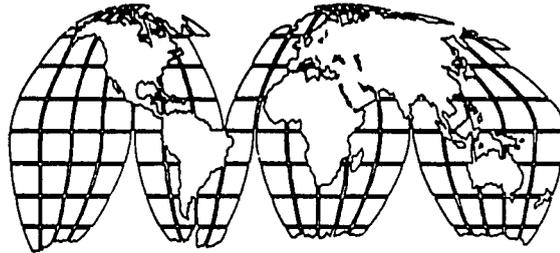


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Protecting Biological Diversity:
Costa Rica Case Study

June 1994

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

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**Protecting Biological Diversity:
*Costa Rica Case Study***

by

Phil Church, Team Leader
Program Economist
Center for Development Information and Evaluation
Policy Directorate

Nora Berwick
Conservation Biology Specialist
Consultant, Development Alternatives, Inc.

Roberto Martin
Natural Resources Management Specialist
Academy for Educational Development

Robert Mowbray
Forest Ecologist
Consultant, Development Alternatives, Inc.

**Agency for International Development
Center for Development Information and Evaluation**

June 1994

This Working Paper is one of a number of case studies prepared for CDIE's assessment of USAID Protecting Biological Diversity programs. As an interim report, it provides the data from which the assessment synthesis is drawn. Working Papers are not formally published and distributed, but interested readers can obtain a copy from the DISC.

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PREFACE

In the battle to halt destruction of the world's biological diversity, the forces of conservation have finally established a beachhead and taken some territory. The site of this successful offensive is Costa Rica.

This small Central American republic stands out among developing countries for its leadership in setting aside large primary tropical forest areas as permanently protected habitats for its rich reservoir of biological resources. Equally unique is the innovative spirit with which the country has sought to manage these resources to achieve a positive outcome for economic development and natural resource conservation.

Such has not always been the case. As recently as a decade ago, Costa Rica was being lauded for its efforts at export-led growth, paid for by converting virgin forests to agricultural uses. Run-away deforestation continues to this day with a net loss of forest cover still mounting into the tens of thousands of hectares annually. Not until close to the end of the 1990's is net deforestation expected to be halted, and only then because remaining forested areas are too poor for agricultural activity and too inaccessible for logging. While nature conservation has taken some ground in Costa Rica, the war is far from won.

Still, some promising strategies have emerged from the forested "front lines" of the country's conservation movement. This evaluation examines the impact and performance of those strategies which USAID has helped develop and implement in Costa Rica.

The Costa Rican experiment is one of the few cases that give cause for hope that development and conservation can co-exist. If a win-win outcome cannot be achieved in Costa Rica, with all its advantages of high literacy rates, strong democratic institutions and extensive linkages with the international conservation community, then there seems little hope for many other less well-positioned developing countries.

There is a danger, however, that with its successes so far, Costa Rica prematurely may be declared a victory by the international community and left to its own devices as attention turns to other needy areas. This evaluation is dedicated to emphasizing both the contributions made by the Costa Rican program as well as to warning that the war is not yet won. Much remains to be done to consolidate early successes, win the hearts and minds of those affected and build defenses against forces that can still reverse the modest gains made so far.

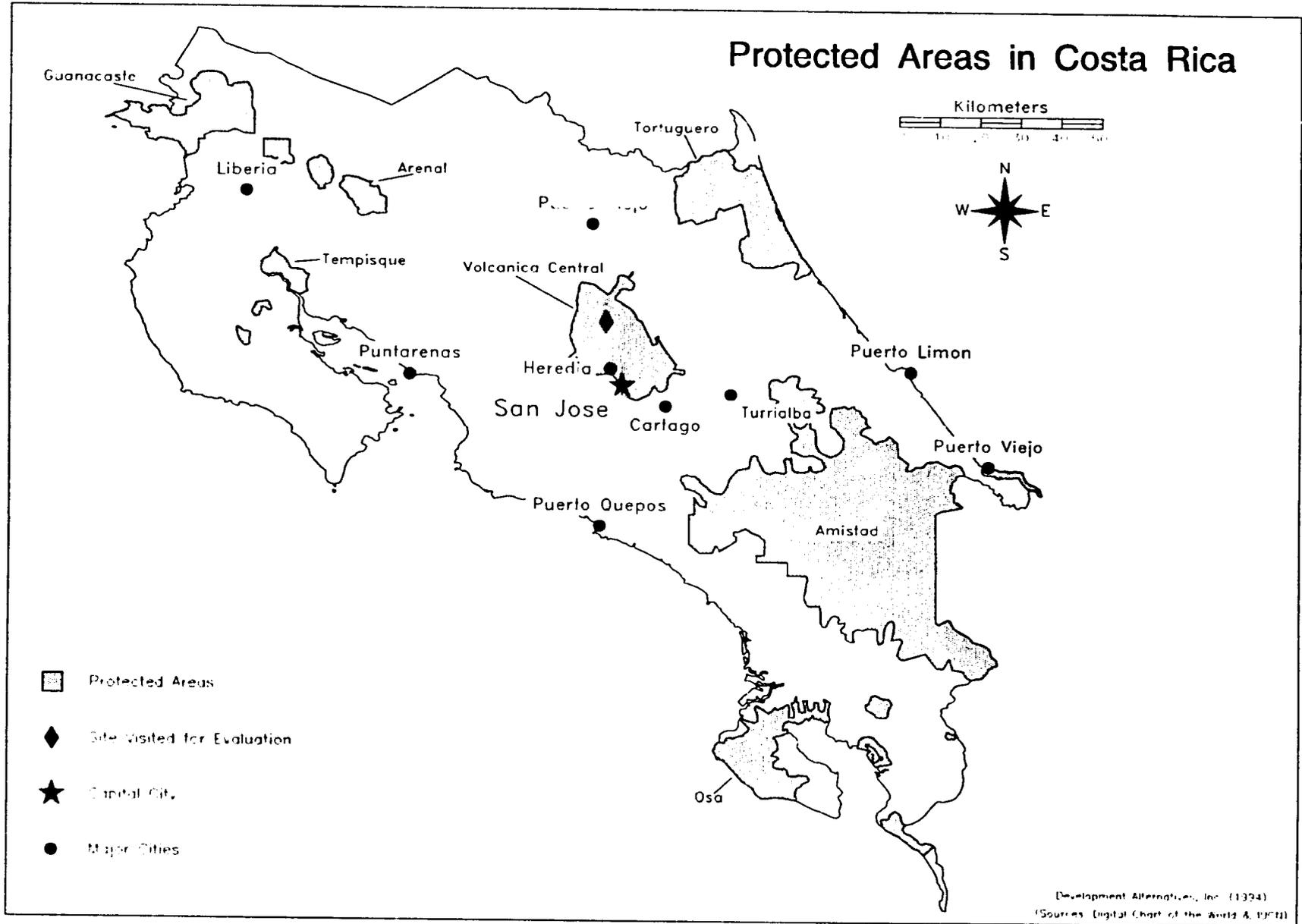
GLOSSARY

ACCVC	Central "Cordillera" Volcanic Conservation Area
BCCR	Central Bank of Costa Rica
BOSCOSA	Program for Forest Management and Conservation of the Osa Peninsula (USAID)
CACM	Central American Common Market
CACSA	Cantonal Agricultural Center for Sarapiquí
CACSI	Cantonal Agricultural Center for Siquirres
CASEM	Artesanry Committee of Santa Elena Monteverde
CATIE	Tropical Agricultural Center for Education and Research
CDIE	Center for Development Information and Evaluation
CEA	Center for Environmental Studies
DGF	General Forestry Directorate
DVS	Wildlife Directorate of MIRENEM
FAO	Food and Agricultural Organization
FORESTA	Forest Resources for a Stable Environment Project (USAID)
FUNDECOR	Foundation for the Development of the Central Volcanic Cordillera
FUNDEVI	Foundation for Research of the University of Costa Rica
GIS	Geographic Information System
GOCR	Government of Costa Rica
GPS	Global Positioning System
IAF	Inter-American Foundation
IDA	Agricultural Development Institute

IDB	Inter-American Development Bank
INBio	National Bio-diversity Institute
ICT	Costa Rican Tourism Institute
MADELENA	Timber and Fuelwood Program (USAID)
MAG	Ministry of Agriculture
MEP	Ministry of Public Education
MIRA	Information System for Tree Resources
MIRENEM	Ministry of Natural Resources, Energy and Mines
MOU	Memorandum of Understanding
NGO	Non-governmental Organization
NPS	National Parks Service - United States
NRMP	Natural Resources Management Project (USAID)
OTS	Organization for Tropical Studies
ROCAP	Regional Office for Central America Programs of USAID
SINAC	National Conservation Areas System
SPN	National Parks Service
TNC	The Nature Conservancy
TSC	Tropical Science Center
USAID	United States Agency for International Development
USFS	United States Forest Service
WRI	World Resources Institute
WWF	World Wildlife Fund

Note: English translations are given for the Spanish equivalents of many acronyms.

Protected Areas in Costa Rica



1. INTRODUCTION

The Central American nation of Costa Rica is a rich reservoir of plant and animal species, several found nowhere else in the world, many yet to be classified and inventoried. Costa Rica is a home to an estimated 7 percent of the world's biological resources and one of the most ecologically diverse countries of its size in the world, with nineteen different life zones (IUCN 1992). The variety of plant and animal species is due to the country's unique geographic location -- in the center of a land bridge between the North and South American continents -- and to its diverse microclimates and physiographic features such as mountains, volcanoes and two oceans.

This report examines the U.S. Agency for International Development (USAID) assistance approach used in Costa Rica to protect its valuable forest habitat and biological diversity resources. USAID's Forest Resources for a Stable Environment (FORESTA) Project provides an opportunity for the Agency's Center for Development Information Evaluation (CDIE) to assess the impact and performance of strategies to mitigate the degradation of natural forest habitats in Costa Rica.

The purpose of FORESTA is to introduce approaches to managing forest wildlife habitats within Costa Rica's national parks and protected areas, halt the loss of the country's remaining natural forests on private lands bordering the parks through sustainable yield management of natural forests and reforest degraded areas that have little agricultural or alternative use. The FORESTA approach also involves the creation of an environmental NGO with a trust fund to finance its management and oversight of the parks and surrounding areas of Costa Rica's central volcanic highland areas.

Section 2 of this report describes the problems threatening forest and wildlife habitats in Costa Rica and the approach that USAID has taken to resolve them. Sections 3, 4 and 5 describe the evaluation findings on the program's implementation, impact, effectiveness, sustainability, and replicability. Section 6 summarizes the major lessons learned from the evaluation.

The Costa Rica case study is part of a global examination of park and buffer zone management approaches to biological diversity conservation in USAID forestry and bio-diversity protection programs. Other country program assessments include Thailand, Sri Lanka, Nepal, Madagascar and Jamaica.

Evaluation Procedures

CDIE employed a variety of primary and secondary sources of data and information to construct the chain of events linking FORESTA activities to observed program impacts and issues and to identify lessons learned (See Appendix A: "Evaluation Methodology").

In preparation for the field work, CDIE collected and analyzed relevant secondary information available in Washington, D.C. and in the host country from a range of sources including project papers, reports, special studies, and mid-term evaluation documents. In Costa Rica, the assessment team reviewed USAID project document files and reports prepared by host-government agencies, private voluntary organizations, USAID contractors, and international donor institutions. The CDIE field team also conducted extensive key informant interviews to obtain data, ideas, insights into events and actions, suggestions for unresolved issues, etc., from a range of project beneficiary participants and knowledgeable people. Questions were based on an interview guide developed prior to the site visit. Respondents included government officials and technicians, buffer zone land and forest owners, and representatives of international agencies, local NGOs and universities (See Appendix D: "Persons Contacted").

CDIE selected Braulio Carillo National Park and its buffer zone areas for intensive examination because it combines several conditions that highlight the agriculture development and wildlife habitat conservation nexus in Costa Rica (See Appendix B: "Wildlands Habitat Protection in Costa Rica"). The park has households settled in areas immediately adjacent to its perimeter. The Park has also been the subject of major upgrading with staff facilities and roads now under FUNDECOR management. These interventions provide the opportunity to examine the impact of efforts under FORESTA to establish a biologically and institutionally sustainable system for the conservation of the country's biological diversity.

2. BACKGROUND

The Problem

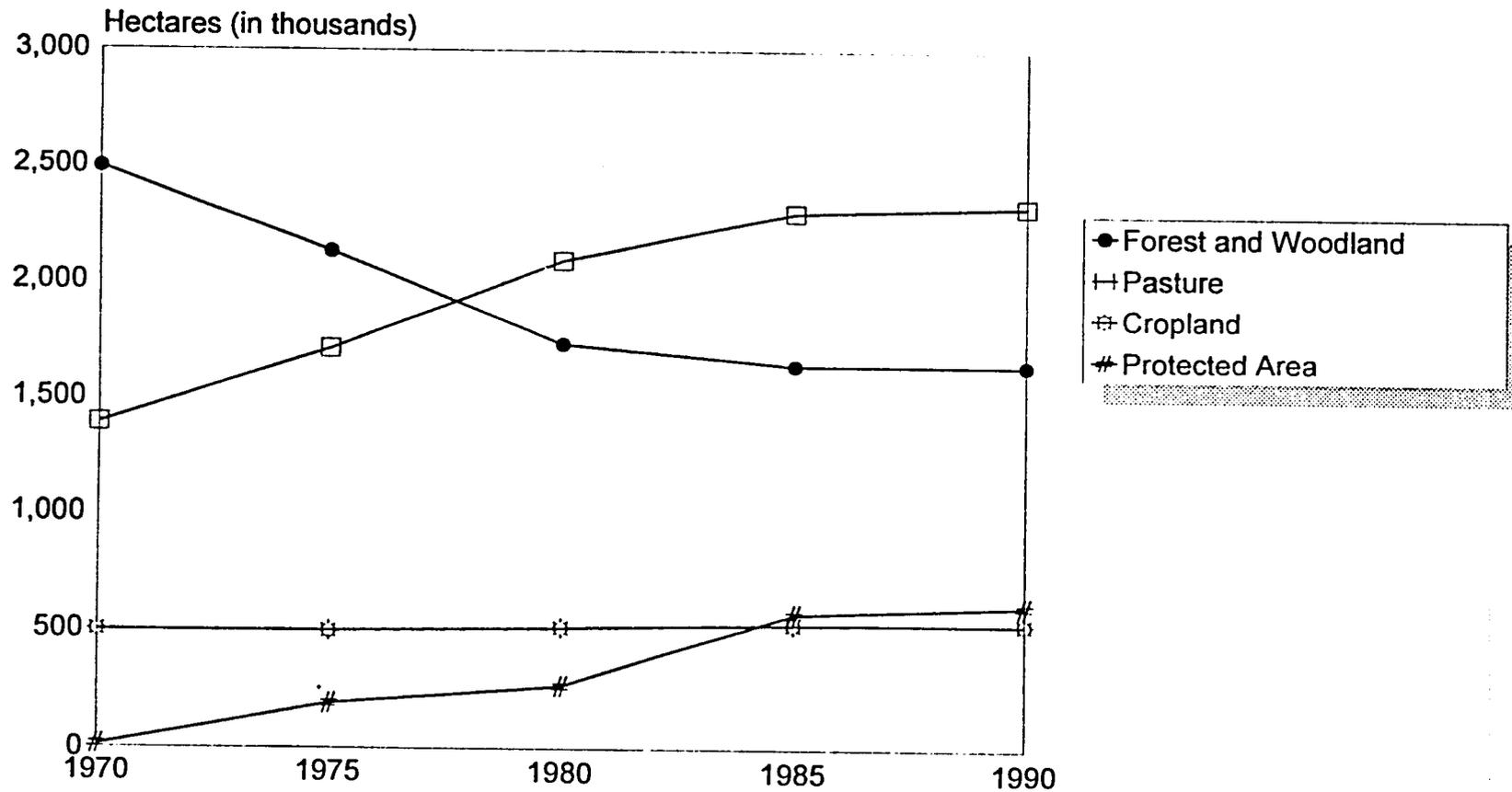
Costa Rica is internationally recognized as one of the world's leaders in wild life park and forest reserve creation. The country has a significant array of conservation assets: a cadre of natural resource managers in both the public and private sectors; an extensive wildland system encompassing an array of ecosystems; high environmental awareness among the public and decision makers; and financial, and technical support from the international community.

Despite these seemingly positive factors, environmental degradation in the form of rapid deforestation threatens Costa Rica's economic development, as well as its ecological resources. From an area of 26,000 square kilometers, covering more than half of the country in 1970, the forests have been reduced to only 13,230 square kilometers covering one fourth of Costa Rica in 1987. During the 1980s an estimated 50,000 to 60,000 hectares of forest land were cleared annually largely for pasture and livestock grazing (MIRENEM 1990). While the rate of net forest loss is lower today, Costa Rica has not yet put a halt to the destruction of natural forests that are habitats for much of the country's wildlife.

The principle cause for this widespread deforestation is not only the demand for timber but also the large-scale demand for agricultural land, a scarce commodity in a country marked by steep slopes, poor soils, and heavy rainfall. Trends in land use over the 20-year period 1970-90 (See Figure 1) reveal the steady loss of over 1.5 million hectares of forest land and an almost equal expansion of pasture area. During this period the Costa Rica's environmental story was, in large measure, one of "converting trees into hamburger" to satisfy the world's demand for beef and to fuel the country's ambitious export led development strategy that promoted beef production for sale in international markets.

Continued deforestation threatens sustainability of the country's economic development. With the depletion of the forests, it is estimated that by the end of the century the annual import bill for wood could range from \$50 million to more than \$200 million -- a financial situation which would reverse any macroeconomic gains Costa Rica will have gained from stabilization efforts (MIRENEM 1990). Less than 30 percent of the country's territory is considered appropriate for even the most limited agricultural activity. Yet, over 60 percent of its land base is used for agriculture, pasture, or urban development.

Figure 1: Costa Rica - Land Use (1970-1990)



Source: FAO 1987; IUCN 1990b; WRI 1992b

Note: Forest and Woodland, Pasture, and Cropland data are from 1971, 1976, 1981, 1986, and 1989.
Protected Area data are from 1970, 1975, 1980, 1985, and 1990.

Deforestation also threatens Costa Rica's biological diversity. The runaway destruction of forests for crop cultivation and cattle grazing is putting pressure on the 13% of Costa Rican land area (687,110 ha) which is protected as critical habitats essential for maintenance of the country's diverse wildlife. Today, most of these forest habitats stand as isolated "biological islands" surrounded by expanses of degraded secondary forest, pasture and commercial agriculture. Their small size and fragmentation raise questions about the long-run viability of the genetic resources they contain.

Approximately ten percent of the country's terrestrial vertebrate species are considered endangered, primarily by habitat loss, and some, such as the harpy eagle, may be locally extinct. Biologically rich aquatic ecosystems, such as the coral reefs off Costa Rica's southeast coast, are being choked by sedimentation due to erosion, a common problem in a country where over 17 percent of all lands are seriously eroded.

Current public efforts appear inadequate to alleviate the rapid deterioration of the country's forests (Bradley et al. 1990). If forest management does not improve over the next decade, woodlands under federal protection will be severely endangered. The National Park Service and the General Directorate of Forests responsible for the protection and management of designated wildlands do not have the resources to perform their jobs effectively. For instance, in 1988 the 45,000 ha Braulio Carillo National Park, was managed and protected with a staff of only 36 individuals including 28 guards and an annual budget of only \$7,300 to cover all operating costs.

The conservation movement in Costa Rica has, in a sense, experienced a "mid-life crisis." According to some observers of the Costa Rican setting, it has evolved from a young, vigorous initiative to a more institutionalized and bureaucratic effort (WWF 1988). The basic groundwork for the systematic conservation of important biological resources in Costa Rica has been done or is well underway, via wildland acquisition (WWF 1988). Improving the quality, protection and management of existing national parks and forest reserves is the necessary next step.

The Costa Rican Biological Diversity Protection Program

In 1989, the Costa Rica National Park Service (Servicio de Parques Nacionales or SPN) devised a National Conservation Area System (SINAC) approach to Costa Rican wildland management in order to consolidate protected area conservation and management, while orienting wildlands toward satisfying the socioeconomic needs of the local communities, and other national and international interests. The broad objectives of the new conservation area system include the maintenance of ecological processes of natural

ecosystems, preserving genetic diversity, and permitting sustainable harvest of plant and animal species of these ecosystems (MIRENEM 1990).

Specific objectives of SINAC include:

- establishing endowment funds for each conservation area to ensure long-term financing;
- decentralizing the organization, to give each conservation area more authority in decision-making and budgeting;
- establishing financial and administrative systems with the involvement and participation of NGOs;
- involving community participation in different activities within the system as an element to promote local stewardship of the natural resource base among communities adjacent to the conservation areas.

SINAC groups 74 of the 78 wildlands within seven major Conservation Areas: La Amistad, Arenal, Cordillera Volcanica, Tempisque, Guanacaste, Tortuguero, and Osa (See Figure 2). Three disconnected marine wildland areas are also considered a Conservation Area, as are the Carara Biological Reserve and Manuel Antonio National Park. (See Annex B: "Wildlands Habitat Protection in Costa Rica" for more details).

TABLE 1: Costa Rica's Conservation Areas

<u>Conservation Area</u>	<u>Nucleus Area</u>	<u>Marine Area</u>
Amistad	273,451 Ha.	22,400 Ha.
Arenal	2,920 "	
Osa	57,548 "	7,775 "
Guanacaste	161,713 "	
Tempisque	21,378 "	
Tortuguero	18,946 "	52,265 "
Volcanica Central	71,551 "	
Total	607,507 Ha.	82,440 "

Source: MIRENEM 1993

The conservation areas are groups of contiguous or clustered wildlands placed in one of several management categories depending on their bio-physical features, socio-economic characteristics and regional relationships. (See Map of Costa Rica) Each conservation area may include one or more core or nucleus areas, consisting of one or more existing protected areas such as national parks, managed for biodiversity conservation, plus surrounding buffer

zones for sustainable development activities. Governmental wildlands (forest reserves, wildlife refuges, and protected areas) or private lands adjacent to the core areas serve as buffer zones where, sustainable uses of natural resources are promoted, including controlled timber or firewood extraction, wildlife management, and ecotourism. Each conservation area has a regional commission, made up of local community representative and SPN staff detailed for its administration and management.

Each conservation area has its unique characteristics and needs which call for independent administrative bodies. The Costa Rican Government has the legal authority for management and decision-making in the Conservation Areas while non-governmental organizations (NGOs) play an important role in actual development and implementation. At the time of this evaluation, a multi-agency configuration of institutions had jurisdiction over the protection and management of Costa Rica's Conservation Area System (See Table 2).

Table 2: Administrative Responsibilities for Costa Rica's Biological Resources

<u>Government Agency</u>	<u>Category</u>	<u>Number</u>	<u>Area (Ha)</u>	<u>%</u>
Park Service (SPN)	National Parks	19	501,704.5	44.63
	Biological Reserves	8	17,653.3	1.57
	National Monument	1	217.9	0.01
SUBTOTAL		28	519,575.7	46.22
Forestry Dpt. (DGF)	Protected Zone	29	187,897.9	16.71
	Forest Reserve	9	303,385.4	26.99
SUBTOTAL		38	491,283.3	43.71
Wildlife Dpt. (DVS)	Wildlife Refuge	8	113,098.5	10.06
TOTAL	6 Categories	74	1,123,957.5	100.00

Source: MIRENEM 1994

The Central "Cordillera" Volcanic Conservation Area (ACCVC) is one of the seven SINAC areas and an administrative unit within Costa Rica's Servicio de Parque Nacional (SPN) (See Figure 3). A Regional Committee comprised of local community members and SPN staff and a Technical Committee advise the ACCVC Director. There are four program areas within the ACCVC: protection, research, education, and land tenure. Through FORESTA, FUNDECOR is coordinating with the ACCVC-SPN in management of protected areas within the ACCVC.

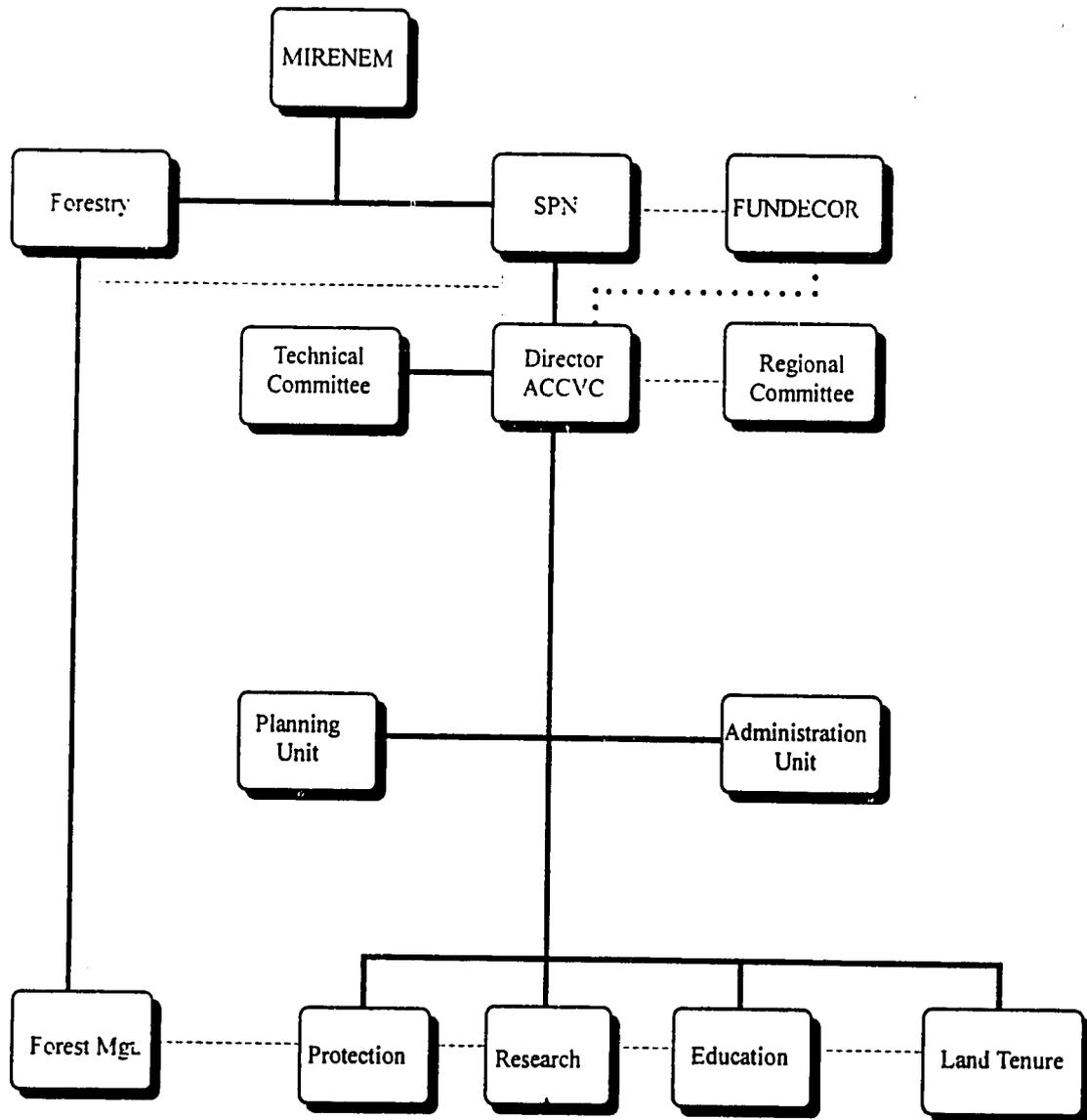
The Director of a Conservation Area oversees management of the national parks contained within the geographical boundaries of the Conservation Area. A Conservation Area director also serves as a "coordinator" for the administration of other protected areas, such as forest reserves, wildlife refuges and watersheds. Legally, however, these areas remain under the authority of the DGF, DVS, the Costa Rican Institute of Electricity (ICE) and the Institute for Aqueducts and Sewers. A law was proposed to the Costa Rican Legislative Assembly in June of 1991, creating SINAC within the MIRENEM. Although the legal base which formalizes the organizational, administrative and financial policy is still under negotiation in the legislative assembly, MIRENEM is implementing many aspects of SINAC (Vaughn 1994).

The ACCVC contains some of the largest blocks of primary forest wilderness remaining in Costa Rica and has several unique features both in its natural resources and in the way they are managed and protected (See Figure 3). Physically, the region has three volcanic parks which are unique geological attractions for tourists. Poas and Irazu are Costa Rica's top tourist attractions, while the Turrialba site has yet to be developed for tourism. The ACCVC has one park, Guayabo, around an archeological site of cultural significance and it has two additional parks composed largely of primary forests with some successional growth where human activity once occurred.

Most of these parks are of recent vintage, being legally constituted in the last two decades and in some cases still having human activity, farming, cattle raising within their borders where land has not yet been purchased by government and transferred from owners to make the parks. The GOCR has banned any further hunting or logging on lands -- public or private -- within the official park boundaries and assigned the national park service to enforce the regulation. However, where private lands still have not been purchased, where land titling is in dispute, or simply, where control and enforcement are weak, sporadic hunting and logging continue.

Figure 2:

Central Volcanic Cordillera Conservation Area
Proposed Administrative Organization



Source: MIRENEM

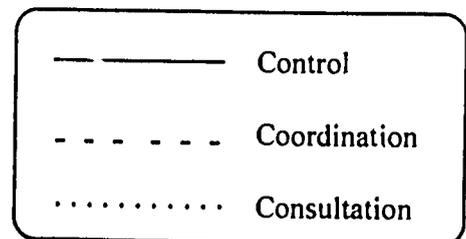
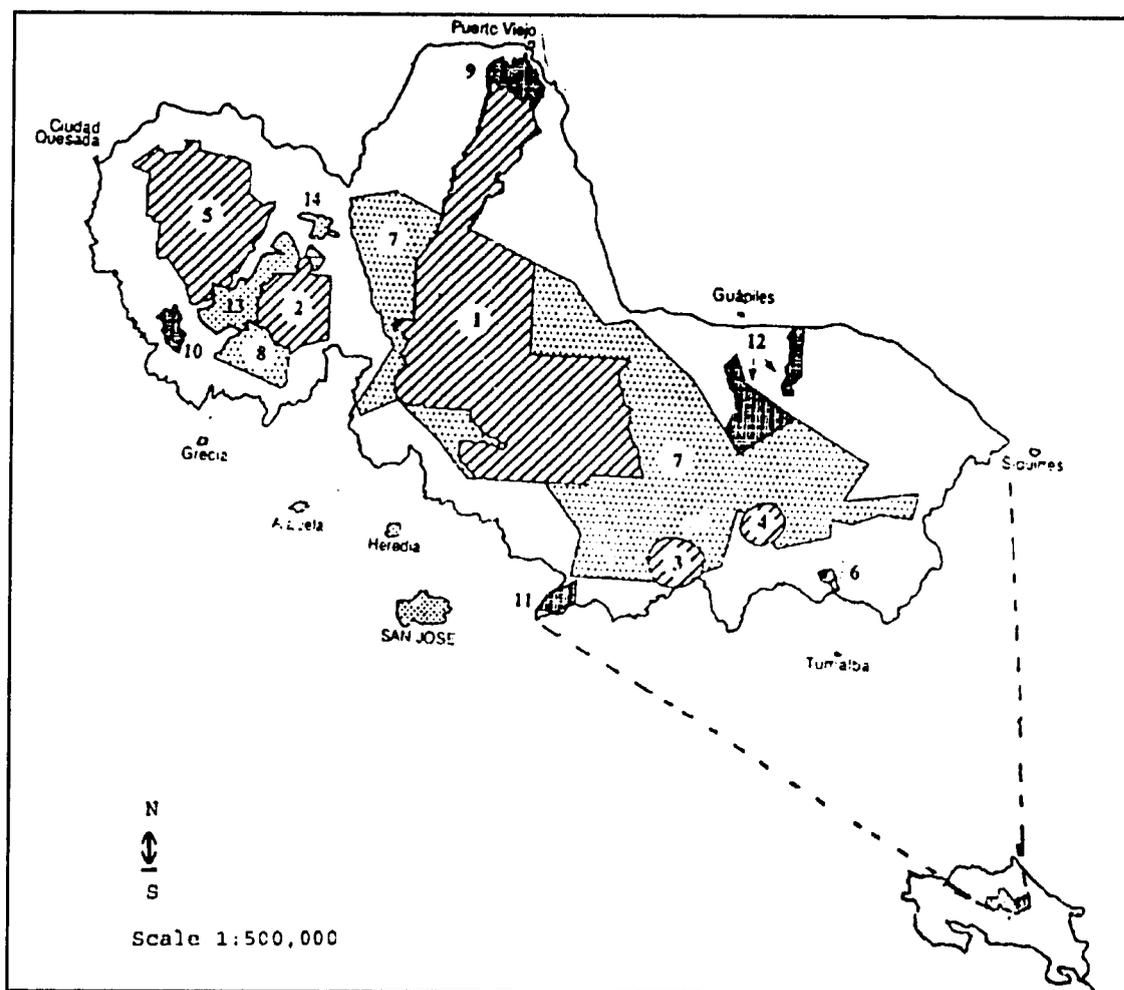


FIGURE 3: CENTRAL CORDILLERA VOLCANIC CONSERVATION AREA

National Parks:	71,551 ha	National Parks:	1-Braulio Carrillo
Buffer Zones:			2-Volcán Poás
Forest:	102,402 ha		3-Volcán Irazú
Other uses:	116,234 ha		4-Volcán Turrialba
TOTAL AREA:	290,187 ha		5-Juan Castro Blanco
		National Monuments:	6-Guayabo
		Forest Reserves:	7-Central Cordillera Volcanic
			8-Grecia
		Protected Areas:	9-La Selva
			10-Chayote
			11-Río Tiribí
			12-Acuíferos Guácimo Pococi
			13-Toro
		Refuges:	14-Vida Silvestre Bosque Alegre



The USAID Assistance Approach

Support for Costa Rica's export led growth was the focus of the USAID development strategy in Costa Rica through most of the 1970s and 1980s. In 1982, USAID included the sustainable management of the country's natural resources base, particularly its forests, as an additional dimension of its development program. This revised development strategy recognized that runaway deforestation was threatening the water supply and hydroelectric power, destroying wildlife habitats and moving Costa Rica toward being a net wood importer before the end of the century (USAID 1989). The USAID strategy targeted improved management of national parks as well as contiguous commercial forests (buffer zones) in an effort to achieve a win-win balance between economic development and natural resource conservation.

The first major USAID initiative to implement its new strategy was the Natural Resources Management Project (1982-1987), that spanned a range of forestry and park protection activities. While the Natural Resources Management Project did not meet all of its objectives, its accomplishments in forestry training and forest policy reform have built a foundation for subsequent USAID and GOCR initiatives.

More recently USAID has supported Costa Rica's efforts at managing its expanded protected system through a number of project initiatives. USAID authorized a \$1.9 million Forest Conservation and Management (BOSCOSA) Project (1990-96) to promote sustainable forest development in the buffer zones surrounding Costa Rica's Corcovado National Park in the Osa peninsula. Most recently, USAID authorized a \$2.0 million Regulation for Forest Management (REFORMA) project (1993-96) to support reform and implementation of Costa Rica's forestry policies. USAID has given smaller grants to U.S. and Costa Rican NGO's for the management of the private Monteverde Cloud Forest Reserve and the Tortuguero, Corcovado, Talamanca and La Amistad National Parks, and for implementation of regional biodiversity programs.

The most ambitious initiative in USAID's revised development assistance strategy in Costa Rica -- and the focus of this evaluation -- is the \$7.5 million Forest Resources For a Stable Environment - FORESTA project (1990-96). USAID and the Costa Rican government designed FORESTA as a regional effort to support ecologically sound long-term economic development of the parks and buffer zone areas in Costa Rica's central volcanic "cordillera" region. The Costa Rican government is contributing an additional \$10.0 million in local currency generated from earlier AID economic support funds to capitalizing an endowment that will provide ongoing financial support to a Costa Rican NGO, FUNDECOR, created to continue FORESTA activities.

The objective of FORESTA is to enhance the protection of biological resources within the newly created ACCVC park boundaries by both giving the national park service the financial and administrative capacity to monitor park activities, patrol and enforce park use regulations and to educate and motivate members of local communities in park buffer zone areas to observe those regulations through incentives such as employment and investment opportunities that would draw on the tourism potential the park areas have to offer. FORESTA also promotes reforestation and natural forest management as economically and ecologically appropriate land uses in the buffer zones around the Braulio Carrillo, Poás, and Irazú National Parks as well as other natural protected areas of the Central Cordillera, and to support management of these protected areas (USAID 1989a).

FORESTA operates through a newly created independent non-government organization, FUNDECOR, to provide direction, technical assistance, coordination and funding for a) the management of the national parks and other natural protected areas in the Central Cordillera, b) promotion of sustainable production of the natural forests of the buffer zone around the parks, and c) assisting residents of the areas to increase their incomes and to improve the quality and value of their land by integrating trees into their farming systems." (USAID 1989a)

Operating components of the FORESTA project include: 1) general operations, 2) management of protected areas, 3) management of natural forests for production, and 4) introduction of trees on farms or reforestation.

The FORESTA "General Operations" component provides technical assistance and funding to FUNDECOR as a permanent, private, non-profit entity to carry out project activities over the long term under the general guidance of the MIRENEM. The GOCR is also arranging with USAID to use local currency generations from an earlier Economic Support Fund agreement to set up a local currency endowment, the earnings from which would pay a share of FUNDECOR operating expenses after FORESTA funding terminates in 1996. Under the general operations component, FUNDECOR:

- develops overall plans and guidelines for the Central Volcanic Cordillera and strengthens the administrative organization to carry out these plans;
- manages and monitors all FORESTA project components and reports on their performance;
- contracts for outside technical assistance services needed to support FORESTA and MIRENEM operations;
- secures other sources of donor support for activities in the ACCVC conservation area.

Under the FORESTA "Management of Protected Areas" component FUNDECOR is improving habitat and wildlife conservation by:

- helping the ACCVC/SPN to develop park management plans, demarcating park boundaries, acquiring land from owners located inside the newly demarcated park boundaries, improving park protection programs, building tourist infrastructure and contracting for park visitor service operations from communities bordering the parks;
- assisting MIRENEM to establish procedures for using a share of income earned from ACCVC park visitors to pay for improvements and operation;

Under the FORESTA "Natural Forest Management" component FUNDECOR works to halt further destruction of natural forests by:

- developing guidelines for sustainable logging of natural forests by contracting and advising individuals as well as farmer groups (cooperatives, associations) in the creation and execution of management plans for minimum impact tree felling, tree extraction, road construction and other;
- working with the DGF to simplify procedures for preparation and approval of natural forest management plans and where necessary with land owners to obtain titles to the forested land they wish to manage.

Under the FORESTA "Trees on Farms" component, FUNDECOR works to restore degraded forest and agricultural lands by:

- identifying and promoting the use of native tree species in reforestation;
- working with the DGF to simplify the procedures for preparing and processing reforestation plans;
- assisting land owners in obtaining titles and preparing and getting approval for reforestation plans;
- contracting and advising nursery operators in the collection of seed, propagation of seedlings and the production of planting materials for reforestation;

3. EVALUATION FINDINGS: PROGRAM IMPLEMENTATION

This evaluation examines the following strategies as determinants of forest habitat protection programs receiving USAID support:

Institution building -- strengthening local and national level public agencies and non-governmental organizations to carry out programs aimed at forest habitat and biodiversity protection;

Technological change -- introducing new practices and techniques for protected area management;

Education and awareness -- increasing local and national knowledge and understanding of the value of forest habitat protection;

Policy reform -- enhancing economic and other incentives for the conservation of biological diversity.

FORESTA employs each of these strategies in the implementation of the park protection and management component of the project to achieve its biological diversity conservation goals in the Central Volcanic "Cordillera" Conservation Area (ACCVC) of Costa Rica. Moreover, other elements of the USAID assistance program in Costa Rica have employed these strategies in various manners to achieve similar goals elsewhere in the country. This section examines the effectiveness of the conditions created through FORESTA implementation of these strategies.

Institution Building

Institutional capacity is defined in this study as the ability of both public and private sectors to:

- maintain infrastructure -- roads, shelters, visitor-centers, trails, and other facilities inside protected areas;
- enforce and patrol protected area boundaries to prevent illegal or restricted activities;

- develop and implement comprehensive protected areas management plans;
- conduct biological resource inventories, applied research, and monitoring activities;
- provide staff training and skills upgrading.

In Costa Rica the framework for building and applying this capacity has evolved in two important pioneering ways:

- regional conservation areas have emerged from draft legislation as integrated land use planning, management and use arrangements. The Central Cordillera Volcanic Conservation Area (ACCVC) is the focus of assistance provided by USAID through the FORESTA project.
- not-for-profit NGOs have been legally constituted to function as agents for conservation areas in order to contract operation services, solicit donations, and provide other assistance. The Foundation for Development of the Central Cordillera (FUNDECOR) is the NGO through which FORESTA project activities are conducted.

By fostering the creation of FUNDECOR, the USAID FORESTA project is helping the GOCR define a new role for NGOs in managing the country's forest and biological resources.

In designing FORESTA, USAID has worked with the GOCR to create a private regional development foundation responsible for carrying out what have traditionally been public sector tasks of managing natural resources. Costa Rica hosts examples of privately managed forest parks; these arrangements are small and are limited to specific tourist attractions. FUNDECOR has been granted responsibility for the natural resources planning and management direction within the entire area of one of the country's new conservation zones, the "central cordillera" region of the country. As a legally constituted NGO, FUNDECOR can act on behalf of the Costa Rican National Park Service (SPN) to contract concession services - food, crafts, upkeep -- within the ACCVC park areas and to negotiate the purchase of lands to incorporate within the park boundaries.

FUNDECOR brings to national park management and protection a degree of flexibility and management expertise not possible within government structures. This is most clearly evidenced by FUNDECOR's progress at moving the ACCVC park system toward its goal of becoming self-financed and not dependent on external donors for covering its operating costs of capital expenses. Moreover,

FUNDECOR has introduced management tools such as computer-based mapping systems that have helped the ACCVC-SPN better track the legal status and physical condition of the 71,000 hectares of land that make up the ACCVC protected areas system.

At this point, however, FUNDECOR remains more a conduit for FORESTA grant assistance flows than an agent for the ACCVC-SPN capable of mobilizing and managing funds from donors to operate the protected areas system. For example, at the time of the evaluation, private concession contracts had not yet gone out for bid and no concession revenue had been generated, although permission had been granted by the government to start. Moreover, FUNDECOR has not yet raised money for the purchase of private lands that lie within the recently established boundaries of new protected areas.

The major success scored by FUNDECOR and the ACCVC-SPN to date has been approval from the GOCR for the ACCVC-SPN to retain 75 percent of the earnings from park entrance fees to fund ACCVC operations. Still to be approved by the GOCR is the strategic plan for the protected areas that would guide how the system is to be strengthened and managed. Despite the lack of a global strategy, the ACCVC-SPN and FUNDECOR have developed annual and quinquennial work plans for park development and operation.

Infrastructure Development and Maintenance

The physical facilities of the parks within the ACCVC are relatively well equipped for the ranger staff, but vary in adequacy for visitors.

FORESTA has provided resources for the construction and reconstruction of some high priority facilities for park staff and for park visitors in Poás, Braulio Carillo Parks, Irazú, and Guayabo National Monument. A fifth protected area (Juan Castro Blanco National Park), which was created after FORESTA was initiated, was not part of the project and therefore was not examined in this evaluation. Additional funding for facilities, trails, etc. is to come from park revenues and donations.

The public trail system within the national parks of the ACCVC measures 23 kilometers. The majority of these trails are unsigned, leaving hikers with absolutely no indication of what to expect. Only 2 kilometers contain descriptive signs which indicate the nature of the trails, such as how long or steep they are, the direction they follow, points of interest along the way, etc.

There are no overnight facilities for visitors in any of the parks visited by the evaluation team. The SPN lacks the staff to maintain and monitor these areas, and has discouraged visitors from exploring the more isolated areas of the parks.

The Individual ACCVC Parks

Poás Volcano National Park. Poás Volcano National Park is roughly a 45 minute drive from San Jose and is the most frequented tourist destination in the country.

Poás, as one of the oldest parks, is perhaps the best equipped from the standpoint of the needs of both park staff and park visitors. Existing ranger dormitories are still in use and have not needed improvements with FORESTA funding. Power and water systems are present and operational, although the water in the visitors center is not presently potable.

FORESTA resources were used to renovate the visitors center that had deteriorated from the damage of acid rains caused by the nearby volcanic gas emissions. The intent was to provide a facility -- which previously was reserved for official use only -- that could accommodate food and craft concessions as well as be a nature interpretation center from which guides could work.

At the time of the evaluation team's visit, the visitors center, initially built around 1980 with World Wildlife Fund support, was nearing completion of its reconstruction phase and was being readied by the park service for operation at the beginning of the high tourist season beginning in November 1994. The visitors center has been completely refurbished and made handicapped accessible. The current available facilities include restaurants, souvenir shops, a 135-person capacity auditorium, and a 240 to 270-car capacity parking lot.

Braulio Carillo National Park. Braulio Carillo National Park is only 20 minutes from San Jose on a national highway that bisects the park and provides a link between San Jose and the port of Limon on the Atlantic coast. Access to the park, therefore, is easy and the highway provides a good scope for developing visitor facilities at both entrances (Quebrada Gonzales/Atlantic and Zurqui/San Jose).

The adequacy of the Braulio Carillo Park facilities were found to vary drastically. Personal inspection by the evaluation team revealed that the new USAID-funded living quarters at the ranger stations in Zurqui and Quebrada Gonzales are functionally equipped, well maintained, and clean. In contrast, the park buildings and grounds were found to be uninviting to tourists. There are no signs located outside of the immediate park vicinity that let tourists know they are travelling in the correct direction. Not until one actually reaches an entrance to the park is its location apparent. The only accessible trail to these facilities from one entrance of the park is characterized by rough terrain and subsequently is not suitable for visitors with mobility problems.

At the Atlantic entrance (Quebrada Gonzales) to Braulio Carillo Park, the SPN operates newly constructed dormitories -- 4 double rooms with kitchen and common living facilities -- funded by USAID. The small tourist center contains a covered sitting area for visitors, restrooms, and a small t-shirt and soda vendor. The gravel parking area at the Quebrada Gonzales station is inadequate for the number of visitors (16,601 in 1993, registered at both entrances). Only about 10 cars, or a couple of tour buses can be accommodated at one time. The park guard on duty is instructed to discourage visitors from parking on the roadside or out of his sight due to the danger of theft and vandalism.

The San Jose entrance (Zurqui station) to Braulio Carillo Park serves as the headquarters for the Protection Program and the Land Tenure Program of the ACCVC. It contains a tourist center with an exhibit area of the plant and animal species within the park, restrooms, and a souvenir shop. The Zurqui station is surrounded by a chain link fence. Computer equipment used by the Land Tenure program is located in a room with no security other than a glass window.

The ranger station at El Ceibo, which is not a park entrance, was built by the SPN. USAID funded the purchase of a radio which is used primarily by the SPN patrols. The station is spartan, but clean and well maintained. It contains a small exhibit of cultural artifacts and wildlife skulls.

Irazú Volcano National Park. Irazú Volcano National Park surrounds Irazú Volcano, which is an active volcano standing 3,432 meters high. It is a 1 and 1/2 hour drive from San Jose, just north of Cartago. The road to Irazú Volcano is winding, but it is paved and well-maintained.

USAID has provided funding for infrastructure development at Irazu, initially through the Natural Resources Management Project and currently through FORESTA. USAID financed the construction of covered kiosks and picnic tables next to the parking area, and a small building with restrooms on the other side of the parking lot. Though constructed nearly a dozen years ago, the restrooms have been in service for just 2 years due to lack of water. More recently FUNDECOR has financed trail improvements, installation of railings, and design and construction of garbage receptacles.

Facilities at the park are limited. The main parking area can accommodate approximately 50 cars and 8-10 tour buses. There is currently no descriptive information on the park available to visitors. The trails and other visitor infrastructure at Irazú are poorly maintained. One section of the trail has been damaged by water runoff. Several sections of a railing along the volcano crater are missing, and the remaining sections, which were painted black, show the scars of graffiti. Only the stone foundation of an

overlook shelter at the edge of the crater remains. Beyond the first crater only regularly spaced posts identify the trail, and there are no protective railings or interpretive signs.

The evaluation team learned of the death of a tourist who, during heavy fog in January 1994, walked too far out on a ridge and fell into a crater. At the very edge of the volcano a sign written in English and Spanish warns tourists to proceed at their own risk.

SPN and FORESTA have agreed to use project resources to build a retaining structure along the crater rim. FORESTA resources will also be used to upgrade the picnic facilities, and to design and build a new visitor center.

Guayabo National Monument. Guayabo National Monument is located on the slopes of Volcano Turrialba, 20 kilometers north-east of the city of Turrialba via a mostly unpaved road. Guayabo is considered the most significant archeological site, and the only formally-declared archeological park, in Costa Rica. Visitation has been increasing steadily at Guayabo, from approximately 2,000 in 1989, to 22,000 in 1993.

The monument, which covers 218 hectares, was established in 1973, but only since 1989 has there been a concerted effort to excavate and reconstruct the ruins. FUNDECOR has assisted the SPN in developing a network of interpretive trails, which are to be well maintained. In contrast to Irazú, Guayabo contains a small information booth offering visitors a self-guided trail brochure in English and Spanish for 40 colones. Camping is allowed in the park, and several covered structures were built for this purpose.

The living quarters for the park manager and his family are clean and well-maintained. FUNDECOR has provided funding for the remodelling and upkeep of these quarters.

Enforcement

FORESTA logistics support to the SPN were found to be adequate for enforcing park protection, with the exception of an insufficient number of vehicles.

Enforcement of the ACCVC is carried out by the SPN. Although FUNDECOR has provided the ACCVC-SPN with material support for patrol units, including backpacks, tents, canteens, and rain gear, the scope and effectiveness of the Protection Program of the ACCVC has been compromised by the lack of vehicles in which to conduct patrols. The 20 park guards, which monitor the entire ACCVC, have access to only four vehicles. The park guards at El Ceibo ranger station in Braulio, for example, must share a pick-up truck with the guards at the Quebrada Gonzales (Atlantic entrance) ranger

station. This means that certain areas do not have any coverage at all, and others only infrequent coverage. To make matters worse, beginning July 1993, SPN headquarters increased the duties of the park guards to include patrolling the buffer zones as well as the parks of the ACCVC.

USAID "buy American" requirements have also presented park management staff with difficulties for vehicle operation and maintenance. American trucks and 4-wheel drive vehicles are not as well suited to the mountainous off-road environment of the parks as are their Toyota, Nissan, or Suzuki counterparts. FUNDECOR maintains operation and repair records for their vehicles, and they appear to be spending an inordinate amount of money on maintenance. The current policy of the park service is to hold on to vehicles until they fall apart. ACCVC-SPN staff believe periodic (2-3 years) trade-in arrangements are critical given the rough conditions and intensive use.

In addition to the need for additional better-quality vehicles, radio communications are also indispensable to the efficient operation of the SPN field operations. FUNDECOR financed the purchase of communication base stations, accompanied by numerous mobile units, located at seven operational centers within the ACCVC. Depending on the size of the park and its degree of mountainous terrain, however, the radio systems can experience considerable static and interference. The closest relay station to Poás National Park, for example, is located at Irazú National Park, a distance of approximately 40 kilometers. The communication problem within Braulio is even greater given its large size and rough terrain, which impede the direct path of radio waves.

Logging, hunting and farming within the ACCVC protected area system is a recognized problem that is being tracked by the ACCVC-SPN Protection Program.

The ACCVC-SPN began operating a new Protection Program in June 1992. The program began with 27 SPN rangers organized into four patrol zones, with the support of one vehicle (June-October 1992), to which three more were added in November 1992. The statistical information provided for those six months is included in the following table along with information for all of 1993.

	June-Dec <u>1992</u>	Jan-Dec <u>1993</u>
Number of patrols:	399	936
Hours of patrol:	3743	7724
Persons:	188	459
Places of patrol:	546	1226
Seizures:	55	185
Illegal logging claims:	-	45
Individuals cited:	140	261

In March 1994, the ACCVC-SPN discontinued patrols in Guayabo in an effort to consolidate and strengthen units in the other parts of the conservation area which have greater forest cover. The number of guards was also decreased to eighteen.

Planning and Operating Capacity

ACCVC managers are undertaking an iterative planning process that allows flexibility to adapt to changing program conditions. However, delays in approving this strategy is leaving the ACCVC with little long-term guidance for implementing park-specific plans.

Under the General Operations component of the FORESTA project, FUNDECOR and the ACCVC-SPN are responsible for elaborating a global strategy that will define a series of goals for the ACCVC for the next ten years to conserve biodiversity and achieve self-sufficiency for the core protected areas. The FORESTA project calls for FUNDECOR and the ACCVC-SPN to use the global strategy as a foundation for developing management and protection plans for the 12 protected areas in existence in 1989 within the ACCVC system, and for elaborating a development and investment plan for protected areas of the ACCVC (USAID 1989). Since then, 2 additional areas have been put under protection (See Figure 3).

The ACCVC requested assistance from a U.S. National Parks Service consultant to analyze the issues and problems raised in the many plans that have been prepared for the ACCVC and its national parks by other organizations and agencies. The consultant found that the ACCVC is reacting to several plans, studies, and diagnoses, some of which were prepared by foreign consultants who do not always understand the realities of the new National Conservation Area System (SINAC), and others which were prepared prior to the implementation of the SINAC. (Smith 1994).

In recent years the ACCVC has been pressured by the Costa Rican Tourism Board (ICT) and tour operators to make physical changes to accommodate increased visitation. The ICT recently contracted the Foundation for Research of the University of Costa Rica (FUNDEVI) to produce master plans for tourism development in the National Parks of the ACCVC. These plans address the physical organization and layout of park areas and the provision of services and information to visitors. The FUNDEVI plans have important implications for broader park management. In the absence of strong management plans of their own, ACCVC-SPN managers have little recourse other than drawing on ICT's tourist-targeted vision for the national parks.

FORESTA has developed but not yet implemented arrangements to draw upon Costa Rica's expanding nature tourism

market as a means for improving protected area operating revenues.

Evidence of Costa Rica's nature tourism industry is found throughout the country. The tourist literature is full of articles and advertisements; billboards advertising eco-lodges and nature resorts can be seen along almost any road. Tour companies conduct trips of one to ten days or more to experience river rafting, horseback riding, birdwatching, jungle walks, sun, beaches, and volcanoes.

The ACCVC parks, all of which lie within a day trip for 60 percent of the Costa Rican population, received 369,884 visitors in 1993. Just over half of them (54 percent) are Costa Rican. Visitors to Poás, Irazú and Braulio Carillo have the option of taking buses, taxis, private cars, or tour packages. Past trends and future projections point to increased visitation to the ACCVC parks. The SPN has put in place a system to capture greater financial benefits from this expanding market, but has only begun to take steps to enhance the quality of the visitors' experiences.

FORESTA's objective in using the market forces of nature tourism has focused on:

- Improvements of facilities within the parks to accommodate increased visitation and to provide concession areas for food and craft sales;
- Implementation of contracts with local communities for road, parking lot and nature trail improvements, and passing of legislation to permit the SPN to enter into concession agreements with local communities to provide food, guide, and other basic services within the national parks.
- Development of guide books describing the birds, mammals, and flora indigenous to the parks of the ACCVC.

FORESTA's progress in meeting the above objectives has been mixed. FORESTA has improved infrastructure in selected parks and set up a mechanism for entering into concession agreements with local communities. However, FORESTA has yet to implement a plan for the ACCVC parks that meets the needs of the SPN to provide better tourist services, including foreign language and naturalist skills training for park rangers, souvenir sales, interpretative trails, and environmental literature.

Research and Monitoring

FUNDECOR and the ACCVC-SPN have yet to develop arrangements for monitoring habitat conditions and wildlife populations within the ACCVC.

Ample capacity exists within the Costa Rican conservation community and its US and foreign affiliates to support research upon which the ACCVC-SPN could base a monitoring program. The FORESTA project therefore does not provide for conservation research as FUNDECOR or ACCVC-SPN activities. This appears an appropriate project design decision. Nevertheless, monitoring activities based on research information is critical in assessing the impact FORESTA supported efforts by FUNDECOR and the ACCVC-SPN are having.

FUNDECOR and the SPN have made coordinated efforts to tap the capacity of other institutions that have capabilities to develop and implement a monitoring program. A comprehensive monitoring effort requires FUNDECOR and the SPN to work out coordination enhancing arrangements with Costa Rica's leading scientists and research institutions to help design and implement a monitoring program.

FUNDECOR contracted the services of two U.S.-based experts to design a research and monitoring program for the ACCVC. The CDIE evaluation team finds the recommendations on development of programs to inventory and monitor biodiversity in the ACCVC by these experts (Hazlett and Lehmkhul 1994) to be valid. They suggest the use of landscape analysis programs to determine changes in forest pattern and fragmentation outside and inside protected areas. Parks such as Braulio Carillo National Park serve as a control area to compare with changes in buffer zones. Variables to estimate include forest patch size, patch edge, distances between patches, and indices of fragmentation or landscape patterns. Other useful indicators of disturbance might include changes in the number of kilometers and types of roads (access for hunters, loggers, invasion of exotic species, etc.) and changes in forest cover along streams which are managed as corridors. Public-domain programs to estimate these variables are available to use with existing GIS maps generated by FUNDECOR staff.

By virtue of its location in the FORESTA project area, FUNDECOR has benefitted from and contributed to the research program at the La Selva Biological Station of the Organization for Tropical Studies (OTS). (See Box 1). The Executive Director of FUNDECOR has been invited to sit on the consultative board of OTS. Cooperative agreements with other institutions such as the University of Costa Rica, CATIE, ICT, Tropical Science Center (TSC), Universidad Nacional (UNA) and/or the Instituto Nacional para Biodiversidad (INBio), would benefit all organizations involved and contribute to filling in the gaps of the baseline knowledge necessary for effective protected area management. A comprehensive research and monitoring program would provide a

scientific basis for conserving and managing the natural resource base within the ACCVC as well as a system for measuring regional changes in the composition and structure of the ACCVC landscape (e.g., deforestation rates) and the impact of management activities at local scales to determine their effects on the conservation of biodiversity. Research at or near park boundaries would be useful in determining how outside influences affect biotic communities inside protected areas. There are rich possibilities for creating specific types of boundary studies at research stations such as La Selva.

Studies on both the effects of the exploited area on ecological processes in the adjacent forest and the effects of organisms moving out of the forested area onto adjacent exploited land can provide valuable information on the effects of loss of specific components of forest ecosystems as well as information on how those components might be retained in areas where human activity is widespread. Research on vegetation structure and composition followed by bird population studies, used as indicators of the potential effect on wildlife, would provide a first approximation toward determining the effectiveness of biological conservation efforts, as opposed to attempting the more difficult population studies of large mammal populations.

FUNDECOR and SPN staff have developed large-scale Geographic Information System (GIS) [see page 28, section II] baseline maps to describe general vegetation types, physical features, land use, hydrology, roads, streams and population distribution. From those data, maps of proposed biological corridors, critical areas for management and management zones have been developed. Local capabilities include map digitalization and spatial analysis. Data on plant and animal distributions and habitat relations acquired by targeted inventories and field sampling for monitoring the effects of management activities in collaboration with university scientists and research institutions could be linked to the regional GIS database at FUNDECOR to estimate the potential effects of actual and potential changes in the ACCVC ecosystems.

Staff Training

FUNDECOR has not fully explored the technical assistance and training opportunities offered in the Memorandum of Understanding (MOU) between the United States National Parks Service and the National Parks Service of Costa Rica.

Fifteen years ago, national park guards were either graduates of the agricultural preparatory schools or local community members -- people familiar with the natural resources but lacking in

Box 1: La Selva: A Multiple-Purpose Reserve

La Selva Biological Station is a reserve which is owned and managed by the Organization for Tropical Studies (OTS), an international consortium of universities and research institutions (Stone 1988). OTS promotes research and university-level teaching in humid tropical ecosystems, preserves a diversity of habitats for research, teaching and conservation, and educates the general public in tropical biology.

La Selva is located in Costa Rica's Atlantic lowlands in an area originally covered by wet tropical forest. The station currently consists of approximately 1500 ha of protected lands with a diversity of use histories, ranging from pristine lowland tropical forest to abandoned cattle pasture. The research station at La Selva currently has 22 buildings, including a central dining room, dormitories, researcher housing, laboratories, and a library.

The station is now one of the most active sites in the world for teaching and research in wet tropical forest. In 1991, for example, the station conducted 69 university courses or adult workshops and hosted 239 researchers from the U.S., Latin America, and Europe. As a national and international academic research and training center, La Selva is zoned for low and high impact research on a broad variety of habitats with a range of land use histories.

Biological sustainability has been a key issue in the development of La Selva (Pringle 1988). The original reserve was too small to support an intact lowland rain forest flora and fauna. In 1986 Braulio Carillo National Park was extended to surround the southern borders of La Selva. Currently the Braulio-La Selva strictly protected core encompasses approximately 44,000 hectares, and is buffered by about 100,000 hectares of other units of the Central Cordillera Reserve. However, species extinction continues in the area, and it is uncertain as to how much biodiversity a medium-sized reserve like Braulio-La Selva will sustain in the long-run.

La Selva runs an environmental education and community relations program that regularly interacts with local children, adults, NGOs and the county government. OTS teaches an intensive natural history interpretation course to local adults. Several course participants are now active in OTS environmental programs, as well as in research and ecotourism (Paaby et al. 1991).

La Selva currently receives funds from numerous sources, two of which are fees charged to users (57% of 1992 revenues) and long term funding by the United States National Science Foundation (43% of revenues). Neither of these revenue sources is a long-term certainty. However, the continued increase in La Selva usage along with the high level of scientific research productivity increase the probability that both sources will continue funding at least in the near future.

Source: Adapted from Clark 1994

management skills. In 1981, the average salary for a park ranger was approximately 62% below that of a typical agriculture worker, and 76% below that of a construction worker, making park protection a relatively less attractive career option (International Labour Office, 1992). Park directors and management staff were generally university graduates with forestry and biology degrees (mostly with research backgrounds), many of whom were trained in the U.S. model of park management.

Currently, however, the SPN has established more stringent regulations for new park guards, indicated by the minimum education levels and technical skills now required of entry level employees. As a result, the corps of park guards has become more structured and professional. The salary of a park ranger is now approximately 66% higher than that of a typical worker in agriculture, and about 18% higher than that of a construction worker. (International Labour Office, 1992¹).

Despite the apparent progress, the full effect of these changes will not be felt until the SPN hires more guards -- something they have done sparingly over the last five years. As per Costa Rican law, the park guards are allowed a leave of absence to pursue further training opportunities, but this is often not a realistic possibility for guards that are stationed in areas distant from training centers.

The MOU, a five-year agreement which has been in place since October 1991, provides a mechanism for collaboration between the NPS and SPN, as well as other US and Costa Rican government agencies. The MOU recognizes the mutual interest in the establishment and management of national parks and protected areas for the purpose of conserving ecosystems and promoting ecotourism. The MOU identifies the following areas of potential coordination:

- collaboration in the planning, development, management and operations of parks and protected cultural sites and,

¹These statistics are derived using the following information: Selected average monthly salaries in 1982 were approximately:

- 1) 800 colones for a park ranger
- 2) 2114 for an agriculture worker
- 3) 3381 for a construction worker'

** 800 = 38% of 2114, or 62% lower; 800 = 24% of 3381 or 76% lower than 3381

Selected average monthly salaries in 1991 were approximately:

- 1) 16,521 colones for an agriculture worker
- 2) 23,373 colones for a construction worker

The average monthly salary in 1994 was approximately 30,000 - 50,000 colones for a park ranger according to interviews with park rangers in Costa Rica.

** In order to account for inflation, the salaries for 1991 were adjusted to 1994 colones by multiplying them by a ratio of (March 1994 CPI/yearly average 1991 CPI). Using the mean salary for park rangers:

40,000 = 166% of 24,043, or 66% higher and 40,000 = 118% of 34,015, or 18% higher.

in the planning and design of visitor programs and facilities;

- specialized projects related to the management of protected natural areas, including, but not limited to, urban and mountain parks and marine coastal areas; and,
- development of educational and public information focusing on the preservation of the environment and an understanding of cultural heritage.

To date there is no coordinated effort to match up training opportunities with the NPS under the existing MOU. In 1991, 12 FUNDECOR and ACCVC-SPN staff travelled to the United States for a park management course sponsored by Southern Illinois University. Since that time, however, no formal training courses have been offered to ACCVC-SPN field staff under the FORESTA project. The ACCVC-SPN apparently has requested additional training through the FORESTA project. These requests await approval from FUNDECOR.

The head of the Protection Program had returned from a week-long course on developing indices for mammal abundance a few days before the evaluation team visit. The ACCVC-SPN patrols do not currently have the training or resources to institute a tracking program for wildlife populations, but additional training of this type can help patrol units formulate a monitoring plan in the future.

FUNDECOR and the ACCVC-SPN have not coordinated effectively to provide SPN park staff with training support in public environmental education.

Although the primary responsibility for environmental education of tourists in the national parks should rest with the park service staff itself, in the ACCVC parks these activities are conducted largely by private tour guides and school teachers. The serious shortage of park staff means that park guards spend most of their time controlling tourists rather than educating the public on the park program, environmental issues, ecosystem functions and biological diversity. Public education and awareness activities are not given high priority when there are other activities to do. The responsibility of escorting tour groups and giving presentations often fall to those that do not have the skills or training to perform more technical tasks.'

Although training goals for FUNDECOR and SPN staff are set up in the FUNDECOR work plans, the evaluation team found the content and organization of the training activities to vary widely. Two FUNDECOR staff are currently pursuing academic programs in administrative areas. The 1993 Third Trimester Work Plan, it states that training has been provided to 21 staff of the ACCVC Protection Program and 18 staff of the Environmental Education

Program. The evaluation team understands that the head of the Environmental Education Program of the ACCVC has no staff other than himself. The lack of a plan for the development of educational materials further constrains the impact that a visit to the parks can have on attitudes and behavior of the public.

Technological Change

FORESTA has introduced mapping and other geographic information system tools for data collection and analysis in land management.

A critical analysis tool for protected area management at both the regional and site-specific levels is a geographic information system (GIS). The information contained in the GIS for FUNDECOR is substantial. FUNDECOR's "Operations" Department is using GIS images to identify and recruit potential landowners for their reforestation and forest management projects and to determine site-specific characteristics that will assist them in contracting personnel to prepare management plans. The ACCVC-SPN Land Tenure Program uses mapping and GIS technologies to overlay mapped information on private lands and land use within park areas from FUNDECOR's analysis of satellite images from 1986, 1992, and 1994.

FUNDECOR has helped the ACCVC-SPN to identify areas within the ACCVC where the threat of park encroachment is greatest, though they have only begun to apply this technology for habitat management and monitoring.

Using GIS, a data base and maps of "critical areas" have been produced for the ACCVC global strategy. These maps identify areas where land-use change is most likely to occur and the natural resource base for biological diversity is threatened with deterioration. The criteria used in the critical area analysis for the ACCVC Global Strategy include: the size of "biological islands" and the distance between them, periphery circumference, location of roads, population distribution, existing timber harvest permits, location of government agrarian reform settlements, slope, and location of protected areas and potential biological corridors identified in an SPN study for the Cordillera Volcanica Central (Hernández 1992).

However, FUNDECOR has yet to coordinate actively with the ACCVC-SPN in using existing satellite imagery and aerial photography in GIS manipulations for monitoring and habitat management of protected areas within the ACCVC. Map information currently available includes: roads by type, population distributions, forest cover by type, areas of existing timber harvest, agrarian/pasture land settlements, slope, park perimeter demarcation, areas of reported poaching activities, watershed location, etc. For

example, an area with forested land that is close to a population center with an existing road network, gentle slope and existing timber harvest or wildlife poaching activity would have a greater potential for sustainable use than an area that has none of these characteristics. Such an area could be defined by GIS overlaying of digitalized maps and the resulting information targeted at habitat monitoring and management.

The ACCVC's use of park overflights and new boundary demarcation techniques hold promise for more effective park protection.

The ACCVC-SPN, with support of FUNDECOR, contracted with a private company to provide overflights of the park areas during 1992 and 1993. The principle objective of the flight program was to allow the ACCVC-SPN to monitor areas that are generally not covered on their patrols. Overflights were particularly useful for identifying new logging roads and illegal tree harvesting sites within the national parks. Overflights are hampered by weather problems (fog, low clouds, rain) which cause frequent and costly delays, cancellations and rescheduling. The ACCVC-SPN has not identified a contractor capable of providing overflight services for 1994, so this program is not active at this time. The ACCVC-SPN is considering the possibility of switching from plane to helicopter flights to decrease the danger of flying in inclement weather over rugged terrain, and to increase flight scheduling flexibility.

A more efficient system for identifying park and forest reserve boundaries is an essential aspect of effective protection. To date, the most common method of boundary marking is cutting a 3-meter swath in the forest, planting native tree species at regular intervals, and putting up boundary signs every 100 meters. This is proving costly. The cleared boundaries need to be constantly maintained and the signs, many of which have been uprooted by poachers, need to be replaced. Currently only 84 kilometers of a total of 627 kilometers of protected area boundaries in the ACCVC have been formally marked. The Head of the Land Tenure Program of the ACCVC explained that rather than attempt to complete marking of individual protected areas in a sequential fashion, the ACCVC-SPN prioritized boundaries and opted to eliminate, at least for the time being, 159 kilometers of natural boundaries (mostly rivers) and boundaries that may be changed (around areas being considered for incorporation or deletion from protected areas), leaving a total of 468 kilometers of artificial boundaries. FUNDECOR is testing the use of global positioning system (GPS) technology to meet these needs. Results to date have been positive.

Awareness and Education

The ACCVC-SPN has not yet developed a coherent plan to guide its environmental education activities.

To date, FUNDECOR and the ACCVC-SPN have been conducting sporadic environmental education activities without a clear understanding of how these activities will contribute to the overall goals of better natural resource management in and around the system's parks. FUNDECOR education activities are targeted at buffer zone landowners and consist of technical assistance and training. The ACCVC-SPN environmental education efforts are targeted at park visitors and consist of development of promotional and descriptive materials about the park and its fauna and flora.

The ACCVC-SPN has budgeted resources to support one person dedicated to environmental education and community outreach. At the same time, The ACCVC-SPN is putting resources into the patrol program to protect the natural resources of the ACCVC from the activities of people who are not convinced of the necessity to protect the natural resource base.

FUNDECOR submitted an Environmental Education Action Plan to USAID in November of 1993 to address these problems. However, the plan does not link the problems faced by FUNDECOR in the ACCVC with activities of other public and private organizations in the area. Furthermore, a thorough assessment of the performance of the current environmental education program has not been done. This assessment is a critical step to determining the different strategies that FUNDECOR could take in future environmental education activities.

FUNDECOR and the ACCVC-SPN have not addressed staff and resource needs for carrying out effective environmental education and awareness activities.

A number of educational methods and techniques can be applied by the ACCVC-SPN toward achieving environmental education and awareness objectives. Neither FUNDECOR nor the ACCVC-SPN are required under FORESTA to develop comprehensive environmental education programs. However, FUNDECOR and the ACCVC-SPN are expected to engage the local community in an interactive education program that takes advantage of the FORESTA facilities and activities.

FUNDECOR is supporting the efforts of the ACCVC to do outreach projects to local schools. The Director of the ACCVC-SPN Environmental Education Program developed a proposal to print 2000 copies of an environmental magazine (ecologico escolar) and distribute it to 200 children in ten schools. Teachers would incorporate the

topics covered in the magazine into their lesson plans and encourage the students to cut out articles and pictures from the magazine, add their own poems, thoughts, etc., and make a bulletin board display for the community. The cost of publication could be defrayed by corporate advertisement. The ACCVC-SPN has yet to make an effort yet to coordinate these activities with the Ministry of Education or the teacher's association.

The objective of the FORESTA environmental education program within the National Parks of the ACCVC is to provide information about the parks and their contribution to habitat and biodiversity protection. This service could best be provided by the people who work in the parks. As noted previously in this report, however, private tour guides and teachers currently conduct most of the environmental education of tourists in the national parks. The shortage of SPN staff has meant that park guards spend most of their time controlling tourists and do not have the time to give tours to visitors. The SPN has a system in place for school teachers to give advance notice of a visit, and they make every effort to provide a guide for these groups. However, ACCVC-SPN guards often resort to giving tourist groups a brief orientation upon arrival and then leave them in the hands of teachers or private guides.

Park guards are currently not provided any language training or substantive technical training in the area of natural resource management, either of which would encourage greater interaction with park visitors. The ACCVC-SPN has considered using volunteers to provide educational services, but has yet to overcome obstacles such as housing and quality control. Programs to train local residents to become naturalist guides hold promise for addressing SPN staff limitations as well as providing economic benefits to local communities (See Box 2).

The seven SPN staff members assigned to Guayabo are supplemented by several volunteers from the local community, and by visiting researchers. These volunteers and researchers help with general visitor orientation and crowd control. In addition, the SPN has contracted with local communities to provide a range of services including trail maintenance, security, excavation services, and infrastructure construction.

Box 2: OTS Naturalist Training Course

ACCVC-SPN activities in the areas of environmental communication and education suffer from a lack of skilled staff. The Organization for Tropical Studies (OTS) is addressing this deficiency by training and organizing rural residents to be naturalist guides (Paaby 1991).

In 1990 OTS conducted its first naturalist guide course at the La Selva Biological Station. A group of 26 local residents (18 males and 8 females) were chosen to participate in the course that consisted of 40 hours of lectures and 103 hours of guided field walks distributed among 11 full-day sessions. Later that year, 22 of the 26 trained guides were surveyed by the course organizers. Only 2 of those surveyed had not worked during that tourist season as guides. All others had worked as full- or part-time guides. The same course participants decided to form a cooperative of local naturalists. Members of this cooperative are owners and are responsible for all activities, and each member receives economic benefits in proportion to the work and profits each contributes. Forty percent of the net revenue is put into a fund for education, social welfare, and investment.

This type of training for local naturalists has been spontaneously replicated elsewhere in the country, but the materials and teaching methods have not been standardized. One of the main organizers of the OTS course indicated to the evaluation team that he had received requests from other organizations about the course, and that OTS had produced a technical report that outlines the content and structure of their course. This report is for sale by OTS. OTS has not, however, been directly involved in organizing similar courses since 1990.

The evaluation team observed that environmental knowledge of private tour guides varies widely. While it appears that many of these private guides are motivated and well trained (language and attitude/behavior) to deal with tourists, others have little formal training in the natural sciences. The apparent trend toward use of freelance guides by tour operators, while economically rational, may not provide freelancers with the opportunity or the motivation to pursue further training. A tour guide at Braulio Carillo mentioned that she had taken an ICT-sponsored tour guide course four years ago that was designed to certify her to conduct tours. The course covered such topics as first aid and Costa Rican history but little about the flora and fauna of the parks.

As a complement to any park guard training activities, FUNDECOR has supported ACCVC-SPN initiatives to provide educational interpretation along park trails. At this time, of the 23 kilometers of trails in the ACCVC, only 2 kilometers have interpretative signs. A few other trails have had interpretation in the past, but they had deteriorated to the point that they had to be removed. The content and quality of the current signs vary considerably. In addition, interpretative trail signs which could contribute to increasing the environmental consciousness of the

nearly 50% foreign visitors are in Spanish only. With over 100,000 international visitors to Volcano Poás Park in 1993, there is a missed environmental education opportunity for all non-Spanish speakers as well as for domestic tourists.

The evaluation team also observed that the content of the trail signs varies considerably. At Poás, for example, interpretive signs provided "poetic" inspiration rather than information on the environment. Such an approach may be effective in "connecting with" nature, but again, there is a missed opportunity to educate the tourist community about the ecological functions and relationships of the forest habitat protection -- flora, fauna, watershed protection, etc.

Policy Reform

FORESTA has encouraged the GOCR to initiate within the ACCVC a new revenue management system that will enable the system's parks to retain and use 75 percent of the revenues generated from park entrance fees and concession licenses and contracts.

The revenue management system is based on Costa Rica's as yet unapproved Conservation Areas Law (Proyecto de Ley de Areas de Conservacion) which grants the Director of the National Parks Service the authority to distribute funds generated from park entrance fees and concession contracts. Under FORESTA, the SPN has agreed that the ACCVC system's parks could retain and use 75 percent of the revenues generated from park entrance fees and concession contracts for direct protection management activities.

According to the Conservation Areas Law, the 75 percent of total park income is returned to the park "to administer the parks of the ACCVC", and many expenditures can fit under this umbrella unless prohibited by higher authorities. The SPN, with instruction from higher authorities, can limit the availability of such funds for the purchase of certain goods -- except when these funds are used for paying salaries. The SPN can, at their discretion, cut back the 75 percent to a lesser figure.

In 1992, of the revenue generated by visitor fees, the ACCVC parks received approximately 16 million colones. This figure represents 6.6 percent of the total ACCVC parks budget. As a result of the new revenue management system, visitor fees retained by the ACCVC parks increased to 47 million colones in 1994, raising the contribution to the total budget to 15.4 percent (See Table 3).

New GOCR procedures are in place which allow for the contracting of food, crafts sales and guide services

concessions in the ACCVC parks by operators from neighboring communities.

The FORESTA project calls for FUNDECOR and the ACCVC to promote local community participation in protected areas operations by granting them contracts to operate food and crafts shops and guide services within the national parks. This requires reform of current park policy which did not permit private concessions within the parks. Previously, the only opportunities for community participation has been occasional contract work for park trail repair and maintenance.

FUNDECOR has worked with the SPN to obtain GOCR approvals to solicit bids from concessionaires to operate food and crafts sales within the parks. The GOCR also granted permission for revenues from concession contracts to flow back to the park system to cover operations.

At the time of the evaluation, bid advertisements had been prepared but not yet publicized. At issue is how to assure that local communities will participate and not get pushed aside by larger capital city enterprises. Since communities bordering the parks are already providing services to park visitors before entering or after leaving the parks, FUNDECOR also seeks to avoid taking away some of their business and giving it to concessionaires operating inside the parks.

4. EVALUATION FINDINGS: PROGRAM IMPACT

Impact on Practices

Available SPN data on rates of park encroachment are inconclusive as to the effectiveness of the ACCVC protection program.

The team was unable to determine whether increases in the number of citations for illegal activities filed are leading to reductions in illegal natural resource use behavior by local populations. Neither FUNDECOR, the Wildlife Service (Division de Vida Silvestre) or ACCVC-SPN staff had any evidence to support this. What appears to be evident is that increased patrols tend to increase the number of citations issued. However, staff shortages put a ceiling on the number of patrols that can be sent out. The above parties agree that the percentages of citations which lead to sentences are increasing. The ACCVC Protection Program requires an inordinate amount of time for processing citations. The process of apprehending and filing claims against poachers and illegal loggers is also very time consuming. The result is a reduction in the amount of time available for park guards to effectively monitor the field situation.

The ACCVC-SPN recognizes that using the number of citations to gauge the program's effectiveness is a misguided strategy. Changes in the number of citations could mean that the patrols are doing good work, but it could also mean that the patrols are losing motivation due to the difficult working conditions, that hunters are altering their behavior to compensate for increased patrols (i.e. night hunting), that the SPN is slow in keeping up with changing tactics of wary poachers, or that certain animal species are being hunted into extinction. On several occasions the SPN used road checks in the areas where poaching has been greatest as a mechanism to deter illegal activities.

The park guards are concerned for their safety while on patrols. They patrol in groups of two to four, and always carry firearms. Confrontations with poachers and illegal loggers are frequent and the patrols are often outnumbered. This presents a very threatening situation for patrols and may affect their decision to make citations.

Local tour guides and operators are showing greater interest in the natural wildlife of the ACCVC protected areas system and greater willingness to support the work of the National Parks Service.

The National Park Service of Costa Rica and the private tourism industry have had differences of opinion in the past over the management of tourism activities in the national parks. The SPN perceives private tour operators to be interested primarily in increasing visitor volume, while recognizing the limited capacity the SPN has in exercising or encouraging quality control. The private tourism industry has been frustrated by the staff and resource limitations of the SPN and the slow pace at which improvements in tourism facilities are made.

In spite of these long-standing issues, evidence exists that both the SPN and the private tourism sector are finding ways to work together to provide visitors with a higher quality experiences. According to a survey of Costa Rican tour operators conducted by The Ecotourism Society in April 1993, 67 percent of respondents have helped to protect park areas, primarily through financial help to the SPN for trail maintenance or construction and land purchases. Three-quarters of the respondents indicated that an environmental "code of conduct" is a useful tool for educating tourists, although only 3 operators apply such a code in their workplaces. Just over half of the operators surveyed indicated that they facilitate first aid training for their guides, while 78 percent claim to invest money and time in training programs for their employees. Some of these same companies have endorsed proposals that the SPN charge tourists a higher fee for access to the national parks, with the additional funds going toward park maintenance and operation activities.

FORESTA has not yet had any visible impact on park visitor behavior in the ACCVC protected areas system.

With the exception of Guayabo National Monument, where signs encourage visitors to protect Costa Rica's cultural heritage, evidence of vandalism can be seen in each of the parks. Destructive behavior is particularly notable by the graffiti and damaged facilities at Irazú. Several signs indicate pathways but there are few posted warnings about where to go and what to avoid except in areas where physical danger is greatest. Park rangers report that the attitude of some visitors appears to be one of: "this is my park and I will do what I want." Park rangers have based their conclusions on evidence that tourists have strayed from the main pathway, a process that can be disruptive to the ecosystem.

Some tour operators are critical of SPN decisions to close trails for security or lack of maintenance. In turn, the SPN faults private tour operators for using tour guides that are not knowledgeable about the national parks and their resources, and who are unable to control tourist behavior in the parks.

Biophysical Impact

Forest habitat fragmentation continues to be a problem within the ACCVC area.

The biological integrity of the ACCVC's national parks continues to be threatened by the presence of private landholdings within the borders of these protected areas. The principal objective of the ACCVC Land Tenure Program is to acquire private landholdings in Braulio Carillo National Park, to clearly define the boundaries of the remaining protected areas, and to provide update information on proposed biological corridors (MIRENEM 1993).

FORESTA calls for 75% of lands in private enclaves to be purchased and ownership transferred to the Government of Costa Rica by the end of the project in 1996, a target that seems unlikely. FORESTA resources are not there and assumptions that donors and the GOCR will come up with the needed funds appear overly optimistic. Land tenure issues are an enormous problem throughout Costa Rica, and problems with verification of current land holdings within the park and along the park borders are slowing the process of the ACCVC-SPN acquiring private lands. As of May of 1993, the percentages of private land holdings in the ACCVC and the estimated cost to purchase these lands were:

<u>Park</u>	<u>Land Area (ha)</u>	<u>Private land (%)</u>	<u>Cost (millions of col.)</u>
Volcano Poás	5,600	15.2	110
Braulio Carillo	45,899	9.6	120
Volcano Irazú	2,309	31.9	100
Guayabo	218	50.6	15
Juan C. Blanco	14,258	80.5	500

(Source: Departamento de Planificacion y Servicios Tecnicos, MIRENEM, SPN, 1993)

Habitat regeneration and restoration within the ACCVC protected areas system is improving.

FUNDECOR land-use maps (1985-1992) showed that while in the six-year period there were some 35,000 hectares deforested, approximately 15,000 hectares came back as secondary forest. FUNDECOR plans to make a land use map every two years (instead of every four years as initially planned) and compare the future area with the 1992 map. Such a map will help illustrate the effectiveness of FUNDECOR's forest management and protection plans.

The area where Guayabo National Monument is located was previously pasture land and is being allowed to grow back into forest more similar to the original premontane forest. The park director indicated to the team that wildlife is becoming more abundant in the area, mostly birds, but also some mammals.

Socio-Economic Impact

The benefits of park use are limited by shortages of SPN staff to monitor visitor safety or to upgrade and maintain more hiking trails.

At the Zurqui ranger station, one of the two entrances to Braulio Carillo National Park, the evaluation team was informed by the SPN guard that one of the most well marked and easily accessible trails, which also contained interpretive signs, had been closed for some time due to the lack of personnel to oversee it. This translates to a missed opportunity for increased environmental education and visitor satisfaction. Another trail, the only one of three nearby trails that was open, began at the station. The 1.2 km trail was unmarked (except for the entrance) and was extremely rough. It is clearly not appropriate for anybody with any kind of mobility problems.

Security of the tourists is a major concern of the SPN. Park guards make themselves responsible for preventing visitors from getting lost in the woods, being bitten by snakes, or being attacked by thieves, all of which have happened in and around park areas. Lack of overnight facilities and marked trails effectively discourages tourists from venturing into most areas of the ACCVC park system for camping or other recreational use. Implementation of the concession program in the parks should help to lighten the demands put on the guards and free them up to cover a wider area. This may lead to a gradual acceptance of the multiple use approach to parks, an approach that to date the SPN has been hesitant to promote given their limited resources.

Improvements in ACCVC park facilities are creating new opportunities for local communities and the tourism sector to generate employment and income from bringing tourists to these locations.

The evaluation team identifies note-worthy expansionist activities as a result of the improved ACCVC park system:

- SPN guards and professional staff have increased;
- More nature tourism investors are operating facilities around the ACCVC protected areas;

- More employees of nature tourism operations and local community members are working as guides or as food and lodging service assistants.

The evaluation team spoke with tour guides and tour operators at the park sites and in San Jose. All agreed that Costa Rica's park system has been a big draw for the tourism industry. Tour bus operators and tour guides are regularly contracted to take groups of tourists to where they can go for a walk in the rain forest. Resort operators, restaurants and craft shops have sprung up around the edges of national parks and some jobs have been created during reconstruction within the park system.

Even under the best of conditions, the share of the tourist dollar -- in the form of salaries and services -- that reaches local communities is small, ranging between 10 and 20 percent or about \$US 250 from a typical one-week \$2,000 tour package. (See Box 4). In part, this is a result of selling many Costa Rican tour packages in the visitor's country rather than in Costa Rica and of using the capital, San Jose, as the tour base rather than lodges or resorts in rural areas closer to the parks. Because Costa Rica must compete with so many other tourist destinations, it does not have much bargaining power over tour package rates that foreign travel agencies promote. This greatly limits the scope of ecotourism to contribute to the national economy and, of course, to local communities.

A positive impact on local communities was to come from jobs created by added tourist flows. Local communities were to be given access to contracts for park maintenance and improvements and for operating food and crafts concession. At the time of the evaluation, concessions have yet to be contracted to any local operators. Government permission has been arranged and contract bidding procedures have been drawn up with the expectation that concession contracts would be concluded within the year.

One issue facing FUNDECOR is how to arrange for food and craft concessions within the parks without adversely affecting food and crafts enterprises that operate just outside the park borders. To avoid negative impact and opposition, FUNDECOR plans called for limiting concessions to packaged food items, some of which could be contracted from suppliers operating food establishments near the parks.

Box 4: How Eco-tourism Dollars are Distributed

A look at how the costs of a typical eco-tourism package are distributed gives an idea of how much impact on local communities -- in the form of salaries and services -- can be expected from the draw of the ACCVC park system. A typical one-week package originating and ending in the continental United States breaks down as follows:

<u>Item</u>	<u>Amount</u>	<u>%</u>
Air transportation	\$ 600	30
US tour commissions/fees	\$ 400	20
Local tour commissions/fees	\$ 200	10
Meals and lodging	\$ 600	30
labor	\$ 200	10
other	\$ 400	20
Local services (transport, guides)	\$ 100	5
Taxes (12% of local costs)	\$ 100	5
Total	\$ 2,000	100

5. EVALUATION FINDINGS: PROGRAM PERFORMANCE

Program Efficiency

The protected areas component has not yet fully achieved efficiencies in park management or operations that will generate positive returns to FORESTA expenditures.

Within ACCVC protected areas, FORESTA has not advanced yet to the pilot stage of testing the efficiency of changes in park protection and management. Until concessions have been granted and are operating, park revenues and operating cost savings from these activities is at best speculative. Until the ACCVC begins to collect and analyze data on halting encroachment into the protected areas, the impact of FORESTA on the efficiency of new park patrolling methods cannot be determined. FUNDECOR has contributed significantly to the development of visitor services and infrastructure in Poás and Guayabo parks, while investing little in the other parks of the ACCVC.

Program Effectiveness

FORESTA has done little yet to help Costa small and locally-based individuals to participate in the nature tourism market.

The tourism industry is booming in Costa Rica. All indications are that tourism, especially nature-based tourism, will continue to increase over the next decade. The benefits of this boom, however, are being distributed unevenly among the Costa Rican population. A large percentage of international tourists to Costa Rica either purchase all-inclusive packages in their country of origin, or have their lodging and meal arrangements made through large tour agencies in San Jose. This arrangement not only concentrates the financial benefits in the hands of larger tour operators, but also limits the range of experiences available to the tourist.

Some local communities attempt to capitalize on the natural advantages they have in catering to nature tourists -- intimate knowledge of the region and its resources, direct relationship with, or use of, resources, or a stronger cultural identity -- but

are hampered by lack of capital, limited accounting or management skills, and inexperience with marketing and promotion activities.

To date, FUNDECOR has submitted only one proposal to increase local community and individual involvement in nature tourism operations: a proposed "ecocamps" project that seeks to provide greater economic incentive to landowners under forest management plans by introducing revenue-earning tourism activities on their lands between harvesting cycles.

USAID has assisted small business owners and operators involved in tourism promotion through its private sector training program with the Costa Rican Coalition for Development Initiatives (CINDE). USAID has also provided at least one loan guarantee for the construction of a hotel adjacent to a protected area. The Private Sector Office has carried out these efforts with little feedback from the Rural Development Office, which oversees the FORESTA project. The FORESTA project is not being implemented with a view toward linking private sector development objectives with conservation opportunities.

Program Sustainability

FORESTA has enhanced but not yet assured the economic viability of the ACCVC park system.

Beginning in 1994, a major share of revenues generated from ACCVC park operations were returned to the system for underwriting the next year's budget. The rate of reflows is about 75 percent of total revenues from park admissions fees, and net income from park service sales of crafts, books, etc.

FORESTA can take credit for the reduced dependency of the park system on donors for both its development and operating costs. Table 3 indicates for 1992 and 1994, the rate of park system financial dependency on donors taken from annual revenue budgets for the ACCVC system. In 1992, dependency on external donors stood at 60.8 percent for the overall budget and 26.5 percent for operating costs. For the first time, in 1994, park revenue reflows contributed to reducing this dependency to 52.3 percent and 11.4 percent respectively.

TABLE 3-ACCVC PARKS SYSTEM BUDGET

[Millions of Colones]

BUDGET CATEGORY	GOCR	FEES	DONORS	TOTAL	
1992					
Current Expenses					
Personnel	55.0	0.0	20.0	75.0	
Maintenance	0.0	0.0	7.0	7.0	
Other	4.0	16.0	0.0	20.0	
Sub-Total	59.0	16.0	27.0	102.0	
Capital Expenses					
Infrastructure	0.0	0.0	60.0	60.0	
Land Purchases	20.0	0.0	60.0	80.0	
Sub-Total	20.0	0.0	120.0	140.0	
Total	79.0	16.0	147.0	242.0	
1994					
Current Expenses					
Personnel	55.0	24.0	6.0	85.0	
Maintenance	0.0	4.0	6.0	10.0	
Other	4.0	14.0	1.0	19.0	
Sub-Total	59.0	42.0	13.0	114.0	
Capital Expenses					
Infrastructure	0.0	5.0	65.0	70.0	
Land Purchases	20.0	0.0	60.0	80.0	
Sub-Total	20.0	5.0	125.0	150.0	
Total	79.0	47.0	138.0	264.0	
DEGREE OF ACCVC PARK FINANCIAL INDEPENDENCE				1992	1994
A - Total Budget					
GOCR + Fees as a Share of Annual Total				39.2%	47.7%
Fees as a Share of Annual Total				6.6%	17.8%
B - Current Expenses Budget					
GOCR + Fees as a Share of Annual Total				73.5%	88.6%
Fees as a Share of Annual Total				15.4%	36.8%

SOURCE: FUNDECOR AND ACCVC-SPN RECORDS

The ACCVC protected areas system management is vulnerable to changes in tourism patterns and volume from which it draws a significant share of its future operating revenues.

At present the ACCVC protected areas system depends heavily on revenues generated from its two "cash cow" parks, Poás and Irazú. The SPN is counting on revenues from these two parks to support the maintenance and operation of the other ACCVC protected areas.

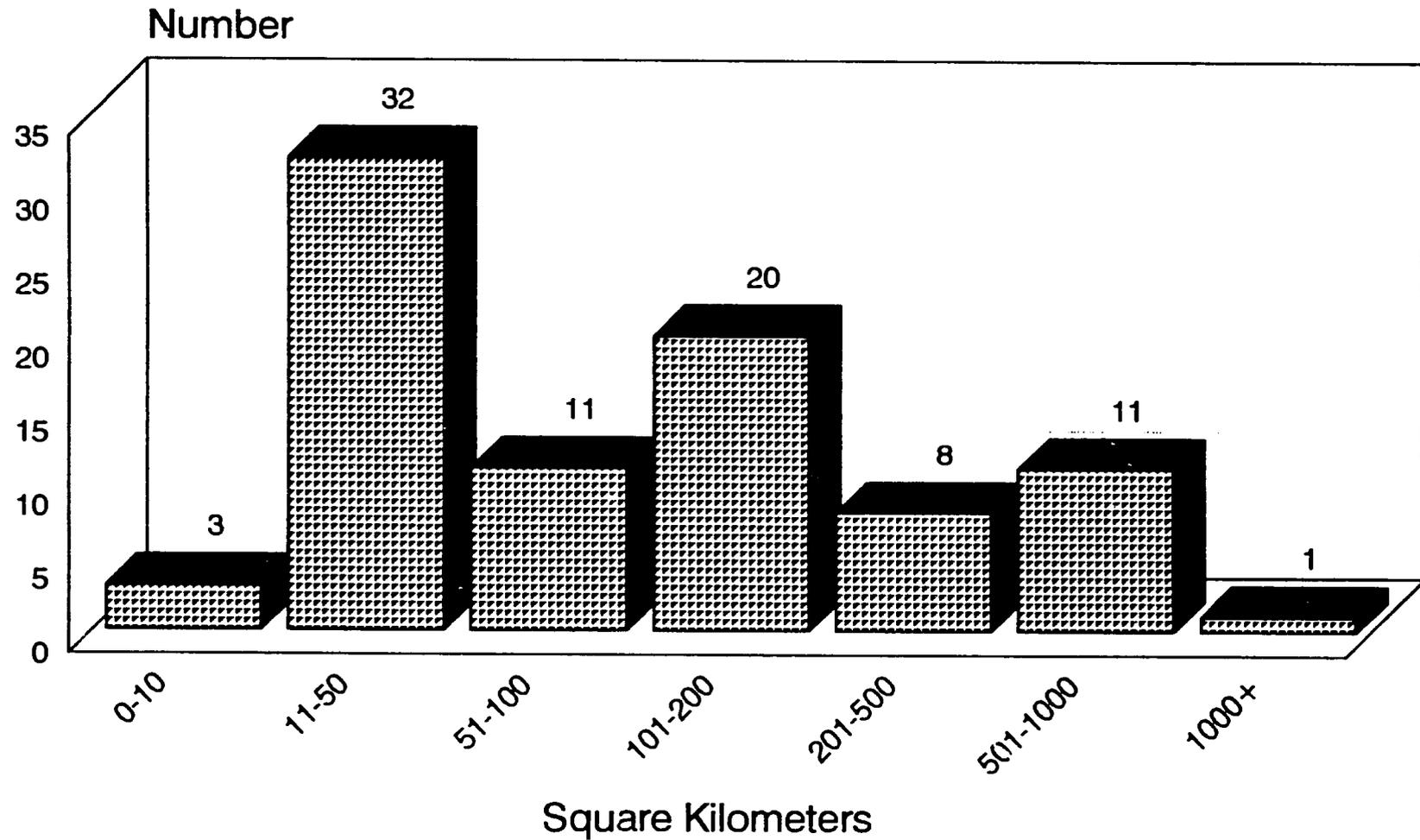
The main problems confronting the GOCR-managed national park system are outdated laws, regulations and enforcement mechanisms, and a slow bureaucratic approval process that essentially precludes the SPN from capturing and using current tourism benefits efficiently. The 10,500 hectare Monteverde Cloud Forest Reserve obtains more income from tourism than the entire Costa Rican National Park System of more than 1 million hectares. Despite the fact that 15 times more tourists visit the Costa Rican National Parks than Monteverde, the SPN takes in less income than the privately-managed Monteverde Reserve. Lack of updated laws to allow increased tourist entrance fees precludes the SPN from tapping into the tourism income opportunity for park maintenance and operation. As a privately managed operation that relies entirely on donations and user fees, the Monteverde Reserve has had the incentive to create a legal framework to increase visitor fees, a task yet to be accomplished by the government operated SPN.

While efforts are underway to consolidate the ACCVC protected areas system with more land acquisition and provision of biological corridors, fragmentation of habitats within the system still pose a threat to the existing diversity of some plant and animal species.

The ACCVC provides a microcosm of the processes that have occurred in many frontier regions of tropical countries. The parks and reserves of the region are essentially forest habitat islands in a sea of agriculture and pasture land. Like any system, the forest habitat island archipelago within the ACCVC consists of components that are anticipated to function toward maintenance of biological diversity.

Whether by design or otherwise, animal movements cause the component forest patches to interact. This interaction is essential to the perpetuation of within-species genetic diversity and the survival of many species. The design of corridors into the ACCVC system facilitates linking isolated forest habitats together and increases the prospects for migration and genetic interchange. But, for example, provision of the La Selva-Braulio Carillo National Park complex, seen as essential to the survivability of altitudinally migrating species is no guarantee of the survivability of plant and animal species in the region.

Figure 4: Costa Rica -- Distribution of Protected Areas by Size



Source: IUCN, *Caring for the Earth: A Strategy for Sustainable Living*, 1992.

Limited research to date suggests that in the tropics, the minimum viable breeding population of 500 trees of low density species require between 0.06 and 10 km² for their conservation (Whitmore 1984). Essentially all of Costa Rica's protected areas meet this requirement (See Figure 5: Distribution of Protected Areas by Size). Five hundred km² is usually considered a minimum size for maintaining viable populations of rain forest species and populations of rare and wide ranging species such as larger mammals and birds (Zola 1993). An estimated 14 percent of Costa Rica's protected areas meet this requirement.

Existing ACCVC-SPN GIS data identify areas where forest habitat has become fragmented and isolated by agricultural land uses. The high risk to these areas is attributed to the reduction of size and increase in isolation of plant and animal populations in forest fragments. Small patches contain small populations, which are more prone to local extinction from random fluctuations in population size and from outside influences (hunting, etc.) than larger populations. Isolation compounds this problem by making movements of individuals between patches more difficult, thus increasing the probability that small isolated populations will go extinct even though forest stands remain.

Timm (1994) reports that several species of mammals at La Selva have increased in abundance as human activities adjacent to the reserve opened the forest and as the reserve expanded to include secondary forest and other disturbed areas. Conversely, hunting pressure and forest destruction have a direct negative impact upon the number of species, and often, the densities of mammals. Subsistence farming, especially when based on small family garden plots surrounded by forest has a positive effect on species diversity and abundance of certain marsupials, bats, and rodents. Crops and their associated insect pests provide a dense and readily available source of food for animals. In addition, opening up increases the edge effect, or ecotone habitat, creating a "different" but rich habitat for many species.

Both FUNDECOR and the ACCVC still face an uncertain future.

The key components of FORESTA necessitate developing both public and private consensus and/or informed consent in the planning and implementation process. There is lack of clarity in the roles and responsibilities between FUNDECOR and the ACCVC in the planning and implementation process of FORESTA in the Central Cordillera Conservation Area.

FUNDECOR was established under the Foundations Law of Costa Rica in 1989 and operates under various funding and cooperative agreements signed by USAID, FUNDECOR and the Government of Costa Rica. Although FUNDECOR was established under legitimate channels,

it does not have a clear mandate from the interested public and private sectors in the Cordillera Volcanica Central to solve the complex land-use problems in the area. FUNDECOR has been operating in the field, under the FORESTA project, for approximately three years. During this time, FUNDECOR has increased its presence only in selected areas of the ACCVC. Some of the affected publics are not completely confident that FUNDECOR alone is the appropriate institution to be solving protected area management and natural resource problems in the area (Martinez 1994).

The ACCVC also has an uncertainty problem in that the new Conservation Area System continues to operate without a legal mandate (the Conservation Area Law Project is still being debated in the Legislative Assembly). Moreover, there is uncertainty in how to maintain coordination between the different public agencies that operate within the conservation area (Engert 1993).

Another issue is the dynamics of the FUNDECOR-ACCVC relationship. Under FORESTA, FUNDECOR has the expertise and budget to develop, plan and implement activities in the Conservation Area. On the other hand, the ACCVC has the legal authority for protected area management, but access to more funding and staff training is limited.

Program Replicability

Several conditions unique to the ACCVC protected areas system raise questions about how transferable to other Costa Rican locations is the FORESTA approach to fostering habitat management and wildlife conservation.

The topography of many of the park lands within the ACCVC are not suitable for uses other than wildlife habitats or tourist attractions. This is particularly true of the two volcano parks which are really protective rings around geologically active areas. In addition Braulio Carillo is made up largely of steeply sloping areas with dense tropical vegetation. Some logging and farming have taken place in lands now incorporated within the parks but further expansion of these areas is limited by physical barriers. In other parts of the country where park lands could be used for purposes other than wildlife habitats, the FORESTA model may encounter resistance in neighboring communities seeking access to the same lands for logging, farming and other means of livelihood.

Good roads and proximity to major population centers make the ACCVC parks system an attractive tourism destination that brings in significant sources of operating revenues from entrance fees. Observers of the Costa Rican tourism scene characterize the ACCVC parks as the "cash cows" for the country's national park system. No other parks have attendance rates approaching those of the ACCVC. Still, some more remote park areas -- Monteverde is an

example -- are also major tourist draws. By raising entrance fees to finance quality visitor services, Monteverde has demonstrated that parks located in more remote areas can operate on a sustainable basis.

The spread of conservation efforts within the ACCVC is limited by lack of funding to purchase private lands found within the park system.

Successful system management is unlikely to occur where funding for land acquisition is a problem. Other protected areas such as Monteverde have the advantage of outside contributions for land purchases and willingness of surrounding private owners to lease lands on a long-term (99-year period) basis for incorporation within the reserve. A share-ownership arrangement among owners of natural forest lands may be one potential vehicle for building protected areas in other locations. Flows of funds into Costa Rica and to other countries in the future are not likely to reach the levels enjoyed in the last decade, unless major donors, or mechanisms such as the Global Environmental Fund, can mobilize the financial resources.

Not many developing countries have the political and economic conditions that would enable a program such as FORESTA to be replicated.

The Costa Rican government stands out as unique for its demonstrated interest in experimenting with alternative approaches to protected area planning and management on a regional basis and using private non-government organizations in the process. While cautious from a legislative and legalistic perspective, the GOCR has shown its creativity by allowing non-government organizations such as FUNDECOR to support park operations and the Tropical Science Center to operate a private wildlife reserve. Many developing country governments appear to lack enlightened and self-confident political systems that would permit, let alone promote, government leadership in these types of protected areas management arrangements.

Private sector entrepreneurial and technical skills are resources that Costa Rica enjoys in more relative abundance than many other developing countries. It would be hard to imagine creating a "FUNDECOR" institution in most African countries where such skills are lacking, or in Asia where protected areas are much more tightly controlled by the public sector.

Minimum political and social conditions for replicating a FORESTA approach elsewhere appear to be a supportive and innovative government structure, a settled land tenure system, a viable private sector, local community involvement and awareness, and an infrastructure for handling large numbers of foreign and domestic

visitors. Even conditions in the ACCVC fall short in some of these categories -- notably absence of local community involvement and continuation of land tenure disputes.

6. LESSONS LEARNED

Land tenure policy must be clear and unambiguous if it is not to obstruct progress in protected area land consolidation.

Costa Rica has been blessed with an environmentally responsive political leadership that has moved the country far ahead of most developing nations in setting aside lands for protection of habitats and wildlife. Unfortunately, in doing so government agencies have confiscated land within newly declared park boundaries but little or no compensation has followed. Poorly conducted cadastral surveys have led to disputes over whether or not other properties were even within park boundaries.

The haste with which some protected areas have been set up has created an atmosphere of distrust and confusion among many land owners in and around the new protected areas. Those located within the protected areas, but not compensated, have chosen to continue to extract trees and continue farming activities feeling they should get as much from the land as possible since the government has not offered payment for the lands. Those bordering the parks fear their land may be the next to be included within protected areas and have acted similarly to log and exploit their land not knowing how many more years of use they would have of their properties.

Such activity and its environmental damage might have been avoided had the government pursued a more responsible land use program that was transparent and understandable with local community participation in the process. As it stands now, failure of the government to follow through with its land purchasing program continues to feed suspicions and uncertainty that leads to the very deforestation and habitat degradation its programs are aimed at averting.

Without direction and regulation, nature tourism can result in superficial economic benefits and degradation of the very natural resources on which it is based.

Costa Rica has promoted nature tourism as an environmentally sound and economically viable activity that would at once generate jobs and foreign exchange for the country while stimulating appreciation for and protection of the country's plant and wildlife on which it depends. Nature tourism literature -- in fact almost all tourism literature -- promotes images of primal tropical forests, pristine beaches and exotic wildlife.

In practice, much nature tourism is simply commercial tourism with a "green" spin. Because government agencies have little control over how nature tourism is conducted, abuses are becoming a growing threat to the country's biological resources. Resorts are springing up around major forest parks without proper environmental assessments before their construction and without monitoring their activities after they begin operation. The result is such anomalies as rare and endangered hardwoods used in the construction of "nature lodges" and untreated sewage and solid waste from "green resorts" accumulating in forest areas and along beaches.

Costa Rica has yet to police itself in step with the growth of nature tourism. Cash strapped local municipalities compete for tourism investor business by relaxing environmental requirements and not enforcing environmental laws. The tourism authority has too few staff of its own to inspect and fine abusers. Clearly, nature tourism can expand faster than administrative capacity and political will to regulate it. Needed are training and awareness programs for tourism authorities and local government officials as a first step in bring nature tourism more into harmony with nature itself.

Monitoring habitat change and its relationship to protected area use and management might best be undertaken entirely apart from the agencies, public and private, responsible for park operations.

Presently, the FORESTA project calls for FUNDECOR to work with the ACCVC-SPN to develop and implement a program to monitor program progress and performance. This places FUNDECOR in the role of a "watchdog" over itself and the agencies it is supporting and creates a potential adversarial "watchdog" relationship that can affect its ability to function also as a collaborating agency.

An alternative scenario might be for FORESTA to create a separate monitoring group with separate funding. Organizations exist in Costa Rica that are capable of performing such a monitoring role and addressing researchable issues that might come up in the course of monitoring.

At issue is how USAID could administer such a monitoring program carried out independently of FUNDECOR. One measure that might be considered is the introduction into the FUNDECOR charter of a provision for periodic renewal of a foundation's status based on an independent monitor's assessment of the beneficial impact that it has made. A foundation, no matter how successful it might be financially, should be accountable periodically for what difference it is making in carrying out its mandate.

APPENDIX A

EVALUATION PROCEDURES

CDIE assessments of environmental programs are aimed at answering two central questions: "Has USAID made a difference?" and, if so "How well did it do it?" The central hypothesis of the environmental assessments is that USAID, through the right mix of program strategies, can impact on local conditions and practices to produce favorable long-lasting changes in the bio-physical environment and on the socio-economic welfare of cooperating countries. This Appendix describes the process used to test this hypothesis in USAID programs aimed at protecting biological diversity.

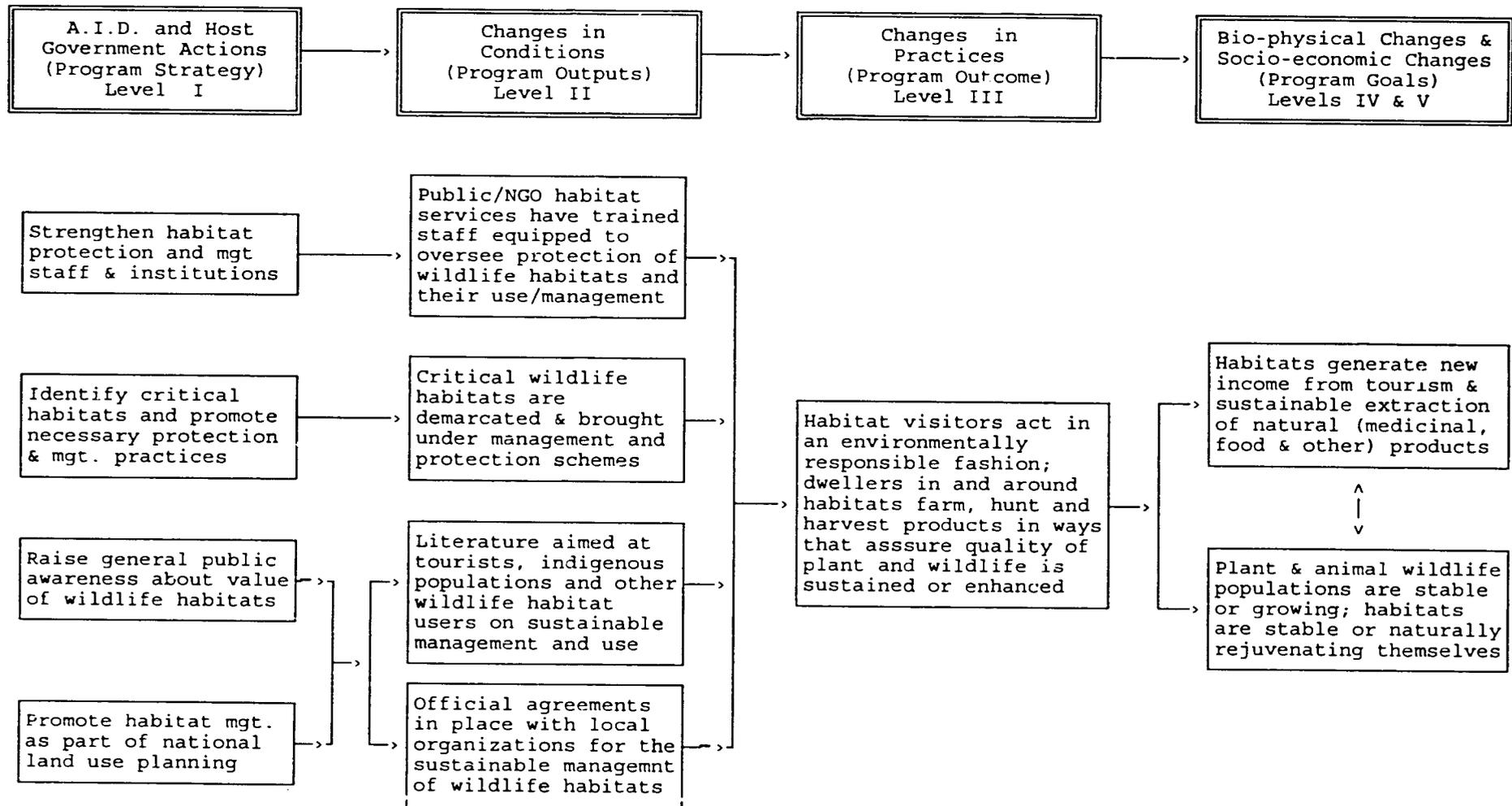
Impact - How much?

The assessment seeks to establish plausible associations between USAID program strategies or activities and the benefits to the human population which result from improved environmental quality and better natural resource management. In answering the first question, "Did USAID make a difference?", the assessment has attempted to document what happened or can be expected to happen from USAID assistance. The evaluation examines the relationships between environmental impact and USAID program investments using a five-level analytical framework (See Figure A-1.)

In the assessment framework, **Level I** describes the "**program strategies**" that USAID and the host government employed to conserve biological diversity through forest and marine habitat protection programs. These strategies include: strengthen habitat protection and management staff and institutions, identify critical habitats and promote necessary protection and management practices, raise general public awareness about value of wildlife habitats, and promote habitat management as part of a national land use planning.

The information is collected and organized in terms of four, cross-cutting strategies employed by USAID: 1) strengthening institutional capacity; 2) introducing technological change 3) fostering environmental education and awareness; and 4) adopting environmentally sound economic, regulatory, and tenure policies. The operating hypothesis is that by successfully carrying out development programs that create enabling conditions in these areas or by successfully recognizing and building on pre-existing conditions, meaningful progress toward the conservation of biological diversity will be made.

Figure A-1: Framework for Assessing USAID Bio-Diversity Protection Programs
(Focus of Forest and Marine Wildlife Habitats)



At **Level II, "program outputs"** are the conditions that have resulted from implementing these strategies. Examples include: public agencies or NGOs services have trained staff equipped to oversee protection of wildlife habitats and their use/management, critical wildlife habitats are demarcated and brought under management and protection schemes, literature is published and disseminated to tourists, indigenous populations and other wildlife habitat users on sustainable management, or official agreements are in place with local organizations for the sustainable management of wildlife habitats.

The **Level III "program outcomes"** resulting from changes in Level II conditions are the adoption of practices and technologies by target groups. Such changes in practice include: habitat visitors conduct themselves in an environmentally responsible fashion, dwellers in and around habitats farm, hunt, and harvest products in ways that assure quality of plant and wildlife is sustained or enhanced.

Level IV and V "program goals" constitute the biophysical and socio-economic changes expected to result from the adoption of Level III program outcomes or practices. Level IV and Level V goals can be viewed as mutually supportive; each contributes to the sustainability of the other (and in many respects each flowing from the other.)

For the purposes of the evaluation, **Level IV "bio-physical goals"** are the specific environmental objectives of the program being assessed. Level IV indicators measure environmental conditions and biophysical changes that contribute to producing the strategic objective. Such changes would include: plant and animal wildlife populations are stable or growing, or habitats are stable or naturally rejuvenating themselves.

Level V "socio-economic goals" represent the development goals and are generally associated with sustainable increases in income, profits, remunerative employment, overall well-being, or production. While access to income data is difficult, the continued involvement of beneficiaries in the program can be used as a "vote with their feet" proxy indicators of improved farm incomes and profits, at least at the time of the evaluation.

Performance Scales: How well?

In answering the second question, "How well?", CDIE's primary concern is the **efficiency, effectiveness, sustainability and replicability** of the program.

Where data exist, the evaluation measures program **efficiency** by using monetary estimates of the flow of benefits to calculate an economic rate of return for those USAID and host government program

investments to which benefits can reasonably be attributed. Because benefits occur into the extended future, their value must be annualized and adjusted to net out all costs and expressed as a discounted net present value to compare with project investment.

To assess program **effectiveness**, the evaluation examines how well USAID sponsored techniques or services are reaching intended target groups and whether there is equity or bias in access and participation by these groups. Examples of effectiveness indicators include the make-up of participating groups according to resource endowments and social status (e.g., farm size, gender)

The examination of **sustainability** is important at all program levels (See Figure A-1). Evidence of sustainability includes the continuation of activities, regulations, or institutions beyond the termination of USAID technical and financial assistance either on their own "internal" momentum or with host government or other donor assistance. At the conditions level II indicators include how long NGO's have continued to operate independently of outside support or how successful local NGOs have been in obtaining outside funding support for their operations. At the practices Level II indicators include the economic viability of new enterprises introduced to dwellers around the perimeters of protected areas and the financial soundness of park management and protection programs. At the bio-physical Level IV indicators include evidence that native plant and animal populations are stable and growing, invader species of exotics are under control and that feeding and breeding grounds are remaining in or returning to their natural state.

To determine the **replicability** the evaluation examines whether conditions and practices, promoted by the program, have spontaneously spread beyond the target areas. This spread may occur among participants by "word of mouth" or other means without further outside support, or "induced" by public, private or donor agencies which have picked up on a USAID supported concept. Replicability indicators include the number of similar activities supported by local or international agencies outside the program target area and population; number of participants outside the target area that have adopted in sum or in part USAID sponsored practices.

Data collection procedures

CDIE employs a variety of primary and secondary sources of data to: construct the chain of events linking program activities and to impacts; examine major evaluation issues; and identify lessons learned.

In preparation for the field work CDIE collected and analyzed relevant secondary data and information that are available in Washington or in host countries from a range of sources including

project documents, technical reports, and special studies (available with the Agency's Development Information System).

CDIE's fieldwork methods combine an examination of changed and changing conditions at the national policy, planning and institutional levels with a more in-depth evaluation of one case where a site-specific protected area program has been operating with USAID support. Data collection methods included key informant, focus group and informal interviews, direct observation and analysis of secondary sources

Evaluation data collected in the field will form the basis for a country case study synthesizing lessons learned from USAID programs in fostering conservation of biological diversity through protection and management of protected forest and marine habitats. The case study experience will in turn contribute a global assessment of USAID biological diversity.

In addition to a review of program and project documentation (see bibliography of all documents cited in this assessment), data collection includes field visits to document implementation efforts. These include non-statistical evaluation of the biophysical state of habitats under improved management practices and a comparison of conditions in areas that have not experienced USAID supported interventions.

Following each field site visit, participating team members gather to discuss their findings. A structured checklist is applied to these discussions to ensure team consensus on key points related to program performance. In addition, the team develops a roster of key technical, institutional, social and economic indicators for evaluating program impact at each site. The team members use this roster to strengthen their consensus on the assessment of field site. The consensus building checklist and the key indicators lists are attached in the following pages.

Biodiversity Conservation Site Assessment Checklist

A. Institution building

1. Evidence of an increased ability by government personnel to implement biodiversity conservation.
2. Evidence of an ability by user groups to implement biodiversity conservation.
3. NGO's - Evidence of an increased ability by NGO's to assist in the implementation of biodiversity conservation.

B. Awareness, Education and Advocacy

1. Evidence of educational/awareness programs being carried out in the project areas.
2. Evidence of an increased level of awareness of biodiversity conservation by villagers.
3. Evidence of villager advocacy for extension of biodiversity conservation.

C. Impact on Practices - A description of biodiversity conservation practices.

1. User group organization.
2. Methods of protection.
3. Methods of harvest and product distribution.
4. Description of sanctions.

D. Socio-economic impacts

1. Evidence of increased benefits to the community.
2. Evidence of increased benefits to individual user group members.
3. Evidence of development activity funded through the sale of community forest products.

E. Program effectiveness

1. Evidence of equitability (cast, tribal, proximity) in the management of the habitat.
2. Evidence of the addressing of gender concerns in habitat management.

E. Program Sustainability

1. Description of the external inputs provided in establishing and managing the habitat.
2. Description of the external inputs that are perceived to be necessary to future biodiversity conservation management.
3. Team's assessment of the sustainability of the biodiversity conservation efforts.
4. Continuation of government inputs.
5. Continuation of NGO inputs.
6. Sustainability of the Users group (economic and institutional).
7. Sustainability of the resource under management.

G. Replicability

1. Evidence of program replication beyond project input sponsored areas.
2. Evidence of increased participation of villages within project sponsored areas.

KEY PROGRAM IMPACT INDICATORS LIST

Field Visit Site: _____ Date: _____

Technical Indicators¹

- ___ Years habitat has been officially protected.
- ___ Habitat size, perimeter length.
- ___ Miles of internal roads.
- ___ Miles of internal trails.

Social Indicators

- ___ Representative membership of all stakeholders. How participatory has the process of Habitat User Group (HUG) formation and function been?
- ___ Local leadership. How representative of the community is HUG leadership?
- ___ Quality of HUG Leadership. How involved and committed to the success of the HUG is the leadership?
- ___ Extent of women's involvement. How extensive has been women's involvement in the function of the HUG?
- ___ Sense of stewardship/responsibility for resource. How developed is the sense of "ownership" among stakeholders for the resource?
- ___ Incentives for participation. How extensive and enduring are the incentives for stakeholders to participate in HUG?

Institutional Indicators

- ___ HUG origins. To what extent was the HUG formed from the "bottom up"?
- ___ Security of rights. How secure are the rights of stakeholders to their resources? To what extent to the stakeholders understand their rights?
- ___ Planning. If the HUG has an operational plan, to what extent

¹ Ranking: 3=High; 2=Moderate; 1=Low

is the operational plan collectively derived and understandable to all stakeholders?

- Training. To what extent did/does project staff/government staff provide training to HUG members in development of operational plan and HUG management?
- Technical Support. What is the level of technical support available to the HUG (e.g., from Line Departments, from project)?

Economic Indicators

- Changes in land use/resource use patterns. Extent to which project inputs have affected existing land use/resource use patterns.
- Benefits/Costs. How do the benefits of project/HMG inputs compare to the cost of the project inputs?
- Cost effectiveness. Extent to which project/HMG inputs incorporated low cost local resources.
- Changing employment patterns. Extent to which local employment opportunities have improved as a result to project/HMG inputs.
- Improved markets. Extent to which project/HMG inputs have improved marketing opportunities for beneficiaries.
- Sustainability. Extent to which project/HMG benefits are likely to continue when project inputs are completed.

Tourism and Hotel Operators Questionnaire

1. Name and Position of Interviewee:
 - a. How did he or she enter hotel business?
2. Name of establishment:
3. Number of rooms
 - a. Electricity Yes___; No___. River view: Yes___; No___.
4. Date Established:
5. Rate per night:
6. What do tourists request most from the guides (to see)?
7. What do you do to better educate the tourists about the forests, the wildlife, and the local people?
8. What does the hotel do to influence the impact on the park?
9. Overall, do you think the tourist business has a positive or negative impact on the
 - a. vegetation of the park
 - b. Wildlife resources in the park
 - c. On the environment outside the park
10. What could the government do to help hotel owners become better partners in managing the park?
11. Describe your experiences with:
 - a. anti-poaching units
 - b.
 - c.
12. Have you learned about conservation? If so, how?
13. What controls or regulations (including changes) would enable Sauraha to develop as a desirable destination for tourists?

APPENDIX B

BIO-DIVERSITY PROTECTION IN COSTA RICA

Background

Costa Rica is recognized worldwide for its comprehensive system of protected wildlands. These areas occupy approximately 22 percent of the national territory (1,085,000 hectares) and protect a vast diversity of unique tropical ecosystems that exist in the country (Engert 1993). The system includes national parks, biological reserves, wildlife refuges, forest reserves, national monuments and other types of protected areas. National parks are those lands under full protection from development, while forest reserves, wildlife refuges and protected zones allow a range of controlled activities and development.

The national parks and equivalent reserves of Costa Rica protect some of the nation's most outstanding natural and cultural heritage. These wilderness areas provide shelter for most of the 205 species of mammals, 849 species of birds, 160 species of amphibians, 218 species of reptiles and 130 species of freshwater fish which have been discovered in the country, and at the same time they preserve almost all of the approximately 9,000 species of vascular plants that have been identified to date. These plant species make up almost 4% of the total number of plant species known to occur in the world (Boza 1988).

The protected wilderness areas also assure the conservation of almost all of Costa Rica's diverse habitat types, such as deciduous forest, mangrove swamps, rain forests, herbaceous swamps, cloud forests, paramos, hillside forests, oak forests, coral reefs, riparian forests and swamp forests. Furthermore, the system of national parks and reserves contains an astounding variety of areas of interest: for the geologist and geophysicist, there are active volcanos, hot springs, caves and relict mountains from plate tectonics setting; for the historian and archeologist, there are battlefields and pre-Columbian settlements; from a scenic point of view, there are cascading waterfalls and sandy beaches; and of vital importance for world conservation, there are island nesting sites for the pelican and magnificent frigate bird, beaches where the huge arribadas of endangered sea turtles take place, and the last remaining fragments of middle American dry forests.

The national parks of Costa Rica provide a refuge for a wealth of plant and animal species that are in danger of extinction in the Neotropical zone, that have a limited range of distribution, or that are endemic to Costa Rica. Some of these plants are giant trees such as the chiricano, masicaran, purple heart, mahogany,

Panama redwood and gonzalo alves. Some of the endangered species are the tapir, jaguar, ocelot, cougar, giant anteater, squirrel monkey, golden toad, crocodile, West Indian manatee, leatherback turtle, jabiru and Cocos Island finch.

The wildlands system is an important economic base for the Costa Rican people. During the 1980s, tourism in national parks and other protected areas increased over 50 percent (Boo 1990). Visitation figures to protected areas increased by over 100,000 going from 367,000 in 1990 to 483,400 in 1991 (MIRENEM 1992). Tourism is projected to surpass agricultural exports (coffee and bananas) as the leading source of foreign exchange in the next few years. In 1990, the GOCR increased the budget of the Costa Rican Tourism Institute (ICT) by establishing additional taxes on airline flights and hotels to generate additional revenues to provide more services to tourists (WWF 1990).

The Costa Rican wildlands system attracts many researchers, conservationists and institutions worldwide to study and participate in creating an appropriate balance between the economic development needs of a developing country and the conservation of its natural resource base. That many of the protected areas are isolated islands of primary forest in a sea of agricultural lands and pastures has led to the current direction wildland management - from individual park or protected area management to a regional system of conservation area management.

This change involved moving from a philosophy of allocating most of the park system operating budget for park protection to one of integrating parks into the socio-economic context of the surrounding communities. The concept of conservation area management encourages sustainable natural resource activities in areas adjacent to protected areas, and promotes generating new income revenues related to park activities and integrating community issues and opportunities into park management. Costa Rica is currently experimenting with the operational feasibility of the concepts of "sustainable development", "buffer zone management", and "people-based development".

The Conservation Area System Approach

In 1989, the Costa Rica National Park Service (Servicio de Parques Nacionales or SPN) devised the Conservation Area System (Sistema Nacional de Areas de Conservaciones or SINAC) approach to Costa Rican wildland management in order to consolidate protected area conservation and management and orienting wildlands toward satisfying the socioeconomic needs of the local communities and other national and international interests. The broad objectives of the new conservation area system articulated by MIRENEM in 1990 included the maintenance of ecological processes of natural

ecosystems, conservation of genetic diversity and sustainable harvest of plant and animal species within these ecosystems.

Specific institutional and operational objectives of SINAC include:

- establishing a Conservation Area Service to combine the Costa Rican National Park Service (SPN), the Forest Service (Dirección General Forestal or DGF) and the Wildlife Service (Dirección de Vida Silvestre or DVS);
- establishing endowment funds for each conservation area to ensure long-term financing;
- decentralizing the organization, giving each conservation area more authority in decision-making and budgeting;
- establishing financial and administrative systems with the involvement and participation of NGOs;
- involving community participation in different activities within the system as an element to promote local stewardship of the natural resource base among communities adjacent to the conservation areas.

SINAC unites 74 of the 78 wildlands within seven major Conservation Areas: La Amistad, Arenal, Cordillera Volcánica, Tempisque, Guanacaste, Tortuguero, and Osa (MIRENEM 1994). Three disconnected marine wildland areas are also considered a Conservation Area, as are the Carara Biological Reserve and Manuel Antonio National Park.

The conservation areas are groups of contiguous or clustered wildlands placed in one of several management categories depending on their bio-physical features, socio-economic characteristics and regional relationships. Each conservation area may include one or more core or nucleus areas, consisting of one or more existing wildlands such as national parks, managed for conservation of biological diversity, plus surrounding buffer zones for sustainable development activities. Public and private lands adjacent to the core areas serve as buffer zones where, depending on the management criteria, sustainable uses of natural resources are promoted, including controlled timber or firewood extraction, farming management and ecotourism. Each conservation area has a regional commission, made up of local community representative and SPN staff detailed for its administration and management.

Each conservation area has its unique characteristics, administrative body and problems to resolve. The Costa Rican Government has the legal authority to make decisions in the conservation areas, while non-governmental organizations (NGOs) play an important role in actual development and implementation. At the time of the evaluation, a multi-agency configuration of

institutions had jurisdiction over protection and management of Costa Rica's Conservation Area System.

The Director of a Conservation Area has direct control over management of the national parks contained within the geographical boundaries of the Conservation Area. A Conservation Area director also serves as a "coordinator" for the administration of other protected areas, such as forest reserves, wildlife refuges and watersheds. Legally, however, these areas remain under the authority of a range of government agencies including the DGF, DVS, and the Costa Rican Institute of Electricity (ICE). In June 1991, the Costa Rican Legislative Assembly introduced draft legislation creating SINAC within the Ministry of Natural Resources, Energy, and Mines (MIRENEM). While SINAC had not yet received legislative approval in mid-1994, MIRENEM has reorganized many aspects of its park operations as if the new system were a legal reality (Vaughn 1994).

The Central Cordillera Volcanic Conservation Area (ACCVC)

The mission of the SPN within the ACCVC is the conservation of biodiversity for the sustainable development of the region. FUNDECOR is supporting the SPN in carrying out its mission by fostering economic self-sufficiency of the national parks of the ACCVC and promoting the development of sustainable economic activities in the area.

Within the ACCVC, FUNDECOR and the SPN have established the goal of consolidating the protected areas to conserve biodiversity and the water supply, and to preserve the scenic beauty of the region. To attain this goal FUNDECOR and the SPN focus their activities on self financing, more effective management and administration of the protected areas, and territorial consolidation.

Within the ACCVC buffer zones, FUNDECOR and the SPN strive to bring all natural forests under sustainable management, and to reforest all areas that have been deforested and are suitable for forestry activities.

TABLE B-1: Administrative Responsibilities for Costa Rica's Biological Resources

<u>Government Agency</u>	<u>Management Category</u>	<u>Number</u>	<u>Area (Ha)</u>	<u>%</u>
Park Service (SPN)	National Parks	19	501,704.5	44.63
	Biological Reserves	8	17,653.3	1.57
	National Monument	1	217.9	0.01
SUBTOTAL		28	519,575.7	46.22
Forestry Department (DGF)	Protected Zone	29	187,897.9	16.71
	Forest Reserve	9	303,385.4	26.99
SUBTOTAL		38	491,283.3	43.71
Wildlife Department (DVS)	National Wildlife Refuge	8	113,098.5	10.06
TOTAL	6 Categories	74	1,123,957.5	100.00

Source: MIRENEM 1994

The guiding principles under which FUNDECOR and the SPN operate include:

- conservation as a viable economic activity for owners of forested lands;
- recognition of the region's natural resources as essential and permanent inputs to private economic development activities;
- stability of buffer zone areas is contingent on a clear understanding of these principles;
- the above concepts as the basis for development of economic activities within the national parks into the next century.

The ACCVC is one of the eight conservation areas in Costa Rica. It contains some of the largest blocks of primary forest wilderness remaining in Costa Rica. The ACCVC has several unique features, both in its natural resources and in the way they are managed and protected. Physically, the region has three volcanic parks which are unique geological attractions for tourists. Poas and Irazu are Costa Rica's top tourist attractions, while the Turrialba site has yet to be developed for tourism. The ACCVC has one park around an archeological site, Guayabo, and it has two additional parks largely consisting of primary forests, with some successional growth where human activity once occurred.

The ACCVC is an SPN administrative unit. A Regional Committee comprised of local community members and SPN staff and a Technical Committee advise the ACCVC Director. There are five program areas within the ACCVC: protection, research, education, land tenure and natural resources management. The Director of the ACCVC is legally responsible for the activities and management of the National Parks in the Conservation Area. The natural resources program of the ACCVC, which involves management of protected areas other than parks, private land outside national parks and buffer zones, is coordinated with the Forestry Directorate (DGF).

A significant legal, administrative, and spiritual separation, in terms of ACCVC management of land inside national park boundaries and management of the rest of the area within the ACCVC, exists despite the new focus on socio-economic issues "outside" National Parks. The majority of the ACCVC staff work "within" park boundaries because of a lack of definition of SPN policies for and experience in buffer zone management. The major NGO providing support to the SPN and working actively in the buffer zones of the ACCVC is FUNDECOR. Through THE USAID FORESTA Project, FUNDECOR is coordinating with the SPN in management of the major parks within the ACCVC: Braulio Carrillo, Volcan Poas, and Irazu National Parks.

Braulio Carrillo National Park

Braulio Carrillo National Park (44,099 Se. Ha.) is situated in one of the most rugged zones of the country. The park's landscape is composed of sheer mountains covered by dense forests. Numerous rivers flow through deep canyons and a multitude of waterfalls tumble to the forest floor. The park was named after Costa Rica's third Chief of State, Braulio Carrillo Colina, who attempted to build a road between the Central Valley and Matina on the Atlantic coast. The road eventually took more than thirty years to complete and much of the original route has returned to forest. In 1978 the area was designated as a National Park.

The park receives an average of about 4,500 mm. of rainfall a year. The park land includes two extinct volcanos, Cacho Negro highly visible because of its conical shape, and Barba, which is

composed of several craters. Two lakes have formed in the depressions. One of these is Barba Lake, which is a round lake of crystal-clear water that measures 70 meters in diameter, and Danta Lake which measures 500 meters in diameter. The Las Marias Peaks, which are easily seen from the city of San Jose, are the remains of a calderic structure. Examples of seven distinct life zones are contained within the park. The precipitous volcanic terrain and the diversity of soil types have provided for a myriad of organisms.

The plant life in the park is composed of very dense, complex evergreen forest and a wide variety of flowers. The type of forest varies according to topography, watershed, temperature, cloud cover and rainfall. The tallest and most species rich forests are located in the park lowlands. In the upper and more rugged reaches of the park, the trees are stunted and deformed and the species count is reduced. Most of the park is covered with primary forest in which there are at least 6,000 plant species.

Some of the species that grow in the upper regions of the park are mountain cypress (*Podocarpus montanus*), winter's bark tree (*Drimys granadensis*), Poas magnolia (*Magnolia poasana*), oak (*Quercus spp.*), and small cypress (*Escallonia poasana*), which is a highly conspicuous tree shaped like a Chinese pagoda. In the lower region of the park some of the more prevalent species are the wild fig (*Ficus spp.*), olive (*Simarouba amara*), mayo (*Vochysia ferruginea*), alcanfor (*Protium glabrum*), copal (*Tetragastris panamensis*), crabwood (*Carapa guianensis*), quaruba (*Vochysia honudurensis*), banak (*Virola spp.*), and jiggerwood (*Bravaisia integerrima*). There is also an abundance of tree ferns, heliconias (*Heliconia spp.*), palm trees and bromeliads. Poor man's umbrella (*Gunnera insignis*) is a plant frequently seen growing alongside the road. It can grow as high as 1.5 meters and is unmistakable because of the enormous size of its leaves.

There is a fair amount of wildlife, with birds being especially plentiful. Some of the mammals that live in the park are the howler monkey (*Alouatta palliata*), spider monkey (*Ateles geoffroyi*), white-faced capuchin monkey (*Cebus capucinus*), all of which are frequently seen from 1,000 meters down, tapir (*Tapirus bairdii*), jaguar (*Felis onca*), cougar (*Felis concolor*), ocelot (*Felis pardalis*), paca (*Agouti paca*), which is very prevalent, northern tamandua (*Tamandua mexicana*), red brocket (*Mazama americana*), kinkajou (*Potos flavus*), agouti (*Dasyprocta punctata*), Mexican tree porcupine (*Coendou mexicanus*), two-toed sloth (*Choloepus hoffmanni*), and three-toed sloth (*Bradypus variegatus*), both of which can be found at heights of 2,650 meters on the slopes of Barba Colcano.

Three hundred forty-seven species of bird have been identified, including the resplendent quetzal (*Pharomachrus mocinno*), the bare-necked umbrella (*Cephalopterus glabricollis*)

which migrates according to altitude, ornate hawk-eagle (*Spizaetus ornatus*), solitary eagle (*Harpyhalietus solitarius*), clay-colored robin (*Turdus grayi*) which is the national bird, king vulture (*Sarcoramphus papa*), white hawk (*Leucopternis albicollis*), osprey (*Pandion haliaetus*), Central American curassow (*Crax rubra*), crested guan (*Penelope purpurascens*), greater sunbittern (*Eurypyga helias*), collared trogon (*Trogon collaris*), black-faced solitaire (*Myadestes melanops*), and three-wattled bellbird (*Procnias tricarunculata*).

Frogs and toads abound in the park, especially in the area known as Bajo de la Hondura. An endemic species is the *Bufo holdridgei* toad, which is frequently seen on Barba Volcano and in the Bajos del Tigre region. The most venomous snake in the country, the bushmaster (*Lachesis muta*) also lives in the park.

A modern highway, Braulio Carrillo, crosses the park from northeast to southwest. It has look-out points and offers views of the river canyons, volcano cones and waterfalls.

Volcan Poas National Park

Volcan Poas National Park (5,599 se. ha.) is the home of Poas Volcano, a compound basaltic volcano with active and a dormant craters. Poas National Park encloses one of the three volcanos on the continent that are accessible by road. It is also one of the best developed national parks in Costa Rica.

Poas is a composite basaltic volcano 2,708 meters high. It is often noted as one of the most spectacular volcanos in the country. The active crater is a depression that measures 1.5 kilometers in diameter and 314 meters deep. It has been suggested that it was formed by the collapse of an empty magmatic chamber a short distance from the earth's crust (Boza 1988). At the bottom of the crater there is a circular, hot-water lake with temperatures that vary between 40-70 degrees celsius, and that is 350 meters in diameter. There is also a cinder cone that rises about 40 meters above the lake that has active fumaroles. The level of the water in the lake varies and its color changes from turquoise green to gray.

To the north of the active crater is the long-extinct von Frantzius composite cone. It is the oldest center of volcanic activity on the summit. To the southeast, there is another cone known as Botos which was the center of activity up to approximately 7,500 years ago. It now contains a cold-water lake that measures about 400 meters in diameter. Nine distinct craters have been identified on Poas' surface. The largest of these, visible only from an airplane, is more than 4 kilometers across.

Poas has a long history of violent eruptions, dating back as far as 11 million years. Poas, in conjunction with Volcan Barba, created the first "floor" of the entire Central Valley during the Pliocene epoch. Possibly the largest eruption occurred on January 25th, 1910, when an immense cloud of ash rose 8,000 meters in the air. It sent an estimated 640,000 tons of ash falling on the central valley. From 1952-54, Poas shook the area with underground rumblings while the volcano itself spewed out huge clouds of ash and burning rocks. More recently, in 1974 Poas sent a column of volcanic ash that rose to 10,600 meters in elevation, and for most of 1989 the park was closed due to the intensity of volcanic activity.

In the 150 years that Poas has been observed, it has displayed four different kinds of volcanic activity. These are: 1) geyser-like eruptions with columns of muddy water and steam that can rise several meters or kilometers into the air and which have occurred with intervals that go from minutes to years; 2) violent phreatic eruptions, such as those that took place in 1834 and 1910, which spread a fall-out of ash over the Central Valley; 3) strombolian and effusive activity, such as in the eruptions of 1953-55; and 4) a quiet degassing which began in 1981. The geyser-like eruptions have won Poas the fame of being the largest geyser in the world. An interesting discovery made recently is that beneath the waters of the crater lake, there is a reservoir of melted sulfur. As of today, the volcano releases gases and steam; occasionally, it produces geyser-like eruptions.

There are four main habitats in the park: areas with little or no vegetation, an area of arrayans, stunted forest, and cloud forest. The first habitat corresponds to the crater and near-by areas. Plants is scarce inside the crater due to the effects of gasses, natural erosion and lack of soil. However, on the edge of the crater and in neighboring areas some species are specially adapted to the terrain of hardened ash or lava. These species include the paddle fern (*Elaphoglossum lingua*), and small *Pernetia coriacea* plants. The farther away from the edge of the crater, the greater the number of species and their height. Several species of moss and lichens grow here, together with arrayan (*Vaccinium consanguineum*) and *Myrica phanerodonta*.

The arrayan zone is made up of dwarf plants, some of which are dead or budding. This habitat is located near the look-out point over the crater and along the first part of the trail between the crater and the lake. The plants here grow from 2-3 meters high and some of the most common species are arrayan and *Vaccinium poasanum*. There are also small specimens of mountain mangrove (*Clusia odorata*), didymopanax (*Didymopanax pittieri*), and small cypress (*Escallonia poasana*).

The habitat of stunted or dwarf forest can be seen along the trail between the crater and the lake. This slow-growing forest is

almost impenetrable and the branches of the trees are completely twisted out of shape. The predominant species are mountain mangrove, arrayan, tucuico (*Ardisia sp.*), *Hesperomeles obovata*, *H. heterophylla*, and *Sphyrospermum cordifolium*. The cloud forest grows behind Potrero Grande and surrounds the lake. In this very damp and shady forest, most of the trees grow to about 20 meters high and are completely cloaked with moss, liverworts and other epiphytic plants. The predominant species are didymopanax, mountain mangrove, oak (*Quercus spp.*), small cedar (*Brunellia costaricensis*) and white cypress (*Podocarpus oleifolius*).

There is hardly any wildlife, although birds are common. Some of the 79 species observed are the sooty robin (*Turdus nigrescens*), black guan (*Chamaepetes unicolor*), fiery-throated hummingbird (*Panterpe insignis*) quetzal (*Pharomachrus mocinno*) and emerald tucanet (*Aulacorhynchus prasinus*).

Volcan Irazu National Park

Irazu Volcano National Park (2,039 se. ha.) surrounds Irazu Volcano, an active volcano with a long history of eruptions. Irazu is an active strato-volcano with an irregular sub-conical shape that stands 3,432 meters above sea level and is accessible by road. Its eruptive cycles typically consist of huge clouds of vapor, ash and scoria. Often these effluents are accompanied by regional or local seismic tremors, by underground rumblings that can be heard in the Central Valley and by a shower of large and small rocks, which are sometimes incandescent and which usually fall near the crater. The first historical account of eruption dates from 1723, while the last period of activity lasted from 1962-1965. The last period of activity took place between 1962 and 1965, when the volcano spewed out huge clouds of ash and rocks, some as large as boulders, and shook the ground with tremors and underground rumblings.

At the summit there are four craters: the principal crater, Diego de la Haya (extinct), and two small craters located to the southeast and to the northwest of the principal crater. The principal, or western crater, measures 1,050 meters in diameter, 250-300 meters deep and is circular with very steep sides. There is a permanent lake at the bottom with yellowish-green water. Presently, the crater is dormant. Diego de la Haya crater was active in 1723. It is round, measures 690 meters in diameter and is 100 meters deep. It is enclosed and often a small lake forms on the flat bottom due to the rains. Las Fumarolas is an area of shifting terrain on the other side of the main crater where several solfataras emit steam and gases such as carbon dioxide and hydrogen at temperatures below 100 degrees celsius.

Original plant cover is found only in the most inaccessible ravines and river courses. Above 2,000 meters the vegetation is

typical of the tropical montane wet forest type, which is restricted primarily to Irazu. The plant life at elevations above 3,100 meters has elements of the *paramo* community. Plants living at this elevation are slow-growing and stunted by the cold, and on Irazu volcanic activity has further hindered plant development. Sparse vegetation grows inside and near the craters. Elsewhere, it is possible to see areas of stunted vegetation, secondary forest and the remains of primary forest. Some of the species that grow near the craters are arrayan (*Vaccinium consanguineum*), *Agrostis toluensis*, *Trisetum viride*, *Eupatorium semialatum*, *Senecio oerstedii*, *Castilleja irazuensis*, and *Smilancina paniculata*. The open vegetation includes, among others, the arrayan, arrecachillo (*Myrrhidendron donnell-smithii*), *Acaena elongata*, *Pernetia coriacea*, *Eupatorium subcordatum* and *Coriaria thymifolia*. The most abundant trees in the primary and secondary forests are the miconia (*Miconia sp.*) and black oak (*Quercus costaricensis*). Other trees include the alder (*Alnus acuminata*), slavia (*Buddleia nitida*), growing stick (*Oreopanax xalapensis*), loro (*Weinmannia pinnata*), escalonia (*Escallonia poasana*), mountain mangrove (*Clusia odorata*), and magnolia (*Magnolia poasana*).

Wildlife on Irazu is very scarce. Some of the mammals identified on the upper reaches of the volcano are the eastern cottontail (*Sylvilagus brasiliensis*), coyote (*Canis latrans*), common long-nosed armadillo (*Dasypus novemcinctus*), porcupine (*Coendou mexicanus*), long-tailed weasel (*Mustela frenata*), and tiger cat (*Felis tigrina*). Some of the birds that live in the park are the volcano junco (*Junco vulcani*), ant-eating woodpecker (*Melanerpes formicivorus*), black-faced solitaire (*Myadestes melanops*), mountain robin (*Turdus plebejus*), unspotted saw-whet owl (*Aegolius ridgwayi*), ruddy woodcreeper (*Dendrocicla homochroa*), eastern meadowlark (*Sturnella magna*), and long-tailed ptilogenys (*Ptylogonis caudatus*). There is also a fairly large population of hummingbirds.

APPENDIX C

MONTEVERDE CLOUD FOREST RESERVE

Background

The Monteverde Cloud Forest Reserve, founded in 1972, is one of the oldest private nature reserves in Central America. The Reserve is owned and administered by the Tropical Science Center, a private foundation based in San Jose, Costa Rica. Its primary purpose is to preserve the flora and fauna of the area, to protect the headwaters of rivers originating in the reserve, and to ensure optimal and stable ecological conditions. Monteverde Reserve is located in northwest Costa Rica and encompasses portions of three provinces: Puntarenas, Alajuela and Guanacaste. Positioned in the Continental Divide on the Tilaran Mountain Range, the reserve is exposed to a range of weather patterns and to a changing topography that combine to produce habitat variety and biological diversity.

The reserve has many unique biological and administrative features. Unlike Costa Rica's national parks, Monteverde was created specifically to protect a particular endangered species, the golden toad, and relies entirely on donations and user fees to fund its operations. However, many of the policies and techniques used by the Monteverde staff to ensure the reserve's ecological health and economic viability have applications for other protected areas. Monteverde is a testing ground for different management strategies such as changes in admission fees, limitations on the number of visitors based on carrying capacity studies, introduction of new technologies for trail construction, use zoning, and development of stronger relationships with the local community and tour operators.

Since 1972, the reserve has evolved from a 328 hectare farm to a 10,500 hectare protected area. Reserve staff have grown from two honorary members in 1972 to fifty-three persons in 1993 working under a professional administrative system, divided into seven different departments. Because of its management and expanding nature, it is one of the more successful nature reserves in Costa Rica. The reserve cooperates closely with the Monteverde Conservation League, which is responsible for managing the adjacent 700 hectare International Children's Rain Forest.

The reserve has an environmental education program in the community, and has become the focal point for ecotourism. In 1992, twenty-eight hotels catered to Monteverde tourists, who that year numbered close to 50,000. More than eighty private businesses and cooperatives have begun operation as a result of the tourist attractions offered by the reserve. These enterprises include

restaurants, souvenir shops, food markets, a butterfly garden, a reptile zoo, horse stables, bars, a gasoline station, environmental education institutes, a private experiment station, a cheese factory, small bakeries, etc. (Solorzano 1992).

Operations

The tourism industry generates over 400 full-time jobs and more than 140 part-time jobs for the local area alone. In addition, the reserve provides impetus for the tourist industry at large in Costa Rica, with many tour agencies in San Jose partially dependent on requests of tourists to visit Monteverde. The reserve and its secondary businesses generate an estimated US \$6 million annually to the Costa Rican economy. Until 1993, when visitation limits and a new fee structure were put into place, the ecotourism industry at Monteverde had been growing between 17 and 30 percent per year for the past several years.

In 1974, 471 visitors came to Monteverde; in 1993, that number had increased to 49,861. With people visiting the reserve in increasing numbers, the Tropical Science Center decided to develop the protected area through self financed private conservation activities while, at the same time, continue strict conservation of its rich biologically diverse resource base that supported the tourism. From its inception, the reserve depended on donations and entrance fees. Entrance fees went from 20 colones in 1977 for all visitors, (about \$2.3 at the 1977 dollar rate of 8.65 colones per dollar) to a staggered fee system in 1994 where tour groups paid \$16 per person, other foreigners paid \$US 8.00, and Costa Rican nationals paid 200 colones or \$US 1.30.

Increased visitation and entrance fees mean more income. Before the build-up of tourism, Monteverde had almost no income. To meet tourist-related expenses more maintenance and administrative personnel, new staff positions (e.g. receptionists and nature guides), and the purchase of office and operations equipment became necessary.

The average cost of trail construction is US \$15 for every meter of hardened trails, and since 1990 more than 10,000 meters of trails have been hardened to prevent erosion. Beginning in 1991, the number of visitors allowed inside the reserve boundaries was limited to 100 at any one time to avoid degradation to the ecological integrity of the Monteverde system. Since 1990, the reserve has set aside funds annually for programs that don't produce income, but that help conserve its natural resources. These funds support operations of the Environmental Education Department and the Science Department to enhance reserve management and local community understanding.

The reserve has also been given credit for recent economic growth of the surrounding area. According to Solorzano et al.

1992, most of the economic impact of the reserve occurred in the 1990s -- less than 1 percent before establishment of the reserve, 6 percent in the 1970s, 29 percent in the 1980s, and 64 percent in the 1990s. Rojas (1992) reports that 40 families and 215 employees benefit directly from Monteverde tourism. Solorzano (1992) estimates the economic impact of tourism in a community of no more than 4000 habitants to be US \$5 million, about \$1,250 per capita. This figure appears conservative given that it ignores the "informal economy" composed mainly of unregistered business and individuals (Chamberlain 1994).

Thirteen percent of the total monies spent by tourists visiting in Monteverde is goes to reserve operation and maintenance. The remaining 87 percent goes back into the Monteverde community, through, for example, job opportunities in the area. In 1992, the reserve employed 48 workers and paid a total of 39 million colones (\$283,500) in wages. In 1993, the reserve employed 53 workers, with wages and benefits at 55 million colones (\$400,000 at then US dollar rate of 137.7 colones per dollar). Other minor economic and social effects include direct donations from the reserve to the community for education in the area, road maintenance, and other activities that comprise about 1 percent of the total expense budget for 1993.

With massive increases in tourism, the main goal for Monteverde staff is to continue to operate the reserves tourism program with a minimum negative impact. Reserve administration has combined the use of "Limits of Acceptable Change" methodology with scientific monitoring of key species to determine current and future use of the Monteverde area. Both environmental and social conditions are monitored on an ongoing basis and measures taken when conditions approach the limits of acceptable change (Pederson 1992). The area affected by tourist activities inside the reserve covers less than 2 percent of the total protected area known as the Monteverde Cloud Forest reserve. Inside this 2 percent area only a 2 meter strip of trails about 12 kilometers long is the actual area where tourists are allowed.

Reserve Use Strategies

The Monteverde Cloud Forest reserve contains a rich diversity of species, including more than 400 species of birds, among which are the quetzal (*Pharomachrus mocinno*), the three-wattled bellbird (*Procnias tricarunculata*), and the bare-necked umbrella bird (*Cephalopterus glabricollis*). The reserve also contains 100 species of mammals, more than 120 species of amphibians and reptiles, and some 2500 species of plants and thousands of insects (Chamberlain, 1994). The reserve is also the only known habitat for Costa Rica's endemic golden toad.

However, the reserve's current area does not cover the complete needs for the survival of the altitudinal migratory birds. Years of research indicate that altitudinal migratory birds live in the reserve for several months of the year, and then migrate to lower, and in most cases, non-protected and deforested pasture land areas. The few forest patches left surrounding the reserve, especially on the Pacific slope, are essential for completing the migratory cycle of these birds, who depend upon the fruiting cycle of trees in this area. The Monteverde area is becoming an ecological island, surrounded by deforested cattle farms. Deforestation and forest fragmentation threaten the genetic viability and survival of large mammals and migratory birds, which require larger habitat areas than those protected within the reserve boundaries, posing a challenge for Monteverde conservation.

The strategy for the last decade has been to interconnect different protected areas into regional conservation units through biological corridors. The Monteverde Cloud Forest reserve is linked with nearby protected areas by the Arenal-Monteverde Protected Zone which is part of the larger the Arenal Conservation Area. The Arenal-Monteverde Protected Zone is composed of the Monteverde Cloud Forest Preserve, the Children's Rain Forest, the San Ramon Forest reserve, the Arenal National Park, and the Arenal Emergency Zone that surrounds the active Arenal Volcano. Together these protected areas cover an estimated 80,000 hectares that better preserve wildlife habitat and protect the watershed of Costa Rica's largest hydroelectric plant in Arenal.

The primary challenge for the Tropical Science Center (TSC) in the 1990s is to meet the habitat requirements of the Monteverde reserve's migratory bird species in spite of developmental pressures of population expansion for new agricultural lands and tourism. As the population in the area continues to grow, the need for land and related jobs and income is increasing, making purchasing land for conservation purposes only a difficult proposition. To address this issue the TSC is in the process of developing what is known as the Monteverde Corridor Project. The main purpose of the project is to conserve the existing biological diversity of the Monteverde Cloud Forest reserve and to maintain viable habitats for species that require lower altitude areas for survival. Another goal is to create a major buffer area for the reserve to minimize human impact of the surrounding communities by developing a sustainable economic program for the people in the Monteverde area.

In 1992, the TSC developed a land use map for planning biological corridors and determining land use capacity. A study by Bolanos (1992) determined that less than 2 percent of the land was suitable for extensive cattle production, and that more than 70 percent of the land in the corridor was suitable for natural forest management and forest production. TSC is currently purchasing land not suitable for extractive activities from miners and ranchers in

the Penas Blancas area and setting the land aside for conservation purposes.

Over the years, conservation strategies of the Monteverde reserve have changed from sole protection and management of the natural resource base within its boundaries toward greater involvement of surrounding communities. More intensive land use and growing land abuse in the 1980s posed a serious threat to the natural resources of the area. The reserve administration therefore decided to play an active role in changing the attitude of the people in the area towards preserving natural resources and the environment. In 1992, the reserve initiated an environmental education program as a first step toward increasing public awareness and developing community ties involving activities such as waste recycling programs and trail construction and maintenance within the reserve.

Community Cooperatives

A womens' cooperative (CASEM), formed in 1982 in the Monteverde community, makes local crafts for sale at the reserve and local hotels. The women work in their homes making items for sale at a co-operative outlet. The co-operative started with eight founders and expanded to 127 members. The existing multiple purpose cooperative in Santa Elena initially coordinated with CASEM in the purchases of materials and supplies funded by an initial 10,000 colon donation from a German tourist. With this help, CASEM received an additional loan from a local bank. INACOP, the Costa Rican Institute for Co-operatives, has also helped CASEM with workshops. Currently CASEM wants to formally join the Santa Elena Cooperative.

Each department within the Santa Elena Cooperative pays the co-op for accounting costs, and has its own assembly. Each woman in the co-operative must make at least 6 items per month for sale. All individual work is on consignment and the co-op members must be from the Monteverde area. To date, ten percent of the cooperative's money goes for social capital, 25% is for expenses and about 25% is profit. Painted T-shirts have proven to be among the most popular items. The co-operative needs to diversify a little, but there are no major problems. Interestingly, another group of women wish to start a second co-operative in the area. They too want to make crafts for sale to tourists, but also want to open a botanical-medicinal plant garden, upgrade their dairies, and export flowers on the international market.

Another part of the Santa Elena Cooperative is the Cafe Monteverde project which advertises that their coffee is "Grown in harmony with the Cloud Forest". The Monteverde reserve sells this boutique coffee in their retail store as does the cooperative. One dollar per pound is returned to the reserve. In 1991, \$7,000 was

reinvested into the reserve as a result of coffee sales alone (Williams 1992).

Inter-institutional and Community Cooperation

A lesson learned through the Monteverde experience is that management of conservation units is a dynamic process that of necessity must evolve with the social and economical circumstances of the surrounding community. Monteverde's ability to develop and implement different strategies under different conditions is what makes the Cloud Forest reserve one of the more successful examples of protected area management.

The main problems confronting the GOCR-managed national park system is the lack of financial resources to enforce regulations encroachment activities in park lands. The 10,500 hectare Monteverde Cloud Forest reserve obtains more income from tourism than the entire Costa Rican National Park Service of more than one million hectares. Despite the fact that 15 times more tourists visit National Parks than Monteverde, the SPN takes in less income than the privately-managed Monteverde reserve. As a privately managed operation, the Monteverde reserve has obtained the legal authorization to set its own visitor fees, an arrangement yet to be introduced in SPN operated parks.

APPENDIX D

PERSONS CONTACTED

USAID/WASHINGTON D.C.

Philly, Mike, G/RD/ENR
Brokaw, Jeff, LAC/DR/E
Gibson, Dave, G/RD/ENR
Koshear, Jeannine, G/RD/ENR
Hester, Jim, PPC
Rosario, Rafael BHR/FFP/DP
Gardello, Dave LAC/DR/RD

USAID/SAN JOSE

Wingert, Steven, Director
Barrau, Enrique, Rural Development Officer
Lewandowski, Anne, Environmental Officer
Heesen, David, Environmental Officer
Batchelder, Alan, Economics Officer
Holder, John, Investment Promotion Advisor

UNITED STATES GOVERNMENT INDIVIDUALS AND ORGANIZATIONS

Lampman, Scott, U.S. Forest Service, Forestry Support Program
Dunn, Walter, U.S. Forest Service, Sister Forests
Wetterberg, Gary, U.S. Forest Service
Engert, Jan, U.S. Forest Service
Raffaele, Herb, U.S. Fish and Wildlife Service
Mason, Larry, U.S. Fish and Wildlife Service
Grifo, Francesca, NIH
Rentscher, Mark, Environmental Policy Analyst, Treasury

COSTA RICAN GOVERNMENT INDIVIDUALS AND ORGANIZATIONS

Herrera Arguedas, Carlos A., Ministry of Natural Resources,
Energy and Mines, Director, Cordillera Volcanica Central
Mora Vargas, Ronald, Ministry of Natural Resources, Energy
and Mines, Protection Program Coordinator, Cordillera
Volcanica Central

UNITED STATES NONGOVERNMENTAL ORGANIZATIONS AND INDIVIDUALS

Hartshorn, Gary, WWF, Vice President, Science
Symington, Meg, WWF, BSP, LAC
Housheal, Brian, TNC, Central America
Reid, Walter, WRI
Dickinson, Joshua, Executive Director, The Tropical Forest
Management Trust
Venezia, Ron, Former USAID/CR Mission Director

Curtis, Randy, U.S. National Park Service

COSTA RICAN NONGOVERNMENTAL ORGANIZATIONS AND INDIVIDUALS

Budowski, Gerardo, Director of Natural Resources, University for Peace
Barborak, James, Technical Advisor, CCC-WCI
Rivas, Carlos Jose, Director of Integrated Natural Resources Management, CATIE
Navarro, Carlos, National Coordinator, CATIE
Galloway, Glenn, Technical Forestry Advisor, CATIE
Salazar, Rodolfo, Leader of Forest Seeds Project, CATIE
Cornelius, Jonathan, Forest Geneticist, CATIE
Campos, Jose Joaquin, Leader, Silviculture of Natural Forest Project, CATIE
Castaneda, Froylan, Principal Technical Advisor for Forest Protection, CATIE
Cannon, Phil, Director, Madelena Project, CATIE
Reiche, Carlos, Tree Program/Agroforestry, CATIE
Hilje, Luko, IPM, CATIE
Tattenbach, Franz Capra, Executive Director, FUNDECOR
Villalobos, Ricardo, Administrative Director, FUNDECOR
Solano Garro, Gustavo, Director of Operations, FUNDECOR
Joslyn, David W., Deputy Director General, Inter-American Institute for Cooperation on Agriculture
Folgarait, Patricia J., Research Associate, OTS
Flores, Paul G., Chairman, Price Waterhouse Interamerica
Schnell, Charles E., Associate Executive Director, OTS
Chamberlain, Francisco G., Director of Operations and Administration, Monteverde Cloud Forest Preserve, TSC
Kaye, Michael S., President, Costa Rica Expediciones, Aventuras y Recreaciones, SA
Gomes, Carlos, Naturalist Guide, Costa Rica Expediciones, Aventuras y Recreaciones, SA
Salazar, Javier, Manager of Hotels and White Water, Costa Rica Expediciones, Aventuras y Recreaciones, SA

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