pose unique challenges to those concerned with watershed conservation. To confront these challenges, hard work, dedication, and a true commitment are required. These elements are clearly present among TNC's partners in Quintana Roo. We hope the future will provide the circumstances and resources they need to continue their watershed valuation and conservation work.

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List of People Interviewed:

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2. Judith Morales, Consultora, Amigos de Sian Ka'an
3. Paul Sánchez Navarro, Director, Centro Ecológico Akumal (CEA)
4. Ana Lilia Córdova, Coordinadora de Desarrollo Sustentable, Grupo Xcaret
5. Catherine Magnon, Programa Consejo de Cuenca, Comisión Nacional del Agua
6. Sam Meacham, Director, Centro Investigador del Acuífero de Quintana Roo (CINDAQ)
7. Carlos Meade, Director, Yaxche Árbol de la Vida A.C