Community-based Conservation

Participatory Conservation in Buffer Zone Communities in the Natural Protected Areas of Chiapas, Mexico

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Community-based Conservation

Participatory Conservation in Buffer Zone Communities in the Natural Protected Areas of Chiapas, México

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Instituto de Historia Natural
Comisión Nacional de Áreas Naturales Protegidas
The Nature Conservancy

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This publication represents the culmination of the Chiapas Community-based Conservation (CBC) Work Group's efforts. Each member of this team contributed to designing, preparing and drafting the final product. Each reserve was responsible for describing the creation and evolution of their community-based conservation efforts. The introductions, lessons learned and "Where Do We Go from Here" sections were written by an independent consultant in collaboration with Work Group members. The Instituto de Historia Natural and The Nature Conservancy collaborated in the organization of all meetings and workshops.

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Foreword

One of the greatest challenges facing humanity at this turn of the century is how to make natural resource conservation compatible with community development. Despite their long history of interaction with ecosystems, neighboring communities have contributed to endangering their equilibrium through the incompatibility between conservation and their productive practices —orthodox forestry development, extensive cattle grazing and subsistence agriculture. This is especially true in the case of tropical rainforests. Likewise, they have contributed to long-term environmental impacts of global proportions through climate change, an increase in greenhouse gases and the loss of biodiversity, soils and water. This situation has prompted the deterioration of living standards and has inclusively placed the aforementioned social groups at great risk by increasing the likelihood of natural disasters.

On the other hand, success stories have been made possible by the persistent work of individuals and through joint endeavors to ensure continuity and community appropriation of good practices. Such work can be seen in the state of Chiapas, a global site of megadiversity located within the transition zone between neartic and neotropical flora and fauna.

With the highest number nationwide of protected natural reserves and strong dynamics in terms of community work and research, this state of many contrasts —where natural resources are valued for the services they provide to society— is also home to one of the nation's most marginalized, dispersed populations. Its conventional agroproductive models are in crisis, generating migration, underemployment, and the extension of agricultural borders.

These are the challenges that have given way to a productive working relationship between the Instituto de Historia Natural [Institute of Natural History], The Nature Conservancy and the current administration's Comisión Nacional de Áreas Naturales Protegidas [National Commission of Natural Protected Areas]. During ten years of sporadic work under the Parks in Peril Program, experiences have arisen that, through systematization and dissemination, can be adopted by other conservationist organizations seeking to harmonize the conservation and valorization of natural resources with human development. All this, without minimizing the importance of these experiences in terms of sustainable development practices. Once written down, they can be transferred to farmers, technicians, researchers, and decision makers.

These capacities can strengthen, update, and extend opportunities to interact with financial, public, and research institutions; thus catalyzing the possibility of bringing about a change in attitudes, activities and future planning with greater certainty and, above all, with the participation of the local community as the main beneficiaries of access to a development more compatible with conservation and the sustainable use of natural resources. This will benefit the future generations, in this case, of Chiapas and Mexico.

Froilán Esquinca Cano
Director - Instituto de Historia Natural
1998-2001

Preface

Community-based conservation has come under increasing scrutiny over the past few years, with critical questions raised about its efficacy in achieving conservation results. Under a different moniker, integrated conservation and development projects face similar and, admittedly in many cases, well-founded criticisms. Not only have the conservation impacts of these efforts proven elusive, but also the socioeconomic returns have been found wanting on counts of equity and profitability.

The authors of the case studies presented here are to be commended for their frankness and transparency in recognizing many of these same challenges in some of their own efforts. The true application of adaptive management in protected areas requires the self-critical reflection and innovative solution definition represented in their site-based examples. The insightful observations and concrete recommendations in this volume will go a long way towards strengthening the conservation results at these protected areas, and will serve equally well in informing community-based efforts beyond the Chiapas region.

Several recurring themes in this volume warrant highlighting as they represent universal challenges. The authors consistently emphasize the need to build community capacity for self-management, to value and utilize local knowledge and to reduce stakeholders' dependence on paternalistic funding patterns. This volume is a timely and substantive response to the clarion call for shared knowledge on these challenges and opportunities.

The histories of some of the sites here indicate that many years often elapsed between the formal establishment of a protected area and the first community engagement efforts, a common scenario around the globe. In reconciling the understandable conflicts that often were generated during this period, the authors rightly call attention to the significant time that must be invested in successful community-based conservation. This time commitment entails staff resources in annual budgets and work plans supported by an institutional perspective that coincides its long-term conservation goals with equally compelling steadfastness in addressing the relevant socioeconomic context and stakeholders.

The authors rightly embody responses to some of their own recommendations. They strongly voice the need to dedicate staff resources and to invest in training for community-based personnel. Timely, consistent and frank documentation of stakeholder engagement in conservation is also called for by the authors. This volume attests to their own dedication to addressing these two areas of improvement in community-based conservation and it contributes to our understanding of how to better integrate the skills and capacities of the social and biological sciences.

Several of the site experiences here recognize the need to apply an analytical and action agenda that is attuned to intra-community dynamics such that gender, age, economic power and other socioeconomic variables can better inform protected area management. An area that deserves

increased attention is that of human population dynamics, especially given the migration and growth patterns that contribute to the conservation context of many protected areas around the globe.

As we move towards the 5th World Parks Congress with its theme of 'Benefits Beyond Boundaries,' the recommendations of these authors for participatory conservation planning and evaluation are particularly salient. Given the increasing prevalence of decentralized protected area management within a mosaic of private and public conservation mechanisms, their calls for management and policy approaches that reach throughout civil society must be heeded. The authors' experiences with protected area residents and neighboring communities underscore the inherent and urgent need to engage stakeholders across many institutional scales in defining conservation strategies linking productive and protective interests. Otherwise, we as conservationists run the risk of losing the vast potential of collaborative conservation with our fellow citizens and the immense value of the biodiversity we all seek to protect.

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Abbreviations

IHN and IHNE	Institute of Natural History and Ecology in Chiapas
TNC	The Nature Conservancy
CONANP	National Commission of Natural Protected Areas
PIP	Parks in Peril Program
USAID	United States Agency for International Development
ANP	Natural Protected Areas
SEDUE	Secretary of Urban Development and Ecology (1983-1988)
DOF	Official Federal Register
SEMARNAP	Secretary of Environment, Natural Resources and Fish (1995-2000)
msnm	meters above sea level
INE	National Institute of Ecology
IUCN	International Union for the Conservation of Nature
CITES	International Convention for the Traffic of Endangered Species
NGO	Non-Governmental Organization
SSS	Society of Social Solidarity
SAGAR	Secretary of Agriculture, Cattle, and Rural Development
AC	Civil Association
PRODERS	Program for Sustainable Rural Development
m^2	Square meters
M	Meters
Ha	Hectares
SMAM	Mames Indigenous People of the Sierra Madre de Chiapas
GEF	Global Environmental Facility
DIF	System for the Integral Development of Families
UACH	Autonomous University of Chapingo, Mexico
CESMACH	Ecological Rural People of the Sierra Madre de Chiapas
FMCN	Mexican Fund for the Conservation of Nature
PROFEPA	Federal Commission for Environmental Protection
Mm	millimeters
REBISO	El Ocote Biosphere Reserve
REBISE	La Sepultura Biosphere Reserve
REBIEN	La Encrucijada Biosphere Reserve
REBITRI	El Triunfo Biosphere Reserve
UEAO	Union of Ejidos General Alvaro Obregón
UMA	Management and Sustainable Harvesting of Flora and Fauna Unit
NOM-ECOL – 054/94	Official Mexican Ecological Guideline –#054 approved in 1994 for the protection of threatened species.

Introduction

This publication is the result of a joint effort between The Nature Conservancy (TNC), the Institute of Natural History of Chiapas (IHN-Instituto de Historial Natural) and the National Commission of Natural Protected Areas (CONANP-Comisión Nacional de Áreas Naturales Protegidas) in particular: the "El Triunfo," "La Encrucijada," "La Sepultura" and "El Ocote" Biosphere Reserves. It came about through the need to systematize and analyze nearly 10 years of experience working with communities on these four reserves, during which the Parks in Peril program supported by The Nature Conservancy and U.S. Agency for International Development (USAID) have played a major role.

In this vein, personnel from the IHN Department of Natural Reserves, the El Ocote Reserve Ecodevelopment Program and TNC dedicated themselves to the task of designing and promoting the creation of a workshop with the objective of sharing past and current experiences of work in local communities. This has shed light on some areas of interest that might help improve strategies while stimulating discussion with regards to achievements, limitations and lessons learned through each of these experiences.

These efforts culminated with the organization of the first "Community-based Conservation. Participatory Conservation in Buffer Zone Communities in the Natural Protected Areas of Chiapas, Mexico" Workshop, held August 2-6, 1999, in Tuxtla Gutiérrez, Chiapas, Mexico with the purpose of sharing conservation and sustainable development experiences with communities from Chiapas' Nature Reserves.

Likewise, this was considered to be the start of a process to systematize community experiences in order to evaluate results and issue recommendations for reserve management. In addition, there was the expectation that guidelines and recommendations would be generated in order to approach community work within the context of the natural reserves.

During said workshop, the evolution experienced by community programs on each of the reserves was presented. Thus, those in charge of said program on each reserve presented their history of community work, with special emphasis on their achievements, failures and limitations, culminating in the presentation of current and ongoing work as well as future outlook. There were also exercises carried out to define the criteria of community selection and prioritization, round table discussion on participative processes, and talks and exercises on the elaboration of project evaluation indicators.

Within this context, the importance of carrying out monitoring and evaluation activities within community projects was highlighted. This, in order to determine the degree of progress towards pre-established goals and objectives. Finally, a work group was formed with representatives from all four reserves, the IHN and the TNC that would be responsible for following up on later activities as well as the publication of the proceedings of said workshop.

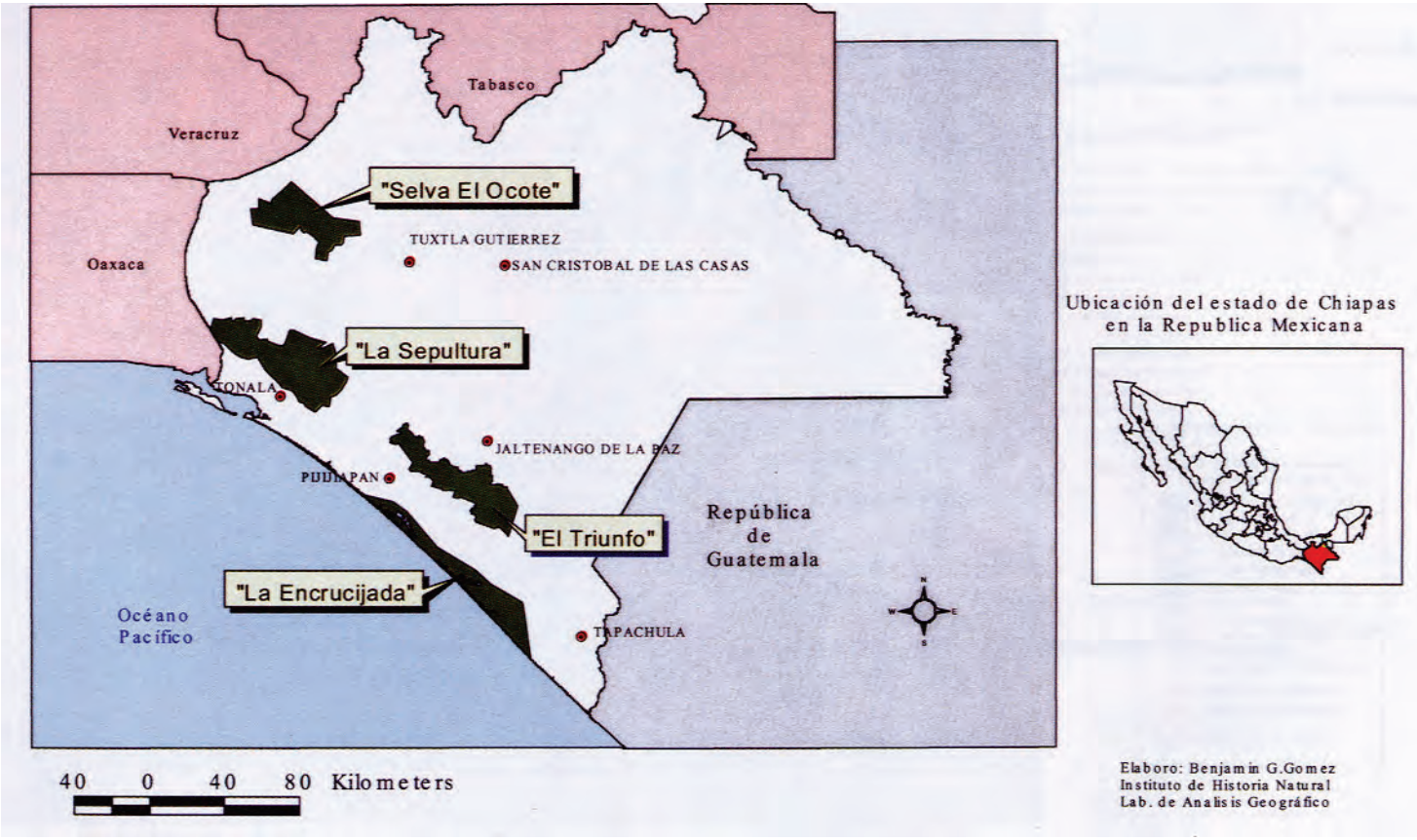
During the second half of the year 2000, through several meetings of the Community-based Conservation Work Group, progress was made in advancing towards the task of

compiling and updating information on community work carried out on the four reserves. This task was completed during two follow-up workshops held in November and December 2000 during which "lessons learned" and "where do we go from here" were discussed with respect to local community work.

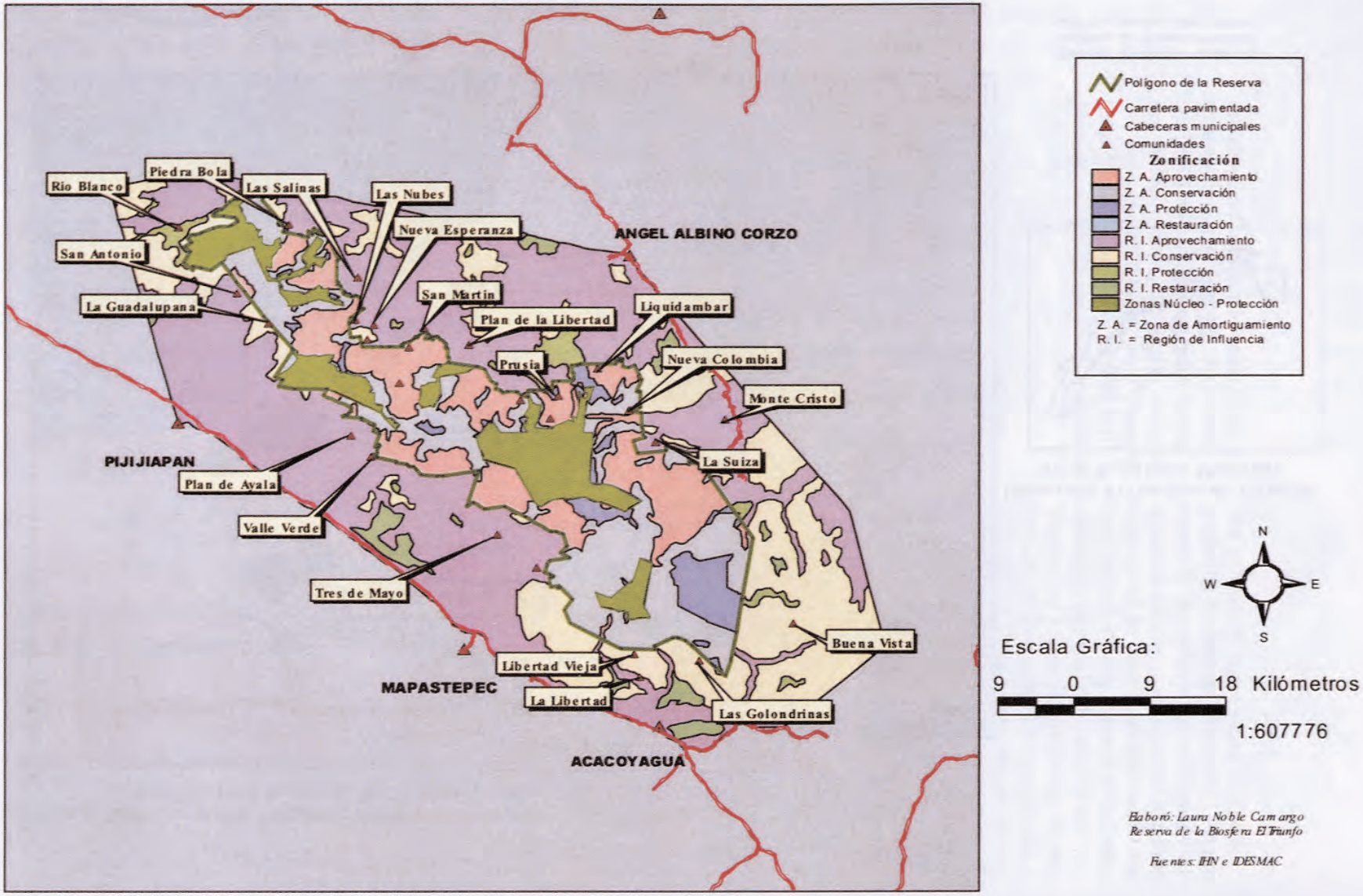
In this publication, case studies are presented on all four reserves where TNC and its conservation partner, the IHN, carry out conservation work with local communities in close coordination with the CONANP - the institution in charge of the administration of federal natural protected areas in Mexico.

This publication begins with a brief background on the historic role the IHN has performed in the conservation and management of natural reserves in the state of Chiapas. A summary of the most important lessons that were learned is given, followed by the presentation of case studies for each of the reserves and a discussion regarding the pros and cons of the community work process, concluding with the lessons learned during said process. Finally, actions are recommended by the Work Group to strengthen each Community-based Conservation natural reserve program as well as the role of the Instituto de Historia Natural and The Nature Conservancy.

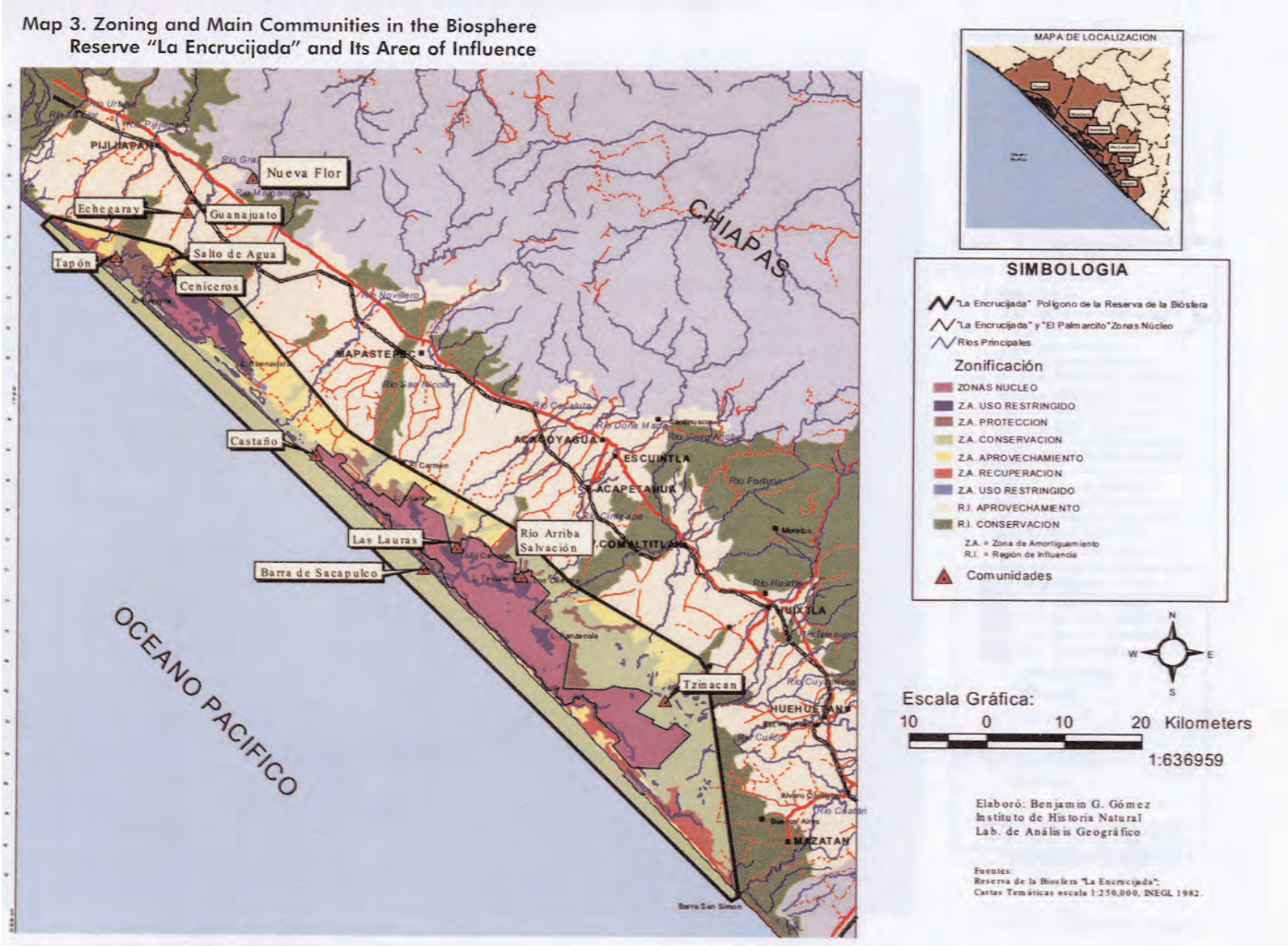
Map 1. Location of the Biospherre Reserves within the Parks in Peril Program, in Chiapas, Mexico



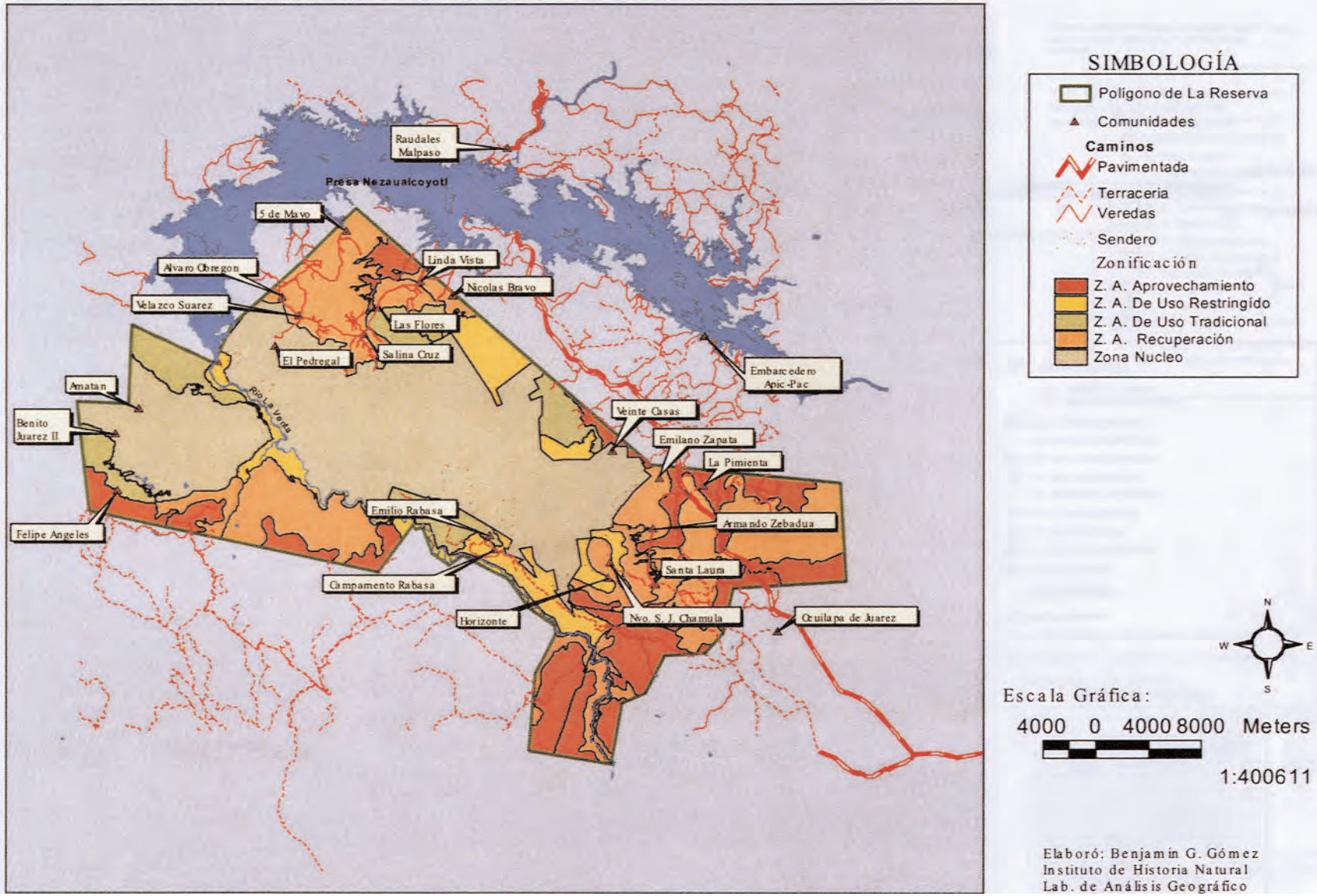
Map 2. Zoning and Main Communities in the Biosphere Reserve "El Triunfo" and Its Area of Influence



Map 3. Zoning and Main Communities in the Biosphere Reserve "La Encrucijada" and Its Area of Influence



Map 4. Zoning and Main Communities in the Biosphere Reserve "Selva El Ocote"



Map 3. Zoning and Main Communities in the Biosphere Reserve "La Encrucijada" and Its Area of Influence

SIMBOLOGIA

- "La Encrucijada" Polígono de la Reserva de la Biósfera
- "La Encrucijada" y "El Palmarcito" Zonas Núcleo
- Ríos Principales

Zonificación

- ZONAS NUCLEO
- Z.A. USO RESTRINGIDO
- Z.A. PROTECCION
- Z.A. CONSERVACION
- Z.A. APROVECHAMIENTO
- Z.A. RECUPERACION
- Z.A. USO RESTRINGIDO
- R.I. APROVECHAMIENTO
- R.I. CONSERVACION

Z.A. = Zona de Amortiguamiento
R.I. = Región de Influencia

Comunidades

N
W E
S

Escala Gráfica:
10 0 10 20 Kilometers
1:636959

Elaboró: Benjamin G. Gómez
Instituto de Historia Natural
Lab. de Análisis Geográfico

Fuentes:
Reserva de la Biosfera "La Encrucijada".
Cartas Temáticas escala 1:250,000, INEGI 1982.

Background

These backgrounds present a brief historical review of the role played by the Chiapas Instituto de Historia Natural (IHN) in the conservation of Natural Reserves (ANP) in Chiapas, with particular emphasis on those that have had a relevant role and formed part of the Parks in Peril program: El Triunfo, El Ocote, La Encrucijada and, more recently, La Sepultura.

The IHN was created in 1942 with the objective of developing research and disseminating information regarding the biological patrimony of the State of Chiapas in order to foment the conservation of wild flora and fauna and to propose the creation and management of natural reserves. Likewise, IHN acted as an organism for technical consultation within the Chiapas State Government with regards to ecology and the conservation of natural resources (Periódico Oficial [Official Daily Newspaper], 1985).

IHN's interest in conserving natural reserves was born out of various field studies that Dr. Miguel Álvarez del Toro —a renowned Mexican naturalist, the founder of IHN and pioneer in the study and conservation of biodiversity in Mexico and the State of Chiapas—, carried out on sites currently covered by the biosphere reserves El Ocote, El Triunfo and La Encrucijada during the decades of the 50s and 60s (IHN, 1991a; IHN, 1991b). However, it was not until 1972 that, through initiatives backed by the IHN, portions of the territory now occupied by said Natural Reserves were protected by state decree (Periódico Oficial, 1972).

Later, in 1984, the Secretariat of Urban and Environmental Development [SEDUE – Secretaría de Desarrollo Urbano y Ecológico], (institution which at the time was in charge of Natural Reserves of federal interest) began the administration of these reserves with security and protection activities such as the hiring of park rangers and the construction of the first camps. However, these initiatives lacked continuity due to budget shortfalls (IHN, 1991a; IHN, 1991b).

In 1986, the IHN held the First Workshop on Planning Natural Wilderness Reserves, resulting in the first operative blueprints for the El Ocote and El Triunfo Reserves. These defined and prioritized activities while establishing basic requirements in terms of personnel, equipment, infrastructure and financing (IHN, 1986). In 1987, the IHN signed a joint agreement with SEDUE with the objective of equipping these operative plans through joint administration of the reserves, resuming activities of protection, supervision and research at that time (IHN, 1991a; IHN 1991b).

From 1990 to the present, these three parks have entered the Parks in Peril program sponsored by The Nature Conservancy (TNC) and the U.S. Agency for InternationaI Development (USAID), providing the technical and financial support necessary to operate the reserves through annual operating plans and permitting the consolidation of conservation and management structures at each reserve.

On a parallel, the legal protection of these major natural reserves has been consolidated throughout the years via IHN proposals for their extension and recategoratization. In this vein, the following federal decrees were successfully promoted: The Forestry and Fauna Protection Zone El Ocote in 1982 (D.O.F. [Official Federal Daily Newspaper], October 20, 1982); El Triunfo Biosphere Reserve in

1990 (D.O.F., March 13, 1990); and La Encrucijada and La Sepultura Biosphere Reserves in 1995 (D.O.F., June 6, 1995). Finally, the "Selva El Ocote" was recategorized as the El Ocote Biosphere Reserve in 2000 through the efforts of Reserve management under the CONANP (D.O.F., June 7, 2000) (Map 1).

Accordingly, the National Environmental Institute of the SEMARNAP (Secretariat of the Environment, Natural Resources and Fishing-institution in charge of Natural Reserves of federal interest up until mid-2000) assigned a core group of management personnel to each of the reserves, as of 1994 in the case of El Triunfo and as of late 1996 in the case of the other reserves. In addition, starting in 1997, the IHN obtained resources from the State Government of Chiapas to finance hiring 43 people dedicated to the support of conservation work and reserve management.

Since management of these Natural Reserves began, the importance of involving local communities in the conservation and sustainable management of natural resources was clear. That is why, since 1990, initial approaches have begun within communities settled inside or in the immediate vicinity of the Natural Reserves through disseminating actions that have broadcast the existence of the reserves. Early socioeconomic diagnostics were also carried out, providing the guidelines for initial community work strategies.

Community work on these Natural Reserves has evolved through a learning process in which experiences acquired at different times have been useful analyzing issues relating to man and nature in a new light while reformulating strategies towards existing community work programs currently employed on each of the reserves.

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El Triunfo Biosphere Reserve

Reserve Background

El Triunfo is a reserve initially designated in 1972 as a "Natural Area Native to the State of Chiapas" with a surface area of 10,000 ha (~24,700 acres) (D.O.F., 1972). In 1990, the federal government issued a declaration establishing it as a Biosphere Reserve. The total surface area is 119,177 ha (~294,500 acres), divided into a buffer zone of 93,458 ha (228,500 ac.) and a conservation core area of 25,763 ha (63,660 ac.), which is in turn subdivided into 5 core areas (D.O.F., 1990). (See Map 2)

The reserve spans the central portion of the Sierra Madre de Chiapas mountain range, covering altitudes from 500 meters above sea level (1645 ft.) with moderately steep slopes to 2,750 meters above sea level (9047 ft.) with elongated slopes and steep peaks. The longest axis of the Reserve lies in the foothills of the Sierra Madre de Chiapas. The northern slope of the Central Valley includes the headwaters of five watersheds within the Grijalva River basin, and the Pacific slope contains headwaters of seven watersheds. As a result, there are four different types of climates ranging from warm and humid to cool and humid, with average annual precipitation from 1,000 to nearly 4,000 mm (39-157 inches) (INE, 1999b).

Within the Sierra Madre de Chiapas, the reserve is attempting to protect three important conservation values: biological, ecological and socioeconomic. For example, 10 of the 19 vegetation types in Chiapas can be found in this Reserve (Breedlove, 1981), including mountain mesophyte forest and mountain rainforest. There are 989 registered plant species, representing 12% of all the species in Chiapas, 13 of these are native to the State and 2 are only found within El Triunfo. Also, there are 110 species with some conservation status in keeping with IUCN, CITES and NOM-ECOL-54/94 (State protected species).

Its outstanding ecological assets include serving as the principle catchment of rainwater then distributing the abundant water via pluvial tributaries throughout the lower regions of the watersheds. This also contributes to the regulation of the local climate. In addition, ground cover conserves the soils and reduces the risk of erosion and silting of rivers and coastal lagoons found downstream.

The socioeconomic values of El Triunfo Biosphere Reserve are the environmental services it provides, such as the principal water source for irrigation in two regions of Chiapas: the coastal lagoons where Pacific shrimp are harvested and the hydroelectric dams of the Grijalva River.

Objectives of the El Triunfo Biosphere Reserve

The Reserve Management Plan clearly states the conservation objectives for El Triunfo Biosphere Reserve. These are, in summary (INE, 199b):

- Conserve Sierra Madre ecosystems, especially the mountain mesophyte forest and mountain rainforest;
- Conserve in situ Reserve germoplasm banks and prevent the loss of wildlife species;
- Protect the watershed headwaters in order to conserve the ecological services they provide;

- Control and prevent soil erosion;
- Provide means and opportunities to research the physical, biological, economic and social aspects of the region and propose alternative sustainable uses of its natural resources;
- Promote the integral development of local communities through the sustainable and rational use of natural resources;
- Support the development of environmental education activities; and,
- Provide opportunities for ecotourism and recreational activities.

These objectives must be attained in an area with over 14,000 inhabitants plus a floating population of migrant workers responsible for harvesting coffee. The Reserve is located in a territory of eight municipalities: the core areas are Federally owned; within the buffer zone, there are 27 *ejidos*[1] (community managed lands), one communal territory, 315 private properties, and a piece of federally-owned land.

The management of the Reserve is subject not only to the categories of core are and the buffer zones, but also to a more detailed zoning derived from a process called Ordenamiento Territorial – or zoning law. (Table 1 and Map 2).

History of Community-based Conservation

Describing steps that have been taken over several years can be enriching but at the same time vague. Given the lack of documentation, we must depend on the memory of our on-site colleagues with the most seniority (Annexed you will find a list of names

Table 1. Management Policies of El Triunfo Biosphere Reserve (INE, 1999b).
The protection policy is exclusive to the core area. Conservation and use are for community development within the buffer zone where there are eijdos, small properties and one communally owned property. Restoration is mainly for sites where the forests of these communities have been seriously disturbed. The work of Reserve personnel is to promote the reorientation of land use practices of the local population to those permitted under the Management Plan, inclusively through participation in scientific research activities.

Management policies by zone	Permitted land use	Compatible use	Conditioned Use
Protection	Scientific and research	N/A	N/A
Conservation	Organic coffee production Palm cultivation Agroforestry Ecotourism Forest management Cycad cultivation Extraction of medicinal plants	Scientific and research	Soy bean cultivation Traditional coffee production
Use	Agroforestry/pasture management Organic corn production Fruit plantations Intensive cattle management	Scientific and research Organic coffee Palm cultivation Agroforestry Ecotourism Forest management Cycad cultivation Extraction of medicinal plants	Palm utilization Conventional tourism Intensive agriculture Flower nurseries
Restoration	Productive restoration	Scientific and research	

1. Ejido – a land tenure designation established to redistribute lands to community groups for agricultural development during the agrarian reform of 1930. Ejido members (*ejidatarios*) are given usufruct rights to the natural resources but not title. The federal government retains title to ejidal lands.

of those people who have worked with communities in El Triunfo). Work with the communities of El Triunfo Reserve has continuously transformed in keeping with certain key factors at different times: (a) environmental issues; (b) socioeconomic issues; (c) differing focus on resource conservation and community development; and most importantly (d) the vision of our working team members. However, as time passes, a trend can be observed. It has evolved from the concept that conservation consists of protection, strictly speaking, and that any community relations are tantamount to policing and imposing rules for the use of natural resources (pre-1990s). It was then transformed into the vision that it is essential to attend to the economic and productive needs of farmers in order for the conservation message to have any impact (mid-1990s, see for example the Risk Assessment in IHN/INE, 1997). Finally it has arrived at the point where development of the local population is a direct and necessary condition for conservation success (Year 2000 to present day).

This trend has been replete with proposals, twists, turns, advances, retreats, remissions, and rethinking. The changes at times have been brusque due to personnel turnover for lack of funding and the whims of allied institutions and conservation partners of the Reserve. In the beginning, it was the Instituto de Historia Natural (IHN) with an environmental agenda. Next, it was the ecodevelopment vision developed through the financial support of the World Wildlife Fund (WWF). Subsequently government agencies came into the picture with a focus on economic development. Then, more recently, non-government organizations have focused on sustainable development. IHN, itself, has transformed its vision to such a degree that it currently proposes fostering sustainable development. The Nature Conservancy, which has accompanied this process over the past 10 years, has experienced this same evolution. In general, there seems to be a consensus to date among affiliated institutions with respect to the need to foster sustainable development within its conservation mission.

The Current Community-based Conservation Program

Community-based conservation program is currently undergoing reorganization through the integration of sustainable development and environmental education components. Until early in the year 2000, each component had its separate projects, normally limited to periods of six months to two years, whose impact was diluted by the fairly vague number of beneficiaries from various communities. After over a year-and-a-half of Reserve personnel participation in reflection exercises (INE, 1999a), a shared vision has been reached by the various members of the work group, a process that has fortunately been documented step by step.

More recent exercises, through the revision of an Environmental Threats Analysis process, reserve personnel came to the conclusion that in a biosphere reserve, by definition, the goal is not just conservation using community development as a guideline. Just as there are "objects of conservation" (key species, fragile ecosystems, etc.), there are also "subjects of development" (men, women, children; or small-scale communal farmers, ranchers, and small landowners, etc.) Thus, the sustainable development of the local community— human development in harmony with nature— is a goal in and of itself.

We have concluded that, in order to achieve the objectives of the Reserve, we need to work under the following focus:

"Conservation of natural resources implies the development of local communities and creates a forum for research of the potential uses of natural resources for local purposes. …Therefore, in the El Triunfo Biosphere Reserve the solution to conservation prob-

lems requires a focus that encompasses social issues in long-term processes. Thus, management of the Reserve is based on a quest for sustainable development as applied to the particular conditions of El Triunfo" (Castro et al., 2000).

Thus, the current approach for the Reserve is to promote sustainable development with mid- and long-term vision through strategically complementary and integrated projects. This holistic approach consists of having each of these projects conceptually based on the relationship between community participation, education, and productive alternatives (Figure 1) (CONANP, 2000a).

Under this focus, the Research and Monitoring, Protection of Natural Resources, and Social Communications programs will work together in a unified strategic plan. As a result, work with communities will not be ascribed to any one program in particular, but rather will become a managing principle for El Triunfo Biosphere Reserve.

The first long-term project derived from this approach is the Pilot Communities project, currently being designed by a multi-disciplinary team. It has defined as its mission "that communities achieve their own development through self capacity-building."

This project intends to achieve human development through involvement, education and self-development as the foundation on which other arenas of community development —economic, political, cultural, social, and natural resource management— can be constructed. In terms of operations, the reserve intends to carry out an initial stage of approximately eight months, during which an outline for participation will be fostered among the members of four communities. The result will be one integrated development project with specific actions and indicators per community. Simultaneously, the Reserve will attempt to identify viable alternatives that promote sustainable use of natural resources by the community. The Pilot Communities strategic project will be applied under a set of principles by a technical team with the capacity to make its own decisions, but with consultation and follow-up from Reserve personnel. By the end of 2000, the appropriate financing conditions were starting to come together to sustain this project over the next five years.

Other strategic projects will encompass different issues at different degrees of scope and depth across the landscape and area of influence of the El Triunfo Biosphere Reserve. In the near future, the reserve hopes to create a strategic project designed to strengthen grassroot organizations. This approach will not focus so much on integrated community development, but rather the institutional development and productive capacity-building of the conservation organizations with whom the Reserve has traditionally worked with throughout its history. Soon, the synergetic effect of these strategic projects will provoke a unique relationship between communities and their natural resources, whereby the quality of life

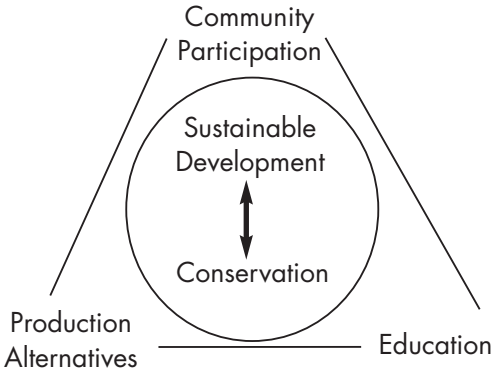

Figure 1. The El Triunfo team believes that natural resource conservation in places where people live occurs as a result of an intimate interaction between three basic elements. This is the main principle of the Sustainable Development Program and of each strategic project derived therein to address specific Reserve management issues.

of the local inhabitants is interdependent on the health of the rich natural community of El Triunfo.

Transition between Historical and Present-day Community-based Conservation Program

The leap towards a new focus on community work involves a transition process on two specific fronts: management programs and projects in progress.

Management Programs

In February 2000, Reserve personnel redefined their objectives during an internal strategic planning workshop (INE, 2000). The overarching objective of the sustainable development is primarily defined as reducing human pressure on the natural resources of the Reserve. The objective of the Sustainable Development program is to achieve local community involvement in the sustainable use of natural resources on the Reserve. Attaining both of these objectives requires several complementary facets of development; for organizational purposes, each of these will be outlined in the plan as a subcomponent with its own expected results.

1) Sustainable agriculture
2) Alternative forest use
3) Intensification and diversification of cattle ranching
4) Ecotourism
5) Local crafts
6) Community participation (Actually, this is a subcomponent with activities corresponding to the work of each of the other subcomponents).

Projects in Progress

Follow up is being provided for the following activities:

- **Community Participation:** Since 1999, assessments have been carried out in four coastal zone communities to better understand social, economic and environmental conditions, as well as the way of thinking of local inhabitants regarding these conditions and the Reserve itself. These assessments will foment a permanent dialogue between the field staff who apply them and local communities. In October 2000, the first assessments were presented to the inhabitants of a community (Carrasco & Hernández, 2000). The remaining assessments should be completed in early 2001.

- **Training of Community Promoters:** After concluding a two-year farming training project, several farmers were selected for their interpersonal, leadership and technical skills to promote development and conservation in their communities. To strengthen these initiatives, they are organizing a Civil Association in which seven communities will be represented, each with a male and female representative.

- **Conservation of Palm Plants through Sustainable Use:** Over two years' work with farmers who extract shate palm leaves (*Chamaedorea quetzalteca* and *C. graminifolia*) for commercial use has managed to stop illegal extractions from the reserve in one community. Instead, the farmers are producing palm trees in nurseries and conserving forested areas where these plants are still abundant. The benefits of this experience have begun to attract the attention of other communities. Through farmer-to-farmer exchanges, ideas and information are transmitted from one community to the next.

- **Green Fertilizer and Orchards:** For three years, demonstration plots have been cultivated in four communities. During this period, the benefits of natural "green" fertilizer have become evident to the farmers. Farmer-to-farmer exchanges will help share the experiences with other communities, and ideally replicate the practices throughout communities in the buffer zone.

- **Restructuring of Rural Cattle Ranching:** This project began in 1999 with an assessment by the Chapingo Autonomous

University in the community of Bienes Comunales San Antonio. This site is characteristic of rural communities in the buffer zone of the Reserve where cattle ranching is prevalent. The project promotes the rational use of the land most important to the community and offers different options, such as intensifying pasture management to reduce the area of impact while increasing milk production.

- **Eco-friendly Coffee:** With aims to conserve biodiversity through the improvement of the habitat of critical species, this project attempts to convert conventional coffee plantations (i.e., heavy chemical input and maximum plants per area) to shade-grown coffee plantations using native species as shade trees. The key elements behind this project are: community development, sustainable production and conservation of native tree and bird species.

Achievements and Limitations

The historical record of community-based conservation projects in the communities of El Triunfo Biosphere Reserve suggests a tendency towards the incorporation of social aspects in conservation. After an initial clash between government institutions and local communities when the Reserve was first established on their lands, there have been repeated attempts to integrate conservation and development, environmental education and development, and community participation in conservation. Technical personnel have gained valuable experience in techniques to foster community participation. Also, local residents are slowly becoming an integral partner while serving as local technical resources and conservation promoters. There is a growing trust and understanding between technicians and communities, which has been reflected in the reduction of conflicts on both sides.

However, as a result of this new approach of integrating community participation, there are a variety of different obstacles. First, some local communities still hold the opinion that the Reserve blocks their progress or development. This issue has been compounded by a lack of a holistic perspective both by technical staff of the Reserve and the local community development promoters. Likewise, there has been a lack of sensitivity in terms of understanding the community's needs and clearly establishing the Reserve's message regarding compatible alternatives and the protection of natural resources. On the other hand, the constant turnover of technical staff has not allowed the Reserve to take full advantage of the experience gained in the field over the years. Similarly, the lack of follow-up from the start of these community projects and the lack of core field team devoted to community work has kept specific experiences from being processed and systematized that could have helped the Reserve avoid future conflicts. Finally, the number of technicians the Reserve has at its disposal is small compared to the number of communities within the buffer zone.

Future Outlook

In the foreseeable future, two possible lines of action could overcome the limitations of community projects outlined above. The first priority would be to respect the commitments made in the field and fulfill current obligations while beginning to integrate the new management approach. This way, staff from Environmental Education program will accompany production-oriented project teams to provide technical support and seek interactions between education and the children and adults of the community. Also, the Monitoring program will be incorporated into community projects in order to systematize relevant best practices learned at the project level. The second line of action would be to develop integrated work plans for the buffer zone of the reserve. The principal purpose of such planning is to streamline the work of a relatively small team, and

concentrating specific actions in pilot communities and providing guidance to other institutions to focus on specific projects in other regions.

In the short-term, an integrated vision will be developed among all members of the technical team, a vision that should eventually be adopted by the community promoters as well. Also, using the palm tree project experience, there should be research institutions interested in tapping local knowledge to generate mid- and long-term sustainable and viable production alternatives (example: via the Maximizing Native Species strategic project.) On a wider scale, in coordination with the Environmental Education program, the use of educational tools regarding conservation within the Reserve will be promoted among education officials in elementary schools within the buffer zone. In harmony with the Social Communications program, experiences generated by producers in palm tree cultivation and demonstration plots will be broadcasted via radio.

On a mid-term basis, the reserve plans to create rural training centers through the Biosphere Stations strategic project along several points within the buffer zone. These stations will be managed and operated by local NGOs. It is expected that in these centers, experiences of human and community development, organic agriculture, production alternatives, and restoration techniques will be shared.

Finally, on a long-term basis it is hoped that, through immediate short- and mid-term actions, the children of today will actively participate as adults of the future in the conservation of natural resources within their communities. It is also expected that the processes initiated within pilot communities will be replicated in other communities within the Reserve.

Project Case Study: "Cerro Polo Greenhouse Group of the Ejido Las Golondrinas, township of Acacoyagua, Chiapas"

Introduction and Background

The gathering and sale of camedor or 'shate' palm (*Chamaedorea quetzalteca* and *C. graminifolia*) is an economic activity practiced by the local residents throughout the reserve, with greatest intensity in the northeastern region. The camedor palm leaf is used as ornamental greenery in floral arrangements. Individual palm fronds are harvested with a machete leaving the growing stem of the plant to survive. The lucrative flower industry provides a steady demand for high quality camedor fronds. This activity offers an important source of income for many of the rural families producing mostly subsistence crops. However, in some palm harvesting areas, natural palm communities have been drastically depleted by the overharvesting and poor extraction practices. This situation translates into a loss of natural resources that have the potential to serve as an economic staple for these rural communities (INE, 1999b).

Since 1980, some producers from the Las Golondrinas Ejido have devoted themselves to harvesting camedor palm foliage for sale by brokers working as exporters to the floral industry. These producers set aside a percentage of their income from the sales of the camedor palm fronds to create a savings fund in a regional bank. Since the ejido commission granted them permission to extract palms from the ejidal forest, the producers decided to use a portion of this fund to benefit the ejido. For instance, the producers used some of the funds to purchase furniture for the ejidal meeting house.

Likewise, given that a prerequisite to sell palm, gain credits and receive training was that the producers legally organize themselves into a social solidarity society (SSS), these people formed the "Palmar La Glo-

ria" SSS, currently with approximately 50 members. Through this association, the producers established the first camedor palm nursery under the guidance of SAGAR (Secretariat of Agriculture, Cattle Ranching and Rural Development – a federal agency in charge of agriculture extension and training) by the mid 1990s. This agency offered them credits that never materialized, while at the same time supporting them with chemical pesticide products.

In 1986, a researcher from the Instituto de Ecología, A.C. [Ecological Institute] visited the ejido Las Golondrinas in search of cycads, a prehistoric plant found in the Sierra Madre de Chiapas. Through conversations with locals hired as guides and field assistants, he launched a program to create awareness among the local residents regarding the importance of the palms and cycads as well as the mechanisms to harvest these plants for profit.

At a later date, IHN researchers who followed up on palm and cycad studies continued to promote these plants and create opportunities to make it a lucrative venture. The interaction between the IHN researchers and the local residents offered an excellent means of technical and informational exchange. This, in turn, reinforced the idea of establishing a palm and cycad nursery.

Hoping to strengthen this kind of technical exchange and establish the greenhouse, the project Conservation of cycads and palms in the Sierra Madre of Chiapas through sustainable use began in 1997. IHN drafted the proposal and found financial support from the Fondo Mexicano para la Conservación de la Naturaleza (Mexican Fund for Nature Conservation). The objective of the project was to "Establish greenhouses in situ for *Zamia soconuscensis, Ceratozamia matudae* and *Chamedorea quezalteca.*"

Methodological Aspects

At the start of this project, the number of SSS members diminished from 50 to 28 people, given that, rather than offering "credits" or other cash support, participants were provided only with technical assistance.

The first stage of the project consisted of locating and georeferencing natural communities of palms and cycads. To that end, exploratory searches were conducted whereby the ejido members participated as guides, contributing their knowledge about the local environment and aspects of the natural history of these plants.

Next, the study "Population structure of *Zamia soconuscensis*" (a species intended for harvesting along with the palms) was completed, in which researchers explained to local communities the nature of the study and significance of its results.

Afterwards, the producers proceeded to harvest the seeds of palms and cycads. At this time, Association members organized into groups and periodically monitored the palm and cycad communities. This activity greatly contributed to gaining a better understanding of the reproductive phenology of these plants.

Finally, a rustic nursery was established on an area of 10 x 20 meters (33' by 66') and closed off with a chain link fence. Water came from a nearby stream and local materials were used in the construction of the nursery and shade areas.

Currently, the greenhouse occupies half a hectare (1.25 acres) of property owned by the SSS, obtained through the support of the Program for Regional Community Development (PRODERS). A small savings fund has been created.

Results

The main results of the project include:

- The cooperative membership has remained consistent and has actively participated in the development of this nursery. Until 1999, the number of participants was 28 people. In 2000, there were only 25 members; however, given that those who stayed with the project are the community members most committed to its success, this is considered a positive change.
- A new group with 17 members was created with the objective of cultivating palms and cycads. It is worthwhile to mention that these producers were not accepted by the SSS "Palmar La Gloria". The members of Palmar La Gloria argued that they have made significant investments of time and resources in establishing a viable palm and cycad nursery and were protective of their assets.
- The SSS "Palmar La Gloria" has its own internal regulations.
- The nursery was expanded from 200 m^2 (660 ft.2) to half a hectare (16,450 ft.2).
- Only 150 cycad plants have been sold on the export market, a number which seems small, but which marks the beginning of a marketing process capable of linking to international markets.
- These products were exhibited in the town fair of Acacoyagua, Chiapas for the last two years.

Conclusions

The key to success of this project is that it was not an activity that was brought into the community but rather responding to a need of the communities that would be compatible with the conservation goals of the Reserve. The cooperative was originally formed out of the need to "legally" sell its product and have access to potential agriculture credits. The decision to work together was made by the producers themselves recognizing the existence of a market that could continue to generate an economic income and would not circumvent the regulations of the Reserve.

In addition, the participation of producers in research projects fostered a research-action-participation process, where the producers contributed to the necessary baseline information needed by the researchers. This dynamic created a mutually beneficial feedback of their combined knowledge. While the researchers received information on common names, uses of the plants and their locations; the producers acquired knowledge about the physiology, importance and function of plants and animals. This process provoked fluid communications between Reserve staff and the cooperative members and helped create mutual respect between the different entities while developing interest in conservation. The presence of the Reserve field staff in the community also helped establish greater confidence not only between the producers and the Reserve but also among the producers.

Another factor that favored the strengthening of the greenhouse group is the existence of community leaders, ejidal land authorities, and the participation of members from ISMAM (a local farming organization, leader in the production, processing and marketing of organic coffee) in the group. In fact, ISMAM has been the principal source of experience that has reinforced conservation activities initiated by the Reserve in the ejido Las Golondrinas.

Finally, this group of producers and the project show tremendous potential, however, they still have a strong dependency on external technical assistance from the Reserve. One lesson learned is that it would be wise to develop a training process on project design and evaluation, financial management, and marketing research for their products before launching an initiative. Their dependence on external brokers to set the price and monitor quality control has taken the power out of the cooperatives hands and making them vulnerable to external factors beyond their control.

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La Encrucijada Biosphere Reserve

Reserve Background

In May 1972, the state of Chiapas first designated an area of 2,500 hectares (6,175 acres) of Zapotal mangrove swamp as a "Natural Area Native to the State of Chiapas," on the Pacific coast of southern Mexico (D.O.F., 1972). In June 1995, it was declared the La Encrucijada Biosphere Reserve comprising of approximately 144,870 hectares (~357,800 acres) of which approximately 36,215 hectares (89,500 acres) correspond to two conservation core areas ("La Encrucijada" and "Palmarcito") and 108,651 hectares (268,400 acres) correspond to the Reserve buffer zone (D.O.F., June 6, 1995). It has been listed under the RAMSAR Convention as one of the most important wetlands in the world and an international conservation priority. It forms the region known as the Coastal Plain of the southern Mexican Pacific. (See Map 3).

La Encrucijada Biosphere Reserve contains tremendous biological richness derived from its unique geographic location forming the only natural bridge between nearctic and neotropical regions. The climate in the region is warm and humid, the average annual temperature reaching 28ºC (82°F). With an annual average rainfall of 2,500 mm (98 inches) falling in a 8 month period and slopes of 1 meter per kilometer broken up by a few ridges and hillocks, the area is subject to permanent and seasonal flooding (INE, 2000).

Two of the State's three major wetland zones are contained in the Reserve, and are comprised of the lagoon systems "Carretas-Pereyra" and "Chantuto-Panzacola." These systems, in turn, include seven coastal lagoons and diverse estuaries, salt marshes, canals and sand bars that permit an exchange between freshwater rivers and the sea. These wetlands represent areas of great biological and socioeconomic interest. Not only is there enormous biological wealth, but that diversity helps support a healthy fish population. These wetlands cover a wide river network constituted mainly by 12 short course rivers (30 kilometers long on average) that begin in the headwaters of the Sierra Madre de Chiapas at altitudes of around 2,000 meters (6580 ft.) above sea level (INE, 2000).

The Reserve serves as a collection of the diverse types of vegetation represented on the Chiapas coast, such as: mangrove swamps, tulle groves, sapodilla groves, coastal scrub, floating and subaquatic vegetation, palm communities, medium semi-evergreen and low deciduous forest. In terms of biodiversity, 239 species of flora, 294 species of birds, 61 of reptiles and amphibians, 73 of mammals, and 58 species of fish are reported (INE, 2000).

Coastal ecosystems are important because they are considered, together with tropical rainforests, to be the most productive ecosystems on the planet. It is also known that the mangrove swamp is a major soil retainer, a source of nutrients indispensable for the maintained productivity of coastal fisheries and as a filter for different classes of pollutants, mainly municipal, industrial and agricultural organic wastes. This is why coastal ecosystems play an important role in the maintenance of essential ecological cycles in terms of the quality of coastal waters, the productivity of natural resources

and the supply of environmental goods and services.

The Reserve estimates approximately 29,900 inhabitants live within the Reserve distributed among 78 communities. The land tenure studies found 728 properties within the boundaries of the Reserve, 554 of them privately owned (76%), 65 federally owned (9%), 61 communal land or ejidos (approximately 8%) and 48 are nationally owned (~7%) (INE, 2000).

Objectives of the Reserve

- Conserve representative samples of coastal wetland ecosystems.
- Conserve and protect wildlife species of flora and fauna, mainly those that are rare, endemic, threatened or in danger of extinction.
- Maintain environmental quality, fishing production and the sustainable use of natural resources in a way that permits regional development and well-being.
- Promote social development activities that allow an improvement in the standard of living of local inhabitants, guaranteeing the permanence of natural resources along the Chiapas coastal zone.

Taking into consideration the characteristics of the region and of the La Encrucijada Biosphere Reserve, a land use management plan was created based on four general management policies: Protection, Conservation, Use, and Restoration. From the terrestrial coastal limits to the headwaters, the Reserve has used indicative and unregulated zoning with the purpose of providing congruence and continuity in terms of both the ecological processes and the management activities carried out within the Reserve (Map 3).

History of Community-based Conservation in La Encrucijada

The first community-based program was implemented by IHN beginning in 1991 in La Encrucijada Reserve and was called the Environmental Culture and Public Information Program. It acted as a letter of introduction among communities and populations immersed within this natural protected area.

At the same time this program was developing its activities, the fishing sector was voicing their many concerns and demands to protect their livelihood. In particular, they wanted action taken against the environmental impact on the wetlands and fishing areas caused by the State and Federal Government's hydrologic infrastructure construction project to benefit agriculture and livestock sectors on the coastal plains.

This situation led to a relationship of collaboration and alliance with some of the cooperative associations and fishing groups. Many of the concerns and demands of this social sector were taken into account in the proposed declaration of La Encrucijada as a Biosphere Reserve and in the application of specialized studies that addressed the fishermen's issues.

When the National Ecological Institute was considering a proposal to upgrade La Encrucijada to Biosphere Reserve status, some fishing cooperatives were beginning to express a commitment to conservation goals of the Reserve. They formally requested the support of the Instituto de Historia Natural (IHN) to work on fishing area restoration and in turn made a pledge to Dr. Miguel Alvarez del Toro, then Director of the IHN to respect the regulations of the Reserve. The fishermen demonstrated their commitment, first by obtaining fishing permits, then they collectively followed the fishing concession guidelines to continue traditional river fishing in the estuary lagoon systems of La Encrucijada Biosphere Reserve.

A number of communities are scattered throughout the La Encrucijada Biosphere Reserve including areas well within the inte-

rior of the Reserve. Inhabitants depend on a a wide range of productive activities including fishing, agriculture, and cattle ranching. Consequently, the Reserve community conservation work has had to be flexible in keeping with the complex nature of these activities and stakeholders. Community work has had to address not only the diverse economic activities, but also the presence of other kinds of social, economic, and political issues such as culture diversity, tradition practices, ethnic origin, and social organization. All this implies taking into account different interests and ways of thinking, living, and pursuing the well-being of the community.

The community-based conservation strategy has been based on the valuable professional field experience with communities settled within La Encrucijada Biosphere Reserve. Living with daily community issues has led to a healthy discussion of possible alternative solutions which has lead to concrete proposals from the community itself. The Reserve has successfully inserted the component of conservation and environmental protection through ecologically compatible development alternatives into community.

Likewise, there has been an attempt to instill in the inhabitants of communities their own capacity to design, organize and manage these kinds of projects. This has allowed the Reserve staff to establish a close working relationship based on approaching priority communities, maintaining a clear presence and fostering connections to meet the conservation and development needs of those communities. A good example of this approach has been the work with the fishing sector. This sector was the most vulnerable to the potential threats or environmental risks detected by Risk Assessment. The Reserve worked with the fishermen to negotiate compatible fishing practices while curbing the upstream threats to the estuaries.

Current Community-based Conservation Program

The current strategy of the Program of Community Extension and Compatible Development is based on the establishment of model or pilot communities. Sustainable development projects are implemented under an integrated work plan based on programs of community education, information and outreach covering all sectors of the population: children, adolescents, men, women, teachers, etc. The goal is to widely share the experiences from each of these different sectors to demonstrate the positive impact they have on their communities. Optimally, this will foster their inclusion and active participation in community development related activities as well as begin to replicate their approaches and experiences. Similarly, the Reserve is committed to providing field staff that will accompany the development process and offer technical training to the local inhabitants and contribute to the technical knowledge of the different initiatives identified by the community.

Key components of this strategy are environmental education and extension services to provide basic information about the Reserve, its natural resources, its surroundings, its importance, its issues and its benefits. The principal objective is the creation of a sense of awareness, value and ownership of the projects and conservation activities across all sectors of the community towards the Reserve.

Likewise, the participation of rural communities both inside and outside the Reserve is encouraged through:

- Agriculture, livestock, fishing, and aquaculture outreach activities;
- Understanding wildlife flora and fauna and their rational management; and
- Waste management and recycling as a strategy to improve the environmental health and quality of life in the area.

These activities are modified or adapted according to the socioeconomic, cultural, and environmental characteristics of each community so as to support and identify possible alternatives to resolve community issues or to satisfy important community needs. The Reserve is then responsible for assuring that these alternatives remain faithful to the principles of sustainability and conservation of the Reserve's natural resources.

This program seeks to promote the rational use of natural resources in the Reserve through management strategies, compatible economic alternatives, and sustainable use. These initiatives must provide a real option for the socioeconomic development of these communities, as well as protect and conserve the natural wealth and heritage of the communities within the Reserve (See Table 2).

Achievements and Limitations

Achievements

The achievements or scope of this work strategy can be measured in two ways: a) by the demand from new communities to form part of the network of model community projects; and b) by the increase of community participation in sustainable development projects in the model communities.

It is worthwhile to point out that the majority of these projects started out with modest contributions from the communities and small-scale financial support from various sources. Currently, much of the technical support and economic incentives to change or manage these activities have handled through Temporary Employment Programs offered by the Federal Government in the State of Chiapas.

Table 2. Current projects in La Encrucijada Biosphere Reserve

PROJECT	OBJECTIVE
Green Iguana Management	Generate a practical and simple technological package for the management of the green iguana that will permit its conservation and sustainable use on a community level.
Marine Tortoise Protection and Conservation	Raise the level of awareness and participation of the local community in tasks that protect and conserve marine tortoises by cleaning beaches, painting T-shirts and creating arts and crafts.
Rehabilitation and Restoration of Bodies of Water and Fishing Areas	Recover fishing productivity through the restoration and rehabilitation of the natural hydrologic flow of estuaries and canals that feed into fishing areas.
Management and Recycling of Solid Waste	Reduce pollution caused by the development of conventional tourism and promote rational use of solid waste by recycling and establishing craft workshops, toys and useful articles.
Establishment of Community Tree Nursery	Involve communities in the production of commercial trees and fruit trees for the reforestation and restoration of areas impacted by forest fires and land use change as a soil conservation strategy.
Establishment of an Organic Corn Field with Nitrogen-fixing Beans	Propose practicing organic agriculture as an alternative to traditional corn cultivation and as a conservation strategy that will improve soil quality.
Establishment of Community Tree Nursery and Organic Backyard Gardens	Promote the creation of community tree nursery for the restoration of areas impacted on the Reserve by planting of native timber species and fruit tree species. Likewise, foster organic agriculture practices through family gardens.
Reforestation on the Banks of the River Coapa	Restore the areas impacted by deforestation and fires along the banks of the River Coapa through reforestation as a strategy for soil and water conservation.

The key advances include:

- Permanent presence of Reserve personnel in the zone, which has translated into an image widely recognized across the region by communities and institutions;
- Consolidation as a Parks in Peril site;
- Continuity within integrated model community projects and programs since 1996;
- Creation of a multidisciplinary team for the management of the Reserve and its programs;
- Channeled funds from Temporary Employment Programs to fishermen and agricultural producers working on sustainable development projects; and,
- Developed a strong alliance with fishing cooperatives.

Limitations

The obstacles the community-based conservation program has faced are related to federal and state policies governing development and agricultural intensification that are diametrically opposed to the conservation of natural resources. Likewise, cash and in-kind incentives have been offered for personal, political, and economic reasons contrary to the conservation work in targeted communities.

The lack of credibility of government institutions within to local communities has been another serious obstacle faced by the Reserve. This has been due to a lack of continuity in the programs and projects that these institutions have come to offer and develop, translating into an attitude of rejection among the communities towards any institution or agency that tries to help them.

The recent socioeconomic analysis (July 1998 to January 1999) completed by the Reserve pointed out that the majority of the settlements contained in the Reserve know about its existence and have a positive opinion in general of the work done by the Reserve. However, there is an urgent need for more public information about regulations, jurisdiction, licensing, goals and objectives that drive the management of the Reserve. These studies also discovered that the communities identify government functions mostly with respect to the restrictions, prohibitions and sanctions carried out by the regulatory agencies (SEMARNAP and PROFEPA). These agencies do not have a permanent presence in the region and consequently causes confusion with regards to the scope of activities and jurisdictions pertaining to the Reserve and the role they play in the protection and management of the natural resources.

Future Outlook

The Reserve has identified a need to disseminate information and offer training in the regulatory and judicial aspects of the natural protected area in the communities. Ideally, this will foster community participation in sustainable development projects, thereby generating a sense of ownership and value for the natural resources and strengthen the abilities of these communities to play an active role in the administration of the Reserve.

The Reserve must place greater emphasis on linking educational actions, the dissemination of environmental information and community development activities, specifically those that have to do with agricultural or income-generating activities and social development. It is also essential that the Reserve must collaborate with state and federal agencies in the design and implementation of development policies. This will ensure that projects correspond to both the needs of the communities and the conservation goals of La Encrucijada Biosphere Reserve. The goal is long-term sustainability of all of these types of activities.

It is clear that training Reserve field staff and community extension agents in conservation practices and sustainable development has permitted the transfer of knowledge to community members as well. This training, in

turn, has made it possible to jointly address the concerns, needs, and demands that lend meaning to the implementation of these conservation and development projects. In this sense, it is essential that the Reserve provides continuity in terms of personnel training and specialization in order to keep everyone abreast of innovations and appropriate technologies that emerge in the field natural resource management.

It is essential to recognize that the achievements gained over that last nine years of community-based work in La Encrucijada Biosphere Reserve can be attributed to the constant on-site presence of Reserve field staff. Equally as important is the fact that many of the community projects are managed by community members hired and trained by the Reserve for the past five years. This dynamic has contributed to creating a good institutional image and sustaining a process of continuity in community-based projects.

There is a need to consolidate the relationship between the Reserve and communities in which an integrated work dynamic has been established and to strengthen the creation of strategic alliances with new communities in order to have a larger impact and greater community participation within the Reserve.

Finally, it is important and essential that the Reserve establish monitoring mechanisms and indicators that allow continuous evaluations of completed community projects. This way the Reserve can adjust and correct aspects that did not meet expected results so that it can fulfill its conservation objectives.

Project Case Study: "Restoration and Rehabilitation of Bodies of Water and Fishing Areas in La Encrucijada Biosphere Reserve"

One of many problems currently faced by estuary systems and their fishing productivity is the rectification and diversion of rivers from their natural course, as well as the deforestation of upper and middle watershed to establish agricultural systems and cattle ranching.

According to the Risk Assessment for La Encrucijada Biosphere Reserve (1997), deforestation of middle and upper watershed has been one of the principal factors triggering high rates of soil erosion. This material is transported by the tributaries and drainage systems of the rivers in the form of sediment that eventually clogs estuaries, lagoons and mangrove swamps on the coastal plain.

The diversion of rivers and construction of irrigation dams during low water periods diminish and even eliminate the supply of fresh water to coastal lagoons and estuaries, causing imbalances in natural hydrologic flows. As a result, commercial species are displaced by this imbalance, loss of habitat and disruption of the biological cycle of these species found in lagoon systems. Also, sediment build up on the mouth of the rivers and coastal canals create sand bars that can close off the natural flow of nutrients to the ocean.

This situation has reduced currents capable of carrying sediment out to the open sea and alterations in the hydrological and hydrobiological equilibrium of these ecosystems, mainly in the mangrove swamps and wetlands. In turn, this translates into an overall negative impact on fishing productivity in the region and on the fishermen in particular.

Over the past five years, La Encrucijada Reserve has worked together with four fishing cooperatives on community development projects. Different projects and programs have been implemented to address siltation that clogs fishing areas and attempt to resolve the most pressing development needs of the fishing sector. These projects have strengthened the relationship between those coordinating and participating in Reserve management activities. It has created

the Reserve to gain recognition, respect, and support from fishing cooperatives and leaders of these communities. They have also consolidated the groups' unconditional support of Reserve personnel as well as natural resource protection and conservation tasks within La Encrucijada Biosphere Reserve.

The objective of these different activities has been to revitalize the fishing areas clogged with sediment. By restoring the riverbed, channel and estuary and investing in rehabilitation efforts, the Reserve can reestablish the hydrological exchange between fresh water coming from rivers and the intercoastal and estuary flows and currents. In turn, this will improve the fishing productivity of these ecosystems.

The Reserve with support from the cooperatives and the communities as a whole, helped to improve natural flows, restored and rehabilitated estuaries, drainage systems, and river deltas. These actions have included the extraction of vegetation and soil runoff and sedimentary deposits in water bodies and prime commercial fishing areas. All tasks have been done using manual labor through the sheer physical effort and will of the cooperative members. The only tools they had available were shovels, hoes, wheelbarrows, canoes, pulleys, ropes, and machetes.

The principal aim behind these activities is to reestablish the hydrologic flow of these systems, thus improving the water and nutrient exchange caused by tidal effect and downstream flow of the freshwater rivers and streams. By improving these natural flows and nutrient exchange, this should improve the physical, chemical and environmental conditions of the water bodies that serve as the principal fishing grounds of the cooperatives. The result is a recovery of fishing productivity that will generate social and economic benefits for these communities.

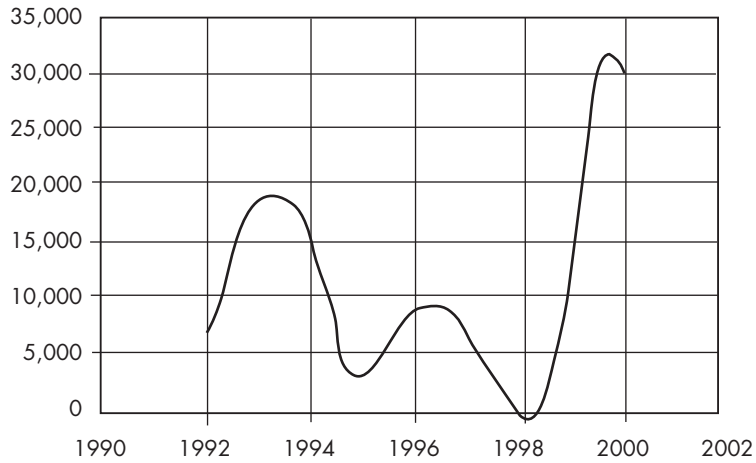
Technical exchanges between fishermen and fishing cooperatives have been a most effective tool to motivate other fishing cooperatives to become engaged in rehabilitation and restoration activities. These exchanges began in 1996, supported and fostered by the Reserve's operative programs (for example, Parks in Peril supported by The Nature Conservancy) as a community level training program. Through these exchanges a heightened awareness among fishermen has developed regarding a common threat that has affected them over the past decade: the siltation of their fishing grounds.

By restoring and rehabilitating natural estuary, riverbed and canal flows, there has been a significant recovery of fishing productivity in the lowlands and lagoons. The modifications and rehabilitations have improved hydrodynamic circulation in these areas and permitted the ebb and flow of water and nutrients essential to the maintenance of productivity in these ecosystems.

To date, the Technical Aquaculture Cooperative Fishing Association of Pijijiapan has been able to restore approximately 118 hectares (~291 acres) of fishing areas through cleaning and removal of dead vegetation (tree trunks, branches and logs) that obstructed the river beds of estuaries and canals, creating sediment traps.

SEMARNAP (Secretaría de Medio Ambiente, Recursos Naturales y Pesca) and the Mexican Fund for Nature Conservation (Fondo Mexicano para la Conservación de la Naturaleza) have provide significant support and stimuli for restoration activities and overcoming the floods and fires in 1998. These two institutions have provided a total of 7,164 workdays in cleaning approximately 3,185 linear meters (10,479 ft.) of riverbeds and estuaries, as well as extracting approximately 2,091 cubic meters of sediment (loam clays, organic material, sands, and dead vegetation). This has generated an increase in fishing production for the coop-

Graph 1. Historic Fishing Production of the Technical Aquaculture of Pijijiapan SCPP in Kilograms of Shrimp



erative over the past 2-and-a-half years (Table 3 and Graph 1).

Supporting these practices is intended to have a direct effect on fishermen and heighten their interest in a productive work model compatible with conservation principles in the coastal lagoons found within La Encrucijada Biosphere Reserve.

By assisting in the restoration of the hydrologic flow, major refuge areas have been successfully recovered for the feeding and breeding of the principal commercial species, generating a positive, optimistic change in attitude among these fishermen.

Today, the perception of fishermen within La Encrucijada Biosphere Reserve has

Table 3. Historic Fishing Production of the Technical Aquaculture of Pijijiapan SCPP and Tasks for the Rehabilitation and Restoration of Fishing Areas through Temporary Employment Programs

Year	Kg./Year	Workdays employed	Lineal Meters	M^3 of displaced material
1992	8,100			
1993	18,453			
1994	14,797,5			
1995	3,582			
1996	8,453			
1997	8,239			
1998	150			
1999	32,300	3,060	1,200	900
2000*	30,000	4,104	1,985	1,191
Totals		**7,164**	**3,185**	**2,091**

*Until September 2000, approximately 30,000 kilograms (66,000 lbs.) have been accounted for with the possibility of surpassing productivity levels registered in 1999.

changed greatly in comparison to that of their predecessors. It has become clear to them that through their hard work they will be able to increase their production and keep their fishing areas in good shape, while at the same time conserving and respecting natural resources of the Reserve.

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El Ocote Biosphere Reserve

Reserve Background

El Ocote tropical forest was declared a "Natural Area Native to the State of Chiapas - tall rainforest vegetation type" in 1972, with a surface area of 10,000 ha (24,700 acres) (*Official Daily*, 1972). In 1982, El Ocote forest, with a surface area of 48,140 hectares (~118,906 acres), was declared a Forest and Fauna Protected Area (D.O.F., 1982). Unfortunately, this declaration left unprotected rainforests that serve as a biological corridor between El Ocote forest and Los Chimalapas forested area. Finally, in June 2000 its legal status was upgraded to the El Ocote Biosphere Reserve (D.O.F., 2000) and extended its coverage to 101,288 hectares (~250,181 acres), including the aforementioned biological corridor and a contiguous core conservation area of nearly 50,000 hectares (123,500 acres).

The Reserve is located on the western portion of state of Chiapas, with altitudes that range from 800 to 1500 meters above sea level (2632 to 4935 ft.), with steep slopes comprised of mountain ranges and smaller mountains. This produces as a result three types of climate, ranging from humid and warm to humid and semi-warm, with average annual precipitation from 1,400 to 2,300 mm (55" to 93") (Map 4).

In terms of biological wealth, there are 10 kinds of vegetation from a total of 19 existing in Chiapas (Breedlove, 1981), most notably tall and medium evergreen and semi-evergreen rainforest. 705 plant species have been registered, a number which may increase to nearly 2000 once the area has been more thoroughly studied. In terms of fauna, a total of 646 species of terrestrial vertebrates have been reported, distributed in the following fashion: 24 amphibians, 58 reptiles, 460 birds and 104 mammals, representing 45% of the vertebrates of Chiapas and 23% of the vertebrates found in Mexico. Of this wealth of species, the El Ocote Biosphere Reserve also protects 19 species of animals endemic to Mesoamerica. There are 103 species in the Reserve under some protective status such as the International Union for the Conservation of Nature (IUCN), International Convention for the Traffic of Threatened and Endangered Species (CITES) and the Official Mexican Ecological Guideline #054 (1994, NOM-ECOL-54/94). The Reserve also protects plant species endemic to Chiapas, one of which is endemic to El Ocote Reserve, and 30 that fall under the protective status of CITES and NOM-ECOL-54/94 (SEMARNAP-REBISO, 2000).

The Reserve also offers important ecological functions. For example, the native vegetation helps capture rainwater and filter it down to the intricate underground water systems (above ground rivers and streams are almost entirely absent in the area) towards the Netzahualcoyotl Dam. The Reserve also moderates climatic conditions for the agriculturally important region of the central valley of Ocozocoautla de Espinosa and Cintalapa de Figueroa municipalities. The protected forested biomass in the area serves as a carbon sink. Vegetative groundcover also conserves soil and reduces the risk of erosion and landslides that can block the rivers that flow into La Venta canyon. On the other hand, unique geomorphological characteristics in

the Reserve make it a special attraction to speleologists with close ties to archeology and hydrogeology.

The socioeconomic values of the El Ocote Biosphere Reserve are the environmental services it provides, mainly the contribution of water to the Reservoir of the hydroelectric dam on the Grijalva River, where there is also considerable fishing activity among the communities settled along its banks. The water Reserve of the La Venta River Canyon measures 600 million cubic meters which, given that it is still unknown to many, is kept pure and unpolluted (SEMARNAP-REBISO, 2000).

Objectives of the El Ocote Biosphere Reserve

The El Ocote Reserve Management Plan is based on these important values mentioned above. The Reserve staff have defined the following objectives as the guiding principals behind their work:

- Conserve and maintain the natural cycles and biological processes of tropical forested ecosystems;
- Conserve wildlife species, particularly those that are rare, endemic and in danger of extinction;
- Promote the development of local and regional communities, based on sustainable and integrated land use and natural resources, in order to improve social well-being and quality of life;
- Protect forest cover and the Grijalva River watershed to prevent erosion and runoff;
- Protect the archeological sites, caverns and subterranean rivers;
- Maintain the climatic stability of the region;
- Create relative comprehension of the balance of natural resources among neighboring communities and the public in general through environmental education, interpretative programs and ecotourism;
- Provide opportunities for the development of scientific research and monitoring; and,
- Protect scenic beauty.

Fifty-two percent of the El Ocote Biosphere Reserve territory is federal land (core conservation region), 48% is held by 32 communal land parcels or ejidos (buffer zone), of which 23 are Tzotzil Native American and the remaining nine are of mixed ethnic heritage. Within these boundaries lives a population of 8,013 inhabitants, with an annual growth rate of 3.6% for the 1990-1995 period. It is important to underline that 63% of this population speaks indigenous languages (predominantly Tzotzil), of which 83% also speak Spanish and 17% are monolingual.

The management of the Reserve is focused not only on activities in the core conservation area and the buffer zone, but also on more specific zoning based on landscape assessments and land use planning. Twenty different land uses have been defined. A series of land use guidelines have been developed to help mitigate or prevent unwanted environmental impacts and fomenting technological improvement of traditional production systems. These guidelines are organized in four comprehensive management policies: a) protection (core area polygons and some well preserved sites within the buffer zone); b) restricted and traditional rights use only; c) sustainable extraction of natural resources; and d) restoration (SEMARNAP-REBISO, 2000) (Map 4).

History of Community-based Conservation

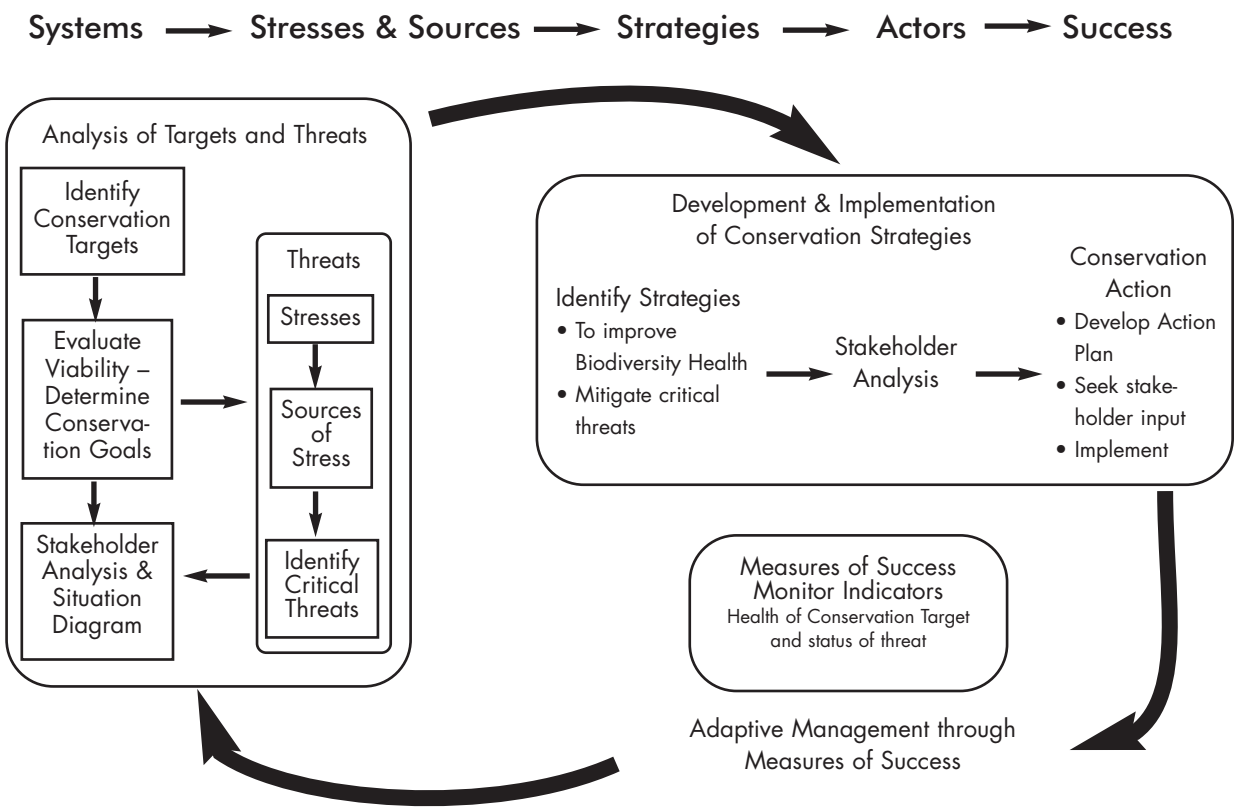
Work with local communities began in 1991-1992 with an incipient program of community development in two communities of the southern zone of the Reserve,

neighbors to the first ranger's station established in the Reserve (Rabasa Station). Some alternatives were promoted for the improvement of agricultural production systems (such as corn and coffee) and basic information was gathered on these communities in order to complete socioeconomic evaluations. At the time, the working philosophy was community development through the implementation of productive projects as a first step towards approaching the communities. The Reserve hoped to establish social linkages where the farmer became a subject of the process and not just an object to be managed.

Later on, the 1993 Operative Plan was developed, in which productive or extractive human activities were identified as key threats to the Reserve. The focal area of the program was increased to include communities located in the northeastern and eastern regions of the Reserve with experimental plots using corn and natural, organic fertilizers, family gardens, and camedor palm greenhouses.

In 1994 and 1995, several events took place that created the ecodevelopment program. First, the Reserve held a Threat Assessment Analysis workshop using the Nature Conservancy's Site Conservation Planning methodology (with some modifications and adaptations – see Figure 2). This analysis showed that the ecosystems under the most duress were the semi-evergreen medium rainforests and the principal threats being caused by slash and burn agriculture, extensive cattle grazing and population growth. Likewise, by stratifying environmental impacts and their causes (threats), the Reserve identified two critical conservation areas: Northern zone and

Figure 2: The Nature Conservancy's Site Conservation Planning Methodology



Eastern zone. In the Northern zone the main impact is the destruction of habitat through the expansion of cattle grazing and seasonal agriculture. In the Eastern zone the environmental impact comes from habitat fragmentation provoking future habitat destruction, caused primarily by the cultivation of corn and beans, and later by cattle raising.

The threat assessment was of enormous value as a tool to define land use capacity and protected areas zoning to help identify management guidelines for the Reserve. However, it only focused on the sources of environmental impact on conservation targets, without going into greater depth in terms of socioeconomic analysis of the threats. Thus, the threat assessment failed to identify technological, social, or cultural characteristics that might influence or provoke the environmental impacts.

It was then necessary to study and evaluate the production systems identified as high priority threats to be able to propose alternative solutions. In this vein, diagnostics studies were completed for coffee production, cattle ranching and corn cultivation that allowed the Reserve to better understand these productive systems and detect determinant factors that provoke the critical environmental impact, as well as identify appropriate solutions.

Based on the original threat assessment, socioeconomic diagnostic studies and subsequent threat assessments, the Reserve staff learned that the agricultural endeavors by themselves were not necessarily the cause of the environmental impact, but rather the level of technology and antiquated practices used in these systems that caused the threats.

On the other hand, when the El Ocote Forest and Fauna Protection Area Strategic Plan for 1995-2000 was written, all organizations and institutions working in the region agreed to not duplicate efforts in the same communities. For example, Biosfera A.C., a local non-governmental organization (NGO), and the El Ocote Biosphere Reserve were both working in communities in the northern zone of the Reserve. Phase one of implementing the plan was considered complete when the Reserve was recognized as a permanent entity, which had garnered positive local acceptance and a basic understanding of the Reserve's conservation agenda in these priority communities. The next step for the Reserve was to consider how they could encourage a sense of ownership within the communities of this conservation agenda and sustainable development so that local communities were invested in applying these conservation tools. It was clear that through proactive involvement of the local communities and leaders there would be powerful results.

When drafting the 1995-2000 Strategic Plan, the Reserve extrapolated from the threat assessment results, formulating an objective for each one of the priority threats, then identifying strategic actions to achieve these objectives. These actions were grouped into programs, once again giving shape to the ecodevelopment program with the following subprograms: agroecology, organic coffee production, environmental education, sustainable livestock systems and forestry.

From this strategic plan emerged a new generation of projects that were implemented in communities located in the Eastern Zone of the Reserve: organic coffee production, energy-efficient stoves, bee keeping, cattle ranching, pasture rehabilitation and farmer training.

In 1997, the search for answers to the problem of community project participation and community ownership of the projects and alternatives proposed by the communities, provoked the Reserve to use rural participatory evaluation methodology as a new

Table 4. Production and Social Aspects of El Ocote Biosphere Reserve.

Cattle Ranching	Corn Production	Population growth
* Based on extensive grazing * 50% native Bermuda grass * Herd density of 1 head/hectare * Low production and reproductive parameters * Occupies 70% of ejido lands * Capital-poor producers	* Agriculture on the slopes of steep mountainsides * Slash and burn system * Erosion and loss of soil fertility * Low productions not enough for self-sufficiency	* Total population of 8,013 inhabitants * Annual growth rate of 3.6% for 1990-1995 * 63% Native American population * 51% of the population is under 15 years of age

strategy to the approach, problem identification, reflection and problem solving.

Likewise, in early 1998, the socioeconomic diagnostics were updated. The key results of these diagnostics are summarized in Table 4.

The forest fire that took place on the Reserve in 1998, given its magnitude and the grave ecological impact it triggered, suddenly changed the immediate priorities of Reserve management and made it necessary to once again update the threat assessment in 1999, with the following results:

- Most stressed systems: Medium semi-evergreen rainforest and high evergreen rainforest.
- Principal impact: Destruction of habitat, erosion and decline of biodiversity.
- Principal threats: Forest fires, seasonal agriculture and extensive cattle ranching.

This latest change in priorities, as a result of aforementioned fire, established a new line of work that by the year 2000 had permeated all programs of the Reserve: environmental restoration, which gave the ecodevelopment program a very important role in the prevention and fighting of forest fires, reforestation and sustainable agriculture which includes practices such as no burn corn production, plantation-pastoral systems to diversify extensive cattle ranching.

Current Community-based Conservation Program

The current community-based conservation program in El Ocote Reserve was developed based on new guidelines established in the 5-year management plan recently approved and in accordance with the "Use of Natural Resources, Sustainable Development and Public Use." This plan is subdivided into 10 subcomponents, including projects channeled into the planning, promoting, and regulating of sustainable use of natural resources. Community participation and institutional interaction is emphasized throughout these subconponents. Working with communities requires forming alliances and creating a common front to conserve existing biodiversity so that the quality of ecosystems is not impacted by incompatible resource use by buffer zone communities. In order to achieve this, techniques and methodologies focused on sustainable development are being implemented, with the goal being income generating mechanisms that permit the sustainable use of natural resources, thus contributing to the improvement of the quality of life in local communities without harming the resources (Table 5).

Achievements and Limitations

Achievements

Community work in the El Ocote Rainforest has not followed a linear course, on the contrary, its path has been reactions to

Table 5. Community Initiatives and Objectives within the Buffer Zone of El Ocote Biosphere Reserve

Current projects	Specific objective
Stabilizing shifting agricultural systems such as corn production	Improving and conserving the fertility of soil through the use of leguminous cover crops associated with corn production
Organic coffee production	Foster an agroforestry system of organic coffee, replenishing natural resources and the culture of local inhabitants
Reforestation	Reforest compact areas effectively and with social benefits, while restoring deteriorated ecosystems
Management units for sustainable use of wildlife flora and fauna	Promote the sustainable use of wildlife flora and fauna through species and habitat management with productive goals, based on rates of sustainable use and non-extract uses (ecotourism)
Semi-intensive cattle ranching	Detain and reverse the advance of border cattle ranching through the support of technologies focused on generating agricultural, plantation and pasture systems in a field called agrosilvopasture
Family gardens	Intensify the family productive unit through the use of gardens as a food supplement

obstacles that have halted actions or changed its direction. However, the program has generated some major achievements and advances towards making conservation compatible with social and community development. The most outstanding achievements of community-based conservation on the Reserve are listed below:

- Continued presence in six communities with technical assistance and project replications in other communities through community extensionists;
- Appropriate training for Reserve staff to resolve technical issues;
- Community assessments have created a deeper knowledge base of social dynamics which, in turn, has led to better articulation of the community-based conservation work;
- Guidelines and benchmarks to measure communities according to progress on social processes, such as the strengthening capacity building, management skills, leadership and empowerment;
- "Gender-related" activities;
- Coordination with three town councils, achieving joint participation in preventing and fighting forest fires;
- Joint Reserve-community participation in project design;
- Collaboration with the Reserve in conservation planning by the Union of Alvaro Obregon Ejidos, which includes 22 communities located in the El Ocote Biosphere Reserve buffer zone.

Limitations

The main limitations that have come up in the completion and performance of community work in the Reserve are as follows:

- Lack of trained personnel from different disciplines;
- Lack of financing in order to provide continuity to projects and personnel, a situation that translates into the loss of trained and conscientious employees;
- Lack of integrated, shared vision between the productive and environmental sectors of the state and federal governments;
- Lack of a system to monitor and systematize results, which would permit the timely evaluation of the impact of conservation projects and community development;

- The still scanty appropriation by communities of projects proposed and implemented by the Reserve;
- Not having a mid- and long-range training plan that would allow the Reserve to provide consistent, focused training for long-term employees and better define the professional profiles and skills to manage the Reserve; and,
- The language barrier, given that technical staff are not fluent in the predominant indigenous language: Tzotzil.

Future Outlook

The activities contemplated within the Ecodevelopment program will be developed in line with the Utilization of Natural Resources component presented in the El Ocote Biosphere Management Plan.

The strategy in progress also includes cooperative mechanisms that would permit conceptualizing the natural resources of the Reserve as having productive potential for alternative development in buffer zone communities. In turn, a mechanism could be established to raise awareness among residents, visitors and persons passing through of the benefits obtained through the Reserve in terms of environmental services such as ecotourism, water catchment, and climate regulation. These mechanisms will promote a wide range of stakeholder participation in conservation and sustainable development of the area.

The involvement of all sectors constitutes the foundation of this effort, consequently the Reserve supports increased participation among indigenous and farming organizations, the El Ocote Reserve Technical Advising Council, town councils, institutions, and any foundations that encourage the sustainability of all management strategies, especially those that apply to the following actions:

- The establishment of ejido borders with respects to the Natural Protected Area, promoting self-regulation of agricultural activities within the ejido, strengthening the application of existing legislation in terms of livestock management, especially that which promotes community development;
- The regulation of natural resource use in keeping within the capacity for sustainability and zoning of the area. Likewise, the promotion of alternative cattle ranching practices such as the use of agrosilvopasture production systems, intensifying pasture management, and streamlining the use of natural resources involved in these systems. In addition, diversification of rural production through applied research, recovery of local wisdom and extension of the range of products to explore to access alternative markets such as organic or environmentally-friendly;
- Environmental community land use management, which includes regulating the land and observance of the criteria for physical, biological, and socioeconomic land uses;
- Regional support for concepts of sustainable development, environmental services and green markets as a strategy to obtain technical and financial support;
- Financial support through public and private investors in sustainable projects channeled into rural development; and,
- Social participation and interaction with institutions in order to forge alliances that allow combining forces for conservation tasks and protected area development.

Project Case Study: "El Ocote Reserve Agroforestry Alternatives"

The Ecodevelopment program serves buffer zone communities in the Reserve that are causing the deterioration of ecosystems and face a classical quandary of the environment versus production. For example, many small-scale farmers who actually own land rarely are capable of managing their land to its optimum potential and must suffer the consequences

of working livestock on poor pasture or steep slopes. In other areas, forested lands are being cleared to establish agriculture activities, causing severe erosion.

Agricultural staples, like corn and coffee, are important crops in the region, being what most rural inhabitants consider their only means of survival. However, farmers use traditional practices like slash and burn that depletes soil fertility in two or three years forcing the farmer to search for new, more productive sites. The original sites are often logged for commercial timber then cleared for marginal coffee plantations.

From a regional perspective, agriculture and cattle ranching have caused the greatest environmental transformations in rural areas, causing deforestation with significant environmental costs and limited social benefits.

The specific objectives that define this project are:

- The creation of alternative agricultural activities in local and regional communities. These programs are based on the sustainable and integrated use of land and other natural resources;
- Diversifying and improving production systems to improve the standard of living in communities near the core conservation area, without damaging and degrading the natural ecosystems to which they are directly linked.
- Detaining and reversing the advance of the agricultural frontier in forested regions of the Reserve, avoiding land use changes by offering technologies such as agroforestry systems and adopting practices that stabilize and diversify production systems.

Steps taken by the Reserve to promote organic coffee were:

- Establishing criteria to select the ideal communities: a) communities located at altitudes of 900 meters above sea level or higher, a situation that would allow them to produce mountain coffee (to offer the best potential for value-added coffee production); b) communities that belong to the Alvaro Obregon Ejido Union (to leverage the highest impact among associated ejidos); and, c) communities that maintained forest coverage in their territory (existence of biodiversity);
- Applying ecological criteria for coffee production based on the requirements of organic coffee certification;
- Integrated management of coffee, that respects traditional values but defines management tasks that will increase productivity per hectare and promote the conversion of traditional coffee production to organic coffee production; and,
- Marketing and certification of organic coffee.

In terms of the agroforestry alternatives for corn production (corn and other crops), parcels that had already been worked in previous years were selected. In general terms, the activities carried out on these parcels included:

- Contour planting of corn to reduce soil erosion;
- The use of nitrogen-fixing trees (*Gliricidia sepium* and *Leucaena* spp.) as live fence posts and to retain soil of steep slopes;
- Application of post-emergent herbicides in crops invaded by aggressive grasses only during the first year;
- Manual control of weeds;
- Corn planted in alternate rows with cover crops such as velvet bean *Mucuna pruriens* and *Canabalia ensiformis* to increase soil fertility and reduce erosion.

The results of this process are presented in Table 6.

Table 6. Results of the Agroecological Actions carried out in the El Ocote Biosphere Reserve.

Projects	Results
Organic Coffee	* Creation of a group of 112 producers on 200 hectares found in the process of transition from traditional to organic coffee growing. * 95 producers on 73 hectares with continued technical assistance in organic coffee production in 6 communities. * Training in quality control and organic coffee production management, as well as marketing potential. * Infrastructure for coffee roasting and grinding for value-added sales. * Sales of organic coffee on a local level. * Exchange of experiences with other organic producer organizations in the region.
Stabilization of corn production	* Technology demonstrated with growing acceptance on the part of the producers. * 96 hectares of corn-green fertilizer are held by 96 producers in 6 communities. * Elevation of production per hectare from 800 kg. to 2332 kg. on the average 3 years after the project began.

Conclusion

The work carried out by the Reserve in communities with regards to the management of organic coffee production and stabilization of corn production with the use of green fertilizer has generated interest among ejido members and technical staff from other government agencies and NGOs operating in the region. The communities have received visitors interested in learning more about the technical and operative aspects of the projects. These visits have served to provide orientation and technical assistance for tasks being carried out in other communities within the region. This suggests that the communities are working as a living and effective example to repeat successful experiences among other communities located in the buffer zone of El Ocote Biosphere Reserve.

The agroecological processes have to emerge, become accepted and mature within the local spaces of communities. This implies that the community members must be genuinely convinced by the government institutions and conservation organizations working in the area. This is a long process to motivate local people to adopt these changes into their everyday life. It is often complicated by the tendency of the government and NGOs to succumb to their paternalistic vices, that leads to the attemption of turning the project into a source of temporary employment or quick fix for producers.

The results achieved on the El Ocote Biosphere Reserve are due in great measure to the degree of participation, commitment, and integration of the different social organizations. Similarly, the integration of the different institutions into an efficient and bi-lateral coordination, around the goal of an integrated natural resources management program with participatory administration for regional and community development.

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La Sepultura Biosphere Reserve

Reserve Background

In 1995, the region of La Sepultura in the northeastern portion of the Sierra Madre de Chiapas was declared a Biosphere Reserve in the state Chiapas, Mexico. It has a total surface area of 167,309 hectares (413,420 acres), of which 13,759 ha (33,985 acres) correspond to five noncontiguous core conservation areas; and 153,550 ha (379,422 acres) are found in the buffer zone (D.O.F., 1995). The topographic, altitudinal (60 to 2550 meters above sea level, or ~200 ft. to 8400 ft. above sea level), climatic and edaphic conditions of the Reserve have permitted the development of at least 10 to 18 types of the primary vegetation registered for Chiapas such as: evergreen pine forest, evergreen forest, mesophyte mountain forest, low deciduous rainforest, medium semi-evergreen and semideciduous rainforest, foggy chaparral and savannas. Such a collection of vegetation types illustrates its environmental value to the region, offering a unique site with tremendous wealth and natural diversity in the State of Chiapas. This is reflected in 507 species of vertebrates of which 38 are amphibians, 78 reptiles, 293 birds and 97 mammals, which are equivalent to 42% of state fauna and 20% of national fauna. Likewise, to date 407 species of plants from 72 families have been identified. 30% of fauna and 3.6% of flora in the Reserve have been given conservation status of some kind including a high number of endemic species (INE, 1999).

On the other hand, being located on the continental divide between the Pacific Ocean slope and the Central Valley of Chiapas (Gulf of Mexico slope) attests to its important role in the maintenance of hydrological cycles in the region. The dense forest cover acts as a sponge to ensure a constant flow of fresh water to the coastal lagoons on the Pacific coastal plains. All these services provided by the Reserve creates favorable conditions for the development of agricultural and production oriented activities essential for regional economic development.

The population of the Reserve is 23,145 inhabitants. The annual rate of population growth from 1990 to 1995 was 1.47%, slightly less than the state median. The dispersion of the population in rural communities is characteristic of the Reserve, by virtue of the fact that 89% of the population is disseminated among 125 rural settlements and 11% in a single urban community. Many of the communities within the Reserve have been marginalized, due to the inaccessibility, difficulties in communication, and the productive characteristics of the land, triggering a very low level of income (INE, 1999).

Land tenure is distributed as follows: 47% small landowners, 48% ejidal lands (communal lands for agriculture and livestock) and 5% vacant and federal lands.

The principal objective of La Sepultura Biosphere Reserve is to maintain biological wealth and diversity, essential ecosystems, and environmental processes that provide socially just, environmentally benign, and economically viable development for communities in and near the Reserve. The Reserve hopes to create a living model of sustainable development for current and future generations.

Objectives of the La Sepultura Biosphere Reserve

- Conserve representative samples of the ecosystems of the Sierra Madre of Chiapas.
- Protect, manage and restore the hydrological basins that compose the Sierra Madre of Chiapas
- Provide and supply opportunities for the economic and social development of local communities through the generation, rescue and adoption of productive experiences akin to conservation and protection of natural ecosystems.

The management of the natural protected area takes into consideration the legal zoning handed down by decree (Nuclear Zones and Buffer Zone) as well as the zoning produced by the territorial environmental ordering developed for the area (Table 7 and Map 5).

History of Community-based Conservation

In 1996, the Reserve was included in the program of service and administration for pilot areas implemented by the National Ecological Institute (Instituto Nacional de Ecología –INE) from a list of 25 natural protected areas. In November 1996, field staff was appointed consisting of professionals with experience in the management of Natural Protected Areas.

This five-person team was faced with the challenge of how to adequately manage such a wide area with limited human resources. They decided to stratify the area into distinct regions to maximize coverage. Within a year, the original Reserve staff was able to provide public information to all 42 ejidos in the area regarding the establishment of the Biosphere Reserve. Also, this team began to gather first-hand information about the environmental and socioeconomic conditions of these ejidos.

The diverse landholdings and tenure illustrate diverse land use patterns and practices. Small private landowners possess the best lands, developing cattle with adequate management practices and economic returns. On the other hand, ejidal lands tend to be less fertile and more difficult to access and generally offer deficient productive systems. For instance, most farmers practice agriculture and extensive cattle ranching throughout the intermountain valleys, fertile lowlands and slopes, causing serious environmental problems such as in terms of erosion, nutrient leaching and water contamination.

Table 7. Objectives of La Sepultura Biosphere Reserve per Management Zones

Management Zones	Objective
Core Conservation Area	Conserve ecosystems representative of the Sierra Madre de Chiapas in situ Permit only environmental research and education
Outstanding Natural Areas	Conserve natural resources of the Reserve by fostering research, recreation, environmental education, and sustainable use
Restoration	Rehabilitate areas with serious problems of deterioration
Open Areas	Permit and foment recreation with non-destructive activities, develop educational and environmental interpretation activities on controlled sites
Cultural or Historic Areas Agriculture and Livestock	Foment archeological and anthropological research, restoration and tourist activity development
Intensive Agriculture and Forest Use Restoration	Promote the development of sustainable forms of agroecological activities with emphasis on best management practices and recovery of production forest areas
Livestock Use	Foster improved traditional practices with appropriate technology
Urban and Suburban Zones, Roads	Foster planning, environmental regulation and community organization

However, it is important to mention that parts or all of the core conservation areas have been superimposed on ejidal lands and, in some cases, over private property. Likewise, illegal extraction of timber and non-timber forest products has been ongoing for many years.

Therefore, work on the Reserve has been based on three fundamental concepts:

1) Working with communities causing a negative impact on important ecosystems within Reserve by using inappropriate agricultural, livestock and forestry practices.

2) Negotiating with ejido members to establish permanent forest areas to support the critical conservation core areas within their ejidal lands.

3) The development and publication of the La Sepultura Reserve Management Plan (completed in 1999), and establishing the foundation on which the operation and management of the area will be carried out. This document contains strategies and actions to foster the conservation of Reserve's natural resources.

After developing good relations with ejido leaders and communities and insight gained towards the principle issues causing impact on the natural resources, ironically, the Reserve initiated activities focused on controlling illegal logging by filing complaints with the Federal Commission for Environmental Protection (Procuraduría Federal para la Protección Ambiental - PROFEPA).

These actions triggered a negative reaction among some inhabitants of the communities, who attempted to keep Reserve staff from the area from doing their work. The situation escalated to threats. However, among other community members, it sparked a process of reflection. The Reserve staff emphasized to community leaders that more damage was done by illegal extraction of forest resources with very few economic benefits to the community as a whole.

In some cases, illegal harvesting was stopped. But in areas where such activities continued, it was necessary to change strategies in order to convince these communities of the value of conservation activities within the Reserve and to demonstrate sustainable livelihoods that were compatible with these conservation activities. The goal was to try to counteract any antagonism between the communities and Reserve personnel.

The next phase consisted of implementing production-oriented projects in the communities to begin to offer alternatives to avoid land use change from forest to agriculture. Not only were projects based on improving farm productivity but also ecological restoration, protection of natural resources, and environmental education. The Reserve worked with communities to consider an array of activities that could mitigate the environmental impacts caused by inappropriate management practices in the area, and offering training to test alternative agricultural systems capable of improving production and reducing costs or increasing efficiency. These activities included the use of Nitrogen-fixing bean as a green fertilizer, conversion of seasonal crops to perennial coffee production, recuperation forested areas by reforesting degraded lands, and farmer to farmer exchanges.

Current Community-based Conservation Program

Community work on the Reserve is based on four fundamental aspects:

1) **Productive Restoration –** Consists of achieving self-sufficient food production among regional communities through activities that improve and conserve soils, establishing appropriate crop production and intensive land management;

2) **Ecological Restoration –** This component has as its fundamental premise the recovery of degraded forested lands that are an important source of environmental services and habitat for numerous species of flora and fauna;

3) **Protection of Natural Resources –** Promotes the support of management and sustainable use of natural resources within the area; and,

4) **Training and Environmental Education –** This program intends to foster an understanding of the importance of natural resource conservation in order to improve the quality of life, as well as the adoption and adaptation of forms of agroecological production that permit the sustainable use of natural resources.

These strategies are described by the components of the Reserve management plan, which are:

1) Conservation and Management

Objective: To ensure the permanence of attributes, species and natural populations within the area protecting the successional processes that initiated these populations and guaranteeing the conservation of the biological wealth and diversity of the Reserve, through suitable and sustainable use of natural resources.

2) Sustainable Use of Resources and Public Participation

Objective: To promote the conservation of the natural attributes of the Reserve through the sustainable use of its resources, preserving the traditional knowledge of local inhabitants and tailoring diverse production oriented activities, to reduce the environmental stresses caused by agricultural activities on ecosystems and natural resources as a whole.

3) Environmental Education, Information and Training

Objective: Promote the comprehension and local participation by the general public in the protection, conservation and management of the natural resources within the Reserve. Establish best management practices for the sustainable use of resources ensuring that they are environmentally benign, economically viable and socially beneficial practices.

Taking into account the four aspects of work on the Reserve, current projects are outlined in table 8.

Achievements and Limitations

One of the main achievements has been an outreach program that has provided basic information about the Reserve to 42 ejidos within or near the Reserve. Similarly, 27 ejidos are included in the ecological restoration program with a total of 688 hectares of reforestation with timber species (pine and tropical hardwoods) and 31 hectares of non-timber species, 165 hectares of natural regeneration management in pine forest, tropical cloud forest and rain forest sites.

The work developed among communities of the Reserve has required a need to obtain real information on community issues. Therefore, it was necessary to assess community participation and prioritize their conservation work in the communities most willing to work with the communities. This has led to the development of a healthy relationship between the Reserve staff and several key communities. The Reserve and the community members have addressed key issues and sought alternative solutions that are compatible with the protection of the Reserve. Eight community participation assessments have been used to address these needs and integrate a conservation approach to fulfilling the expectations of these communities. These assessments serve as a cornerstone of community work in the Reserve. With these assessments, the Reserve plans to work towards the implementation of environmental planning through participatory process to foster solid buy in by the interested communities.

More specifically, the Reserve has accomplished the following:

❖ The control of illegal logging that was taking place in some communities.

- Successful negotiation with a community to designate part of their land (301 ha) for conservation within the conservation core area of the Reserve.
- Reserve Management Plan with a consensus support from communities in the area, published by the Official Daily of the Federal government.
- A Technical Advising Council, composed of representatives from the communities, municipal town councils and some government institutions in the academic and research sector. This council is regionalized and participates in conservation activities of the protected area.
- The role and participation of the Autonomous University of Chiapas has increased in conservation tasks and management of natural resources within the Reserve.
- Intense community participation has been clearly evident in the prevention

Table 8. Current projects in La Sepultura Biosphere Reserve

Project	Objective
a) Productive Restoration	
Establish Family Organic Gardens	Promote home gardening activities to help improve self-sufficient food production among Reserve communities.
Establish Green Fertilizer Treatments	Promote the use of green fertilizer for agricultural use and counteract the loss of soil, likewise, create alternatives that avoid the use of fire in agricultural areas.
b) Environmental Restoration	
Reforestation	Recover forest areas by reforesting parcels where agricultural use is detrimental.
Management of Natural Regeneration	Recover forest areas in those areas with a potential for natural regeneration, where agricultural and livestock use is detrimental.
Plant Production	Promote the production of native plans for use in the recovery of forest areas in the Reserve.
Establish Soil Conservation Tasks	Promote soil conservation through the establishment of tasks that permit its recovery, above all in zones with serious erosion problems.
c) Protection of Natural Resources	
Fire Prevention Program	Prevent and diminish the occurrence of forest fires through environmental education, training, and producer involvement promotion actions as well as the control and extinguishing of fires.
Supervision and Follow-up of Forest Utilization	Detect and report illicit environmental activities to the appropriate authorities and provide follow-up until they have been solved. Provide technical assistance in extraction of timber and non-timber forest products.
Integrated Watershed Management	Promote community and watershed ordinance as well as the formation of a watershed council.
Palm Belt on the La Sepultura Biosphere Reserve	Protect core conservation area by eliminating extraction of camedor palm, promoting its cultivation and management in the buffer zone of the Reserve and establishing wildlife management units.
d) Environmental Training and Education	
Forest Education and Creation of a Forestry Culture	Promote changes in attitude within communities that values the forest resources as alternative sustainable development.
Training on Agroecology Activities	Foster the use of green fertilizer and conservation work, through training workshops targeting communities in the buffer zone of the Reserve.
Assessment of Training Needs	Identify training needs in agriculture, livestock and forest producers with the objective of developing a training agenda to fulfill these needs.

and control of forest fires through the formation of fire fighting brigades.

- Approximately 240 hectares of organic bean cover crops associated with corn production has been established for the restoration of agricultural soil on 12 communal land parcels of the Reserve.

Limitations

One of the more pressing drawbacks in rural community work has been the dependent attitude many communities have on government institutions. Most communities rely on these institutions to resolve any issues the community might face rather than proactively search for a solution with the resources they have. There is no pursuit of a self-development process for problem solving; likewise the level of education is extremely low, which limits the transfer of alternative technologies.

Also, access to community project financing is difficult. When financial assistance is provided by government institutions, the process is slow and bureaucratic. This means that resources become available at times when the conditions for the execution of the projects are not optimal.

Finally, there is little participation of government institutions in conservation activities outside of the work being done by the Reserve. The lack of Reserve staff for community development and conservation activities has become a substantial limitation to following through with initial community-based conservation work in these priority communities.

Future Outlook

Community work in the Reserve will be based on assessments of community participation and focused on priority communities located in the buffer zone of the five core conservation areas. This means that the resources will be channeled into these communities with the objective of having them serve as model communities in the conservation, protection, utilization and management of natural resources.

It is essential that a process of community organization, environmental education and training be initiated based on community needs, community assessments and the potential for land use within the buffer zone of the Reserve, in order to achieve the project objectives focused on community development.

Given the limited personnel and the cost required to dedicate staff to community work, the Reserve will develop a program to develop community promoters who will help identify the needs and resources of the communities and help prioritize the key producers and leaders of the community.

In this sense, community training is important for the formation of the promoters, as well as the adoption and adaptation of different technical tools to improve the development of activities carried out in each of the communities. And, if needed, those community members that hinder innovative approach should be exclude from the process and benefits of the program.

Given that most projects and financial support target adult men, La Sepultura Reserve aims to encourage gender equality within the communities through projects that take into account the different roles played by women, youth and children.

The organization of producers with common goals will improve community development, assist in marketing channels for their products, obtain resources for projects, and hopefully improve public health conditions and educational resources. Optimally, these community benefits will eventually improve natural resource use and management that can improve the community's quality of life.

But, support førom inter-institutional participation is key to success. These institutions, if managed appropriately, can ensure a focus on economic resources and capacity-building for the creation of community development initiative that will have a multiplying effect as living laboratories of sustainable development.

By establishing the necessary mechanisms to encourage long term financial investments that will allow community work on the Reserve to be consolidated and not cut off under any circumstances, will be essential in creating the culture and institutional support to such initiatives.

The Reserve plans to strengthen Environmental Education efforts to increase the value of the forest as a source of environmental services such as the supply of water and firewood, soil retention and protection against flooding as well as for its potential to generate a sustainable economic income. Reserve personnel are convinced that this region offers an excellent opportunity to demonstrate to local communities the importance of the forested landscape and the loss represented by poor forest resource use. Those interested in the forested landscape will attempt to use forestry experts as a means of determining how to balance the protection versus production of agricultural and/or pasture areas.

Project Case Study: "Tierra y Libertad Ejido, Villaflores, Chiapas - Reforestation and Natural Regeneration Management Plan"

On the ejido Tierra y Libertad of Villaflores municipal area in Chiapas, the inhabitants practice slash-and-burn agriculture, extensive cattle raising and logging. Heavy equipment for logging, wide-spreading pastures on steep slopes, and poor nutrient cycling of slash and burn agriculture all lead to serious environmental deterioration. Approximately 900 hectares of communal land is found within the core conservation area of Tres Picos, making this a priority ejido for the Reserve for developing more compatible land use practices to protect the conservation area.

Three years (1998-2001) following the implementation of the project "Reforestation and Natural Regeneration Management Plan," eight hectares of reforestation and 38 hectares of natural regeneration management has restored and enriched an important pine-oak evergreen forest. Nevertheless, the project has still run into several challenges as described below.

From the communities perspective, the project was initially approved in 1998 because it offered a more interesting economic package that surpassed the support normally provided by government subsidies for corn production (a program called Pro-

Table 9. Characteristics of the Natural Regeneration Sites

VEGETATION TYPE	COVERAGE (%)	AVERAGE HEIGHT (m)	
		Sept/98	Sept/2000
Tropical Cloud Forest *(Pinus, Quercus, Liquidambar)*	*Pinus chiapensis* 50%	0.40	2.50
	Quercus 20 %	0.50	1.20
	Liquidambar styraciflua 30 %	0.35	3.00
Pine-Oak Forest *(Pinus, Quercus)*	*Pinus maximinoi, P. oocarpa* 80%	0.35	1.70
	Quercus 20%	0.20	0.70

Table 10. Evaluation of Reforestation Efforts

Species	Surface area (Ha)	Average Height (m)		Survival percentage (%)		
		Aug/98	Sep/2000	Maximum	Minimum	Average
Pinus oocarpa	8	0.40	1.57	95.0	24.6	55.9

campo). The Project participants used $2,555 Mexican Pesos (approximately $285USD) per hectare of reforestation and $1,900 Pesos (~$212USD) per hectare of natural regeneration management, while Procampo provided only $750 Pesos ($83USD) per hectare of planted corn.

At first the classic negative aspects of a government initiative are repeated: paternalism, failure to complete tasks and fulfill project objectives. Also, some producers did not carry out the established activities while the government found pretexts not to carry them out. As a result, during the first year of the project, the rate of mortality among planted trees was high. In the years that followed, given the presence and technical consultation of Reserve personnel in the community, the Reserve pushed the agenda so that producers would meet their objectives for the year.

As the project progressed, the community participation in the reforestation project in Tierra y Libertad remained steady at 80% of producers (those who continue to implement the actions), while approximately 20% of producers have abandoned the project completely.

By comparing reforestation areas with the areas designated as natural regeneration sites, the regeneration sites were more successful, maintaining 100% of the producers in the program. Both the technical staff and the community participants found that it was easier to manage and protect seedling growth than to establish conventional reforestation plots. Natural regeneration required less physical effort, and was more economical and logistically simpler while reaching close to 100% coverage. The height increases of individual ***Liquidambar styraciflua*** and ***Pinus chiapensis*** trees over the two year period are outstanding (Table 9).

In contrast, the reforestation efforts had only minor success: only 56% of the seedling survived on the ejidal land plot and tree heights ranged from 0.5 to 2.0 m at two years of age (Table 10).

This success is based mainly on the permanence of Reserve personnel in the community and on producer participation in the program. The Reserve credits their efforts in fostering producer comprehension of and interest in regional environmental problems.

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Lessons Learned

After the initial workshop on Community-based Conservation in December of 1999, the reserve staff from each of the four Biosphere reserves worked together over a nine month period to complete the case studies presented above. This activity was concluded with a workshop that focused on defining the lessons learned across the reserves, the Instituto de Historia Natural and The Nature Conservancy. The lessons learned presented below are the result of reflection by the Community-based Conservation working group (reserves-IHN-TNC) during a workshop held in November 2000. These are grouped into five thematic areas:

Community Participation

1) Community projects that do not take the community into account are doomed to failure.

This was the first lesson made evident by its recurrence during the work processes developed with communities in four reserves. This can be considered as the starting point in any conservation and natural protected area management initiative that involves the local population.

2) The level of community participation achieved thus far is insufficient; there is a need to advance to deeper levels, including and extending participation, resulting in a shared responsibility for decision making and taking action.

The community participation achieved to date on the reserves is limited and incipient. There is limited information (assessments) focused solely on producers, excluding other sectors of the community as a whole (youth, seniors, women, and other marginalized figures).

3) The focus on participation should not be seen as an isolated program or project, but rather as a strategic, integrating focus that permeates all reserve tasks.

For reasons related to financing, infrastructure, and programming among others, the reserves have demonstrated that many community initiatives begin with a single idea and are not integrated into the organization or planning from the start.

4) Assessments of community participation are useless if they do not generate the necessary community planning to solve problems detected from within.

On the four reserves, a focus on participation has been incorporated into the inertia of community-based conservation, however, these foci have been conceptualized as specific projects within the management planning of the reserves, with the concrete objectives coming from isolated community assessments and rarely from community planning. The participatory process has not been an integral part of the management planning process for the reserves. This situation has proven to be inadequate and ineffective.

Community Work Strategy

5) Results are better if they concentrate greater efforts in fewer communities, with the intention of having selected communities serve as models and produce a multiplying effect on the neighboring communities.

One of the most common characteristics is that, in the first few years, community work on the Natural Protected Areas showed a

dispersion and lack of continuity for different reasons: changes in personnel, budget changes, changed priorities, etc. This situation limited to a large degree the desired impact of community projects, resulting in lost ground, frustration and inevitably broke any trust that had been fostered during the process within the communities.

6) It is necessary and indispensable to maintain a permanent presence on behalf of reserve personnel involved in community work and other key institutions in target communities in order to gain significant results in community work.

Similarly, as mentioned above, greater efforts focused on fewer communities presuppose a more intense and constant presence of reserve personnel.

7) The reserves must define criteria to select key communities in order to launch a new initiative. The key criteria developed in the first workshop are:

- proximity to core conservation area or zones of high biological value;
- communities are strategically located in terms of their accessibility and communications with other communities, i.e. that they act as a central hub in a microregion;
- identifiable areas of environmental deterioration such as habitat fragmentation, deforestation, over-harvesting among others, that offer the opportunity to adopting more sustainable management of these resources; and,
- acceptable level of social cohesion in the community; it is very difficult to generate participation processes in divided communities.

These statements lead in turn to the problem of knowing which communities should be selected in order to achieve the desired multiplying effect. Which selection criteria should be used? Once again, reflection and experience provided the basis for developing criteria that should be taken into consideration by all of the reserves.

8) There is a need to comprehend that these communities are not homogeneous ideal models, but rather heterogenous, differentiated from within, with figures who represent a wide variety of interests such as religious, political, and economic interests.

Everyone recognized the high diversity of interests and priorities that exist in any given community. There is no mold or recipe that can be implemented that will meet all the needs of a community. But there are methodologies to extract these interests and hopes and filter them so as to arrive at a list of priorities for the well-being of the entire community without damaging natural resources.

9) The external technical team from any reserve must present itself as a facilitator of a self-reflective and self-managing process within a given community. Local wisdom must be fundamental to the solution of problems identified in synergy with external knowledge. In this sense, the working group recognized that the external team is a fleeting entity in the lives of the communities, therefore, relations of dependency should not be established.

10) It is necessary to abandon "conservation as imposition" and conceive of "conservation as convincing," seeking relations between community well-being and conservation of natural resources and processes.

Given the persistence of conventional outreach models in which the attitude of external technicians is one of imposition of their "superior" knowledge over the "inferior" knowledge of the farmers, has proven to be very detrimental to community-based conservation.

11) There is no methodological recipe to approaching community work, but rather general action guidelines: "the road is made by walking".

The Working Group recognized that with such different socioeconomic and environmental conditions on each reserve, no recipe methodology would work across all communities. It was clearly apparent in terms of the way to approach community work that one had to look at the each situation as a unique set of circumstances and apply each methodology in the most flexible and efficient manner. The working group recognized the need to apply these methodologies in the reserves in order to identify the needs of the communal land owners and collective needs of natural resources.

12) Community work processes are long-term, there can be no significant results on a short-term basis.

Many government and financial institutions involved in community projects require short term results (1-2 years), a situation that overwhelmingly complicates community development processes. Community work complex and long-term processes, and significant results may be gained only by the degree in which we successfully advance towards more effective participatory models that include all those who are involved: local communities, the different levels of government and diverse institutions, as well as local environmental and social development non-governmental organizations.

Training

13) It is fundamental that sufficient weight be given to the formation of human capital and the value of trained rural inhabitants via different kinds of incentives. Trained community members and partner organizations should be considered one of the most important attributes of reserve management.

A technical team trained in generating participatory and self-managing processes, aside from generating solutions to technical issues, is required of every institution that attempts to work with rural communities with satisfactory results. However, training brings with it the valorization of human resources, which in turn, if their moral and/or economic motivation is not renewed, tend to seek better alternatives that allow them to improve their standard of living. This has been a constant problem on the reserve teams to which we might add the high cost of training.

Inter-institutional Participation

Within the Mexican context, the difficulty involved in generating forums for inter-institutional collaboration and coordination is well known. The situation of the reserves and their Technical Consultation Councils is not immune to this reality. This situation permeates the work by the reserves with communities. In many cases, reserve personnel work in isolation, with little or no participation from government institutions interested in pursuing compatible objectives. Thus, the working group propose the following two recommendations:

14) It is necessary to achieve greater collaboration, participation and complementary efforts between different government institutions and non-government organizations.

15) It is important to carry out environmental policy and lobbying actions in hopes of promoting effective inter-institutional participation.

On the other hand, given the wide range of technical and social needs to foment community development and resource conservation, there are a large number of niches where each institution may collaborate in keeping with its work profile. There has been competition between institutions to carry out the same activities on the same sites, despite the fact that their general objectives and specific capacities do not correspond with the appropriate solutions. It is important to recognize that the institutions with rural development profiles can complement those that have research objectives or who are dedicated to generating alternative uses of natural resources, without risking

the loss of their identity or contribution by adopting methods and projects outside their missions.

Financing

16) Among the financing priorities of a Natural Protected Area should be relying on the necessary, specific and secured funds to maintain personnel for community-based conservation work. If technicians do not have secured salary, it will be difficult for them to think efficiently and be creative and devoted to the mission.

One of the causes behind discontinuity of community work and loss of trained human resources has been the interruption or redirection of financing at different times in the history of reserve management.

Where Do We Go From Here?

Reflection regarding the future of community work is closely linked with the lessons learned. However, there is a pressing need to reflect on the perspective that the vision developed by institutions in charge of natural protected area conservation is not necessarily a vision shared by local communities. Identifying points of confluence and divergence will remain a constant challenge in the construction of conservation and local development strategies for natural protected areas. One priority for those working on conservation issues is to foster a process that integrates community social issues within the natural protected areas; and, maintain a close, respectful relationship with these communities in order to reach a consensus on the interests and ideals of both through common goals.

Likewise, it is necessary that the alliance formed by the Reserves (CONANP), IHN, TNC and other organizations reinforce and guarantee the continuity of conservation strategies in all four natural protected areas, even in times of political change.

Since each of the four biosphere reserves mentioned above are currently undergoing similar processes of reflection and planning (they are currently drafting their 5-year management plans) and having collectively analyzed their future outlook, several common points were identified to strengthened in the years to come:

- Consolidate the relationship between protected areas and those communities where a dynamic of integrated work has been established, seeking the creation of strategic alliances with them in order to influence and extend their coverage and participation in conserving and managing the reserve.
- Transition towards deeper, more inclusive and extended levels of community participation and towards increasingly closer degrees of participatory decision-making within the conservation and development projects supported by the natural protected areas, while also including women, children, youths and seniors.
- Strengthen the development of self-development capacities, as well as the empowerment of communities, through increasingly more aware and active participation, training, community organization and education of community extension agents and promoters.
- Multiply efforts towards environmental management and policy with all agencies on local, state and federal levels of government, non-government organizations and civil society. Actively involve these institutions in community work within the reserves and create strategic alliances that target this work from the different topics in their respective fields, such as: public health, education, agriculture and livestock support, etc.
- Reorient the Technical Consultation Councils for each reserve, in such a way that they become true forums of inter-institutional and community participation, and encourage reflection and analysis regarding conservation and sustainable development processes in the natural protected areas.
- Regulate the use of natural resources respecting sustainable management guidelines and zoning of land use around these reserves, promoting self-regulation of productive activities within the ejidos and communities.

- Establish monitoring mechanisms and identify indicators that can be measured continuously to evaluate community projects executed on two levels: a) completion of proposed actions, goals, and objectives; and, b) advances toward sustainable development. The reserves will be able to redirect possible deviations or correct errors in project design or implementation and take necessary measures to effectively and efficiently meet the proposed project objectives and goals.
- Foster environmental education to complement production related activities and the management of natural resources, as well as integrating the connectivity of the protected areas management programs. Likewise, incorporate elements of environmental education in the curricula of schools in communities settled in the buffer zones of the protected areas.
- Support initiatives that contemplate payment for environmental services provided by the reserves for the public at large and that translate into tangible benefits and incentives for those communities participating in conservation processes and sustainable use of natural resources within the protected areas.
- Strengthen the organizational structure of the protected areas so that they will permit the generation of technical and administrative capacities in response to social and conservation issues.

Finally, with these actions, the long-term vision is for the communities to take over management responsibilities of the reserves. At least, the reserve personnel are optimistic that conservation initiatives will form part of the agenda and interests of the local inhabitants. This way, conservation will no longer be a quest or induction from institutions and environmental groups but rather a commitment of the people and a democratic demand for universal rights.

Conclusions

Each of the reserves and institutions involved in the workshops and the Community-based Conservation Working Group offer lessons well learned and new tools that can be replicated in other reserves both in Chiapas and in Latin America.

However, community-based conservation work in the reserves has not followed a linear course. On the contrary, it has run up against obstacles along the way that have halted or changed the direction of specific actions. There have been major achievements which have permitted advances in the task of making conservation compatible with social development. Beginning with the initial workshop, the exchanges of the Community-based Conservation Working Group have acted to promote the need for collaboration between different institutions and coordination of community work not directly, but through the communities themselves. This spirit of collaboration began in 1999 but the commitment on behalf of each reserve, the Institute of Natural History, The Nature Conservancy, and other government and non-government institutions has been to seek out a balance between community development and the conservation of natural resources.

In order to highlight the most outstanding items, the Working Group presents the most important advances for each reserve and institution and part of this work.

El Triunfo Reserve – Integration of the Social Component in our Work

The background history of the projects in the El Triunfo Biosphere Reserve communities suggests a tendency toward the incorporation of social issues into environmental work.

Following a clash between institutions and local inhabitants upon establishing a reserve on their territory, there have been attempts to integrate conservation and development, environmental education, community development, and community participation in conservation.

The El Triunfo personnel presented an important idea for consideration in the management of natural protected areas in Mexico:

"...just as there are conservation targets (key species, fragile ecosystems, etc.), there are also 'subjects of development' (women, men, children, ejido farmers, large landowners and small landowners). Therefore, the sustainable development of the local population – human development in harmony with nature – is an end in and of itself."

— Juan Carlos Castro
Assistant Director of El Triunfo Biosphere Reserve

Especially with the long and at times violent history of Chiapas, the federal government and its representatives must adopt a healthy and transparent position by working with communities where there is not a lot of trust in government initiatives.

The Encrucijada Reserve – Presence and Consistency among Personnel

The permanent presence of Reserve personnel in the zone has translated into an image widely recognized in the region by communities and institutions alike. A multidiscipli-

nary staff and team were created for the operation of the Reserve and its programs. Technical personnel have acquired experience through this trend, and recently some farmers began to form part of the process by participating as community promoters.

An increasing amount of trust has been generated among members of the communities as well as understanding between technicians and communities, reflected in the reduction of conflicts on both sides. The success achieved through 5 to 10 years of community work on the biosphere reserves can be greatly attributed to the maintenance of continuous presence in the field by reserve staff. Equally as important is the fact that many of the staff hired for community projects are from the communities themselves. They have been trained and educated in the technical planning of the reserves and have contributed to development of a good institutional image and continuity in the management and operation of these community projects.

The El Ocote Rainforest Reserve – Indicators for the Monitoring of Success

The existence of indicators that social processes are in progress in the communities the Reserve has worked with, as well as the strengthening of self-management and administrative capacities, leadership and empowerment.

La Sepultura Reserve – Community Assessments

Community assessments have been developed in priority communities of the Reserve, which has allowed community inhabitants as a whole to develop issue matrixes with alternative solutions.

The work developed in Reserve communities has carried with it a need to obtain real information on community issues, which is why it was necessary to implement participatory community assessments. In this vein, eight participatory community assessments have been integrated and form the basic foundation for community work in La Sepultura Biosphere Reserve. With these assessments, the Reserve intends to move towards the implementation of community participation in environmental land use planning. Carrying out community assessments has allowed the Reserve to delve deeper in their understanding of social dynamics and thus, our work has been better articulated.

With the conclusion of the third phase of the Parks in Peril program, The Nature Conservancy and its partners have achieved much and learned an impressive list of lessons, all of them in the field of community-based conservation. Now, the Conservancy's new mandate is to replicate and systematize these models and improve practices under new socioeconomic and environmental conditions. In order to broaden the area of impact of these tools and strategies, The Nature Conservancy and its partner, Instituto de Historia Natural, are assessing the scale of the landscape in question. The Conservancy must identify models that work in which the beneficiaries themselves can assist in applying the lessons learned to more communities and municipal areas across the region.

What stood out following the workshops, Working Group meetings and collaboration in drafting this publication was the lack of exchanges between reserve personnel. The 1999 workshop represented the first event in which professionals from each reserve and the Institute of Natural History met with the purpose of discussing their efforts under the topic of Community-based Conservation. In the end, each member of the Working Group recognized the need to document and systematize the lessons learned in their own reserves but also the need to seek out opportunities to collaborate, exchange experiences and learn from their colleagues on other reserves.

With the new structure of the Institute of Natural History and The Nature Conservancy, each institution hopes to offer the capacity to provide more consistent support for this new spirit of collaboration. IHN has contracted a person specifically dedicated to supporting Community-based Conservation initiatives under the Community Conservation Program. The Nature Conservancy – Southern Mexican Program developed a new position for a community-based conservation specialist and also hired a new regional administrator for Chiapas in order to provide follow-up for community-based conservation initiatives. Between these two institutions, there is a responsibility to facilitate collaboration among personnel from each reserve and participatory practical projects with communities. Finally, the Working Group can not emphasize enough, the important role of monitoring the progress of each reserve to adjust and improve innovative initiatives that could have a positive impact on community development and the conservation of biodiversity.

The mission of The Nature Conservancy is to preserve the plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive.

The Nature Conservancy

SAVING THE LAST GREAT PLACES ON EARTH