

**RESEARCH STATION  
DEVELOPMENT AND COMMUNITY  
PARTICIPATION IN CAÑO NEGRO**



July 3, 2002

Sr. Jorge Gamboa  
Sistema Nacional de Áreas de Conservación  
Ministerio del Ambiente y Energía  
San José, Costa Rica

Dear Señor Gamboa,

Enclosed is our report entitled Research Station Development and Community Participation in Caño Negro. It was written at El Ministerio del Ambiente y Energía during the period of May 13 through July 3, 2002. Preliminary work was completed in Worcester, Massachusetts, prior to our visit to Costa Rica. Copies of this report are simultaneously being submitted to Professor Peet and Professor Addison for evaluation. Upon faculty review, the original will be catalogued in the Gordon Library of Worcester Polytechnic Institute. We greatly appreciate all the time and energy that you and the employees of MINAE have devoted to us.

Sincerely,

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Valerie Ambroise

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Kerry Malone

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Aaron Meberg

## **1.0 Introduction**

Choices we make every day are based largely on our needs. Since we as Americans are lucky enough to live in a wealthy country, where most material goods are commonly available, we can afford to be compassionate about the needs of others as well as the special needs of the environment. The residents of Caño Negro Wildlife Reserve, a wetland in northern Costa Rica, are not as lucky. Some are being forced, by economic necessity, to resort to practices that may be labeled by the government as poaching and illegal fishing. Furthermore, additional damage to the wetland comes from outside forces that local residents have little, if any, control over. Deforestation of the environment surrounding and upstream from Caño Negro has caused problems with soil erosion and loss of wetlands in Caño Negro itself. To alleviate the poverty of this community and to protect the fragile wetland environment, a solution must be found that balances both ecological and human needs.

El Ministerio del Ambiente y Energía (MINAE) is now addressing problems of environmental damage resulting from the misfortune of residents in the Caño Negro area. MINAE's main strategy is to develop a biological research station that will not only study the fragile wetland ecosystem but also involve local people in its operations. In this cooperative arrangement, local citizens will learn about how to sustainably manage the reserve's valuable natural resources and thus play a major role in the conservation of those resources. This involvement in the station with its

scientific, ecological concerns should give local residents a new perspective on the Caño Negro environment, as well as very necessary employment opportunities. By giving these people both a greater environmental awareness and economic benefits, the research station will be able to promote ecologically sound management practices throughout the Caño Negro Reserve.

Our project's goal is to create a plan for the development of the Caño Negro research station that will give local residents both educational and economic benefits as well as provide researchers with a suitable research environment. These plans include the effective use of existing facilities and equipment as well as the identification of any new facilities and equipment that may be needed. MINAE realizes that without the support of the local community the station will never reach its full potential. As a result, the main problem MINAE wants to solve is finding a way to productively involve the community in the operation of the research station. We have identified ways to promote greater environmental knowledge about Caño Negro among local residents, staff, and scientists while facilitating a scientific and economic partnership dedicated to finding better ways to manage the ecosystem. This relationship should encourage an exchange of knowledge between scientists and local residents, who would both benefit from such interaction. We have learned from the processes and techniques used by other successful research stations in Costa Rica that in order for the station to prosper there must be a harmony between scientific research and community education that will in turn have a lasting impact on the environment.

In order to achieve this goal, we have pursued two main objectives. Our first objective was to determine what a biological research station needs in terms of basic facilities, equipment, resources, and services, as well as what types of research might be carried out in the Caño Negro Wildlife Refuge. Our second objective was to identify how to most effectively involve the local community in the activities of the station. We have determined possible roles local residents can fill within the station, as well as activities that will build a mutual confidence, respect, and friendship among all participants.

The work we did in Costa Rica involved investigating successful biological research stations, including La Selva and Palo Verde, where we observed and interviewed the available administrative and scientific staff in order to determine how a biological research station should function and be maintained and how the local community can fit into the research station's operation. We also spoke with local residents of Caño Negro to determine possible advantages and disadvantages the future station would create so that advantages could be enhanced and disadvantages minimized or avoided. This gave us a better understanding of what the area and its population needs and what the stakeholders expect. Using this information, we believe we have created a plan for developing the research station that would beneficially involve the people of Caño Negro.

Finally, having designed a plan, we had to investigate ways to fund it. We looked for aspects of the wetland reserve and station that could be easily promoted internationally and identified possible sources for funding. We knew Caño Negro's distinctiveness as a wetland, as well as a program that pursues community

involvement, would be of interest to international agencies seeking to combat the degradation of the earth's environment as well as improve social conditions.

All the problems of poverty, poor education, and environmental stress may not be completely resolved in Caño Negro for sometime to come. The development of this research station will be a way to offer people of the area other economic options than those that are destructive to the refuge's environment and at the same time enhance their role as responsible stewards of Earth's fragile natural ecosystems.

## **2.0 Background Information**

### **2.1 Republic of Costa Rica**

Costa Rica is a Central American country with an enormous variety of plants, animals, and ecosystems. It is located between Nicaragua and Panama and has a total population of approximately 4 million people and a total area of 51,100 square kilometers, a little smaller than the state of West Virginia (CIA -World Fact Book, 2002).



**Fig. 2.1 - Map of Costa Rica (CIA, 2002)**

Of the total area, 12,000 square kilometers are forests and 13.7% is government-protected land. The country boasts 205 mammal species and 600 varieties of birds (The World Bank, 2000 p.69). Costa Rica is also home to 4% of the world's plant species, with 9000. The climate ranges from tropical to subtropical and the rainy season extends from May to November.

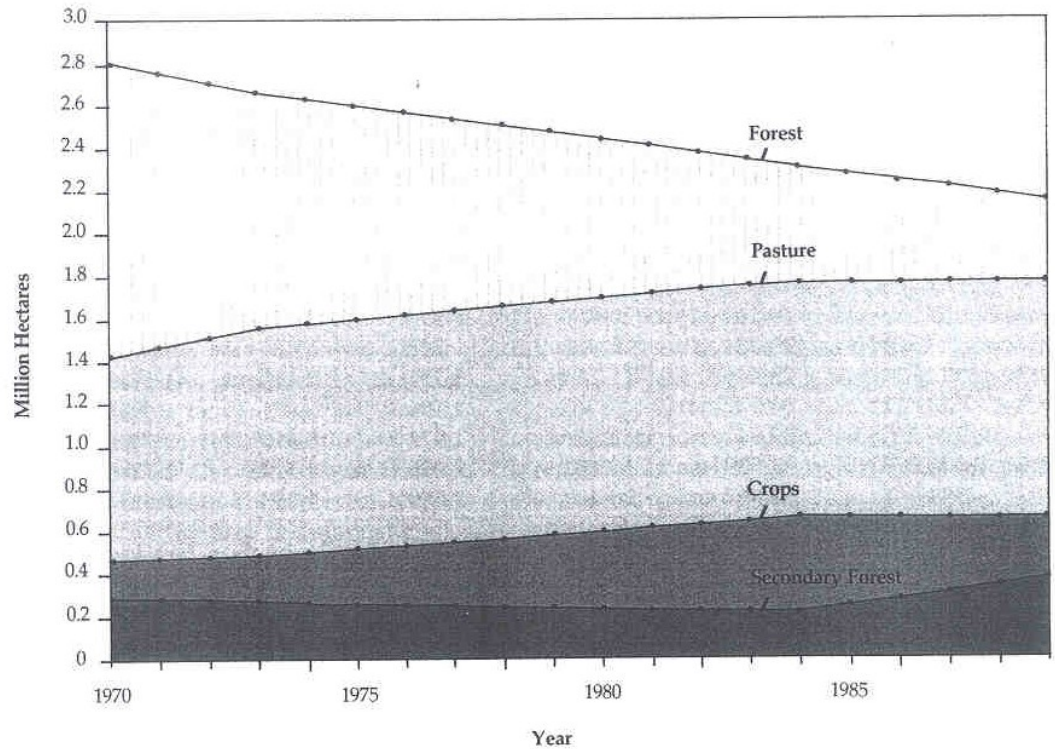
The terrain varies from mountains to plains and dry forests to wetlands (Evans, 1999 pp. 1-10). The three main mountain ranges in the country are the Central, Guanacaste, and Talamanca cordilleras. There are also five major geographical areas: Central Valley, Northern Wet Caribbean, Dry Pacific, Southern Wet Pacific, and Southern Wet Caribbean.

The natural resources of Costa Rica have been steadily decreasing. In 1970, 2.8 million hectares of Costa Rica were in forests. By 1989, only 2.2 million hectares remained. As Solorzano et al. (1991) state, "The history of Costa Rica's forests has been one of lost opportunities and destroyed potential"(p.11). Deforestation has increased due to liberal land tenure laws, and a high population growth rate. The annual deforestation rate is 3% (The World Bank, 2000, p.69). This decline of woodlands can be seen on the following graph (See Fig. 2.2). Pastureland for cattle ranching has increased steadily as government has favored this type of agrarian enterprise.

To protect the land from further deforestation and destruction, the government has set up areas of legally protected land (Evans, 1999, pp. 1-10). The National System of Conservation Areas (SINAC), a division of the Ministry of Atmosphere and Environment (See Appendix A), manages the Costa Rican Park



System and is especially interested in preservation of wetlands. The total area protected makes up 28% of the area of Costa Rica.



**Fig. 2.2 - Land use in Costa Rica, 1970-89** (Solorzano et al. 1991, p. 13)

Many of the Costa Rica's wetlands are internationally recognized because they are part of The Ramsar Convention. Section 2.3 discusses in greater detail the work Ramsar does and why it plays such an integral role in the preservation of wetlands worldwide. Table 2.1 shows how the protected lands are divided in Costa Rica.

Costa Rica is the least impoverished country in the third world (Evans, 1999, pp. 1-10). It has the highest per capita income in Central America and one of the highest literacy rates in the world. It also leads Central America in elementary and

higher education. Costa Rica has the best federal health coverage in the Western Hemisphere and has a life expectancy of 74 years.

**Table 2.1 – Protected Areas in Costa Rica** (Evans, 1999, p. 10)

<b>Designation</b>	<b>No. of Acres</b>	<b>% of Total</b>
National Parks	1,336,196	37.7
National Monuments	3,624	0.1
Wildlife Refuges	397,820	11.2
Biological Reserves	94,954	2.7
Forest Reserves	651,920	18.4
Protected Zones	426,730	12
Wetlands	96,485	2.8
Indigenous Reserves	536,316	15.1
<b>Total</b>	<b>3,544,045</b>	<b>100</b>

Costa Rica is a democratic republic. It is broken up into seven provinces: Alajuela, Cartago, Guanacaste, Heredia, Limón, Puntarenas, and San José. The government consists of an executive branch, legislative branch, and a judicial branch. The executive branch includes the president and two vice-presidents, as well as a cabinet. The legislature is unicameral and includes 57 members (Biesanz, 1999 p. 16). This democratic form of government allows citizens to have a say in what happens in their country. Democracy in Costa Rica supports projects aimed at developing the resources and potential of all citizens, such as our case, through the development of a research station that draws upon local labor and expertise. The main agenda of all democratic government is to better the lives of its citizens by enhancing economic and social development.

The Ministry of Environment and Energy (MINAE), a division of the government, supports the investigation and conservation of natural resources through conservation projects (MINAE, 2002) (See Appendix A). MINAE places a large emphasis on incorporating the local communities in such projects to educate them about the ecology. In rural areas, these efforts are aimed at helping *camposinos* learn better farming techniques, so they will no longer damage the land with their cultivation methods. This leads to a discussion about how people degrade the environment and ways to prevent this problem.

## **2.2 The Relationship Between Poverty and Environmental Stress**

The rural poor often can put stress on the environment because their sustenance is directly dependent on using local natural resources. Incorporating low-income rural people into the functioning of the Caño Negro biological research station will help alleviate this stress by teaching good conservation practices and by providing alternative employment. The specific economic conditions and community organization of Caño Negro will determine how these people can most effectively contribute to the research station's operation.

Former economic policies of the Costa Rican government have raised concern among ecologists because they gave incentives to citizens to clear land and ranch for profit (Cruz et al., 1992, p. 5). During the 1980's the Costa Rican government experienced a debt crisis as a result of lowered tax revenues due to decreased wages and rising unemployment. Urban areas of the country experienced out migration as city dwellers sought refuge in rural areas. During the early 1980's,

the number of Costa Ricans leaving the cities and urban developments exceeded the number of those entering. As a result, the populations of rural farming areas increased dramatically. It has been observed that in lands stricken by poverty, this type of increased population growth can have a detrimental effect on the environment and natural resources (Cruz, et al., 1992, pp. 7-8).

Other causes of poverty also affect the environment indirectly. A factor contributing to the increase in population is the lack of opportunities in the work force for women. Housewives have more time to raise large families than working women do. Costa Rica possesses only half the ratio of employed women to men, than does the average developing country.

The population density of those areas outside of the Central Valley in Costa Rica is 28 persons per square kilometer and is mainly concentrated in wetlands in poor areas (Cruz et al., 1992, pp.47-49). These areas have been deforested by migrant workers and have been converted to pastures and cropland. The economic status of people living in these rural settings is low compared to those residing in the Central Valley. During the late 1980's, the poorest fifth of the population received only 3.3 percent of the total national income. These people also suffered the consequences of unequal land distribution. Many Costa Rican families are forced to live on *minifundios* or small farms that do not provide enough land to support their economic needs. As a result, minifundios are farmed very intensively and are subject to degradation (Cruz et al., 1992, p. 51).

The Costa Rican government and general public once had a much less progressive attitude towards the environment than they have adopted now (Cruz, et

al., 1992, p.52). Originally people believed that the forests were a barrier to progress and thus contributed to the number of people living below the poverty line. At that time migrant workers invaded the forests and cultivated publicly owned lands with the incentive of gaining profit by improving the productivity of the land.

A serious consequence to the environment resulting from such cultivation has been soil erosion. During the time period of 1970-1989, it is estimated that 2.2 billion tons of soil eroded from farmland and pastureland (Cruz et al., 1992, p. 50).

In 1979, Costa Rica experienced a debt crisis: stock prices fell, loans and foreign exchange were diminished, interest rates and inflation increased. Funding for public services was reduced and unemployment increased. This largely urban crisis contributed to the number of local people migrating out of the cities and into rural settings due to poverty (Cruz et al., 1992, pp. 56-57).

There are many ways to counteract the detrimental effects of population growth and poverty on the environment. Providing employment, improving health care, offering community-based education, and strengthening the economy are all necessary to reduce poverty and strengthen the environment.

The social conditions that lie behind this process are discussed in the next section about the people of Costa Rica, the Ticos.

### **2.3 Ticos**

Most Ticos live in the same community their whole lives (Biesanz et al., 1999, pp. 1-10). Once villagers leave their village, they have a longing for home, which is where they feel most welcome and accepted. It is looked down upon for a

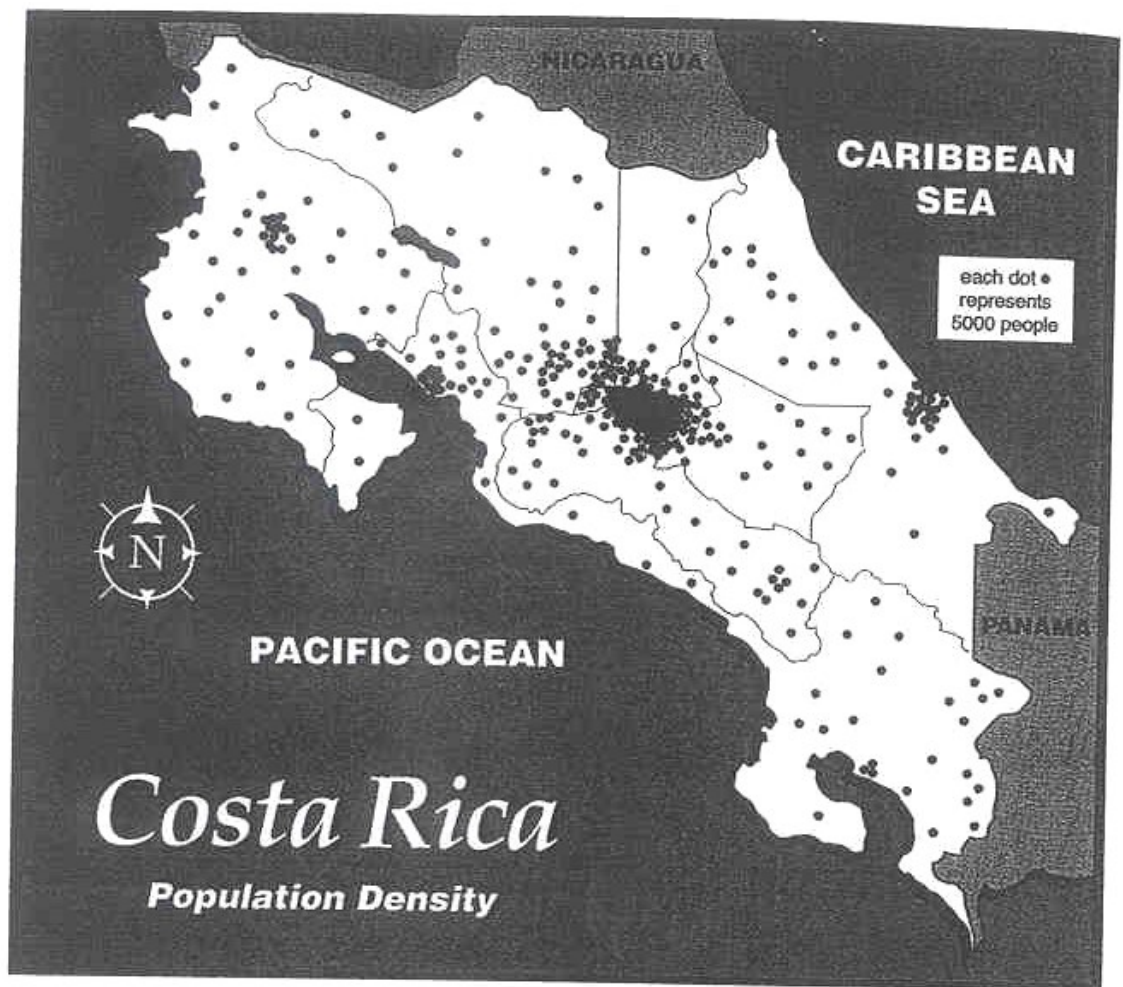
person to commute from a small village to work in the city and is especially not well received when a person moves away from his or her home community, according to Biesanz et al. (1999, pp. 1-10).

Ticos are slowly adjusting their views to deal with modern times (Biesanz et al., 1999, pp. 2-12). Many old towns and villages are now suburbs, where people commute to San José or other suburbs to work, shop, and socialize. There is no longer a sharp distinction between urban and rural towns, especially in the Central Valley. Some of the rural communities that were once poor and underdeveloped now have running water, buses, and school systems.

This modernization has brought about a change in the lifestyles of many Ticos. The land communities once depended on for crops or to graze cattle is no longer available. Large businesses bought land to mass-produce, leaving small farmers with little chance of survival. This has forced many Ticos to leave their villages and find work elsewhere. Some work on coffee or banana plantations, while others work in a nearby city. They then bring modern technology and urban culture back with them to their villages when they return home for visits.

Unfortunately some communities are too far away to be able to rely on cities for work. Figure 2.3 illustrates the areas where high populations of people live. Those areas with no large populations around them are far from the cities and often have large mountain ranges separating them. These villagers living far away from major cities may be forced to engage in illegal activities such as hunting in national forests and cutting down trees.

Ticos engaged in hunting and timber harvesting may not understand that they are causing harm to the environment. Our project deals with individuals who are involved in these activities. Such illegal activities may cause further harm later on. For example, people kill the fish that birds rely on for food, so in turn the birds also die or migrate somewhere else. Educating people about the harm they are causing to their own environment can help them understand the reasons for changing their use of the land. This leads to the issue of community-based education.



**Fig. 2.3 – Population Density in 1994**

Based on data from Departamento General de Estadística y Censos (Biesanz et al., 1999, p. 126)

## **2.4 Community-Based Education**

People do not always understand the importance of the resources, educational or natural, around them. This is perhaps the situation in the Caño Negro area, according to our liaison Jorge Gamboa of PNH (personal communication, April 9, 2002). The indigenous people of Caño Negro can, however, be educated about valued local resources. The most efficient way of educating them would be to involve a significant number of people from the community, in turn, they would be expected to share the information they learn about conservation with the rest of their community.

There are five fundamental tenets of community-based education (May, 1999, p. 27). First, there must be a mutually supportive relationship between the research station and the community. Second, the community and the researchers in the station must share the facilities productively. Third, the curriculum must be community-oriented, meaning that it must suit their knowledge and lifestyle. Fourth, the station must promote lifelong education. Fifth, there must be community involvement in the decision-making and management of the station.

Many problems can arise with community-based education (May, 1999, pp. 27-29). A huge issue is the generation of a culturally appropriate curriculum, including the language and explanations of scientific information. Community education enables people to develop an understanding of their own community and its ecology. Once they understand the ecology, they can manage it more sustainably. This leads us to a discussion about how to best promote conservation in Caño Negro.



## **2.5 Conservation**

Conservation is a complex subject. However, the following sections discuss the main ways conservation has been applied to the society in Caño Negro, specifically and to Costa Rica in general.

### **2.5.1 Community-Based Conservation**

Once the local residents understand the ecology of Caño Negro through community-based education, they may practice different ways to use the land. Conservation of resources is an important issue that needs to be addressed and can be promoted by sharing scientific information with local residents. Some local families in Caño Negro are involved in conservation programs that have already benefited both the land and their economic situation. If local people do not have a complete understanding of the value of preserving the ecosystem in which they live, they may unintentionally harm it and themselves. An example of irreversible harm includes activities such as illegal hunting and farming, which may be causing at least 0.1 to 0.3% of tropical forest species to become extinct (Balmford, et al., 1998, p. 1). Although Caño Negro is a tropical wetland and not a tropical forest, similar problems do exist.

“Conservation is about ensuring the persistence of value” (Balmford, et al., 1998, p. 211). If conservation is ensuring the persistence of the value of the land, local communities should be taught the value of conserving the land in terms of preserving their own resources. They live and thrive off of the land, so it should easily be understood that it is in their best interest to maintain it. Ensuring the

persistence of the value of land can be done most effectively by deliberate attempts to conserve its resources (Balmford et al., 1998, pp. 211-220).

Although some authors have put an emphasis on educating local people about the value of the land and its conservation, the role of the government in promoting conservation also needs to be discussed. The local community can only do so much to help preserve the environment. The government along with environmental organizations must be active in carrying out ecological research to learn how to successfully sustain the natural resources in the area. The Organization of Tropical Studies is a good example of a research organization that is seeking information to preserve the surrounding ecosystem in collaboration with local people.

## **2.5.2 Conservation History of Costa Rica**

### Early Organizations

Because of many international scientific investigations in Costa Rica, there has been an increased national appreciation for the conservation of national resources (Evans, 1999 pp.13-34). Many organizations have contributed to conservation awareness. In 1926 the National School of Agriculture was formed. The schools taught farmers better cultivation techniques to prevent erosion, better ways to control burning, and other soil conservation techniques. The Inter American Institute for Agricultural Sciences (IICA) was founded in 1942 by the Organization of American States (OAS) to train people in the agricultural sciences, forest conservation, and wild life management. In 1950, the University of Costa Rica (UCR) added a biology department to their institution. One focus of this department was to educate students about the value of conservation. In 1959, the Caribbean Conservation Corporation

(CCC) became the first non-governmental conservation organization in Costa Rica. The CCC focused on the preservation of large sea turtles that were threatened with extinction.

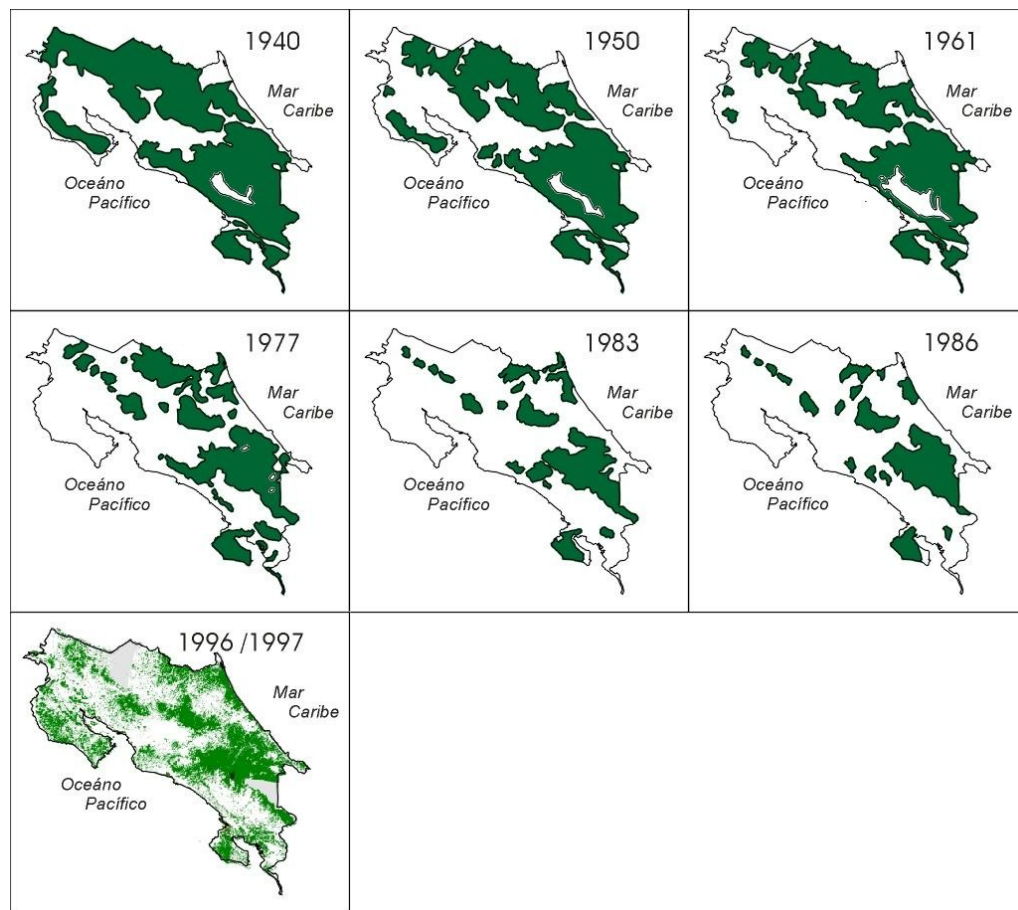
### Environmental Problems

In Costa Rica there are large areas of erosion, deforestation and wildlife loss (Evans, 1999, pp. 34-39). These problems can be traced back many hundreds of years. The first inhabitants, the Native Americans, did not harm the environment to a large extent. They practiced resource management techniques and prevented erosion by reseeded areas. Beginning in the 16<sup>th</sup> century, the Spanish moved into Costa Rica. They deforested large areas of land for livestock and agricultural crops. On the eve of independence, Coffee was introduced as a crop in the 1830's, again creating the need to deforest thousands of acres of land. In 1870, bananas were introduced. Not only were plantation lands cleared, but also miles of roads and railroads were built to transport the crop. In the 1960's, cattle became one of Costa Rica's major exports. More land was cleared for pasture. By the 1980's, deforestation was growing at a rate of 4% a year. Pasturelands increased by 250% from 1950-1984 (See Fig. 2.4).

Even more land has been cleared since the 1980's. The timber industry alone cleared over 17,000 miles of roads in the 80's. The colonization during this time became more significant, causing economic, sociological, and environmental problems. People began buying land on credit and clearing it, opening the way for increased amounts of erosion. They also began over-farming land and using harmful farming practices. The crops would grow for 3-5 years and then the land was

converted into pastureland, further stripping the land of nutrients. Once the land was no longer productive, the farmers moved to new territory, deforesting the countryside further.

Deforestation has been at the root of economic problems throughout the country (Evans, 1999, pp. 40-46). The rivers are used to generate hydroelectric power, but their potential to do so has decreased greatly due to the high amounts of sedimentation.



**Fig. 2.4 – Costa Rican Deforestation Over Time** (shaded areas represent forest coverage) (MINAE office, 2002)

Soil infertility and overgrazed pasturelands have led to a loss in agricultural productivity. An idea developed in the late 1960's, widely believed by the people of Costa Rica that the abundance of natural resources would prevent any future shortages. Deforestation was at that time seen as an improvement to the land as it made room for more agricultural development.

Many agricultural practices are slowly destroying the environment of Costa Rica (Evans, 1999, pp. 46-52). Banana cultivation not only creates deforestation, but pollution as well. Sediment runs off the plantations and into the streams, rivers, and lakes, causing toxic chemicals and heavy metals to buildup in the water. Other forms of pollution include pesticides and fertilizers, which run off the land causing similar problems. A study shows that 3.5 million tons of waste, such as soil, fertilizers, and plastics, were produced annually by the banana industry; 2.14 tons of waste are produced for every ton of bananas harvested.

According to Cristián Coronas (See Appendix K), trees are cut everyday, damaging ecosystems. Many thousands of trees are harvested in banned areas. Other deforestation occurs around the national parks and preserves, affecting their ecosystems by causing soil erosion. This is, in fact, a major problem in Caño Negro.

### **2.5.3 Forestry Law of 1969**

The Forestry Law in Costa Rica distinguishes different protected areas (Evans, 1999, pp10-11). According to Article 74, there are six recognized areas: National Parks, National Monuments, Biological Reserves, National Wildlife Reserves, Forest Reserves, and Protected Zones. The National Park is an area of historic beauty and has national and international importance for wildlife. The main

purpose of this type of area is to promote education, tourism, and scientific research. A National Monument has an area of 2,500 acres or less. It has less natural and historical value than a National Park and is used primarily to protect specific resources, such as a certain plant species. Biological Reserves are made up of forestland and their main purpose is for conservation and research on wildlife. The National Wildlife Refuge's main purpose is to conserve, protect, and manage flora and fauna. Caño Negro is an example of this. The Forest Reserves were added to the Forestry Law in 1990 as Article 35-A. These areas are reserved for the production of timber. The last recognized zone is the Protected Zones. This area is for the protection of soil, regulation of hydrology, and the conservation of watersheds.

## **2.6 Wetlands**

### **2.6.1 Environmental Contributions**

According to the Ramsar Convention's 7<sup>th</sup> Handbook (2002c), wetlands can be defined as "areas of marsh, fen, peat land or water whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salty, including areas of marine water the depth of which at low tide does not exceed six meters...and may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of water deeper than six meters at low tide lying within the wetlands"(p.11). This definition gives an idea of how diverse a wetland can be and how many different types of areas can constitute a wetland. These different categories of wetlands are all rich in biodiversity. Countless fauna and flora depend

upon the resources available in wetlands. Fish can be used as an obvious example. Out of the 20,000 species of fish in the world, over 40% live in fresh water (Convention on Wetlands, 2002e). These fish depend upon wetland areas to survive. Another example that may not be as obvious is rice. Rice is a common wetland plant as well as a staple food for more than half of the world (Convention on Wetlands, 2002e). The interactions of the different components of wetlands such as soil, water, plants, and animals allow wetlands to perform many different and vital tasks. These tasks include water storage, storm protection and flood migration, climate stabilization such as temperature and rainfall, and water purification through retention of nutrients, sediments, and pollutants just to name a few (Convention on Wetlands, 2002e).

### **2.6.2 Economic Benefits**

Although the environmental benefits of wetlands can be easily identified, economists and scientists are still urgently trying to demonstrate their economic value in order to hold the interest of governments. A research station in Caño Negro will undoubtedly have to face this task. There was a recent study done that showed that the ecosystems of the United States provided about \$33 trillion in services (Convention on Wetlands, 2002e). Approximately \$4.9 trillion of that revenue can be attributed to the services provided by wetlands. Over two-thirds of the world's fish harvest is linked to the health of coastal and inland wetland areas. Agriculture utilizes the nutrient retention around some wetland areas. Wetlands can be used for timber production, energy resources, and even tourism opportunities. The list can go

on and on. And the assessment of such resources will need to be made for Caño Negro.

Is there any wonder why so many scientists, economists, and environmentalists have such an interest in wetland ecosystems? Despite all of the benefits provided by wetlands both economically and environmentally, they continue to be one of the most threatened ecosystems in the world (Convention on Wetlands, 2002e). These problems are mainly due to drainage, erosion, pollution, and over-exploitation of their resources. There have been organizations and governments that have shown interest in saving these ecosystems. One of the most prominent and recognizable of these organizations is the Convention on Wetlands, otherwise known as the Ramsar Convention (Ramsar, 1971). This is actually a cooperative effort by numerous countries to help conserve the valuable resources of wetlands. If these efforts were not in place, one could only imagine the damage caused to the world due to the loss or damage of these wetlands.

## **2.7 Ramsar Convention**

### **2.7.1 History**

On February 2, 1971, an intergovernmental treaty was adopted at a convention in the city of Ramsar, Iran (Convention on Wetlands, 2002a). The name of the convention is written as "Convention on Wetlands (Ramsar, Iran, 1971)", but it is most commonly known as the Ramsar Convention. The official name of the treaty adopted by the Convention was *The Convention on Wetlands of International Importance especially as Waterfowl Habitat*. This name emphasized the initial



intent of the Convention to promote the conservation of wetlands for water birds.

This emphasis has been broadened to include all aspects of wetland conservation. It is now seen as an important ecosystem for biodiversity conservation and an asset to local communities as well. The Convention continues to stay up-to-date on environmental issues by amending the treaty and meeting annually. After the 1999 convention meeting that was held in Costa Rica, the Ramsar Bureau Convention, a branch of Ramsar, published a series of nine handbooks. These handbooks outline the goals and objectives of the Convention as well as how they may be achieved.

Every year new countries become contracting parties or members of the Convention (Convention on Wetlands, 2002a). These countries in turn designate new sites for the List of Wetlands of International Importance. This is a major step taken by the country because, by this act, it makes a commitment to promote conservation and wise use of the designated area. Costa Rica became a contracting party or a member of the Convention in 1988. As of 2002, it has designated ten sites to be on The List. Caño Negro was one of the first two sites designated as a Ramsar site in 1991 by Costa Rica (Convention on Wetlands, 2002e). The significance of these actions taken by Costa Rica will be explored in the following sections. The mission of the Ramsar Convention is “the conservation and wise use of wetlands by national action and international cooperation as a means to achieving sustainable development throughout the world” (Ramsar Convention Bureau, 1999c). As a result of this mission, the Convention has joined forces with different organizations such as BirdLife International, The World Conservation Union (IUCN), Wetlands International, and the World Wide Fund for Nature (WWF) to have an international

impact on conserving the world's treasured environmental assets (Convention on Wetlands, 2002a).

### **2.7.2 The List of Wetlands of International Importance**

At first thought, there might not seem to be a need for a list of designated sites. Once a country becomes a contracting party of the Convention, one might assume that it would be obligated to protect all of its wetland areas equally. The Convention recognizes that this type of thinking is unrealistic. Governments need encouragement and support because taking care of wetland sites requires direct attention. Ramsar helps governments prioritize these sites and gives them a specific guideline about how to manage them.

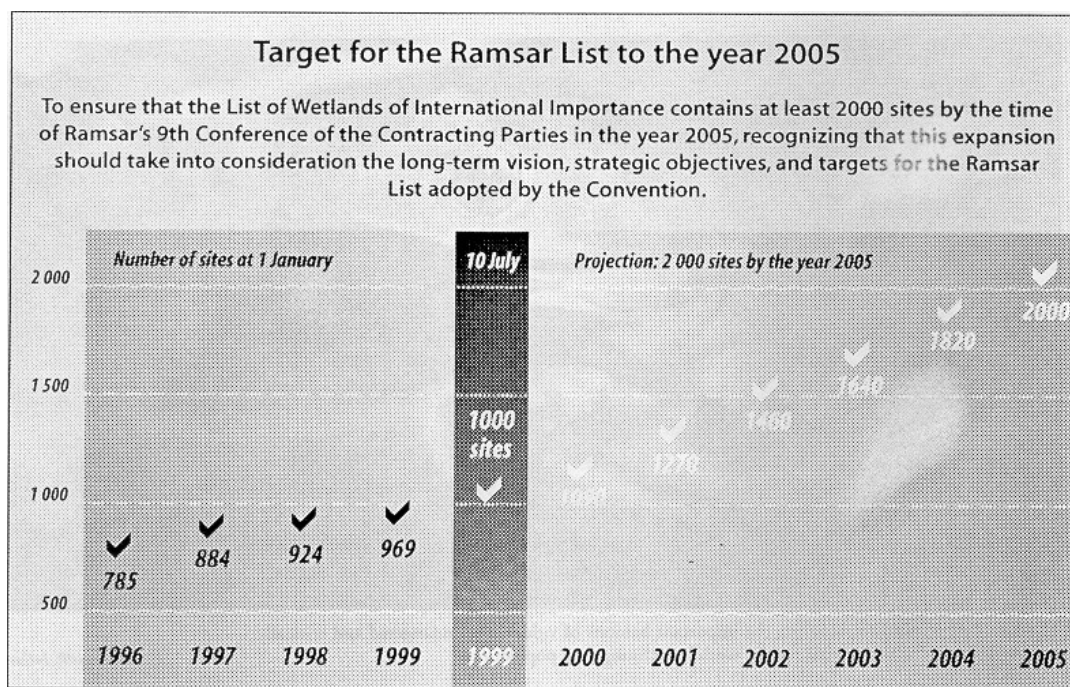
The vision of the Ramsar List is “to develop and maintain an international network of wetlands which are important for the conservation of global biological diversity and for sustaining human life through the ecological and hydrological functions they perform” (Ramsar Convention Bureau, 1999c, p. 6). To achieve any vision or goal, there must be set objectives that provide step by step measures necessary to achieve the ultimate end. There are four main objectives that have been identified by Ramsar (Ramsar, 1999c, pp. 6-8). The first objective is to establish national networks of Ramsar sites in each participating country that represent the diversity of wetlands and their functions. The second objective is to contribute to maintaining global biological diversity by designating and managing appropriate wetland sites. The third objective is to foster cooperation among Contracting Parties, the Convention's International Organization Partners, and local stakeholders, in regards to the selection and the conservation of the Ramsar sites. The fourth

objective is to use the Ramsar site network as a tool to promote national, regional, and international cooperation in regards to complementary environmental treaties. These objectives can be summed up as a means of achieving large-scale cooperation between countries and organizations to conserve and manage wetland sites on the List.

The extent of the Ramsar List can be made concrete just by its short-term target for the year 2005, the goal of which is to have at least 2000 wetlands designated as Ramsar sites (see Fig. 2.5). The highlighted section in Fig. 2.5 was the last year the conference was held before the target number was set (Ramsar, 1999c, p. 8). One must note that to date the Convention has fallen short of its projected yearly goals. As of today, there are 1,171 Ramsar sites instead of the 1,460 desired.

Once the goals and objectives of the list are understood, the question of criteria follows. What determines a wetland to be internationally important? Ramsar has comprised a list of eight criteria that can be separated into two separate groups. Group A pertains to sites containing representative, rare or unique wetland types in a specific region of the world. Group B pertains to sites of international importance for conserving biodiversity. An example is Criterion 2, which states: a wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities (Ramsar, 1999c, p. 21). As stated above, Caño Negro was added to the List of Wetlands of International Importance in 1991. Caño Negro has many qualities that make it internationally important when one realizes the resources that Caño Negro has to offer. Costa Rica has approximately 850 species of birds and about 400 of them can

be found in Caño Negro. Approximately 47 percent of the bird species in Costa Rica are dependent upon the resources at Caño Negro (see Appendix M). The site is also host to some endangered or vulnerable species.



**Fig. 2.5-Ramsar Target Chart** (Ramsar Convention Bureau, 1999c, p. 8)

An example is a small group of endangered wading birds called the Jaribu, which have been spotted in Costa Rica during the summer (Convention on Wetlands, 2002e). According to Edgar Ulate, a former administrator in Caño Negro, there are approximately 27 species of fish that migrate back and forth between Caño Negro and outside bodies of water through the Río Frío and Río Mónico as well as rich and unique vegetation available for study that has not been completely identified (see Appendix M). The ecological resources of Caño Negro are explained in greater detail in a later section. All of these characteristics meet the requirements of most of

the Criteria (see Appendix BB). It should be noted that a wetland does not have to meet all of the criteria outlined by Ramsar to be designated as a site of importance.

### **2.7.3 Motivation of the Contracting Parties**

Costa Rica has been a Contracting Party in the Convention since 1988. Becoming a contracting member of the Convention means agreeing to the four main commitments outlined in the treaty (Convention on Wetlands, 2002a). The first obligation of the country is to designate at least one wetland site to be added to the List of Wetlands of International Importance and begin promoting its conservation and sustainable use. The second obligation is to include wetland conservation in its national land-use planning. The third obligation is to form nature reserves of wetlands whether or not they are on the Ramsar List as well as promote training about wetland research and management. The fourth obligation is to cooperate with other Contracting Parties to help achieve the goals of the Ramsar Convention, especially concerning shared water systems and ecology. These obligations may seem extensive, but the Convention has offered guidelines in a series of handbooks published in 2002 to assist in their implementation.

Few countries can be expected to take on so many new obligations and commitments without any incentives or benefits. Reasons for a country to become a member would have to be spelled out. One benefit includes publicity and prestige for the wetland sites placed on the Ramsar List (Convention on Wetlands, 2002a). This increases the possibility of receiving support for the conservation and sustainable use of the site. For a site such as Caño Negro, this is important due to its small size and limited funding. Another benefit is that it brings access to expert

advice on national and site-related problems of wetland conservation and management through contacts with Ramsar personnel and partner organizations. This means that the area could gain the interest of the scientific community. The station that is to be developed in Caño Negro can directly benefit from an increased interest from outside researchers. An important benefit that cannot be overlooked is international cooperation on wetland issues that can generate support financially for wetland area projects. One form of support in place is Ramsar's Small Grants Fund, but there are others available through the partnerships of the Convention, such as the Wetlands for the Future Fund. Now one can begin to see the ways in which Caño Negro can benefit from being on the Ramsar List. If solicited, Costa Rica could conceivably receive international support to develop a station that will not only help conserve the land but also manage it in a sustainable manner. It is easy to see how the area and the future station would benefit from the Convention, but the direct effects of the Convention on the local community have not yet been addressed.

#### **2.7.4 Ramsar and the Community**

The Ramsar Convention has recognized the fact that is difficult to promote the conservation and wise use of wetland sites without the support of local communities. For this reason, two handbooks in the series are dedicated to such social issues. One handbook provides a guideline on establishing and strengthening the local community's participation in the management of wetlands (Ramsar, 1999a). The other handbook deals with the promotion of conservation and wise use through communication, education, and public awareness (Ramsar, 1999b). Currently there are some projects being done in the villages surrounding Caño Negro that involve

local residents (see Appendix M). These projects have direct effects on the lives of the villagers as well as the survival of the Caño Negro Wildlife Reserve. The support of the Convention and other Contracting Parties can develop new projects and much needed support for these projects (Convention on Wetlands, 2002a). In order to fully understand what Caño Negro needs in terms of support, the resources and unique characteristics of the area will be explored in section 2.10 below.

## **2.8 Organization of Tropical Studies**

### **2.8.1 History of OTS**

The Organization for Tropical Studies (OTS), a nonprofit organization, is comprised of 64 universities and research stations from the United States, Central America, and Australia (OTS Online, 2000). It was founded in 1963 by a small group of people from six universities in the United States and the University of Costa Rica. The main purpose for the organization originally was to promote research and education in tropical biology (Chazdon, 1990, pp. 170-178). Later the goals changed to focus primarily on conservation of rainforests and tropical lands.

OTS owns three biological research stations in Costa Rica. They are Las Cruces Biological Station and Wilson Botanical Garden, La Selva Biological Station and Palo Verde Biological Station (OTS Online, 2000). This organization is responsible for the development of these stations as well as their successful management and operation. Research done at these stations has great impact on what is known today about tropical biology and forest ecosystems.

OTS was originally set up to create an ongoing relationship between United States universities and the University of Costa Rica in order to have continuing research in tropical biology, education, and ecology (OTS Online, 2000). OTS sponsors graduate and undergraduate studies at their centers to educate students and researchers about natural resources and their conservation (Chazdon, 1990, pp. 176-181). The organization relies on visiting U.S. and Costa Rican professors to teach eight-week classes because OTS has no permanent faculty. These professors often work without pay but are able to do their own research at the stations.

All three of the organization's stations in Costa Rica are affiliated with the Organization of Biological Field Stations. The stations encourage interaction among biological researchers and promote education (OTS Online, 2000). The organization supports and encourages many different styles of learning, serving a range of people from elementary school students to local citizens to environmental historians.

In 1970, conservation became one of the organization's top priorities because the researchers at La Selva could no longer ignore the destruction of the land surrounding the station area (Chazdon, 1990, pp. 179-183). To save the natural environment needed for effective research, OTS raised \$300,000 to buy the surrounding land in 1981. At the same time OTS raised another \$2 million to buy a 19,000-acre section of forest, which connects La Selva with Braulio Carillo National Park.

The protection of Costa Rica's forests depends fundamentally on the cooperation of its citizens. This is why OTS devotes much attention and effort to the



task of public education. In 1984, the organization began offering courses in forest ecology to local teachers and in 1986, many hundreds of school children visited La Selva to learn about rainforests and wildlife (Chazdon, 1990, pp. 182-181).

OTS is engaged in a few research projects aimed at improving methods of forest management and finding ways to restore damaged forests. In La Selva, scientists are testing 80 species of trees to determine which would be best suited for the reforestation of eroded pasturelands.

The U.S. government funds most of the research done by OTS (Chazdon, 1990, pp. 183-184). The United States National Science Foundation funds studies of ecological processes in the rain forest, such as the way new trees develop in forest clearings. The National Aeronautics and Space Administration (NASA) has a contract with OTS. The researchers at OTS are investigating the trees in the Costa Rican rainforests to determine how much biomass, or dry weight, they represent. NASA will then compare this information with high-altitude satellite pictures of the same forest area. These comparisons will be used by the space agency in the development of a satellite-based system for monitoring global deforestation.

The Organization of Tropical Studies plays an important role in Costa Rica (Chazdon, 1990, pp. 184-185). In a 1987 agreement, OTS was designated as the official technical advisor to the Costa Rican government in the management of all these national resources. OTS aids the government with conservation-related projects, including educational programs, maintenance of botanical gardens, and the promotion of international scientific research.

Because our project focuses on the development of a research station, OTS stations can be very useful as guides or models for establishing a station in Caño Negro. This leads to a discussion of these stations themselves.

### **2.8.2 OTS Biological Research Stations**

The Organization of Tropical Studies provides the funding and management for three research stations: La Selva, Palo Verde, and Las Cruces.

#### La Selva

The unique location of this field station provides an opportunity for much interesting research in the areas of primary and secondary forests (See Appendix P). It is located in north central Costa Rica. It is located on 3746 hectares and shares a boundary with Braulio Carillo National Park. The station's elevation ranges from 35 meters to 150 meters above sea level and has a temperature range from 21 degrees to 31 degrees Celsius (OTS, 2002, brochure). The climate is wet-tropical, with an average annual rainfall of 13 feet. This tropical environment attracts about 250 researchers from 26 countries every year.

La Selva focuses on wet, tropical forests, disturbed lands, salty and freshwater marshes, evergreen forests, and dry forests (OTS Online, 2000). This station provides laboratories, research facilities and "La Selva Digital Flora", a database of vascular plants in the region (See Appendix R).

Thousands of species live within La Selva's boundaries (OTS, 2002, brochure). There are 436 known species of birds, 1,864 species of vascular plants, 500 species of butterflies, 350 tree species, 49 species of amphibians and 43 species of fish. There are also 120 known species of mammals, including 67 species of bats,

and 56 species of snakes, 7 of which are venomous. Different seasons bring different animals. During the wet seasons, frogs are abundant and are often the focus of research.

### Palo Verde

Palo Verde, a National Park in the Guanacaste Province in northwestern Costa Rica, is located on the Tempisque River, giving the park both dry land and wetlands (OTS Online, 2000). The land area in the park is 20,000 hectares and has an abundance of flora and fauna.

Palo Verde has the largest and most threatened system of seasonal wetlands in Costa Rica (Evans, 1999, pp. 11-123). It is home to many species, including 72 known species of mammals, 232 known species of birds, 55 reptile species and 22 amphibian species. There are 619 land plants and 107 species of aquatic plants. During the dry season, migratory birds, turkeys, and animals flock to the region, as well as approximately 40,000 ducks.

According to Marco Solano, director of the Programa Nacional de Humedales, Palo Verde is situated in a wetland region, much like that of Caño Negro, but it also has areas of tropical dry forest (personal communication, see Appendix O). The station is very developed, though it does not contain as many facilities as La Selva. The station has a capacity of holding sixty people and offers them facilities such as living quarters, a large cafeteria, a store, an auditorium, a library and laboratories. There is also a central computer lab, which includes a central database. The station obtains electricity via the national grid and offers clean water, telephone and internet services as well as fax machines.

### Las Cruces

Las Cruces is located near the Panamanian border (OTS Online, 2000). It is a mid-elevation site, with altitudes ranging from 1,120-1,385 meters above sea level. It has a land area of 235 hectares, making it the smallest biological research station run by the OTS.

Las Cruces is home to the Wilson Botanical Gardens, which has many diverse plants, including many rare and endangered plant species. There are 1,000 genera of plant and 212 species. This station was started by Florida horticulturalists, Robert and Catherine Wilson, who in 1963 moved to Costa Rica to start tea farming (Evans, 1999, pp. 29-30). This endeavor failed, so the Wilsons started a botanical garden, to preserve the beauty of their land for future generations. The garden was exhausting and expensive to run, and they looked to OTS for help. They donated the 25-acre garden to OTS.

These stations all have funding through the Organization of Tropical Studies, but many other biological research stations are funded through grants and donations.. The following section provides some examples of other successful research stations.

### **2.9 Other Biological Research Stations**

The services provided by a biological field research station can be numerous. They involve conducting research, providing quality education in a scientific field, keeping equipped facilities, and creating and maintaining accessible databases, as well as providing housing and eating facilities for staff and scientists.

An example of a biological research station proven to be successful in North America is the Mountain Lake Biological Station located in the Appalachian Mountains (Mountain Lake Biological Station, 2000). This station works in coordination with the Biology Department of the University of Virginia, providing courses to local people on ecological communities, field botany, field biology of birds and mammals, conservation biology, and biological research. This station provides databases on weather data, biological collections, and a geographic information system (GIS).

Another example of a successful conservation organization is The Instituto Nacional de Biodiversidad (InBio), which is a non-profit institution whose goal is to protect Costa Rica's biodiversity through education, funding, and creating private foundations (The World Resources Institute – The National Biodiversity Institute of Costa Rica, 1992). InBio works with other conservation organizations and biological research stations such as the Ministry of Natural Resources in San José and the Organization for Tropical Study (OTS). InBio is interested in researching the majority of the nation's animal and plant species. The data collection process will involve the work of scientists and local citizens. The data collected will be used and incorporated in education programs for visiting students and local residents on the flora and fauna of Costa Rica.

A number of factors must be considered in creating a biological research station in Caño Negro, including its actual development and maintenance, and the ways in which the local people can be used to support research activities. This can only be successfully done by understanding the area and people of Caño Negro.

## 2.10 Caño Negro

Caño Negro Wildlife Reserve is located in the northern part of Costa Rica, in the province of Alajuela, near the border with Nicaragua (see Fig. 2.6) (Brenes, 1998, p. 23). The reserve covers a total of 9,940 hectares. The reserve features a variety of wetlands, visible in the dramatic changes in flora and fauna between the different small lagoons in the dry season. In the wet season, the water level raises, and the lagoons flood into each other (See Appendix Z).



**Fig. 2.6 – Location of Caño Negro** (Brenes, 1998, p. 25)

The reserve itself was established on January 4, 1984, for four main reasons (Brenes, 1998, p. 9). These reasons include: being the largest wetland in the northern part of the country, being an ideal breeding and feeding ground for a variety of migratory birds, being a home to many animal and plant species unique to this

area in the country, but having poor drainage and loamy hydromorphic soil, unsuitable for large-scale farming. On December 27, 1991, the Caño Negro Wildlife Reserve was declared a wetland of international importance by the Ramsar Convention.

### **2.10.1 Environmental Characteristics**

#### Land

The land that is protected in the Caño Negro Wildlife Reserve is of three main classifications: marshes, flood plains, and grasslands (Brenes, 1998, p. 23). The drainage throughout the area is poor, the land is marshy, and is subject to periodic floods, which reduces the possibility of stable agricultural use.

#### Climate

Caño Negro has a rainy tropical climate, fueled by air masses from the Pacific and trade winds that penetrate from the Caribbean coast (Brenes, 1998, p. 28). The wet and dry seasons occur at the same general times as the rest of the country. Specifically, the dry season lasts from halfway through February through the month of April and the wet season extends from May to the middle of February, with peak rainfall in the months of July, August, October, and November. Average yearly rainfall is 3.5 meters, and the average temperature is from 25.7 to 26 degrees Celsius, with lows at about 20 and highs at near 30 degrees.

#### Flora

The plant life in Caño Negro is rather specialized to the wetland ecosystem. 310 species of plants can be found, representing 3% of all species native to Costa Rica (Brenes, 1998, p. 32). Of these, 136 are trees, 34 are bushes or shrubs, 91 are

herbaceous, 10 are palms, 8 are epiphytes, and 5 are ferns. All of these species can be grouped into four different habitats: aquatic, banks and shores, marshes, and high lands.

Aquatic plants (See Fig. 2.7) tend to proliferate during the rainy season, when there is more water to live in (Brenes, 1998, p. 32). They either live beneath the surface, or float on top, and conduct the reproductive portion of their life cycle there. Examples of such floating species include nymphaea, pistia, and salvinia. Tall grasses tend to thrive in the area when the water levels decrease, and include species such as paspalum repens, eragrostis hipnoides, and ambrosia cumanensis.



**Fig. 2.7 – Aquatic Plants**

By the banks of rivers and lagoons (See Fig. 2.8), the majority of the plants are arboreal (Brenes, 1998, p. 34). This usually helps prevent erosion, and forms



somewhat of a mutualism between the lake and the trees, with the trees drawing water from the lake, and the lake staying clean due to the erosion protection. Also, the trees provide valuable cover to animals that need to live near the water sources, such as monkeys and cormorants. Trees that can be found near the rivers and lakes of Caño Negro include sotacaballo, ceiba, savanna oak, saragundi, and true cedar.



**Fig. 2.8 – Vegetation along the Banks of the Caño Negro Lagoon**

Marsh plants dominate the region, due to environmental limitations placed on other types of plants (Brenes, 1998, p. 34). Poor drainage and other factors eliminate the possibility of most plant species, leaving it to be dominated by various cativales (*Pitaria copaifera*), marillales (*Calophyllum brasiliense*), and yolillales (*Raphia taedigera*) as well as various herbaceous species. Arboreal species that inhabit these areas include the caobilla (*Carapa guianensis*), cerillo (*Symphonia globulifera*),

poponjoche (*Pachira acuatica*), sangrillo (*Pterocarpus officinalis*), guácimo colorado (*Luehea seemannii*), and campano (*Sacoglottis trichogyna*).

The highlands in Caño Negro (see Fig. 2.9) are classified as those not affected by the seasonal floods and are thus the most sought after for development (Brenes, 1998, pp. 34-35). Ranching and farming are both motivators for the clearing of this land. However, due to more consistent environmental conditions, the most attractive flora are also located here, including the guayacán, guaba, and tempisque. These plants are already scarce in the region, and they are placed in greater danger all the time.



**Fig. 2.9 – Highland Vegetation**

## Fauna

Caño Negro is first and foremost a wildlife refuge (Brenes, 1998, p. 36).

This is largely due to the wide variety of species that can be found in such a small area. Also, the fact that many of these species are endangered or threatened also attracts even more concern for the area. The reptiles, mammals, birds, and fish are all diverse, and in some cases rare, and a fragile, complex web of interactions among such species keeps the environment thriving.

Costa Rica has almost 150 species of amphibians and over 200 species of reptiles, half of them snakes (Baker, 2002). This type of diversity is typical of a tropical environment, but Costa Rica can be considered especially endowed. Snakes in Costa Rica are many and varied (Baker, 2002). Common species include the boa, which is usually benign and far ranging. Less common species are the chunk-headed snake and vine snake. Poisonous species include the fer-de-lance -- an aggressive pit viper -- the bushmaster, the coral snake, and sea snakes. The fer-de-lance is by far the most feared for its aggressive behavior and deadliness. The fer-de-lance and vine snake can both be found in and around the Caño Negro region.

Crocodiles and caimans, their smaller relatives, are a large tourist draw in Costa Rica's wetlands, such as Caño Negro (Baker, 2002). Caimans have camouflaging scales, and the ability to breathe underwater, due to raised nostrils (see Fig. 2.10). However, even these adaptations have not kept them from being killed off at alarming rates by dogs, foxes, tegu lizards, and humans. Tourists frequently buy their skins as souvenirs.



The Jesus Christ lizard is also a resident of Caño Negro (Baker, 2002). This small lizard is so named for its ability to run across short spans of water. It does this with its specially evolved feet and remarkable speed.

Bird life is incredibly varied in Caño Negro, due to the lagoon being an excellent breeding ground for many species (Costa Rica Tourism and Travel Bureau, 2000). In fact, half of all bird species that can be found in Costa Rica exist in Caño Negro. Besides the obvious attraction to bird watchers, many bird species are also hunted because they are an excellent source of food. Spoonbills, white ibis, northern jacana, woodstork, jaribu (the largest bird and seriously endangered), ducks, and cattle egret can all be found here. The park is also the only location that has a permanent population of the Nicaraguan grackle, a bird that is endemic to the Lake Nicaragua basin.



**Fig. 2.10 - Caiman**

The park also protects endangered cats (Costa Rica Tourism and Travel Bureau, 2000). Species found, though rare, include the puma, jaguar, and ocelot. These are not considered to be dangerous, as they prefer solitude and do not interfere with human activities.

Being centered on a lake, Caño Negro has a wide variety of fish as well (World Wide Fishing, 2002). Sport fishermen regularly try for tarpon, gar, Irish pampano, lagunero, and bass. Other species found include the guapote, machaca, and even freshwater sharks.

The tarpon (also called the silver king, sabalo, and sabalo reale) is a predatory fish that is usually 100-120 lbs., but specimens over 200 lbs. have been found occasionally (World Wide Fishing, 2002). Due to its immense size and the amount of work needed to land it, sport fishermen do not usually keep the tarpon. The gar, or gaspar, is a relic. Seemingly a cross between the caiman and a fish, it has gills and a nose. The gar can survive in water with very little oxygen, and even more surprisingly, it can survive out of water on dry land for up to twenty-four hours.

### **2.10.2 Social Characteristics**

Along with its environmental mission, the research station in Caño Negro is also a means to involve the local people, and thus encourage conservation and other environmentally helpful practices, as well as give the station itself a foundation in the area. The following is general information about these communities, and the people who comprise them.

### Socio-economic and Cultural Status

Politically, the area is divided into three different districts: Caño Negro, Los Chiles, and Buena Vista (See Appendix W) (Brenes 1998, p. 38). The Caño Negro district contains the population nuclei of Caño Negro, San Antonio, Las Playuelas, and Las Cubas. El Amparo contains no village close enough to be important to the area, with the exception of Sabogal, which is known also as Playuelitas. Buena Vista has both Caño Blanco and Betel, which do not have much influence other than being near points of entry to the reserve (See Appendix X).

A social analysis reveals that over half (56.3%) of the people in the region are from Nicaragua (Brenes 1998, p. 39). The other two main cultural groups in the region are Costa Rican farmers and the native Maleku people, who inhabit a reservation near San Rafael de Guatuzo. Most of the people in the region live in the towns of Caño Negro, Veracruz, San Antonio, and Aguas Negras.

Brenes states that education in the region is scarce (1998, p. 40). The literacy rate in the Huetar Norte region is among the lowest in the country at 86.7%, compared to the national rate of nearly 95%. The village of Caño Negro has a rate of only 76.4%. To varying degrees, the lack of population density, manpower, suitable roads, and perhaps a lack of appreciation for the value of education have contributed to this condition. However, to varying degrees, the literacy level of the area provides the capability of supplemental training.

As for housing, most residents of the region (85.4%) own their own homes, while the rest either borrow or rent their living space (Brenes, 1998, p. 41). Almost half of these facilities have plumbing, walls, or roofing that is in need of repair.

The land itself is used largely for grazing, seasonal cultivations, permanent cultivations, and forest (Brenes, 1998, pp. 41-43). Most cattle are raised for beef, although dairy cattle are used for sustenance on small settlements throughout the region. Seasonal cultivations are planted largely on the flood plains, in the dry season as the water recedes from the area. This is normally corn, beans, or rice, usually raised for subsistence, with an occasional surplus sold for income. Permanent cultivations include that of the cocoa, citrus fruits, *ayote*, *tiquisque*, cassava, yucca, *guineo*, and banana. The Tico Fruit Company, south of Los Chiles, has started most of these cultivations, which provides jobs, but has led to large amounts of land being owned by few people. Forests in the area are mostly secondary, but some primary forest can be found. The main causes of the elimination of forests are clearing for agriculture, fires (both naturally occurring and man-made), and replacement of local species with exotic varieties, such as eucalyptus, teak, and *melina* for export.

### Services

The region of Caño Negro has limited electric power available, currently only available in the communities of Caño Negro, Playuelas, and San Antonio (Brenes, 1998, p. 43). These towns may be able to supply surrounding areas with power, as the latter develops. Other towns in the region receive power from small generators.

Potable water is only available in the communities of Caño Negro and parts of San Antonio (Brenes, 1998, p. 43). This is provided by the Servicio Nacional de Acueductos y Alcantarillados (National Aqueduct and Sewer System Service) with

the source based in Caño Negro. Other communities draw untreated water from small wells.

Education in the area is scarce (Brenes, 1998, p. 44). Most areas have problems with students not completing school, due to economic hardship. The only primary schools in the region are located in Caño Negro, San Antonio, Veracruz, and Playuelitas of Sabogal. Secondary schooling is not available in the area. This forces juveniles to emigrate from the region, if they plan on receiving any secondary or university schooling.

Health care is also a problem in the area (Brenes, 1998, p. 44). There are minimally equipped public health stations in Veracruz and Caño Negro, which carry out preventative medicine programs with vaccinations and malaria treatment. More serious events, such as acute sickness or childbirth, are transferred to Los Chiles or Upala, where better facilities are available.

### Economy

The economy in the area is based largely upon cattle ranching, and subsistence farming of staple foods, such as rice, beans, and corn (Brenes, 1998, pp. 44-45). Small restaurants, groceries, and tourism operations allow other employment, but these opportunities are limited. Fishing is also a way of life for some, although it is largely a seasonal activity, and laws prevent commercial fishing in the area. A major problem is that since local farmers do not actually own the land they use, it is difficult to monitor its use or provide rewards-based systems, where the government would pay farmers not to farm. Such reward systems have been applied in other areas, however.



### **2.10.3 Problems with the Caño Negro Ecology and Society**

The combination of environmental richness and economic necessity in Caño Negro has produced conflicts over the treatment of the land (Brenes, 1998, p. 47). Many conditions threaten the existence of the reserve, and they are not easily dealt with.

The combination of rapid population growth, relatively high population density in the villages of Caño Negro and San Antonio, and not having garbage disposal services puts a large strain on the environment (Brenes, 1998, p. 47). Also, with the exception of these towns, potable water is also not available. The lack of water treatment, waste treatment, or well-placed latrines also magnifies this problem.

Agriculture is in itself a subject of controversy in the region (Brenes, 1998, pp. 47-48). Although the majority of the residents make their living from the land, the very act of tilling the soil is without doubt harmful to the fragile wetland (see Fig. 2.11). This is a basic economic and environmental conflict and must be approached very carefully.

Deforestation throughout the Río Fríowatershed, has contributed to a long-term lack of arable land as well as massive amounts of erosion and damage to the wetland (Brenes, 1998, p. 48). Felling trees and clearing land is largely done out of immediate necessity (for firewood or other uses), or the replacement of native species with exotics, such as eucalyptus and teak, for timber harvest.

Forest fires harm the area by increasing erosion and destroying precious habitat but are more commonly used to clear land for agriculture, or are accidentally started by an fire intentionally set for clearing grass (Brenes, 1998, pp. 48-49). Also,

some hunters will set a fire to chase their quarry, thus destroying a large area of forest, and contributing to the destruction of the wetland.



**Fig. 2.11 – Ranching and Erosion in Caño Negro**

Disposal of wastes and sewage is a huge problem for the region as well (Brenes, 1998, pp. 49-50). As previously stated, there is no garbage collection service in the region, and thus, local residents are forced to dispose of their waste in whatever ways they can. Running untreated sewage directly into the Río Frío, and thus depositing it on the banks and flood plains during the dry season, is a common occurrence. There is no sewage network among any of the settlements in the area, nor is there any regulation for such disposal being enforced in the area.

Illegal hunting, or poaching, is another activity that is considered to be a problem in the area (Brenes, 1998, p. 50). The white-lined deer, green iguana, tepezcuintle, caiman, freshwater turtle, and red-faced monkey are all hunted

(illegally), inside and outside of the reserve. Species are also trafficked out of the area, both juvenile creatures and eggs, for use in private zoos and for breeding.

Fishing in the area is also considered to be a problem (Brenes, 1998, pp. 50-51). The fact that fishing during the dry season, and other periods, depending on need, is largely legal has been exploited to the point of having the fish populations decrease “flagrantly over the past 20 years,” according to Brenes. Illegal fishing has also contributed greatly to the problem. Most fish are either kept or sold illegally in the towns of Playuelas, San Antonio, and Caño Negro where the tourist trade creates a demand for such fish.

Changes in hydrology, especially in the upper part of the Río Frío basin, have caused rapid erosion, as well as ruined habitats for many species of birds (Brenes, 1998, p. 51). This has also caused the water level to change dramatically between the two seasons, which can lead to flooding for the towns of Caño Negro, San Antonio, Las Cubas, and Los Chiles.

Boat use has also contributed to erosion and other environmental problems in the area (Brenes, 1998, pp. 51-52). The large wakes caused by powerboats near shores erode the banks of the rivers. Also, the motors have killed aquatic species when they come into contact with the engine’s propeller. Excessive noise from the motorboats has also chased away nesting birds and other animals. Leaks and spills of fuel and oil can also harm the local flora and fauna.

Pesticide use has also damaged the environment (Brenes, 1998, p. 52). Used largely in areas with permanent cultivations outside of the actual refuge, the toxic chemicals soak into the groundwater, and eventually reach the rivers and lakes in the

region, poisoning many species of plants and animals. Pesticide use has even been found in corn, beans, and rice cultivations inside the refuge, where the use of such substances is banned.

Conservation techniques and information, which should be applied to Caño Negro, are discussed in section 2.5. The following section describes the criteria involved in making a research station at Caño Negro successful.

### **2.11 Planning Successful Conservation Projects**

Many researchers have expressed agreement on the basic criteria that must be met to have a successful conservation project. Evans (1989, pp. 230-236) observes that one of the most significant points is that every project must in some way benefit the local community, both in the long term and the short-term. Non-governmental organizations are almost always essential, providing external opinions and ideas. Another important concept is that funding should be acquired on the basis of long-term commitments. Projects should set moderate and manageable goals, and plans should remain flexible and be monitored by administrators. Another criterion is that projects should concentrate on ecosystems that are diverse, meaning lands with a variety of flora and fauna, rather than on land that simply needs to be protected. Finally, Evans stresses that a dedicated staff must be available to persuade local people about the importance of environmental projects.

There are many conservation problems in Central America (Green, 1989, pp. 235-242). Conservationists must not attempt to solve on all the problems at once, but need to recognize a particular problem and a particular approach to have a

realistic chance of success. Many conservationists attempt to solve problems that are too complex. Many times they do not have the skilled staff needed to complete the project nor the resources. This, in turn, ends with large amounts of money being wasted on half-finished conservation endeavors.

Studies are often conducted, focusing on the local community (Green, 1989, pp. 242-244). The local population in some way has to be involved with the project so that the project has the support of local people. This investigation is usually carried out before funds are invested in drawing up project plans. This is because if there is a lack of local acceptance of the project, the project will not be successful.

## **2.12 Summary**

Costa Rica is a country full of contrasts. Landscapes, animals, and lifestyles change drastically with different locations. Many of the ecosystems are very fragile and the low-income families that live in such rural areas may be harming the environment out of economic necessity. This can be a vicious cycle because destruction of the land and further impoverishes its inhabitants. Conservation of the land is both an environmental and socio-economic goal. Involving and educating the local community about conservation issues is a responsibility of the scientific community, who in turn, can call upon the services and special knowledge of local residents. We laid out the methodology in the next section to answer that important question.

### **3.0 Methodology**

Our goal in this project is to develop a plan for a biological research station in Caño Negro that will encourage the participation of local people in its activities. In order to do this, we first needed to determine how other research stations have successfully achieved this goal. Also, we needed to determine what a research station working in the Caño Negro Wildlife Refuge requires in terms of particular types of facilities and resources, and how such a station could be funded.

Before going to Costa Rica, we conducted some interviews in Worcester, MA, to gain a better understanding of Caño Negro's ecology and the environmental problems that would have to be addressed by the future station. We interviewed Professor Phil Robakiewicz (see Appendix H), an assistant professor at Worcester Polytechnic Institute, who has carried out biological field research in Costa Rica. Prof. Robakiewicz gave us his opinions about the country, the people, and what biological research stations should have in the way of basic equipment. Along with the interviewing, we did archival research in books, articles, and websites.

After we arrived in Costa Rica, we found many more sources of information about Caño Negro and other local areas. We continued archival research through the resources that were available at the office of the Programa Nacional de Humedales (PNH) and the Organization for Tropical Studies (OTS) library, but the main methods we used to gather data were face-to-face interviews and direct observations.

All these different steps in our research process are discussed in greater detail in the following sections.

### **3.1 Investigation of Palo Verde and La Selva**

Through our background research, we learned that Palo Verde and La Selva research stations have already achieved many of the goals we and MINAE have set for Caño Negro. On the 31<sup>st</sup> of May, we had an opportunity to visit the La Selva station, specifically to see how it operated. We also looked at how local people were involved in the station's operation and how local residents, researchers, and staff interacted. On the 19<sup>th</sup> of June, we obtained similar information about Palo Verde through an interview with Marco Solano, a MINAE official.

#### **3.1.1 Stations' Operations**

There are many scientific and operational aspects that must be taken into consideration in the construction of a biological research station. We needed to observe exactly what services and resources were important to researchers, staff, and local residents. We also observed to what extent these needs were being met. Facilities we were particularly interested in investigating included sleeping areas, laboratories, workstations, cafeterias, maintenance services, and transportation options. Infrastructure we checked for included plumbing and electrical systems, as well as telephone and Internet connections. We also observed what important equipment was used in each laboratory, such as microscopes and balances.

We hoped that the interviews conducted would provide insights into the operation of each station. We interviewed Joel Alvarado, a nature guide at La Selva

(see Appendix J) to learn how that station has changed over the last 38 years. We also obtained a list of the five main projects being conducted in La Selva to understand the difference between the research done at La Selva and that to be done at Caño Negro. We realized the importance of this because the type of projects conducted in Caño Negro would, of course, affect the type of equipment and resources needed.

### **3.1.2 Suggestions for Caño Negro**

After obtaining a full idea of what was available in the stations, we asked for suggestions as to what should be available at the Caño Negro research station. We realized that Caño Negro would only be able to start out with a fraction of what La Selva and Palo Verde now have. We interviewed administrators for suggestions because they have the most complete idea of what running a research station entails. We interviewed head administrators, such as Cristián Coronas of La Selva (see Appendix K), to find out what it took to keep visitors, researchers, and students satisfied. We also needed an idea of what facilities and resources would be necessary from the beginning of the operation of a Caño Negro research station. We consulted administrators closer to the research end of a station such as Robert Matlock (see Appendix L), the Scientific Manager of La Selva, to understand what scientific equipment would be needed from the beginning at Caño Negro. We used these interviews to evaluate what was available at La Selva and Palo Verde and decide what could best apply to Caño Negro's biological research station.



### **3.2 Investigation for the Basic Caño Negro Station Requirements**

In order to determine what the research station in Caño Negro needs, we interviewed MINAE officials working at Caño Negro and directly observed the interactions and activities in the Caño Negro Wildlife Reserve. This was also done to help us decide what must be available from the very beginning of this biological research station. The interviews were also conducted to get a clearer idea of what the staff and the local residents might look for in the development of a station in their area.

We had two different foci for our observations at the station. The first was what the existing facilities already have. We needed to know what was already available to work with and developed upon. The second focus was what the station would need given the potential areas of research. We talked to the staff of the existing MINAE station to determine what they felt was required. We wanted to be able to combine the information gathered from outside research stations with the needs of the staff working at the station already and the needs of the villagers.

When we began our research, it became apparent that we were not starting entirely from scratch. We were developing a plan that would build upon what was already available at Caño Negro's station. We researched everything there is to know about the station using key informative interviews and available documents. Jorge Gamboa, our liaison, provided a document that contained information about Caño Negro. It included a list of equipment and resources available for the staff. The list was not elaborate, but it was a starting point. The interviews were the most informative aspects of our research. The first interview was with Edgar Ulate, an ex-

manager of the station (see Appendix M). We interviewed him to discover what existed at the station, as well as what programs and activities existed in the surrounding communities. We also interviewed the staff at Caño Negro to provide a more in-depth look into the functions of the existing station. They would be able to explain the list of needed items from the document provided by Sr. Gamboa and elaborate on the information provided by Sr. Ulate, such as existing programs and future plans for the station. The staff would also be able to explain the existing plans for the station in detail as well as provide more informative documents.

While we were collecting information about what the station had available, we were also documenting what the station needed. We used the documents given to us, as well as the interviews with Sr. Ulate and the Caño Negro staff, as well as our direct observation, to determine what equipment, services, and buildings would be needed to make the Caño Negro research station successful.

Funding research was important to find out what source of money the station would have available to obtain the basic equipment and resources necessary. We wanted to investigate as many different sources of income that would support the work of the station and the programs in the refuge. We gathered and researched suggestions from administrators at La Selva and MINAE. We used the uniqueness of Caño Negro's environment and goals of this project as a guide for our search, including such factors as being a Ramsar wetland site, being the habitat for some endangered species, and being the focus of existing conservation programs run by local residents.

### **3.3 Investigation of the Perspectives of Local People**

The research station that will be developed does not exist in a secluded area far from human communities. It is in an area that is surrounded by local residents and their own property. Involvement of the local people is needed to ensure the success of station in Caño Negro as well as the conservation of the refuge. We obtained ideas about how La Selva and Palo Verde have been able to involve the local residents in the operation of their stations using observations and interviews. We also interviewed Joel Alvarado (see Appendix J), a local resident of the La Selva research station, and Marco Solano (see Appendix O), an authority on Palo Verde, to obtain a sense of the general attitude of the public towards the station. We wanted to be able to apply some of these examples to Caño Negro.

To determine if the methods of local involvement found in La Selva and Palo Verde could be applied in Caño Negro, we conducted interviews with the Caño Negro residents. We wanted to gain insights about the willingness of the local residents to work with foreign researchers as well as to uncover barriers to communication and cooperation that either do or do not exist.

#### **3.3.1 Local Residents of La Selva and Palo Verde**

We used observations and/or interviews to determine exactly what types of involvement the community has in the station. Employment is an excellent way to involve local people, but we realize that it is not the only way. We were interested in what types of programs have been set in place to involve or inform the surrounding community. We interviewed Cristián Coronas of La Selva (see Appendix K) to learn what other programs the station sponsors.

### **3.3.2 Local Residents of Caño Negro**

Although we knew there was an existing station in Caño Negro, we wanted to know what was being done there in cooperation with the local communities. We interviewed Edgar Ulate (see Appendix M) to finding out what programs existed in the area, as well as what community problems existed there. This suggested the types of programs we would have to focus on.

When we visited Caño Negro, we also saw the condition of the station first-hand. We were able to talk to the staff, who expressed the same concerns as Sr. Ulate. We interviewed the staff about the environmental consciousness of local villagers. This was done to get a clearer idea of the willingness of locals to be involved with the operation of the station.

An important aspect of our research was talking to and interviewing the local villagers themselves. We wanted to obtain a sense of their interest in conservation as well as education for their children.

## **4.0 Results and Analysis**

The following chapter is a summation of information gathered about equipping the station, incorporating the local community into its operations, and the sources of potential funding for Caño Negro. The conclusions and recommendations provided in chapter five are based upon these findings.

### **4.1 Station Requirements**

Many examples of buildings, equipment and services were found at La Selva and Palo Verde. We learned that both stations offer researchers and students the same two types of housing: dormitories (See Fig. 4.1) and cabins. The dormitories are equipped with the bare essentials, such as beds and dressers, while the cabins include a bedroom, bathroom, and small kitchen. Although the existing facilities in Caño Negro are quite different, there are sleeping accommodations comprised of three rooms that can hold up to 10 people. We discovered that a dining area would be an important addition, especially for long-term researchers. Other stations were able to offer this service through large cafeterias near the living quarters, which serve three full meals a day for approximately US\$3 a meal. In Caño Negro, there is a kitchen available, but it is currently only for the use of MINAE staff.



**Fig. 4.1 – Dormitories at La Selva**

Both La Selva and Palo Verde offer similar research facilities. Three laboratories are essential aspects to the stations: environmental, computer, and dry (See Fig. 4.2). We learned that a library is an important part of a research station and can be used to house both research papers done at the station, as well as reference materials to aid researchers and students. Scientific journals, magazines, books and large computer databases are included in a library. Air-conditioned office spaces are available for researchers and administrators, as well as air-conditioned classrooms. Although the existing facilities at Caño Negro do not include a library, they do include a two-story building for future laboratories (See Fig. 4.3). According to



Vincente Meza, the head administrator, MINAE has plans to divide the building into an environmental lab on the first floor and a computer lab on the second floor.



**Fig. 4.2 – Laboratory at La Selva**

Each research station had some similar laboratory equipment and some that is unique to its special environment. We learned the basic needs were similar and that the most important and frequently used pieces of equipment in the environmental labs are dissecting microscopes, dry boxes to prevent mold, heating and refrigeration units and a variety of scales. We also obtained a list of all the equipment included in the laboratories (see Appendix R). La Selva has computer centers that are well equipped with new computers and internet connections for every computer, but Caño Negro has only one computer without internet connection in the MINAE office.



**Fig. 4.3 – Laboratory Building at Caño Negro**

We learned that research stations are not efficient without proper transportation between the station and the actual research areas. We discovered that the best way to get around in a tropical forest is on foot or by bicycle using paved trails, while wetlands require various types of boats. In fact, the MINAE officials at Caño Negro already have four small aluminum boats and two small plastic boats, but only two outboard motors in operating condition. During the dry season, when the lagoons no longer contain water, the officials can ride around the refuge on the six available horses or in the two 4X4 vehicles that are assigned to the station by MINAE.

For basic utilities and services, we learned that the best electricity service available is from the national grid, and that clean running water is important, both of which are fortunately available at Caño Negro. Telephone service is necessary for



communication outside the research station. La Selva and Palo Verde have an internal telephone network as well as a few public telephones to call outside the station. The internet is available in all offices, the library, and the laboratories at La Selva. The whole village of Caño Negro will have to wait at least until the fall of 2002, before receiving telephone connections; therefore neither telephone nor internet service is currently available. Mail service is available at the OTS stations to receive and send documents twice a week, which researchers and students find useful. These research stations, similar to Caño Negro, are located far from the major cities of Costa Rica. The nearest town to La Selva, Puerto Viejo, is about 4 kilometers away where transportation outside the stations is made possible through the use of public buses in town or rental cars from the station. Caño Negro does not have paved roads, which makes it more difficult to have buses and other vehicles travel to the area. It can take as long as six hours to reach Caño Negro from San José. In some cases, boats, through the Caño Negro Lagoon or the Río Frio, can access the village of Caño Negro.

## **4.2 Sources of Income**

### **4.2.1 Funding**

We discovered many organizations that offer funding to conservation projects and research stations similar to the one MINAE wishes to develop in Caño Negro. We discussed below the organizations we think would be most helpful to MINAE to fund Caño Negro's development. In the next chapter, we make recommendations as to which donors we believe should be contacted.

The World Wide Fund for Nature (WWF), an important international conservation organization, supports many different conservation programs, two of which can be applied to the future station in Caño Negro (WWF Global Network, 2002). The first program is part of The Living Waters Campaign called *Investing in Nature*. We learned that this program has US\$16 million to train 200 scientists in developing countries on conservation; these scientists are then given grants to begin conservation projects. The *WWF Latin America and Caribbean Program* is designed to support local conservation groups in that geographical region, such as those currently working in Caño Negro, by helping with finances and training.

Another source of funds is the United States Department of State and the US Fish and Wildlife Service, which support a program called *Wetlands for the Future Fund (WFF)* (Convention on Wetlands, 2002g). This fund focuses on support of wetland conservation projects. Eligibility requires the area to be a wetland located in Mexico or the Neotropical Region, which would include Caño Negro. The WFF aids national, state, provincial, and local government agencies as long as they are non-profit organizations. MINAE falls under this category, so WFF is a possible source of funds for Caño Negro.

Another international conservation organization, Conservation International, has a joint initiative with the World Bank, the Global Environment Facility and the Ecosystem Partnership Fund. Conservation International was established to improve the management of protected areas. *The Conservation International Fund* is a US \$150 million dollar fund that supports programs that safeguard the world's threatened biological hotspots in developing countries. It aims at improving the

management of protected lands. Conservation International donates money to organizations starting conservation programs that need help with training, conflict resolution, priority setting, strengthening indigenous organizations, and facilitating partnerships between the private sector and protected areas.

The People's Trust for Endangered Species, which supports scientific research and conservation, is another potential donor. Funds are available for wildlife researchers and conservationists who carry out work on endangered species throughout the world. The People's Trust provides money for projects that involve conservation work in the field and for research on a particular species.

Another promising donor is The Nature Conservancy (TNC), whose mission is to preserve the plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive (The Nature Conservancy, 2002). TNC is undertaking a private conservation campaign of US \$1 billion to save 200 of the world's most ecologically diverse places. It is looking to find solutions that benefit both people and the environment.

#### **4.2.2 Local Sources of Funding**

Stations can also receive money from researchers, students, and tourism. Services, such as housing and food, cannot be offered for free. Researchers must also pay to do research at the station. A list of charges made by OTS for using their stations can be found in Appendix S, and this list can be used as a guideline on what to charge at Caño Negro for similar services. Tourism is another source of income for a research station. La Selva and Palo Verde research stations do not allow

tourists to walk freely about their reserve. They must pay for a nature guide, for both educational and safety reasons.

### **4.3 Community Involvement**

Since one of MINAE's main goals is to involve local people in the operation of the Caño Negro research station, how local people have been involved in other successful research stations and what local people think about these research stations is very important. The main methods of involvement, community education, community employment, and conservation programs are all detailed and evaluated. Also, what the local people think of these programs must be considered, in determining which are the most effective, both socially and environmentally, to create the most cohesive partnership between MINAE and the community, that is, the population of Caño Negro and surrounding areas.

#### **4.3.1 Community Education**

Community education is to some degree a passive type of community involvement, in terms of environmental results, but the effects of it are much more far-ranging. Essentially, what such a program does is involve the station in the community, thereby encouraging the community to become involved with the station.

According to Robert Matlock, the scientific director of La Selva and head of its community education program, the program they conduct has researchers and scientists from the station visit the school in nearby Puerto Viejo and give presentations to the students there. He emphasized that it is a small program, but that

it was a relatively successful one, that is, the students are very receptive to the programs that La Selva has introduced in the schools. They have covered topics such as deforestation and ecological corridors in these presentations.

The community education program at the Palo Verde research station is extensive and is one of the station's keys to success. Palo Verde based researchers and scientists speak to groups of farmers and local people about conservation and the environment at public meetings.

#### **4.3.2 Conservation Programs**

Conservation programs are also an excellent way to involve the community in a research station. The benefits of such programs are three-fold: the environment benefits from the program's operation, the people involved benefit from the knowledge gained about environmental and ecological issues, as well as economically, and the environment also benefits from the increased ecological awareness of people who were involved.

In Caño Negro there are already a variety of conservation projects that involve the local community. These are not currently operated by MINAE, but by other organizations, which have handed their operations over to local people. These projects include: a turtle farm, a caiman-nesting project, a butterfly farm, a tree nursery, and a commercial fishing project.

The most successful project, Ullima, is a freshwater turtle farm (see Fig. 4.4). This project has a dual purpose. One focus is to help protect the population of the turtles in the area. The other is to economically benefit the participating families. This is done through the sale as pets of 70% of the newly born turtles that are not

released back into the lagoon. This project is currently based on the 2.3 hectares of land where the research station building is located, making it easy for the station to provide support and involvement.



**Fig. 4.4 – Turtle Farm at Caño Negro**

The caiman-nesting project was started last year in 2001, and is also situated on land where the future research station is located. In this project the local people collect young caimans and eggs and raise them in the program's facilities, which are adjacent to the Ullima turtle farm. After reaching adolescent size, these caiman are then released into the wild. According to Edgar Ulate, former MINAE director of the Caño Negro Wildlife Refuge, this project has been very successful in increasing the number of caimans in the refuge. However, Vicente Meza, the MINAE

professional at the Caño Negro office, feels that there is still a problem with unknown hunters killing the caimans and selling their skins in Nicaragua.

A third project is a butterfly farm, which has involved many women from the Caño Negro community. The women who oversee this project are not from Caño Negro village, which leaves the farm effectively the responsibility of local people. The butterflies produced are either mounted and sold, or released to help with pollination of plants in the area. This project has also resulted in the formation of several other butterfly farms in the area.

The tree nursery project covers the entire Río Frío watershed. This project's purpose is to counteract deforestation in the area and offers economic benefit from the sale of excess trees. There are seventeen families from the Caño Negro area participating in this program.

The commercial fishing project in Caño Negro has also been a success. This project allows commercial fishing during the dry season (approximately from February to April). Local people are allowed to catch fish that would otherwise die from overcrowding due to falling water levels in the Caño Negro lagoon. The fifteen families that participate gain an excellent food source and sell the excess to nearby communities as a source of income.

There are three community involvement programs in place in Palo Verde that can serve as examples for Caño Negro as well. One is a program for women, in which tiful, a prolific wetland plant, is collected and made into paper. Another is a clam-farming program, in which clams are bred, harvested, and either released or sold. There is also a program among a group of over 500 farmers who own small

plots of land. They operate as a cooperative farm, thus creating a more efficient and profitable business, and use conservation practices in their work. They also restore wetland areas for the 40,000 ducks that occupy the area.

All of these programs in both Caño Negro and Palo Verde have seen encouraging success. The programs have benefited both the people who participate and the resources of the environment being conserved. The level of participation is high also, as well as public opinion about these programs. It would be reasonable to conclude that conservation programs are one of the most effective ways to involve the community and aid the environment directly for the MINAE research station.

#### **4.3.3 Community Employment**

Community employment refers to directly employing the members of the local community in paid positions at the research station itself. This method of community involvement is more cost-intensive than others, that is, it costs more. However, it does influence the community in an economically direct way. New job opportunities increase the popularity of a station because the entire community benefits from such increased revenues.

Community employment is the main way that La Selva involves the community. Currently, about 60 employees of La Selva research station are from the local community. They hold various positions, including food service workers, receptionists, bilingual tour guides, database workers, librarians, janitors and construction staff. In many jobs, such as tour guides, for instance, La Selva staff and scientists trained people who were already involved in the station and had them



receive additional training and education from other organizations. One such organization is ANASA, a tour-guide training group.

At Palo Verde, seven of the ten workers at the station are from the local area. Since Palo Verde is also in a region with less educational resources, this is a good example of how some additional education programs can help train employees for positions that require more knowledge, as may be the case in Caño Negro.

#### **4.3.4 Public Opinion**

The local communities near both Palo Verde and La Selva are extremely pleased with the research stations and the work that they do. In Puerto Viejo, La Selva is the first place that guests of local residents are instructed to visit. The increased tourism and other sources of money have benefited both areas greatly. This type of partnership between the station and local residents has no doubt helped achieve a stable and supportive relationship.

In Caño Negro, it is clear that the conservation projects are not very well known, or if they are, they are not associated with conservation. Conservation is not a vital issue on the minds of the people we interviewed, such as Estanislao Sequeira and Lucrecia Alvaro; naturally their first priority is making a living, not the well being of the environment. This is no doubt influenced by the conditions under which they live, that is, their limited income and education.

When we asked residents of Caño Negro what they thought the effects of a biological research station near their community would be, we were given a unanimous opinion. Regardless of whether the people interviewed had heard of the existing conservation projects or not, everyone looked favorably at the station as a

potential boon to their community. They felt that the research station would help bring more attention to their town, and thus would increase government aid and tourism. Some residents looked past this general benefit, and hoped that the increased attention would lead more practically to better roads and telephone service.

## **5.0 Conclusions and Recommendations**

Our IQP team has gathered fundamental information about the requirements for a biological research station, ways to involve the local community of Caño Negro in the operations of a station, and most importantly, different funding options. Taking this information into account we have developed a plan for a biological research station in Caño Negro that will encourage the participation of local people in its activities. The following sections include our conclusions on this complex but important endeavor.

### **5.1 Station Requirements.**

The building of a research station is going to take a lot of time and money. It should be recalled that many successful research stations developed over 50 years and are still improving. The following three subsections describe in detail the buildings, equipment, and services that we believe are needed to begin the development of a biological research station in Cano Negro.

#### **5.1.1 Buildings**

Basic living accommodations should be one priority of the station at this time. Some housing facilities need to be set up close to the laboratory building. We recommend downsizing the “wish list” and focusing on building enough housing to hold up to ten researchers and ten staff members (see Appendix T). Although we believe the Caño Negro station should incorporate both dormitories and personal

cabins in its future development plans, we believe that it should start with simple dormitories. This can be achieved by improving the existing sleeping accommodations at the MINAE station. There is a large common room area in the dormitory building that can be converted into two more bedrooms. The existing rooms should keep the bunk beds available, but new mattresses would have to be purchased and the lighting needs to be increased. A cafeteria is essential for researchers and administrators. Since there is currently only one kitchen for MINAE officials, other options must be made available. We recommend both enlarging the current kitchen area and hiring cooks from the local community or contracting the local “Soda” restaurant to provide meals for the visiting researchers. A variation of the first option is simply to hire local residents to cook out of their own kitchens until renovations can be completed to the existing facility.

Work areas are an important aspect of a research station. Office space must be available for researchers and administrators. We recommend continuing the use of the present MINAE administrative office, as well as transforming the second floor of the research station into office space and a computer lab for researchers. The laboratory building should be divided into two different research areas, the computer lab already mentioned and an environmental lab on the first floor. A library needs to be available, providing books, journals and other scientific publications relevant to the projects that will be done in the future. It might be beneficial to contact universities, including those in foreign countries, and receive donations of old books and periodicals. We realize that a new building for a library is not feasible at the present time; therefore, a central location for printed information as simple as a

bookshelf in the office space area of the research station would be a start. Later, this space can be expanded into a library. The plans for further development of the station should include a visitor center. It is not essential to the station at the moment, but tourism will become an important endeavor to invest in at a later time. The center will educate visitors about the local ecology and the projects being done in the area.

### **5.1.2 Equipment**

Each building within the station will need certain equipment. This will be a very costly part of the development of the research station, but it cannot be avoided. Our recommendations focus on the basic equipment needed from the very beginning with the expectation that additional supplies will be obtained in the future.

We recommend that the furnishings used for housing and offices be kept to the bare essentials. The administrative offices should contain a desk, a low-cost computer and printer, a telephone, and a combination fax and a copy machine. Air-conditioning will be needed to prevent the computer from overheating. The dormitories should include beds, a dresser, and curtains in each room. Individual bathrooms are not essential; it would be more economical to use communal bathrooms.

The laboratory building is big enough to hold large amounts of equipment, but the focus should lie on the basic needs to get the station started. Two extensive lists of laboratory equipment that we recommend the station look into at a later time can be found in Appendices R and T.

A basic dissecting microscope needs to be available, as well as test tubes and petry dishes for samples. A dry box is necessary to prevent mold, especially taking into account the humidity of Caño Negro. There should also be refrigeration to preserve samples and heating units available to dry samples. We suggest good ceiling lighting units be installed, as well as table lamps. A generator will be useful as a back-up power supply in the station, since we learned from personal experience that blackouts are common. Most researchers will need a scale, so it is best to invest in an accurate, high quality one. In case of emergencies, a first aid kit and wash station should be readily available. Our main recommendation for the beginning of the laboratories is to survey the scientists' needs before they come to the station and purchase any necessary equipment then or ask the scientists to bring any special equipment that they might need for their research.

The computer laboratory or office space does not need to be very developed. There should be large tables or desks with internet portals nearby. A two or three inexpensive computers and printers should be purchased for the room, as many researchers have laptops and will only need an internet connection. At a later time, high-quality computers will be needed for a database. The space must be air conditioned to prevent damage to the computers.

Equipment must also be purchased to assist researchers outside of the laboratories and living quarters. Motorboats as well as rowboats should be available to scientists since this wetlands area cannot be effectively researched without them. We suggest starting with the four small aluminum and two small plastic boats available. The outboard motors will need repair, as there are currently only two in

working condition. Also, four-wheel drive vehicles are necessary during the dry season when the lagoon is dry and boats cannot be used. We are recommending only two vehicles to begin with because they are very expensive. As the station develops and expands, more should be purchased.

### **5.1.3 Services**

There are basic services that a research station must offer to scientists and employees. All buildings should have electricity from the national grid, clean running water, a telephone and a restroom. We highly recommend internet access to be available as well, beginning with the computer lab and administrative offices. We propose that a vehicle service to the nearby city of Upala be offered at least two times a day, and a bus to San José should be available twice a week. Mail service should also be available at least twice a week for researchers and others at the station.

## **5.2 Financial Options**

As mentioned in chapter 4, there are many organizations that provide funding. After analyzing these different funding sources, we believe MINAE should look particularly into World Wide Fund for Nature (WWF). We also recommend the *Wetlands for the Future Fund* because it is aimed at government agencies that promote the wise use of wetlands. Another option, *The Conservation International Fund*, supports improved management of protected areas such as Caño Negro. Other donors mentioned in chapter 4 should also be considered. Application forms and contact information are provided in Appendices CC through FF.

We realize that other research stations charge for the services they provide, which is another source of income to cover costs, so we recommend that MINAE also follow this policy. We believe that these charges should include housing, dining services, and use of the facilities and equipment at the station. We foresee an increase in the amount of visitors to the area as a result of the research station, and we recommend accommodating them with guided tours and educational programs that can also provide a source of income.

### **5.3 Integration of Local Community**

As discussed in chapter 4, the community of Caño Negro is already involved in conservation projects. Thirty-five families from the town itself are currently operating the turtle farm, caiman nursery, butterfly farm, and commercial fishing project. These projects have all visibly helped the community, and the environment, which makes them appear to be successful.

However, it was also evident from our research that some local people have no idea that such programs exist and do not see how a biological research station can actually be of help to the environment. Increased tourism and governmental assistance is all the benefit that some residents foresee.

The objective of MINAE is to involve the community in the research station, and for good reason. In a community as small as Caño Negro, it would be impossible to develop a successful biological research station without the approval, involvement, and guidance of the local community. We recommend that this be



done in a variety of ways ranging from conservation projects, as previously discussed, to employment at the research station itself.

### **5.3.1 Community Education**

The main idea behind a community education program is to teach the community directly about the environment. Essentially, what such a program does is involve the station in the community, and thereby encourage the community to become involved with the station.

We recommend a community education program, as utilized by La Selva research station, to be especially appropriate for the Caño Negro research station. The local primary school, as well as the schools in Veracruz and Playuelas, would be excellent places to expose young people to the biological treasure that is Caño Negro, and thus spread awareness of the area across the region.

Such a program would also encourage interest in the station itself. By generating curiosity about what happens at a biological research station, a curiosity about biology itself should definitely be a byproduct. If this is accomplished, the station can be used as an educational resource for the community, as well as for visiting researchers and scientists.

The actual time commitment of such a project is minimal, a few hours a week, and the cost is small also, just enough time and effort to make a memorable presentation. This makes it an ideal starting point not only for community involvement, but also for improving public awareness of the station and its mission of helping the environment.

### **5.3.2 Conservation Programs**

Conservation programs can be very effective and have been implemented in the Caño Negro village with considerable success. The caiman, turtle, butterfly, and fishing projects are examples of this.

If MINAE can unite some or all of these projects under the supervision and facilities that are (and will be) available at the Caño Negro research station, it will reinforce community involvement and partnership with MINAE, and thus give new strength to these projects. MINAE could also extend these projects to other communities, such as Playuelas. Of course, this does not mean that conservation projects should be limited to these. A wetland bird nesting project or an aquaculture program could easily be instituted along the same lines as the turtle farm and caiman-nesting program. Also, due to the obvious increase in personnel that this station will require, the commercial fishing program can be more efficiently monitored.

Conservation projects would be especially effective if introduced by MINAE, since they would demonstrate more than any other approach an ideal relationship between the station and the people: a partnership, working towards a common cause, with mutual benefits.

### **5.3.3 Community Employment**

Community employment is another excellent way to involve the community, and benefit the community ecologically and economically. If local people are hired, this is not only a new source of income for the community, but it will also offer the chance to influence the environmental outlook of these employees. This new income

for the community will also improve the town's view of the station and encourage participation in other ways.

Of course, actually running the station will require more personnel than the seven people who are currently employed by MINAE at the existing station in Caño Negro, so we recommend hiring receptionists, librarians, mechanics, and guides from the region. There are some major hurdles to accomplishing this objective, which include the fact that Caño Negro is not only one of the poorest regions in the country, but also the local people have had limited education. Thus, supplementary training will need to be provided for certain positions, such as nature guides and field research assistants. This will be a slightly more costly option, but we feel that it will save money in the long term.

However, at this point the station will probably only need to increase its staff by a few positions, and this should not be looked at as the primary method of involving the community. In time, when the station is more developed, employment will undoubtedly play a much larger role in the station's operation. However, since this is a lengthy process, it will not need to be addressed on a large scale until this point is reached. The education and training process for local people may be started soon to prepare them for the time when jobs will need to be filled.

Our project in Caño Negro has given us a glimpse of the richness and complexity of the natural environment and the diverse society of Costa Rica. The Caño Negro research station will be a place for scientists and other students to further explore

these complexities. The research done for the development of the station is preliminary work that will have to be improved over time just as La Selva grew from a simple river station to become a successful research station. The station should be seen as an opportunity for MINAE to make an important partnership with the surrounding communities through the common goal of conservation. This partnership will be able to utilize the benefits of technology to help improve the socio-economic hardships in Caño Negro. Although Caño Negro is small in size, as a member of the Ramsar Convention, it has the potential to make an impact on the larger world through the example of how science and society can work hand in hand.

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## **Appendix A: Sponsor Information**

El Ministerio del Ambiente y Energía (MINAE), is Costa Rica's ministry of environment and energy (MINAE, 2002). MINAE's purpose is to support the investigation and conservation of natural resources, mining, and other energy developments. They also develop strategies for community involvement, and preserving biodiversity by protecting wetlands, water sources, wildlife, and the environment. MINAE's underlying goal is to improve the quality of life for all Ticos.

MINAE has several departments, known as "Direcciones," which are responsible for different programs, like Mining, Meteorology, and Hydrocarbon Usage (Dodd, Jaramillo, and Morin, July 2001, Appendix A). The department in charge of the nation's natural resources in each of its protected areas is the Sistema Nacional de Áreas de Conservación, or SINAC. MINAE created an advisory program, the Programa Nacional de Humedales (PNH), to consult with SINAC and MINAE about wetlands specifically. The PNH also works in conjunction with the Universidad Nacional, World Conservation Union, and the Organization of Tropical Studies (OTS), which all promote education about wetlands and their ecology. The Programa Nacional de Humedales has an annual budget of US \$356,000 and consists of ten members. The PNH coordinates studies between these organizations, and directs results to SINAC for policy development.

PNH is a relatively new division of MINAE, and does not have official goals yet (Dodd, Jaramillo, and Morin, July 2001, Appendix A). It serves as an advisor to other agencies, so the parks and other protected areas are not under its control. However, its recommendations are treated with the utmost respect, as the prevailing advisory agency in natural resources.

## **Appendix B: What is an IQP?**

An Interactive Qualifying Project (IQP) is a project based upon society's relationship with technologies (WPI, 2002). This project was created by Worcester Polytechnic Institute to give students a hands-on view of problems and the successes that can arise when society and technology interact with mutual understanding. The project is designed to make sure students will be competent as professionals by understanding the societal implications of their professional work.

The IQP is an interdisciplinary project. The problems in these projects relate science with society and encourage learning about the interaction between the two. The projects also require the students involved to conduct independent research and collaborate as a group. This also develops group dynamics and interaction, which is common in the workplace.

Throughout the IQP different research methods are tried. Methods such as surveying, case studies, interviewing, along with others, are used to gather important information. The students working on the IQP many times do not have experience working in the area they are assigned to or with the research methods they must use. The project is based on personal interests; it allows the students to decide what they want to focus on. All of these conditions encourage active learning, through hands-on research and self-teaching.

Our project, "Research Station Development and Community Participation," is an Interactive Qualifying Project. The focus of the project is developing ways to incorporate local residents of Caño Negro in the successful running of a biological

research station. Our project concerns the education of the local people as well as ways they can help this station operate.

Our project qualifies as an IQP because not only did we work with other biological research stations to gather information on the technological aspects of such stations, but we also worked with the local Caño Negro community to better understand how they can become involved in such a project. We proposed a station that incorporates both local people and the scientific community in a mutually beneficial partnership.

## Appendix C: Task Chart

<b>Task</b>	<b>Week 1</b>	<b>Week 2</b>	<b>Week 3</b>	<b>Week 4</b>	<b>Week 5</b>	<b>Week 6</b>	<b>Week 7</b>
1. Liaison Meetings	X	X	X	X	X	X	X
2. Group Meetings	X	X	X	X	X	X	X
3. Advisor Meetings	X	X	X	X	X	X	X
4. Spanish Classes	X	X					
5. Orientation with MINAE	X						
6. La Selva Research			X				
7. Cano Negro					X		
8. Palo Verde Research						X	
9. Interviews with MINAE				X			
10. Write Report	X	X	X	X	X	X	X
11. Work on Presentation						X	X
12. Final Presentation							X

## **Appendix D: List of Acronyms**

<b>IUCN</b>	The World Conservation Union
<b>MINAE</b>	El Ministerio del Ambiente y Energía The Ministry of Environment and Energy
<b>OAS</b>	Organization of American Studies
<b>OTS</b>	Organization of Tropical Studies
<b>PNH</b>	Programa Nacional de Humedales National Program of Wetlands
<b>SINAC</b>	El Sistema Nacional de Áreas de Conservación The National System of Conservation Areas
<b>UCR</b>	University of Costa Rica
<b>WWF</b>	World Wide Fund for Nature
<b>WWF</b>	The World Wide Fund for Nature (World Wildlife Foundation)



## **Interview Protocols: Appendices E-G**

## **Appendix E: Interview Protocol – MINAE**

Person Interviewed:

Associated Agency/Organization:

Date Interviewed:

Experience/Connection to Biological Research and/or Caño Negro:

What are possible problems or limitations with developing a research station in Caño Negro?

What are the benefits of developing this research station?

What are your ideas about how to involve local people at the research station?

## **Appendix F: Interview Protocol – La Selva and Palo Verde**

Person Interviewed:

Associated Agency/Organization:

Date Interviewed:

What purposes does this biological research station serve (i.e. services offered, etc.)?

What are the main features of this biological research station?

What features did this station start with, and which ones took priority?

In your opinion, what essential features should a starting research station have?

What are some of the problems that this research station has encountered?  
(technological, financial, cultural, management)

How have these problems been dealt with, and which are the most serious?

How does community involvement fit into this biological research station's operation?

What has been your personal interaction with the local community (at the station)?

Have activities involving the locals been successful, or have problems occurred?

What do you know about the Caño Negro Wildlife Reserve? (And what do you think of a biological research station being developed in the area?)

## **Appendix G: Interview Protocol: Caño Negro Community**

Age:

Family/Household Characteristics:

Occupations:

How long have you lived in this area?

Do you have any concerns about Caño Negro?

How do you think the community would feel about a research station in Caño Negro?

What do you feel would be the effects of a research station on your community?

## **Interviews: Appendices H-O**

## **Appendix H: Interview with Professor Robakiewicz**

Location: WPI

Date: April 10, 2002

1. What should be in a biological research station?

A biological research station should provide advanced research facilities, laboratories, databases, and services such as a cafeteria and food and shelter for those working in the fields and jungles. The research station should be patrolled and protected as well, in order to discourage poaching.

2. Have you ever worked in a research station?

Professor Robakiewicz has worked in the La Selva Biological Research Station in the northeastern part of Costa Rica, relatively near the Nicaraguan border. He conducted research in a wet forest there in 1987.

3. Did it incorporate the local community?

La Selva research station hires local people to work at the station and to be research assistants. They can provide help in the field, and as an incentive, the station will charge a reduced fee to those researchers who will hire a local to help them with data collection.

4. Do you know anything about Caño Negro?

Caño Negro is a flood plain in a river area in the northeastern part of Costa Rica, relatively close to Nicaragua. It resembles the wet forest that La Selva is located in and has the same species assemblages.

5. Do you know what a tropical wetland area ecosystem is like?

Caño Negro is a “Tropical Moist” ecosystem, meaning it accumulates less precipitation than does the La Selva research station.

6. What was your impression of the Ticos of rural areas (esp. in Caño Negro)?

The Ticos have access to education, are well informed, have successful survival tactics in wetland areas. They do not live as though they are in a “third-world country”, and have a culture differing from the Nicaraguans. They are a mixed culture of European influence, speaking languages such as Spanish, French, and German.

7. Do you have suggestions for other good resources?

OTS: Organization for Tropical Studies

The Natural History of Costa Rica, author: Daniel H. Janzen

The Costa National Park System in Costa Rica

Additional Ideas:

- Community based education proves to be ineffective, taking into consideration that the majority of poachers are either criminals, or are not interested in being educated about preservation. An effective method of preventing poaching is to ensure that biological research stations are patrolled and protected well.
- The Costa Rican government had made a political attempt to educate the local population on ecotourism, explaining that it increases the Gross National Product, and thus will benefit the Ticos. This encourages them to promote ecotourism.

## **Appendix I: Interview with Jorge Gamboa**

Location: WPI-IGSD (Phone Conversation)

Date: April 9, 2002

Attendance: Kerry and Aaron

The conversation started out with a few greetings via speaker phone. Aaron did the talking while Kerry recorded. The first topic of conversation was directed to the actual project focus. It has been determined the project will be based on developing a plan in which both researchers and locals run a biological station. The actual building for the station is already in place. Jorge would like us to develop ideas for an activity that will promote community involvement. He would also like us to have an understanding of how stations work. Some researchers have been recruited for the project and have some experience with Caño Negro.

Our project team also found out that Jorge is very eager to hear our ideas. He wants us to make suggestions of how to make the station work. Jorge will also be taking us to Caño Negro often, he thinks. He thinks fieldwork will be the best way to develop our research. The last part of our conversation was based on how we should keep in touch. He told us he will check his email daily and would love to talk to us soon.



## **Appendix J: Interview with Joel Alvarado**

Location: La Selva Biological Research Station

Date: May 31, 2002

Joel Alvarado was our nature guide during our visit to La Selva. He first started with a brief history lesson about OTS. He then gave us a tour of the facilities present at the station and explained many of the operations of the station. Joel is also a member of the nearby town, Puerto Viejo. He was able to give us a perspective as a local resident about the significance of the station to the town.

### **General Information about OTS and La Selva:**

The Organization of Tropical Studies (OTS) is a non-profit organization with a consortium of 64 universities and research institutions in the United States, Latin America, and Australia. Leslie Holdridge was the original owner of the land before it was sold in the name of research to OTS in 1963. The “Old La Selva” was just a river station. It began with one laboratory with no equipment. It now has 27 buildings. The research area is easily navigated through a system of small numbered posts spaced 100 meters apart that make up a grid throughout the forest (see Appendix P for a detailed map). The grid system is coupled with a GIS system that helps researchers determine the exact place of their research. There are certain plots of land that have been restricted or reserved for long-term research studies. The forest itself has rich diversity that includes approximately 100 species of trees per

hectare of land and an area especially rich in altitudinal migratory birds, which migrate from high to low elevations, in dealing with changes in the weather. It is 60% primary forest area and receives 5-8 meters of rain per year. It is connected to other research sites through a corridor that connects La Selva to the Braulio Carrillo National Park. Researchers can travel by foot for six days. There are shelters along the corridor for travelers. There are current plans to improve the condition of the corridor to improve access to the station. At La Selva, only basic science is done on how the forest works. Conservation is not a main focus of the research conducted even though it may be a product of it. Below is a list with explanations of some of the projects being done at La Selva.

#### Main Projects at La Selva:

La Selva has approximately 205,000 research projects being conducted on-site at the present time that attract about 250 researchers and students every year, but there are five main projects that have attracted the most group of researchers for many years. *The Alas Project* is focused on the study of the arthropods in the La Selva forest. The project has lasted for 10 years and included 9 different research groups. An example of the complexity of this project is the 450 species of ants discovered. One research developed a bar code data system to record all of these different species of arthropods. *The Bosques Project* deals with secondary forest growth. It began in 1997. The goal of the project is for the establishment of trees in the area to make up for the damage done due to degraded forest patches, agricultural lands and urban centers. *The Carbono Project* is the study of the carbon dioxide use

of the trees. This study is aimed toward solutions to global warming and pollution. *The Streams Project* is the study of attributes of the water sources such as water level, and phosphorus and oxygen levels. *The Huertos Project* is a long-term land fertility study. It is focused on the best means of the reforestry of the primary forests. Most of these projects are funded by the National Science Foundation with additional funds from other funding organizations such as the Andrew W. Mellon Foundation.

#### Facilities and Resources Available:

As mentioned earlier, there are 27 buildings in total at the station. All of the beautiful wood used to construct the buildings was imported. There is a specialized library started in 1980 that is still expanding. Joel explained that although it is small at the present time, La Selva would like to improve the resources available at the station. The library is specialized because contains a copy of over 3,000 research papers and theses done at the station. Scientific papers are filed at the station every three days. 40% of all tropically themed papers from Costa Rica are from La Selva. There is also a computer database to find information in the library. They have an impressive Herbarium in the library. A researcher set up a database called La Selva Digital Florula to search for flora in that environment of La Selva, which can be accessed at the library. There is a water treatment facility at the station because there are no septic tanks. There are two sleeping halls, a dining hall, cabins for long-term researchers, shed houses, storage rooms, empty laboratories, classrooms, offices and more. All of the rooms except for the dormitories and the location for the *Stream*

*Project* have internet connection. In the academic building, there were two dry labs for every classroom that included only a sink and a counter. Being in Costa Rica, La Selva would not be complete without a soccer field for recreation. Along with the grid system through the forest, there are 12 kilometers of paved trails. The whole station has phone service, but it is an intranetworking system. To call out of the station, there are public phones available. There is no clinic at the station to take care of medical emergencies. The nearest clinic is in Puerto Viejo which is about 4 kilometers away. In almost 40 years of the station's operation there have only been eight medical emergencies due to snake bites during field study.

#### Local Community Involvement:

At the beginning La Selva was not always very welcome to the community, but in 1983, it began a community outreach program. The older residents, especially, are proud of the work of the station. Television advertisements about La Selva have also helped increase recognition to the local community. There are approximately 60 workers who were hired from the town. They are given various positions such as field research assistants where training is necessary because the position is so technical. Researchers have to pay for assistants which go to the training costs. One important training program that Joel mentioned was ANASA. ANASA is a guide association that trains local residents to be nature guides. When La Selva needs more than just the three full-time guides that it has, it can hire members of ANASA. It was the first program of its kind in Latin America to train local residents to be nature guides.

Equipment Observed:

- Refrigerators
- Heating Ovens
- Chemical Hoods
- Emergency Showers
- Sinks
- Balances
- Microscopes
- Auto Analyzers
- Fire Blankets
- Tricycles with carrying baskets for rent
- Fire Hoses

See Appendix R for a complete listing of available equipment at La Selva and Appendix Q for a complete list of observations made at La Selva.

## **Appendix K: Interview with Cristián Coronas Sáenz**

Location: La Selva Biological Research Station Dining Hall

Date: May 31, 2002

Cristián has been the Administrative-Financial Coordinator and the director of the La Selva biological research station for a year and a half. His credentials include a MBA in Administration and a minor in Finance & Accounting. He also has many years of Customer Service Experience. He has been working at La Selva for approximately a year and a half. He attributes the success of the station to two important factors: the biodiversity of the forest and the facilities available. He provided the following information about the station as well as suggestions for what Caño Negro should have.

### **Facilities and Services Available at La Selva:**

He said that there is an academic center where most of the educational programs at the station are done. There are environmental, dry and computer laboratories available with extensive research equipment important for on-site research. There is a library and offices for researchers and students to do archival research and private work. La Selva has 61 kilometers of trails for researchers to make traveling easier through the forest. 12 kilometers of these trails are paved. Transportation services are provided through bicycle and car rentals. There are also buses that run from the station to Puerto Viejo, the nearby town, four times a day and

to San José twice a day. Mail service is also available twice a week for the residents of the station. The services specifically for the residents were most impressive. The dormitories and the cabins are taken care of in the form of a one star hotel as he called it. Linens and towels are provided to all residents, which include the long-term researchers. The dormitories have communal bathrooms with hot water included.

#### Problems at La Selva:

When asked what problems La Selva has had to face in the short time that Cristián has been around, he focused on three main issues. There have been management problems of illegal practices, specifically poaching, which are now being controlled by two forest rangers. Another issue that La Selva has to deal with is competing with other research stations. La Selva has a strategic plan to increase marketing to new universities in the U.S., Europe, Asia, and Latin America. Finance is always an issue that research stations will have to deal with as well. Cristián has to make sure that the station has enough money to maintain the facilities and services that the station is known for as well as support the strategic plan that La Selva has developed.

#### Sources of Income:

La Selva has four sources of income that include OTS membership fees (\$8,000 per year), researchers' and students' resident fees, tourism and endowments

for research projects. The station has a budget of \$1 million. 80% of the budget goes back into the operation of the station.

#### Benefits to Local Community:

La Selva has benefited the local towns, especially Puerto Viejo, in many different ways. La Selva has approximately 60 people from the local communities employed at the station in all different aspects of the operation of the station including nature guides, cooks, field research assistants, and more. When new positions are available, the station looks to hire in the local areas first. The station also buys materials from Puerto Viejo. In short, La Selva has helped boost the income of the town.

#### Educational Opportunities:

Along with economically benefiting the local communities, La Selva has also provided educational programs for the community. Researchers go into town and teach local schools. The station also offers educational courses at the station. There are courses for credit offered for university students and learning courses for interested visitors.

#### Suggestions for Caño Negro:

Cristián says that the first things a station at Caño Negro would need to start are principal donors to help fund the station. He mentioned how OTS still had to write proposals to fund the different research projects. He suggests having an



executive board with a board president in charge of the operation of the station. The board will be able to define a goal for the station. It will dictate the direction that the station has to go. The board will even be able to describe the positions needed at the station. He suggests hiring local residents to fill many of the positions at the station such as a local cook. Local residents will know how to shop inexpensively for food for the station. A nutritionist may be needed to assure that all the meals are well balanced. There are certain services that Cristián feels will be necessary such as dormitories with community showers. Services should be run like a one star hotel, which includes providing hot water, towels, and sheets.

## **Appendix L: Interview with Robert Matlock**

Location: La Selva Biological Research Station Dining Hall

Date: May 31, 2002

Robert Matlock is the Scientific Manager and Supervisor of Environmental Education Program at the La Selva Biological Research Station. He has been at La Selva for approximately four years.

### **Information on Financing:**

Robert explained that one of his main duties was to write proposals to finance research projects. At La Selva 40% of the endowment for projects is provided by the National Science Foundation. He could not stress enough the importance of writing proposals for projects at Caño Negro. He also emphasized the fact that Caño Negro will need a steady source of income. It will need the support of organization.

### **Environmental Education Program:**

As supervisor of one of the educational programs at La Selva, Robert was able to provide information on the connection of the station to the community. He explained that the program was small scale. Scientists and researchers from the station would go into the town of Puerto Viejo and give presentations about the environment to local schools. As a result of this program, school children understood their environment and obtained greater environmental awareness.

### Problems at La Selva:

In his four years at La Selva, Robert could only think of two main problems that La Selva had to face that could be potential problems for Caño Negro. There have been issues of security to handle which includes break-ins into personal cabins at the station. Another problem that Caño Negro will have to be able to face is emergency medical attention. There must be emergency procedures in place for potential accidents. An example at La Selva would be poisonous snake bites. If there is not immediate action the victim will die.

### Suggestions for Caño Negro:

He mentioned the need for housing and office space for the investigating researchers at the station. Necessary services include electricity, telephone and internet connections. Electricity is the most reliable if it is on the National Grid. He suggests that the station start off with little or no equipment. The station must survey the needs of the researchers who will be visiting Caño Negro to find out which equipment take priority. There have also been many cases at La Selva where scientists left equipment that they bought at the conclusion of the project. If Caño Negro is planning to buy equipment, he suggests inexpensive computers with laser printers, dissecting microscopes, and dry boxes that have a heating element because mold will grow on lens in the humidity.

## **Appendix M: Interview with Edgar Ulate Castillo**

Location: PNH office, SINAC building

Date: June 5, 2002

Edgar used to be the head administrator of the MINAE station in Caño Negro. He is currently the Technical Coordinator of the group in charge of the larger conservation area called Área de Conservación Arenal-Huetar Norte (ACA-HN), which includes the area of Caño Negro. He provided us with a lot of information about the Caño Negro area and the Wildlife Refuge before we were able to visit, which gave us a better idea of what to expect. It should be noted that some of the information Edgar provided does not agree with the updated information that we received from Vicente Meza (see Appendix N).

### **General Information:**

The Caño Negro area most resembles a village than a town with a population of about 350 people. There are other small villages nearby such as San Antonio and Las Cubas. There are influences from larger towns that include Los Chile with a population of about 8,000 people 25 kilometers away from Caño Negro, Upala with a population of about 15, 000 people 38 kilometers away and San Rafael de Watuzo with a population of about 12,000 people 40 kilometers away. Although the area of Caño Negro is government about 10, 000 hectares of protected area it is mixed land. Only 30% of the land is state land while the other 70% is privately owned. The

villages and towns around the Caño Negro area have a mixture of influences. The area is only 15 kilometers away from the Nicaraguan border and there is influence from an indigenous community called the Malekus. Caño Negro is also second poorest zone in the country with one of the lowest illiteracy rates. It is not a big attraction for tourism because the roads are in poor condition and the regulations on the area control the amount of access to it. Edgar understands that tourism can be a benefit to the station, but it can also affect the ecosystem because of increased use of the resources.

#### Biodiversity of Caño Negro:

Although Caño Negro is a small wetland area, it is home to several different species of flora and fauna. Edgar provided some examples of the richness of the area. There are approximately 850 species of birds in Costa Rica. 400 of these species have been found in Caño Negro Wildlife Refuge. Most of these birds are migratory traveling from the Caribbean side to the north side. There are at least 27 different species of fish in the lagoon which include the guapote, machaca, mojares, tilapia, and gaspar. There are species of fauna that travel back and forth between Caño Negro and Nicaragua because of the close proximity to each other. He mentioned that there is some unique vegetation called marialles with at least three different species. He also notes that the trees on the waterfront are different than those found in the wetland itself. The vegetation has been the least studied aspect of the areas so he does not know much about it. He can only speculate on the possible findings such as new species and medical benefits.

### Existing Conservation Programs:

There have been studies done at Caño Negro by universities such as the University of Costa Rica (UCR), The National American University (UNA) and the Technological Institute of Costa Rica (IT). The biggest surprise to us was to hear from Edgar that there were existing conservation programs. The people are understanding the need to conserve and the benefits in conservation. Although most of them were run by the ACA-HN, there has been community involvement in these programs for over 12 years. Approximately 36 families are involved with many of these programs. Conservation programs are not new to the area. There is one program called Ullima (Maleku for turtle) that deals with turtle farming. It has been started by the ACA-HN as a 5 year training program. The families have been trained on how to maintain the population of the turtles and how to raise them. Fresh water turtles are raised as pets. Some are sent back to the refuge while the rest are sold. There has been an average of \$1500 increase of yearly income since the start of the programs for the families involved. There is a butterfly farm program that is run by women. There is also a program with an association called La Asociación de Pesca Artesanal. Fishing is only made legal before the end of the dry season when before the fish die because of the decreased water levels and oxygen. Four to five metric tons are caught yearly. There are also five projects in cooperation between Costa Rica and Nicaragua that total a \$4 million effort. One project is focused on the recuperation of Río Frío because its water levels have also dropped.

### Ideas for more Programs:

Edgar realizes the importance of involving the local communities in the conservation programs of the area. The people will not only become more environmentally conscience but also will receive economic benefits. The station wants to centralize the work of these programs that will form a partnership between MINAE and those involved in these programs. It also wants to initiate other conservation programs. There is a need to further investigate the vegetation, the fish, and the endangered species in the area. Programs concerning sedimentation will need to be explored further. The government is slowly helping to recuperate the refuge with monetary support. As mentioned before Costa Rica has a few joint programs with Nicaragua. Edgar sees the possibility of the Nicaraguan government helping the station with making international proposals, but knows that it does have the money to give to help support the station.

### Master Plan for Caño Negro Research Station:

The station already has plans to expand. This master project is a three part plan. The first part of the plan is to build the investigation or laboratory building and fill it with equipment. The 400 square meter laboratory has been built already with two floors on a plot of land that is about 6 hectares. It has electricity on the National Grid system and access to drinkable well-water. There is no telephone or internet access in the building because there are only three public phones in the area (no private ones). He said that there should telephone connection for the whole area with three or four months though. The station needs money to finish this first part of the

project by providing the equipment needed to begin operation at the research station. The second part of the project is to build an administration area for the MINAE officials and the future staff of the station and fill it with necessary equipment. The third part of the project is to build the dormitories or sleeping areas for researchers. The vision of the station is to have a place for researchers to study on-site without having to send samples to San José for preservation and to have a central location for all of the programs being run in the area. The station is actually located between the Caño Negro village (800 meters away) and Las Cubas (1 kilometer). When operations begin at the station, more staff will have to be employed because there is not enough employees to take care of both the station and the refuge.

Problems:

He said that many of the problems that Caño Negro has stems from the necessities of the local residents. Agricultural areas are growing which is one of the causes of deforestation. The agricultural areas upstream are also causing the sedimentation of the lagoon. Sediment from the lands ends up in the Río Frío which flows directly into the Caño Negro lagoon. The loss of lagoon is visible to the officials as it is being replaced by more and more land. Illegal hunting is also a problem in the area. An example is the hunting of caimans for their skin, which caused a drastic decrease in the caiman population in the 90s until the management program started.



## **Appendix N: Interview with Vincente Meza**

Place: MINAE office in Caño Negro

Time: 10:00 AM, June 14, 2002

Vincente Meza is the head of the MINAE office in Caño Negro. He has been working in the area for the past 11 years. His official title is the site professional, because he holds a bachelor's degree in biology. He is originally from Heredia and San José.

In addition to him, there are six other people employed by the Caño Negro office: two technical assistants, three rangers, and one miscellaneous. The equipment that the MINAE station has already is two cars, three motorcycles, six horses, four outboard motors (two in good condition, two in bad condition), four small aluminum boats, and two small plastic boats. The area has an annual budget of 2,000,000 colones, without salaries. The money is used mainly for basic needs of protecting the area and equipment repair.

The land itself that the Caño Negro Wildlife Refuge lies on is 45% private land, and 55% state land. Some of the major problems in the area are erosion, hunting, and pesticide use.

The problem of erosion first began to emerge fifty years ago when farmers from the Caño Negro and San Antonio built a canal from the Río Frío to the lagoon of Caño Negro itself. This was done to provide a route over water to their cropland upstream on the Río Frío. It effectively rerouted the majority of the water flow from the river basin to pass directly through the lake, eroding tons of sediment yearly, and

disturbing calmer waters throughout the area. It also left the branch of the Río Frío that used to pass by the lake nearly empty. Today, this old riverbed is called the Río Viejo or “Old River” by the people in the area. In an attempt to help prevent erosion, in 2001, tons of sediment from the bottom of the lagoon was dredged up, and a dike was built to prevent erosion of the shoreline near the city. This dike also serves as a walkway by the edge of the lagoon.

Hunting has become a larger problem in the last four years, especially in the case of the caiman. The caiman are killed, skinned, and sold in Nicaragua, a mere fifteen kilometers away, where such practices are legal. This has been the apparent trend among hunters, and has taken its toll on the caiman populations in the area.

Pesticide use has not been a terrible problem immediately in the area, however, permanent cultivations toward the east of the lagoon have used pesticides, and they are washing into the lake also, harming the flora and fauna.

Conservation projects in the area have been very successful. Already, there are four main projects that involve the local community: A turtle farm, caiman nesting area, butterfly farm, and commercial fishing program.

The turtle farm project, called Ullima, involves about six families from the community. They collect approximately 20,000 eggs for the hatchery. 70% of those turtles are sold commercially, and the other 30% are released back into their natural habitat.

The butterfly farm, called Fufurama (fufu means butterfly in Maleku, the indigenous language) is a local project that is operated by and involves mainly

women. It has had a markedly positive effect on the community. The women who run the project are based in Upala, which is 38 kilometers away.

The commercial fishing project is only operated during the dry season, to catch the fish that would have otherwise died due to falling water levels. It is operated from February to April, and fish is sold to local communities. The farmers who participate in this project can earn 300,000 colones from the sales.

The research station that our project focuses on was built in 1998. The section of land that it was built on covers 2.3 hectares. The turtle farm and caiman nesting area are also currently on this land.

## **Appendix O: Interview with Marco Solano**

Location: PNH office, SINAC building

Date: June 19, 2002

The Palo Verde research station has been in existence for nearly 50 years. It started as just a small farmhouse, but with the help of OTS, grew into the successful research station that it is today. The station is located in tropical dry forest, which is the only one in Costa Rica, and one of the last in the world. It also has wetlands, like Caño Negro. The Río Tempisque also runs through the area.

The station has the capacity to hold 60 people. It has a cafeteria, store, bathrooms, an auditorium, library, and computer database. The station also provides electricity from the national grid, telephones, internet, and fax capabilities. The waste water is not treated, but a septic tank system is used. There are 40 students that take special courses offered at the station.

There are community education programs offered, where scientists and researchers go out into the community and speak with farmers and ranchers about conservation and other subjects. 7 of the 10 station employees are from the local area, the other three are from San José.

There are conservation programs in place too. Coorpeotega is a farming co-op project that has nearly 500 local farmers working together on a large communal farm. They also work to restore destroyed wetlands to their former glory.

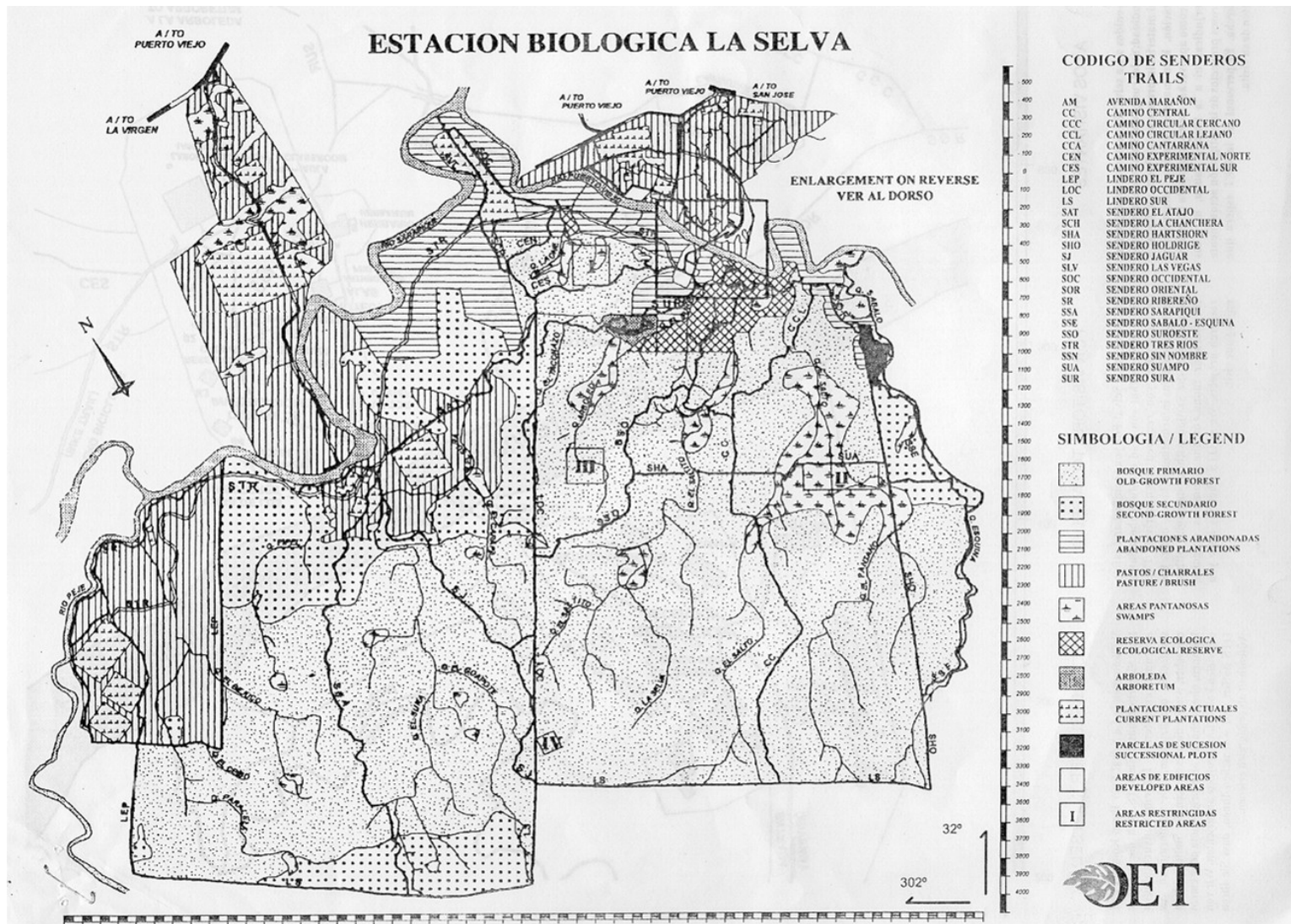
There is also a clam farming project that has local people harvesting young clams and raising them for some time, before they are re-released or sold.

Main problems in the area are erosion, like Caño Negro, calcification of the plumbing, and forest fires. The bomberos, or firefighters, are all volunteers from the local community. They take great pride in their work to save the dry forest, and are held in high esteem by the community.

The local community is grateful for the development of this station, mainly because of the economic boost that the tourism and government aid have provided to the community.

In Caño Negro, on the other hand, there has been very little work done. This includes with the lagoon, community, and indigenous community. The problems with developing a research station in the area include a lack of funds, lack of university involvement, lack of good administrators, lack of a manager, lack of marketing, and a lack of professionals.

## **La Selva: Appendices P-S**



**Appendix P: Map of La Selva**

## **Appendix Q: La Selva Observations**

The OTS research station La Selva had many features that were apparent to us by direct observation. This appendix is intended to be a listing of these observations.

The station had 27 buildings, including a cafeteria, water treatment facility, classrooms, cabins and dormitories, laboratories, offices, storage areas, and others. It also had an area cleared away for use as a soccer field.

The laboratories and classrooms all had power, fans for air circulation, lights, phone hookups, internet connections, and selected rooms also had air conditioning. Every classroom in the newly developed area had two dry labs attached to it.

The equipment visible in the main laboratories included microscopes, refrigerators, ovens, dryers, balances, safety showers, fire blankets and extinguishers, chemical hoods, centrifuge, auto-analyzer, and mass spectrum analyzer, as well as various flasks, beakers, and other chem. lab equipment.

Also of note were the Ambiolabs, which are intended for the study of live animals.

There were also a variety of bicycles and tricycles with cargo baskets that the station maintained for use on the trails. Public phones were available outside the main cafeteria/office building, and inside other main buildings as well.



## **Appendix R: La Selva Equipment**

<b>Communication:</b>	Telephone Fax Internet
<b>General:</b>	24-hour line power with generator backup Air-conditioned workspace Running water Course rooms (up to 60 people) Projector and screen Library
<b>Laboratory Equipment:</b>	3 Pentium Microcomputers & 1 laser printer 8 Dissecting microscopes Epifluorescence Scope Wiley Mill Corning Stall Barnstead Reverse Osmosis System Licor Leaf Area Meter Analytical Balance Top-loading Balances Perkins Elmer UV-visible Spectrophotometer Drying Ovens Microwave Ovens Refrigerator & Freezer Units Freeze Dryer Centrifuge Current Meter Oxygen Meter Fume Hoods Gas Chromatographs PH Meters Technicon II Analyzer Hansatech Oxygen Electrode Photosynthesis System Porometer Digital Fluorometer Spectroradiometer Kjeldahl Digestion System Autoclave Root Eluriator Electrophoresis Equipment

**Other:** Geographical Information Systems (GIS) Laboratory  
Wood/ Metal/ Electrical Shop  
4-wheel drive vehicles available for rent  
Boats available for rent  
50 km of footpaths  
5.2 km of bike paths  
Bicycles & Cargo Bicycles

*Source: OTS Online, 2000*

## Appendix S: Research and Education Rates For OTS Stations

Station Rates (US dollars)  
Valid from: Jul 1, 2002 - June 30, 2003

	La Selva	Las Cruces	Palo Verde
<b>Latin Americans (not internationally financed)</b>			
<b>Seniors</b>			
<b>Day visitors</b>			
day (lunch)	10	10	10
day (no lunch)	6	6	6
<b>Overnight</b>			
senior researchers or non OTS courses(O/N)	23	23	23
<b>Long-term (monthly/yearly)</b>			
long-term senior researcher w/PhD	530/5800	530/5800	530/5800
<b>Off-station resident</b>			
Off-station resident senior w/PhD	11	11	11
<b>Students</b>			
<b>Day visitors</b>			
Day (lunch)	8	8	8
Day (no lunch)	2	2	2
<b>Overnight</b>			
student res or member school courses (O/N)	18	18	18
students non OTS institutions (O/N)	26	26	26
<b>Long-term (monthly/yearly)</b>			
long-term student (O/N)	470/5125	470/5125	470/5125
<b>Off-station residents</b>			
Off-station resident student researcher	7	7	7
<b>Guests and Special Fees</b>			
Extensión courses & symposia, (O/N)	30	30	30
Extension courses & symposia day visit/lunch	15	15	15
walk-on technician working for researchers(monthly)			
Resident's guests (O/N)	23	23	23

OTS special interest guest day visitor (lunch)	5	7	5
OTS special interest guest (O/N)	27	27	27

### **Non Latin Americans and/or internationally financed)**

#### **Seniors**

<b>Day visitors</b>			
day (lunch) (senior)	17	17	17
day no lunch	11	11	11
<b>Overnight</b>			
senior (O/N)	48	48	48
<b>Long Term (monthly/yearly)</b>			
long-term senior (\$40)	1240/13670	1240/13670	1240/13670
<b>Off-station residents</b>			
Off-station resident senior researcher	22	22	22

#### **Students**

<b>Day visitors</b>			
day (lunch) students foreigners	15	15	15
day no lunch	10	10	10
<b>Overnight</b>			
Course/groups OTS member institutions (O/N)	39	33	33
Course/groups non-OTS member institutions (O/N)	48	43	43
Student researchers (individuals) from OTS member	30	28	28
Student researcher (individuals) from non-OTS member	32	30	30
<b>Long Term (monthly/yearly)</b>			
long-term student from OTS member institution	840/9220	840/9220	840/9220
long-term student from non-OTS member institutions	900/9900	900/9900	900/9900
<b>Off-station resident</b>			
Off-station resident student researcher	16	16	16

#### **Guests and Special Fees**

Extensión courses & symposia, (O/N)	52	52	52
Extensión courses & symposia day visit/lunch	26	26	26
Resident's guests (O/N)	39	39	39
OTS special interest guest (lunch)	35	35	35
Spouse or dependent	22	22	22
OTS guest/personnel's guest (lunch)	7	7	7
OTS guest, personnel'sgst, paid w/grant (o/n)	27	27	27
OTS courses O/N	35	35	35
OTS workshops O/N	35	35	35
OTS fellowships + development time (O/N)	25	25	25
Pasantes	18	18	18

*Source: OTS Online, 2002*

## **Caño Negro: Appendices T-AA**

## **Appendix T: Caño Negro Wish List of Equipment**

### A. Laboratorio de investigación

2 microscopios  
2 estereoscopios  
2 magnificadores

Equipo de análisis de agua  
2 cámaras de cultivo  
1 cámara de transferencia  
1 estufa de secado

Equipo de análisis de suelo  
2 agitadores  
2 destiladores  
2 equipos de aire acondicionado  
3 bombas centrífugas  
1 bomba de vacío  
4 desecadores  
1 oxígeno metro portátil  
1 balanza  
1 centrífuga de 5500 rpm  
3 anaqueles  
1 planta eléctrica  
Mesones y muebles

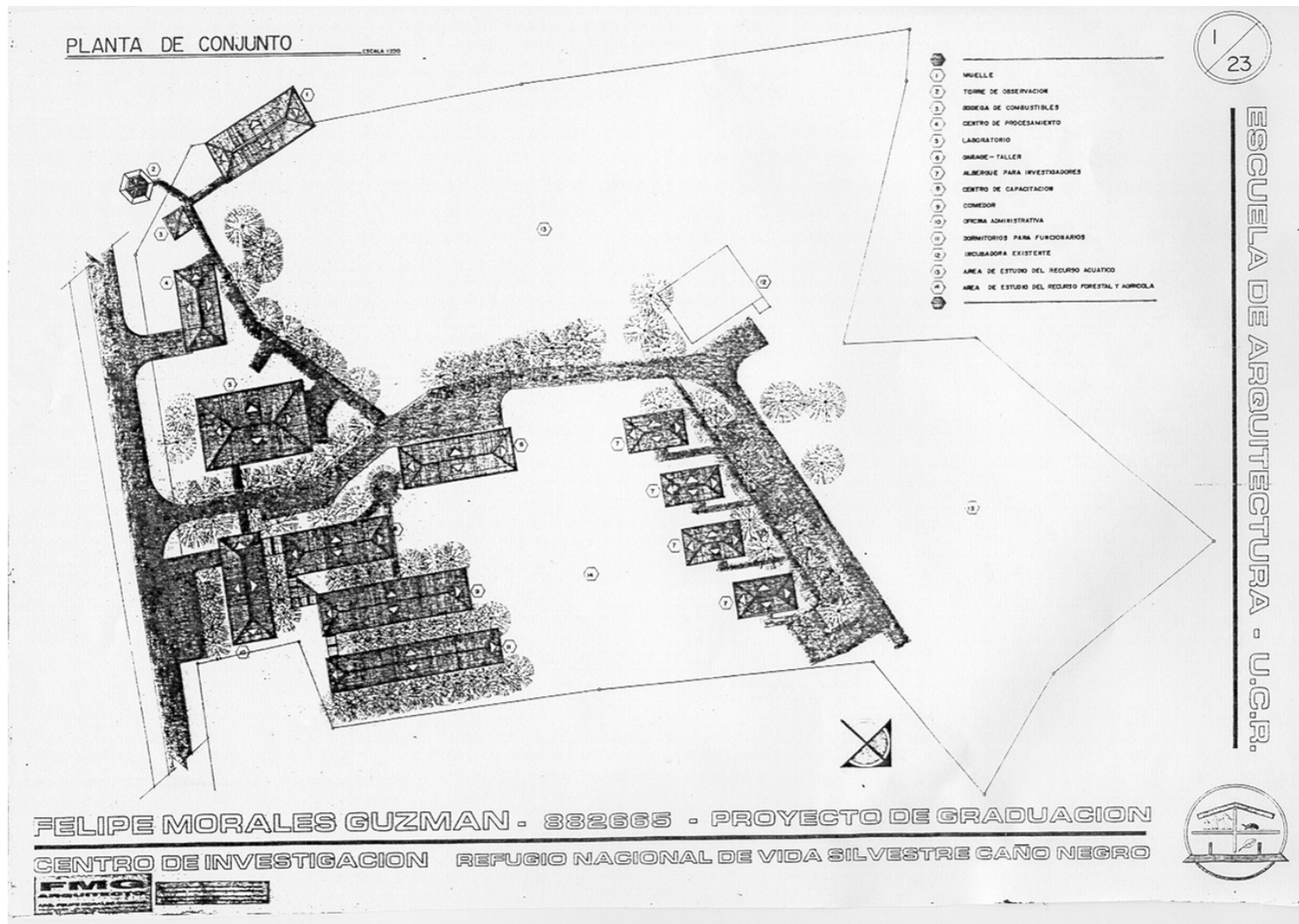
### B. Área administrativo

2 computadores y equipo audiovisual  
2 vehículos de doble tracción  
46 camas con colchón (10 para la administración y 36 para los albergues)  
Materiales de oficina  
Sillas, mesas, cortinas, lámparas, ventiladores, sábanas

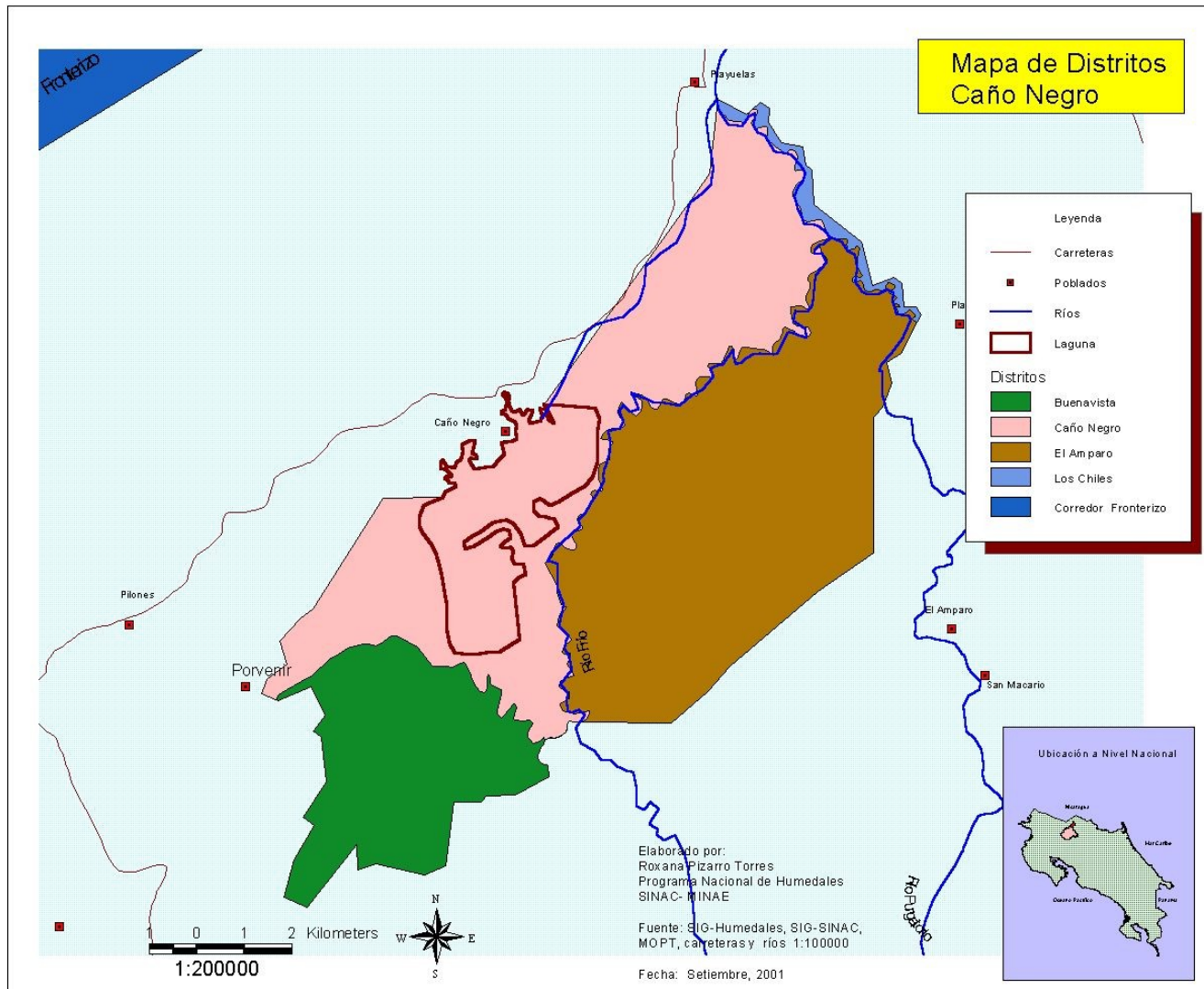
*(Loría H. A., et al., 1995, pp.34-35)*





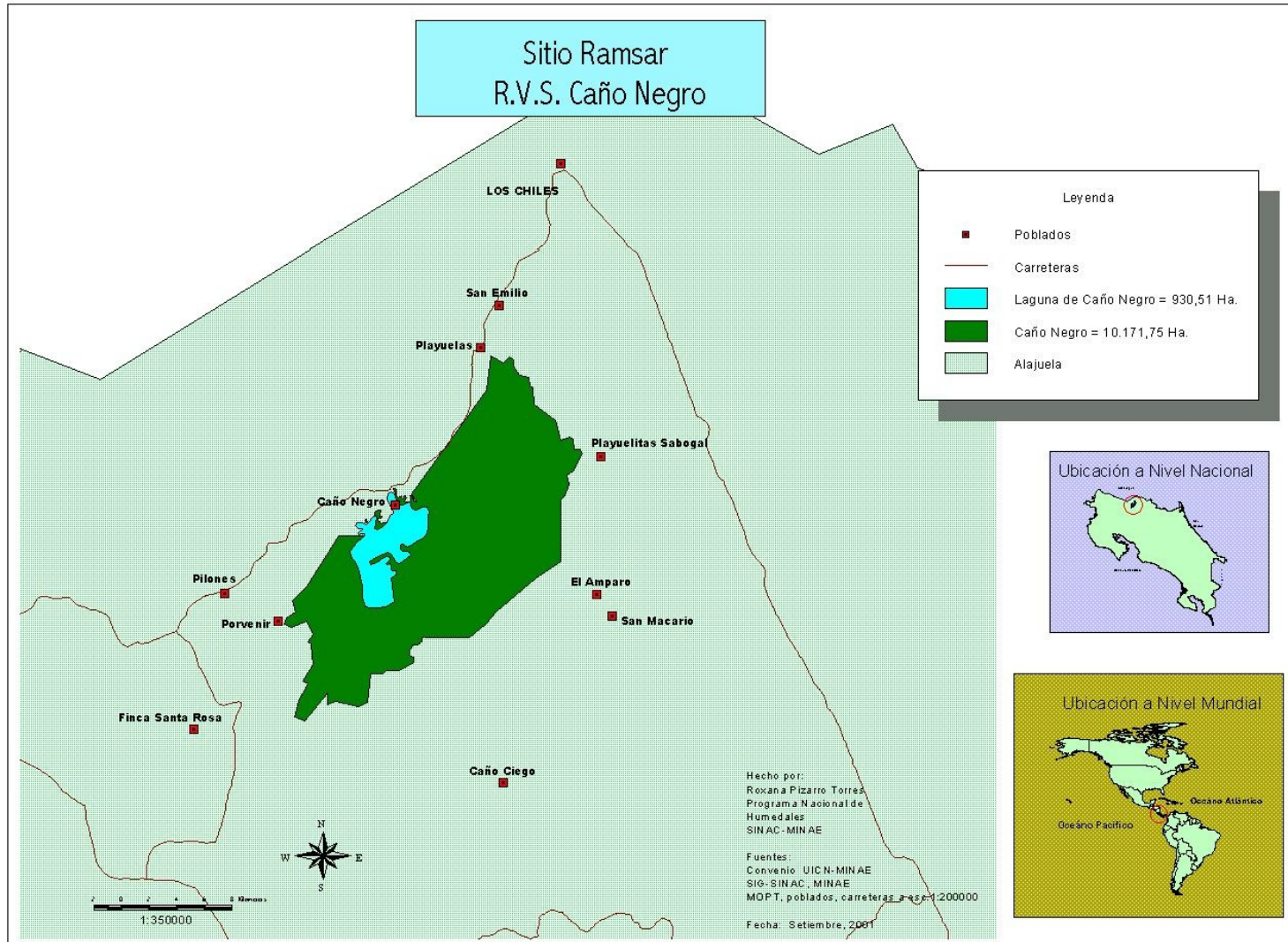


**Appendix V: Blueprint of Station Plans**



**Appendix W: Map of Caño Negro Districts**

**Appendix X: Map of Towns near Caño Negro**



**Compatible and Incompatible activities for use of areas in the Caño Negro Wildlife Reserve During the Dry Season (1) and the Wet Season (2)**

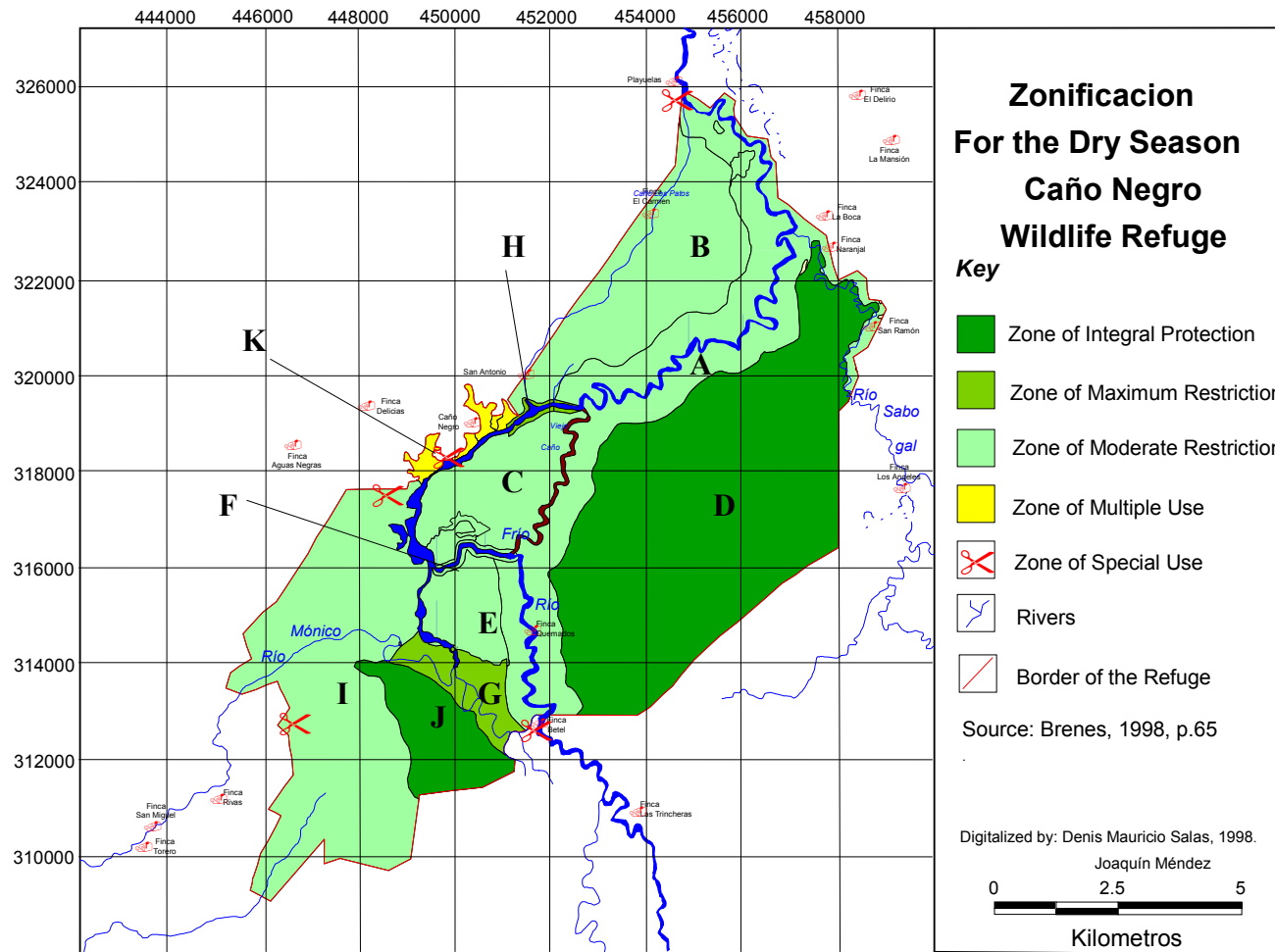
Areas within the Reserve ⇒	A		B		C		D		E		F		G		H		I		J		K		
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	
Activities ↓	C	C	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Forest Use	C	C	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Limited agriculture	C	C	I	I	I	I	I	I	I	I	I	I	I	I	I	I	C	I	I	I	C	I	
Hunting	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Plant and Animal Sample collection	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Construction	C	C	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	C	I	
Ecotourism	C	C	I	I	C	C	I	I	C	C	C	C	C	I	I	C	C	I	I	I	I	C	C
Environmental Education	C	C	C	C	C	C	I	I	C	C	C	C	C	I	C	C	C	C	I	I	C	C	
Forest Use	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Large Scale Agricultural Use	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Scientific Investigation	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Exotic plant and animal introduction	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Ranching	C	I	C	I	C	I	I	I	C	I	C	I	I	I	I	I	C	I	I	I	C	I	
Sport Fishing	C	C	I	C	I	C	I	I	I	C	C	C	I	I	I	I	C	C	I	I	C	C	
Primitive Fishing	I	I	I	I	C	I	I	I	C	I	I	I	I	I	I	I	I	I	I	I	I	I	
Subsistence Fishing	C	C	I	C	I	C	I	I	I	C	C	C	I	I	I	I	C	C	I	I	I	I	
Controlled Burning	C	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Passive Recreation	C	C	I	C	C	C	I	I	C	C	C	C	I	C	C	C	I	C	I	I	C	C	
Native Reforestation	C	C	C	C	C	I	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Pesticide Use	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Viveros	C	C	I	I	I	I	I	I	I	I	I	I	I	I	C	C	I	I	I	I	C	C	
Surveillance	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Zoocriaderos	C	C	I	I	I	I	I	I	I	I	I	I	I	I	C	C	I	I	I	I	C	C	

1: Dry Season  
2: Rainy Season

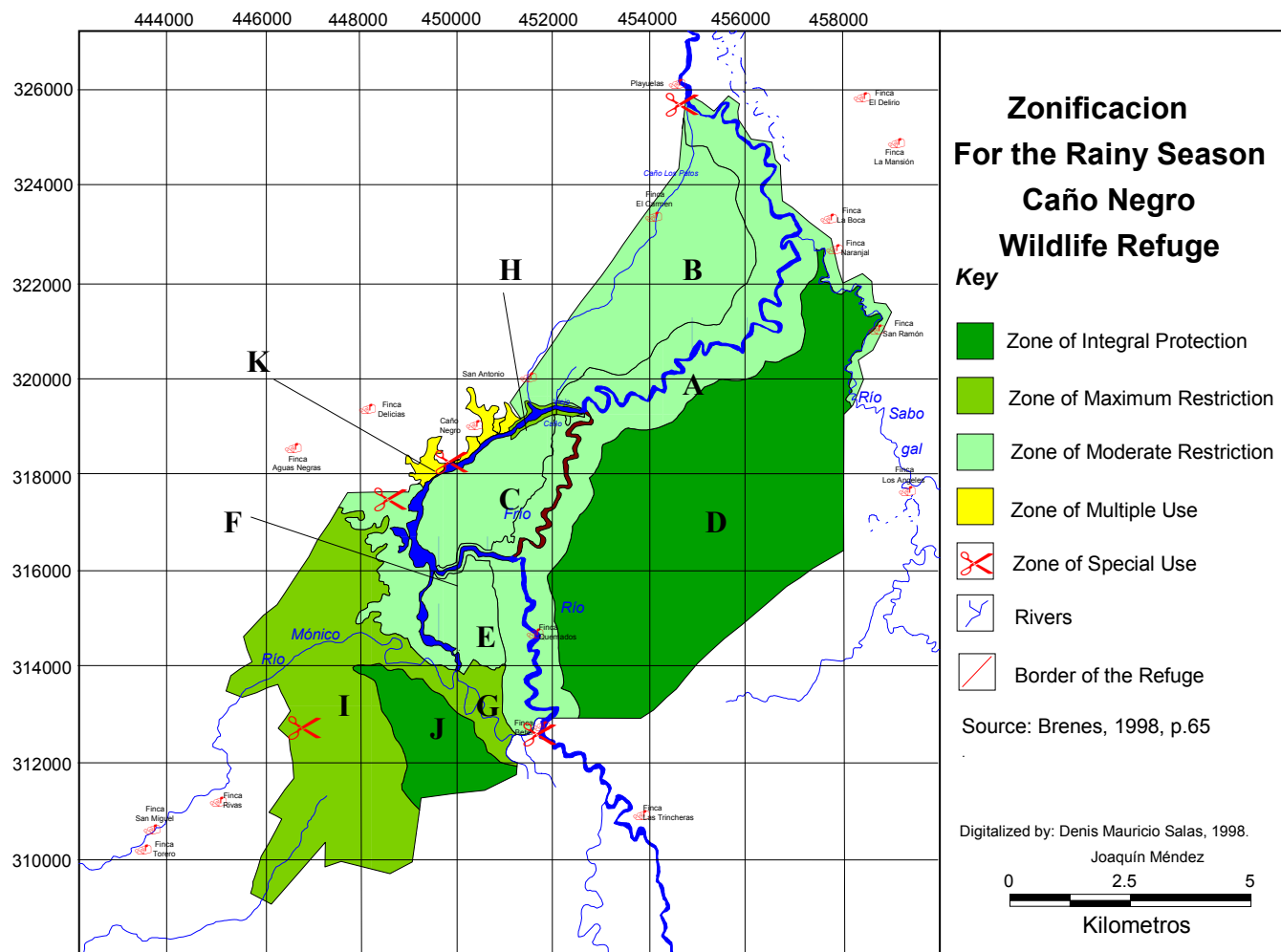
C: Compatible activity with the Area  
I: Incompatible activity with the Area

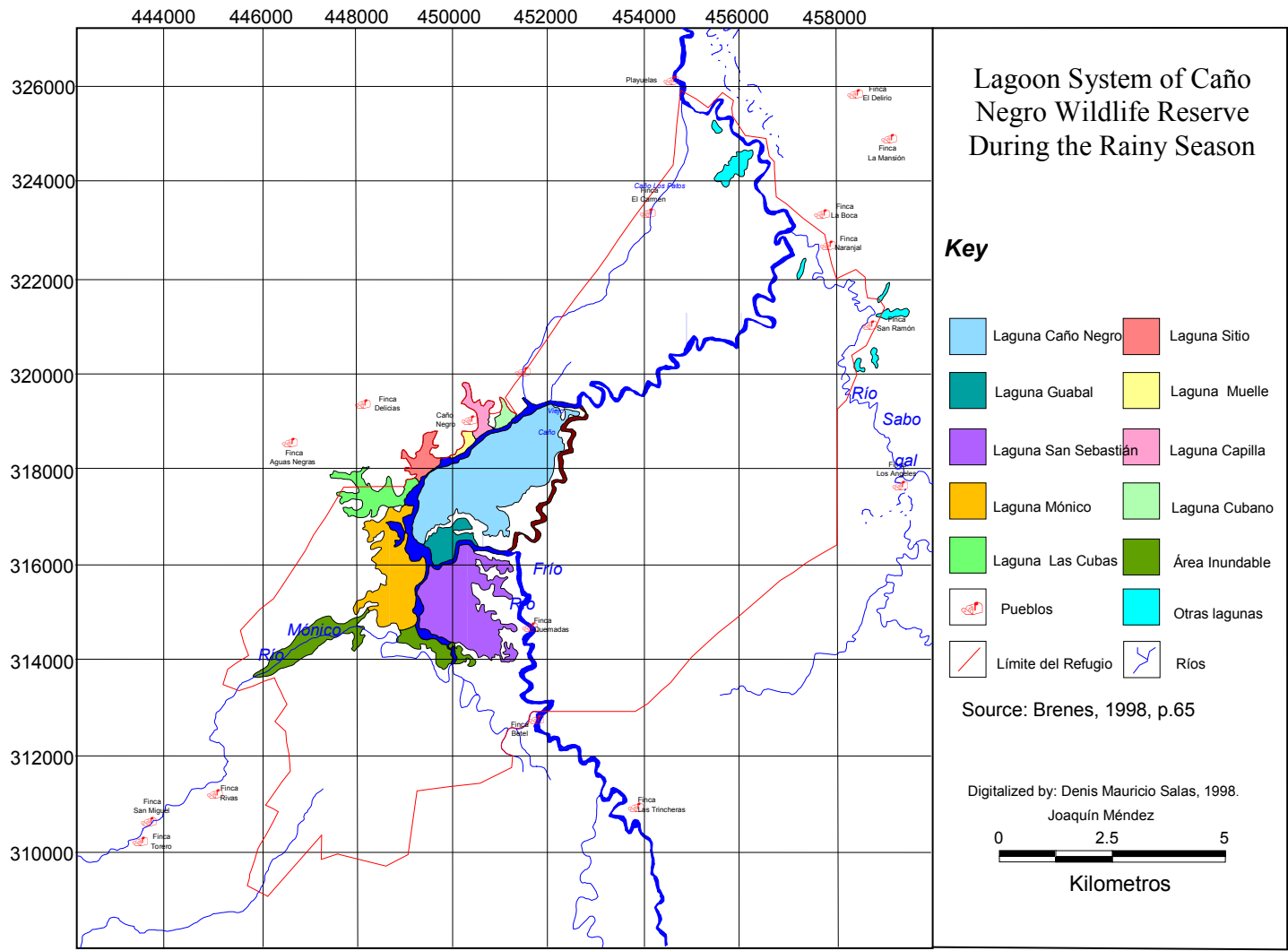


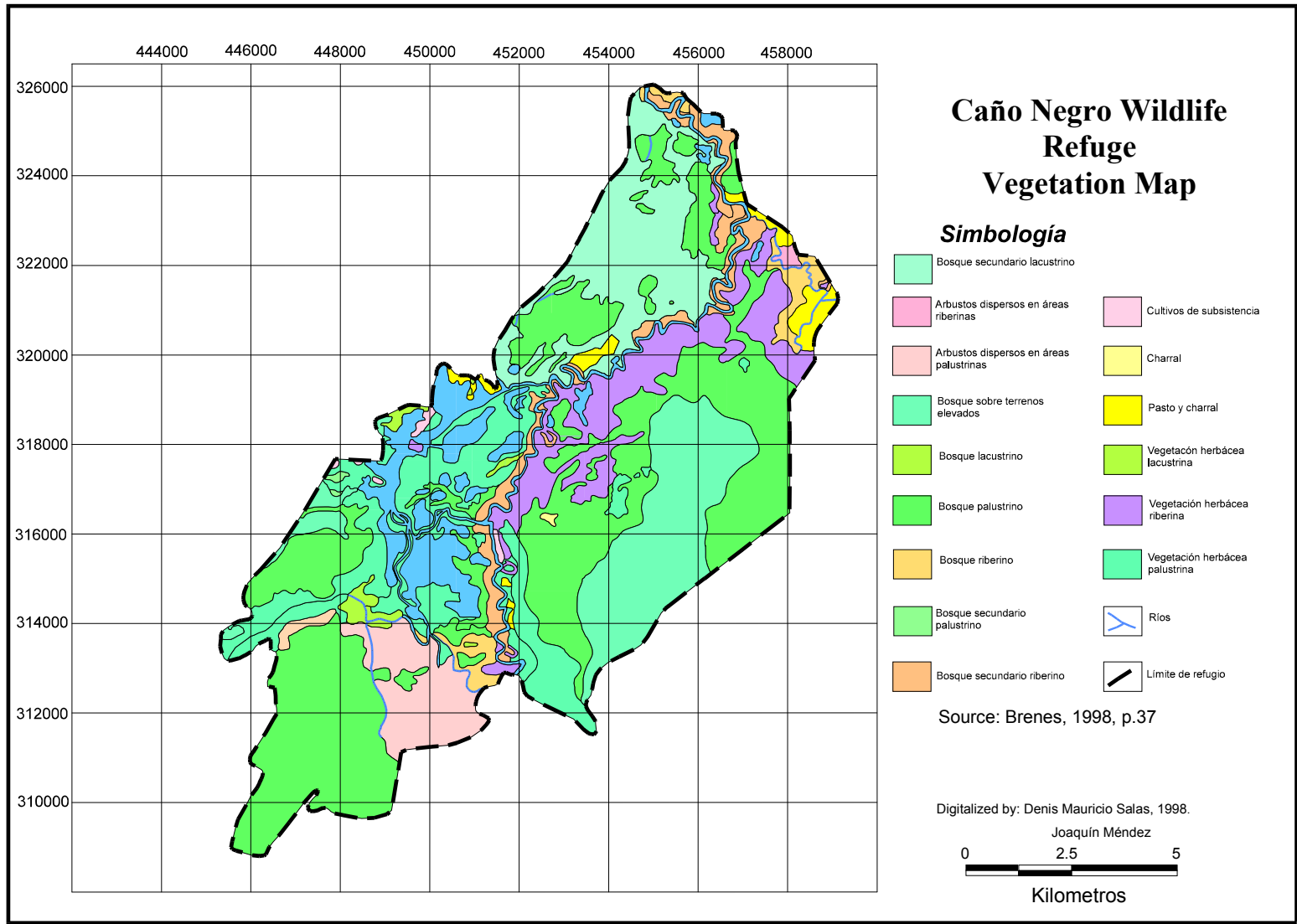
**Appendix Y: Acceptable Land Use During Wet and Dry Seasons (cont.)**



**Appendix Y: Acceptable Land Use During Wet and Dry Seasons (cont.)**









**Ramsar and Funding: Appendices BB-FF**

## **Appendix BB: Wetland Criteria for Ramsar List**

### **Group A of the Criteria:**

Sites containing representative, rare or unique wetland types

**Criterion 1:** A wetland should be considered internationally important if it contains a representative, rare or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

### **Group B of the Criteria:**

Sites of international importance for conserving biological diversity

#### *Criteria based on species and ecological communities*

**Criterion 2:** A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

**Criterion 3:** A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

**Criterion 4:** A wetland should be considered internationally important if it supports plant and/or animal species as a critical stage in their life cycles, or provides refuge during adverse conditions.

#### *Specific criteria based on water birds*

**Criterion 5:** A wetland should be considered internationally important if it regularly supports 20,000 or more water birds.

**Criterion 6:** A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of water bird.

#### *Specific criteria based on fish*

**Criterion 7:** A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or values and thereby contributes to global biological diversity.

**Criterion 8:** A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

*Source: Ramsar Convention Bureau, 1999*

## **Appendix CC: Request For Funding (WFF)**

### **Request for Funding**

A complete request for funding will contain both documents I and II as described below:

#### **I. Summary of project and endorsement of the project application**

Please complete and enclose both the "Project Summary and Endorsement Form" (follows in this section) with the "Detailed Proposal" and submit it with the summary of the project. Kindly use only the space provided on the form for each question. Though the endorsement of the Administrative Authority is not a pre-requisite for WFF financing, in case it has been obtained we recommend including it with the rest of the request for funding documents, since it will result in a higher score during the evaluation of the proposal. In case the endorsement of the Administrative Authority is or will be obtained after the request for funding is submitted to the Ramsar Bureau, it can be submitted by fax or post mail separately.

#### **II. Detailed proposal**

Please use a **maximum of five (5) pages** (A4 size paper) to provide detailed information on your proposal, following the headings and instructions given below. Kindly type, do not use margins less than 1.5 cm and letters smaller than 10-point font size.

##### **A. The problem(s) to be addressed**

In this section identify the problem(s) that can be usefully addressed by this project. Determine the underlying causes of the problem(s) and the aspects that can be addressed by this proposal and WFF support.

##### **B. Background and justification**

Background information should include sufficient factual and descriptive information to put the problem(s) in its local, provincial, national, or regional context. The amount of background information presented should be limited to that which is essential to understand the current circumstances. If the project will be carried out at a certain location(s), the site(s) should be clearly described and ideally a map should be attached to show the location of the site(s). It should be clearly stated if the wetland where the project will be carried out is a

Ramsar site or not. Justification for the request should identify the project beneficiaries and state the rationale for WWF support.

**C. Objective(s)**

**General Objective(s):**

Please review the Ramsar's Work Plan 2000-2002, as well as the Americas yearly work plan, and indicate the issues you are addressing in this project, and which objectives of the Plan they relate to.

**Specific Objective(s):**

The specific objective(s) state the results to be achieved by the project. These results should address and solve the problems and issues identified in Section A. Objective statements should define the intended results that should have been achieved by the end of the project. For clarity and ease of understanding, objectives should be written in standard grammatical patterns and phrases, e.g. ...to achieve the wise use of..., ...to raise awareness of wetland values..., ...to reinforce the capacity of institutions to..., ...to identify the wetlands....

**D. Outputs**

Outputs are results or products of the project to achieve an objective. Several outputs may be necessary to enable the achievement of an objective. The vocabulary used should describe the finished products or a completed result, e.g. "trained personnel".

**E. Activities**

Explain all the activities that will be undertaken to produce each output. Explanation of the activities should be detailed and analytical so that at the end of this section the methodology of the project is clear. The vocabulary should describe actions that will be taken, e.g. "implementation of training", "consultation with ministries", "conducting seminars".

<b>Objectives</b>	<b>Outputs</b>	<b>Activities</b>

## F. Work Plan

A schedule should be presented for production of all the outputs of the proposed project during the life of the project. This work plan should indicate the order in which activities will be undertaken so as to show the sequence and relationship between activities.

	Month											
Outputs & Key Activities	1	2	3	4	5	6	7	8	9	10	11	12
Output 1												
Activity 1:												
Activity 2:												
Output 2												
Activity 3:												
Activity 4:												

## G. Follow Up

Intended follow-up after completion of the project timetable

## H. Budget

The WFF provides a maximum of USD 20,000 per project depending on the objectives (see section A-III). Indicate costs in local currency AND IN US DOLLARS. Please distinguish between the amounts to be covered by the WFF grant and by counterpart funding. Please note that WFF FINANCING CANNOT BE USED TO COVER SALARY EXPENSES. Counterpart contribution may be in-kind but must, at least, match the funds requested from the WFF grant. If there is counterpart funding, please indicate whether the funds have been secured and, if so, which organization these funds will come from. Please list these other sources of funding, financial and in-kind (including government input), and give a broad break down of these funds.

In this section a detailed budget should be presented (please give the unit costs). All items for which support is requested from the WFF

must be justified in the activity section. Present the budget for a maximum of one-year period. The WFF contribution should be spent in line with the work plan.

Please follow the format of the following example of a budget table:

*Exchange rate - 1 USD =*

	Ramsar	Executing Organization		Co-executing Organization		TOTAL (USD)
		Cash	In-kind	Cash	In-kind	
<b>OUTPUT #1 – WORKSHOP...</b>						
<b>Personal</b>						
Coordinator for .. (1/3)	N/A	.	.	\$0.00	.	\$0.00
Consultant for .. (1/3)	N/A	\$0.00	.	.	.	\$0.00
4 environmental technicians (1/3)	N/A	\$0.00	.	.	.	\$0.00
Subtotal	N/A	\$0.00	.	\$0.00	.	\$0.00
<b>Material</b>						
Elaboration of ...	\$0.00	.	.	.	.	\$0.00
Computer software for...	\$0.00	.	.	.	.	\$0.00
Office supplies ...	.	.	\$0.00	.	\$0.00	\$0.00
Photographic materials ...	.	.	\$0.00	.	\$0.00	\$0.00
Subtotal	\$0.00	.	\$0.00	.	\$0.00	\$0.00
<b>Equipment</b>						
Photographic camera	.	\$0.00	.	.	.	\$0.00
Overhead projector	.	.	\$0.00	.	.	\$0.00
Computer equipment	.	.	\$0.00	.	.	\$0.00
Small motorboat for...	.	.	\$0.00	.	.	\$0.00
Subtotal	.	.	\$0.00	.	.	\$0.00
<b>Services</b>						
Workshop instructor for ...	\$0.00	.	.	.	.	\$0.00
Workshop instructor	\$0.00	.	.	.	.	\$0.00

for ...						
Instructor for elaboration of ...	\$0.00	.	.	.	.	\$0.00
Photographic development ...	.	.	\$0.00	.	\$0.00	\$0.00
Subtotal	\$0.00	\$0.00	\$0.00	\$0.00	.	\$0.00
<b><i>Publications</i></b>						
Brochures (quantity)	.	.	.	\$0.00	.	\$0.00
Posters (quantity)	.	.	.	\$0.00	.	\$0.00
Programmes (quantity)	.	\$0.00	.	.	.	\$0.00
Workshop summary (quantity)	\$0.00	.	.	.	.	\$0.00
Subtotal	\$0.00	\$0.00	.	\$0.00	.	\$0.00
<b><i>Training</i></b>						
Per diem (number of people, place, date)	\$0.00	.	\$0.00	.	\$0.00	\$0.00
Accommodations (number of people, place, date)	.	.	\$0.00	.	.	\$0.00
Subtotal	\$0.00	.	\$0.00	.	.	\$0.00
<b><i>Travel</i></b>						
Trip #1 -Tickets (number of people, place, date)	\$0.00	.	.	.	.	\$0.00
Trip #2 -Tickets (number of people, place, date)	\$0.00	.	.	.	.	\$0.00
Fuel	\$0.00	.	.	.	\$0.00	\$0.00
Subtotal	\$0.00	.	.	.	\$0.00	\$0.00
<b><i>Miscellaneous</i></b>						
Telephone	.	.	\$0.00	.	.	\$0.00
Internet	.	.	\$0.00	.	.	\$0.00
Mailing of ...	\$0.00	.	.	.	.	\$0.00
Security ...	.	.	\$0.00	.	.	\$0.00
Subtotal	\$0.00	.	\$0.00	.	.	\$0.00

**OUTPUT # 2 - BOOK ...****Personal**

Coordinator of .. (1/3)	N/A	.	.	\$0.00	.	\$0.00
Consultant on .. (1/3)	N/A	\$0.00	.	.	.	\$0.00
Editors (1/3)	N/A	\$0.00	.	.	.	\$0.00
Subtotal	N/A	\$0.00	.	\$0.00	.	\$0.00

**Material**

Design elaboration...	\$0.00	.	.	.	.	\$0.00
Camera film	\$0.00	.	.	.	.	\$0.00
Office supplies ...	.	.	\$0.00	.	\$0.00	\$0.00
Subtotal	\$0.00	.	\$0.00	.	\$0.00	\$0.00

**Equipment**

Digital camera	.	.	\$0.00	.	.	\$0.00
Scanner	.	.	\$0.00	.	.	\$0.00
Computer equipment for ...	\$0.00	.	.	.	.	\$0.00
Subtotal	.	.	\$0.00	.	.	\$0.00

**Services**

Field data collector for...	.	.	.	.	\$0.00	\$0.00
Specialist in ....	\$0.00	\$0.00	\$0.00	.	.	\$0.00
Subtotal	\$0.00	\$0.00	\$0.00	.	.	\$0.00

**Publications**

Book printing (quantity, type)	\$0.00	.	.	\$0.00	.	\$0.00
Subtotal	\$0.00	.	.	\$0.00	.	\$0.00

**Travel**

Book transport to...	\$0.00	.	.	.	.	\$0.00
Trip #1 - Train Tickets (number of people, place, date)	\$0.00	.	.	.	.	\$0.00
Fuel (trip, place, date)	\$0.00	.	.	.	\$0.00	\$0.00
Subtotal	\$0.00	.	.	.	\$0.00	\$0.00

**Miscellaneous**



Telephone	.	.	\$0.00	.	.	\$0.00
Internet	\$0.00	\$0.00	.	.	.	\$0.00
Mailing of book to ....	.	.	.	\$0.00	.	\$0.00
Subtotal	\$0.00	\$0.00	\$0.00	.	.	\$0.00
TOTAL	\$0,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0,000.00
N/A = does not apply						

***Budget Summary***

Source	cash	In-kind	Total (USD)
Wetlands for the Future Fund – Ramsar	\$,000.00	.	\$,000.00
Executing Organization	\$,000.00	\$,000.00	\$,000.00
Co-executing Organization	\$,000.00	\$,000.00	\$,000.00
Total	\$,000.00	\$,000.00	\$,000.00

**Subcontracts:** external assistance for any activity of the project

**Equipment:** durable equipment such as computers, etc.

**Materials:** office supplies, photographic materials, etc.

**Publications:** brochures, reports, etc.

**Training:** seminars, workshops, roundtables, etc.

**Travel:** travel costs, fuel, etc.

**Miscellaneous:** such as consumables, printing costs, communications, etc.

**I. Project Management Arrangement**

A plan for management and implementation arrangements of the project should be prepared, including a clear definition of who is responsible for the different tasks of the project implementation. This section should include information on the organization implementing the project and describe its institutional and technical capacities to undertake the work.

**J. Bibliography**

Please list only key references.

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**Wetlands for the Future Fund (WFF)**

**Section B continued**

**Project Summary and Endorsement Form**

**Country requesting support:**

**Title of project proposal:**

**Proponent:**

**Name of the person responsible for the project:**

**Complete mailing address:**

**e-mail address:**

**Telephone numbers:**

**Fax numbers:**

**Name of the institution which he/she represents:**

**Category of assistance requested: (See detailed description in Section A.II)**

1. Long and Short-term Training
2. Practical Application of Ramsar's "Wise Use" Concept and Guidelines
3. Reserve Personnel Training Program
4. Information Management and Transfer
5. Emergency assistance
6. Preparatory assistance

If the financial support sought from the Wetlands for the Future Fund is requested to carry out part of a larger project, please indicate:

- Title of the main project:
- Duration of the main project:
- Total cost of the main project:
- Have the main project and the other funds been approved: o Yes o No
- If yes, please indicate the sources of these funds:.

If the proposed project is a stand-alone activity please indicate:

- Duration of the activities to be covered by WFF grant:
- If also requested from the Ramsar Small Grants Fund, please indicate the amount:

- Other financial contributions (including in-kind):

**Summary (maximum 500 words)**

Describe background, justification, objectives and intended follow-up. Indicate if the project will be carried out in a Ramsar site(s) or how it otherwise contributes to the implementation of the Ramsar Strategic Plan 2000-2002 and the fulfillment of its objectives:

Endorsement of this project application by the Ramsar Administrative Authority:

Institution/Agency:

Name/Title:

E-mail address(es)

Telephone number: Fax number:

Date: Signature:

**Wetlands for the Future Fund (WFF)**

**Section C**

**Project Proposal Review Form**

**(for official use of the Ramsar Bureau)**

**Summary Details**

**Country:**

**Project code: WFF/ / /**

Please add the program initials/year (use suffix "-2" for second cycle)/country code/consecutive number of multiple projects submitted by the country.

**Project Title**

**Proponent:**

**Implementation:**

Amount requested from WFF \$. \_\_\_\_\_

**Additional counterpart financial contribution, including in-kind support from proponent**

\$ \_\_\_\_\_

**TOTAL PROJECT BUDGET. \$ \_\_\_\_\_**

<b>Project was assessed as feasible (Stage I)</b>	Yes/No
<b>First assessor's overall project rating (Stage II) (Ramsar Bureau)</b>	
<b>Second assessor's overall project rating</b>	

(Stage II) (U.S State Department and U.S Fish and Wildlife Service)	
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**STAGE 1**  
**ASSESSMENT OF THE PROPOSAL FORMAT**

**I.1 *The proposal must include:***

- I.1.1 Complete project summary and endorsement form
- I.1.2 The problem(s) to be addressed
- I.1.3 Background and justification
- I.1.4 Objectives
- I.1.5 Outputs
- I.1.6 Activities
- I.1.7 Work plan
- I.1.8 Evaluation and follow-up
- I.1.9 Detailed budget
- I.1.10 Supporting documentation: CV. In the case of institutions, they must briefly describe their previous experience

**I.2 *The budget proposal cannot :***

- I.2.1 Include salaries
- I.2.2 Request funds more than US\$20,000, nor more than 50% of the total cost of the project

**I.3 *Evaluation of the content of the proposal:***

- I.3.1 Are the objectives clearly related to the priorities of WFF?
- I.3.2 Is the methodology appropriate to reach the objectives?
- I.3.3 Is the work plan appropriate?
- I.3.4 Have the contents of the course/workshop been included? (in accordance with the application)
- I.3.5 Will the proposal promote exchanges about the application of the wise use concept?
- I.3.6 Will the project results be followed up in an adequate manner by the proponent?
- I.3.7 Is the future implementation of the recommendations/results of the project guaranteed?

**If the proposal complies with all the previous requirements, proceed to Stage II. If not, recommend to the proponent to modify the proposal.**

---

**STAGE II  
SCORING TO DETERMINE THE PRIORITY  
FOR FUNDING**

**II.1 Higher priority (max.15 points)**

The proponent country is Party to the Ramsar Convention	10
The proposal is endorsed by the Ramsar Administrative Authority	5
The proponent country is not Party to the Ramsar Convention	5
The proposal is endorsed by the country's wetland management authority	5

***Total***

**II.2 Scope of the project: (max. 10 points)**

Regional/Multinational	10
National	5
Local	2

**II.3 Capacity building elements of the project: (max. 15 points)**

Two or more institutions	15
Ramsar Administrative Authority	10
Only one institution and/or well known expert	5

**II.4 Leverage effect of the WFF funds (max. 10 points).**

The counterpart funds provide:	
More than 75% of the total cost of the project	10
Between 50% and 75% of the total cost of the project	5

**II.5 Level of importance of the wetland (max. 10 points)**

Ramsar site	10
Potential Ramsar site	8
Wetland of national importance	5
Wetland of local importance	2

**II.6 Local participation: (max. 10 points)**

Participation and benefits for administrative and field staff and communities	10
Intervention or benefits for indigenous or local communities	5

<b>II.7 Replicability of the results in other areas or countries</b>	
Yes	10
No	5
<b>II.8 Mechanisms for the implementation of recommendations and or monitoring</b>	
Yes	10
No	0
<b>II.9 Organization has received previous WFF funds for projects: (max. 10 points)</b>	
Never	10
Only once	5
Twice or more	0
<b>II.10 Number of project proposals submitted by country</b>	
One to two proposals	10
Three to four proposals	5
Five or more proposals	0

**Total score: /110**

**Rating:-----of----- (assessment proposals)**  
**Reviewer's comments:**

---

**Wetlands for the Future Fund (WFF)**

**Section D**

**Standard format for the preparation of progress reports**

**(to be filled in by the implementing agency/organization/proponent)**

**Country:**

**Title of the Project:**

**Project code:           Year of approval:**

**Total funds allocated:**

**Funds received to date:**

**Project officer (See section 6 below for further details):**

**Date progress report due:                   Date progress report provided:**

**1. Abstract**

Please report on what has been accomplished so far (approx. 200 words). Please attach the abstract to this form.

**2. Progress with meeting projects objectives**

In a separate page for *each objective* of the project please describe briefly the status of the progress, in terms of:

A) Task completed or B) Task partially completed or C) No progress as yet and additionally, in the page, please provide a summary of action(s) taken for *each objective*.

**3. Overall progress**

Overall, has the project made appropriate progress towards meeting the objectives within the time frame initially agreed upon?  Yes  No

If No, please indicate the reasons for any delays or proposed changes in project objectives.


**4. Budgetary details**

Please advise what amount of the funds received from the WFF for this project have been spent so far (in US dollars and local currency).

Have the funds been spent in accordance with the project specifications and budget?

Yes       No

If No, please advise of where variations have occurred, the cost of these variations and provide a justification for this variation.


**5. Final report**

When can the project's final report be expected?

**6. Project Officer (person responsible for executing the project)**

Name:

Institution:  
Complete mailing address:  
Email address:  
Telephone number:  
Fax number:  
Signature:  
Date:

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## Wetlands for the Future Fund (WFF)

### Section E

#### Standard format for the preparation of Final Reports

(to be filled in by the implementing agency/organization/proponent)

Country:

Title of the Project:

Project code:                      Year of approval:

Project Officer (see Section 5 below for further details):

Date project was completed:                      Date final report provided:

Have you provided the Final Report in electronic as well as hard copy format?

Have you enclosed:

a) some suitable photographs or colour slides (with the necessary description) illustrating the project? o Yes o No

b) the copies of the materials produced with WFF funding (if applicable) ? o Yes o No

#### 1. Abstract

Please report on what has been accomplished by the completed project (approx. 300 words). Please attach the abstract to this form.

#### 2. Achievements against each project objective

In a separate page for *each objective* of the project, as stated in the project proposal, please indicate the *output(s)* in terms of:

A) Task completed or B) Task only partially completed or C) Task not attempted

and in addition, in the same page, please provide a summary of action(s) taken for each *output*. Where tasks were only partially completed or not attempted, please provide the reasons for not fulfilling this expectation.

#### 3. Overall project outcomes

Overall, has the project achieved what it set out to do? Yes o No

If No, please indicate the reasons for failing to meet the overall objective.




**4. Budgetary details**

Please submit a *detailed expenditure and income account* referring to the original project budget. Indicate expenditure and income in the currency(s) in which they have actually occurred, and as necessary provide the exchange rate into US Dollars to be applied. Please attach a separate finance report table (preferably in Excel or Word) which presents all the expenditures in the categories of the original budget, as well as a summary table with the totals by category.

Were all funds allocated to the project from the WFF spent in accordance with the project specifications and budget?  Yes  No

If No, please advise of where variations have occurred, the cost of these variations and provide a justification for this variation. Include this information in your *detailed expenditure and income account report*.

If all funds were not spent please indicate below the amount of unspent funds and recommend possible uses for these funds that the Ramsar Bureau can consider.

Unspent funds: US Dollars


**5. Project Officer (person responsible for executing the project)**

Name:

Institution:

Complete mailing address:

E-mail address:

Telephone number:

Fax number:

Signature:

Date:

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## **Appendix DD: Eligibility and Funding Available**

### **(Wetlands for the Future Fund)**

#### **Eligibility:**

The WFF is open to eligible Contracting and non-Contracting Parties for:

- a. activities that clearly contribute to the implementation of the Convention's Strategic Plan 1997-2000 and work within the Neotropics & Mexico, and particularly for actions identified in the 2000-2002 Convention's Work Plan as adopted by Resolution VII.27 of Ramsar COP7;
- b. emergency assistance related to wetlands of regional importance or Ramsar sites;
- c. assistance to allow non-Contracting Parties to progress toward accession to the Convention; and
- d. activities that link this initiative to other programmes that share the overall goals of wetland management and conservation.

#### **Funding:**

##### **Implementation of the Convention Work Plan 2000-2002**

The WFF is open to Contracting and non-Contracting Parties of the Ramsar Convention (see II above), particularly for activities which will clearly contribute to the implementation of the Convention Work Plan 2000-2002, and in particular training related to the implementation of the priority actions in the Americas Work Plan.

The maximum amount to be requested from the WFF for each project depends on the project's objectives:

#### **1. Long and Short-term Training**

- a) preparation of teaching materials and implementation of university-level courses on management and conservation of wetland ecosystems: US\$20,000 (maximum).

b) support for participation in wetland-related training courses (primarily in Latin America and the Caribbean): US\$20,000.

c) support for thesis research and fieldwork on wetlands: US \$3,000 (maximum).

d) Graduate placement (for MSc and Ph.D. graduates who have specialized in wetlands and wish to start a wetland project upon returning to their own countries after graduation): US \$3,000 (maximum).

## **2. Practical Application of Ramsar's "Wise Use" Concept and Guidelines**

a) On-the-job training opportunities and internships for wetland managers, planners, academic, field and technical staff. Short internships (1-2 months) at wetland sites and/or conservation and/or management programs associated with universities, resource management agencies or NGOs, primarily within Latin America and the Caribbean: US \$5,000 (maximum)

b) Exchange opportunities for managers, planners, technical and field staff from "wise use" sites to wetlands in other countries within the region, particularly when such exchanges can contribute to training efforts under this initiative and/or the establishment of similar projects elsewhere: US \$5,000 (maximum)

c) Hands-on (practical) training experience in wise-use activities for members of local and indigenous wetland-dependent communities: US \$5,000 (maximum)

## **3. Reserve Personnel Training Programs**

a) Assistance to develop and conduct reserve personnel programs in the fields of wetland management and wardening within the region: US\$20,000 (maximum).

b) Revision of current training curricula and/or for strengthening existing training programs to enhance the wetland management aspects of the curriculum and

to offer more comprehensive training in this area:  
US\$20,000 (maximum).

#### **4. Information Management and Transfer**

a) Information sharing and networking through documentation centers within the region (including dissemination of locally produced technical reports relevant to conservation and wise use of wetlands, and purchase and installation of hardware and software to facilitate information sharing and networking through electronic mail) US \$5,000

#### **5. Emergency assistance**

Countries may request emergency assistance for training in connection with wetland sites of regional importance which have suffered damage or are in imminent danger of damage as the result of technological developments, pollution, other human interference or natural phenomena such as hurricanes or drought. Such assistance may be made available to assess damages and to take actions to safeguard the site. The maximum amount to be requested from the WFF for each emergency assistance project should not exceed USD \$10,000. Emergency assistance can be sought at any time and the decision on such allocations is made jointly by the Ramsar Bureau and FWS

#### **6. Preparatory assistance**

Countries that are not yet Contracting Parties to the Convention, but have clearly signaled their intention to accede, may apply for training and technical assistance grants from the WFF to support activities necessary for the identification, boundary delineation, and mapping of the first site to be included on the List of Wetlands of International Importance, as required for accession to the Convention. The maximum amount for each preparatory assistance project is fixed at USD \$10,000. It should be noted that if resources in the WFF are scarce, such assistance may receive a lower priority than assistance to Contracting Parties.

**To qualify for the Wetlands for the Future Fund, matching funds "in kind" contributions (50% of the total project costs or more) must be available.**

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#### **Funds available for annual allocation**

The WFF is administered by the Ramsar Bureau (the Convention's secretariat) pursuant to the Terms of Reference for the Financial Administration of the Convention and subject to the terms of a MOU between the Ramsar Bureau, the US Department of State, and the US Fish and Wildlife Service.

The US Government finances the Fund through congressional appropriations, and year-to-year allocations may vary. The US Government intends to make available to

the Ramsar Convention Bureau a contribution of USD \$250,000 per year, for the US fiscal years of 2000, 2001 and 2002, to fund this initiative. Of this amount USD \$50,000 is targeted annually to support coral reef-related projects.

## Appendix EE: WFF Funding Proposal Guidelines

(Wetlands for the Future Fund)

<b>Ramsar Bureau</b>	<b>Time Frame</b>	<b>Proponent's responsibilities</b>
<b>A</b> Countries are invited to submit project proposals through the Web page.	January and June of each year (two cycles)	
<b>C</b> Advisory service	February-March / July-August	<b>B</b> Drafting project concepts/proposals
	April / September	<b>D</b> Submission of the proposals before 30 April/30 September
<b>E</b> Project assessment	May-June / October-November	
<b>F</b> Project selection	July-August / December-January	
<b>G</b> Preparation of agreements & transfer of first payments	September-October / February-March	
<b>I</b> Comments and follow-up	Six months after receipt of the first payment	<b>H</b> Progress Report

<b>K</b> Evaluation of the completed project	Six months after the completion of the project (at the latest)	<b>J</b> Final Report
<b>L</b> Transfer of last payment after approval of the report	Three months after reception of final report	

### Explanatory Notes

#### **A. Notification**

Each year, normally not later than 31 January and 30 June, the Ramsar Bureau by Web posting invites applications to the WFF, with a deadline for receiving them at the Bureau of 30 April and 30 September respectively. Application materials are available in the Convention's Web site at any time.

#### **B. Formulation of project proposals**

All project proposals MUST be submitted using the format indicated in the application instructions. This includes both the Project summary and endorsement form and a detailed project proposal (see enclosed Section B).

It should be noted that projects should, in general, be implemented within a one-year period maximum.

#### **C. Advisory service of the Ramsar Bureau**

The Ramsar Bureau offers an advisory service to those developing projects that wish to seek guidance. In order to do this, project developers are invited to submit draft project proposals or project concepts to the Bureau by 30 March and 30 August each year.

#### **D. Submission of project proposals**

Applications MUST be submitted using the "Project Summary and Endorsement Form" and the "Details of Proposal" as prescribed in these Operational Guidelines (Section B). It is recommended that the Administrative Authority of the Ramsar Convention in the country concerned endorse the project before it is submitted to the Ramsar Bureau (see Step B in Table 1). Formal submission of project proposals can be done either by 30 April or 30 September of each year.

**Exception:** Emergency assistance projects may be submitted at any time of the year. Once the Ramsar Bureau has undertaken a technical and feasibility analysis of the proposal, the Bureau will make a decision, usually within three months of having received the request.

#### **E. Assessment of projects**

The Ramsar Bureau makes a technical and feasibility assessment of all project proposals received using the WFF Project Proposal Assessment Form (attached). During this process, the Bureau may invite views, as appropriate, from members of the Convention's Scientific and Technical Review Panel (STRP) or other experts.

**Important note.** Prospective project developers are urged to consider the enclosed Project Proposal Assessment Form (Section C) and, in particular, the so-called Stage II assessment designed to determine the relative priority of projects. Reference to that form will show that the project assessment process favors the following types of projects:

- i. those projects from least developed countries;
- ii. those projects from organizations which have received no previous, or relatively fewer allocations from the WFF;
- iii. those projects involving working in partnership between two or three institutions;
- iv. those projects where the impacts of WFF funds are being effectively multiplied through other funds or in-kind contributions to the project;
- v. those projects which are of importance at the regional/multinational level involving several countries; these are of higher priority than those involving two countries, one country, or local projects.

#### **F. Selection of projects**

The Ramsar Bureau submits its recommendations for funding to the FWS and projects are approved jointly by the two organizations. Information on selected projects will be circulated for information to all proponents with copy to the Administrative Authorities of the countries where projects will be carried out.

#### **G and L. Transfer of funds**

The Ramsar Bureau prepares the agreements and sends them out to the project grantees. The beneficiaries of funding up to 10,000 USD will receive one payment equivalent to 100% of the approved funds once the Ramsar Bureau receives the signed agreement. Beneficiaries of funding of more than 10,000 USD will receive an



initial payment of 80% upon receipt by the Bureau of the agreement duly signed. The 20% balance of the funds is retained pending the submission of acceptable Final and Financial Reports (see Section D, attached).

#### **H and J. Progress Report and Final Report**

Each recipient agency is required to provide a Progress Report on the implementation of WFF-funded projects six months after receipt of the first payment, and three copies of the Final Report up to six months after completion of the project. For projects that are 6 months or less in duration there is no need to submit a progress report. The standard forms for both the Progress and Final Reports are attached (Sections D and E). A copy of all reports will be submitted to the Ramsar Administrative Authority in each country.

***Important note.*** To assist the Bureau with its evaluation and reporting to donors, each project funded is requested to provide, with the Final Report, copies of any materials produced under the project and suitable photographs illustrating the activities undertaken. Materials produced with WFF funding should acknowledge the origin of the funds, and insofar as practicable display the logos of the Ramsar Convention, the US Fish & Wildlife Service, and the US Department of State. If necessary, the Ramsar Bureau will provide these logos in electronic form, if requested.

Final reports are also requested in electronic as well as hard copy format. The person responsible for executing the project is encouraged to maintain regular contact with the Americas Regional Coordinator and his/her Assistant in the Ramsar Bureau and the designated focal point in the Ramsar Administrative Authority of the recipient country.

As part of the financial report, grantees **MUST** include a financial statement of expenditures, stating clearly the amounts spent per approved budget, certified by the legal accounting authority of the organization. It is recommended to include in the financial report copies of all receipts and financial records related to WFF expenditures. In case of not including these, grantees **MUST** keep all pertinent financial records for a period of three years, and the Bureau will reserve the right to request proofs of all expenditures at any time during these three years.

#### **I and K. Follow-up by the Ramsar Bureau**

The Ramsar Bureau reviews Progress and Final Reports, the latter with the use of the adopted Project Evaluation Form attached (Section F). During implementation, and after projects are completed, Bureau staff will carry out their follow-up and evaluation when they deem it necessary.

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## **VI. Terms of Agreement to be concluded with agencies receiving WFF assistance**

An agreement will be concluded between the Ramsar Bureau and the organization executing the project that sets forth:

- i) the extent and purpose of the financial assistance granted;
- ii) the obligations of the recipient organization;
- iii) the obligation of the recipient organization to indicate on all equipment and all products arising from this assistance, that it was provided under the Wetlands for the Future Fund with the Ramsar Convention, US Department of State, and the US Fish and Wildlife Service logos displayed, if possible.

The Bureau shall be allowed to visit the site where the project took place and/or visit the project implementing organization, and/or to designate one of its partners or collaborators to do so on its behalf, in order to have a first-hand appraisal of the progress made during implementation and/or the results obtained after completion of the project.

It is noted that Swiss law governs these agreements.

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## **VII. Reporting to donors**

To report to the donors and for general promotion of the WFF, the Ramsar Bureau prepares for each year an Allocation Report of Funded Projects, which is also available through the Convention's Web site.

**Appendix FF: Application Form (People's Trust For Endangered Species)**

<b>1. Title of Project:</b>
<b>2. Endangered or Threatened Species Involved:</b>
<b>3. IUCN Classification:</b>
<b>4. Project Head:</b> <b>Post Held:</b> <b>Institution:</b> <b>Address &amp; e-mail:</b> <b>List all others involved giving name, age, qualifications and relevant experience.</b>

**5. Summary of main aims of project:**

Form A

**6. Timetable summary:**  
**Duration of project with start and end date:**  
**Anticipated date of completion of final report:**

**7. Estimated costs in detail:**

**Salaries (if appropriate) and scale:**

<b>Admin Costs:</b>	
<b>Report Production:</b>	
<b>Consumables:</b>	
<b>Travel costs (if appropriate):</b>	
<b>Fares:</b>	
<b>Freight:</b>	
<b>Field equipment:</b>	
<b>Scientific equipment:</b>	

Form A Form A

<b>Food:</b>	
<b>Fuel:</b>	

<b>Insurance:</b>	
<b>Other:</b>	
<b>TOTAL</b>	
<b>Contingencies at 10%</b>	
<b>TOTAL REQUESTED</b>	
<b>Amount being contributed to project by project participants (Students Only)</b>	
<b>8. Which other grant giving bodies have you approached?:</b> <b>Results of applications if known or when expected:</b>	

**9. Give a detailed account of your proposed objectives:**

**10. Outline the methodology you will use to achieve these objectives:**

**11. Justification for seeking a grant from PTES. Outline how you envisage the results will ultimately benefit an endangered species.**

**12. Any other information in support of your application, which you would like the Trustees to consider: Please continue on separate sheet if necessary.**



**13. What arrangements have been made to obtain permission to carry out this work, including political permission if the work is to be undertaken abroad?**

**14. Names and addresses of two referees:**  
**1. 2.**

## **Appendix GG: Contact Information for Funding**

### **Organizations**

- Conservation International:  
<http://www.conservation.org>
  
- The Nature Conservancy:  
Sabana Norte a la Esquina Oeste del ICE  
150 mts al Norte  
San José, Costa Rica  
(506) 220-2552  
<http://nature.org/>
  
- People's Trust for Endangered Species:  
<http://www.ptes.org>
  
- Wetland for the Future Fund (Ramsar):  
[http://www.ramsar.org/key\\_wff\\_guide\\_e.htm](http://www.ramsar.org/key_wff_guide_e.htm)
  
- World Wide Fund for Nature (WWF):  
<http://www.panda.org>

- WWF's Investing in Nature Program:

<http://www.panda.org>

- WWF's Latin America and Caribbean Program:

<http://www.panda.org/latinamerica/central3.htm>

Other websites to look into for further research:

<http://www.audubon.org/campaign/wetland/funding.html>

<http://www.savingcranes.org/abouticf/smallgrants.asp>

<http://www.conservation.org/xp/CIWEB/home>