PRIVATE ECODEVELOPMENT CENTERS: AN APPROACH TOWARD SUSTAINABLE DEVELOPMENT

by

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CHAPTER I

INTRODUCTION

Wildlands are lands where the native ecosystems are still largely intact and human influences have not significantly changed natural processes. The world is composed of a continuum of land, from human-dominated landscapes through virgin wilderness. Whenever humans exploit the natural ecosystem to produce goods and services, there is an impact on that system. That impact, positive or negative, along with regenerative natural processes will determine how long that ecosystem will remain productive for human needs. In many ecosystems of the world, people are exploiting the ecosystem beyond its capacity to renew itself and thereby to sustain that use. To use an economic analogy, they are liquidating natural capital rather than managing the sustainable flow or interest from natural capital (Miller, 1976). This exploitation can take many forms: excess catch of fish, overgrazing and consequent spread of deserts, excessively cleared forests and subsequent deterioration of watersheds and loss of topsoil, fauna hunted to scarcity and even extinction, pollution of a river beyond its natural restorative capacity, etc.

Management of the biosphere's sustainable goods and services is imperative if the planet is to support present human populations into the next century, not to mention any increases in population.

> Human beings, in their quest for economic development and enjoyment of the riches of nature, must come to terms with the reality of resource limitation and the carrying capacities of ecosystems, and must take account of the needs of future generations. This is the message of conservation. For if the object of development is to provide for social and economic welfare, the object of conservation is to ensure Earth's capacity to sustain development and support all life. (Forward, World Conservation Strategy, IUCN, 1980).

Management of wildlands has developed to ensure conservation of renewable natural resources on wildlands for the benefit of this generation as well as future generations. National parks, the first modern wildland management category, were first conceived in the United States with the creation of Yellowstone National Park in 1872. Since then a series of management categories has been developed and utilized to respond to diverse needs of society. These categories provide for the management of tracts of public land. Categories, such as national parks, monuments, forests, etc., have served the purpose of managing for specific objectives of conservation and development. Throughout the world, acceptance and implementation of these categories is gradually becoming standardized; they seem to serve well the public's wildland needs on public lands.

A major conservation priority should now be focused on private rural lands where most of the lasting deterioration of the environment is occurring. The rural poor around the world face significant development obstacles. Many of these obstacles are fostered by unsustainable practices of renewable resource exploitation. People are exploiting and destroying natural capital to produce food because of a lack of knowledge and technology to use their natural resources in a sustainable manner. Solutions to this problem are needed that provide opportunities for long-term stable development. Rural people need access to a form of land use that permits them to improve their socioeconomic condition without undermining the ecological basis of land productivity, that produces food, fiber, water and other outputs for this generation as well as for future ones, and that neither bankrupts the small farmer with foreign chemicals nor fills the streams and rivers with rich topsoil, the most precious resource in the tropics.

Existing wildland management categories are mandated to manage public lands. Looking into the future with the most optimism possible, about 10 percent of the world's lands will be mandated for wildland management under current protection categories. These categories are oriented toward protection rather than consumptive utilization. Ninety percent of the world's lands are

private lands or largely unmanaged public lands and it is these lands that are receiving the vast majority of abuses. It therefore appears relevant and is in fact crucial to improve the management of natural resources in this ninety percent.

This gap in land management is not currently being filled by any existing category. There is a high-priority need for a category with the following characteristics: (1) relatively small, flexible lands that are managed locally; (2) that protect patches of biogeographic provinces, species and ecological communities; (3) that facilitate and guide conservation practices, sustainable rural development, and applied research; (4) that set up and promote demonstration areas based on research; and (5) that disseminate and educate local people about sustainable rural development. The conceptual development of such a category is the focus of this thesis.

The broad objectives of the Man and the Biosphere Program (MAB) Project #8 on biosphere reserves are similar to the objectives of this new category. Unfortunately, there has been much difficulty in realizing Project #8 objectives. There are many reasons for this. A few of the problems have been the lack of inter-institutional cooperation necessary for success, the large scale of management operations needed to accomplish the objectives, and the lack of incentives or immediate constituency that

could provide the local MAB Project political strength within government institutions.

This thesis will propose a new category that incorporates the concept of "thinking globally and acting locally." Conservation to sustain meaningful long-term rural development is the central goal of this proposed category. It will blend conservation and development objectives and will do so through the means of protection, research, demonstration and extension. It is recognized that reaching this goal has eluded previous efforts. While this new category should not be expected to produce miracles, it could be a big step toward implementing the goals of the World Conservation Strategy (IUCN, 1980).

This type of management program has been used at the private nature reserve of Merenberg in Colombia, South America. The Merenberg Reserve is a family-owned nature reserve that is part of a larger cattle ranch owned by the Buch family in the central Andes. It has evolved from a strict protection-oriented nature reserve to incorporate applied research, demonstration areas, and extension programs. In this thesis the Merenberg Reserve will be presented as a pilot project of this new type of category.

This thesis will present this new wildland management category, the Private Ecodevelopment Center (PEC), by introducing and presenting the problem; providing background information and a review of relevant literature;

developing a normative model; presenting Merenberg Reserve as a pilot project; analyzing and evaluating the Merenberg Reserve in terms of the features, characteristics, and objectives of the normative model; discussing the pros and cons of both the normative model and the Merenberg project; and providing recommendations for conservation leaders, protected area managers, and the Merenberg Reserve.

CHAPTER II

BACKGROUND

Introduction

This chapter will review the dilemma of rural people with regards to sustainable development. Renewable natural resource problems and trends will be discussed, as will the need for new solutions to resource management on private lands. The characteristics of a recommended solution will be presented. Parameters will be proposed which are useful for implementing a land-use ethic that embodies the conservation for development philosophy. Some existing and proposed alternatives for wildland management will be critiqued in terms of their potential and their record in solving these problems.

Development Issues

"Probably the most serious conservation problem faced by developing countries is the lack of rural development" (IUCN, 1980). This statement presents the issue in simple terms. Currently, many rural people in developing countries barely succeed in their struggle to survive. Not only are levels of personal actualization out of reach, but the survival of future generations is

threatened by destructive land-use practices. With sustainable development, not only will these people be able to produce more with less, but they will also be able to plan for the future as they recognize the importance of conserving their resources. The process of surviving can evolve into a more sustainable enterprise as the destructive and self-defeating land-use practices currently employed are replaced with more naturally harmonious technologies. The process of development does not, of course, automatically generate this transformation, but it can with vision and incentives.

Without development, conservation in developing countries cannot become a reality. There is little "spare" land or funds for traditional conservation efforts. But, development will not necessarily bring conservation either, unless it is sustainable development. The terms -- conservation, development, and conservation for development -- have different meanings to different people. The way they will be used in this thesis is based on IUCN's definitions (IUCN, 1982).

> Conservation: Managing our use of the environment to ensure maximum benefits for man in the present and future.
>
> Development: Modification of the environment and use of resources to satisfy man's needs and improve the quality of his life.
>
> Conservation for Development: The application of conservation principles to the process of socio-economic development and vice-versa (development for conservation) so

that man derives the greatest sustainable benefit from living resources.

To alter a society whose present and future economic way of life is endangered by destructive land-use practices entails a change in cultural environmental perceptions. Successfully adopted alternatives to current practices are dependent on environmental and developmental perceptions that are culturally viable. Without any alternatives, the current deteriorating process will continue; few will voluntarily stop exploiting their environment if they know no alternative. Alternatives must not only bridge from short-term survival strategies to long-term sustainable development, but they must also be based upon the input of local people. If the needed transformation reflects the concensus of those benefiting from it, they are more likely to participate in it and complete it on their own lands. It is a powerful incentive to adopt a progressive alternative if it is demonstrated to improve one's quality of life.

Renewable Natural Resource Problems

Renewable natural resources, which are the basic life support system for humans in both urban and rural areas, are in grave peril of irreversible decline; yet the demand for those resources is skyrocketing. There are several contributing causes to this decline in natural resources and to the increased demand for them, such as poor

resource management, or more accurately, the exploitation of natural capital rather than the cultivation of nature's interest; dramatic increases in human population worldwide; and an overall increase in consumption of resources, especially by the industrial countries. The decline of renewable natural resources per capita is a new phenomena. Most people assume that natural resources are endless, as new lands are exploited and new technology are developed. Technology may be able to correct some of the current decline in resources, but to do so it would have to be developed and implemented rapidly and radically, an unlikely scenario.

The decline in renewable natural resources has been studied and documented by several organizations and authors. The literature includes: The Twenty-ninth Day (Brown, 1978); U.S. Strategy Conference on Tropical Deforestation (A.I.D., 1978); Global 2000 (Council on Environmental Quality and Department of State, 1980); Conversion of Tropical Moist Forests (Myers, 1980); Tropical Forest Resource (Lanly, 1982); Forestry Activities and Deforestation Problems in Developing Countries (U.S. Forest Service, 1980); World Conservation Strategy, (IUCN, 1980); Renewable Natural Resources of Latin America and the Caribbean: Situation and Trends (Dourojeanni, 1980).

Some of these studies have been compared and the salient features of each brought into sharp focus in Ominous Trends and Valid Hopes (McHale, 1981). The World Conservation Strategy (IUCN, 1980) is less a status report than a strategy for changing current development practices into sustainable development. The Strategy can be seen as a blueprint for the future if decision makers truly want a lasting improvement in the quality of life throughout the globe.

It is clear from all these studies that conservation for development, or integrated rural development, is needed if not required by developing countries. It is the best hope available to improve land management and to conserve natural resources in developing countries. A direction for action has been identified by these recommendations, but to date the methods to achieve this goal are poorly defined and implementation has been sparse and sporadic. Several management alternatives have been proposed to reach this goal; the more important ones will be reviewed later in this chapter. Initially, the features and characteristics recommended by this author and others will be reviewed.

Features and Characteristics Recommended for Integrated Rural Development Projects

An integrated rural development (IRD) project can be designed in an infinite variety of ways to deliver

sustainable development. The following parameters are those this author believes are most important.

Objectives

The objectives of an IRD project should be based on ecodevelopment philosophy. This philosophical approach to development seeks to blend the objectives and concerns of local people with the sustainable means of achieving them. It assumes local participation, a type of grass-roots democracy, which provides for a community's search for self-reliant technologies to be determined by their needs, cultural traditions, and the capacity of the natural resource base to sustain development (see Appendix A). This type of democratic participation may be the first opportunity rural people have had to improve themselves with their own ideas. This philosophy is a radical departure from traditional hierarchical decision making by bureaucrats in a distant capital. Local involvement helps insure the success of the entire project, both during and after start-up efforts. Such self-reliant socio-economic development can be peacefully revolutionary in its impact.

It is interesting to note that Singapore's Prime Minister, Lee Kuan Yew, in 1949 outlined his approach to improving the social welfare of his people while insuring against a communist insurgency. He said, "How far . . . governments can counter the appeal and force of communism

will depend on how far they are bold enough to carry out social reforms in the teeth of their own vested interests . . . whether they can, without the communist religion, do all that a communist state can do for the masses" (Szanto, 1983). While Singapore is not a center for ecodevelopment, the concept of peacefully improving the status quo for grass-roots stability has succeeded there.

Batisse, writing about the vital need to increase the involvement of local people in Man and the Biosphere Project #8, The Biosphere Reserve, comments, "It cannot be overstressed that conservation measures - especially those which involve productive lands - will not succeed without the agreement, support and participation of the population directly concerned. Unless the administrative habits of most countries, which tend to dictate from above what has to be done in the field of nature conservation - and indeed in other fields - are radically modified, and unless major efforts are made to explain the value of protected areas and to associate the local people with their management, all conservation measures will be bound to collapse sooner or later." (Batisse, 1982)

Exploring ways to encourage local involvement, Don Graybill writes:

> Being a "community educator," "community organizer," or "citizen participation expert," among the various professional titles I have worn means basically I am concerned about the social technologies of grass-roots development. That is to say, how

> to get people more effectively defining their own needs; sorting through and choosing desirable goals for themselves; investigating resources at their disposal; and strategizing the most effective, responsible way to achieve those ends. In short, trying to help people become their own development agents.
>
> While certain biotechnologies or agricultural practices may lend themselves to decentralist development, unless local citizenry is involved in the investigation and decision-making surrounding those technologies, a subtle form of manipulation may occur in the name of progressive ecological, social and economic development. Basic dependency relationships may shift rather than be significantly altered.
>
> Yet as issues become more complex and are increasingly "forced" on the community either externally (such as the road which raises land-titling concerns) or internally (increased migration to the area which produces greater demand for services), the social technologies of development will become essential elements of the decision-making process and directions taken. The long-range ecological, social and economic benefits of certain biotechnologies may be clear to those who have an analytical, global perspective, but unless the connections and choices are made by the end-users themselves, the residual impacts of such development may be marginal at best. (Graybill, 1983)

Dasmann has written about cultural differences between ecosystem people, who are tied into a local ecologically sustainable form of resource utilization, and biosphere people, who are dependent on global trade rather than on a local ecosystem (Dasmann, 1982). This differentiation of ecosystem people as a distinct group with their own needs, fits with the ecodevelopment

philosophy and can be a useful concept in developing an integrated rural development project.

The Role of the Private vs. Public Sectors

First, the private sector has a tradition of innovation and efficiency in almost any field. Centralized governments that plan the production of practical and innovative technologies seem to lag behind governments with a strong private sector. We can see it clearly in high technology competition; state-run economies are so far behind other economies that some are actually mounting campaigns to steal high-tech secrets. The same is true in the agricultural sector. The private farmer generally produces more than government farms. A.I.D. spends hundreds of millions of dollars a year funding private voluntary organizations to develop and implement projects that it feels they do better than the public sector agencies. There is a lesson from this observation. For innovating new practical methodologies and techniques, the private sector will progress faster and in more realistic ways, given proper incentives than the public sector would in the same time. This lesson applies to integrated rural development. Incentives may be tax, status, or demonstration of improved management.

A second reason to consider private organizations is that often in less developed countries the government is often controlled by large landowners and the ministry of agriculture reflects this. A government project administered by bureaucrats with those allegiances is bound to favor the status quo rather than strive to nourish an ecodevelopment approach. A private organization independent of large landowners and agribusiness interests could coordinate an ecodevelopment project with government agencies and private individuals and organizations. Such an organization could put the applicable parts of the government bureaucracy together in a creative synergistic paradigm.

Integrated rural development projects that need innovation, flexibility and local participation would probably be most successful if carried out by the private sector. This is particularly the case during the initial stages when many details will need to be worked out through trial and error. Perhaps some private conservation organization may have a future in integrated rural development. Once a program is established and only needs expansion and stability, then a government agency could be an appropriate body to continue managing it.

Entrepreneurial Aspects

The success for any integrated rural development project will be measured by the improved quality of life

it brings the beneficiaries. It must be a profitable alternative to successfully replace any current tradition-bound exploitive system. It must also be more profitable over time. This is not to say that the start-up costs of an IRD project will not require venture capital, but if it is well planned and implemented the returns will be worth the investment. A goal all IRD projects should seek to achieve is self sufficiency from outside funding as soon as is realistically possible given ecological and social constraints. This can be achieved by marketing products produced by the project. Self-sufficiency will also be an important demonstration to neighbors of incentives to adopt the ecodevelopment approach.

Small Size

The small size of an IRD project is important not only for administrative reasons, but also so the pilot project will be compatible with the small lands of local landowners, the targets of the IRD project. If it is too large, then the bureaucracy to run it could stifle the necessary innovation mentioned earlier. The freedom to innovate is important in carrying out progressive field trials with small landowners.

There is a need for development efforts to change from a few relatively large projects (which are of a "top-down" variety) to more small projects ("bottom-up"

variety). People can relate more easily to small projects and can participate without being so overwhelmed by the scale that they lose interest. Small projects need the infrastructure of a large private institution or government agency for technical, logistical, scientific, and financial support, but the projects themselves should be small.

For biological reasons also, size is an important parameter. Traditional wisdom was that small reserves protected the flora and fauna on the site. Then island biogeographic theory questioned the usefulness of small areas in preserving the genetic pool over long periods of time. This theory was first introduced by MacArthur and Wilson in 1967, and has since been widely discussed. The most important writings on the theory include Conservation Biology, by Soule and Wilcox (1980), and Conservation and Evolution, by Frankel and Soule (1981).

This theory correlates an increase in faunal or floral diversity with greater island area and with decreasing distance from the mainland. The species equilibrium between immigration and extinction is quantitatively higher for larger islands near the mainland source than for distant small islands. Theoretically, the larger the island area the greater is the chance that it will intercept immigrants. Larger size also will provide more and diverse habitats suitable for larger populations

and for a greater number of species, thereby lessening extinction risks. The smaller island will possess lower immigration rates (because there is less territory to chance upon) and a higher risk of species extinction because its smaller size supports smaller populations.

Increasing the distance between the immigration source and the receiving island will decrease the total species present at equilibrium and will restrict immigration to species capable of withstanding the rigor of the longer journey. The species equilibrium is a balance between immigration rates and extinction rates, and is determined by island size and distance parameters.

Equilibrium can vary depending on the history of the island. For example, if it was connected to the mainland and was only recently isolated, as many land-bridge islands have been (due to glacial melting during the last ice age as late as 4 to 6,000 B.C.), then the island will start out with a mainland species diversity. It will lose species through local extinction until a species equilibrium level is reached for that island, after which time immigration rates will offset extinction rates although species turnover will still take place. For oceanic islands of volcanic origin, the reverse is true. Initially the rate of immigration exceeds the rate of extinction. Once an equilibrium is reached the number of species should remain relatively constant. However, the

species composition will remain dynamic, with species turnover still occurring as a function of immigration and extinction.

It is suggested that nature reserves may be similar to continental islands, because most reserves are experiencing a faunal relaxation. The term relaxation is used to denote the process of reaching equilibrium within a reserve as a result of the insularization of reserve habitat due to disturbance (Diamond, 1973). Diamond (1972) has calculated relaxation times for birds to reach equilibrium in the New Guinea archepeligo from, what he calls, four experiments of nature: recolonization of exploded volcanoes, contraction in island area due to rising sea level, severing of land bridges, and disappearance of land-bridge relict species. He found that smaller islands have shorter relaxation times, because "extinction rates increase with decreasing area." For example, with the severance of first-order land bridges during the late Pleistocene, the island Ron was created with 21 square miles. It has already relaxed to avifauna equilibria, while island Batanta with 175 square miles has a relaxation time of 6,450 years and Ara with 3,000 square miles has 8,210 years before it will relax into avifauna equilibrium.

Once an island's faunal species diversity has relaxed into equilibrium it will continue to dynamically turnover

in species composition as before even though its species numbers will maintain a steady state. This phenomena is analagous to a glacier neither advancing nor retreating, yet still flowing down the mountain; its meltwaters represent extinction and fresh snow immigration. A large remote island predictably will have a lower turnover rate compared to small close islands, assuming quality of habitats are equal, because the larger size affords it larger populations and greater habitat diversity and remoteness limits immigration.

On Barro Colorado island created by flooding during construction of the Panama Canal, it has been shown that there are certain species which tend to be more prone to extinction (Willis, 1974). These species fall into one or more of the following categories: 1) species with low initial populations due to extensive territory needs; 2) species with low initial populations because of very special habitat needs; and 3) species that depend on seasonal or patchy food sources and usually have great fluctuations in their populations (Diamond, 1975).

The importance of differential extinction of these species is even more important when one considers simultaneously their immigration potential. In general, these species have a much lowered ability to recolonize an area after being extirpated; this is directly linked to their dispersal potential. In New Guinea, it has been

found that the species lost from former land-bridge islands are overwhelmingly those that do not colonize oceanic islands. Thus once these species are extirpated, there is a very low probability that they will recolonize the island.

It is suggested that island biogeography theory may explain the dynamics of species loss in forest "islands" created by land cleared of the surrounding forest.

There has been considerable debate within the literature on whether several small reserves may contain more or less species than one large reserve of equal size. Theoretically many small reserves could protect greater species diversity than a large reserve of the same size (Simberloff and Abele, 1982). However, they will not protect high trophic-level species that need large areas; for those species, large reserves are indispensable. Another advantage of small reserves is protection from catastrophes such as hurricanes or epidemics which have limited impact on dispersed small reserves, but could be devastating in large reserves (Frankel and Soule, 1981).

The specific objectives of a management category should determine the critical minimum size necessary in a given biome for that category to achieve its objectives. In the case of national parks, a primary objective is to protect ecosystems and genetic resources. Therefore they must have larger protected areas than a management

category such as recreation areas where protection is not primary to the success of the management category. The size and island biogeography issues are summed up in Appendix B.

The preservation needs of an IRD project, such as the proposed Private Ecodevelopment Center (PEC), are less than those of a national park. Society's needs for strict nature protection will be provided by other management categories than a PEC. The PEC protection zone will be important for baseline research, monitoring of natural environments, and conserving local genetic resources for breeding and/or planting on off-site private lands. An important issue here is that the protection zone's genetic resources will be used to increase the natural environments off-site thereby expanding populations of useful non-domesticated plants and animals as well as improving habitats. Therefore the protection zone in a PEC is an actively managed one intended to produce for outside utilization, rather than an exclusionary zone evolving in its own direction in perpetuity as is the case with many national parks. A small protection zone can produce valuable tangible benefits for a PEC if managed properly and used sustainably to expand natural or semi-natural environments. Although a larger size may be better than a smaller one for biological conservation, there are uses and roles for small reserves that should not be passed over.

Relationships Between Research and Management

Research in an IRD project should support management. The management objectives of the project are paramount. Research should be designed to support achieving those defined objectives. Research that does not support management objectives should be postponed until programs that focus on sustained development are in place and functioning. Within the context of an IRD project, there is no need to carry out research that has no specific function, when management needs specific applied research.

Management Approaches

Wildland Management Categories

The management of wildlands in less developed countries has been aided considerably by the methodology designed by Kenton Miller during his involvement with a United Nations Food and Agriculture Organization (FAO) wildland management project in Latin America. This work is best expressed in his book, Planning National Parks for Eco-development (1978).

Table 1 presents the synthesis of the methodology. This matrix lists objectives for conservation and development as they are addressed by different management categories. To achieve the specific objectives identified in planning, the management category that best fulfills

TABLE 1

Decision Making Guide to the Alternative Categories for the Management of Wildlands to Support Eco-Development

OBJECTIVES FOR CONSERVATION AND DEVELOPMENT	ALTERNATIVE MANAGEMENT CATEGORIES										
	National Park	Natural Monument	Scientific or biological Reserve	Wildlife Sanctuary	Resource Reserve	National Forest	Game Reserves, Farms, & Ranches	Protection Zones	Recreation Areas	Scenic Easements & Rights of-way	Cultural Monuments
Maintain sample ecosystems in natural state.	(1)	(1)	2	(1)	—	2	4	4	4	4	4
Maintain ecological diversity & environmental regulation.	(1)	(1)	(3)	(1)	(1)	(1)	(3)	(3)	(3)	(3)	(3)
Conserve genetic resources.	(1)	(1)	3	(1)	—	3	3	3	3	3	3
Provide education, research & environmental monitoring.	(2)	(2)	(1)	(2)	—	2	4	4	2	4	2
Conserve watershed production.	3	3	3	3	—	(2)	3	(1)	3	3	4
Control erosion, sediment & protect downstream investments.	3	3	3	3	—	(1)	3	(1)	3	3	4
Produce protein from wildlife: sport hunting and fishing.	—	—	—	—	—	(2)	(1)	—	—	—	—
Provide for recreation and tourism.	(2)	4	—	4	—	(2)	2	—	(1)	3	4
Produce timber on sustained yield basis.	—	—	—	—	—	(2)	—	4	—	—	—
Protect sites and objects of cultural, historical, archaeological heritage.	(1)	4	—	—	—	4	—	—	4	—	(1)
Protect scenic beauty and green areas.	(1)	(1)	3	3	—	3	3	3	(1)	(1)	4
Maintain open options through multipurpose management.	—	—	—	—	(1)	(1)	—	3	3	3	—
Support rural development through rational use of marginal lands and provision of stable employment opportunities.	(3)	(3)	(3)	(3)	(4)	(1)	(1)	(3)	(1)	(3)	(3)

( ) Major purposes for employing management systems.

1 Objective dominates management of entire area.

2 Objective dominates management of portions of area through "zoning".

3 Objective is accomplished throughout portions or all of area in association with other management objectives.

4 Objective may or may not be applicable depending upon treatment of other management objectives, and upon characteristics of the resources.

— Not applicable.

(*) In the case of the Watershed Programs or River Valley Corporations, the areas normally include towns, agriculture and other land uses.

Source: Miller, Kenton R. 1975. Guidelines for the Management and Development of National Parks and Reserves in the American Humid Tropics. In: The Use of Ecological Guidelines for Development in the American Humid Tropics. Proceedings of IUCN Meeting, Caracas, 1974. pp. 94-95.

those objectives would be chosen. The numbers and symbols in the table indicate the relative importance of each objective in that management category and therefore which management category (or categories) are optimal to achieve a set of objectives. For example, if the objective is to produce protein from wildlife through hunting and fishing, the categories of game reserves, farms and ranches, and of national forest are designed to produce the desired benefits. More specifically, if producing protein throughout the managed area is needed, then the game reserves, farms and ranches category would be preferable to the national forest category in which this objective is managed in only a portion of the total reserve.

The objective of sustainable rural development is the last in the list of objectives along the left side of Table 1. Although all categories recognize this objective as a major purpose of management, there are three management categories that seek to achieve this objective throughout their entire geographic area. The categories are national forest; game reserves, farms and ranches; and recreation areas. National forests and recreation areas are government owned. Game farms can be public or private. All government-owned and managed units are designed to manage public lands only and do not provide management services to lands off-site. Although, private game farms involve the private sector in conservation of

non-public lands, the game farms serve specific objectives and do not address many of the objectives of integrated rural development previously discussed. The national forest is a much broader category in terms of the objectives it serves. It offers the opportunity to utilize or preserve, depending on the zoning employed. Sustainable production is the overall goal of national forests, which fits with the goal of conservation for development. The major drawback to this category for integrated rural development is that it is publicly owned and managed for lands within its jurisdiction rather than for impacting on nearby private lands that might need management assistance.

Man and the Biosphere Project #8 Biosphere Reserves

Unesco (United Nations Education, Scientific and Cultural Organization) has an ongoing program to carry out research, education, and training on man and his relationship to the Biosphere. This Man and the Biosphere (MAB) program is made up of 14 different projects, most of which are designed specifically for a particular environment, such as tropical forests, or for specific environmental problems, such as pest management.

The MAB Project #8 Biosphere Reserves is the land management project of this program. Biosphere Reserves are specific areas throughout the world selected by MAB to

be representative of the major global biogeographic provinces. They are managed by national natural resource agencies under the umbrella coordination of MAB national committees. They are not intended to replace other natural resource management categories but rather to complement and include them in a grander global system. The basic goals of MAB Project #8 are the conservation of biological diversity, research into man's relationship with the biosphere and into sustainably utilizing it, and education and training.

Unesco has defined MAB Project #8 objectives in the following terms:

1. To conserve for present and future use the diversity and integrity of biotic communities of plants and animals within natural ecosystems, and to safeguard the genetic diversity of species on which their continuing evolution depends;

2. To provide areas for ecological and environmental research including, particularly, baseline studies, both within and adjacent to such reserves, such research to be consistent with objective 1 above;

3. To provide facilities for education and training. (Unesco, 1974)

A Biosphere Reserve should have the following characteristics according to Unesco:

1. Biosphere reserves will be protected areas of land and coastal environments. Together they will constitute a world-wide network linked by international understanding on purposes, standards and exchange of scientific information.

2. The network of biosphere reserves will include significant examples of biomes throughout the world.

3. Each biosphere reserve will include one or more of the following categories:

   i) Representative examples of natural biomes.

   ii) Unique communities or areas with unusual natural features of exceptional interest. It is recognized that representative areas may also contain unique features, e.g., one population of a globally rare species; their representativeness and uniqueness may both be characteristics of an area.

   iii) Examples of harmonious landscapes resulting from traditional patterns of land-use.

   iv) Examples of modified or degraded ecosystems capable of being restored to more natural conditions.

4. Each biosphere reserve should be large enough to be an effective conservation unit, and to accommodate different uses without conflict.

5. Biosphere reserves should provide opportunity for ecological research, education and training. They will have particular value as benchmarks or standards for measurement of long-term changes in the biosphere as a whole. Their existence may be vital to other projects in the MAB program.

6. A biosphere reserve must have adequate long-term legal protection.

7. In some cases biosphere reserves will coincide with, or incorporate, existing or proposed protected areas, such as national parks, sanctuaries or nature reserves. (Ibid.)

The Commission on National Parks and Protected Areas (CNPPA) of the International Union for Conservation of Nature and Natural Resources (IUCN) prepared a report at the request of Unesco (IUCN, 1979). This report attempted

to distinguish biosphere reserves from other protected areas and to define the management zoning appropriate for such reserves. The four management zones which could be contiguous, or clustered nearby, that CNPPA recommended were:

1. Core natural zone. This is a preservation zone only used for baseline research.

2. Buffer zone. This is a buffer to the core zone and is to be used for experimental research of a manipulative nature.

3. Restoration zone. This is to be used to research and demonstrate reclamation of degraded lands.

4. Cultural zone. This is to support and promote harmonious man-nature relationships generally based on traditional land use.

The ideal biosphere reserve has been difficult to implement in actuality, even though there are 226 official biosphere reserves (Chakalall and Geoghegan, 1983). Generally MAB Project #8 has been interpreted by national natural resource managers to be a new way of obtaining international financial support and stature or of gaining national political backing for projects based on their international recognition.

The majority of reserves have been superimposed on existing operational conservation or research units, which although reasonable, has not produced the holistically integrated research and management envisioned by Unesco. The existing agencies continue to operate with traditional mandates from their governments without restructuring or

integrating their forces to work in new directions for practical solutions to man and environment problems. The mandate of national agencies is focused on government lands rather than private lands. Without a new mandate, these agencies will not focus on improving man's relationship to his natural resource base to assure that it can sustain usage. Most research projects in MAB reserves are specialized and basic in nature; only 60 reserves even have ongoing research projects (Batisse, 1982).

The most productive relationship of biosphere reserves to sustainable utilization has come when other projects in the MAB family join together in what is called an MAB integrated pilot project. These pilot projects combine the following components in an interdisciplinary fashion: research, demonstration, training and education. The biosphere reserve is used as the site for the pilot project but the two programs have different objectives. Figure 1 presents a schematic representation of the characteristics of MAB pilot projects.

The biosphere reserve, a concept only a little over a decade old, broke new ground by attempting to integrate research with environmental management for sustainable development. It has not yet succeeded at the fundamental issue it can best treat, that of development and implementation of sustainable natural resource management. The majority of protection zones are overlayed on existing

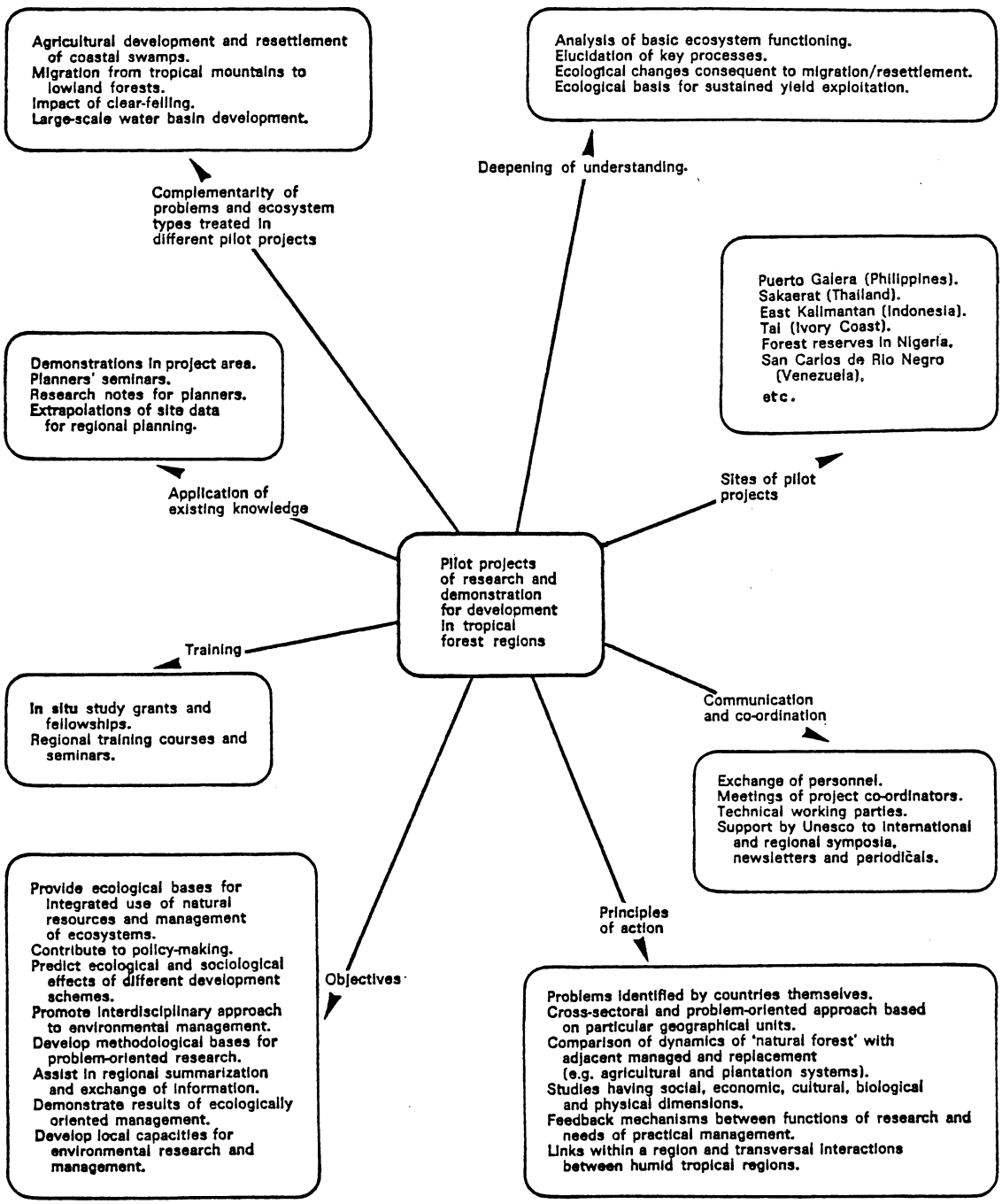

Figure 1. Schematic representation of characteristics of pilot projects. After Unesco, 1977.

national parks and most research is not tied to the local community. The achievement of the integrated goals has by and large remained elusive. Some of the reasons for this will be presented here.

The MAB program is international, but the biosphere reserves are coordinated by national committees. These committees are in the capital cities and are generally composed of the elite of biological science academics and researchers. Their reasons for creating a reserve may be very different from the local residents' needs for a reserve. A planning methodology for biosphere reserves does not exist but in 1983, Miguel Cifuentes (1983) designed and tested a methodology for the strategic planning of a national system of biosphere reserves. Historically, they have been planned and organized in many ways. The most common working objectives were preservation and basic scientific research. Identifying rural people's needs and organizing an applied research program on sustainable rural development issues has not been done. The inclusion of local people in the goal setting, planning, and data collection process is difficult to implement with biologists who are interested in their own research priorities and with the managing agencies who have priorities based on their traditional mandates. The contributions of local people have suffered in the inter-institutional maze. Objectives are set by capital

city biologists in a hierarchical and scientific manner rather than through the decentralized social technologies described by Don Graybill. Local people's integration into planning their future and improving their welfare, as well as long-run global conservation aims, would be better served if they played a bigger role.

The research performed so far on biosphere reserves has not supported management needs; it has been too specialized and basic. The biosphere reserve should promote applied research to support its needs and the needs of eco-development. To use the reserves only for basic research, is a luxury a developing society can only afford once sustainable rural development research has been carried out and implemented.

The research in most traditional protected areas is funded by agencies who have specifically mandated interests in the scientists' area of expertise. In contrast, MAB can funnel its own research money toward support for applied research on sustainable development in MAB biosphere reserves. It can also help persuade other funding organizations to do the same. The individual reserves could set the goals for research, specify the sites, and search for funding; MAB could request proposals to fund efforts toward their objectives. MAB should implement this alternative support for integrated rural development.

The dissemination of the results of applied research to local people, i.e., the extension program of these projects, has not been well defined and responsibilities have not been allocated; so, extension has not been implemented. Extension is critical if the results of the research are to be adopted by the local people. Again, MAB Projects #8 would be better served by the involvement of local people throughout the process and by an increased emphasis on extension.

The fundamental problem to be overcome by most biosphere reserves remains their management. The reserves as currently organized are hindered by inter-institutional communication and authority problems. Agencies jealously guard the areas of authority and responsibility given to them. The subsequent interagency competition prevents cooperation and communication. The MAB mandate requires them to work together to create and manage a new natural resource management category. Not only are the objectives of this category new to these agencies but they also require them to integrate the project with local community needs. Most agencies in the natural resource sector are not equipped with community organizing or interfacing skills and techniques. Also, most of these agencies manage government land; relating to the private sector is outside their current interpretations of their mandate and beyond their experience. The MAB Project #8 requires a

difficult combination of both local involvement and institutional cooperation from government agencies.

Even given these problems, integral rural development (IRD) projects on a few biosphere reserves have been exceptionally successful and productive. Two of these are in northern Mexico. The La Michilia Biosphere Reserve has not only addressed the MAB objectives of conservation, ecological research, and technical training, but has also strived for successful implementation of viable IRD alternatives to treat socioeconomic problems of the area. This biosphere reserve is coordinated by the National Polytechnic Institute's Center for Interdisciplinary Research for Integral Development of the Rural Community. Since 1974 they have been working closely with the local community to discover the problems and needs of the people, to propose and rank solutions, to initiate and consolidate projects into commercially viable programs (agro-industries), and to integrate these programs. They are thereby achieving the IRD's final objectives which are: 1) creation of employment, 2) production and distribution of food, 3) improved health of the population, 4) education, and 5) conservation of the environment (Ochoa, 1981).

This project has successfully gained the active support of local people; some have even voluntarily taxed themselves to help support the programs. The tangible

results have also included: 1) introduction of new agricultural crops on a commercial scale, 2) development of appropriate processing and marketing for these new crops, 3) new uses of wild plants, 4) active conservation, research, demonstration, and extension programs, 5) improved health care, 6) introduction of apiculture, 7) technical training of new students, and 8) conservation of the core area.

Some important observations on La Michilia Biosphere Reserve are: 1) it is coordinated by a Center for IRD, 2) it is directed by a native of the region, 3) local participation and integration has been the norm from the start, and 4) researchers understand the need to actively participate in all phases of the project, including extension, marketing, processing, etc. Their role has been to serve and help the community develop and implement new alternatives, not just to conduct basic research and publish it for other scientists.

The other biosphere reserve, Mapimi, run by the same institute has also reported excellent success in its mission (Halffter, 1981). These two Mexican examples are the most widely cited MAB Projects #8 serving local people's needs. Such successes can and should happen more in biosphere reserves, but the vast majority have not done so.

A Private Ecodevelopment Center (PEC) could be a practical and adaptable way of achieving many of the MAB Project #8's goals. The PEC has the advantage of being small so the local community can relate more easily to it and also of functioning more freely from bureaucratic inertia. It would involve local people in implementing the project, thereby benefitting them more directly than most biosphere reserves. It can cover many more regions of a country than the MAB program. The PEC single management authority would have one role, that of coordinating the project; in comparison MAB has the many different and sometimes conflicting mandates of multiple public agencies. Research would be focused on specific management needs. The integrated connection between protection, research, demonstration, and extension in a PEC provide a practical progression of means, the implementation of which MAB Projects #8 have generally had difficulty doing.

Nature Conservancy

The world's largest system of private nature reserves is owned and managed by the Nature Conservancy. Their well-run system is assembled specifically to preserve biological diversity. They have not included sustainable rural development or eco-development objectives in their strategically limited objectives. They manage their reserves for what is on them, whereas a PEC would be

managed both for what is on it and for the improvement of land management and conservation on surrounding lands.

The Nature Conservancy approach is needed to minimize the risk of extinction in today's world where innumerable species are threatened. On the other hand, it is difficult to assume that many natural ecosystems can survive, given non-sustainable approaches to development in the Third World. An important way to improve existing management of the biosphere is to provide sustainable development alternatives (that is, eco-development) for private lands, which are the majority of lands.

Using the proposed PEC format, a significant protection zone would fulfill Nature Conservancy objectives and would also provide for the needs of an IRD project. The integration of these two approaches would provide a foundation of sustainability for Nature Conservancy objectives. Without integrated rural development how long can pristine areas in the Third World be protected, given the trends discussed earlier in this chapter?

Some Examples of Sustainable Development Demonstration Projects

This section will briefly discuss diverse efforts toward sustainable development.

New Alchemy Institute

The New Alchemy Institute was founded in 1969 by a University of Michigan graduate student. The objective

was to apply responsible scientific research to develop appropriate technologies for sustainable methods of providing food, energy, shelter, and landscape design. It is located on a small farm on Cape Cod, Massachusetts. It has developed expertise in biological agriculture, aquaculture, bioshelter design, and permaculture. The Institute involves the community in its work as volunteers and as planning participants. It provides educational activities including conferences, weekly demonstration tours of the farm, publications, courses, and consulting. Demonstration projects are produced which refine research findings and which foster the interest of others so they will implement and utilize the technologies on their own land.

New Alchemy has initiated the Cape Cod Bio-regional Development Plan that seeks to show how conservation and development conceptually based on the World Conservation Strategy can occur on the Cape. This is a consortium of local groups, planning organizations and individuals (Watson, 1983).

New Alchemy also has a branch office in Costa Rica. The projects there include aquaculture, fresh water wells, tree nursery, horticulture, experimental garden, pig breeding, and extension courses on farm animal management.

EcoVillage

EcoVillage is run by the magazine, Mother Earth News, and is an appropriate technology group in North Carolina. This group researches, demonstrates, and publishes information on self-reliant technologies. They have an experimental eco-village, one mile square, which is their primary research and demonstration area. The topics they address are as diverse as food preservation, hydroelectric systems, solar systems, composting, aquaculture, and intensive gardening, among many other topics currently being demonstrated. They invite visits by readers of their magazine and even encourage tourists to vacation at EcoVillage. Demonstrations are scheduled for every day of the week; each day has a different topic, so one can see all the demonstrations in a week's time. (Mother Earth News, 1983)

Pampa Galeras

Peru was one of the first to express interest in conservation for development. In the late 1960s the government began a program to save the vicuna from extinction. This animal had been hunted illegally for centuries for its wool, the most valuable in the world. Preserving the species necessitated taking control of a core geographic zone vital to the remaining vicuna population. This zone, named Pampa Galeras, was located on

community land of the Peruvian Indians. To convince the Indians to give up their use of their land, the government proposed a cooperative long-term development plan based on a vicuna economy, once the vicuna population recovered. The local people would be employed in protecting, harvesting, shearing, and spinning and weaving raw wool into yarn and garments. The government would manage the reserve, research topics needed for management, develop processing plants and markets. Income would be shared between the Indians and the government, with the government committing its portion back into rural development projects such as roads, schools, and health centers. This project was agreed to by all concerned and was a landmark case of conservation for development. The vicuna population is now of commercial size and the wool, hides and meat are being harvested.

Unfortunately, the government cannot market the products because of the CITES international treaty preventing trade in endangered species products. The implementation of the rural development plan has been hampered since no income has been generated. If the government could sell the wool, then this would be a successful eco-development project. The local people need either direct income from the vicuna land or the permission to graze their domestic animals there so they can survive. The government cannot subsidize the community in

perpetuity for their lost lands. Unfortunately, this project which showed such great promise is in danger of failing, unless Peru is permitted to sell vicuna wool.

Diversificacion Agricola

In Turrialba, Costa Rica, there is an outstanding example of community-based development. This is a cooperative called Diversificacion Agricola, that was set up to diversify and sustain the production of small farmers in the region. The cooperative conducts research, introduces species, demonstrates new techniques, involves local people as adopters of these techniques, arranges credit, designs and implements processing solutions, develops markets, and trouble-shoots all of the above. The cooperative is vertically integrated, as these tasks show, and it is very successful. It has reforested with pine and eucalyptus, cultivated macadamia nuts, and generated apiculture and aquaculture projects. The cooperative is committed to completing the total development of one resource before taking on a new one; this has kept their management focus clear. Although Diversificacion Agricola does not deal with strict protection objectives, its eco-development objectives match the aims of an IRD project (Shores and Cross, 1981).

La Planada

In 1981, the World Wildlife Fund-U.S. (WWF-US) sent a researcher to Colombia to identify priority habitats for preservation. The site chosen was in the southwest part of the country, a farm called La Planada. In 1982 FES, the Colombian Foundation for Higher Education, purchased La Planada after substantive dialogue with and funding from WWF-US.

Both organizations agreed that the program planning for La Planada should combine protection of the new reserve with sustainable development of the neighboring community. In 1983, a draft operational management plan was prepared. It is too early to know how the implementation is going, whether it is successful in achieving its objectives, but the plan includes a significant commitment to the goal of conservation for development (Barborak and Glick, 1983b). The objectives for La Planada are as follows:

1. Maintain essential ecological and hydrological processes and preserve the high floral and faunal diversity and endemism in the reserve.

2. Implement sustainable socioeconomic development projects in communities adjacent to the reserve.

3. Facilitate the scientific investigation of the natural and cultural resources of the reserve and its zone of influence and promote appropriate land uses and technologies.

4. Carry out comprehensive environmental education programs both in the reserve and on a local and national level.

5. Serve as a catalyst in the promotion of adequate management and protection for nature reserves and other wildlands managed by both governmental and non-governmental entities in Colombia and neighboring countries.

6. Offer outdoor recreation opportunities and stimulate national and international tourism in the reserve and adjacent areas.

This plan is especially exciting because of the active participation of local people in its preparation and FES's enthusiasm and skill in coordinating inter-institutional development projects (Barborak and Glick, 1983a). The eco-development framework for La Planada, focusing on protection of the reserve and off-site sustainable development, promises to fulfill on a small portion of the globe many of the goals of the World Conservation Strategy.

Summary

Global trends on the availability of natural resources on a per capita basis are not promising. This new phenomena still has yet to be reflected in new approaches to natural resource management. To solve this problem, a locally-based approach to sustainable natural resource management is needed to effectively improve the management of private land. Most land management categories deal exclusively with government lands, yet most of the long-term damage to natural resources, which support human life, is on lands not managed by

governments. The need to salvage, nourish, and sustain non-public lands has surfaced in report after report. Yet, until recently the only significant attempt to deal with this has been the MAB Project #8 Biosphere Reserves.

The MAB Projects #8 are a big conceptual step forward, but only a few MAB reserves have achieved their integrated rural development objectives. The majority have had difficulty implementing their community-based sustainable development goals. This chapter reviewed two successful MAB Projects #8 and several independent progressive eco-development projects. There has been some, though not enough, progress toward conservation for development, but only on specific topics or in isolated ecosystems.

From this review, it is clear that there is a strong need to work toward a new management category -- one oriented to the problems of privately-held lands, that can supply flexible management for integrated rural development throughout the world. The next chapter will propose a normative format for a new wildland management category, the Private Ecodevelopment Center (PEC), that is designed to implement the sustainable development goals of the World Conservation Strategy.

CHAPTER III

THE NORMATIVE MODEL

Introduction

The normative model will present the ideal form, purpose and direction for a proposed new management category, the Private Ecodevelopment Center.

Objectives and Means

The objectives and means should not be confused with each other if management is to be successful. Objectives come in two forms, overall and specific. Both forms focus and direct the management of inputs to produce what society needs and wants. Overall objectives, also called goals, are broadly focused on a general overview of the problem being addressed. Specific objectives are more narrowly focused; they need to be sufficiently concrete to permit periodic evaluation to determine if objectives are being met.

Means fulfill the goals and objectives. They can be conceptual guidelines used in planning or in actual management. They can also be tangible resources or manipulative techniques. Means can take many forms, but they are always subservient to goals and objectives.

Goals and objectives set the direction and layout for the project tasks, while the means are the tools used to accomplish the goals and objectives.

Objectives

Overall objectives for the normative model of this management category, Private Ecodevelopment Center (PEC), will follow those established in the World Conservation Strategy (WCS) by IUCN (IUCN, 1980). The WCS presents three main overall objectives of living resource conservation:

- to maintain essential ecological processes and life-support systems;
- to preserve genetic diversity;
- to ensure the sustainable utilization of species and ecosystems.

The overall objective for PEC is sustainable rural development within the WCS framework. The form of development must allow local people to participate directly in setting specific objectives in keeping with their needs and the capabilities of the local natural resource base to sustain that level of development. Sustainable rural development must value and protect natural resources in a multitude of ways from species diversity and genetic variability to watersheds, forests, coral reef fisheries and fuelwood plantations. It must

yield an improved standard of living and quality of life by integrating ecological principles into man's modification of the collective habitat.

The central thesis of this management category is that private lands off site of the PEC will be better managed for sustainable rural development because of the services the PEC provides.

Specific objectives for the PEC include:

1. Support participatory, sustainable, rural development through rational use of lands and provision of stable employment opportunities.
2. Provide environmental education, research, and monitoring.
3. Maintain sample ecosystems.
4. Maintain ecological diversity and environmental regulation.
5. Conserve genetic resources.
6. Produce protein from wild fauna and flora sustainably.
7. Produce timber on a sustainable basis.
8. Maintain open options through multipurpose management.

Means

To achieve these overall and specific objectives, the managers of the PEC will utilize four principal programmatic means. These are protection, research, demonstration and extension.

Protection is a means to maintain living natural resources. Protection is important to ensure that the existing resource base provides necessary services such as genetic resource preservation, watershed regulation, and maintenance of sample ecosystems in their natural state. Protection will permit a perpetual flow of goods and services from the protected area to off-site beneficiaries, as well as provide for the internal needs of the PEC for such resources as a stock of flora and fauna, and water. Protection also provides natural areas for research, monitoring, demonstration, and extension.

Research is a means to discover the information needed to improve management. Research in a PEC is intended to support the needs of local management, not be an end in itself. It could be basic research if that was needed to implement programs. Baseline information may or may not be available; if it is, applied research in support of management objectives may begin. The research process, especially the data collection, should involve local people as much as possible and should reflect their needs and aspirations. Local involvement is critical if eventual implementation of research results is to be successful. The research can focus on topics such as cultural values, traditional management systems, agro-forestry, aquaculture, or environmental communication. It

can be oriented for outputs of information or for the development of techniques.

Demonstration serves to substantiate research findings, illustrate techniques, and persuade local people of the value of sustainable rural development. Demonstration presents to the local population alternative land management practices or technological options, by illustrating the alternatives' effectiveness in surroundings similar to those of the population. Demonstration areas can be used for fuelwood plantations, silvopastoral projects, vegetable gardens, solar, wind and hydro projects, or any other project that will encourage sustainable rural development.

Extension is a means to further validate and disseminate sustainable rural development. Extension takes the experience and lessons from the PEC's protection, research, and demonstration activities to the community in a form that can be adopted for private use. Reaching out to the community to disseminate information has several benefits. The PEC gains valuable community (and political) support. Feedback from actual or potential adopters of new alternatives becomes an integral part of the PEC's management because it allows efforts to be fine tuned to the needs and experiences of the community. Outreach facilitates the rapid and widespread dissemination and adoption of practices, approaches,

techniques, and technologies which might otherwise be implemented more slowly and randomly.

Normative Characteristics

There are certain characteristics that are important to consider in designing a PEC to achieve the objectives set forth earlier. These are relative in their importance; depending on local needs at specific sites, the weight given each characteristic will vary. The order of presentation here does not suggest a ranking. Each site will have different priorities.

1. Access to the site is important because it will be visited for research, demonstration, and extension purposes. The demonstration area is the most important one to be accessible; ideally it should be located in proximity to a road allowing people passing by to view it easily. Easy access can be a problem however for protection efforts, because it facilitates the illegal removal of plant and animal products.

2. Ownership of the land the PEC manages should be stable and should provide management continuity over the long term. This is important for several reasons. The protection program must be transgenerational to be fully effective and the research and demonstration programs are also likely to be relatively long-term projects. The critical factors of ownership are its stability and

continuity. Whether the PEC is privately owned by an individual or institution, legal arrangements should be written into the land title to ensure its continued management as a PEC.

The advantages to operating a PEC outside a government include greater freedom of action, particularly the potential to be more innovative because of independence from a bureaucracy. In addition, private status protects lands from swings in the political pendulum; it promotes protection of small areas otherwise left out of government management; and it offers the private sector the chance to get involved in conservation. Government agencies can be dependable for continuity of management and for stable land tenure, but they are usually less innovative and more subject to bureaucratic inertia than the private sector. For these reasons the private sector is best suited to develop this management category.

3. The shape of a PEC should, ideally, be as close to round as possible to minimize its perimeter. This is important for protection purposes. If all other factors remain equal, the integrity of the ecosystem is better maintained in a compact area with a minimum perimeter than if it is spread out and has many "peninsulas." The rate of species loss, or species decay, per area is less with a compact perimeter than with a lengthier one.

4. The location of the PEC on a Holdridge life zone map (Holdridge, 1957) is an important consideration. Because the major goal of this management category is to foster sustainable rural development, the PEC must be located in a rural area. Not only must the land be similar to that inhabited and farmed by rural populations, but the PEC must also be physically close to that population to assure successful outreach efforts. This will help provide the maximum transferability of results for the PEC. Another issue in determining a PEC's location is the area's potential for sustainable development. Life zones that are small in size, that support few people, or that are inherently low in ecological productivity for human utility (e.g., glacial alpine zones), should be passed over in favor of areas that will yield greater returns for sustainable development efforts, given the same investment.

The areas where PEC's will be of most use will be densely inhabited areas of marginal lands. Areas characterized by poor lands, lack of appropriate management, and little knowledge of alternatives will benefit greatly from a PEC. The selection of land for a PEC should include evaluating current land use versus potential land use. The value of present human use of the land, with existing management technology, should be compared to the potentially improved utility of that land

with alternative technologies. Areas that will gain the most from development of a PEC should rate priority over others.

5. The threat of destruction to the last remaining natural area in a portion of a life zone is an important issue. The maintenance of sample ecosystems and protection of the genetic heritage are objectives often met by other management categories such as national parks, monuments, etc. When threatened areas are not or cannot be protected by other conservation units, then a PEC may include such areas particularly if the area needing protection meets the size characteristics of the PEC (see #7).

6. The degree of alteration by man to the land is less significant in a PEC's design than in a national park's. Also, alteration varies more in a PEC than in a park. The PEC needs different zones to meet different objectives. For protection, some areas should be relatively untouched. For research, virgin areas and transition areas undergoing natural succession allow research on the spectrum of successional states. For demonstration, a disturbed site is often best so that new techniques will be illustrated on lands similar to those in the community. Such lands also make a more viable extension program. A PEC can be very successful with a substantial percent of lands in a disturbed state. The

management goal with disturbed areas should be to study and restore them by using them as demonstration areas as they are transformed into productive lands.

7. Size is a parameter that must be considered from several points of view. All other things being equal, a larger PEC is better, mostly because a larger area will have a slower rate of species loss than a smaller one. But small areas can also be strategically important for protection, because they may be adequate for protecting endemic plant species or close-ranging fauna. Small areas could fill in between larger protected areas and thereby function as an ecological bridge. Small patches of successional growth are important for many species during their lifecycle. These patches may not occur in either a national park (too much old growth) or traditional agricultural lands (all cleared lands); therefore a PEC could provide managed habitat for select identified species. Ecologically speaking endemism may, in certain circumstances, override large size in designing a PEC if tradeoffs must be evaluated. The basic size requirement is that the area be adequate to achieve all objectives. Actual size will vary from site to site. In fact the PEC may be many different disjunct parcels, each used for a different means, e.g., protection, demonstration, or research.

8. Management planning is essential to operate any wildland unit effectively. PEC management planning must begin by systematically becoming acquainted with the available natural and human resources, the level of demand for them and their capacity to fulfill those demands. Next, the PEC's management and staff must derive goals and objectives with the involvement of the local community. And lastly, management must organize programs to accomplish the set objectives and implement the means to attain those objectives. Management planning builds management capacity and its necessary constituency by involving the staff and the community in developing an awareness of their collective natural resource values, uses, needs and priorities and in designing a plan to manage for the specific objectives they set. This exercise is best done in a teamwork style in which decisions are reached by consensus. Planning is an ongoing process, continually open to new inputs, even after a plan has been produced on paper.

9. Staffing a PEC with competent personnel is important for successful management of the area and programs. Each program or set of means (protection, research, demonstration and extension) requires a distinct set of skills to manage it optimally. Ideally a separate job description for each program director should be written by the PEC organizers. It may be feasible to combine two or

more directorships under one or two people if they are qualified, especially if a PEC is new or small and funding is scarce. These directorships need not be full time; they could be part time depending on the scale of activities in the program. Staffing of PEC could even be a cooperative inter-institutional arrangement directed by the PEC director. With more institutions, coordination can be a problem but the advantages include tapping the knowledge and skills from organizations with specific expertise in disciplinary fields. Because of the integrated design of this new management category, traditional skills will need to be honed with problem-solving approaches appropriate for the new alternatives to be developed on and off-site. Approaches to problem solving will probably need to be developed by the staff since these skills are rarely taught at institutions of higher learning.

Each separate program will need personnel to implement its duties. These duties could be shared by staff of the PEC; for example the same ranger could work in protection, assist in research, work in the demonstration areas, and interact with the community in the extension program. Alternatively these duties could be carried out by specialists. The number of employees will vary with the PEC. The fulfillment of objectives is the key issue for adequate staff size. The inherent synergy of the

PEC's programs can allow economizing on staffing. For example, as extension becomes successful the staffing level for protection will probably decrease; and as community familiarity with successful demonstrations increases, the extension program should be easier to implement.

Staffing is a critical element in the success of a PEC because of the integrative and outreach nature of the management category. The coordination necessary for the PEC's success and the integration of expertise in natural resources and rural socio-economic development mean the staff's training and backgrounds must be highly integrated and that communication between all participants must be stressed.

10. Adjacent lands to the PEC are important because of the potential bridge effect. This is the transfer of benefits from one area to another because of their spatial proximity. This can work in at least two ways. If there is a nearby national park or other large natural area, the PEC can act as an island or temporary refuge for mobile species, thereby maintaining or extending their habitat between the two areas. Another way the PEC can function as a bridge is in its rural development role of spreading information, techniques or ecological benefits from a PEC to the surrounding community thereby bridging from the PEC out to off-site areas.

In the MAB Project #8 Reserve program, a national park or similar large area could function as a core protection area and the PEC could perform the rest of the objectives. A significant difference between them is that the PEC would not have rural inhabitants living inside the managed area, whereas the MAB Project #8 Reserve's definition can include local inhabitants. For preservation purposes it is clearly better to have a large core area nearby to supplement the protected zone of the PEC; for rural development it is necessary to have neighboring rural residents who will be the beneficiaries of the PEC.

PEC and the Wildland Management System

By incorporating consideration of the above characteristics in the design of the PEC, successful implementation of the means to achieve the PEC's goals and objectives will be facilitated.

Wildland management categories are designed to produce needed and desired benefits from the available natural resources. To optimize managerial success, the specific output or product (in this case the achievement of objectives) should be produced from a production system designed for that output. The objectives should govern the design. If one wants to produce cars, the factory must be a car factory, not a boat factory. Likewise for each of the major objectives of conservation and

development, there are management categories that optimize management for achieving each objective.

Table 1 in Chapter II presented Miller's decision making guide to thirteen alternative categories for wildlands management to support eco-development. One can use the matrix in Table 1 to analyze the management priorities and characteristics required to reach the objectives of a PEC. The application of the matrix to the PEC category is presented in Table 2: Objectives for Conservation and Development Served by PEC. The table presents Miller's objectives for conservation and development and the degree to which PEC meets those objectives.

As seen in Table 2, the major purposes of the PEC management category are to support rural development; provide sites and facilities for environmental education, applied research and environmental monitoring; maintain sample ecosystems in a natural state; and maintain ecological diversity and environmental regulation. The PEC's highest priority objectives which apply throughout the entire area are: support sustainable rural development; maintain open options through multipurpose management; and provide for environmental education, applied research, and environmental monitoring. The following objectives dominate portions (or zones) of the total area: maintain sample ecosystems in natural state,

TABLE 2
Objectives for Conservation and Development Served by PEC

OBJECTIVES FOR CONSERVATION AND DEVELOPMENT	PRIVATE ECODEVELOPMENT CENTER
Maintain sample ecosystems in natural state.	(2)
Maintain ecological diversity and environmental regulation.	(2)
Conserve genetic resources.	2
Provide education, research and environmental monitoring.	(1)
Conserve watershed production.	3
Control erosion, sediment and protect downstream investments.	3
Produce protein from wildlife: sport hunting and fishing.	2
Provide for recreation and tourism.	4
Produce timber on sustained yield basis.	2
Protect sites and objects of cultural, historical, archeological heritage.	NA
Protect scenic beauty and green areas.	3
Maintain open options through multipurpose management.	1
Support rural development through rational use of marginal lands and provision of stable employment opportunities.	(1)

() Major purpose for employing management category.

1 Primary objective which dominates management of entire area.

2 Objective dominates management of portions of area through "zoning."

3 Objective is accomplished throughout portions or all of area in association with other management objectives.

4 Objective may or may not be applicable depending upon treatment of other management objectives, and upon characteristics of the resources.

NA Not applicable

Adapted from: Miller, Kenton R. 1975. Guidelines for the Management and Development of National Parks and Reserves in the American Humid Tropics. In: The Use of Ecological Guidelines for Development in the American Humid Tropics. Proceedings of IUCN Meeting, Caracas, 1974, pp. 94-95.

state, maintain ecological diversity, conserve genetic resources, produce protein from wildlife, and produce timber on a sustained yield basis. In addition to these high priority objectives, the following objectives can be achieved on the whole area or in zones: conserve watershed production, control erosion and protect downstream investments, and protect scenic beauty and green areas. Recreation and tourism may be applicable to the PEC category depending on other management objectives, which have a higher priority, and on the site itself.

Table 2 allows us to see the strength of the PEC category relative to previously designed categories. The table shows that the majority of Miller's thirteen objectives for conservation and development can be served by a PEC. In fact, a PEC maximizes achievement of two objectives in particular. The combination of sustainable rural development with environmental education, applied research, and environmental monitoring as major purposes for managing an area, is an important innovation that will likely provide greater success in merging conservation and development on and off-site, than opportunities currently offered by other categories. A PEC is unique because it primarily serves these two objectives and combines them in an innovative and synergistic way and also because it serves almost all other objectives for conservation and development to a varying degree. This integrated approach

focuses on two objectives which need to be addressed more strongly by natural resource management. This capacity combined with serving multiple objectives for conservation and development and the category's uniqueness merits the PEC's inclusion as an additional category in wildland management.

In addition the PEC complements other wildland management categories in various ways. It can efficiently protect small but important areas. It improves natural resource management on private lands and helps rural people develop their resources in sustainable ways. It can be the focus of applied research on improved natural resource management. The PEC thereby complements the management activities of other institutions which have different priorities.

A system linking PEC's could be initiated as well. It could include strategic sites in different life zones, thereby supporting alternative sustainable development activities and allowing for coordinated training and development among and between PEC's. A system of PEC's would have more impact on the national environment and community than isolated and scattered PEC's. The implementation of such a system should be incremental, allowing management to learn from one PEC to the benefit of another. PEC's should be initiated in the areas where people are interested and involved and where land

management needs are greatest. The actual coordination of PEC's could be by a grant-sponsored coordinating organization initially, and then by volunteer networks.

Particular attention would have to be paid to different interests and problems likely to be encountered when discussing PEC development with owners of private reserves who are considering adopting this exploratory format. The concept of PEC's will need to be sold to them, whatever their interest and situation: whether they are presently cattle ranchers and need coaxing to adapt land for increased long-term economic return as well as for community service, or whether they are protectors of the natural world on their property and need coaxing to expand into sustainable development as a stronger tool to protect the entire region's natural heritage. The role of the coordinating organization would be to sell the goals and objectives of PEC's to such interested parties by exploring their questions and fears and by encouraging their enthusiasm for this type of management. Once interested they could help recruit and/or train personnel and eventually foster communication, sharing, and coordination among PEC's.

The initial years of a PEC will be the most difficult, because the concept must be marketed and the community must be motivated sufficiently to sustain their involvement until tangible results prove their utility to

local residents. Once the idea is supported by the local people and they see results which benefit them, they will keep the PEC operating and growing largely through their own creativity and needs. Then other PEC's can be created in another area by the coordinating organization, using experience from and site visits to the original PEC area.

Critical to an effective system of PEC's are that the directors would need good staff training, local populations would need to participate and to see incentives for their participation, the PEC's would have to be distributed appropriately in strategic life zones, and the communication, and coordination between PEC's would need to be strong.

A PEC system could function in a similar manner to an agricultural research station system as they research, develop, and disseminate new technologies and species appropriate for sustainable rural development. Once a PEC system was developed, other government or private agencies could further spread these management practices in an integrated fashion throughout the country using tax incentive programs or large-scale public campaigns. In effect, the Private Ecodevelopment Center then becomes an "eco-development field station."

Theoretical Operational Flow of a PEC

Once the conceptual framework of a PEC or a system of PEC's has been completed, work must begin on the operation

of one (or more) pilot projects. The design of the pilot project must include the normative characteristics, as they apply to the specific site. The design should be one that will optimize achievement of the goals and objectives, by proper use of the programmatic means.

The relative importance of each programmatic mean will change in the PEC over time. At the beginning, protection may be the only fully operational program. This is because the protection mean is the best understood and most widely used one. Also strict private nature reserves owners are the ones most likely to be involved in early adoption of the PEC concept. With time, funding, and managerial input, the other means - research, demonstration, and extension - will develop.

The funding of applied research in sustainable rural development is one of the most difficult issues in getting a PEC operational. It is not a traditional research topic. The research director must therefore be aggressive in getting funding allocated to the PEC and to this field in general, so that other researchers applying for funding will find support. The development of funding sources would then allow the research director to refer such researchers to these supportive organizations. The research director should visit and correspond with funding sources, both government and private, national and foreign, to find support for ecodevelopment research needs. Seed money for specific research projects from

government or private sources may be necessary to get a program going. One possibility would be to identify a hydroelectric agency with similar objectives who would fund PEC research.

Because the PEC's integrated approach puts research results to work for the local community, there is hope that available funding will increase as word spreads about PEC's. The research should involve local people in identifying their concerns and in data collection. It is the first major link with the community and their involvement increases the effectiveness of later phases of the PEC's efforts. Based on assessment of local needs, the PEC would act to help satisfy those needs by coordinating government or private assistance where applicable. If the problem is one best solved by local action, the PEC could act as a catalyst to organize the community for its own work projects.

The demonstration areas will be a direct outcome of research projects and results. Field tests will be observed and discussed by the local community. When demonstration areas provide significant success stories, they can also be used as tour sites. Demonstration will be based on the applied research and will provide a basis for the extension program.

The extension program will be the contact between the PEC and the community. It will conduct surveys of local

people's concerns. It will explain to them the goals and objectives of the PEC, how it works, and what their role is in shaping its development. It will also transmit outputs from the PEC to the community. Working with and for the community will create a bond between the local community and PEC management, a bond difficult to achieve in most other wildland management categories. A connection between the center and the local people will spill over into protection benefits, as understanding grows of the value of sustainable and regenerative land management techniques for improving their lands' productivity. As protection's role is understood and local benefits go up, the cost of guarding PEC land should go down.

The biggest advantage of PEC will be the incorporation of sound practices for managing living natural resources of local people and the subsequent improved quality of life for the community. With this as a foundation the condition of the communities resource base should actually improve. Most of the credit for this should go to incorporating local people and their concerns directly in the management program, which permits them to shape as well as support the outcome of their PEC.

To achieve the desired results, the PEC staffing could be self-sufficient or it could use experts from other organizations as discussed earlier. Generally it

would be more effective if the PEC made contractual collaborative arrangements with agencies for experienced personnel to help with some duties, especially at the beginning. For example, the extension program could be handled by agricultural extension agents after inservice training on the PEC approach. Inter-institutional cooperative ventures must specify a clearly defined role for the loaned employee and a clear understanding of the operational hierarchy within the PEC. As time goes on, local recruitment and training of staff may occur.

Summary

A new natural resource management category has been described and termed a Private Ecodevelopment Center (PEC). It would generally be privately owned by individuals or by non-profit institutions under arrangements providing for long-term transgenerational management. It would generally be smaller than publicly managed wildland units. It typically would contain valuable genetic resources as remnants or portions of ecological communities that may or may not be protected in public units. It facilitates and promotes applied research to benefit local communities. This research pertains to strategies and tactics for sustainable rural development based on local needs and ecological limits. This research may be oriented to such topics as

restoration of degraded lands or to agroforestry. Some of the land will be devoted to protection, some to manipulative research, and some may be degraded landscape that will be rehabilitated. The protection, research, demonstration, and extension programs will reach out to the surrounding community and involve them in goal setting, data collecting and implementation.

PEC offers the opportunity to protect smaller ecological communities while involving the human community in forging solutions to its natural resource management problems. The primary objective for management of the PEC is to foster sustainable rural development.

This description of a PEC has briefly presented its operation. It should serve to paint an image of this new category and of how it can fulfill the goals and objectives proposed for it through appropriate execution of the programmatic means of protection, research, demonstration, and extension.

CHAPTER IV

THE MERENBERG RESERVE

Introduction

The conceptual design for the PEC management category has been presented. Field testing of this normative model has not been performed. In lieu of such testing, an existing private nature reserve that functionally resembles the normative PEC will be examined. This reserve is the Merenberg Farm Nature Reserve in Colombia, South America. It was not designed from a PEC management plan but rather evolved from the owners' dedication to conservation and sustainable rural development. This fact must be kept in mind throughout this thesis so as not to compare rigidly either Merenberg or the PEC category against each other as one would do if a field test of the normative model had been designed. There is, however, a remarkable similarity between the two which is why Merenberg is being discussed. There are no known PEC's operating as set forth in the previous chapter and therefore a facsimili is needed.

This chapter will present information about the Merenberg Reserve and Foundation. There will be sections on: 1) History of Merenberg, 2) Review of Normative PEC

Characteristics at Merenberg, 3) Merenberg's Objectives and Their Achievement, and 4) Merenberg's Means.

History of Merenberg

European settlers first came to the Merenberg site in southwestern Colombia (see map, Figure 2) during 1929 from Germany. They found no native American Indians or other inhabitants and were isolated by a two-day hike from the nearest settlement. These pioneers, named Kohlsdorf, built a home in 1931. Mr. Kohlsdorf had a doctorate in agriculture and the family began agricultural experiments to determine which crops to grow. They found that cattle were their best product after traditional crops failed consistently because of excess moisture. Even when the crops were not producing well, the family didn't hunt the abundant wildlife.

During the 1940s, a road was constructed through their farm to link up two cities (Popayan and Neiva) on either side of the central Andes. This brought an influx of new pioneers or colonos as they are called locally. As these colonos became more numerous, controversy began over land use on the Merenberg Farm. The owners had set aside the steep land and broader forests as a nature reserve and natural buffer between their pastures. They protected the forest and wildlife; they understood that the springs flowed from the forest, that tree roots hold the soil from

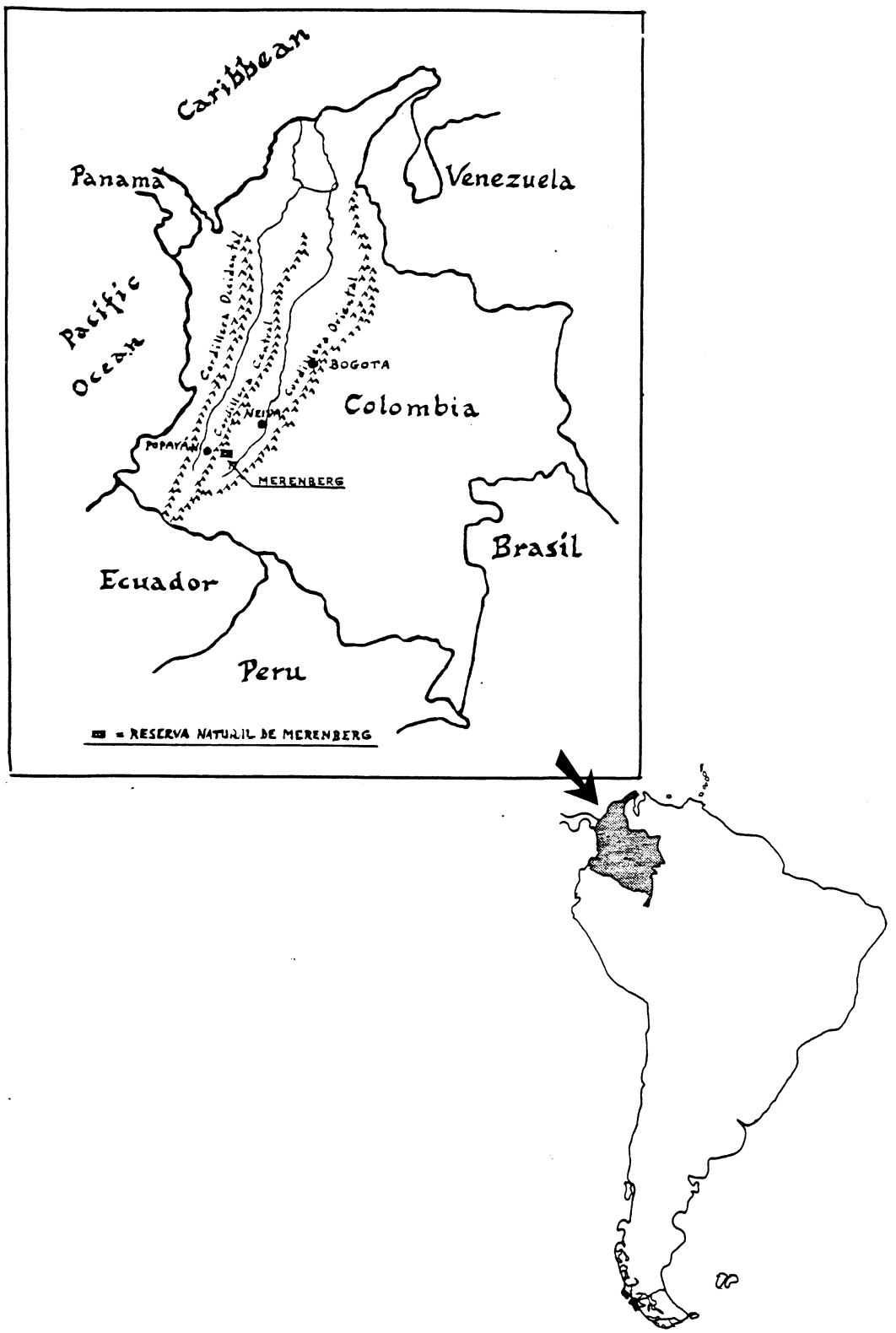

Figure 2. Location of Merenberg, Colombia.

eroding on slopes, and that a bountiful wildlife population kept farmyard pests under control. The colonos wanted to cut all the forest and eat all the wildlife that "God had provided for this purpose." The colonos did not understand why these resources should not be exploited even though they did not own them. They sporadically hunted wildlife on Merenberg, cut trees and cleared patches of land for slash-and-burn agriculture. These incursions into Merenberg continued and escalated over the years.

A colono invasion of the farm in the 1970s initiated a call for help to INDERENA (Instituto de Desarrollo de Recursos Renovables Naturales, Colombia's natural resource management agency) from the farm's owners, who were now Mechthild Kohlsdorf Buch (daughter of Dr. Kohlsdorf) and her husband, Gunther Buch. INDERENA posted signs proclaiming Merenberg a private nature reserve and helped mobilize the army to clear the reserve of colonos. After this support from the national government, mass invasions ceased. There were still individual invasions which the Buch family generally managed to solve peacefully themselves or through the courts. Unfortunately, one of the colonos who had invaded a portion of the reserve and had lost a legal review of the case swore vengence against the Buch family. Within a year he organized an assassination plot, killed Mechthild Buch, and narrowly missed killing

Gunther. The killers were found, tried, convicted, and sentenced to long prison terms.

Gunther Buch has since redoubled his efforts to protect the reserve. Scientists had already been allowed in the 1960s to use the reserve as a research site and, since the early 1970s, it has received increased attention from the scientific community. Gunther Buch was named Colombian Conservationist of the Year in 1977. A documentary movie was produced and widely distributed to present the Merenberg Reserve story and the tragic killing of Mrs. Buch to the Colombian people (Cajiao, 1976).

Most significantly, in 1980 the Merenberg Reserve, the World Wildlife Fund-United States, and ACUA, a private Colombian conservation organization, signed a contract providing for cooperation between them, particularly financial cooperation. The contract also presented a Preliminary Management Strategy for Merenberg Farm Nature Reserve and an Integrated Management and Development Project for the Merenberg Farm Nature Reserve (Cross, 1976b; Chaux, 1980; included in Appendix C). In these documents, preliminary objectives are presented along with six major programmatic elements or means. The six programmatic elements were: 1) conservation, 2) research, 3) education, 4) technical training, 5) Merenberg and the region; and 6) infrastructure.

About one year after this agreement, a fourth organization was formed. This new entity was named the Fundacion Merenberg or, in English, the Merenberg Foundation. This is the land-holding and managing authority for new lands to be acquired in the Merenberg area. Since its creation it has purchased two parcels of land, Fincas Candelaria and Cascada, through significant assistance from the WWF-US via their Merenberg Project. Agroforestry and silvopastoral research and reforestation are carried out on both parcels.

The Foundation also has extensive institutional linkages throughout Colombia, northern Latin America, and the United States. One of the most important contracts is with the University of Popayan, a new university being developed in Popayan, Colombia, that will devote an entire department to teaching ecology and sustainable development. Merenberg Foundation lands will be the field laboratory for this new university. Other institutions the Foundation works with include IUCN (where it participates as a member), the International Center for Tropical Agricultural Research (CIAT), the Cauca Valley Corporation (CVC, a TVA-type authority), University of Valle, the higher education foundation (FES), the government vocational training agency (SENA), the nation's natural resource agency (INDERENA), the Coffee Growers Association, Institute of Natural Sciences at the National

University in Bogota, and a large paper company (Carton de Colombia).

Review of Normative PEC Characteristics at Merenberg

1. Access to Merenberg Reserve is via the national highway linking Neiva to Popayan. This road is gravel but passable all year long. The same road passes through the nearby land the Merenberg Foundation owns. The research and demonstration portion of this property, the Finca Candelaria, is on a slope facing and adjacent to the road. The travel time from Popayan is three hours and from Cali, the nearest major city, six hours. The road bisects both the Merenberg Reserve and the Finca Candelaria. Gunther Buch has built an all weather driveway from the road to his dwellings. There is also a public right-of-way foot path that bisects the Reserve in another direction. This public right-of-way is necessary to provide people who live below Merenberg at the bottom of the valley, access to their lands from the road. Within the Reserve there is a network of foot trails for researchers and guests that totals over 2 kilometers in length.

2. Ownership of the Merenberg Reserve is under the name of Gunther and Mechthild Buch's three children. The children, Dietlind, Gerfried, and Svanhild, are Colombian citizens. (Gunther has retained his German citizenship.) The children inherited the property in equal thirds after

their mother was assassinated. They have signed an agreement that they will not decrease the amount of forest on the reserve; that is, they will not exploit the forest nor will they permit others to do so. They are also considering giving the Merenberg Foundation right-of-first-refusal if they ever need to sell their property. There have been discussions on the Merenberg Foundation gaining legal right to use the Merenberg Reserve forests for research, but so far (1983) no formal agreement has been reached. Currently research on the Reserve is conducted with the permission of the Buch family; to date this has not caused any problems for researchers.

The Merenberg Foundation property is held in its own name. The foundation is a non-profit, charitable, tax-exempt institution under Colombian law. The Board of Directors and officers are unpaid volunteers. Membership in the foundation is open to anyone recommended by two existing members and requires a contribution of 5,000 Colombian pesos. This latter restriction was included to prevent a takeover of the Foundation by any unscrupulous group of people seeking an easy way to acquire land.

3. The shape of Merenberg Reserve has changed since Dr. Kohlsdorf first settled the area. Much of what was Merenberg is now inhabited by neighbors who came in as colonos years ago. The Reserve is longer than it is wide and is bisected by the public right-of-way path in the

narrow direction and by the road along the longer dimension. Its irregular boundaries are the result of squatters taking land from the original farm.

The Reserve is a mosaic of virgin forest, secondary forest, and cattle pasture. The forests encircle the pastures thereby separating all pastures. This increases the edge effect and reportedly decreases disease problems with cattle (Buch, 1976). The pastures are mostly on relatively level land; the steeper terrain is kept in forest to minimize erosion and protect the watershed. The largest tract of virgin forest is located on a steep valley wall, and is approximately rectangular in shape. This forest is bisected by the public access pathway.

Finca Candelaria, the farm owned by the Foundation, is roughly oblong with the road bisecting it through the narrow dimension.

4. Both Merenberg Reserve and Foundation lands are representative of lower montane moist forest life zones in the Holdridge life zone classification system. They are located at an average elevation of 2,300 meters. This relatively high mountainous elevation is well populated throughout South and Central America. Because Colombia has three distinct branches of the Andes running through much of the country, a large portion of Colombia's territory and population is represented by this life zone.

5. The threat of destruction to the lower montane moist forest life zone is great throughout Colombia. This life zone is not protected near Merenberg except by the Reserve and Foundation. In other distant areas of Colombia, national parks protect this life zone.

6. The proposed management zones of Merenberg Reserve are varied and include protected forest, reforestation area, pasture including some grazed forest, and living area. The proposed zones of Finca Candelaria are areas of protected forest, of reforestation, research and demonstration, and of pasture. The relative degree of alteration is higher on Candelaria than on Merenberg. Both sites have reforestation efforts as well as pasture.

7. The size of Merenberg Reserve is 286 hectares of which 160 hectares are forest. Of the 160 hectares of forest, 70% is virgin forest, the remainder is secondary forest returning from either pasture or a colonos' invasion. The ages of the secondary forests are known which permits studies of succession to be performed quickly. Mr. Buch has reforested with native species several small areas that had for years been weeds under natural succession; these areas total about 1½ hectares. There is also a botanical garden of 5 hectares in the reforestation zone where field tests are conducted on dozens of species. The Reserve is financially supported

by the cattle ranch that occupies the remaining 126 hectares of pasture land on the property.

The Finca Candelaria is 37 hectares in size. The forest is approximately 7 hectares and the reforestation research and demonstration zone covers about 2 hectares. The remainder is pasture. The pasture to forest ratio is high because this was formerly a farm and was purchased by the Foundation as a buffer zone and experimental reforestation site.

8. Merenberg has not developed a management plan. The staffing at Merenberg has hardly been sufficient to permit active promotion of the reserve and foundation, let alone organization of a management plan. Interim guidance has followed a preliminary management strategy developed by this author (Cross, 1976b) and by additions to that strategy by Dr. Gustavo Wilches Chaux (1980). Both are included in Appendix C. In addition to these documents, the Merenberg Foundation Board has discussed policy and set some short-term priorities. The need to develop a management plan is understood by the Board of Directors of the Foundation.

In the absence of a management plan, the objectives used for comparison with the normative PEC are derived from the preliminary management strategy and additions mentioned above and provided in Appendix C.

9. The staffing of Merenberg has been by Gunther Buch, volunteer organizers, and assistants to him. Buch is Director of the Merenberg Foundation and administrator of the Reserve. In the mid-1970s, the United States Peace Corps stationed a volunteer at Merenberg to help Gunther Buch manage the Reserve. After that volunteer's tour of duty, Merenberg did not receive more assistance because the U.S. Embassy declared the area unsafe for permanent Peace Corps sites. Since then, individual Peace Corps volunteers have worked at Merenberg on their own until Peace Corps left Colombia in 1981, and several have continued working for Merenberg after their Peace Corps duty. Three have provided continuing assistance to both the Reserve and Foundation. Gina Green worked as Assistant Director of the Foundation with Gunther Buch, generating support among Colombian and American organizations. Paul Carlson has been instrumental in beginning the silvopastoral research program and developing the tree nursery. Bradley Cross, with his brother Harry, has coordinated the WWF-US: Project Merenberg fund raising activities.

Other significant volunteer efforts on behalf of the Foundation have been provided by Veronica de Bruyn-de Osa (Merenberg's European Coordinator), Dr. Alfredo Casa Martinez (Secretary General and Lawyer), and Gustavo Glauser (Deputy Director). Dr. Gustavo Wilches Chaux has

provided valuable conceptual direction and tangible support as President of ACUA (a private conservation organization) and Regional Director of SENA (the national vocational training agency). Dr. Humberto Alvarez, a zoology professor at the University of Valle, has coordinated many student thesis projects at Merenberg and has also conducted his own research there. He has been nominated to become Director of Research for the Merenberg Foundation.

Gunther Buch is the key individual behind the Merenberg story. He has donated endless hours, indeed his life, to ensuring that the fauna and flora of the Merenberg area survive. He has survived threats on his life and the murder of his wife. His son, Gerfried, is managing the cattle ranch at Merenberg, freeing Gunther to devote more time to managing the Reserve and the Foundation's property at Candelaria.

Gunther is the only person that could formally be classified as staff at the current time. During 1981, 1982, and 1983, Gina Green worked for her expenses coordinating support in the U.S. and Colombia. There have also been local employees in the past that did manual labor for the development and maintenance of the WWF-US: Project Merenberg. If Dr. Alvarez accepts the position of research director, Merenberg will have another staff member besides Gunther Buch.

10. Adjacent lands to Merenberg Reserve and Foundation are populated by rural peasants using traditional subsistence agricultural techniques. The lands have been largely deforested and springs and creeks have dried up. The fauna on adjacent lands is depauperate because of the incessant hunting and habitat destruction.

Within a kilometer of Finca Candelaria is a linkage or corridor to the Purace National Park. This is via a large farm called the Finca Bavaria. This farm is pasture and forest; the majority is forest. The national park is large, 87,000 hectares, and is managed by INDERENA, the national natural resource agency.

Merenberg's Objectives and Their Achievement

Written objectives for guiding Merenberg have not been consolidated in a formal management plan. The objectives used for the WWF-US agreement came from the Preliminary Management Strategy for Merenberg Farm Nature Reserve (Cross, 1976b). The following thirteen general objectives for Merenberg Reserve are taken from that document.

Objectives for the Merenberg Reserve:

1. To ensure the survival of the Reserve.
2. To maintain the ecosystems in their natural state.
3. To maintain the genetic resources in dynamic evolutionary processes.
4. To maintain the local watersheds in productive capacity.

5. To provide opportunities for formal and informal environmental education on-site and off-site.
6. To provide opportunities for environmental monitoring and research in natural areas.
7. To protect the archeological and historical heritage and to provide research opportunities in these fields.
8. To protect and manage the scenic resources of the Reserve.
9. To protect the soil resource from unnecessary erosion.
10. To maintain a sustained flow of outputs from natural processes.
11. To function harmoniously with Merenberg's cattle farm.
12. To promote, by example, a healthy attitude towards the environment.
13. To more fully integrate the Reserve into the community.

In addition to these general objectives for the Merenberg Reserve, the Merenberg Foundation's central goal is to "create a natural reserve within which native species of flora and fauna threatened with extinction will be guaranteed survival by means of land acquisition, conservation, research and reforestation" (Buch, 1981). The Foundation's specific objectives are three-fold:

1. To create a buffer zone around the Merenberg Reserve, using the assistance from the WWF-US agreement.

2. To develop a native species forest nursery, perform reforestation experiments in collaboration with other organizations in Colombia, and reforest the buffer zone.

3. To protect the natural resources of the region by helping the neighboring community develop and maintain their sustainable resources and improve their welfare.

The achievement of the Merenberg Reserve's objectives will now be reviewed.

1. To ensure survival of the Reserve.

After Mrs. Buch's death, the Reserve was threatened by invasions and poaching and by lack of outside support. Since then, Gunther Buch has built up such a strong national and international support base for the Reserve, that there is no threat to the Reserve at this time. The legal agreements the owners of the Reserve have amongst themselves not to diminish the forest area is important in the Reserve's survival. Poaching and invasions have dropped significantly in the last few years.

2. To maintain the ecosystems in their natural state.

Merenberg has protected and maintained some virgin ecosystems in their natural state. Some of the secondary forest ecosystems have been grazed which has had detrimental effects on species diversity and natural succession.

3. To maintain the genetic resources in dynamic evolutionary process.

Merenberg has protected the forests and fauna in its natural state as much as possible to ensure a healthy gene pool; this gene pool can then be the basis for the recuperation of surrounding land. The prohibition of collections, hunting, and fishing of

forest flora and fauna, except by special permission and only for scientific research, has protected the gene pool from rapid depletion.

4. To maintain the local watershed's productive capacity.

Merenberg has 36 natural springs that flow from its forests. These supply water to farmers downstream who have no springs of their own due to deforestation. The reforestation Merenberg has accomplished on the Reserve will increase the forest cover and will eventually further increase the local watershed's capacity.

5. To provide opportunities for formal and informal environmental education on-site and off-site.

Merenberg has had numerous students conduct their thesis research on-site. Many classes with students of different ages have walked the trails and learned about natural history. It is now recognized that the area is too small and the fauna too few to permit these repeated disturbance and still protect the area. For this reason, large classes of children below college level are no longer permitted to tour the Reserve as was once common, because of disturbances caused in the forest. Now only observers capable of quiet appreciation are allowed in the forest.

There has not been appreciable environmental education for local people by Merenberg personnel. The predominant educational effort has been oriented to making people outside the immediate area aware of Merenberg's conservation story. A recent agreement between the Foundation and the new University of Popayan will provide for Foundation lands to be used for educational and research purposes. As classroom studies on-site occur, case histories will be developed. Students will also be available to work with the local community on environmental education.

6. To provide opportunities for environmental monitoring and research in natural areas.

Merenberg Reserve has functioned as an observational research site for many years. The trail system mentioned earlier is over 2 kilometers in length and is special because it is mostly in the virgin forest region on a steep slope. This permits observers to look into the tops of downslope trees at close range where the fauna are at ease in their natural habitat.

The Reserve has facilitated research projects which span many of the sciences including geology, ornithology, primatology, botany, ecology, entomology, forestry, enthnobotany, and meteorology. These projects have all been made possible through the generous hospitality of the Buch family in

providing the Reserve and accommodations. Unfortunately, Merenberg does not have a research building at this time, which restricts research capacity. Also, there presently is not a research director, although Professor Humberto Alvarez of the University of Valle may accept the position. If he does, research will certainly increase and be applied to management needs.

Environmental monitoring, to the extent it has occurred, has been predominantly bird surveys which assessed species diversity and population levels in a grazed versus an ungrazed forest.

7. To protect the archeological and historic heritage and to provide research opportunities in these fields.

Merenberg Reserve has identified several sites of pre-Colombian cultural developments. These are protected on the Reserve and would be available to a qualified archeologist. Mr. Buch has also unearthed many relics of a pre-Colombian culture in the process of farming the pastures and constructing farm buildings. These relics are guarded at the Reserve.

8. To protect and manage the scenic resource of the Reserve.

Scenic resources have been maintained on the reserve. The only new development has been the botanical garden where reforestation experimentation

and construction of two aquaculture ponds is taking place.

9. To protect the soil resource from unnecessary erosion.

The soil resource has not eroded at Merenberg because the forest cover on the steep slopes has been maintained and thick pasture grasses hold the soil on flatter areas.

10. To maintain a sustained flow of outputs from natural processes.

Merenberg Reserve is protecting the forests that harbor the springs people downstream use. Its forests have produced fence posts and firewood for local consumption. The flora and fauna are reproducing and evolving in natural equilibrium. The cattle farm has maintained stable production over the years by field rotation, productive grasses, and prevention of overgrazing. Adjacent lands show significant declines in pasture productivity over time which reinforces the validity of the Merenberg form of management.

11. To function harmoniously with Merenberg cattle farm.

The Reserve is funded by the cattle farm. Without the income from the cattle farm, there could be no Reserve. The Reserve and farm are operated by the same management and have complemented each other well over the years. The Reserve is protected, its trails

maintained, its taxes paid, and its edge effect increased by the cattle element. The cattle benefit from the reserve by having a constant source of water from springs, by having pastures separated by forests which minimizes pests, and by having secondary forest to enter for protection during storms or calving. The cattle are kept out of the virgin forest to prevent damage.

12. To promote a healthy attitude towards the environment by example.

Most of the people learning environmental attitudes are supporters of Merenberg from outside the immediate vicinity. Generally the local people do not comprehend why the Reserve exists, though they realize the water they use comes from its forests. Their time frame is oriented to tomorrow, not to future generations. Merenberg staff and supporters feel that the local people will learn the value of sustainable land management when they see economic benefits. This may happen with the aquaculture project and some fruit production experiments once they are successful.

13. To more fully integrate the Reserve into the community.

This objective has been furthered through a socioeconomic study by a sociologist at SENA, the Colombian vocational education agency. The report of

this study presents the community composition, social stratification and economic structure (Alvarez, 1982). Alvarez analyzed the community into three socioeconomic groups and made recommendations for each group on improving the socioeconomic condition of the community and conserving the environment. This insightful report into the socioeconomic nature of the surrounding community will provide the basis for substantive participatory interaction between the community and Merenberg and will be beneficial for years to come.

Since this SENA report was completed in May, 1982, the Merenberg Foundation submitted a proposal including significant community participation elements to the Ford Foundation. It is titled "An Action Research Program to Develop Community Participation in Conservation of Native Andean Forest." This is designed to develop and test

> ...a mechanism for integrating the local community into sharing the objectives and benefits of conservation and their native forests...for identifying self-sustaining processes whereby local people participate in defining the problems, and identifying solutions that are compatible with both their short-term needs, and long-run benefits of conserving their resources. (Buch and Green, 1982)

The decision of the Ford Foundation is not known at this time.

Presently, there is little community integration beyond the employment of some manual labor for maintenance of the Merenberg or Candelaria Farms.

The achievements of the Merenberg Foundation's objectives will now be reviewed.

1. To create a buffer zone around the Merenberg Reserve, using the assistance from the WWF-US agreement.

To date, only the beginnings of the buffer zone have been purchased. Finca Candelaria and Finca Cascada have been paid for by Merenberg Foundation. Both of these farms are neighbors of the Reserve.

2. To develop a native species forest nursery, perform reforestation experiments in collaboration with other organizations in Colombia, and reforest the buffer zone.

The forest nursery on the Merenberg Reserve is funded and used by the Merenberg Foundation for reforestation experiments. This nursery has a capacity of about 3,000 seedlings per year. It includes a pressurized water system and a 10 x 15 foot greenhouse. There are about 15 native species that the nursery produces. Most of the seed stock comes from the Reserve. Seedlings are also produced for Foundation use at the SENA nursery and the nursery of a large paper company, Carton de Colombia, both of which are in Popayan.

Reforestation experiments have been occurring since 1974. In 1980 and 1981 several plots were planted by Paul Carlson, a former Peace Corps volunteer and currently a graduate student at the University of Illinois. Mr. Carlson has about 1.5 hectares in experimental companion plantings based on the alder (Alnus jorullensis) which fixes nitrogen symbiotically with nodule-forming actinomycetes of the genus Frankia (Buch and Carlson, 1982). He has combined the alder with valuable timber species native to the area. The most important species he is using is Billia colombiana. The objective of this experiment is to quantify the increased growth of the companion trees in close proximity to the nitrogen-fixing alder, compared to the growth of the same species without the alder association. This work is being done with the collaboration of Carton de Colombia, International Center for Tropical Agricultural Research (CIAT), the University of Illinois, and World Wildlife Fund-US.

Another experiment in tree planting on the buffer zone is planting alder at various spacings in a cattle pasture to determine the alder's effect on grasses. Other native species of trees have been planted randomly in a small plantation which is replacing overgrazed pasture in an experiment to

partially rebuild a native forest with several valuable species of trees that also supply important wildlife habitat.

Two grant proposals have been written and submitted by the Foundation to support further reforestation research and experiments. The first is "Silvicultural Uses of Nitrogen-Fixing Alnus jorullensis and Inga (family Mimosaceae) in Colombian Highlands" (Buch and Carlson, 1982). This project was designed to increase knowledge of the Alnus-Frankia relationship, quantify the nurse tree effects of associated plantings for pasture improvement and valuable timber species, conduct a provenance study of two species of Alnus, and carry out cost/benefit analysis of the timber project and increased soil fertility in addition to other objectives. It was submitted to the U.S. National Academy of Sciences, Board of Science and Technology for International Development Research Grants Program. This proposal was not funded because of the National Academy of Science's perception of a lack of Colombian training and scientific development opportunities.

The other reforestation grant proposal is "Modelo Agro-Forestal Para Colombia" (Fundacion Merenberg, 1982). This proposal was designed to support development of a pilot project of an agro-

forestry model to recuperate, preserve, and sustainably manage natural forests; to perform research on suitable species that would best provide a sustainable flow of resource benefits from the site; and to expand the wildlife habitat of the Foundation's land thereby conserving the regional genetic resources of the flora and fauna.

The project was organized to take advantage of the lands and natural resources owned by the Reserve and Foundation and the practical experience of their staff and supporters with the topic. It was submitted to the Coffee Growers Federation of Colombia for funding with the hopes that project results could be disseminated throughout Colombia via their respected and well-organized Federation. The Foundation has had no word from them as of this time.

3. Protect the natural resources of the region by helping the neighboring community develop and maintain their sustainable resources and improve their welfare.

Progress with this objective has largely been by the tree experiments that will eventually provide a sustainable development alternative. The research base for sustainable development is only partly developed; much remains to be learned. This is not to say that nothing can be done until long-term research results are in; on the contrary, the Merenberg Foundation proposal to the Ford Foundation

on "An Action Research Program to Develop Community Participation in Conservation of Native Andean Forest" will be a substantial step in this direction if it is funded. Local people will identify their problems and the solutions to those problems, which will move them toward sustainable development. At this time though, the welfare of Merenberg's neighbors has not been improved by the Foundation.

Merenberg's Means

The Merenberg Reserve agreement with WWF-US and ACUA signed in 1980 refers to 6 fundamental elements that are to be incorporated into the plan and function of the reserve. The first four of these elements are MAB Project #8 Objectives and the next two were added by the Colombian President of ACUA, Dr. Gustavo Wilches Chaux. In terms of the normative section of this thesis, these elements are means. For purposes of consistency, they will be reviewed as programmatic means.

The six means of the Merenberg Reserve are: 1) conservation, 2) research, 3) education, 4) technical training, 5) Merenberg and the region, and 6) infrastructure.

The implementation of the means of the Merenberg Reserve will now be discussed.

1. Conservation. Since 1980 the Reserve has strengthened its conservation program. It has participated

in the formation of the Merenberg Foundation which has aided the Reserve by purchasing land as a buffer zone and by beginning to reforest parts of the buffer zone. The Reserve itself has remained without serious infringements for several years now and its resource can be considered protected. Parts of the Reserve have been reforested with valuable native species which replaced weedy scrub growth that was holding succession at bay for decades with an impenetrable low-level canopy cover. The nursery facilities have increased from a few boxes to a facility with a capacity of 3,000 seedlings per year, a water system, and a greenhouse. A subsystem of the nursery water system are two experimental aquaculture ponds, which will hopefully provide the community with an alternative to illegally hunting the Reserves' wildlife once the specific details needed to implement an aquaculture project for the community is worked out. Occasional employment of local workers to plant or maintain the forest plantations seem to give a protective aura to the Reserve. Sporadic patrols by INDERENA personnel never catch poachers but do set a protected image for the Reserve. INDERENA's help may or may not be helpful because many local people do not like the agency and its policies.

2. Research. Research studies have been conducted in natural forest communities on the ecology of native

oaks, howler monkeys, avian community, bats, insects, and geology. Rare germplasm valuable for human use has also been surveyed and collected. These studies have all been basic research.

There has also been a history of applied research at Merenberg. Topics included the socioeconomic study of the surrounding community, reforestation, relative bird species diversity and density in a grazed secondary forest compared to virgin forest, pasture improvement, tree forage production, and bean cultivation and varieties. In progress are experiments in the horticulture of fruits appropriate to the area and aquaculture project designed to eventually increase the availability of protein and replace hunting for local peasants.

3. Education. Education at Merenberg has occurred on many different levels, from the scientific to the community level.

On the scientific level, several master's theses and one doctoral dissertation have been carried out at the Merenberg Reserve. Several papers have been published in scientific journals on research at Merenberg. There have also been presentations about Merenberg at conservation conferences in Colombia and elsewhere by Merenberg personnel.

On the larger community level, a color information booklet on the Merenberg Reserve and Foundation has been

distributed in Colombia. A 16mm documentary film on the Reserve and the Buch family, produced by Guillermo Cajiao in 1976, has been shown on national television and in movie theaters (Cajiao, 1976). This film has also been presented in the two villages nearest Merenberg. In addition, Merenberg helps fund and receives coverage in a monthly newsletter published by ACUA, which is distributed as a supplement with the daily paper in Popayan. This supplement is devoted to environmental education and usually includes an article about Merenberg. Lastly, the Fundacion Popayan, the institution organizing the new University of Popayan, is placing major emphasis on a department of ecology and environmental management. Finca Candelaria will be used in a cooperative fashion by this new department of the University.

4. Technical training. Technical training in conservation as envisioned in 1980 has not developed, in part because there has not been a demand for reforestation training. An initial training effort in the region has been made by SENA who conducted several short courses on small farm management and cattle production in Santa Leticia (seven miles from Merenberg). SENA has conducted these training courses in the Merenberg area to improve rural resource management in the region.

5. Merenberg and the region. As mentioned previously, a socioeconomic study has been carried out on

the Merenberg region. This report will provide a sound basis for future interactions between Merenberg and the local community. Based on the report, two proposals have been submitted to potential funding sources.

There have been several notable projects by institutions in the Merenberg area. The SENA training courses mentioned above were stimulated by Merenberg. A bean project in conjunction with CIAT, the International Center for Tropical Agricultural Research, tested improved bean production in the Merenberg region, which has a low bean productivity relative to its potential. Merenberg has provided educational material to the local school which is intended to increase understanding of environmental processes.

Much more needs to be done to help the local community develop sustainable resources but a strong foundation has been started that can be built on over the coming years.

6. Infrastructure. To achieve the objectives of the Reserve, appropriate support facilities and staff must exist. The two biggest infrastructure requirements still to be met are staffing and management training.

The nursery, with its water system that can also be used for aquaculture projects, has been developed over the last few years. The botanical garden is testing numerous species of fruits and hardwoods appropriate to Merenberg.

There is also a great need for a multipurpose building that can be used for environmental education, housing guests and researchers, and a research laboratory. Fencing of land on both the Candelaria and Merenberg property is still needed.

CHAPTER V

ANALYSIS

Introductory Analogy

Analyzing the validity of the Private Eeodevelopment Center as a new wildland management category can be seen as analogous to a journey. The overall objective or goal is the destination that everyone agrees on. The specific objectives are the map which indicates the direction and checkpoints along the way. The programmatic means are the vehicles used to arrive at the final objective. The characteristics of the PEC are elements of the vehicle (means), which vary depending on the journey's destination. Some elements will be more influential or stronger than others in some situations and not in others. This variability is accommodated by flexible design of the vehicle (means) and route (objectives), depending on the situation and given characteristics.

This analogy can be used to analyze Merenberg as a PEC and to analyze the concept of PEC as a valid management category; i.e., are we getting closer to the destination following this route in a vehicle made up of these characteristic elements? If we are, can we get to our destination more quickly or inexpensively and can we

develop a standardized vehicle, a "prototype," that can be used for journeys to other similar destinations in other areas of the world?

This chapter will examine Merenberg's objectives, means, and characteristics relative to those set out in Chapter III, The Normative Model. It will also review Merenberg's achievements or failures relative to its own objectives.

The Objectives of Private Ecodevelopment Centers, Merenberg Reserve and Merenberg Foundation

Table 3 presents the objectives of the Private Ecodevelopment Center (PEC), the Merenberg Reserve (MR), and the Merenberg Foundation (MF) that have been discussed in this thesis. In Table 4 (on page 127), the fit or convergence of the objectives of PEC, MR, and MF are given. Table 4 has been printed on a fold-out page after the discussion of the analysis to simplify the reader's reference to it.

Upon reviewing these tables, it is clear that MR and MF are compatible with the majority (7 out of 8) of PEC's objectives. Only PEC Objective 6, sustainable wildlife production, is not covered by MR or MF objectives. MR and MF are preserving wildlife but do not have surplus wildlife stock. However, both MR and MF have plans to begin aquaculture experiments with the intention of disseminating fish pond techniques in the local community

TABLE 3

Objectives of Private Ecodevelopment Center, Merenberg Reserve and Merenberg Foundation

Private Ecodevelopment Center Objectives (1983)	Merenberg Reserve Objectives (1976)
1. Support of participatory, sustainable, rural development through rational use of land and provision of stable employment opportunities.	1. To ensure the survival of the Reserve. 2. To maintain the ecosystems in their natural state. 3. To maintain the genetic resources in dynamic evolutionary process. 4. To maintain the local watershed in productive capacity. 5. To provide opportunities for formal and informal environmental education onsite and offsite. 6. To provide opportunities for environmental monitoring and research in natural areas. 7. To protect the archeological and historical heritage and to provide research opportunities in these fields. 8. To protect and manage the scenic resources of the Reserve. 9. To protect the soil resources from unnecessary erosion. 10. To maintain a sustained flow of outputs from natural processes. 11. To function harmoniously with Merenberg's cattle farm. 12. To promote a healthy attitude toward the environment by example. 13. To more fully integrate the Reserve into the community.
2. Provide environmental education, research, environmental monitoring.	
3. Maintain sample ecosystems.	
4. Maintain ecological diversity and environmental regulation.	
5. Conserve genetic resources.	
6. Produce protein from wild fauna and flora sustainably.	
7. Produce timber sustainably.	
8. Maintain open options through multi-purpose management.	
	Merenberg Foundation Objectives (1981)
	1. Create a buffer zone around the Merenberg Reserve, using the assistance from the WWF agreement. 2. Develop a native species forest nursery and perform reforestation experiments in collaboration with other organizations in Colombia and reforest in the buffer zone. 3. Protect the natural resources of the region by helping sustainably develop the neighboring community and improve their welfare.

to provide an alternative to poaching wildlife. Although sustainable wildlife production has not been specified as an objective by MR and MF, the two aquaculture ponds being built on MR for these experiments suggest that this PEC objective is being addressed by MR and MF.

Analysis of Fit Between MR and MF Objectives and PEC Objectives

This section will analyze how MR and MF objectives fit with PEC objectives. To read the following pages easily, fold out Table 4 (page 127). This will make reference to the objectives and their relationships simpler. Table 5 details the comparison of the objectives of the PEC, MR, and MF referred to below and summarized in Table 4.

The criteria used in the following analysis is two tiered. The first is based on the applicability of MR and MF objectives to the PEC objectives. Which MR and MF objectives are supportive and applicable to which PEC objectives? This provides the first tier of analysis, segregating and grouping the objectives to demonstrate their compatibility (Tables 4 and 5). The second tier consists of an examination of the performance of MR and MF in achieving their stated objectives relative to PEC objectives. Each PEC objective is stated, and the applicable MR and MF objectives are enumerated. Then each MR and/or MF objective is stated and performance is

TABLE 5

Detailed Comparison of PEC Objectives to MR and MF Objectives

PEC OBJECTIVES	MERENBERG RESERVE (MR) AND FOUNDATION (MF) OBJECTIVES
1. Support of participatory, sustainable, rural development through rational use of land and provision of stable employment opportunities.	MR 10. To maintain a sustained flow of outputs from natural processes. MR 11. To function harmoniously with Merenberg's cattle farm. MR 12. To promote a healthy attitude towards the environment by example. MR 13. To more fully integrate the Reserve into the community. MF 3. Protect the natural resources of the region by helping sustainably develop the neighboring community and improve their welfare.
2. Provide environmental education, research, environmental monitoring.	MR 5. To provide opportunities for formal and informal environmental education onsite and offsite. MR 6. To provide opportunities for environmental monitoring and research in natural areas. MR 7. To protect the archeological and historical heritage and to provide research opportunities in these fields. MF 2. Develop a native species forest nursery, and perform reforestation experiments in collaboration with other organizations in Colombia and reforest the buffer zone.

Table 5. (Continued)

PEC OBJECTIVES	MERENBERG RESERVE (MR) AND FOUNDATION (MF) OBJECTIVES
3. Maintain sample ecosystems.	MR 2. To maintain the ecosystems in their natural state. MR 10. To maintain a sustained flow of outputs from natural processes. MF 1. Create a buffer zone around the Merenberg Reserve, using the assistance from the WWF agreement.
4. Maintain ecological diversity and environmental regulation.	MR 4. To maintain the local watershed in productive capacity. MR 8. To protect and manage the scenic resources of the Reserve. MR 9. To protect the soil resource from unnecessary erosion. MR 10. To maintain a sustained flow of outputs from natural processes. MF 1. Create a buffer zone around the Merenberg Reserve, using the assistance from the WWF agreement.
5. Conserve genetic resources.	MR 3. To maintain the genetic resources in dynamic evolutionary processes. MF 1. Create a buffer zone around the Merenberg Reserve, using the assistance from the WWF agreement.
6. Produce protein from wild fauna and flora sustainably.	No MR or MF objectives specifically addresses this PEC objective.

Table 5. (Continued)

PEC OBJECTIVES	MERENBERG RESERVE (MR) AND FOUNDATION (MF) OBJECTIVES
7. Produce timber sustainably.	MR 10. To maintain a sustained flow of outputs from natural processes. MF 2. Develop a native species forest nursery, and perform reforestation experiments in collaboration with other organizations in Colombia and reforest the buffer zone. MF 3. Protect the natural resources of the region by helping sustainably develop the neighboring community and improve their welfare.
8. Maintain open options through multi-purpose management.	MR 1. To ensure the survival of the Reserve. MR 10. To maintain a sustained flow of outputs from natural processes. MR 11. To function harmoniously with Merenberg's cattle farm. MR 12. To promote a healthy attitude toward the environment by example. MR 13. To more fully integrate the Reserve into the community. MF 2. Develop a native species forest nursery, and perform reforestation experiments in collaboration with other organizations in Colombia and reforest the buffer zone.

described relative to this objective. Based on Merenberg's performance and the author's familiarity and experience with the organizations, a determination is made at the end of each descriptive paragraph as to whether that MR or MF objective tangibly and successfully supports that PEC objective. This provides a perspective on both the compatibility of PEC, MR, and MF objectives and the relative achievement of these MR and MF objectives as they apply to specific PEC objectives.

PEC objective 1: Support of participatory, sustainable, rural development through rational use of land and provision of stable employment opportunities. This objective is compatible with MR objectives 10, 11, 12, and 13, and MF objective 3.

MR 10: To maintain a sustained flow of outputs from natural processes. The Reserve is managed for sustainable yields of water, firewood, fence posts, and for the continuing evolution of the ecological community. This objective has been successful because of the dedicated protection efforts of the administrator, Gunther Buch. The low volume of subsistence wood consumption from the secondary forests is substantially less than the growth volume, thereby ensuring a constant supply without endangering the resource. MR is achieving its objective 10.

MR 11 and 12: To function harmoniously with Merenberg's cattle farm; to promote a healthy attitude

toward the environment by example. The Reserve is managed in conjunction with the Merenberg cattle farm. This combination provides benefits to each operation and serves as an example of productive and sustainable land use management. The Reserve provides a buffer for the cattle from weather and from neighboring ranches. The reserve occupies the steeper slopes where cattle would create erosion problems and degrade the land's productive base. By managing the cattle on the flatter areas of Merenberg where intensive use is most appropriate, the slopes are available to produce forest reserve benefits of water, firewood, flora and fauna, and gene conservation. This beneficial combination of land management provides an example of a style of ecodevelopment that protects the environment as well as earns a profit. MR objective 11 is being achieved. Objective 12 is occurring mostly with people outside the local area. Near the reserve the people are poor and struggle constantly to grow their families' food, so they have not understood why the forest is protected and not exploited.

MR 13 and MF 3: To more fully integrate the Reserve into the community; protect the natural resources of the region by helping sustainably develop the neighboring community and improve their welfare. The role of the Reserve in the community is currently outside the cultural traditions and concerns of local people. It is decades

ahead of its neighbors in management philosophy and techniques. One of the reasons Merenberg is more progressive is that it has more land than most surrounding farms and thus has had the freedom to be managed differently. Another reason is the foresight of the Buch family. To achieve PEC objective 1, the reserve must integrate itself more fully into the local community. This will likely occur as MF initiates community involvement through a version of the proposal, "An Action Research Program to Develop Community Participation in Conservation of Native Andean Forest." If funded, this proposal will involve and integrate the MF and the MR into the local community. The socioeconomic study and the proposal to implement its recommendations lay the groundwork, but until actual community involvement takes place, MR objective 13 and MF 3 will be unmet.

PEC objective 2: Provide environmental education, research, environmental monitoring. It is compatible with MR objectives 5, 6, and 7 and MF objective 2.

MR #5: To provide opportunities for formal and informal environmental education onsite and offsite. Merenberg Reserve's environmental education activities have largely been student research work and informal visitor tours in the forest. The color brochure produced by MF is a good educational tool, as is the 16mm movie Guillermo Cajiao produced in 1976. (He plans to produce a

follow-up film in 1984.) The problem of the lack of environmental awareness at the local level still has to be conquered. Developing this awareness will take time and the efforts of a professional environmental educator. This person could be linked with the local school and could conduct periodic classes for both school-age children and adults. This is a more likely possibility with the agreement between MF and the new University of Popayan, which could provide student teachers onsite. MR 5 has been partially achieved, but more must be done.

MR 6: To provide opportunities for environmental monitoring and research in natural areas. MR has facilitated many research projects, providing the forest, the trails, and accommodations. This has been a central objective of MR over the years and researchers have been encouraged to do work at Merenberg. The demands on Gunther Buch's time as Director of the Foundation have led to the creation of the new position of Director of Research. This person would coordinate all research for MR and MF. Before this position becomes operational, the relationship between MF and MR with respect to research usage of MR forests must be clearly defined and agreed upon. (Currently the forests are controlled exclusively by the three owners.) Once an agreement has been reached, the Director of Research, who would serve part time, would be expected to coordinate an increased generation of research.

The research should be designed to solve land management problems at the basic level, if that is what is needed to solve a management problem, or at the applied level if basic information is known. Basic research for the benefit of general knowledge has a lower priority because of the pressing land use and development problems that must be solved if MR is to survive. Once sustainable rural development is firmly rooted in the community, in both the technical and social sense, then the MR and MF will have the time to perform basic research not directed at an applied goal.

It is remarkable how much research work has been done so far even though there is no research center or building. All logistical support from food to forest research workers and laborers has been provided through the generous hospitality of the Buch family. Presently, Gerfried Buch and his wife Elizabeth, Gunther's son and daughter-in-law, are managing the cattle farm and kitchen. The Buch family plan to construct, probably with MF funds, another building to house and feed visitors and scientists. The structure may be built on a piece of MR land leased to MF for 99 years or on Finca Candelaria. The latter would be more distant from both the family home's and the MR forest. This distance is a problem since the interests of both visitors and scientists are centered on the MR forest. This problem of distance may diminish over time

as more applied research is conducted on Candelaria and demonstration plots mature into young forest.

No matter where it is built, the new structure must be secure and have a full-time caretaker to cook, clean, and provide security. The Foundation Director would train and manage this person. The facility should charge visitors on a sliding scale to generate profit for the MF, thereby strengthening the Foundation's finances with every visitor. Tourism emphasizing environmental education could become a major source of income for MF with strong and well-managed promotion.

Environmental monitoring is not well understood in Colombia; there is not the financial support, expertise, or data base as there is in the U.S. Nevertheless, awareness exists about erosion problems, deforestation, declining species of fauna, and disruptive weather cycles. MR has put together a baseline species inventory of plants, birds and other wildlife. One study has been conducted on the differing avian species diversity and population levels between grazed and ungrazed forest. The result of this monitoring was to recommend increased fencing to protect the avian communities.

MR 6 has supported PEC objective 2, even though much more needs to be done to increase its future success.

MR 7: To protect the archeological and historical heritage, and to provide research opportunities in these

fields. MR has protected several archeological sites and a collection of artifacts for future research. To date, no archeologists have been interested in researching the area. If one ever does, MR will provide the research site and access to the collection. MR 7 supports PEC objective 2.

MF 2: Develop a native species forest nursery and perform reforestation experiments in collaboration with other organizations in Colombia and reforest the buffer zone. MF has developed a small nursery on MR. It has reforested several hectares of Candelaria and plans to continue reforesting the rest of Candelaria in the next two years. The reforestation has been experimental in nature and much valuable experience has been gained that can be applied in future reforestation efforts. One significant unexpected finding is that young trees transpire enough water to partially drain soggy pasture lands. This permits more nutritious grasses to successfully compete against weedy grasses in the humid montane cattle pastures. This finding could significantly increase cattle production as well as promote the many benefits of reforestation once the spacing for different species is worked out. Cattle ranches in Colombia's rainy montane zone could be useful in meeting the objectives of both cattle ranches and conservation. Carton de Colombia, the largest paper company in Colombia, is cooperating with

MF by providing seedlings at cost from their large nursery in Popayan. MF 2 supports PEC objective 2.

PEC objective 3: Maintain sample ecosystems. It is compatible with MR objectives 2 and 10, and MF objective 1.

MR 2: To maintain the ecosystems in their natural state. As is obvious from the history of Merenberg, the Reserve has always protected the virgin ecosystems through the tremendous personal devotion and sacrifice of the Buch family. This is one of the key reasons why MR is supported by international and national conservation organizations. MR 2 strongly supports PEC objective 3.

MR 10: To maintain a sustained flow of outputs from natural processes. MR manages its hillsides for forest thereby providing the sustained flow of water, wildlife habitat, and subsistence wood uses. By managing zones of the reserve for sustainable forest production of water and subsistence wood, this permits managing other zones for non-consumptive preservation of their sample ecosystem. MR 10 supports PEC objective 3.

MF 1: Create a buffer zone around the Merenberg Reserve, using the assistance from the WWF agreement. The MF goal of creating a buffer zone around MR supports PEC objective 3 in two ways. First, by buying adjacent forest and reforesting pastureland, habitat is expanded and natural forest size increased thereby buffering MR from

deleterious impacts caused by conflicting land uses at the borders. Second, the buffer zone purchase in itself increases the protected area outside the reserve thereby maintaining the sample ecosystems that remain on those parcels. Presently, only two parcels, Finca Candelaria and Finca Cascada, have been purchased by MF; they are only the first pieces of the buffer system which is far from being complete. These pieces of buffer zone support MF 1 as described above, thereby supporting PEC objective 3.

PEC objective 4: Maintain ecological diversity and environmental regulation. It is compatible with MR objectives 4, 8, 9, and 10, and MF objective 1.

MR 4: To maintain the local watershed in productive capacity. MR has protected its watershed for home, cattle and wildlife use. It also provides the watershed for farms below it who have lost their own springs through deforestation. By managing the forest on the hills, a constant supply of water comes from the 36 natural springs on MR land. The forest also acts as a sponge to absorb heavy rains, thereby reducing the potential for floods and regulating water flow. MR 4 supports PEC objective 4.

MR 8: To protect and manage the scenic resources of the Reserve. The visitor's first impression of MR is one of scenic beauty. The forest fringed pastures, waterfalls, and virgin oak forest are all aesthetically appealing.

Though management is oriented primarily to less subjective concerns, scenic values have been cared for. Because of this many photographers have come to MR over the last decade. The forest-pasture mix also provides a strong edge effect which is ecologically beneficial for many wild species. The mix is also thought to be beneficial in keeping cattle pests at low levels, thereby naturally regulating costly pests. This pasture-forest mix, coupled with the virgin-secondary forest mix, provides local ecological diversity greater than would be found on a purely virgin tract. MR 8 supports PEC objective 4.

MR 9: To protect the soil resources from unnecessary erosion. The MR has protected the soil resource through the previously described land use management. The soil is not eroding from MR and it is eroding rapidly from surrounding farms. By preventing erosion the soil resource is stabilized and environmental regulation is enhanced. MR 9 supports PEC objective 4.

MR 10: To maintain a sustained flow of outputs from natural processes. The MR is managed for a sustained flow of outputs as previously described. By definition, to get a sustained flow of outputs means a stable environment. MR 10 supports PEC objective 4.

MF 1: Create a buffer zone around the Merenberg Reserve, using the assistance from the WWF-U.S. agreement. The buffer zone being created around MR will protect the

reserve from outside impacts, thereby gradually increasing further the MR's capacity for self regulation as the managed area encompasses more of a complete ecosystem. This will be especially true as neighbors adopt conservation for development practices and thereby convert the nearby region into a self-regulating ecosystem. MF 1 supports PEC objective 4.

PEC objective 5: Conserve genetic resources. It is compatible with MR objective 3 and MF objective 1.

MR 3: To maintain the genetic resources in dynamic evolutionary process. The MR is specifically managed to protect the genetic heritage for present and future generations. In fact, this dedication is what led to the entrapment and murder of Mrs. Buch in 1975. The killers knew the Buch's would come into the forest to protect the wildlife from hunters. The MR will not allow consumptive scientific research of the fauna and only herbarium specimens are taken by botanists from the virgin forest. Gunther Buch sees the Reserve as a Noah's Ark for this area of the Andes because he feels that someday native forests will again be valued by the local people for the benefits they provide in addition to timber. Seeds from Merenberg have been used to reforest parts of the MF land. More of that land will be reforested in the future. As the native forest habitat gradually returns, the remaining fauna of MR will expand to the new forest. MR 3 supports PEC objective 5.

MF 1: Create a buffer zone around the Merenberg Reserve, using the assistance from the WWF-U.S. agreement. The buffer zone protects genetic resources as described above, by providing space for new forest habitat. In fact, a tapir was seen on MF land in 1983, the first sighting in the area for years. The Foundation also protects some remnant forest on its land. The expectation is that the genetic base of MR will gradually spread wider and will become less vulnerable to negative influences. MF 1 is gradually supporting PEC objective 5.

PEC objective 6: Produce protein from wild flora and fauna sustainably. This objective is not specifically addressed by any MR or MF objectives. There are two completed aquaculture ponds installed at MR which need a little capital investment and scientific advice to implement a fish protein project. If this project is successful, it could be inexpensively replicated by local people so they could grow high-protein fish themselves.

PEC objective 7: Produce timber sustainably. It is compatible with MR objective 10 and MF objectives 2 and 3.

MR 10: To maintain a sustained flow of outputs from natural processes. MR wood needs are minimal - fence posts and subsistence firewood for cooking. These needs are met in a sustained manner by selectively cutting some trees from the secondary forests of the reserve. By cutting selectively and doing so only in the secondary

forests, sustainable subsistence supplies are maintained without touching virgin forest. MR 10 supports PEC objective 7.

MF 2 and 3: Develop a native species forest nursery and perform reforestation experiments in collaboration with other organizations in Colombia and reforest the buffer zone; protect the natural resources of the region by helping sustainably develop the neighboring community and improve their welfare. MF and MR have developed a nursery and planted several reforestation experiments. In these endeavors, they have worked cooperatively with several institutions. The reforestation experiments are designed to test faster tree growing techniques and species compositions. They are intended to show that cultivating trees can be profitable and can provide necessary resources, as well as benefit conservation. Two grant proposals have been submitted for funding which would develop an information base on reforestation and agroforestry in the high humid Andes. The current reforestation project and the proposed experiments, provide and will continue to provide a technical alternative for sustainable rural development once they test out successfully.

There is a plan to reforest major parts of Finca Candelaria during 1984 using a reforestation loan from the government. Part of the plantings will be in firewood

species to produce a sustainable level of firewood for local consumption. MF 2 and 3 currently support PEC objective 7 and will provide stronger support in the future.

PEC objective 8: Maintain open options through multipurpose management. It is compatible with MR objectives 1, 10, 11, 12, and 13, and MF objective 2.

MR 1: To ensure the survival of the Reserve. MR struggled for many years to survive and be recognized. It has, for the time being, secured both through much dedicated hard work. The Reserve must exist and operate before it can attempt any outreach projects. By developing the way it has, many options are open to it including continuing its present multipurpose management approach. MR 1 supports PEC objective 8.

MR 10: To maintain a sustained flow of outputs from natural processes. The Reserve's objective of managing for sustained yield from natural processes has been successfully achieved with respect to different natural resources. By managing for sustained yield, it has maintained its options for future management priorities without depleting any natural resources. MR 10 supports PEC objective 8.

MR 11 and 12: To function harmoniously with Merenberg's cattle farm; to promote a healthy attitude toward the environment by example. The Merenberg Reserve

is part of a larger cattle farm. They have coexisted harmoniously for over 50 years. Management for both conservation and cattle ranch objectives has been an innovative example of multipurpose management. These multiple objectives are closer to the objectives of owners of medium to large cattle ranches than to those of poor farmers who have only a few acres of land. Millions of Colombians have seen or heard about the Merenberg story and have thereby been exposed to a healthier attitude toward the environment. MR 11 and 12 strongly support PEC objective 8.

MR 13: To more fully integrate the Reserve into the community. The Reserve has not been able to effectively integrate with the community. The basis for greater community participation in conserving native forests exists with the socioeconomic study and the grant proposal. Current experiments with fruits, alder and pasture, and alder and timber species fit the needs of local residents. As these experiments continue and show a positive alternative, it is hoped that local adoption will follow. Merenberg's approach of being both a functioning farm and a nature reserve is one that will show a new alternative for the local people through multipurpose management. Although MR 13 is compatible with PEC objective 8, up to now MR has not achieved this objective.

MF 2: Develop a native species forest nursery and perform reforestation experiments in collaboration with other organizations in Colombia and reforest the buffer zone. By reforesting with different species and spacing, the MF's goal is to develop several different options for permaculture management. The four combinations tried so far are pasture and trees, agriculture and trees, nurse trees (i.e., nitrogen-fixing trees) and timber trees, and lastly fruit trees alone. These different approaches by MF will open many new options for multipurpose management when properly developed and demonstrated. MF 2 supports PEC objective 8.

Comparison of Means Between PEC and Merenberg Reserve

Table 6 presents the programmatic means designed to implement the objectives of both the PEC and MR. The four PEC means are more general than the six MR means, which are more specific to the Merenberg area. In the case of the PEC, the means are as critical as the objectives. They are the program for implementing objectives. Using our analogy, they are the vehicles for the journey. MR's means implementation record was presented in Chapter IV. That record will now be reviewed and the fit of MR and PEC means will be discussed.

Table 4

Fit of MR and MF Objectives to PEC Objectives

Merenberg Reserve Objectives	PEC Objectives (1) Sustainable rural development	(2) Environmental education, research, monitoring	(3) Maintain ecosystems	(4) Ecological diversity and regulation	(5) Conserve genetic resources	(6) Sustainable wildlife protein sources	(7) Sustainable timber production	(8) Multi-purpose management	
1. Reserve survival								+	1.
2. Maintain ecosystems			+						2.
3. Maintain genetic resources					+				3.
4. Maintain productive watershed				+					4.
5. Environmental education		+							5.
6. Envi. monitoring & research		+							6.
7. Archeological & historical research		+							7.
8. Scenic resources				+					8.
9. Soil resources				+					9.
10. Maintain sustainable outputs	+		+	+		+		+	10.
11. Harmonize with cattle farms	+							+	11.
12. Healthy environmental attitudes	+							+	12.
13. Integration of Reserve with community	+							+	13.
Merenberg Foundation Objectives									
1. Buffer zone for Reserve			+	+	+				1.
2. Reforestation		+				+		+	2.
3. Sustainable development of community	+					+			3.

+ = convergence of objectives.

Table 6
Private Ecodevelopment Center and Merenberg Reserve
Programmatic Means

PEC Means	MR Means
1. Protection	1. Conservation
2. Research	2. Research
3. Demonstration	3. Education
4. Extension	4. Technical training
	5. Merenberg and the Region
	6. Infrastructure

Analysis of MR Means and their Fit to PEC Means

1 MR: Conservation. The conservation mean has been among the most effective of the six MR means. Protection has been established and much has been done to improve it further in the MR and MF.

Because of the small size of the MR, it is important to keep in mind the limited time scale that genetic preservation efforts have to be effective for many species. The lessons of Island Biogeographic theory show that the smaller the area created, the faster will be the species diversity decay rate, as well as the genetic decay within species. It is also believed that the smaller the area, the fewer new species will immigrate.

The MR is quite close (within 3 kilometers) of Purace National Park. Purace is higher in elevation than the MR;

therefore the MR offers a valuable lower-elevation continuation of the protected area of the biome. The creation of a corridor between MR and Purace has been a goal of Gunther Buch for over a decade. Purchase of a corridor for protection would be costly -- several hundred thousand dollars. It would also require men to protect it. The MF is striving, without this corridor, to increase native forest habitat on the lands it buys through planting and natural regeneration, and thereby increase the forest area under protection.

The real answer to protection, however, is with the lands that remain privately owned. Protection would be assured if private lands around Merenberg were managed for sustainable productivity and improved conservation. For the long-run protection of MR, improved land use on surrounding lands is a must. Therefore, an emphasis on sustainable development for conservation is crucial for genetic heritage preservation.

The conservation mean of MR matches the PEC protection mean quite closely. The preservation of genetic resources, representative ecosystems, and watersheds are covered by both means. Merenberg's conservation program also covers active management to restore altered or damaged lands by reforesting those lands with a new native forest in those areas where this is the most productive use of the land.

2 MR: Research. The research that has been accomplished so far at MR pertains mostly to basic natural history and reforestation topics. There has also been the socioeconomic study, mentioned previously, and some limited agriculture experiments.

The MR research objectives have broadened from an original focus on basic biological and applied reforestation research to include applied social science research. The outstanding MF proposal will further increase this research with a program to implement community involvement.

Research objectives of a PEC would be designed to help manage it. Research would be clearly applied and would be basic only when needed by a future applied project. PEC would also include local input, wherever possible, to foster more contact and understanding between the center and the local community. It would also train and employ local people in data collection for the research. Conversely greater local input would allow researchers to interact, understand, and work with the eventual beneficiaries.

3 MR: Education. The MR has educated sectors of the public about the Reserve and the Foundation's objectives and philosophy. Many institutions in the country are aware of Merenberg, as are many international non-governmental conservation organizations. In addition, most readers of the local newspapers in Popayan know of

Merenberg and what it is trying to achieve. The challenge still awaiting Merenberg is to educate its local neighbors to its goals in a way they can understand and accept and in which they can feel proud to participate. This effort will probably be worked on intensively by the students from the new University of Popayan. It is also the central topic in the proposal, "An Action Research Program to Develop Community Participation in Conservation of Native Andean Forest," which MF generated and sent to the Ford Foundation.

Support of educational activities such as theses and tours have been constant at MR. Merenberg has also been represented at scientific conservation conferences by various persons making contributions from the Merenberg experience. Neither Merenberg Reserve nor the Foundation have sponsored ecodevelopment conferences as originally planned in 1980, but the intention to do so is there once the need, the staff, and the funding for such an undertaking permit it. Most of the other educational activities planned in 1980 have been carried out, such as ACUA bulletins and a descriptive brochure.

The Reserve's mean of education approximates the PEC extension and demonstration means. The MR mean is broader than PEC's, as it is designed for a larger audience. The PEC extension mean is outreach only to the local community using the lessons from the other PEC means of protection,

research, and demonstration. It is oriented to its neighbors with the aim of their adopting improved land management practices.

4 MR: Technical Training. MR activities on this mean have been minimal. Only a few traditional rural development courses have been given through cooperative efforts with SENA. Originally Merenberg was to be the site of a technical training center run by SENA. This center was intended to train people in reforestation and ecodevelopment skills. SENA has since decided that such training can be performed more efficiently and economically in Popayan. The other aspect of MR's technical training mean is similar to PEC's extension mean: provide traditional extension efforts on topics needed by local people to improve the quality of their lives. Because SENA provides vocational training in many fields, from agriculture to data processing, and is cooperating closely with MR, it is expected that as MR and MF develop and are ready for an expanded extension program, SENA will be able to provide quality support. Such extension programs will fulfill the PEC extension mean.

5 MR: Merenberg and the Region. This program mean encapsules the entire PEC concept. It is a conservation-based community-development program which is to be implemented as soon as it can be funded. The socioeconomic study needed for the community involvement proposal has

been completed and the proposal itself, discussed in the section on the education mean, has been submitted.

The intent of this programmatic mean was to foster the community's ecodevelopment which would then lessen pressure to invade and poach the Reserve's wildlife. There is no parallel PEC programmatic mean to this one. This MR mean is closer to PEC objective 1: Support of participatory, sustainable, rural development through rational use of land and provision of stable employment opportunities.

6 MR: Infrastructure. This program includes the necessary support to implement and administer the other programs. The major needs are staffing, management training, and a multi-purpose structure. Funding is still necessary to fill these needs.

This MR program is not paralleled in the PEC category. Administrative programs, such as infrastructure, would be developed in the management plan of a specific PEC. As previously noted, the PEC model presented in this thesis is a conceptual introduction, rather than a detailed blueprint.

Summary of Comparison of Means Between PEC and Merenberg Reserve

The Merenberg Reserve's means fulfill all the programmatic means of PEC. The Reserve has more means than PEC; it means are unique to the organization and

site. The PEC means are intended for the more general case. The PEC program also distinguishes between demonstration and extension rather than combining them as MR does in its education mean.

The means are the programs implemented to achieve objectives. By and large MR has had good success with many of its objectives, mostly through its conservation, research, and education means. There is much more to do, especially greater implementation of MR means 4, 5, and 6 as funding permits, but much has been achieved by volunteers during its three years of existence.

Comparison and Analysis of MR and PEC Characteristics

A comparison of the normative characteristics of PEC from Chapter III and the Merenberg characteristics from Chapter IV will now be discussed. Merenberg generally fits the PEC characteristics. It should be remembered that every individual PEC will vary in its circumstances and will thereby create a unique combination of characteristics. No two can be expected to be the same, nor should such expectations be a goal. Because of this, MR and PEC characteristics will not be formally compared. Instead, what follows is an abbreviated analysis of selected MR characteristics from the PEC model that require priority action.

Ownership. The Buch family owns the Reserve. There are many volunteers working and contributing to MF whose fundamental goal is to protect and buffer MR. Visitors of the past and present are also interested in MR. Many supporters are concerned about the future of MR after the passing of Gunther Buch. The question is how best to ensure the continuation of MR. The supporters of MF in cooperation with Gunther Buch have proposed a right-of-first refusal from the Buch family to MF should the family ever need to sell. There is a further proposal made by some supporters who would buy MR from the family immediately or whenever the family preferred, put the title under MF, and write into the contract that the family would live on and manage the land, as they do presently, as long as the three current owners are alive.

One of the reasons for concerns about ownership is that increased funding of MF would not be the optimal use of very scarce funds, if MR could possibly be sold to outsiders sometime in the future. If guarantees that MR would always remain a nature reserve could be provided, MR would have a very strong case for scarce funds. The Reserve would also set an example which would encourage others to follow suit, which to a certain extent already happened with the planning of La Planada Reserve. Although privately owned, MR has protected natural resources very well, better than most government agencies.

Leasing the Reserve's forest to MF has been proposed as one type of guarantee, but this has problems. One is that the forest is already well protected while the family lives at MR, so there would be no increased benefits to a lease arrangement, but there would be increased cost and responsibility to the Foundation. Leasing would give short-term control of the forest to MF, but that is not what is needed since the Buch family has generously opened their forest to thousands of visitors in the past. The need is for secure perpetual management.

This issue must be resolved before more significant fundraising by the many supporters of MF and MR can be successful.

Management Plan. The Reserve has been managed by Gunther Buch since its creation. He knows the resource base, the objectives, and the constraints. Obviously protecting the Reserve from invasion, stopping hunters, and gaining outside support were critical first steps. In terms of designing a management plan, the present situation is more complex than before because of the success of Buch's management and the deterioration that has continued around the Reserve. The Foundation, a new entity, owns land and raises money. It also considers further land acquisition proposals on an ad hoc basis. The degree of control of the Reserve's forest by the Foundation is an additional issue that needs to be resolved. The family

is committed to conservation, but they also want and need clearer delineation of MF and MR responsibilities and areas to permit them more privacy around their home. Currently, scientists and students arrive at the Buch home throughout the year to work on research or educational studies.

The time has definitely come for management planning. A planning effort should include the participation of all key people involved in Merenberg in a team planning exercise. All aspects of planning - objectives, strategy, and tactics - should be set by consensus. The three major achievements from this exercise would be: first, a common understanding of the available resources, the future direction of MR and MF, and how to move in that direction (that is, goals, objectives, strategies, tactics, and priorities); second, a written document to guide management and to present to funding organizations; third, a benefit to implementation, the training of those implementing the plan in the reasons and concerns behind the formal document. A recent study of other wildland management categories has shown that once a team planning effort has taken place, successful and sustained management support has been forthcoming (Cross, 1976a). A project organized around well-defined and obtainable objectives with a concrete strategy to achieve them is appreciated by all concerned, from staff to funding agency.

Staffing. Gunther Buch, MF Director and MR administrator, is the only formal staff and he is voluntary. More staff, as identified in the management plan, will be needed. To staff the Reserve and Foundation, a regular source of income will be needed to pay salaries and other bills. Currently MF's income is entirely from donations, which are sporadic. Part of the management plan should include developing a continuing source of funding to pay for staff and projects. This is not to say that some staff work cannot be voluntary, which it can and must be, but that certain projects need the continued efforts of an individual to achieve success. Without a source of income much work will not be forthcoming.

As a general principle, successful demonstration projects should earn a profit for two reasons: one is to prove their utility to local neighbors by establishing markets and thereby helping them adopt new alternatives; the second is to generate income to fund the PEC. This income could go to staffing needs if it were the highest priority.

CHAPTER VI

DISCUSSION AND CONCLUSIONS

This chapter will discuss the significance of the proposed category, The Private Ecodevelopment Center. First, the analysis chapter will be evaluated. This chapter compared the objectives, means, and characteristics of the "pilot project," the Merenberg Reserve and Foundation, to the PEC's objectives, means, and characteristics. Next, the comparative value of the PEC concept relative to the MAB Project #8 for wildland management and rural development will be discussed. Conclusions are presented next and finally, a preliminary strategy for implementing PEC's and systems of PEC's will be considered.

Evaluation

The objectives section of Chapter V showed that the MR and MF fulfill nearly all the PEC objectives. Only one PEC objective, to "produce protein from wild fauna and flora sustainably," was not specifically defined as an MR and MF objective. An aquaculture project is being developed which meets this objective, even though it had not been thought of when MR and MF objectives were first formulated. The rest of the objectives fit together very

closely, showing that in their conceptual design the objectives of the pilot project match those of the PEC. The effectiveness of achieving the objectives of MR and MF was also reviewed. In most cases MR and MF objectives were met, further supporting the value of PEC objectives. From the comparison of objectives, the MR and MF are a good example of a PEC.

The means section of Chapter V analyzed the PEC and MR means. The fit of MR to PEC means is close; the major difference is that more explicit emphasis is put on demonstration in the PEC model than in the MR.

The characteristics section of Chapter V did not compare all MR and PEC characteristics, because the characteristics of a PEC can vary so much. In the descriptive chapter (Chapter IV), MR characteristics were examined using PEC nomenclature. Three were discussed further in Chapter V because progress on these three must be improved for the Reserve and Foundation to move ahead. They are ownership, management planning, and staffing.

Merenberg is slightly different from the normative PEC. The differences are minor, reflecting the flexibility of the proposed category. Approaches to the PEC category can vary depending on the specific site conditions. Merenberg was not designed as a PEC but it has stimulated thought and action that has brought its independent development very close to the normative PEC.

With more money, staff, and planning, it could become even more successful as a PEC.

PEC and MAB Project #8

The differences between the PEC and an MAB Project #8 are of scale, ownership (private, rather than public), and management (one authority coordinates several assisting agencies, rather than several authorities coordinating between themselves as is generally but not universally the case with MAB Project #8). These are important differences. Concerning efficiency and field execution, a PEC should be more successful implementing many of MAB Project #8 community level goals than the MAB program. The PEC will be generally smaller in scale than a MAB Project #8. The small scale permits closer monitoring and better management.

The PEC is private while MAB Project 8 programs tend to be mostly, if not all, public. Local people sometimes get the wrong impression with government projects; instead of the project spurring them into adopting the new government technique, rural people have been known to wait for the government to implement it for them. If a PEC works with community leaders, the adoption stage is less likely to become stalled by inappropriate expectations.

The PEC is intended to be a single management authority (MR and MF are exceptions). It works with

assisting institutions on a common strategy developed from the team management planning process. The MAB Project #8 is centrally organized in the capital city of each country, but the managed areas away from the cities are run by different government agencies who have different objectives and who often have a history of rarely cooperating. To expect these agencies to successfully sustain cooperation in fields outside their general mandate is unrealistic. Managing a new and different long-term multi-agency program by committee is not a recipe for success. This is why the PEC concept might be able to produce the tangible results that MAB Project #8 strives for, but has rarely succeeded in producing.

Conclusions

The previous chapters and discussion has presented the need for a new category of land management, the Private Ecodevelopment Center, wich stresses conservation for sustainable rural development. First background information on natural resource management trends and approaches were presented. The conceptual model of a PEC was described. A similar conservation center, the Merenberg Reserve and Foundation in Colombia, was discussed as a prototype and its achievements were presented and discussed. An analysis compared Merenberg with PEC objectives, means, and characteristics.

In conclusion, the need for this new category certainly exists. A significant contribution can be made by the PEC wildland management category toward the goal of conservation for sustained rural development. The Merenberg case provides a good example of a PEC. Merenberg has similar objectives, means, and characteristics. The work performed so far at MR and MF is in keeping with PEC objectives. There are some objectives which Merenberg has not achieved because of a lack of funding or staff. It is too early to assess Merenberg's success with the objectives of community involvement in a PEC because funding and staff limitations have limited progress. But in reviewing the progress made on other objectives and the intent of Merenberg's community objective, it is reasonable to expect that with time, money and staff, these will also be furthered.

If Merenberg is a generally successful model of a small-scale PEC, then can we assume that the PEC model will succeed in other areas? I believe there is great utility in further experiments with PEC's, particularly ones designed with the conceptual framework described here. The costs of testing out this concept on an incremental basis are low and the potential is great. In the face of few other viable designs, let alone realistic alternatives, a pilot project promoting the PEC concept warrants a trial in the developing world so we can begin

in earnest to develop improved prototypes for integrated rural development. This would allow the approach to be refined further. This proposed natural resource management category has not been thoroughly researched and tested. This needs to be done to validate the concept further as Merenberg only approximates it. The PEC is a promising conceptual design that should be tried. Experience with this design would be useful at all levels, from local land managers to political decision makers. Scientifically designed ecodevelopment centers responsive to local needs and interests will produce viable land use alternatives and will make the goal of conservation for development a reality for rural people.

A significant finding from this evaluation of Merenberg is that it seems to be easier to protect natural resources than to create and disseminate new alternatives for sustainable rural development. The Reserve has been successful with protection, while rural development is still only beginning. The discrepancy occurs in part because protection programs have a stronger tradition, more experience, and more successful fundraising. With protection, a specific tangible area is protected; its impact is more obvious. Rural development on the other hand is a long and complex process. It takes time to design, test, and create sustainable alternatives and even more time for them to be adopted by their ultimate users

after a slow and critical demonstration of the program to skeptical local people. Integrated rural development programs will need to cooperate and communicate more among themselves and with local people to shorten the implementation time lag. Also, the cooperation of specialized agencies, such as SENA in the case of MR, is critical in the ultimate success of PEC objectives. The PEC must work with many institutions in order to fulfill its objectives; it cannot succeed alone as it could if it were only focused on protection.

Another significant finding from analyzing Merenberg's experience is that people seem to learn and adopt new alternatives only when those alternatives fit their needs and are presented on their own terms. This can be seen in the lack of success MR has had among its neighbors with MR objective 12, promoting a healthy attitude toward the environment by example. Simply managing land positively and progressively will not induce rural peasants on the edge of survival to adopt new techniques or species. The people around Merenberg have been receptive to the SENA courses on rural farm management, possibly because the courses are presented in a way they can understand. The MR/MF philosophy has not been presented to them in an organized way nor has it been packaged in a way that could be easily presented to rural farmers. So far, success in informing the public about

Merenberg has been with educated Colombians in the cities. The challenge now is to inform rural people so they can understand and adopt the example of Merenberg.

The importance of extension to PEC's is obvious. It will need to be well coordinated and funded. A PEC itself will not be able to recruit, train and fund an effective extension program just as it cannot fund research. These functions will be coordinated by the PEC but they must be funded and often executed by other institutions. The PEC is best suited to manage the protection and demonstration aspects of the management program. This is shown by MR and MF experience; they are successful in protection and in maintaining demonstration areas, but research and extension are dependent on outside arrangements. Participation in these aspects of a PEC can benefit the cooperating institutions because ideas can then be exchanged between the PEC and the institutions.

Just as science has benefited from innumerable accidental discoveries made while pursuing other objectives, so the PEC's research efforts can be expected to generate unexpected and useful results. The experiments at Finca Candelaria by Paul Carlson show this phenomena. He found alder trees may be more important for drainage than for fertilizer, the original question in his research. (This was discussed under MF Objective 2.) Serendipitous findings are inevitable because researchers

are experimenting and learning and many times they cannot accurately predict their results. Integrated rural development is such an unknown field that we can expect many such surprises as more protection, research, demonstration, and extension programs are implemented.

A point that needs special attention is the personality of each owner/manager of a PEC. These properties will be owned by non-governmental organizations or by families. Both types of ownership will have individual and unique concerns that will need to be considered and treated by any systems-wide coordinating body.

Toward a PEC System

An important aspect of the proposed PEC category is that it is an alternative for developing the harmonious mix of conservation and development described in the World Conservation Strategy. The PEC is small and decentralized which permits managers the individual freedom to pursue the common goal and objectives of the PEC. This will help insure that it is locally responsive and successful, if well managed.

A PEC can be a central focal area, or ecodevelopment pole, for private as well as for governmental organizations. In the case of MR/MF, there are many governmental as well as non-governmental organizations involved at one level or another. If PEC's were to become a common

development strategy, it would have political ramifications because it would give local people a voice in their own sustainable development. Some of the power of central bureaucracies would be conveyed to local people working through their PEC. They would be able to get involved in conservation activities with a personal incentive to improve their welfare. It would also give the conservation-oriented owner of the PEC a chance to directly influence development around the PEC. It would also give the owners of a PEC a lot more responsibility to respond to local needs than would be the case with only a protection reserve. Many owners may not want this added responsibility. Others would thrive on it though, thereby providing good examples for an expanding network of PEC's funded by a foundation or international agency.

The incremental approach should be used to develop more model PEC's, allowing planners to work slowly and learn from their experience. As a planning methodology is developed for the PEC's, and feedback experience from individual projects is acquired, a strategic plan for new PEC's could be developed for specific high priority areas and prospective PEC participant managers/owners could be recruited. This would require a strategic planning team for the PEC system probably from a private organization with outside funds.

This non-governmental organization could recruit, promote, and coordinate the PEC system. Since each PEC could be privately-owned, they would only have philosophy and goals in common. Some PEC's will have different specific objectives and characteristics. This diversity does not mean they cannot cooperate in a system toward a common goal; on the contrary, the innovation by independent managers working toward a common goal will speed the development of appropriate technological solutions to the problems facing sustainable rural development.

The existing wildland management system is publicly owned and managed. The PEC system in contrast will seek to help private landowners sustainably develop their lands, thereby providing substantial public benefits. This private system will be more of an organizational challenge, than if it were public. But the advantages of flexibility, innovative design, and community involvement will outweigh the ease of organization inherent in a government system.

Two large tasks will be faced early in PEC system development. One is recruiting cooperative owners to form PEC's and the second is creating a coordinating organization to supervise the system and promote the idea. The concept of a system of PEC's can be promoted initially through private conservation organizations in newsletters and at conferences. Once a few PEC's are operating, they

will generate more attention. If successful they should attract funding from large international organizations to sponsor a private voluntary organization to develop a PEC system.

Another alternative for PEC management would be a cooperative framework. This is particularly viable in countries with a strong co-operative history like Peru. An existing agricultural co-op system could organize a co-op PEC from several parcels of land owned by individuals, co-ops, and/or organizations. By zoning the land for protection, research, and demonstration, the owners would participate in development of the PEC. Extension and research work could be coordinated by the co-op but staff and funding could come from outside organizations. The PEC system could be promoted and managed from the national office of agricultural co-ops. Promotion of PEC adoption in this way would be acceptable to local peoples in a country like Peru, where co-ops have a role in agricultural land ownership. Such an arrangement would also grant the PEC an immediate entry into the community with a subsequently higher probability of new approaches being adopted.

CHAPTER VII

RECOMMENDATIONS

The following recommendations are intended to foster the PEC concept. The recommendations are directed to three groups: conservation and rural development leaders, protected area managers, and the Merenberg Reserve and Foundation.

Conservation and Rural Development Leaders

-- Land management on private lands needs to be improved to reach the goal of conservation for sustainable development. The PEC approach should be considered an appropriate wildland management category to achieve this goal.

-- Funding for pilot PEC's should be provided to gain further experience with the new category.

-- Funding a private organization to promote and assemble a pilot PEC system in a representative developing country should be considered.

Protected Area Managers

-- Land management of property outside protected areas needs to be improved to provide conservation for

development benefits and assure continued support for protection.

-- Wildland managers should consider the PEC a new management category which addresses new and broader priorities in natural resource management, those of sustainable rural development which are critical to developing countries.

-- Wildland managers should work to identify sustainable development research needs, then work cooperatively with rural development specialists to inform universities, international agencies, and banks of these needs. This information can be crucial to funding new alternative approaches. When financial and scientific decision makers are aware of the needs, potential solutions, and the resulting benefits of a PEC, its funding is more probable.

Merenberg Reserve and Foundation

-- A management plan is needed for the Reserve and Foundation to organize priorities and plan for the future. This would also be a valuable training process for present and future staff as well as for cooperating organizations.

-- A clarification is needed of the legal relationship between MR and MF. The following key points should be discussed and resolved:

a) Does the Foundation have perpetual access rights to the Merenberg Reserve forests? Should it?

b) Is it the responsibility of MR or MF to accommodate and facilitate scientists and visitors to the Reserve?

c) Should MF have the right-of-first refusal if MR ever goes up for sale? If so, when should this right be conferred?

d) As an alternative to c), should MF lease MR forest from the owners? If so, for how long and how much should rent be?

-- The Merenberg Foundation needs to recruit more working volunteer members with assigned responsibilities. This will permit it to become more actively involved in the projects it seeks to promote. It will also relieve the Foundation Director, Gunther Buch, of some responsibility, thereby freeing him for high priority issues.

-- Another Reserve staff person is needed to implement new projects and maintain old ones. Currently, this has all been carried out by Gunther Buch, on a volunteer basis. He is busy with many projects, including the Directorship of the Foundation. More work could be accomplished if another person could take some of these tasks.

-- A multi-purpose building is needed to accommodate research, environmental education, and visitor needs. This project should be included in the management plan. Preliminary points to be considered include:

a) Should MR or MF build and operate the building?

b) Should it be located on MR or MF lands? If on MR lands, should MF lease the land and access rights from MR for a long time period, if MF builds and operates this building?

c) Should tourism to the area be encouraged? If so, should MR or MF be responsible and benefit from it? Can tourism produce income for MF?

-- The proposal, "An Action Research Program to Develop Community Participation in Conservation of Native Andean Forest," should be refined further and presented to other funding institutions. One potential avenue to pursue is for SENA to submit the proposal to the Inter-american Foundation, who has expressed interest in such a proposal.

-- The aquaculture ponds should be further developed, in cooperation with CVC and INDERENA, into experimental fish protein ponds. Once successfully developed, small aquaculture ponds on neighboring lands could have an important impact on the nutrition of the community as well as on poaching problems in the Reserve.

-- Another result from management planning will be clearer priorities of the research needs of management. It is important that MR and MF research needs be clearly formulated and presented to funding bodies and universities for allocation of scarce research talent and funds.

-- MF should continue to reforest the Finca Candelaria using Colombian agricultural loans currently available.

- MF should assist the local school as appropriate, especially in subjects concerning ecodevelopment.

APPENDICES

Appendix A

What is Eco-development?

Eco-development is a part of the Environment and Development activities of UNEP, that has undertaken a series of projects and studies in this domain, to which it gives its support.

This constitutes a new approach to development, a search for a way to harmonize economic and social objectives while ensuring a sound management of the environment as well.

The main characteristics of eco-development are the following:

1. In each eco-region, effort is made to exploit specific resources in order to meet the basic needs of the population in terms of food, housing, health and education, these needs being defined in a realistic and autonomous way, so as to avoid the ill effects of an imitation of consumer styles in rich countries.

2. Man being the most precious resource of all, eco-development must contribute to his fulfillment first. This concept includes employment, security, sound human relations, respect of the various cultures or, in other words, the achieving of an adequate social ecosystem. There is a symmetry between the possible contribution of ecology and social anthropology to planning.

3. The identification, use and management of natural resources is made in diachronic solidarity with the generations to come: predatory practices are banned and the exhaustion, unavoidable in the long-term, of some non-renewable resources is retarded by eliminating wasteful uses on the one hand, and on the other hand, resorting whenever possible to renewable resources which should never be exhausted if they are adequately exploited.

4. The negative impacts of human activities on the environment are reduced, thanks to the use of forms of production organization enabling man to take advantage of all the complementarities and utilize waste for productive aims.

5. In tropical and sub-tropical areas especially, but everywhere else as well, eco-development insists upon the natural ability of a region for all forms of photosynthesis and favours a low profile of energy consumption for commercial sources.

6. Eco-development implies a special technological style. Eco-techniques exist and can be devised for production of food, housing, energy, for new and imaginative ways of industrialization of renewable resources, for labour intensive conservation programmes. Elaboration of eco-techniques will play a very important part in eco-development strategies, as various - economical, social, ecological - objectives can be harmonized at this level, technological change being the multidimensional variable of planning par excellence. However, it would not be right to equate eco-development with a technological style. It implies patterns of social organization and a new education system.

7. The institutional framework of eco-development cannot be defined once for all regardless of each specific case. We can, all the same, put forward three basic principles:

   a. Eco-development implies the creation of a horizontal authority able to overcome the sectorial approaches, concerned with all the aspects of development while always taking into account the complementarity of the various measures undertaken.

   b. Such an authority cannot be efficient without the participation of the concerned population in the working out of eco-development strategies. It is essential to the definition and the harmonization of concrete needs, to the identification of the productive potentialities of the eco-system and the organization of the collective effort for its utilization.

   c. Lastly, it is necessary to make sure that the population that works it out are not deprived of its results to the benefit of intermediaries who stand between local communities and national or international market.

   These principles could be applied without too many problems in the areas of the Third World where the agrarian reform has been achieved and also wherever community structures are still alive.

8. A necessary complement of participatory structures of planning and management is an education that prepares for them. This is especially true for eco-development when people's attention must be drawn, at the same time, to the notion of environment and to the ecological aspects of development.

In last analysis, the problem is to internalize this dimension, i.e., to change the system of values implying domineering attitudes toward nature or, on the contrary, to maintain or reinforce, where it still exists, an attitude of respect for nature which prevails in certain cultures. This target can be fulfilled either by formal or informal education.

In short, eco-development is a style of development which insists on specific solutions to a particular problem in each eco-region, taking into account ecological and cultural contexts as well as present and long term needs. Without denying the importance of exchanges, it tries to react against the prevailing fashion for so-called universal solutions applicable to all situations. Instead of making too large an allowance for external assistance, it believes in the ability of human societies to assess their own problems and find original solutions, while drawing inspiration from other people's experiences. It is opposed to passive transfers and the spirit of imitation, insisting, on the contrary upon self-reliance.

Without going too far in an ecological determination, it suggests that a creative effort to take advantage of the margin of liberty offered by the environment is always possible, great though climatic and natural constraints maybe. Evidence of this is given by the variety of cultures and human achievements in comparable environments. But knowledge of the environment and a will to achieve a lasting balance between man and nature are necessary steps to success.

SOURCE: Wallaceana, September 1977, 10:50-53; taken from Eco-development News, February 1977.

Appendix B

Guidelines for Defining Reserve Area

Should this chapter be taken to mean that only large reserves (thousands of square kilometers) are of any use, and that one should give up if one cannot get a reserve of this size? Of course not! The necessary area of a reserve depends partly on the goals of that reserve, and partly on the effort and expense that can be devoted to overcoming the disadvantages resulting from a small area. We now summarize specific considerations and a decision-making strategy for defining reserve area.

1. Define one's goals.

Does the reserve aim to conserve one or more particular endangered species, or a habitat or ecosystem instead? If the latter, identify the key species of the habitat or ecosystem, such as top predators, important food plants, species important in fruit dispersal and pollination, and other species whose loss would transform the whole habitat or ecosystem through a trophic cascade.

2. Calculate the area such that key species will have effective population sizes of several hundred.

This requires estimating population densities of these species. The figure of several hundred is dictated partly by the ecological considerations (to minimize risk of extinction due to population fluctuations) and partly by the genetic considerations. For species whose populations exhibit large fluctuations in time, the desired effective population size should exceed several hundred. As an alternative to this procedure of estimating population densities, one can examine species lists for isolated patches of habitat similar to those in the reserve, and thus determine empirically how large a patch area is necessary in practice to offer a high probability of containing each key species. Naturally, the resulting area estimate will vary greatly with the species. Certain eagles are likely to require thousands of square kilometers to maintain effective populations of several hundred; small invertebrates and plants may achieve this population in a fraction of a square kilometer.

3. Does this area really correspond to a self-contained ecosystem?

There are at least two types of reasons why an area presently containing an effective population of several hundred individuals of a particular species may nevertheless lose that species quickly, even in the absence of an unusual catastrophe. First, one must ascertain that the area contains the necessary resources for an effective population of several hundred on a year-round basis, not only at the instant. The difference is significant for species undertaking seasonal or irregular movements. Secondly, the area must be sufficient not only for the species of immediate interest, but also for other species on which that species depends. Thus, a particular plant species cannot be conserved effectively in a reserve too small to secure the future of its chief pollinator or seed disperser.

4. Is the proposed area "catastrophe-proof?"

We refer here to the risk of an extinction that is not related to population size per se, but instead to area itself. A local population may be extirpated by a catastrophe, such as a fire, drought, landslide, or a change in lake level. Such catastrophes destroy all individuals within the affected area, regardless of whether the individuals number ten, hundreds, or tens of thousands. Each type of catastrophe has a characteristic range of impact area (e.g., a landslide may easily devastate tens of hectares, almost never tens of square kilometers). Thus the proposed reserve should contain effective populations of several hundred individuals and must also be much larger than the typical impact area of relevant catastrophes. This consideration is likely to be the crucial one in designing reserves for certain plants and invertebrates. For such species, one hectare may contain thousands of individuals and appear safe on a population-size criterion; the real risk of extinction will be from a fire, landslide, or herd of elephants destroying all the habitat in the one hectare reserve.

5. What if the available area is insufficient to meet one's initial goals? Present an explicit argument for enlarging the area.

Part of the reason why official decision-makers often have allocated areas too small to serve as effective reserves is that ecologists were unspecific and unpersuasive in arguing for larger areas. A specific argument could take the following form. Based on knowledge of population densities in the habitat under consideration

for incorporation in a reserve, and of how population size affects risk of extinction, the following outcome can be predicted: "if the area of this reserve remains at only x square kilometers, there is a greater than 90% chance that species a, b, c, and d will go extinct within 5 years; a 50% chance that species e, f, g, and h will go extinct within 10 years; and only for species i, j, k, and l will the chances of long-term survival be high. Increasing the area to y square kilometers would give 75% of these species a high chance for long-term survival."

6. Accept realistic goals.

If the area available for a reserve is limited and is insufficient to meet one's initial goals, given the constraints on knowledge and the financial budget available for management, the remaining option is to work in reverse: to ask what are the most important goals that could be attained realistically, given the available area and budget.

7. Manage the available area so as to enhance survival prospects for the species of interest.

There are numerous steps that a reserve manager can take so as to favour particular species or habitats. These include: creating the desired habitat or mixture of habitats by preventing fires, instituting fire rotation, or other means; maintaining permanent or rotated water sources in an arid environment; periodically introducing additional individuals of the particular species of interest; introducing, or regularly adding, prey species, pollinators, or other species enhancing the species of interest; eliminating competing species; and culling the species of interest so as to optimize the sex ratio or age structure.

The more effort and expense are devoted to management, the smaller the area in which a given species can be accommodated. An effective population of several hundred lions may require thousands of square kilometers under natural conditions; perhaps only hundreds of square kilometers if suitable prey are released periodically for food, as is now being done for the last Indian lions in the Gir forest; and only one square kilometer under zoo conditions.

Three caveats should be added about managing undersized reserves. First, management is expensive, and the expense may be required indefinitely. Culling and transfers of large mammals account for a substantial fraction of the budget in South African reserves. Ongoing

management expenses should be compared with the one-time costs of more land acquisition that would render these management costs unnecessary. Secondly, we simply do not know enough about most species to manage them properly. Finally, managing for individual species may be a tenable strategy in a reserve aimed at protecting a few particular species, but is a hopeless strategy in a reserve aimed at protecting ecosystems with many key species and thousands of constituent species.

SOURCE: Excerpted from: Implications of Island Biogeography for Ecosystem Conservation. J. M. Diamond (convener). HABCON Conference paper, March 25, 1982. Capetown, South Africa.

APPENDIX C

Agreement

BETWEEN La Asociacion (hereafter called ACUA)

AND World Wildlife Fund-U.S. (hereafter called WWF-U.S.), on behalf of World Wildlife Fund-International (hereafter called WWF/IUCN),

concerning the provision of a grant for Reserva Natural Finca Merenberg:

1) The Board of Directors of WWF-U.S. has authorized WWF-U.S. to provide certain funds as available on a quarterly basis to further conservation an environmental education relating to Reserva Natural Finca Merenberg.

2) This grant shall be used only for the specific purposes described in the attached project description and budget for the duration of the project.

3) Any modification of the utilization of this grant involving a significant deviation from the original objectives described in the project description must be agreed upon in writing in advance between WWF-U.S. and ACUA.

4) WWF-U.S. accepts no liablility for acts of third parties, accidents or losses arising as result of the execution of the project. ACUA is advised to take out whatever insurance is appropriate to cover such risks and contingencies.

5) A progress report in English and a Spanish translation shall be submitted by ACUA to WWF-U.S. annually, together with a selection of illustrative slides and/or photographs.

6) A financial report supported by vouchers shall be submitted together with each annual report.

7) Any unexpended funds remaining at the termination of the project shall be returned to WWF-U.S.

8) Any publication of ACUA concerning the project will acknowledge the role of WWF/IUCN and 2 copies will be sent to WWF-U.S. Any publication of WWF-U.S. concerning the project will acknowledge the role of ACUA and 2 copies will be sent to ACUA.

9) Whenever possible the Panda symbol, the name World Wildlife Fund and an appropriate acknowledgement should be permanently displayed at the project site. Informal references to the assistance of WWF are always helpful and will be greatly appreciated.

10) In order to facilitate the achievement of the objectives of this project, ACUA may establish agreements with other regional, national, or international entities.

(2)

11) The funds furnished by WWF-U.S. to ACUA will be managed in accordance with the by-laws of ACUA and all applicable Colombia laws.

Acceptance: We hereby accept the terms and conditions set out above.

Russell E. Train	Gustavo Wilches Chaux	Guntner Buch
President	Presidente	Proprietor
WWF-U.S.	ACUA	Merenberg
Date: May 7, '80	Date: Mayo 19/80	Date: May 19/ 198

GUNTHER BUCH
Finca de Ganadería Merenberg
Reserva Natural
de la Flora y Fauna Andina
Dirección postal:
Santa Leticia (Cauca), via Popayán.

The following information was elaborated in July 1975 as a background for correspondence with international organisations and interested private people with the aim of establishing, as soon as possible, more effective protection for Natural Reserve Merenberg. From a family born love for the virgin forests of the Colombian Andes (Central Cordillera) and a spirit of conservation, grew a 44 year struggle to save the original state of this unique rain forest, its flora and fauna. However, the present situation is so disquieting, that if outside help doesnot come, these efforts may be in vain.

1.) History of Merenberg

In 1931 the father of my wife, the German agronomist Dr. Carlos Kohlsdorf, after having left his post as professor of agronomy at the University of Bogotá, made an exploratory survey of these virgin forests of the Central Cordillera for some German friends in Bogotá, who were interested in purchasing land. He became so attracted to the natural beauty of this untouched area, that he decided to found a farm for himself and his family, using his surveyor's salary to get started.

In the course of many hard years, he cleared level portions of the forests, establishing pastures for cattle, horses, and sheep. But from the beginning he left untouched the virgin forests on all steep slopes and around the natural springs, maintaining an harmonic balance between forest and open land. This policy, together with a strict prohibition from the very beginning against all hunting——even for his own personal domestic purposes, enabled the survival of the original flora and fauna.

The interest of the other Germans in the original group gradually weakened until, ultimately, the Kohlsdorfs were the only ones to succeed in personally settling the area. With the consequent termination of surveyor's fees, the family's income shrank, bringing life to the level of subsistence for many years.

The farm's salvation was the construction of the national road connecting Popayán, the capital of the Department of Cauca, to Neiva, the capital of Huila. The road engineers utilized Merenberg as their major base-camp, paying for room, board and laundry, and employing Hellmut, the son of Dr. Carlos, as an engineering assistant. On the other hand, the new road had the negative effect of attracting many colonos to the area. These people had little respect for the law, occupying large parts of the family property, stealing valuable trees, robbing cattle, and decimating the fauna by hunting bears, tapirs, pumas and other animals. This development unfortunately coincided with the outbreak of World War II, which by disrupting relations between Colombia and Germany, effectively weakened Dr. Carlos' defence of his property and natural resources. After he died exhausted in 1945, his widow Elfride preserved what she could of the shrinking and besieged property. She struggled alone, financially supported by Hellmut, until 1948,when her daughter Hechthild returned from

Germany, bringing Gunther, the author of this letter, whom she had recently married. Mechthild had been in Germany since 1942, participating in the exchange of citizens between warring countries and later undergoing eye operations for cataracts. Since this region of Colombia still had (in 1948) no official survey nor land register, my first work here was fencing our remaining property with barbed wire, to secure the boundaries.

There followed some years with fewer troubles. Elfride, Mechthild, and I continued to live under the same land ethic that Dr. Carlos had practised, instilling these same principles in our own three children as they matured. Even so, we constantly had to defend our forest and wildlife against intruders bent on hunting and stealing timber.

Since 1970, however, our situation has become increasingly tense, as our neighbors, the first colonos, complete the rape of their own forest land, leaving no reserves, even, for firewood or fenceposts. Their numerous sons, now twenty-some years old, have difficulty living on the land of their fathers, now that the forests are cut, much of the soil eroded away, and many springs dried or fouled. Stimulated by propaganda from the timber industry, these second generation "colonos" began invading our farm. Their principal pretexts were and still are:

1.) We are blocking economic progress by refusing to exploit our forests. Instead of sawing timber and clearing for the cultivation of corn, we allow valuable timber to rot in the forest.
2) The trees of the virgin forest were seeded by God. Thus every man has the right to cut them, especially when he is in a state of need. Similarly, since the wildlife has no owner, any man can hunt them, especially if in need.

After much struggle and personal risk, we obtained the support of the Director General of INDERENA (Institute for the Development of Renewable Natural Resources) in Bogotá, which resulted in our forest receiving the designation RESERVA NATURAL. With this designation came assistance from the police and district authorities in ousting the invaders.

Manuel Hoyos and his family, the most fanatic of our neighbors, persisted in occupying part of our forest and hunting our animals with a passion. Before we finally stopped him with a court order, for which he often publically expressed feelings of vengeance, they had killed half of the howler monkeys living within our RESERVA NATURAL.

On March 2nd of this year the tragedy occurred. Mechthild responded to hunter's shots in the usual manner of entering the forest to confront the hunters, explain our no-hunting policy, and persuade them to leave. There in the forest my wife was murdered by two point-blank shotgun blasts in the back in a premeditated ambush. That she was unarmed, alone, and blind in one eye with severely restricted vision in the other, adds to the reprehensible character of the assassination.

The murderers hid her body well with fern fronds. They later confessed that they intended to kill me as I searched for her. I narrowly escaped death by interpreting the mortal shots as more hunter fire and taking a path different from the one predicted by the assassins.

The following day the four criminals were captured; later three confessed and presently all are in jail awaiting trial. Two of the four are from the vengeful Hoyos family; the other two are paid accomplices from outside the area.

I wish to add that up to this day we had had many confrontations with various hunters, including one with the actual murderer, and had always

succeeded in persuading them with the strength of our spiritual convictions. We always went out alone and unarmed, with confidence that our motives were more valid and powerful than those of the hunters. On the day of Mechthild's death, however, the murderers had doped themselves - proven by evidence and confession - with marihuana to make themselves immune to our pleas. This new factor of drug abuse will increasingly continue to undermine our safety.

2.) Characteristics of Merenberg

The RESERVA NATURAL FINCA MERENBERG lies along the road from Popayán, Cauca to La Plata, Huila approximately 100 km east of Popayán and 50 km west of La Plata. It is situated on the eastern slope of the Central Cordillera at an elevation of 2,300 meters above sea level.

Merenberg has a hardened surface all-year entrance road to the farm compound, which consists of the original log cabin built in 1932, a kitchen house with guest room, and garage, and several outbuildings. The dwellings are served by a potable water system fed from a natural spring.

Having shrunk to half of its original size, Merenberg presently covers 286 hectares, of which 160 hectares - primarily the steeper slopes - contain natural forest growth. The balance is devoted to pasture for the cattle, sheep, and horses which generate the income of this self-supporting farm. Approximatel 70% of the forest land is virgin; however, there are some good examples of natural secondary succession in areas which Dr. Carlos originally cleared and later allowed to return to forest. There also exist several small parcels which were invaded by neighboring colonos, cut, then later repurchased and allowed to return to forest. These examples of succession, with their precisel known dates (ranging from 1932 to 1950) and neighboring virgin areas for comparison, can serve as valuable research plots.

Easy access to most of the forest is provided by a system of foot trails designed exclusively for observation of the fauna and flora. This network of hillside paths presently measures over two kilometers, and offers excellent views into the crowns of the virgin trees.

The climate is typical of a mountain rainforest, with precipitation almost every day of the year. The majority of the days are cloudy with fog. The temperature varies between 10º - 20º, with extremes of 4º and 30º centigrade.

Within the boundaries of Merenberg there are 36 natural springs with perpetual flow. These constitute the major hydrographic resource of the area, supplying the pastures as well as domestic water for the surrounding neighbors. Within the forest these brooks provide water for the wildlife and form waterfalls of great beauty.

The forests contain a great variety of plant species. Since up till now no botanist has drawn up here an inventory, I note the local common names of our forest-trees: roble, balsero, carnelo, cedro, encenillo, candelo, chilco, repollo, cariseco, bongo, arayan, chaquiro, jigua, arenillo, aguacatillo, tablero, quino, cafetillo, caucho, jigueron, yarumo, pepo, coroso, lirio, palma, palmicha, and helecho (=tree fern), and others. Of special botanic interest are the exeptional diversity and prolific growth of ferns, liverworts, lichens, mosses, fungi, bromiliads, and orchids — including several native to Merenberg which I have not yet noticed in any orchid book.

With respect to fauna, Merenberg's forests constitute an island refuge for the last representatives of many species of mammals native to this area. They came to our RESERVE as surrounding forests were cut and hunting pressure

forced them out of those areas not yet cut. In the RESERVE, unlike nearby forests, many animals sense their protected status and do not react with unusual fear when they sight a human. Take, for example, the monkeys of Merenberg. There are two bands of howler monkeys, totaling presently 20 animals (with some babies among them), and one group of 10 capuchino monkeys. One of the greatest attractions for any visitor, these primates can be observed in their tranquil natural state, as they do not fear man. Worth mentioning, also, is the fact that the resident animals do not tend to wander beyond the RESERVE'S boundaries, having virtually nowhere else to go. Please see the attached list of Merenberg's fauna compiled by Dr. Carlos Lehmann.

Perhaps the most notable natural treasure at Merenberg is the avifauna. This is illustrated by the continuing increase in birds seen in the last few years as their original habitat disappears. For example, there are now ducks (from the paramo?) nesting in the forest ground that never were here before. The migratory bird flocks (kites, swallows, parrots, etc.) stopping here are also on the increase. Flocks of up to 100 birds have recently rested here. Many large birds, including eagles, falcons, and Royal Vultures, from PURACE NATIONAL PARK (only 50 km to the west) use Merenberg as a resting area. Indeed, many scientists familiar with both label Merenberg "the lower elevation extension of Puracé." In his many birding expeditions to Merenberg, the famous ornithologist Dr. Carlos Lehmann made numerous observations which he incorporate into his forthcoming book on the birds of Colombia. In addition, he discovered a new species of hummingbird here about ten years ago. Please see the attached lists of sighted species up to this date. While these are rather incomplete, having been compiled in just a few mornings and afternoons of bird watching, they do hint at the astounding variety of birds to be found in these forests.

Merenberg's insects are another valuable resource. In March of this year, Robert Dietz, doing research on nocturnal insects for the Smithsonian Institutio collected here (by means of an ultra-violet lamp at night) many insects of the class he was studying, including several he had never seen nor read of before. Carlos Bordon, an entomologist from the University of Maracay, Venezuela, completing a six-month South American research expedition, stated that in Merenberg he encountered a high number of insects that could potentially serve as biological control agents.

The archeological resources of Merenberg deserve mention. It is strange that when Dr. Carlos Kohlsdorf first entered these virgin forests in 1931, they were totally uninhabited. Even though this eastern side of the Central Cordiller was rich in animal life, including tapir, deer, and bear, there was not one human being — Indian or Colombian — from the savannah to the paramo. As the forests were cleared, Indian graves of (still) undetermined age were discovered in great numbers. Each grave was marked by a meter high triangular stone column, anchored in the earth another half meter. Since the type of stone used is not natural to Merenberg, it must have been brought in from some distance. Stone statues similar to those in nearby Tierradentro and San Augustin National Archeological Parks have been found close to Merenberg. Shards of fired clay jugs provide evidence of a thriving pottery industry utilizing a white clay found on Merenberg which is today in great demand by potters from as far as Bogota and Neiva. Although no archeologist has studied this area, the numerous casual finds of stone hatchet heads and metates, stone-lined tombs, ancient hous foundations of rectangular form, and other artifacts invite a professional investigation into Merenberg's distant past.

3.) Current Protective Status

INDERENA has long recognised Merenberg's importance, designating the reserv RESERVA NATURAL FINCA MERKNBERG. In addition, the chief of Inderena's Wildlife

Research Office, the famous zoologist Jorge Ignacio "Jimo" Hernández, has lent his support. During a recent visit here, he stated that he was very impressed with Merenberg and promised to supply us with a complete list of the native mammals of this area. In spite of this necessary and welcome support by INDERENA we feel strongly that our current crisis requires the protection offered by official ties with international organizations. Recent developments seriously threaten our efforts to maintain what has up to now been a family endeavor in conservation. We fear that these efforts will have been in vain if international help does not arrive soon.

For it is questionable whether INDERENA can offer sufficient protection, since in their own Purace National Park, they have tolerated various colono and Indian invasions. which have resulted in the loss of virgin forests, destruction of official park signs and trails, and even erection of homesteads complete with wire fencing. Our experience here at Merenberg in the case of the killing of seven howler monkeys last year is similarly disappointing. Although I immediately filed an official complaint with the proper INDERENA inspector, he refused to even investigate, claiming that two eye-witnesses were necessary before he could do anything.

Having paid our taxes at the full rate for over forty years, relief on our forest land was denied on the grounds that we were stupid for not cutting and that such a lower rate would hinder economic progress. We are understandably disappointed in the weakness of public agencies in providing adequate protection of the common welfare. In desperation we appeal for outside help. Recognition from and ties with the higher authority represented by international organizatio will command for Merenberg a measure of respect from the local people which could be achieved in no other way.

4.) Objectives and Proposals

The objectives of Merenberg, currently threatened to the point of crisis ar

A.) ensure the survival of the natural environment, including wildlife;
B.) utilize the resources of Merenberg for natural improvements in the flora and fauna of Colombia, especially efforts of recovery and restoration;
C.) change, by education and example, the negative public attitudes with respect to conservation towards the necessary positive understanding of its importance.

The first objective is the most immediate and crucial. Without success in preserving Merenberg's treasures, the second objective becomes impossible for lack of resources and the third extremely difficult for lack of a positive examp

Towards these respective ends, we propose the following:

A.) To create a buffer zone around our forests; that is, we propose the purchase of a broad strip of neighboring land, outside of our present boundaries. This will virtually eliminate the stealing of timber and the killing of animals, as it will prevent neighboring people from entering the RESERVE. They now are legally able to cross the RESERVE on a public access trail which is the only route from the road to their properties. It is impossible to control the users of this path, even those suspected of bad intentions. These neighboring properti are not very extensive, totalling between 150 and 200 hectares. The owners are willing to sell at a fair price, that is, one which will allow them to relocate on better land. Besides providing security, the purchase of this land would create more natural and logical boundaries for RESERVA MERENBERG. For example, the northern boundary would be the Candelaria River, with its steep rocky cliffs

forming a natural barricade for both men and wildlife.

Along the new boundaries, except where natural barricades are adequate, a strong, permanent fence — ideally with concrete fenceposts — is planned. Concrete is preferred over wood because of its strength, permanence (wood fenceposts last only three years in Merenberg's climate), and the fact that many valuable trees will thereby be preserved for other purposes. The buffer zone and new fenced boundaries, by positively halting the emigration of Merenberg's animals, will prevent the killing of monkeys and other animals on the pretext that they enter nearby cornfields and gardens to eat and destroy parts of the harvest.

B.) To found on the now virtually barren land of the buffer zone a pilot nursery for all native species of trees that would grow at this elevation. The virgin forests of Merenberg will provide most of the seeds and cuttings for this undertaking. Initially efforts will center on research concerning effective methods of propagation, while ultimately the nursery will provide stock for the reforestation of denuded Colombian land. The profound importance of this project has led me to already begin experimenting with the nearly extinct native walnut. While these humble efforts have been rewarding, they are as nothing compared to the task that lies ahead.

The Colombian government has begun to show interest in this domain by declaring the National Program of Reforestation, the results of which have thus far been disappointing and misguided. All the nurseries and reforestation tracts I have seen consist of only two varieties, pine and eucalyptus. Both are exotic to Colombia. Their continued spread would invite the perils attendant to monocultures and lead to the decimation of the Colombian avifauna, still the world's richest. Quiet reigns in a pure pine forest here, as the habitat suits very few native birds. In addition, the resinous droppings of these two exotics stifle undergrowth and invite raging fires in dry seasons. Scorched plantations can already be found near Cali (pine) and Bogotá (eucalyptus).

It is further planned that the new land of the buffer zone/nursery, together with the present RESERVE, might be used to re-establish as completely as possible the original fauna. Representatives of most of the locally extinct animal species (tapirs, bears, sloths, ant-bears, black wooly monkeys Lagothrix, etc.) could be brought to Merenberg, where it is expected they would thrive and repopulate in their original habitat within a closed natural system. They will thereafter be invaluable both as subjects for investigations and as genetic banks for repopulation efforts elsewhere.

Although our family farming will continue as at present, the land of the buffer zone will be used solely for the purposes outlined above. Ownership of the land of the buffer zone by an entity other than our family is perhaps desirable.

C.) To publicize the guiding principles, present realities, and future possibilities of Merenberg. Current public attitudes favoring exploitation over conservation make this difficult, but already there are a few encouraging developments. A distinguished and enlightened Colombian cinematographer, Guillermo Cajiao, has produced a professional 16mm color documentary film of Merenberg. Designed to be shown either on television or as a short feature in a movie theater, he expresses in this film his and our conviction that nature conservation and economic activities, such as the raising of cattle, can be successfully combined, harmonizing one with the other. This movie is complemented by another of Dr. Cajiao's creations, a film of nearby Puracé National Park. Viewed together, they illustrate much of the natural history of this region.

They are uniquely valuable as material for environment education. That (American) Peace Corps Colombia took an active part in financing the Merenberg film, demonstrates their faith in us. The director of Peace Corps Colombia, Manuel Villalobos, has further shown his support of Meeenberg by allocating a volunteer to Merenberg in either environmental education or scientific research.

Our family farming will continue as in the past, continuing to serve as a positive example of sensible land management.

5.) Conclusion

I firmly believe that Merenberg, uniquely important as the only family owned nature reserve in Colombia and the only reserve protecting such an environment, qualifies for the establishment of a permanent scientific research station for the performance of research in botany, zoology, entomology, ornithology, forestry, ecology, and archeology. To provide for these activities, a new brick building with an electric generator will need to be constructed to house the scientific personnel and laboratories. Our present simple wood dwellings do not provide the security nor facilities necessary. I personally could help since I speak and write Spanish, German, and English and can read French without difficulty. My linguistic knowledge has been helpful in establishing friendly relations and correspondence with scientists and students from all over the world. Everyone with whom I have discussed this idea of establishing a research station has shown warm interest.

I cordially invite representatives of your organization to visit Merenberg, inspect the resources sketched above, and discuss with me in greater depth the various problems and solutions. In addition, any efforts you could make towards introducing us to other institutions that might be interested in contributing assistance or participating in these plans would be greatly appreciated.

Günther Bürk

A PRELIMINARY MANAGEMENT STRATEGY FOR RESERVA NATURAL FINCA MERENBERG

FOR: CLASS N.R. 501 Section 085

DR. KENTON MILLER
SCHOOL OF NATURAL RESOURCES
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BY: BRADLEY R. CROSS

DATE: DECEMBER 22, 1976

I. INTRODUCTION:

Colombia's only family owned and operated nature reserve "La Reserva Natural Finca Merenberg" is also very possibly the oldest conservation unit in the country. This family preserve has been in operation since 1932, or 44 years of stringent protection that dates back before the Panamerican Union held their first meeting on the subject of conservation in 1940. It is currently 286 hectares of which 160 are in forest, 70% being virgin, the remaining in various stages of succession. It is a valuable reserve because of existent unique ecological characteristics, its spacial location amidst an ever growing destruction of natural habitats in the area and its easy access. Located in the Central Andes on the east side along the road from Popayan to Neiva, it is only six hours from Cali, and three from Popayan.

This Reserve has had to struggle to remain viable throughout the years, but recently there was a tragedy where one of the owners, Mrs. Mechthild Buch was assassinated because of the Reserve's enforcement of conservation regulations. The murderers have been apprehended, tried, found guilty, and they now await long jail terms. Because of this urgency there are many people interested in strengthening the Reserve politically, legally, and socially from its present shaky status. This paper will explore a strategy for management of the Reserve to so strenthen it.

II. BACKGROUND INFORMATION:

A. History. The very first settlers who came into the entire Bedon River Valley were the founders of Merenberg. Dr. Carl Kohlsdorf founded the Merenberg Farm-Reserve where no one was within two days walking distance, there were not even Indians in the area. Slowly it took shape as a cattle farm, but always leaving as much forest as possible and never hunting the wildlife. Over time a road came and with it colonos, who began to clear their own farms from the forest. Carl's daughter, Mechthild married Gunther Buch, who presently is the owner. Because of poor land management by the colonos and their increasing numbers Merenberg's property became attractive, especially because it still had forest to cut, etc. and in the early 1970's there were various invasions of squatters. These were repelled though only by much hard work, since no one in Colombia in any governmental office would recognize the right of an owner to keep his forest intact. Finally, with the help of Dr. Carlos Lehmann, some degree

of assistance was forthcoming from the Institute for Development of Renewable Natural Resources, INDERENA. They made some signs using their name on them, though no official designation or further support was available. Following a day at the market Mechthild upon returning home, heard gunshots and set out to control the hunters as had been the policy for all the years of the Reserve's existence. It was a trap and she was murdered, two shotgun blasts in the back at point blank range. The culprits were found to be neighbors with a particularly dangerous criminal record previously established. They are now in jail, and there presently is no danger of bodily harm from other neighbors. They confessed the reason for the assassination was to later squat on the land, take it over and exploit its forests. Gunther is more determined now than ever to see the Reserve protected, respected and used for its many outputs and there are many who support him in this desire.

B. Natural Resources: The Farm occupies 126 hectares all on the more level plateaus, or gently rolling hills. The forest is 160 hectares of both virgin and secondary stands. This cloud forest at 2300 meters is the basic resource of the natural reserve. Because there are practically no boundaries with the Reserve that are not cleared of forest on the other side, this has become in effect a small forest island preserve. In this forest live at least 126 species of birds that have been identified in only one 40 hectare section, and among those species there are 2 that were first discovered here. There are two family groups of Howler monkey and one of Capuchinos. The Reserve has 36 natural springs with year roun flow. The surrounding neighbors need this source of water since theirs dried up with the destruction of the forest. One of the outstanding features of the forest is the existence of various examples of secondary succession. These are important because their history is well known & therefore offer ideal study conditions for comparative research between the climax forest and these secondary forests, and for successional ecology. Dr. Carlos Lehmann characterized Merenberg as an excellent lower elevation extension of Purace National Park, only 50 kilometers to the west. He also described it as lying in the heart of a major precolombian civilization whose region extends from San Agustin to Tierradentro. Merenberg does in fact contain rich arqueological resources, including structural foundations from a small village, cemetaries, many pottery shards and stone implements.

C. Present and Past Use: The Buch family lives on the property and earns their livelihood from a cattle farm. It is well laid out from an ecological point of view, because forests form natural barriers between

pastures & around water sources. They also occupy all steep terrain and are found around the boundary of most the Reserve. The family intends to continue operation of the farm and nature reserve in their present harmonious relationship, and have provided assurances that the forest sizes will not shrink with time, that is to say the reserve part of the farm will always be at least the same size it presently is.

There are relatively well constructed trails laced throughout the Reserve. These are exclusively for the observation of wildlife and vigilance of the forest, not for cattle or farming purposes. Many scientists have used these trails, stayed at the house of Gunther and carried out full-scale research projects. There have been studies of mosquitos, birds, howler monkeys, oak regeneration, nocturnal insects, & photography to name only the larger projects. There is demand to use the area because the trails are constructed so the researcher can see into the crowns of the trees at eyelevel, and because of the protected island effect, the animal life is extraordinary.

D. Current Status: Currently the Reserve has signs along the road by INDERENA. These mean very little except to indicate the location of the Reserve. The reason being that as a private reserve there is very limited protection available for the fauna and flora. If there is an infraction, say hunting, in order to get any response from the INDERENA authorities or the police one must have two witnesses and go through much paperwork, which has resulted in a slow ineffectual protective policy. INDERENA will not supply an inspector to the Reserve, because it is not government property. There is a need for vigilance of the Reserve just as in any national park, only here it must be done privately. The situation is aggravated by the presence of a public access trail that bisects the Reserve. This trail leads to property down the valley from the Reserve, whose owners have no other access.

There has been virtually no assistance from international organizations available to this private Reserve. They all claim the need to go through formal organizations and institutions. One major problem with this is that to do so would involve bureaucracies with little proven management capacity. Another problem with that route is the Reserve would cease to be owned by the family, and any other organization would find it too small to operate efficiently, besides the fact that the Buch family intends to manage the Reserve and maintain ownership. (See appendix #1)

III. MANGEMENT CONSIDERATIONS:

A. Objectives. To adequately manage any resource or production center

there must be objectives to guide the management.

The following are a proposed list of general objectives for the Merenber Reserve which are open to modification, pending new information or inputs which could specify more details.

1. To ensure the survival of the Reserve.
2. To maintain the ecosystems in their natural state.
3. To maintain the genetic resources in dynamic evolutionary process.
4. To maintain the local watershed's productive capacity.
5. To provide opportunities for formal and informal environmental education on site, and off site.
6. To provide opportunities for environmental monitoring and research in natural areas.
7. To protect the arqueological and historical heritage, and to provide research opportunities in these fields.
8. To protect and manage the scenic resource of the Reserve.
9. To protect the soil resource from unnecessary erosion.
10. To maintain a sustained flow of outputs from natural processes.
11. To function harmoniously with Merenberg's cattle farm.
12. To promote a healthy attitude towards the environment by example.
13. To more fully integrate the Reserve into the community.

B. Strategy. To achieve the objectives, and in other ways improve the strength & position of the Reserve the following strategy is proposed

1. Form an organization such as a foundation to gather money, support, & in general be the collective spokesman international organization want to work with.
2. Make a team plan for management of the Reserve.
3. Promote research on reforestation as soon as possible.
4. Explore the benefits & suitability of linking up with the Man & the Biosphere Program of UNESCO.
5. Explore the benefits and suitability of linking up with other management systems, such as Nature Conservancy or Audubon bird reserves.
6. Explore the benefits & suitability of linking up with national & international conservation organizations.
7. Explore benefits & suitability of linking up with C.O.N.I.F., the Corporacion Nacional de Investigaciones Forestales.
8. Maintain good relations with INDERENA, & foster a closer relationshi on technical matters as well as political ones.

9. Utilize publicity to benefit the aims of the Reserve. Since the movie short on the farm is showing in theaters throughout the country, & soon an English version will come out, there is much potential to tap, investigate tactics to use this potential for direct benefit to the Foundation and Reserve.
10. Clearly delineate the responsibilities of the Merenberg Reserve & those of the Foundation, so there will be no confusion.
11. Involve local community in development process, with community interest programs, and provide employment, & other income production for local area.

C. Recommended Tactics. To close in on strategy implementation for achieving the objectives, tactical planning is needed. This moves the abstract guiding principles down to the action level. The following are recommended lines of action or"means" to pursue, that the Merenberg Reserve should work on actively.

1. Charter and organize two foundations, one in Colombia, and one in the U.S. These are to work in coordinated fashion, but remain separate entities. Their proposed objectives will be the following
   a.) To protect the Reserve purchase, own & manage any lands necessary around the Reserve for buffering purposes, for increased security, for decreasing detrimental effects of certain neighbors, for use in reforestation with native tree species or other ecologically sound land reclamation projects for use in scientifi experiments.
   b.) To act as an organization to promote the conservation of the Merenberg Nature Reserve and to generally further the cause of conservation in Colombia. To adequately represent Merenberg Nature Reserve where an organization is called for.
   c.) To raise funds for the purpose of the foundation.
   d.) To construct, own & operate a multi-use building for use as follo
      1. Scientific research
      2. Environmental education including natural history interpretation.
      3. Administration headquarters
      4. Staff housing plus visiting students & scientists.
   e.) To construct & manage an experimental trout pond with hydroelecttric power, as a model to the community & as a source of protein & energy for local consumption.

f.) To promote, manage & regulate scientific research, with emphasis on studies related to reforestation with native species utilizing the foundation's buffer zone area. All species are of intere but specific input should go to species with proven uses, values & utilization characteristics/properties. This effort must include basic ecological considerations, silvicultural characteristics, growth rates, economic cost/benefit, expected rate of return, utility for wildlife. The aim here is to scientifically document how reforested marginal lands can produce economic returns competitive with other uses, while achieving many of conservations objectives in the process. The interest is exclusive in native species, because of their disappearance in the wild, their value for wildlife, their tolerance to local plagues, and their extreme value given lumber markets when of merchantable si Other research besides that on forestry is encouraged but at a lower priority.

g.) To begin an innovative agricultural educational extension progra for local campesinos.

To cover the following points:

1. Agricultural problems in the area
2. Soil management, fertility, erosion
3. Reforestation
4. Aquaculture
5. Alternatives energy systems-methane digesters, hydroelectr solar, wind.
6. Environmental education, organic gardening principles & examples.
7. Cooperatives-Organization & Management-to be taught not administered.
8. Conduct survey of needs & desires of campesinos.

This extension program hopefully can be part peece-corps volunt and part Colombian agricultural extension agent. This is to bring benefits of Reserve to local people, assist in developmer process, gain citizen & local governmental support.

h.) To provide protection for the Reserve and buffer zone area, an inspector or park guard must be employed.

i.) To produce informational materials about the Reserve & the foundations. The following are suggested:

1. A pamphlet on the importance of the Reserve.
2. The purpose of the foundation, appeal letters

3. Research opportunities fact sheet
4. Promote distribution of research results & other important related materials, such as Merenberg film, within Colombia & outside.

2. Gather base-line data in organized manner, such as a meteorological station to start with.
3. Organize a team of knowledgeable experts & team plan a management plan. This should take place as soon as possible, for the plan must guide the management & development of the Reserve and the Foundation. The proposed objectives for the Foundation are open to change and must be viewed at this time as only temporal guides. There must be some conceptual and practical guides, to build interest in the Foundation in the first place so some have been set out in proposal form. The plan will be detailed and be part of the continuing management process, it should be consulted. & added to as situations warrant. It shall employ experimental methodology, monitoring the results of all management action and other changes, and implement the plan over time based on analysis and evaluation of these results using the incremental approach.
4. Recruit a peace corps volunteer forest ecologist to begin research on forest ecology.
5. Pursue contacts with interested conservationists and related field professionals including lawyers. Enlist their help in appropriate ways, the same with organized conservation groups both national and international.
6. Organize the distribution of Merenberg film to appropriate places such as conservation organizations in Colombia, the U.S. and other countries.
7. Pursue contacts with C.O.N.I.F., INDERENA, and other reforestation agencies or experts. Specifically become informed of what experiments have been made at San Lorenzo Forest Experiment Station of INDERENA near Santa Marta at the same elevation as Merenberg.
8. Pursue contacts with interested organizations that have experience in managing small private nature reserves such as Audubon Society, Nature Conservancy, Cornell Ornithological Laboratories, Office of Tropical Studies, Costa Rica.

9. Pursue more information on the suitability of Merenberg Reserve for the M.A.B. Program of UNESCO. There are no known size limitations to the Man and the Biosphere, (MAB)Biosphere Reserves, & according to the objectives and characteristics of a Biosphere Reserve, Merenberg Reserve meets all the requirements except long term legal protection (see appendix 2). This could potentially be overcome if an agreement was worked out somehow between the Foundations and the Reserve to preserve it, guarantee its perpetuation, yet allow it still to remain in the Buch family. This M.A.B. program deserves closer study to determine what advantages & disadvantages it may offer. Contact should be pursued with Dr. Jesus Idrobo on this program's applicability to Merenberg.
10. Contact should be pursued with the Office for Tropical Studies, based in Costa Rica, to learn some practical details on Tropical Research Laboratory business considerations. This should include estimated income to the local area generated by the research facility.

IV. SUMMARY.

The management plan will set priorities for action to be taken by the Reserve and Foundations regarding management, development, and budget allocation. The organization of a planning team should begin immediately, by identifying willing professionals who will participate, collect & develop background data, organize around a date and then begin the plannir process. December 1977 is suggested as a date because that is when Gunther's son Gerfried will be home from studies, and also coincides with vacation times for most other Colombians & many Americans. At that time planning will build up the local management capacity by integrating the present & future reserve managers directly in the planning process in a team effort with the professionals who would be available. This also allows enough time to get substantial information from the other tactical "means" which will be important in the planning process.

The Foundations are currently being organized and the progress so far indicates that this will be a lengthy process especially in Colombia. There must be primary emphasis on getting these foundations set up and functioning since it is clear that they are the key to success and perpetuation of the Reserve. They should not take any development or manager decision until there is a management plan. The responsibilities of the Foundations must be clearly delineated when their by-laws are written up so as not to create confusion in their relationship to the Reserve. This is currently being worked on quite intensely between Gunther and the

principal organizer of the U.S. Merenberg Foundation.

Those proposed tactical points excluding the plan or foundations, are basically information gathering in nature, and the Reserve should be working on them collectively at all times. There are so many fronts to work on which permit multiple projects at this stage that setting priorities reall is not needed until the project is further along, other than emphasis on the organization of the Foundations and organizing the team planning process.

Given success with the Foundations, the ongoing management process & some beneficial links with other organizations the future does look brighter for protection, use and appreciation of the "Reserva Natural Finca Merenberg".

APPENDIX #1

Translated from Estatuto de las Reservaciones del Sistema de Parques Nacionales - acuerdo Nº 42 de 1971 (20 de Octubre).

In the Colombian Statutes for the Reserves of the National Park System under Chapter 4 Article 15 it states, "The reserves in the National Park System, along with lands acquired by INDERENA for the purpose of constituting reserves of the cited system, will form part of the patrimony of the Institute."

APPENDIX #2

The MAB Task Force for Project 8 recommended that a Biosphere Reserve should meet each of the following objectives: conservation, research, education and training. The Task Force defined these objectives as:

"1. to conserve for present and future use the diversity and integrity of biotic communities of plants and animals within natural ecosystems, and to safeguard the genetic diversity of species on which their continuing evolution depends;

2. to provide areas for ecological and environmental research including, particularly, baseline studies, both within and adjacent to such reserves, such research to be consistant with objective (1) above;

3. to provide facilities for education and training"
(Unesco, 1974a, pp. 11-12).

Conservation is the objective of highest priority. Only through the appropriate management of reserves and protected areas can the research, education and training elements of Project 8 and others, be implemented.

The characteristics of the Biosphere Reserve were summarized by the Task Force:

"1. Biosphere Reserves will be protected areas of land and coastal environments. Together they will constitute a world-wide network linked by international understanding on purposes, standar and exchange of scientific information.

2. The network of Biosphere Reserves will include significant examples of biomes throughout the world.

3. Each Biosphere Reserve will include one or more of the followin categories:

(i) Respresentative examples of natural biomes.

(ii) Unique communities or areas with unusual natural features of exceptional interest. It is recognized that representative areas may also contain unique features e.g. one population of a globally rare species; their representativ ness and uniqueness may both be characteristics of an area

(iii) Examples of harmonious landscapes resulting from traditic patterns of land use.

(iv) Examples of modified or degraded ecosystems capable of being restored to more natural conditions.

4. Each Biospere Reserve should be large enough to be an effective conservation unit, and to accomodate different uses without confl

5. Biosphere Reserves should provide opportunities for ecological research, education & training. They will have particular value as benchmarks or standards for measurement of long-term changes in the biosphere as a whole. Their existence may be vital to other projects in the MAB programme.

6. A Biosphere Reserve must have adequate long-term legal protection

7. In some cases Biosphere Reserves will coincide with, or incorporate, existing or proposed protected areas, such as National Parks, Sanctuaries or Nature Reserves" (Unesco, 1974a, pp.15-16).

The above objectives and characteristics are from page 4 & 5 of THE BIOSPHERE RESERVE--AND ITS RELATIONSHIP TO OTHER CONSERVATION EFFORTS

Prepared by Special Committee of the IUCN Commission on National Parks and Protected Areas, October 15, 1976.

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PROJECT DESCRIPTION

The ACUA Nature Association and the owners of the Finca Merenberg Nature Reserve welcome the interest of the World Wildlife Fund-U.S. appeal in signing a joint agreement with the objective of establishing a basis for the management of economic resources budgeted by WWF for the reinforcement and development of the Merenberg Reserve to convert it into a scientific research station where, based upon the careful conservation of the ecological values of the reserve, programs of research, education, and technical training can be carried forth.

With this in mind, we take great pleasure in introducing the annexed document, of several fundamental parts:

1. Comments on A Preliminary Management Strategy For the R. N. Finca Merenberg by Bradley R. Cross
2. Integrated Management and Development Project for the Merenberg Natural Reserve.
3. Draft of an agreement between ACUA and the World Wildlife Fund-U.S. Appeal.

Gustavo Wilches Chaux
President, ACUA
Regional Director, SENA

Comments by Gustavo Wilches Chaux

on

A Preliminary Strategy for the Reserva Natural Finca Merenberg

The document entitled "A Preliminary Strategy for the Reserva Natural Finca Merenberg prepared by Bradley R. Cross in December of 1976, constitutes a valuable addition to the future plans for conservation and development of the Merenberg Reserve being the first effort to elaborate the objectives, strategies, and tactics on the path to integrated management of the reserve.

The introductory portion and fundamental information that Mr. Cross includes about Merenberg are perfectly valid, and the proposal objectives, because they are general and for all-time, having permanent value, can be adopted as the goals of any management plan that is decided upon.

However, as Mr. Cross points out, the document lends itself to progressive implementation as new information or developments permit greater precision in defining the details of the project.

Considering that the original strategy proposal and its corresponding tactics refer to the constitution of a non-profit organization which has as its objectives, among others, the legal representation of Merenberg before national and international organizations, the acquisition of funds used in preparation and implementation of management plans of common agreement with the owners of the finca, and keeping in mind that since June 1979, ACUA has existed as an entity with legal residence in Popayan, Colombia, being an association that by way of its goals and by laws, is authorized to fulfill the aforementioned objectives and of which one member, Mr. Gunther Buch, Proprietor of the Merenberg Farm and Nature Reserve, and his three children, owners of the Merenberg Farm and Nature Reserve; we have redesigned the management plan, retaining the initial

objectives, but adapting the methodology to the actual and concrete facts, for example the existence of ACUA, the monthly publication of an ecological bulletin, and the efforts of government organizations such as SENA, an agency charged with the technical training of farmers for specific natural resource management and farm labor requirements.

The project we propose for the management and development of Merenberg accepts as fundamental the four elements recommended in MAB Project #8 (cited by Cross in Appendix 2 of the Preliminary Strategy):

1. Conservation
2. Research
3. Education
4. Technical Training

For greater clarity, we have proposed an additional two elements.

5. Merenberg and the Region
6. Infrastructure

It is important to clarify that if methodological precision requires the establishment of limits between the various elements of the projects, the limits should not be in any way exclusionary, but, to the contrary, there exists an intimate interrelationship among them. For example, education and training are dependent upon conservation and the results of research. Furthermore, because the management plan is integrative, attention does not focus only on the reserve itself, but extends beyond to the community that surrounds it.

The project described below should be considered part of the Preliminary Strategy proposed by Bradley R. Cross, a complementary expansion of the original.

Gustavo Wilches Chaux
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Regional Director, SENA

Integrated Management and Development Project
for the Merenberg Natural Reserve.

1. Conservation

1-1 Preservation and Maintenance of the Natural Dynamics of:

1.1.1 Primary forest

1.1.2 Streams and headwaters

1.1.3 Native flora

1.1.4 Native fauna

1.1.5 Genetic diversity

1.1.6 Soil cover and fertility

1.1.7 Natural ecosystems

1.1.8 Scenic resources

1.1.9 Samples of secondary forest or of succession

1.1.10 Equilibrium between existent cattle farming and the natural ecosystems

1.1.11 Archeological sites

1-2 Definition and acquisition of a buffer zone around the preserve.

1-3 Recuperation through appropriate reforestation of the cut-over areas and areas where secondary forest has not volunteered.

1-4 Programmed removal of secondary forest from select sites, and reforestation with endemic primary species, giving preference to merchantable species and endangered species, while maintaining samples of secondary forest sufficiently extensive so that (a) succession can be studied and (b) protection is provided for the regrowth in the native reforestation project.

1-5 Installation of tree nurseries with native species to facilitate continuous access to trees for reforestation, derived from seeds collected in the Merenberg forest or collected elsewhere. Utilization and expansion of the existing nurseries at Merenberg.

(4)

1-6 Employment of permanent personnel, adequately trained for the roles of protection, (forest rangers or guards, reforestation, seed collection, nursery management), etc.

2. Research

National and international agreements with entities of the government, non-governmental organizations, universities, the U.S. Peace Corps, independent researchers, and private companies, to utilize the Merenberg Natural Reserve for the following purposes:

2-1 Observation and experimentation "in situ" of the forest and ecological processes.

2-2 Experimentation in the nurseries with native species.

2-3 Research into the ecological and economic perspectives of reforestation with native species.

2-4 Research at different levels on wild flora and fauna

2-5 Exchange and public circulation of reports, findings and experiments with native species reforestation.

2-6 Exchange and free distibution or through buying and selling of seeds, seedlings, etc.

2-7 Installation of a biological laboratory for preliminary studies of species (laboratory to be equipped with basic equipment such as microscope, refrigeration, etc)

3. Education

Dissemination of findings, reports and experiences with the conservation and management of renewable natural resources via conferences, seminars, periodic bulletins (ACUA), specialized publications, audio visual materials, and guided tours, at two distinct levels: (a) scientific level and (b) community level.

The conferences will be aimed as much at visitors as at persons from the nearby region, and will deal with ecology and ecodevelopment

in general as well as the value of protecting the Reserve itself. They will be organized at Merenberg, in other regions of the Department (State) of Cauca, in other parts of the country or in other countries.

As a bare minimum facilities, the education element requires:

3-1 Merenberg Herberium (specimens, photographs, and botanical data for the largest number possible of the species that are protected and managed in the Reserve).

3-2 Field Guide to permit visitors and researchers to identify "on site" the different species of flora and fauna of Merenberg. Maps of the reserve with trails, points of interest, geological and geomorphological characteristics of the land form.

3-3 Educational Audio visual equipment:

3.3.1 16 mm film projector

3.3.2 Carousel projector for 35mm slides

3.3.3 Portable projection screen

3.3.4 Portable electric generator, 110 volts, with gasoline motor and 25 meter extension cord

3.3.5 Portable cassette recorder with microphones for recording bird calls, animal voices, etc. for the study of wildlife communication systems

3.3.6 Portable chalk board

3.3.7 Portable paper flip charts

3.3.8 Other didactic aids

3-4 Basic library on conservation and ecology

3-5 File of studies, projects, and research at Merenberg

3-6 Metal cabinets for the herberium specimens, insect collections, etc. (with humidity protection)

4. Technical Training

Preparation of personnel for field work, especially reforestation conservation and ecodevelopment in general. This step will be in

conjunction with ACUA, SENA, and cooperative entities whose collaboration is expected (INDERENA, CVC, Peace Corps, etc.).

4.1 Training Merenberg personnel. Objective: training for forest guards and workers for their individual tasks.

4.2 Technical training for governmental employees who may work in protection, management, conservation or education concerning reforestation with native species.

4.3 Training for technicians and laborers of private companies that work with forest resources.

4.4 Training for rural community colonists and indians in the utilization of renewable natural resources, conservation and reforestation with native species.

4.5 Specific Projects: the training activities contemplated here shall be the results of specific projects with clearly determined objectives, costs, numbers of participants, etc.. In the same way, the type of activity shall be programmed: conference, seminar, regular course, field day, correspondence school, etc.. The location for training will be the Merenberg Reserve at the beginning, but later will move to an adjoining or nearby area of the community.

5. Merenberg and the Region

Socio-economic development of the area surrounding the Reserve, in the Department of Cauca and Huila with the objective of offering to the rural residents distinctly different alternatives to the current destruction of the natural system.

5-1 Socio-economic study of the region to determine problems and expectations in the community and to prepare a project to address these needs.

5-2 Preparation of a community development project based upon

training farmers in the areas of agriculture, horticulture, fruit-crops, animal husbandry, rural construction, rural mechanics, apiculture, fish culture, chicken raising, sewing and tailoring ceramics, weaving and other artisan techniques to utilize the resources of the region.

5-3 Specific courses in conservation and reforestation with native species aimed at the community and planned as integral parts of the project.

5-4 Organization of production, marketing and consumer associations.

5-5 Formal agreements with the agricultural development sector in order to achieve integrated community development (involving the agricultural loan service (Caja Agraria) Colombian Agrarian Reform Institute (INCORA), Public Health, Coffee Growers Federation, Cattle Ranchers Fund, etc.).

5-6 Implementation: the project will be prepared, based upon a socio-economic diagnosis of the region that will be the responsibility of SENA, by an instructor of the national vocational training institute, the Rural Enterprise Training program, with assistance of the Community Development Unit. Coordination of courses will be by ACUA, and courses will be given by SENA in collaboration with other entities and persons.

6. Infrastructure

Success in achieving the objectives of research, education and training requires an adequate infrastructure especially in the following installations and services:

6-1 Facilities and dormitories for students, scientists, and visitors with capacity for 20 persons. Sanitation, bath, dining room, and kitchen facilities.

6-2 Conference room, with capacity for 20 - 25 persons

6-3 Research laboratory with basic equipment for biological study

6-4 Library and file space with desk space for report preparation and reading

6-5 Cabin for forest guards

6-6 Small bus for transportation of personnel (low priority item)

The construction of buildings and structures will make maximum use of the existence of appropriate technology for the sites, borrowing techniques and practices from the region where adequate or introducing inexpensive new methods and innovations that are efficient from the ecological and economic point of view (solar heaters, passive solar heating, digesters, wind mills for pumping water and generation of electricity, etc.).

In a similar way the location and siting of structures should be done in a manner that does not alter the ecological equilibrium of the Reserve.

The desires of the owners of Merenberg to protect their own privacy should be respected.

7. Implementation of the Integrated Management and Development Project for the Merenberg Natural Reserve.

The project will be implemented gradually and in incremental steps as ACUA, the legal representative of the Merenberg Natural Reserve, possesses funds sufficient for these purposes through the economic and technical support of the WWF-U.S. and other national and international entities, governmental and non-governmental with whom ACUA signs agreements. The implementation of each stage of the project will be structured by specific sub-projects where-in are determined the objectives, costs and methodology for evaluating the results. These sub-projects will be coordinated by the presidency of ACUA .

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