The Rio Platano Biosphere Unique Resource,

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In addition to preserving 500 000 hectares of diverse Central American habitat, this reserve may provide a model for development in the humid tropics.

Honduras, not unlike many tropical nations, is suffering from a massive assault on its broadleaf forests. An estimated 80 000 hectares are annually degraded or destroyed. If trends continue, these beleaguered woodlands will disappear within 25 years (1).

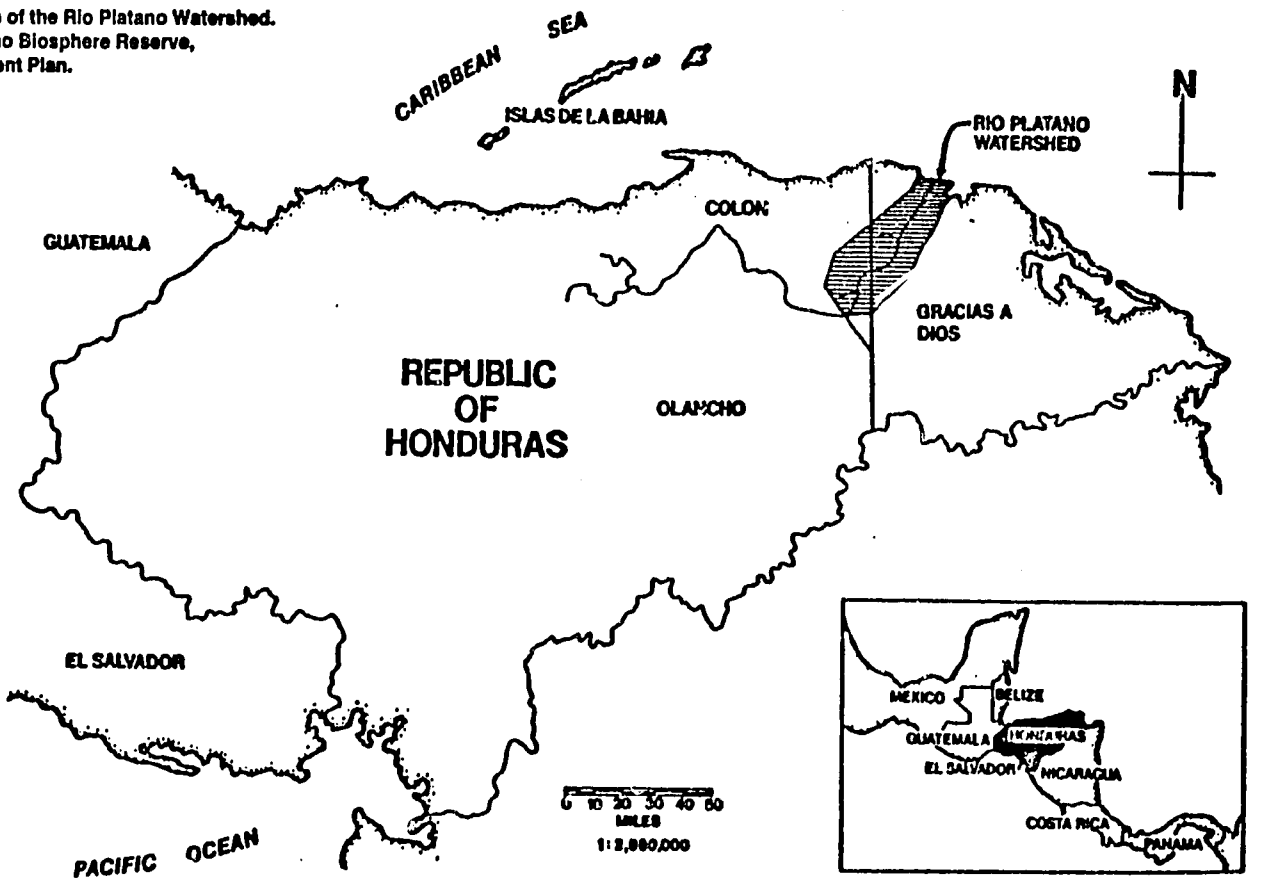
While the need to protect threatened hardwood reserves is imperative, the development of appropriate technologies for their sustainable utilization is an economic necessity. It is with these mutually dependent objectives in mind that the Honduran Department of Natural Renewable Resources (RENARE) has embarked on the Rio Platano River Biosphere Reserve Project. Still in its infancy, the project is already demonstrating that conservation and development can be intregrated in a viable, sustainable manner. Not only will the reserve protect genetic and cultural resources, but knowledge gained from the effort may eventually aid in conserving similarly threatened regions.

Recognition of these unique but timely management goals, and of the reserve's "exceptional combinations of natural and cultural elements" has prompted the World Heritage Committee to inscribe Rio Platano on the World Heritage List (2). This report will explore the area and its management strategy, discuss problems and how they are being confronted, and speculate on the reserve's future, a future deemed worthy of global interest and support.

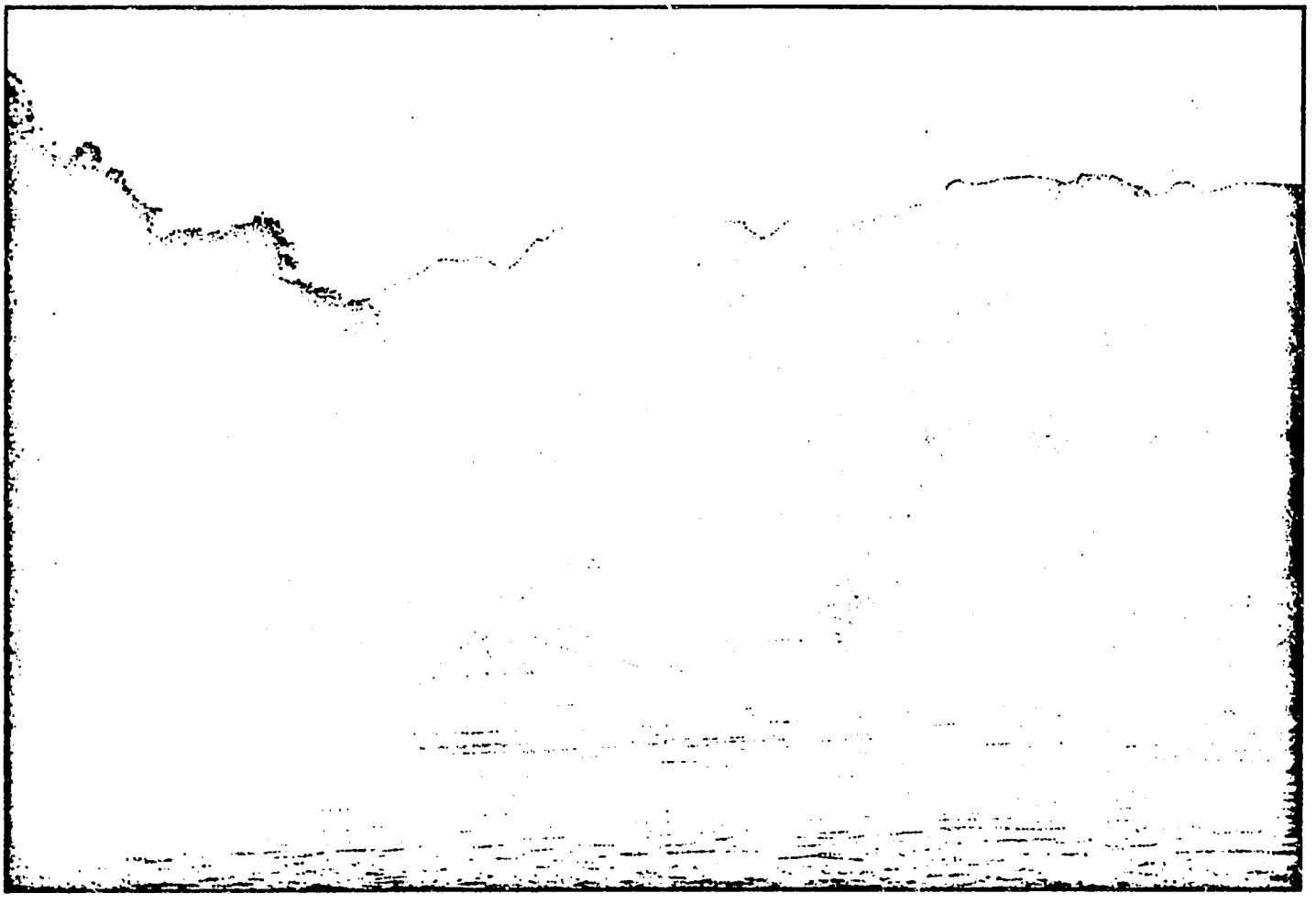
THE SITE

Situated in the heavily forested northeastern sector of Honduras, the Rio Platano River Biosphere Reserve encompasses 500 000 hectares of diverse landforms and habitats (3). The site straddles three Departments: Olancho, Colon and Gracias Adios, and lies partly in the isolated Mosquitia region—one of the largest contiguous expanses of wildland in Central

Figure 1. Location of the Rio Platano Watershed. Source: Rio Platano Biosphere Reserve, Integral Management Plan.



Reserve: Unique Alternative



Beyond the innermost village of Baltiltuk the topography changes abruptly from lowland forest and savannah to the razor-backed ridges of the Platano River headwaters region. Photo: Dennis Glick.

America (Figure 1). The reserve protects virtually the entire watershed of the 100-kilometer-long Platano River as well as major portions of the Paulaya, Guampu, and Sicre Rivers. These three waterways and the Caribbean form the boundaries of the project. There are no roads connecting the reserve to the more densely settled Western Departments and no roads currently exist within the site. Transport in and out is either by plane or boat, and only if the weather is cooperative.

Climatic conditions are best described as hot and humid, at least in the lower elevations. The rainy season lasts from June to December while the first five months of the year are relatively dry. Several strong hurricanes have battered the coastal zone in recent years (4).

Topographic relief also falls into two broad categories: the rugged headwaters region which encompasses almost 75 percent of the reserve, and the coastal plains. Much of the Atlantic seaboard of Honduras is fringed by gently undulating lowlands that extend inward from just a few kilometers to more than 40 kilometers. In the littoral zone of the reserve, this nearly level belt reaches its innermost penetration near the settlement of Baltiltuk, some 35 serpentine river kilometers from the sea. At other points these plains are less than ten kilometers in width.

The Rio Platano River meanders through this region, marooning several oxbow lakes as evidence of its wandering temperament. Natural levees built up along much of this stretch are preferred terrain for the small agricultural plots of the local population (5).

Beyond Baltiltuk, the topography changes abruptly to the razor-backed ridges of the headwaters region. Here steeply sloped mountains reach elevations of over 1300 meters. Dama Peak, an imposing column of exposed rock towering above the almost unbroken emerald canopy, stands as a geologic sentinel at the gates to this mountainous realm. Several cascading waterfalls cut through the forest greenery. One of these is among the most impressive in Central America.

The Rio Platano River, nurtured by heavy runoff in the headwaters, reflects this jagged relief as it cuts its course down to the coastal plain. Although navigable in small, shallow draft dugouts, the upper reaches of the river can be treacherous in stretches to all but the most experienced rivermen. In one cataract known as "Subteranio," the Platano almost disappears from sight as it snakes its way between truck-sized boulders. A precipitous forested escarpment in this same area rises some 100 meters on either side of the river (6).

FLORA

Topographic disparity has resulted in a wide array of ecosystem types. The two dominant life zones: Humid Tropical

(7) can be further broken down into an amalgam of habitats.

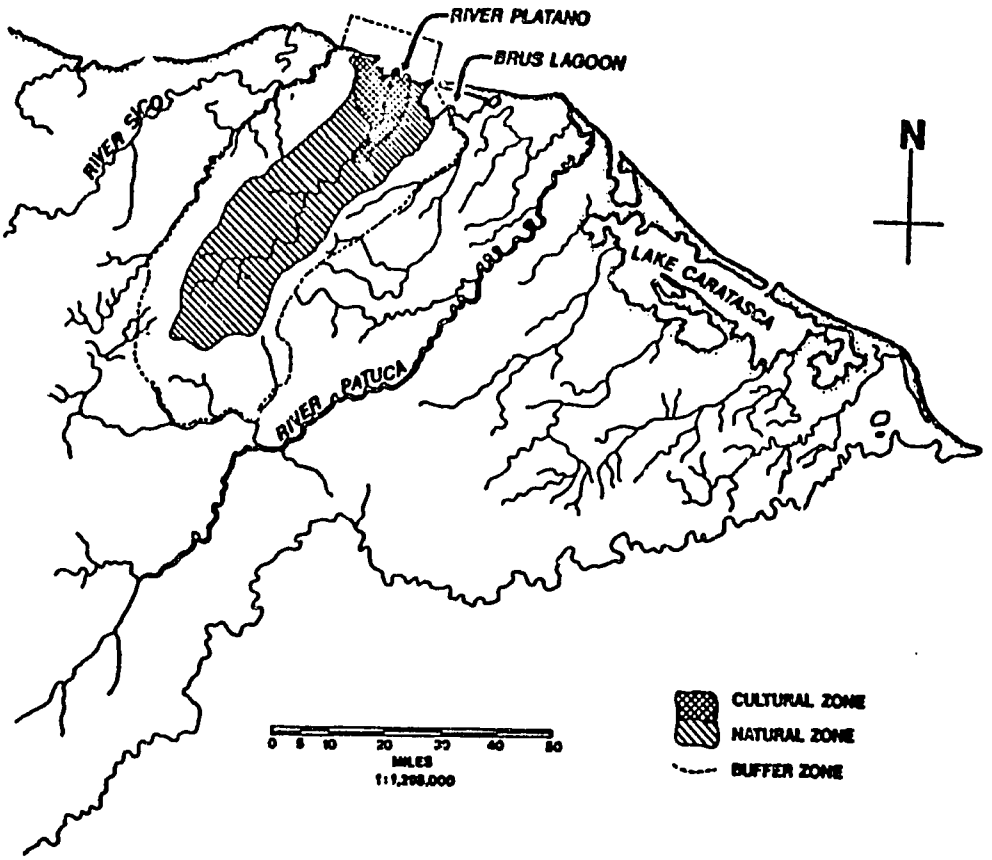
At the coast, wide sandy beaches abut a strip of sea grape (*Cocoloba uvifera*) and coconut palm (*Cocos nucifera*) while the less exposed brackish water lagoons of Brus (120 km^2) and Ibans (63 km^2) are fringed with mangrove (*Rhizophora mangle*) (8). Paralleling the beach is a strikingly barren coastal savannah. The sparse vegetation, dominated by Caribbean Pine (*Pinus caribea*) and studded with short palms, is attributed to poor soils and periodic burning by the natives. Fire is used to maintain pasture for grazing and to drive game into the open (9).

Hardwood gallery forests line the Platano, even through the open savannah. In some areas backwater swamps behind the river-built levees have flooded these riparian formations. Human habitations are concentrated along or within one kilometer of the river and lagoons. There, migrating agriculture has left several small tracts in various stages of succession. These plots of disturbed forest attract many plant and animal species distinct from those of the primary woodlands, adding diversity to the reserve's genetic pool (10).

The greatest portion of the watershed however is blanketed by mature broadleaf forests. In the lower elevations (the coastal plain) undisturbed woodlands are relatively open underneath—the dense arboreal crown blocking most direct sunlight from reaching the forest floor. A distinctive feature of these ecosystems is the impressive buttressing found on many older trees. Some are so pronounced that they provide cavities dark enough to harbor roosting colonies of bats. While no one tree species dominates, *Carapa guianensis*, *Swietenia macrophylla*, *Pterocarpus sp.* and *Cedrela oderata* are found among a myriad of others (11). Trunks and limbs in turn support a lush growth of epiphytic and parasitic plants.

In higher windswept elevations trees are littered with even greater quantities of bromeliads and orchids. These and other growth characteristics bear a notable resemblance to "cloud forests"—a vegetative formation usually found at greater altitudes in Central America.

altered by the hand of man, but generally in a manner harmonious with natural systems. This area will provide protection for indigenous peoples and opportunities to study cultural features. Land use deemed threatening to the maintenance of an acceptable quality of life will be modified by employing appropriate technologies. While permitting indigenous residents the opportunity to evolve at their own chosen pace, adequate management of this area will also relieve human pressures upon the natural zone. *The Natural Zone* protects an area of sufficient size to function as a self-regulating natural system. It will remain unaltered for the conservation of genetic material. Special uses such as: education, tourism and scientific monitoring as well as occasional utilization by the local inhabitants will be permitted but only when tightly controlled and of negligible impact. *The Buffer Zone* protects the integrity of the Natural Zone from outside influences. The rational harvesting of Buffer Zone resources will be permitted in a manner compatible with reserve objectives. Forestry, agriculture and other activities must not drastically alter natural ecosystems except for experimental purpose to measure environmental impacts. Extension programs and demonstration plots will be sited in this and in the Cultural Zone. Source: see Figure 1.



FAUNA

Coastal swamp and forest, savannah and upland landscapes all provide suitable habitat for an overwhelming variety of animal species. The geographic setting of the reserve—the transition zone between North and South America—also contributes to the unique blend of tropical and temperate organisms. Though the area is not yet thoroughly inventoried, some wildlife studies have been undertaken and more are planned.

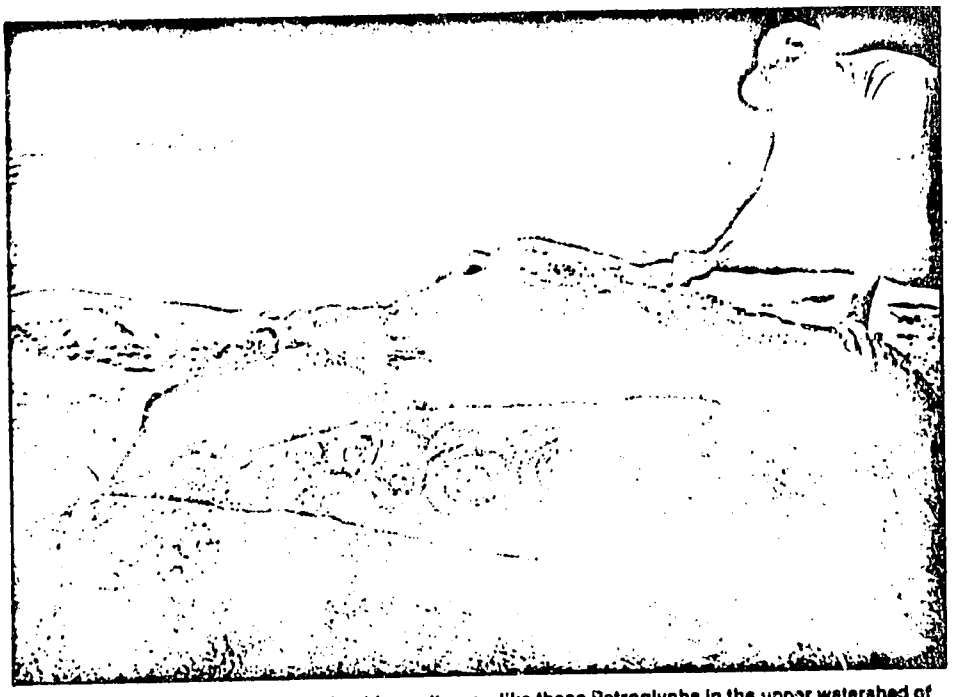
Of the mammals in the reserve, many have been listed by the International Union for Conservation of Nature and Natural Resources (IUCN) as globally rare or endangered. These include: tapir (*Tapirus bairdii*), manatee (*Trichechus manatus*), jaguar (*Felis onca*), ocelot (*Felis pardalis*) and the margay cat (*Felis wiedii*). Other representative species are: the southern river otter (*Lutra annecteus*), jaguarundi (*Felis eyra*), collared and white-lipped peccary (*Tayassu tajacu* and *Tayassu albirostris*), paca (*Cuniculus paca*), white faced and spider monkey (*Cebus capucinus* and *Ateles geoffroyi*), giant anteater (*Myrmecophaga tridactyla*), tayra (*Tayra barbara*), kinkajou (*Potos flavus*), coatimundi (*Nasua narica*) and the sloth (*Bradypus infuscatus*) (12).

Over 375 avian species are believed to reside in or frequent the zone. Some of the more notable are the magnificent Harpy eagle (*Harpia harpyja*), the scarlet and green macaws (*Ara macao* and *Ara ambigua*), a raucous assortment of parrots and several species of toucans (13).

Almost 200 different amphibians and reptiles inhabit the project area. Included in this varied list are several species of sea turtles which periodically nest on the reserve's shores. Though not normally hunted themselves, their eggs are a much sought after delicacy. The green iguana (*Iguana iguana*) often feeds in the tree tops of the riparian forests and is a favored food of the local population. The diversity of poisonous snakes is notorious, with at least seven species identified thus far. Crocodiles (*Crocodylus acutus*) and caimans (*Caiman crocodilius*) haunt the backwater forests and mangrove swamps near the coast (14).

Fresh and salt water aquafauna figure prominently in the nutritional and econo-

mic status of the indigenous inhabitants. Indians living along the river depend on the Platano for much of their protein stores. The coastal waters are exploited principally by commercial fisheries (shrimp and lobster) which hire crews from among the seaworthy local people. The mangrove swamps of the reserve play an important role in maintaining a healthy population of these and other marine species (15).



Archaeological evidence of pre-Colombian cultures—like these Petroglyphs in the upper watershed of the Platano—is prolific, but their exact origin is as yet undetermined. Photo: D Glick.

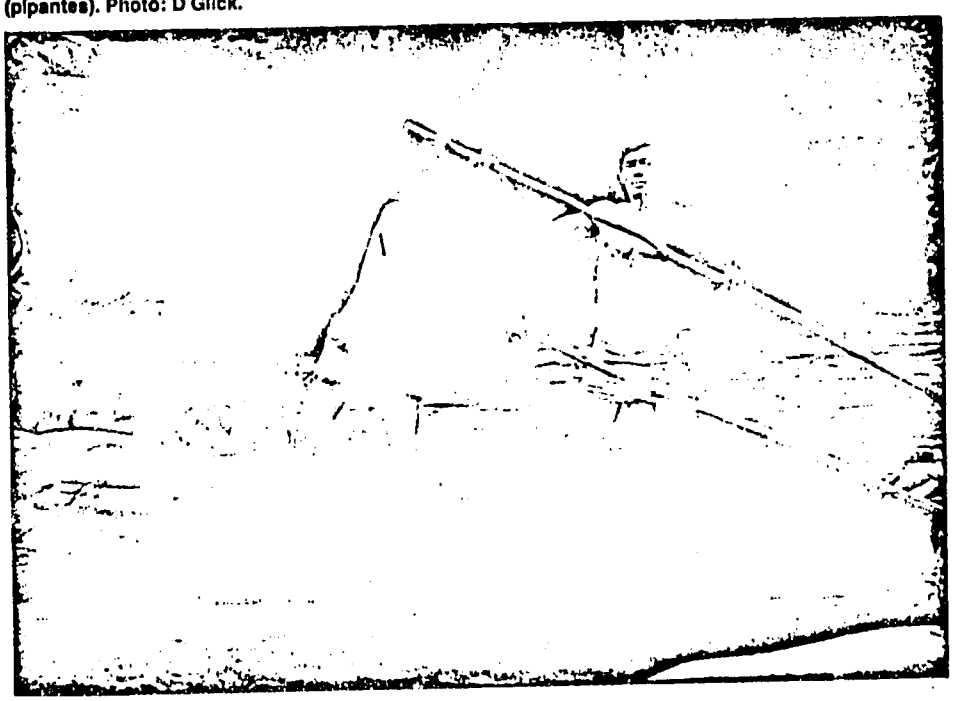
CULTURAL RESOURCES

Though superficially homogeneous, the cultural makeup of the 500 or so human residents is as diverse as the environment in which they dwell. In the pre-Columbian era, pure Miskito Indians from South America displaced many of the local tribes after migrating north. The Payas, Sumos and other indigenous tribes retreated to the remote interior to escape the wrath of these aggressive Amerindians. Today, on annual fishing trips upriver, the dug out canoes—known as "pipantes"—of the inhabitants pass a series of as yet undeciphered petroglyphs that have been carved into boulders of the headwaters region. Abundant mounds and other impressive artifacts attest to the former presence of pre-Columbian cultures (16). Additional research will be necessary to accurately identify the origins of these archaeological treasures.

For many years the English allied themselves with the Miskito tribes in their colonial struggle against the Spanish empire (17). Abandoned cannons and other vestiges of this conflict have long since been swallowed by jungle vegetation. The original Miskitos eventually mixed with rival Indian tribes, escaped African slaves and others. This blending of culture is known today as the "Miskito" Indian. Although they comprise some 90 percent of the reserve's human population, a remnant group of pure Payas still exists in the innermost villages. This clan of about 17 individuals is mostly of advanced age and seems to be heading towards cultural extinction. In addition coastal villages are occupied by Afro-Caribbeans (Garifunas) and Mestizos.

Economic activity is based primarily on agriculture, cattle and fisheries. Recently, with the advent of the lobster and fish industry, many young Miskitos have found lucrative employment on the boats. This has resulted in a radical increase in family income, but also escalating alcoholism and a general loss of self-sufficient skills and knowledge. Those that maintain traditional food gathering techniques generally practice slash and burn agriculture and supplement their diet with fish and game. Medicinal plants are used to treat various maladies and housing and transport (dugouts) are for the most part constructed from local materials. Despite the manyfold increase in per capita income with the boom in fisheries, most families still live an almost subsistence level existence. The need to maintain natural processes is generally understood and respected by the locals. Disequilibrium of the fragile ecosystems is usually the result of "outsider's" efforts to exploit resources in an inappropriate manner (18). As ecosystem degradation in other sectors of the country continues its march eastward, pressure upon the resources of the Platano region will intensify.

Under the Biosphere Reserve Manage ment Strategy, cultural and ecological awareness will be encouraged among the native inhabitants like these Miskito Indians, shown here in their dug out canoes (pipantes). Photo: D Glick.



RESERVE PLANNING AND DEVELOPMENT

Until recently the Platano watershed was virtually unknown to the scientific world, though rumors of unique natural and cultural features had trickled out of the zone for years. Wildland managers at RENARE, who are in the process of formulating plans for an inventory of potential national park sites, decided that this area merited investigation. Overflights and a preliminary resource inventory confirmed many of the folk tales associated with the isolated zone: vast expanses of virgin forest, abundant wildlife, native Indian groups and intriguing archaeological sites. With ecological and cultural data in hand, RENARE personnel aided by the Wild-

Research on land use practices such as slash and burn agriculture will be utilized to develop appropriate technologies for the reserve and the humid tropics in general. Photo: D Glick.

land Management Unit of CATIE (The Tropical Agricultural Research and Training Center) began a review of management strategies for the zone. The Biosphere Reserve concept as developed under UNESCO's Man and Biosphere Program was deemed the most appropriate option. Under the Biosphere Reserve recommended zoning scheme not only would genetic and archaeological resources be protected but the establishment of a cultural zone would incorporate the native inhabitants in the planning and management process. In addition, zoning and operational programs would establish areas and activities for identifying and perfecting appropriate land use techniques for tropical rain forests (19) (Figure 2).

Together with the indigenous population, specialists from RENARE, CATIE and Unesco's Man and the Biosphere Program (MAB) made several follow-up trips and eventually produced a comprehensive management plan, one of the first for a biosphere reserve. The plan includes: management goals and objectives, a zoning scheme, management programs (environmental, public use, resident ecodevelopment, operations, integrated development) and a development sequence. This document is supplemented with biannual operational plans which provide detailed administrative guidelines for on-the-ground action.

Management objectives reflect both the desire to protect biological and cultural resources and the pragmatic need to facilitate their rational development.

General Management Objectives

1) Management of the region's tropical ecosystems in such a manner that they continue to remain self-regulating.
2) Conservation of the ethnological and esthetic conditions represented by the human inhabitants of the area.
3) Protection of the archaeological features and promotion of their scientific investigation.
4) Assistance in achieving and maintaining a high quality of life for the local population through ecodevelopment programs.
5) Promotion of educational and scientific tourism opportunities for the local and regional population as well as for national and international visitors.
6) Utilization of the reserve as a model for the analysis and prediction of man's short and long-term impacts on tropical humid forests and identification of sustainable land use practices (20).

A MAB national committee which includes representatives from various governmental and non-governmental conservation and development related agencies, provided valuable input into the planning process. Several meetings were held with residents of the zone to assure adequate representation in what would essentially be their future. An environmental education campaign aimed at strategic target groups was also initiated. At the local level education teams were sent to the watershed to explain the reserve concept and promote general environmental and cultural awareness. An anthropologist of Miskito origin assisted in interpreting this material to the native peoples. In the capital, conferences were held with high ranking government officials to convince them of the far reaching socioeconomic benefits to be accrued from the project. These activities proved worthwhile as the reserve is now protected by official presidential decree.

STATUS OF THE RESERVE

The prognosis for the reserve is cause not only for guarded optimism but also justifiable concern. In the midst of regional political and economic upheaval, the Platano project has made remarkable advances. While funding for many Honduran government projects is being slashed, there has been a steady increase in RENARE's financial support for the reserve. This, coupled with several years of invaluable "seed" money from the World Wildlife Fund (WWF), technical assistance from CATIE and MAB, and a recent grant from

the World Heritage Fund, has facilitated systematic implementation of the management plan (21).

A resident director chosen from the local population has been hired and is coordinating operational programs within the watershed. He is assisted by two resident guards and by an administrative counterpart in the capital. General training programs have been conducted for all personnel involved. A reserve headquarters has been constructed near the mouth of the river and a facility for guards and scientists in Baltiltuk near the upper watershed was also completed. Environmental education programs are a part of ongoing management activities and MASTA, a Miskito cultural awareness group, has been formed (22).

The reserve is gaining international attention and several scientific studies have been carried out by both national and foreign investigative teams. Information gleaned from this work is beginning to flow from the area and will be entered into MAB's international network of information exchange. Research has focused on indigenous use of natural resources as well as further investigation into the ecological makeup of the flora and fauna. The project is gaining wider acceptance among Honduran government officials that have previously balked at supporting conservation efforts. This is due in part to the promotion of the reserve on economic as well as humanitarian and ecological grounds. A series of ecodevelopment projects utilizing appropriate technology and building upon local knowledge and needs has been initiated. And finally, an extensive case study is being prepared as a guide for similar reserve development in other areas (23).

There are still obstacles that threaten the project. Migrating agriculturalists from the degraded western departments are converging on reserve borders and there is mass migration of Miskito refugees from Nicaragua, moving up from the south. Forest guards, though diligent and motivated, are few in number and unable to adequately patrol boundaries. Within the watershed some resource-damaging activities continue despite regulations to the contrary. A positive sign though was the recent elimination of mining by non-residents and the enactment of stricter controls on mineral exploitation (24).

There are varying degrees of understanding of management parameters among local residents and their personal role in the project is not well perceived. Socioeconomic benefits have been slow in materializing and the amenities of government intervention speak much louder than an attractive master plan. But expanded extension programs should advance local comprehension of the project as well as foster patience in dealing with expected improvements. Health programs for example are being expanded. University students in biology and medicine are now offered the option to complete their mandatory six month social service assignment in the reserve.

A looming threat to the integrity of the fragile tropical ecosystems is the planned construction of a highway linking the Mosquitia to Central Honduras. While the road will not traverse the watershed it will skirt reserve boundaries. With a precedent of massive forest clearing in the wake of road building throughout the humid tropics, this proposal has caused wildland managers and conservationists world-wide to voice their concern (see AMBIO No. 2, 1983, p. 124).

A still more serious problem has been the lack of enthusiastic intragovernmental cooperation on this integrated resource management effort. If involved agencies fail to lend their wholehearted support, the Rio Platano River Biosphere Reserve will never realize its full potential. This obstacle is really a manifestation of an even greater challenge to wildland conservation in Honduras, a nation whose economic and social stability is closely linked to the vitality of its natural resource base. Until the decision-making body, with the support of the general public, begins to seriously attack accelerating environmental deterioration, inappropriate land use will continue to whittle away at their best insurance for continued economic growth.

There are viable alternatives to such grim scenarios. The Platano reserve is one of the most promising. Despite these problems the project continues to advance. The next few years will be an extremely critical period in its evolution. RENARE, encouraged by world-wide recognition and support, has identified this effort as its pilot wildland management project. A sizable portion of the Department's scarce human and financial resources have been earmarked for the Platano. And more importantly, there is a desire to demonstrate that Third World nations such as Honduras can make an outstanding contribution to global conservation.

Without doubt the storehouse of human and natural diversity represented in the watershed, and its utilitarian management plan are of international significance. If administered as envisioned, this World Heritage Site could provide a needed model for conserving others.

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