General Management Plan

for the

Walter Thilo Deininger National Park

El Salvador, Central America

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EXECUTIVE SUMMARY 0F THE GENERAL MANAGEMENT PLAN

DEININGER NATIONAL PARK was established in 1971 by private donation and placed under the management direction of the Instituto Salvadoreño de Turismo (***ISTU***). The park encompasses a 732 hectare remnant of sub-tropical gallery and dry-deciduous forests. Despite its protective status, the park is now facing serious environmental threats from livestock trespass, wildlife poaching, unauthorized wood cutting, and human-caused fires. Part of the problem stems from the inability of park management to properly secure the park's boundary. Social and economic conditions of surrounding private farms, communities and cooperatives, however, constitute the principle threat to the park's ecological integrity. The General Management Plan is an integrated response to the environmental crisis currently facing **DEININGER NATIONAL PARK**. It addresses the need to secure the park's interior while simultaneously addressing the social and economic problems that have compelled local residents to unlawfully extract and destroy the park's bounty of natural resources. Specifically, the plan establishes courses of action that will:

1. Secure the park's boundary from environmentally damaging intrusions;
2. Provide economic options to local inhabitants apart from park resource exploitation;
3. Increase social and economic benefits to local inhabitants above and beyond benefits currently reaped by unlawful livestock trespass, wildlife poaching, and woodcutting;
4. Improve park fire-protection and fire-fighting strategies and technologies;
5. Institute vigorous programs of park interpretation, park restoration and park personnel training and support; and
6. Engage park management in a revenue-enhancing program of Eco-tourism for **DEININGER NATIONAL PARK**.

Thorough implementation of the General Management Plan can be expected to yield positive environmental results for the flora, fauna and overall watershed of the park and its immediate surroundings. In addition, full implementation will generate an array of social and economic benefits to the people who live and work in the ecological shadow of **DEININGER NATIONAL PARK**. Moreover, implementation of the plan will provide essential institutional benefits to the park's managing agency, ***ISTU***, and the park's NGO technical-advisory agency, Fundacion Tecnica Pro-Media Ambiente (***FUTECMA***). Both agencies will gain from an enhanced professional staff, greater opportunities for inter-agency and inter-organization cooperation, and more adequate and secure funding sources.

To facilitate and foster implementation of the General Management Plan, further assistance and follow-up support from Volunteers in Overseas Cooperative Assistance (VOCA), the United States Agency for International Development (U.S.A.I.D.) and private foundations and environmental groups in the U. S. is recommended.

PURPOSE AND NEED FOR THE GENERAL PLAN

The Walter Thilo **DEININGER NATIONAL PARK** is a small but essential ecological fragment of the pre-Columbian, El Salvadoran landscape. It contains remnants of the dry deciduous forests and associated medic gallery forests that once dominated the plains and low mountains extending inland from the Pacific coast. In addition, the park is home to plant and wildlife species that are now either extinct or endangered elsewhere in the country.

The ecological viability of the park, however, is threatened. Since its creation in 1970, the impact of humans on its natural resources has escalated by virtue of an increasing population density around its boundary. In particular, land reform combined with a protracted civil war has altered the settlement and land-use patterns outside of the park and increased local demand for wood, forage, and animal products within the park.

Today, many local residents who farm small private parcels and who work in agricultural cooperatives are forced by economic necessity to trespass onto park lands and to extract park resources. To maintain a bare subsistence living they cut the park's wood for fuel or commercial sale, they hunt and fish its wildlife for food, they capture species such as parrots to sell in local markets, and they supplement scarce livestock forage with park grasslands.

Indirect effects arising from human activity around and inside the park have been no less devastating to the park's ecological integrity. In recent years, human-caused fire has plagued the deciduous forests of the park during the dry season, contributing in part to the extinction of the spider monkey. Whether started by accident or purposely set to create pasture for cattle or facilitate hunting, fires are undermining the natural processes and living structures that are essential to the park's role as a national preserve and protected area. A fire that began kilometers outside of its boundary, for example, burned over 70 percent of the park in 1987. Further, intensive cultivation has damaged the watershed in which the park is located and made river flows increasingly erratic. Runoff in the rainy season is excessive and often damaging to park river banks. Water quality is deteriorating. During the dry season river flows slow or stop sooner and over a much larger portion of the park's watershed.

DEININGER NATIONAL PARK is a biological island under assault from the mounting waves of human population and human resource use converging on its boundaries. Plant and animal species are being extirpated from its landscape, and the intricate hydrological and biological balances that sustain its complex ecology are collapsing at an alarming rate. If the park is to survive as an ecological island in a sea of intensive human use, positive management actions must be planned and undertaken immediately. Such management actions must attend both to the need of the park for protection from outside degradation and to the need of the people who live adjacent to the park for a humane and sustainable living.

The General Management Plan for the **DEININGER NATIONAL PARK** is a systematic and integrated response to the environmental, social and economic needs of the park and its human neighbors. It is a plan to protect and enhance natural resources within the park and to foster and encourage the sustainable use of natural resources beyond the park yet within the bounds of the park's surrounding watershed. It is also a plan of national and international significance, transcending the limits of the park's boundary and the welfare of the 11,000 plus people who live in the park's ecological shadow.

Most notably, the plan sets forth the minimal actions needed to conserve, protect and restore one of the last surviving remnants of a vast sub-tropical forest that once blanketed El Salvador and much of the Central American sub-continent. By preserving this fragile thread of natural history that connects the Salvadoran past with its present, a major step will have been made to secure for future generations their rightful biological and cultural heritage.

An ecologically secure and healthy **DEININGER NATIONAL PARK** offers many concrete benefits to the people of El Salvador and to those in the world community concerned with global environmental protection. It provides safe haven for a degree of biological diversity that is no longer feasible on heavily cultivated lands. It can serve as a sanctuary for the restoration of species lost at the hand of man, a laboratory where scientists can delve into the complexities of nature, and a reservoir of biological materials for future human use. It also promises a bounty of archaeological information that if properly studied can enrich mankind's knowledge of pre-Columbian civilization.

The educational value of a protected and preserved **DEININGER NATIONAL PARK** is also noteworthy. By virtue of its proximity to San Salvador, the largest urban center in the country, the park can and should provide a vital learning center and recreational experience for the more than two million people who live within 40 km of its entrance. It can act as an catalyst to raise the national environmental consciousness. It can become a rallying point for garnering social, political and financial support for more extensive land protection and restoration projects in the future.

An ecologically intact Deininger Park can also serve as the hub of an emerging Eco-tourism industry in El Salvador. Located only minutes away from the country's international airport and the major hotels of San Salvador, **DEININGER NATIONAL PARK** clearly occupies a strategic position in the step by step evolution of an Eco-tourism industry in El Salvador.

There is, however, a more profound reason for protecting and preserving the **DEININGER NATIONAL PARK**. The future ecological viability of the park rests on the sustainability of the people and communities that surround it. The park simply cannot survive unless the people who live on its periphery survive at a standard of living beyond meager subsistence. The park and the people are part of an extended ecosystem where the welfare of one is contingent on the well-being of the other. For that reason, the General Management Plan for the **DEININGER**

NATIONAL PARK is more than a guide to park protection, preservation and restoration. It is a small, yet necessary, first step toward building viable natural and human communities; it sets in motion the mechanisms for attaining sustainable living in the Deininger watershed; and it offers, if successful, a model for the conservation of national parks throughout El Salvador.

DESCRIPTION OF WALTER THILO DEININGER NATIONAL PARK

Geographical Location.

The Walter Thilo DEININGER NATIONAL PARK is located in the Department of La Libertad, 5 kilometers east of the community of La Libertad and 35 km south of the capital of El Salvador, San Salvador. The geographical coordinates of the park are latitude 13 31' North and longitude 89 16' West. Primary access to the park is at kilometer marker number 55 on the litoral highway connecting Puerto La Libertad and the village of Comalapa.

History.

The property that comprises DEININGER NATIONAL PARK was donated to the Instituto Salvadoreño de Turismo (***ISTU***) by the Deininger Corporation in 1970. This donation was made prior to the formal establishment of El Salvador's national park system and the creation of the system's managing agency, the Servicio de Parques Nacionales y Vida Silvestre.

Title to Deininger Park was transferred to ***ISTU*** with the following conditions: 1) the land may only be used for the creation of a national park; 2) construction of houses or buildings for purposes other than employee housing or park administration is prohibited; 3) subdivision of conveyed lands is prohibited; and 4) the segregation of any portions of the real property from the main park is prohibited. In the event that these conditions are not met, ownership of the park automatically reverts back to the Deininger Corporation for reassignment to an alternative government agency.

Currently, technical and advisory support for Deininger Park is provided by a cooperating non-government organization (NGO). Through a contractual agreement with ***ISTU***, the Fundacion Tecnica

Pro-Media Ambiente (***FUTECMA***) provides Deininger Park with funding and personnel for specific park protection and restoration projects. Reforestation is ***FUTECMA***'s present focus.

Physical Description.

The **DEININGER NATIONAL PARK** encompasses a total area of 1047 manzanas, the equivalent of 732 hectares or 1850 acres. Its elevation from sea level ranges from 8 meters at the current entrance to 280 meters at the peak of El Coyolar. The park is located in the Balsamo Cordillera, a chain of coastal mountains. Geologically, the area was formed during the Pleistocene Age of the Tertiary Era. Soils are typically brown or reddish clays of moderate fertility in the families of latosols or lithosols.

The Rio Amayo, the primary drainage in the park, is perennial in it's upper reaches but ephemeral in the southern one-half. Secondary rivers in the Deininger Park include the Quebrada los Cubos and the Rio Chansenora, both ephemeral. The climate of the park is hot and humid. There is a dry season from November through April and a rainy season from May through October. Mean annual precipitation at the park is 1634 mm, with 360 mm of the total amount occurring in October. Mean annual temperature ranges from 22 degrees Celsius (71.6 ~) to 27 degrees Celsius (80.6 F), with the minimum temperature occurring just before the onset of the rainy season.

Flora.

The current flora of the park is a small remnant of the primary vegetation type that historically occupied approximately 70 percent of the total land area of El Salvador. The composition of the park's vegetative communities has been altered, perhaps profoundly, by a long history of human use that includes the harvest of natural resources, cultivation of the land and the intensive use of fire. Nonetheless, the park's principle plant communities continue to exhibit a high level of species diversity and structural complexity.

Many of the representative tree species in Deininger Park are deciduous, a descriptive term for woody plants that shed their leaves as a physiological response to stress induced by the onset of a dry season. In scientific terms, deciduous trees respond to drought by forming abscission zones between essential living tissue and the extraneous photosynthetic tissue of leaves. This strategy allows deciduous trees to conserve water that would otherwise be lost in the processes of transpiration and photosynthesis. All of the deciduous trees occurring in the park - a minimum of 145 counted species -- exhibit this adaptive feature.

Three primary forest community types are located within the **DEININGER NATIONAL PARK**:

Gallery Forest.

The Gallery Forest community type found primarily in valley or river bottoms that have perennial surface or subsurface mo*ISTU*re. The canopy of the community type may reach heights of 30 meters or more. Soils are typically alluvial in origin. Individual tree species, though deciduous by nature, do not completely shed leaves in normal years. Trees that characterize the community type include amate (Ficus glabrata), volador (Terminalia oblonga), conacaste negro (Enterolobium cyclocarpum) and pepeto real (Inga verta).

Low Deciduous Forest.

The low deciduous community is adapted to hot, sub-humid climates and it supports canopy heights extending up to 15 meters. Most trees in the community shed their leaves during the dry season. Characteristic member tree species include Tecomasuche (Cochlospermum vitifolium), jiote (Burseria simaruva), bonete (Luchea candida), and caulote (Guayzuma ulmifolia).

Median Sub-deciduous Forest.

The Median Sub-deciduous community is also characteristic of hot, subhumid climates, and it supports a tree association that typically loses 40 to 75 percent of its leaf canopy during the Salvadoran dry season. Common tree species of this community type include amate (Ficus glabrata), chilamate (Ficus ovalis), pacun (Sapindus saponaria), and conacaste (Enterolobium cyclocarpum).

Fauna.

The park and its surrounding lands once provided habitat for a rich and diverse assemblage of wildlife species. Cultivation of contiguous lands and human encroachment into the park have caused the extirpation of many of the larger animal species of Deininger Park. Regional mammals such as the puma (Felis concolor), danta (Tapirus bairdi), jaguar (Panthera onca), gata zonto (Felis yagouaroundi), spider monkey (Ateles geoffroyi), coyote (Canis latrans), and tigrillo (Felis sp.) and regional birds such as rey zope (Sarcoramphos papa), crested eagle (Zpizaetus ornatus), pahuil (Crax rubra) and mountain turkey (Penelope purpurascens) are no longer found in the park and its surrounding watershed. In addition, other species that can still be found in the park are on the brink of extinction in El Salvador and will survive in the wild only if refuges and protected areas such as Deininger Park can be preserved.

Among the fauna that have the potential for survival or reestablishment in limited populations in the park are: mammals such as the coyote (Canis latrans), spider monkey (Ateles geoffroyi), white-tailed deer (Odocoileus virginianum), Tepescuintle (Cuniculus paca), cotusa (Dasyprocta punctata) and gato zonto (Felis yagouaroundi); birds such as laughing falcon (Herpetothenes cachinnans), chachalacas (Ortalis vetula) and ivorybilled woodpecker (Campephilus guatemalensis); and reptiles such as garrobo (Otenosaura similis) and iguana (Iguana iguana).

General Ecology.

The sub-tropical forest of Deininger Park is characterized by several unique ecological features: 1) structural complexity and diversity; 2) physiological and morphological adaptations to mo*ISTU*re availability; 3) high productivity and associated multiple pathways of energy flow; and 4) a multiplicity of ecological niches.

The forest ecosystem of Deininger Park exhibits continuous to moderately-interrupted canopies of 30 m or more in height. Below the upper canopy is an emergent layer of trees of variable age and height. Still further below, and especially where the secondary canopy is not continuous, is a well developed understory of small trees and shrubs. Ephyphytic orchids and bromeliads plus vines and lianas interconnect the various layers or synusia, creating a diverse, rich vegetative collage and a deeply shaded forest floor.

Most dominant and secondary trees in the Deininger Park forest ecosystem are heavily buttressed at the base and support clear, straight boles emerging into sunlight with flattened, wide canopies. In addition, many of the forest's tree species display highly developed sclerophyll tissue to sustain internal mo*ISTU*re pressure. Though woody plants along waterways tend to be green year round, the greater number of trees found in the park are deciduous and abscise and shed their leaves after the onset of the dry season. The most successful woody species are those which can germinate and establish in deep shade but which can aggressively seek sunlight when opportunistic openings in the forest canopy occur. This results in a distinctive hierarchy among the forest's many woody species.

The high, sustained productivity of the Deininger Park's biological system depends on a rapid rate of energy fixation and transfer, and an equally efficient cycling of nutrients through aggressive decomposition and mineralization. The spatial and dimensional attributes o~ the forest ecosystem facilitate this nutrient cycling. Moreover, large amounts of biomass are manufactured each year by the process of photosynthesis. Decomposition is extremely rapid because of accelerated fungal and bacterial activity. Nutrient losses in the forest ecosystem are offset by high

levels of productivity and fast uptake of nutrients. As a consequence, soils in the Deininger Park ecosystem are typically heavily weathered and heavily leached. They are unable to sustain continuous cropping, having evolved to support a biological system of high above-ground biomass, rapid turnover rates, and accelerated mineralization.

The abundance of biomass in the Deininger Park ecosystem is limited by the incidence and quality of light and seasonal dry and wet seasons. Further, the ecosystem type exhibits a high degree of species interrelationships, including competition, symbiosis, parasitism, and predation. In addition, it supports a wide diversity of ecological niches and a multiplicity of ecological processes and roles. Interdependence among organisms endows the system with resilience but also makes it vulnerable to external influences brought on by human intervention.

One feature of the Deininger Park ecosystem that is not fully understood is the role of fire. This gap in our knowledge is significant because the frequency and severity of human-caused fires appear to be increasing in the park. records of fire occurrence are available for only the last 25 years. In addition, the relative isolation of the park from other natural areas poses serious ecological problems in terms of adequacy of species habitat and sustaining biological diversity. Finally, escalating settlement and cultivation of lands adjacent to the park, combined with the park's relatively small size, pose a serious threat to the sustained biological integrity of DEININGER NATIONAL PARK.

PARK ISSUES AND PROBLEMS

The general plan for the Walter Thilo DEININGER NATIONAL PARK is driven by the major issues and problems that concern the park's protection, preservation and restoration. These major issues and problems, in turn, are divisible into five general categories: park protection; park interpretation; park restoration; park personnel training; and public use and eco-tourism in the park.

Park Protection.

Natural resource protection is the most important issue and pressing problem facing the future survival and viability of DEININGER NATIONAL PARK. On one hand, human activities occurring within the park directly threaten the park's ecological integrity and biological diversity. The park's boundary, for example, has neither prevented nor controlled environmentally damaging or unauthorized trespass activities such as:

1. Wood cutting of successional tree species on the park's perimeter for fuel and resale;

2. Logging and extirpation of climax hardwood species; 3. Livestock grazing throughout the park;

4. Gallery forest and streambank degradation by an introduced herd of horses;

5. Fishing and poisoning of park rivers with Malathion; 6. Live capture and theft of park species for commercial sale (e.g., deer, parrots and iguana);

7. Hunting of park mammals and, in the case of the spider Monkey, destruction of key park species;

8. Human-caused fires originating within the park as the result of unauthorized cooking, hunting and pasture creation for domestic livestock;

9. Human-caused fires external to the park but bridging
park boundaries; and

10. Predation of native birds by domestic cats kept by park personnel.

Many, if not all, of the issues and problems of unlawful trespass and human-caused resource degradation are tied directly to the integrity of the park's boundary, the development and enforcement of management zones within the park, the sufficiency of current levels of personnel numbers and training, the adequacy of ranger patrols and monitoring activities and facilities, and the av~ilability of legal authority and police cooperation to ensure park protection from unauthorized trespass. In particular, these issues and concerns draw focus to the adequacy and appropriateness of park rules, policies and enforcement procedures for the protection of the Deininger Park.

The status and protection of natural resources in Deininger Park, however, are also determined by activities external, yet adjacent, to the park's boundary. Cultivation practices within the Deininger watershed directly impact water quality, water availability, streambank stability, and aquatic life in the park's several rivers. Evidence indicates that farming activities have altered the river ecology of the park by changing the character of water flow in both dry and wet seasons.

Population density and the standard of living of the people who live along the boundaries of the park are probably the most critical factors in determining the success of resource protection in Deininger Park. Clearly, an extreme density of local population coupled with a very low level of per capita income has led to social and economic pressure to trespass on park lands and extract protected park resources. The social and economic welfare of the families and communities surrounding the park is positively correlated with the environmental status of Deininger Park: as poverty deepens outside the park, park degradation can be expected to worsen. Conversely, any actions to stabilize or improve living conditions will likely benefit the protection, preservation and restoration of Deininger Park.

Complicating the relationship of living standards to park protection is the level of understanding among local residents of the purpose and function of the park. Despite some educational efforts in the past by park management, most people living and working near Deininger Park are unaware or uncertain of why the park exists and how the park might potentially benefit them now and in the future. Moreover, links of communication and participation between park management and local family and village life appear weak to nonexistent. The absence of active consultation, coordination and cooperation between park staff and surrounding residents contributes to misunderstanding, suspicion and a lack of commitment by local people to the preservation of Deininger Park.

Park Interpretation.

The ability of **DEININGER NATIONAL PARK** to fulfill its educational and preservation roles is predicated in part on the development of an adequate program of natural and cultural resource interpretation. Yet the crisis and demand of natural resource protection have prevented the development of an adequate and appropriate interpretation program in **DEININGER NATIONAL PARK**. With the exception of three maintained trails, one paralleling the Gallery ~orest of Rio Amayo, one leading to El Coyolar, and one crossing the highlands between Rio Chansenora and Quebrada El Ojushle, there is no developed program of visitor interpretation. Conspicuously missing in the current management and layout of Deininger Park are:

1. Adequate sign postings along existing trails;

2. Clearly marked and well-maintained interconnections between existing trails;

3. Loop trails of near, medium and extended distance; 4. A park visitor center with displays, visitor facilities and educational programs and materials;

5. Park brochures and entrance signs describing trails, interpretative information, and park rules;

6. Well-located, researched and developed

Interpretation sites on existing trails; and

7. Loop trails located near the park entrance with developed living interpretation displays of park flora and fauna.

Besides omissions in visitor interpretation programs and opportunities, park management has not provided other visitor serv~ces and facilities. A small picnic area exists near the park entrance, but no accommodations are provided for overnight camping in the park. Moreover, subsidiary visitor services such as public seminars, summer camps for children and travelling interpretative shows and displays for schools and local residents have not been planned or

developed. A well-groomed and aesthetically pleasing garden area of largely exotic plant species is maintained at the park headquarters, but an equivalent area of native plant species is yet to be developed.

An abundance of scientific and interpretative materials relating to Deininger Park is available. However, park management has not yet utilized these materials for park interpretation. Indeed, many of these materials are inaccessible to on-the-ground management and to the technical staffs of ***ISTU*** & ***FUTECMA***, the non government organization (NGO) cooperating with ***ISTU*** in the

Moreover, many of the as species lists and management of **DEININGER NATIONAL PARK**. existing scientific documents--such descriptive works--are either extremely dated or not suitable for popular interpretative use. serious problem for the park given the research in Dark flora, fauna and ecology

This poses a particularly absence of any current ~ v- Lastly, park management has not focused on the location, protection and interpretation of archaeological resources within the park.

Park Restoration.

Restoration of park natural resources and ecological processes is essential if **DEININGER NATIONAL PARK** is to serve as a representative and sustainable example of the low elevation, dry deciduous and gallery forest ecosystem type.

To its credit, **DEININGER NATIONAL PARK** has invested considerable resources in park restoration. Currently, reforestation activities are ongoing in burned areas where native, fast growing trees, such as madrecacao, are transplanted from the park's nursery in the hope of rapidly restoring forest cover. In addition, some limited plantings of slower-growing, native hardwood species are now in progress in more mature forest stands in the park. Concern, however, exists as to whether an adequate diversity of tree species is being replanted in burned and mature forests. Part of the problem may lie in the lack of knowledge regarding the full range of tree species that once occupied Deininger Park. Also, the availability of seed and vegetative sources for forest restoration is a major constraint on sound reforestation practices, particularly in the cases of extremely rare and extirpated tree species.

Associated with reforestation and forest protection practices is the intensive use of fire breaks throughout the park. Questions exist as to the efficacy of these breaks and to the degree of d***ISTU***rbance they may create within the park's ecosystem. Up to two meters in width, and

criss-crossing the park in a cumulative distance in excess of 20 km, the breaks may displace as much forest cover as annual human-caused fires do during the dry season. Moreover, they provide unimpeded access to poachers and gatherers of vegetative material.

Other restoration activities in Deininger Park have not received equivalent attention. Spider monkeys and iguanas were transplanted into the park during the past 15 years but without apparent success. Because of a lack of biological research on the viability of species transplantation into the park, and the failure to effectively deal with the social factor of predation by outside human residents, these faunal reintroductions were probably doomed from the very beginning. Moreover, the park has not allocated resources to either protect or restore other mammalian, reptilian or avian species. In particularly, the requisite scientific studies on population numbers of existing endangered species and the adequacy of habitat for extinct species has not been performed.

Also missing in the park's restoration program is a thorough and comprehensive program of resource monitoring. Existing reforestation projects are not monitored for long term success as measured by successful establishment of a diverse and mature forest cover. The ecological impacts and significance of fire breaks have not been scientifically evaluated. Moreover, there is no monitoring program currently in place to assess the condition and trend of flora and fauna in the park. The direction and intensity of human impact on park resources resulting from trespass activities (including exotic horses and domestic cats) is subject to conjecture due to the absence of a monitoring program. Finally, no monitoring procedures are in effect to determine the impact of au~llorized visitation on park resources or to ascertain appropriate visitor carrying capacities for potential protective and interpretative zones of the park.

There is also no ongoing monitoring program for watershed conditions or contingency plans for watershed restoration. Yet stream quality, streamflow maintenance and streambank stability are crucial factors in the health of the park and the sustainability of its major ecological processes.

Park Personnel Training.

Effective management and protection of the natural resources of **DEININGER NATIONAL PARK** are dependent in part on the training and skill levels of the park's staff. Achieving those levels of training and skill, however, has been difficult given funding deficiencies, lack of professional criteria for job performance, and the paucity of educational programs available to park personnel.

Professional criteria and skill levels for both the park superintendent and park rangers, for example, have not been set, and provisions for appropriate education and training have neither been planned nor developed. In addition, training and educational standards for maintenance workers and temporary employees from ~ttlements surrounding the park have been either overlooked or poorly implemented.

Technical support staff employed by ***ISTU*** and ***FUTECMA*** and associated with Deininger Park have adequate training and skills in many areas of biology and conservation. However, their professional expertise can and should be strengthened by further instruction in conservation biology, public policy, natural resource planning, community relations, park administration, and scientific procedures for park interpretation and restoration. ~inally, little if any attention has been given to providing park employees with appropriate and necessary equipment to perform their duties. Standard items such as uniforms, rain gear, boots, first aid equipment, canteens, radios, telephones and other related equipment are non-existent. With the exception of machetes, park rangers are denied many of the minimal tools needed to assist them in the enforcement of park rules and park protection--not to mention self-protection. Moreover, opportunities for career advancement, policies to guide management-employee relations, and codes of professional conduct are conspicuously absent from DEININGER NATIONAL PARK operations.

Public Use and Eco-Tourism.

The ability of park managers to protect and restore the natural resources of DEININGER NATIONAL PARK hinges in part on the success of the park in garnering the political and financial support of the people of El Salvador and those in the world community who value global environmental conservation. However, little if any attention has been focused by park management on the development and presentation of Deininger Park for general public use or on the scientific assessment of the park's ecological and aesthetic carrying capacity for human visitors.

Currently, visitation to the park is restricted to educational groups. This policy effectively isolates Deininger Park from the bulk of Salvadoran citizens and the majority of foreign visitors who patronize the hotels, restaurants, shops and authorized tourist~ facilities in El Salvador. As a result, essential sources of domestic and international support are alienated, denying the park the requisite political influence and financial muscle to pursue a vigorous and practical program of park management, protection and restoration. Moreover, the likelihood of the park being included

as part of a nationwide program of eco-tourism is diminished. The losers are the park resources, the economy of El Salvador and the global agenda of natural resource conservation.

Park policies that exclude general public visitation have direct economic conseguences for park management and development. Potential revenues from entrance fees are forgone and various visitor facilities and services that could generate much needed funds for resource conservation are forfeited by default. Moreover, division of the park into zones of intensive and extensive visitor use has been neglected and studies regarding the recreational carrying capacity of the park have been ignored.

Exacerbating the social, economic and political isolation of **DEININGER NATIONAL PARK**, and the associated environmental costs, is the absence of a concerted effort to utilize media sources to advertise and foster support for programs of park protection and restoration. Further, insufficient effort has been made by ***ISTU*** and FUTECMA to enlist the aid and assistance of volunteers, domestic and foreign government support agencies, international environmental organizations, business and civic groups, and local residents in the management of the park, the pursuit of the park's resource protection mandate, and the raising of funds essential to tlle park's success. By not utilizing all available domestic and international resources, park management is not providing Deininger Park the means to make ecologically effective management, protection and restoration affordable and attainable.

DEININGER NATIONAL PARK GENERAL MANAGEMENT PLAN

The General Management Plan for the **DEININGER NATIONAL PARK** is divided into five plans of action, each dealing with distinct areas of park management. The plans of action are: Natural Resource Protection Plan;

Park Interpretation Plan;

Park Restoration Plan;

Park Personnel Training and Support Plan; and

Park Revenues, Public Use and Eco-Tourism Plan.

The individual plans are detailed responses to the key issues and problems of current park management that were identified in the previous section. Together, they represent a prioritized and integrated approach to resolving the social and natural resource challenges now facing **DEININGER NATIONAL PARK**.

NATURAL RESOURCE PROTECTION PLAN

The natural resource protection plan for Deininger Park confronts the critical issue of protecting the land, water, plants and wildlife of the park with a two-pronged strategy. On one hand, the plan proposes actions that will protect and secure the park's interior from trespass, poaching, human-caused fires and other sources of natural resource degradation. On the other hand, the plan proposes actions that will indirectly benefit Deininger Park by attending to the pressing social and economic problems that compel surrounding residents to violate the integrity of the park by trespass and through the deterioration of the park's surrounding watershed.

Internal Management Actions.

The following actions will be implemented, in order of priority, to secure the integrity of the park's boundary and to protect the park's natural resources from human-caused and human-related sources of degradation.

1. Construction of Perimeter Fencing.

A continuous fence will be constructed around the full perimeter of DEININGER NATIONAL PARK. The fence will be constructed of 5 strands of barbed wire; its height will be 1.25m; and the distance between posts will be 2m. Fence posts will be constructed of wood cut from the park, except that in heavy trespass areas every fourth post will be constructed of rebar rods and cement. In addition, the perimeter fence will be signed at intervals of 10m with alternating signs reading: 1) Prohibido La Tala de Arboles y La Caceria and 2) Parque Nacional/Prohibido El Paso. Finally, water gap fences and water panels will be constructed across rivers at the lower boundary of Deininger Park to protect the park's resources from human and animal trespass through open waterways created during the dry season.

2. Perimeter Surveillance and Fire Breaks.

To provide a buffer against fires originating outside of the park (the largest fire in the recent history of the park-1987 -- started kilometers beyond Deininger's boundary) and to provide a clear lane for the detection of trespass, a perimeter clearing will be created. The clearing will extend 2m inside of the perimeter fencing and will encircle the park.

3. Expansion of Park Ranger Force.

Twelve park rangers will be added to the park's staff to bring the ranger force to a grand total of fifteen. This will allow the scheduling of ranger patrols to cover the park's entire perimeter

on a daily basis. Scheduling of patrols will be randomized to avoid easy prediction and evasion by potential trespassers and poachers. The frequency and manpower of ranger patrols will be doubled in boundary areas where trespass, poaching and human-caused fire are most common. Ranger patrols will be equipped with appropriate enforcement and safety tools (see Park Personnel Training and Support Plan).

4. Surveillance Towers.

Three fire and trespass surveillance towers will be constructed inside **DEININGER NATIONAL PARK**. The towers will be 12 m in height, supporting an enclosed viewing platform 2m x 2m x 2m in size. The base and legs of the tower will be constructed of cement and the sheltered viewing platform will be constructed of wood. Each tower will be equipped with a spotting scope, a table, a chair, a two-way communications radio (operated by a solar charged battery), and a vertical antenna placed on top of the tower. One ranger will be assigned to each tower during daylight hours. During periods of critical fire danger, rangers may be assigned, on a rotating basis, to 24 hour watches. Construction of the three towers will be prioritized as follows:

* Priority One: El Coyolar Area.
* Priority Two: Madrecacao Area.
* Priority Three: El Deseirto Area.

5. Fire Response and Suppression.

Park management will develop a fire control and coordination plan for Deininger Park. The plan will include the following measures for suppressing fires in the park and on adjacent private and cooperative lands:

* Radio communications between surveillance towers, ranger patrols and park headquarters; * Upgrading and storage of fire fighting supplies at the park headquarters and at each of the three surveillance towers;

* Development of fire-reporting system for residents living outside of the parks;

* Use of perimeter surveillance clearing, maintained paths and gallery forests as primary fire breaks;

* Development of cooperative procedures with outside communities and cooperatives for suppression of fires on lands contiguous to the park;

* Procedures for immediate call-up of fire - suppression crews and procedures for supervision and fighting of fires inside the park and on lands contiguous to the park; and fire-fighting training for park staff and temporary employees.

6. Patrol and Protection Zones.

To facilitate protection of the park's perimeter and the resources contained within, the following park patrol and protection zones will be identified and enforced:

* Zone One: Zone one will consist of the perimeter fence and the 2m-wide perimeter fire and surveillance break. Patrols will be intensive in this area; focus on resource protection within the surveillance break will be minimal.

* Zone Two: Zone two will consist of areas within the park that have a historic record of high trespass, poaching and human-caused fire. Patrols will be intensive in these areas; focus on resource protection will be high.

* Zone Three. Zone three will consist of all areas of the park that have been successfully reforested by park staff. Patrols will be moderate in these areas; focus on resource protection will be high.

* Zone Four. Zone four will consist of the gallery forests in the park. Patrols will be light in these areas; focus on resource protection will be moderate.

7. Cooperation with Law Enforcement Agencies.

DEININGER NATIONAL PARK will develop in conjunction with relevant law enforcement agencies a formal agreement or "memorandum of understanding" to facilitate and foster enforcement of national laws within the park's boundaries.

8. National Legislation.

DEININGER NATIONAL PARK will cooperate with and assist appropriate government agencies and legislative bodies in the formulation of effective policies, rules and laws for national park protection.

9. Feral Horses.

To protect the rivers, riparian areas and gallery forests of the park, the current herd of feral horses now resident in the park (numbering approximately 15) will be captured and removed. Three to four male horses in good condition will be selected from the herd, gelded, trained and retained for park management. The retained horses will be pastured outside of the park or kept in a corral adjacent to park headquarters and fed with grain and hay. The remaininghorses will be sold.

10. Domestic Cats on Park Grounds.

Domestic cats have been found to be primary predators on native bird populations. Moreover, they have high reproduction rates and high potential for becoming feral. To protect the bird populations of Deininger Park, the ownership and keeping of domestic cats on park property will be prohibited. In addition, all cats found on park property will be destroyed.

External Social and Economic Management Actions.

The following actions will be implemented, in order of priority, to improve understanding and relations between Deininger Park and outlying farms, villages and cooperatives, and to facilitate and foster the economic and environmental health of the people living and working on the lands adjacent to the park and within the park's watershed. Initially, park management will develop the necessary infrastructure and lines of communication to work in close collaboration with surrounding residents. Essential actions will include:

1. Identification of Family, Community and Cooperative Leaders.

Park management will identify individuals in surrounding families, communities and cooperatives to serve as intermediaries between the park and outside residents and to provide the necessary interface between the two to ensure implementation of park social and economic programs. These individuals will act as conservation coordinators.

2. Community Involvement in Park Management.

Deininger Park will develop a process, and the supporting means, to include residents in park decision-making when the results of such decisions will either directly or indirectly affect their social and economic well-being. As part of this program, park management will compile through intensive interviews and meetings with conservation leaders and local residents a list of concerns relating to Deininger Park, its policies, and its management. These concerns will provide guidelines for the adaptation of the General Management Plan to community needs and will offer guidance in the development of a democratic decision-making process between the park and its human neighbors.

3. Educational Outreach Program.

DEININGER NATIONAL PARK will develop and implement an intensive educational outreach program to foster understanding of the park's purpose among local families, communities and cooperatives, to garner support for the park's continued existence, and to

demonstrate the positive benefits that the park can and will generate for local people. Among the outreach efforts to be taken, the following will be emphasized:

* Local School Programs. Through cooperation with local teachers and school administrators, park management will develop educational programs about the park to be delivered in classrooms and through on-site visits to the park by local school children, and

* Adult Educational Programs. Park management will provide park and conservation programs to adults in surrounding communities through 1) special park tours; 2) traveling displays and presentations; and 3) training of conservation leaders to perform supplementary education and instruction.

4. Peace Corps Volunteer.

Deininger Park will request from the U.S. Peace Corps one (1) volunteer to be stationed in the immediate vicinity of the park for a period of two years. The volunteer's counterparts will consist of the technical support staff at ***ISTU*** and ***FUTECMA***. The mission of the peace corps volunteer will be to coordinate and direct the park's social and educational outreach programs and to assist in the development of economic opportunities and sustainable land practices among the people living and working in the Deininger Park watershed.

Once the lines of communication and cooperation are established between the park and local residents, the educational outreach programs developed and engaged, and the peace corps volunteer and his or her counterparts selected and installed, management actions aimed at fostering economic development and sustainable agriculture will be implemented. The principle underlying these actions is simple, yet essential. They must yield net benefits to the people of the Deininger Park area. Despite restrictions on future extraction of natural resources, park policy, programs and actions must be designed to more than compensate for lost opportunities associated with park protection. In other words, for management actions to be viable they must result in a net gain in the social and economic welfare of the people. Action programs that should be emphasized by the park and the coordinating peace corps volunteer include:

Full-Time and Temporary Park Employees.

All full-time (permanent staff) and temporary employees (guides, seed collectors, reforesters, nursery workers, fire fighters, fire break builders, construction workers, etc.) of Deininger Park will be hired, whenever possible, from the local population. The hiring of local residents for fire-fighting will require appropriate planning to ensure that park fires are not started as a means of employment.

2. A food concession at the park visitor center

will be assigned to local residents. Only traditional foods will be prepared, and the quality of those foods will be monitored by park management. The peace corps volunteer will facilitate, as necessary, training in menu selection and food preparation and assist in acquisition of small business loans for the concession's operators.

3. An arts and crafts shop

will be established at the park visitor center and supplied and staffed by local residents. Only film, park interpretative books and pamphlets, and high quality crafts from El Salvador and adjacent Central American countries will be sold. The peace corps volunteer will work actively with residents to establish a local arts and crafts industry.

4. An experimental program in iguana harvesting,

under the supervision of the peace corps volunteer and counterparts, will be implemented. An appropriate number of iguanas will be seeded into the park, and left und*ISTU*rbed for a period of one year. Starting in the second year, and increasing by incremental steps thereafter, iguana harvests will be permitted on an authorized, licensed basis. Iguana harvests will be set, through monitoring, at a level that ensures a viable and sustained population. Implementation of this program will be done in concert with the park's restoration plan and in coordination with a second peace corps volunteer (see park interpretation and restoration plans).

5. A sustainable forestry program

will be developed and implemented by the park to encourage the proliferation of woodlots for family fuel along the parks boundaries. The program will be coordinated by the peace corps volunteer and counterparts from ***ISTU*** and ***FUTECMA*** and will be comprised of three parts:

* Cooperative woodlots. Deininger Park will continue to cooperate with local cooperatives in the identification and selection of cooperative lands at the park's boundary for the purpose of reforestation with fast-growing fuel trees from the park's nursery.

* Private Woodlots. Deininger Park, through the peace corps volunteer and technical staff at ***ISTU*** and ***FUTECMA***, will work with small landowners at the park's boundary to identify and select private lands suitable for reforestation with fast-growing fuel trees from the park's nursery. These reforested areas will be designed to supply fuel wood to individual families on a sustained-yield basis.

* Park Woodlots. In areas of the park where tree cutting for fuel wood persists despite other protection actions, limited harvest areas that are reforested in exclusively fast-growing fuel trees will be established along the perimeter fence. Harvest will be licensed and controlled by the park to ensure sustainable cutting. In addition, licensed harvesters will be restricted to using the

wood for personal use or resale in the immediate community. When such harvesting areas are established along the perimeter boundary, the 2m fire break and surveillance path will be moved to the inside boundary of the fuel-tree woodlot for clear delineation of the conservation area and for more effective patrolling, fire protection and surveillance. 6. A program of supervised salvage wood collection will be designed and implemented by park management. The program will authorize limited collection by local residents of downed and dead wood material resulting from park construction, trail maintenance and the clearing of perimeter surveillance paths and fire breaks.

7. A program to develop commercial nurseries

in the surrounding communities will be initiated by park management through the peace corps volunteer, nursery staff and technical support personnel at ***ISTU*** and ***FUTECMA***. The program will rely on native park plant materials, national small business loans and local residents to establish the nursery industry. Markets for its products will likely include:

* Native plants for decorative uses in urban areas;

* Herbal and medicinal plants for the local population;

* Plant materials for land restoration in other national parks and protected areas in El Salvador and surrounding Central American countries; and

* Plant materials to supplement, as necessary,

the plant materials produced at the Deininger Park nursery.

8. A naturalist guide program,

manned by trained individuals from the immediate vicinity and under the direction of park staff, will be established and authorized to operate in the **DEININGER NATIONAL PARK**.

Development of the program will be assigned to the peace corps volunteer and counterparts from ***ISTU*** and ***FUTECMA***. In intensive use areas of the park (see park interpretation plan), the hiring of naturalist guides by visitors will be optional. In extensive use areas of the park (see park interpretation plan), the use of naturalist guides by visitors will be mandatory. Additionally, naturalist guides will be allowed to design and offer comprehensive, interpretative guided tours. Although paid directly by visitors, fees for their services will be controlled by the park management.

9. A program of wildlife protection and conservation

will be instituted in conjunction with the naturalist guide program, providing additional demand for paid services from the local population. The program will be developed and supervised by the peace corps volunteer and the ISTU/***FUTECMA*** counterparts assigned to

economic development and coordinated with the peace corps volunteer assigned to the park's interpretation and restoration program. Naturalist guides will be asked to perform, and will be compensated for, the following conservation duties:

* Locating, monitoring and protecting parrot nests in coordination with park rangers;

* Keeping counts of type, frequency and time of sightings of various wildlife species; and

* Making systematic counts and observations of the white-tailed deer herd as part of the monitoring program of the park's restoration plan. White-tailed deer will be used as an indicator species to establish the relative success of park protection and wildlife recovery policies.

10. **DEININGER NATIONAL PARK** will cooperate,

through the peace corps volunteer and support staff at ***ISTU*** and ***FUTECMA***, with ongoing efforts to foster and encourage sustainable land-use practices within the park's general watershed. In particular, effort will be aimed at developing sustainable farming practices, diversification of land uses, experimentation in mixed or simultaneous crops, and reliance on appropriate technologies for better utilization of fuel resources.

PARK INTERPRETATION PLAN

Protection of the park's natural resources is a necessary first step in the General Management Plan of **DEININGER NATIONAL PARK**. However, the park's utility as a nucleus of sustainable development, an island of preservation, a tool for education,

and a source of human recreation is contingent upon the development of a thorough program for park interpretation. Elements of this program must include: 1) Management actions for intensive human-use areas;

2) Management actions for extensive human-use areas; and

3)Management actions for resource studies and inventories.

Management Actions for Intensive Human-Use Areas.

Management actions for intensive human-use areas focus on providing park interpretation facilities and opportunities to large numbers of visitors in readily accessible places in the park. Such management actions, in order of priority, will include:

1. Construction of a visitor center with the following facilities:

* Display and park interpretation room containing exhibits that relate and demonstrate the natural, geological and cultural past of Deininger Park and its immediate region, including such interpretative devices as slide shows and video presentations;

* Traditional food concession;

* Arts and craft shop (in conjunction with the sale of film and park booklets and pamphlets);

* Restrooms;

* Room for seminars and film viewing;

* Information booth manned by one park ranger;

* Trash receptacles; and

* First aid services.

2. Maintenance and expansion of park operational facilities as follows:

* Expand the park's nursery as needed to accommodate production of greater diversity of tree species for reforestation (see park restoration plan);

* Maintain and staff the park's entrance station. Establish an intercom communications link with the park's headquarters building. Modify the entrance station accordingly to facilitate fee collection if and when entrance fees are implemented (see park revenues, public use and eco-tourism plan); and

* Outfit current park headquarters with intercom link to entrance station, a telephone (or cellular system) for communications with *ISTU*, *FUTECMA* and law enforcement, and a two-way radio for communications with surveillance and fire towers and park rangers on patrol;

* Restrict housing facilities in the park to the existing building and continue its use as temporary housing for park staff on active duty.

3. Maintenance or expansion of the existing picnic facility in the park entrance area in proportion to public demand.

4. Development of a short loop trail

(less than .50 km in length) around the visitor center with living floral displays (native trees and herbaceous species) and living faunal displays (native parrots, iguana, deer and other common wildlife species) noted and marked by interpretative signs. The interpretative trail will replace the current exotic species garden maintained at the park's entrance.

5. Development and maintenance of a network of intensive-use trails,

looped when feasible, radiating from the visitor center into the more accessible and proximate areas of the park. These trails will follow the general course of four existing walkways:

* Gallery forest trail up to the site of the park's oldest tree;

* Mirador trail with interpretive turnoff to cave area;

* Montano El Zancundo path (largely undeveloped) up to grass overlook of Pacific shoreline; and

* Upland dry, deciduous forest trail, running between the Rio de Chansenora and the Quebrada El Ojushle, for a distance of approximately 1.5 km.

All intensive-use trails will be looped when feasible to avoid two-way traffic. Trails will be developed and maintained with a 2m width and an overhead clearance of 2m. All trails will avoid river banks and other water ways by a distance of 2m when practical. In addition, all trails will be marked at the beginning with directional signs that include distance and walking time estimates and warnings against littering and the collection or destruction of park resources. Interpretative signs will be used to display and explain natural history and major interpretative stops. Park brochures (see below) will provide additional interpretative information to permit self-guided tours. Trash receptacles will be placed at key interpretive stops and at all trailheads. Benches will also be supplied for key interpretative stops such as the Mirador overlook, the park's oldest tree and the Montano El Zancudo Pacific overlook. Finally, low points along intensive-use trails, particularly in the gallery forest, will be elevated with fill-dirt to improve drainage and path consistency.

6. Construction of an intensive-use campground facility

near the visitor center (see park revenues, eco-tourism, and public support plan).

7. Development of a weekend recreational and educational camp

for young children utilizing the intensive-use campground facility (see park revenues, eco-tourism, and public support plan).

8. Development of park rules and regulations

governing visitor behavior, litter, and collection or destruction of park resources.

9. Creation of the Deininger Park information and interpretative brochure

to be purchased by all visitors upon entry to the park. The brochure will contain the following elements:

* Park rules and regulations;

* Map of park and all trails;

* List and description of park facilities for visitor use;

* Park natural and cultural history;

* Self-guided tour for intensive-use trails; and

* Interpretation information on extensive-use trails (see management actions for extensive human-use areas).

10. Placement of a large wooden kiosk at the park visitor center

showing park boundaries and trails. At the kiosk, park management will post park regulations and current information on park operations and conditions can be displayed for visitor review. A visitor sign-in and registration book will be maintained at this site.

Management Actions for Extensive Human-Use Areas.

Management actions for extensive human-use areas will concentrate on the development and maintenance of long-distance trails in Deininger Park and the establishment of one or more backcountry camping areas. Long-distance trails will be created as extensions of existing intensive-use trails and will, when feasible, be constructed in a loop fashion with interconnections (corresponding to existing fire breaks) leading to adjacent long-distance trails. Long-distance trails will be maintained for a 1.5 m walking width and a vertical clearance of 2m. Description and interpretative details for long-distance trails will be included in the park's general brochure. Further, major interpretive stops, such as the peak at El Coyolar, will be marked by a sign and, where appropriate, outfitted with benches. Additional signs indicating path direction, distance and duration of walking time will be posted at trailheads and at mid-way points for all long-distance trails. As with intensive-use trails, pathways will steer clear of stream banks and waterways by a distance of 2m whenever possible. The long-distance trails that will be maintained by park management are:

1. Extended Gallery Forest Trail.

The extended gallery forest trail will interconnect at its upper end with the Coyolar trail. The feasibility of establishing a return loop for the trail on the opposite side of Río Amayo will be studied.

2. Coyolar Trail.

The Coyolar trail will extend beyond the mirador up to the peak of El Coyolar. The Coyolar trail will be interconnected with the gallery trail at its upper end and with the Chansenora trail at its upper end, providing an accessible loop path back to the visitor center. In conjunction with the Coyolar trail, park management will cooperate with private land owners to create and appropriately sign a secondary spur off the Coyolar trail, down the Quebrada Los Olotes drainage, down the connecting El Palomar dirt road to the terminus of the Chansenora trail at the park boundary.

3. Chansenora Trail.

The Chansenora trail is the extension of the upland, dry-deciduous intensive-use trail running between Rio Chansenora and Quebrada El Ojushle. It will interconnect, along a pre-existing fire break, with the Coyolar trail and will meet at its terminus the spur trail following the El Palomar dirt road. Park Management will determine the feasibility of developing a return loop in the existing trail.

Backcountry camping facilities will be developed in one or more areas on the upper reaches of the Coyolar and Chansenora trails following a feasibility study by park management. Each site will accommodate a maximum of six registered and paying campers. Due to fire danger, all backcountry camping facilities will be closed during the dry season. Wood cutting will be prohibited; only camps using downed and dead wood will be permitted.

Resource Studies and Inventories.

To facilitate the park's interpretative program, Deininger park will engage in an active program of natural resource studies and inventories. A second peace corps volunteer (the first having been assigned to educational and economic development outside of the park) will be requested from the U.S. government to coordinate and implement, in conjunction with technical counterparts at ***ISTU*** and ***FUTECMA***, the park's interpretative program, including resource studies and inventories. The peace corps volunteer will be stationed in close proximity to park

headquarters and will be assigned to the park for a period of 2 years. The volunteer and technical counterparts at ***ISTU*** and ***FUTECMA*** will also coordinate and implement the park's restoration program (see park restoration plan). Activities under this program will include:

1. Abbreviation and publication of Arboles del Parque Nacional Walter Thilo Deininger

in an interpretative format suitable for public sale at the park's visitor's center.

2. Updating plant, mammal and bird species lists.

In addition, preliminary lists of reptiles, amphibians, fish and major insects and spiders of the park will be initiated. Lists of threatened and endangered species in the park will also be compiled along with a working list of extinct plant (especially hardwood trees) and wildlife species.

3. Collect and prepare specimens

of major, nonendangered plant and wildlife species for display at the park's visitor center.

4. Verify, amend, and complete the preliminary study of plant communities

developed in Zonificacion del Parque Walter Thilo Deininger de Acuerdo a la Perturbación de la Vegetacion y Alternativas de Recuperacion. Apply community-type data to natural resource interpretation and park protection programs. Where possible, correlate vegetation types with soil groups, wildlife presence, aspect, topographic position, slope and geological material.

5. Develop an interpretative ecology for the park visitor center and general brochure.

Incorporate interpretative ecology into community outreach programs.

6. Locate, study and protect archaeological sites

within the park. Integrate archaeological materials into visitor center displays.

PARK RESTORATION PLAN

Park restoration is an essential component of management in DEININGER NATIONAL PARK. It enhances and enriches park interpretation and educational programs. It also enables park management to extend its activities beyond simple protection of existing natural resources

and to pursue actions that will return the land and its resources to a state that more closely approximates pre-Columbian conditions. Indeed, the policy of the park will be to adopt only those restoration projects that either provide immediate and necessary protection to existing park resources or contribute most to returning the park to some semblance of its probable pre-Columbian landscape. As such, the park's restoration plan is made up of four major components:

reforestation;

protection and reintroduction of wildlife;

supportive scientific research;

and monitoring.

Reforestation.

Reforestation in DEININGER NATIONAL PARK will be conducted under the following guidelines:

1. Continuation of reforestation of areas denuded by fire.

Species selection will be modified to attain an optimal diversity of transplanted species with the objective of mimicking natural succession. Currently, the park relies on only six major species for reforestation, a result of funding arrangements with the U.S. supported El Salvadoran Social Investment Fund. These species -- exemplified by madrecacao -- are intended primarily for the establishment of fast-growing woodlots for sustainable fuel production and not for primary succession in d*ISTU*rbed natural areas.

2. Development of a definitive list of native tree species suitable and available for reforestation;

correlate species with site and community types; and design appropriately diverse mixtures of tree species for transplantation.

3. Location and development of sources and supplies of plant materials

to enhance reforestation diversity; seek plant materials within the park whenever possible.

4. Expansion and enhancement of reforestation program in existing forested areas

by focusing on transplantation and re-establishment of rare, threatened and, when identifiable, extinct hardwood tree species. Management actions to be taken include:

* Prepare species lists of expected climax tree species for the major plant community types in the park and correlate the list with plant community inventories to determine relative impoverishment of specific forested sites;

* Develop ecological criteria for species selection and transplantation with emphasis on restoring species diversity and richness;

* Develop reforestation mixtures for major community types;

* Seek outside plant materials as needed; and

* Adapt and enlarge park's nursery operation to accommodate new reforestation strategy. Utilize commercial nurseries in surrounding communities as required.

5. Termination of park program of intensive fire breaks.

To maximize reforested areas in the park and to minimize wildland d*ISTU*rbance, while at the same time buffering the land from fire, park management will integrate selected fire breaks into the existing trail system. Those trails, in conjunction with the perimeter clearing and the natural barriers of the gallery forests, will serve as the park's physical barriers to human-caused fires.

Protection and Reintroduction of Wildlife.

Creation and implementation of the park's wildlife protection and reintroduction program will be assigned to the peace corps volunteer and technical counterparts of *ISTU* and *FUTECMA*. It will be coordinated with appropriate governmental and private conservation and environmental organizations. Initial management actions in this program will include:

1. Studies and research to determine list of candidate species for possible reintroduction into DEININGER NATIONAL PARK.

2. Habitat studies to determine feasibility of specific species reintroductions.

3. Selection of one or more priority species for reintroduction: stress reintroduction of spider monkey, if feasible.

4. Implementation of conservation and protection programs for the parrot and iguana as described in the park protection plan and identify other wildlife species in need of park protection and/or recovery efforts. When species endangerment is the result of human poaching, protection

and recovery efforts should enlist local support (including park naturalist guides) by means of education and economic incentives.

5. Orient and direct park ranger patrols and naturalist guide activities to the protection of white-tailed deer from outside poaching; create a reporting system for unlawful deer poaching whereby local residents who report confirmable violations will be modestly awarded (e.g., 200 colones) and, at the same time, ensured anonymity.

Watershed Improvement.

An essential element of park restoration is the protection and, where feasible, rehabilitation of the park's surrounding watershed. Specific management actions to ameliorate degraded and deteriorating rivers, streams and upland watershed include the following:

1. Working with surrounding farms and cooperatives to foster and encourage sustainable farming practices. The peace corps volunteer and technical counterparts from ***ISTU*** and ***FUTECMA*** will cooperate with ongoing government programs aimed at improving farming practices, enhancing sanitary conditions, and reducing non-point sources of pollution -- particularly soil erosion -- in the Deininger watershed. Reforestation programs on adjacent private and cooperative lands will be stressed.

2. Manipulation of the park's watershed through the following management activities:

* Elimination of cattle and horses;

* Reduction in the number of fire breaks the resulting sedimentation;

.acceleration of reforestation efforts to arrest overland erosion; and

* Stream bank stabilization by reducing vertical inclines, by rip-rapping streambanks with rock, and by appropriate revegetation.

Supporting Scientific Research.

To facilitate park restoration, supportive scientific research is needed. The peace corps volunteer, in collaboration with ***ISTU*** and ***FUTECMA*** counterparts, will direct this effort. Management actions and guidelines available to them in the establishment of such a research program include:

1. Identification of individuals, groups and organizations capable and interested in conducting park restoration research. Emphasis should be placed on fostering and encouraging academic research in the park among Salvadoran students and doctoral candidates from foreign institutions.

2. Seek and develop sources for funding restoration research from U.S. aid programs and international environmental organizations such as The Nature Conservancy, Audobon Society, and World Wildlife Fund.

3. Determine and prioritize research needs, 2. which are:

* Viability of indigenous parrot population;
* Plant community inventory and mapping;
* Habitat adequacy for spider monkey reintroduction;
* Viability of indigenous iguana population and utility of augmenting existing numbers with transplants;
* Viability and health of the park's white-tailed deer population;
* Baseline inventory and ecology of park's aquatic systems;
* Research on historic fire ecology in the region of Deininger Park; and
* Age structure analysis of park's major forest community types.

Monitoring.

The success of the park's restoration program, as well as the success of its resource protection program, can only be evaluated through a system of scientific monitoring. Park monitoring, either conducted or coordinated by the peace corps volunteer and counterparts at ***ISTU*** and ***FUTECMA***, will focus on the following aspects of the Deininger Park ecosystem:

1. Monitoring of the water flow and water quality of Rio Amayo and Rio Chansenora as an indicator of watershed ,health and trend; rudimentary monitoring of selected fish populations.

2. Monitoring of resource protection efforts by recording and reporting on an annual basis the frequency, nature and magnitude of park trespass violations (e.g., cattle grazing, wildlife poaching and wood-cutting events).

3. Monitoring of visitation and visitor impacts on the physical and aesthetic environment of **DEININGER NATIONAL PARK**; evaluation of visitor impacts against preestablished criteria for maximum acceptable physical d***ISTU***rbance and aesthetic deterioration; and, in conjunction with theoretical baseline calculations, apply monitoring results to the determination of an empirically-based visitor carrying capacity for the park.

4. Monitoring of reforestation success rates by individual tree species and any necessary adjustment of reforestation species mixes.

5. Monitoring of the white-tailed deer population as an indicator of the relative success of the park's overall wildlife protection program.

PARK PERSONNEL TRAINING AND SUPPORT PLAN

The successful implementation of the various elements of the park's General Management Plan depends on the training of its personnel and the support provided to them in the conduct of their duties.

Employee Support.

Specific equipment needs must be met to ensure personnel efficiency and effectiveness. Accordingly, the following management actions will be taken to outfit park personnel with essential tools and equipment:

1. A telephone, or a cellular system, will be installed at the park headquarters.

2. Intercom and radio communications equipment will be installed to connect the park headquarters with the entry gate, the surveillance towers and park ranger patrols.

3. Park rangers will be supplied with standardized pants, shirts and hats, with park insignias attached to one shirt sleeve and the front piece of each cap. In addition to privately-owned machetes, e park ranger will be supplied with a whistle, baton, handcuffs, mace, canteen, small binoculars, flashlight, rain coat, boots, small first aid kit, and a radio for communications to park headquarters.

4. Three to four horses captured from the park's feral herd will be kept for park ranger transportation. The horses will be stabled outside the park or maintained in a corral near park headquarters and fed hay and grain. Requisite riding gear will be obtained.

Personnel Training.

Appropriate training of park personnel is necessary to ensure the successful implementation of the park's general plan. In particular, professional criteria must be established and training programs developed to raise employee skills and training levels to meet minimal standards. Specific management actions to establish professional standards among employees and to develop supplementary training programs will include the following guidelines and strategies:

1. Professional standards and supplemental training for park superintendent. The superintendent of Deininger Park will be expected to have skills and knowledge in the areas of

administration, record and book keeping, personnel relations, communications and natural resource planning. Supplementary training for the superintendent will include:

* Development of headquarters library containing essential management references; and

* Series of week-long seminars in key skill areas designed and taught by the peace corps volunteer and technical counterparts at ***ISTU*** and ***FUTECMA***.

2. Professional standards and supplemental training for technical support staff. The technical support staff of ***ISTU*** and ***FUTECMA*** will be expected to have skills and knowledge in the areas of environmental science, conservation biology, natural area and park management, natural resource planning, sociology and community relations, botany and wildlife management, and ecotourism. Supplemental training for support staff will include:

* Regular attendance at relevant agency and organization seminars;

* Evening enrollment in relevant university courses (with time off from daytime work for completion of course);

* Participate in National Park Service training programs in the United States (with U.S.A.I.D. assistance);

* Provision by ***ISTU*** and ***FUTECMA*** of relevant park and park-related journals to technical support staff;

* Involvement of technical support staff in activities and programs of major national and international environmental organizations; and

* Basic instruction in the use of computers and relevant computer software.

3. Professional standards and supplemental training for park rangers. Park rangers will be expected to have skills and knowledge in the areas of law enforcement, park interpretation, search and rescue, first aid, and human relations. Because of the minimal education background of current and prospective park rangers, supplementary training will include:

* Basic literacy skills provided through a government sponsored literacy program;

* Law enforcement training provided through the park's cooperative agreement with Salvadoran civil and environmental police;

* Short term instruction provided by a VOCA volunteer with park ranger experience;

* Search and rescue and first aid instruction by Red Cross Volunteers; and

* Communication instruction by the superintendent and technical support staff at ***ISTU*** and ***FUTECMA***.

4. Professional standards and supplemental training for maintenance staff. None required; on-site training and instruction will be provided as needed by the park staff and technical support personnel at ***ISTU*** and ***FUTECMA***.

5. Professional standards and supplemental training for temporary employees. None required; on-site training and instruction will be provided as needed by park staff and technical support personnel at ***ISTU*** and ***FUTECMA***.

6. Criteria for selection of peace corps volunteers for 2-year assignments at **DEININGER NATIONAL PARK**:

* Peace corps volunteer assigned to social and economic development outside of the park will have skills and knowledge in the areas of sociology, community development, sustainable agriculture, economics and business, elementary education and appropriate technologies.

* Peace corps volunteer assigned to park interpretation and restoration programs will have skills and knowledge in the areas of environmental science, conservation biology, wildlife management, forestry, fire management, parks and recreation, park interpretation, and landscape restoration.

7. Standards and training required for Salvadoran park volunteers (such as boy scouts or retirees) will be assessed and developed as needed by the superintendent and technical support staff at ***ISTU*** and ***FUTECMA***.

PARK REVENUES, ECO-TOURISM, AND PUBLIC SUPPORT PLAN

Among the many external factors that will determine the success of the park's general plan, the most important will b~ acquisition of operating funds, engagement in eco-tourism, an gathering and holding of broad public support.

Park Revenues.

Securing adequate operating funds is a mandatory first step in the successful implementation of the genera management plan for **DEININGER NATIONAL PARK**. It require aggressive fund-raising efforts by both ***ISTU*** and ***FUTECMA***. Indeed to secure operating funds in excess of those currently budgeted both ***ISTU*** and ***FUTECMA*** must rely on a variety of domestic an, international sources:

1. Domestic.

Domestic revenue sources for park operations and auxiliary activities will be sought through:

* NGO fund-raising activities such as dances, dinners, films and public presentations;

* Solicitation of business and civic donations;

* Salvadoran small business loan programs (for food concession, arts and craft industry, commercial nurseries and other local economic activities); and

* The Salvadoran Social Investment Fund (reforestation program);

2. International. International revenue sources

for park operations and auxiliary activities will be sought through:

* U.S. A.I.D. assistance programs;

* European community and Canadian environmental and sustainable farming programs;

* United Nations environmental and community development programs;

* Organization of American States' assistance programs;

* U.S. and international foundation grants for environmental protection and sustainable agriculture; and

* International environmental organizations such as The Nature Conservancy and its Parks in Peril Program, the World Wildlife Fund, the Audobon Society, the Sierra Club, and Friends of the Earth.

3. Self-funding.

Self-funding will be the most reliable revenue source for park operations and auxiliary activities in the long-term. Indeed, the ultimate success of the park's management plan will rely in large part on how successful Deininger Park is in establishing itself as a self-sustaining enterprise. The relative success of self-funding efforts will rest on the park's ability to attract a paying constituency. Elements of that constituency, and their revenue potentials, include educational groups, general public users, and ecotourists.

* Educational Groups. Currently, educational groups (such as school children) are the only constituency permitted to enter the park. No fees are assessed for this constituency, and future fees are unlikely. However, fees could be charged for weekend recreational and educational camps for young children. These camps would provide outdoor experience and nature instruction to Salvadoran youth. Fees would cover housing in tents (at the intensive-use campground and/or backcountry camping areas), food, supervision and instruction. Likely candidates for this program would be boy scouts and girl scouts.

* General Public Users. Deininger Park is not currently open to entry and use by the general public. A change in current policy, however, will enhance park revenues through fees collected by ***ISTU*** (as formally permitted by Salvadoran law) or through contributions in lieu of fees retained by ***FUTECMA***, the park's NGO (approval by the Salvadoran government for

private retention of contributions to national parks is pending). A reasonable fee for park entry is 5 colones for every person over 12 and under 60 years of age.

Eco-Tourism.

Adoption of a self-funding strategy in conjunction with initial financial support from domestic and international sources will help establish Deininger Park as part of an emerging Salvadoran eco-tourism industry. The advantages of eco-tourism for the park and the communities that surround it are clear. First, eco-tourism will thrust the national park system into public view, fostering and encouraging needed social and political support for its continuance and expansion. Second, eco-tourism will provide an essential economic base for sustaining not only the park but also the people who live and work along its boundaries. Economic opportunities offered by an eco-tourism program at **DEININGER NATIONAL PARK** will include:

1. New fee sources for the park. Under a program of eco-tourism, entry fees for non-citizens will be set at a level higher than domestic fees. A charge of 25 colones will be a reasonable first step.

2. Auxiliary park revenues. Expanded public use of the park will generate many small flows of supplementary income. Examples are:

* Sale of interpretative materials including a charge for the park's general brochure;

* Sale of decorative plants by the park's nursery;

* Recycling of the park's organic waste by composting and its sale as fertilizer (minimize plastics and other inorganic wastes to reduce costs of park trash collection);

* Sale of limited permits in the park for gathering of medicinal and herbal plants;

* Fund-raising programs such as films and parksponsored nature seminars;

* Assessments for backcountry camping;

* Assessments for weekend outings for Salvadoran youth;

* Sale of park T-shirts and caps;

* Creation of "Friends of Deininger Park" program to raise donations from domestic and foreign supporters;

* Rental of park's horses for public use on weekends; and

* Assessments levied on park concessions and the naturalist guide program.

3. Supplementary income for local residents. Eco-tourism at Deininger park will enhance the economic well-being of the communities surrounding the park and alleviate ecological pressure on natural resources by offering employment options to subsistence agriculture (and

sanctioned extraction of such park resources as iguanas, dead and down wood, and managed wood-cutting lots). Examples of economic options created by eco-tourism include:

* Privately-operated parking lots for park visitors (inadequate space exists at park headquarters to facilitate many vehicles);

* Privately-operated campgrounds (owned by local residents or acquired by ***FUTECMA***) adjacent to park headquarters (inadequate space exists at park headquarters for an adequate intensive-use campground);

* Privately-operated food concession at park;

* Privately-operated arts and crafts concession at park and the supporting local arts and crafts industry;

* Privately-operated commercial nurseries to provide decorative plants to tourists;

* Naturalist guide services; and

* Increases in permanent and temporary employment at the park due to expanded eco-tourism.

Public Support.

A successful eco-tourism program in Deininger Park will require additional, and opposing, efforts from park management. Specifically, park management will have to expend resources to attract visitors. At the same time, park management will have to manage visitor numbers to protect the ecological and aesthetic integrity of the park; it will have to take appropriate steps to ensure that the park's human carrying capacity is not exceeded. Accordingly, two courses of action will be taken to satisfy the conflicting demands of increasing visitation and preserving the park's ecological and aesthetic quality for future generations.

1. Media collaboration. To sell its eco-tourism program to Salvadoran and international clientele, park management will collaborate with media and advertising sources at home and abroad.

* Domestically, park management will utilize the printed press and press releases to announce the opening of the park to the general public. In addition, park management will maintain the park's public exposure by seeking television and radio coverage of park activities and by publishing articles on the park in various national publications.

* Internationally, park management will encourage reporting of the park in various environmental and conservation magazines. In addition, park management will cooperate with the National Park Service in the creation of an internationally-advertised, eco-tourism package with

Deininger Park as the anchor park (by virtue of its proximity to San Salvador) and El Imposible, Cerro Verde, Montecristo and Barra de Santiago as supporting parks.

2. Carrying capacity studies. To protect the park from physical and aesthetic degradation by excessive numbers of visitors, park management will:

* Set initial boundaries for carrying capacity based on theoretical and best-estimation techniques;

* Establish criteria and standards for maximum acceptable visitor impacts on the park's natural and aesthetic resources;

* Monitor visitor use and set a final carrying capacity based on attaining but not exceeding maximum acceptable visitor impacts.

EXPECTED BENEFITS OF THE GENERAL MANAGEMENT PLAN

Implementation of the Deininger Park General Management Plan will yield environmental, social and economic, and institutional benefits to the park and its watershed, the people and communities surrounding the park's boundary, and the managing (***ISTU***) and technical (***FUTECMA***) agencies that oversee the protection and restoration of the park's ecosystem.

Environmental Benefits.

The General Management Plan will stabilize and improve natural resource conditions in the park and within the park's surrounding watershed. Specifically, the expected benefits of the plan will include the following:

1. Greater boundary security and enhanced ability to stem wildlife poaching, cattle trespass, and unauthorized wood-cutting;

2. More effective measures to suppress and fight human-caused fires within and outside of the park's perimeter fence;

3. Accelerated reforestation of the park and surrounding lands, enhancement of forest diversity and species richness, and more approximate restoration of pre-Columbian forest communities;

4. Greater protection for indigenous park wildlife and recovery of targeted populations of endangered species; 5. Reintroduction of selected extinct species into the park's ecosystem;

6. Amelioration of the park's watershed through management and support of sustainable farming practices in adjacent communities;

7. Expansion of scientific research in the park and advancement of landscape interpretation and recovery technologies; and

8. Development of education programs to foster local understanding of protected areas and to encourage the rise of national environmental consciousness.

Social and Economic Benefits.

The General Management Plan will contribute to the social and economic well-being of surrounding farms, communities and cooperatives. Specifically, the plan will contribute to higher and more sustainable standard of living in the Deininger Park watershed by:

1. Improving communications between the park and its neighbors and enhancing cooperative relations between the two;

2. Enriching and expanding economic opportunities for local workers, particularly in occupational areas that have minimal impact on natural resource conservation;

and~. Encouraging and fostering sustainable land-use practices both within and outside of the boundaries of DEININGER NATIONAL PARK.

Institutional Benefits.

The management plan will contribute to the institutional well-being of both ***ISTU*** and ***FUTECMA***. Specifically, the plan will:

1. Establish job criteria and training programs that will raise the professional skills and knowledge of park employees and technical support staff at ***ISTU*** and ***FUTECMA***;

2. Facilitate and enhance the working relationship between ***ISTU*** and ***FUTECMA***;

3. Encourage closer cooperation between park management and natural resource protection agencies such as the National Park Service and various international environmental organizations; and

4. Attract and secure funding levels that will enable park management to implement the general plan and to achieve the goals of protection and restoration of DEININGER NATIONAL PARK.

RECOMMENDATIONS FOR PLAN IMPLEMENTATION AND FOLLOW UP BY VOCA AND U.S. SUPPORT GROUPS

Strong institutional support from ***ISTU*** and ***FUTECMA*** is necessary if the General Management Plan for **DEININGER NATIONAL PARK** is to succeed. Beyond the efforts of ***ISTU*** and ***FUTECMA***, however, actions can and should be taken by VOCA and U.S. support - groups to foster and encourage plan implementation and follow-up.

These actions are:

1. Active role by VOCA volunteers in the development, and subsequent follow-up, of issue-specific implementation plans for **DEININGER NATIONAL PARK**. Work on implementation plans should begin within 3 to 6 months of completion of the General Management Plan. This action is essential if the broad outlines of the General Management Plan are to be successfully translated into on-the-ground projects;

2. Assist inquiry into U.S. National Park Service training programs for ***ISTU*** and ***FUTECMA*** technical support staff and availability of USAID training assistance funds;

3. Help initiate request for two peace corps volunteers for the Walter Thilo National Park;

4. Apply to VOCA for a U.S. National Park Service volunteer to coordinate training of park rangers at Deininger Park;

5. Determine availability of U.S. funding assistance for park protection and restoration, community development and sustainable agriculture programs; and

6. Determine availability of funding assistance from U.S. private foundations and environmental organizations for park protection and restoration, community development and sustainable agriculture programs.

CONSULTATIONS IN THE PREPARATION OF THE PLAN

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Rodolfo Huezo

Ing.Carlos Alberto Escobar F.

Arq. Carlos Ramón Zelaya Lopez, Jefe

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APPENDIX A

LISTA PRELIMINAR DE ESPECIES VEGETALES
EN EL PARQUE NACIONAL WALTER THILO DEININGER

1-Cordoncillo	*Piper tuberculatum*
2-Ujushte	*Brosimun costaricanum;*
3-Palo de hule	*Castilla elastica*
4-Guarumo	*Cecropia peltata*
5-Mora	*Chlorophora tinctorea*
6-Amate	*Ficus glabrata*
7-Amate negro	*Ficus godmanii*
8-Capulamate	*Ficus ovalis*
9-Mulato	*Triplaris melanodendrum*
10-Jocote de Danta	*Hyperbaena mexicana*
11-Roble	*Licania arborea*
12-Iscanal(Espinas negras)	*Acacia cornigera*
(Espinas blancas)	*Acacia cornigera*
13-Conacaste blanco	*Albizzia caribaea*

14-Cenicero	*Albizzia guachapele*
15-Conacaste negro	*Enterolobium cyclocarpum*
16-Quebracho	*Lysiloma* sp.
17-Mangollano	*Pithecellobium dulce*
18-Zorra,Carreto	*Pithecellobium saman*
19-Pie de venado	*Bauhinia ungulata*
20-Carao,Carago	*Cassia grandis*
21-Copinol	*Hymenaea courbaril*
22-Memble	*Poeppigia procera*
23-Almendro Macho	*Andira inermis*
24-Guachipilin	*Diphysa robinoides*
25-Pito,Teité	*Erythrina berteroana*
26-Madrecacao	*Gliricidia sepium*
27-Cincho	*Lonchocarpus* sp.
28-Jiote	*Bursera simauruba*
29-Cedro	*Cedrela mexicana*
30-Caoba	*Swietenia humilis*
31-Tempate	*Jatropha curcas*

32-Tambor	*Omphalea oleifera*
33-Chilamate	*Sapium*
34-Ron-Ron	*Astronium graveolens*
35-Jocote Jobo	*Spondias mombim*
36-Jocote pitarrillo	*Spondias purpurea*
37-Pacun	*Sapindus saponaria*
38-Guacito	*Thovinia velutina*
39-Zorrillo	*Thovinidium decandrum*
40-Huilihuiste	*Karwinskia caldenonii*
41-Capulin	*Muntingia calabura*
42-Peine de mico	*Apeiba tibourbou*
43-Bonete	*Luehea candida*
44-Pochote,Cerbillo	*Ceiba aesculifolia*
45-Ceiba	*Ceiba pentandra*
46-Caulote	*Guazuma ulmifolia*
47-Castaño	*Sterculia apetala*
48-Lengua de Vaca Malcajaco	*Curatella americana*

49-Achote	*Bixa orellana*
50-Tecomasuche	*Cochlospermum vitifolium*
51-Volador	*Terminalia oblonga*
52-Flor Blanca	*Plumeria rubra*
53-Cojón,Cojón de Puerco	*Stemadenia* sp.
54-Chilindrón	*Thevetia* sp.
55-Siete pellejos	*Ipomoea* sp.
56-Laurel	*Cordia alliodora*
57-Tihuilote	*Cordia dentata*
58-Cortez amarillo	*Tabebuia chrysanta*
59-Cortez	*Tabebuia palmeri*
60-Maquilishuat	*Tabebuia pentaphylla*
61-Salámo	*Calycophyllum candidissimun*
62-Irayol	*Genipa americana*
63-Quina	*Exostema caribbaeum*

APPENDIX B

LISTA PRELIMINAR DE AVES
EN EL PARQUE NACIONAL WALTER THILO DEININGER

1-Zope Zopilote	*Coragyps atratus*
2-Chachalaca	*Ortalis vetula leucogastra*
3-Paloma de ala blanca	*Zenaida asiatica asiatica*
4-Torogoz	*Eumota superciliosa*
5-Cheje	*Melanerpes aurifrons*
6-Tortolita	*Scardafella inca*
7-Paloma común Paloma de Frente blanca	*Leptotila varreaxi banosi*
8-Perico Verde	*Aratinga holochlora stranue*
9-Pijuyo	*Crotophaga sulcirostris*
10-Aurora	*Glaucidium brasilianum ridgwayi*
11-Tecolote Lechuza común	*Tito alba guatemalae*
12-Búho nocturno de tejas	*Chordeiles acutipennis texensis*
13-Colibri	*Hylocharis*

14-Chio,Biente-veo	*Pitangus sulphuratus*
15-Golondrina urbana	*Progna c. chalybea*
16-Chara	*Cissilopha melanocyanea*
17-Urraca	*Calocitta formosa pompata*
18-Chonte común	*Turdus g. grayi*
19-Tordo cantor	*Dives dives*
20-Clarinero	*Cassidix mexicanus mexicanus*

APPENDIX C

LISTA PRELIMINAR DE MAMIFEROS
EN EL PARQUE NACIONAL WALTER THILO DEININGER

1-Tacuazin	*Didelphis marsupialis*
2-Conejo	*Sylvilagus floridamus*
3-Ardilla	*Sciurus variegatoides*
4-Tepescuintle	*Cuniculus paca*
5-Cotuza	*Dasyprocta punctata*
6-Mapache	*Procion lotor*
7-Pezote	*Nasua narica*
8-Venado	*Odocoileus virginianus*
9-Cusuco	*Dasypus novencinctus*
10-Ratón	*Liomys salvini*
11-Taltuza	*Orthogromys grandis*
12-Murciélago	*Carolia* sp.

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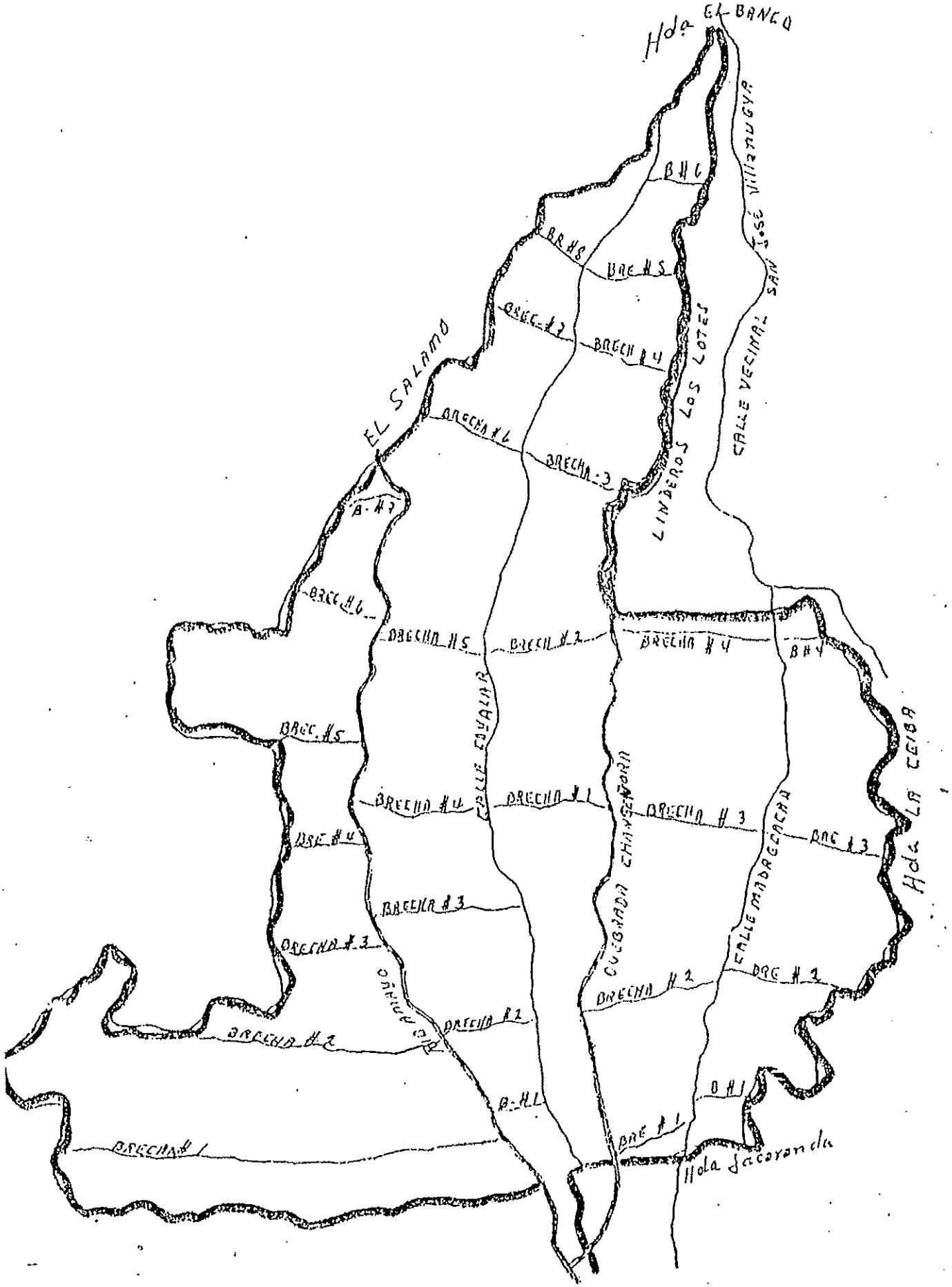
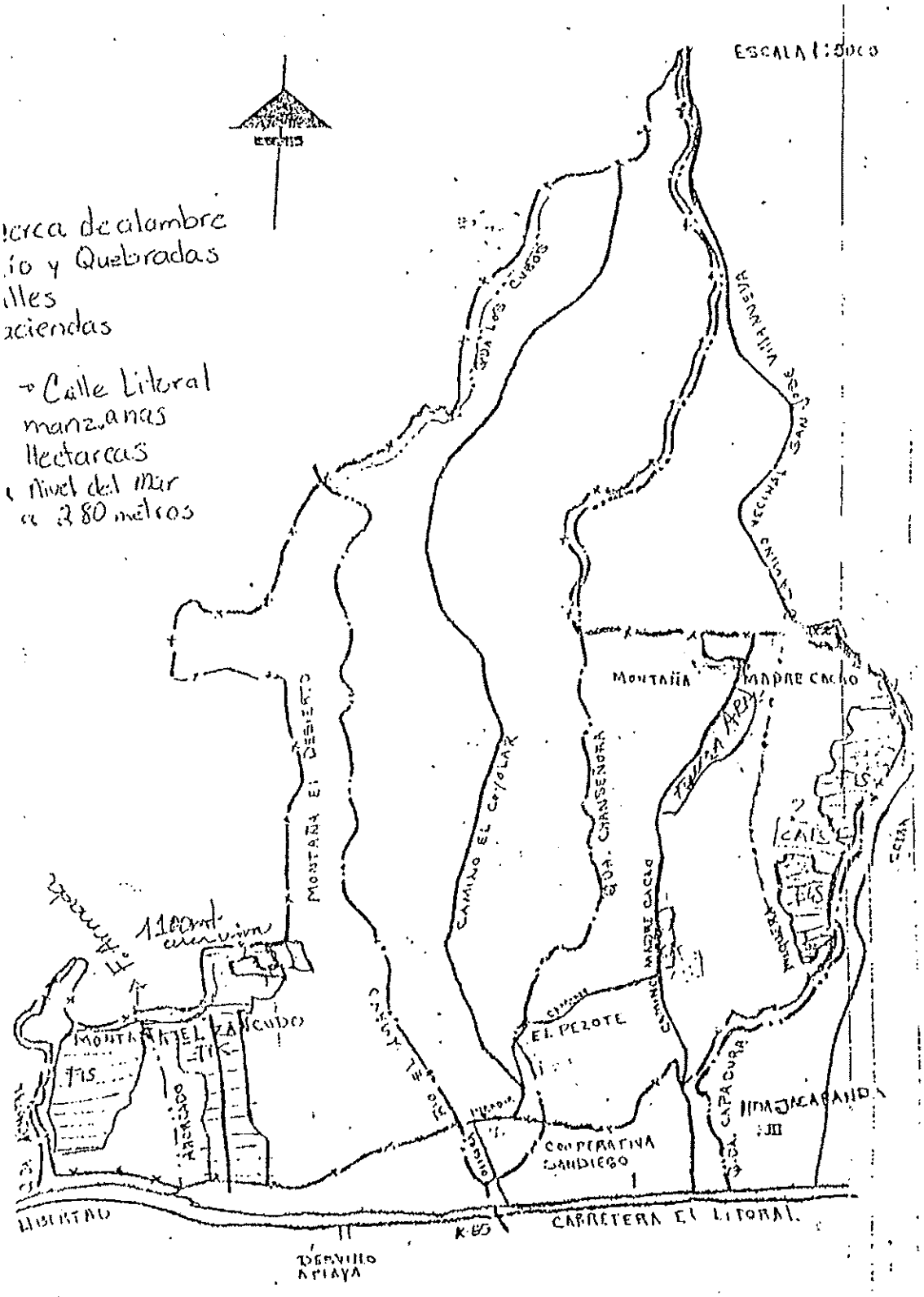


ESQUEMA DEL PARQUE DEININGER - 1047 MANZ.

PARQUE NACIONAL "WALTER T. DEININGER"



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MAPA TOPOGRAFICO DEL PARQUE NACIONAL "WALTER IRIBO DEININGER

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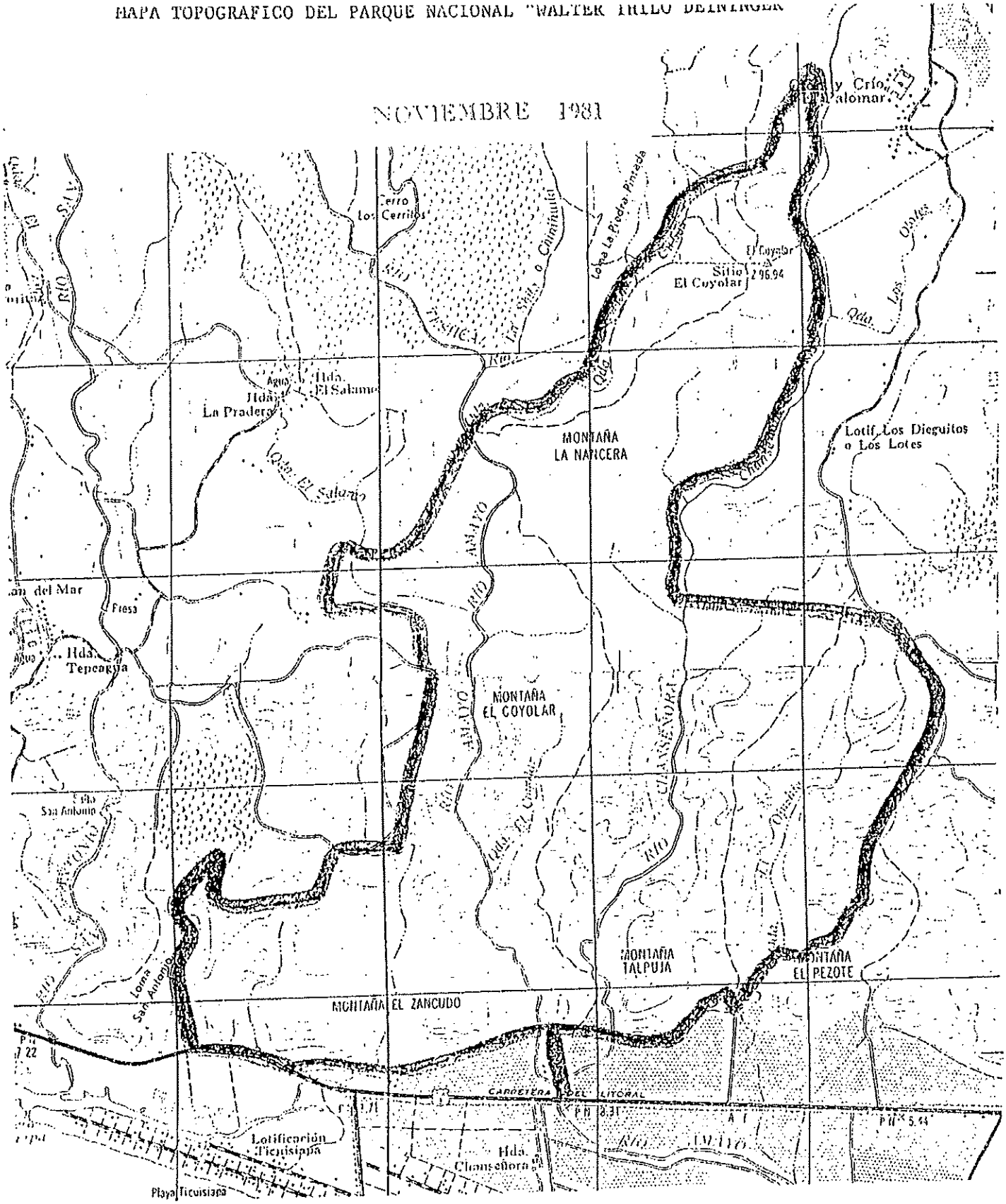

JOSÉ VILLANUEVA, EL SALVADOR

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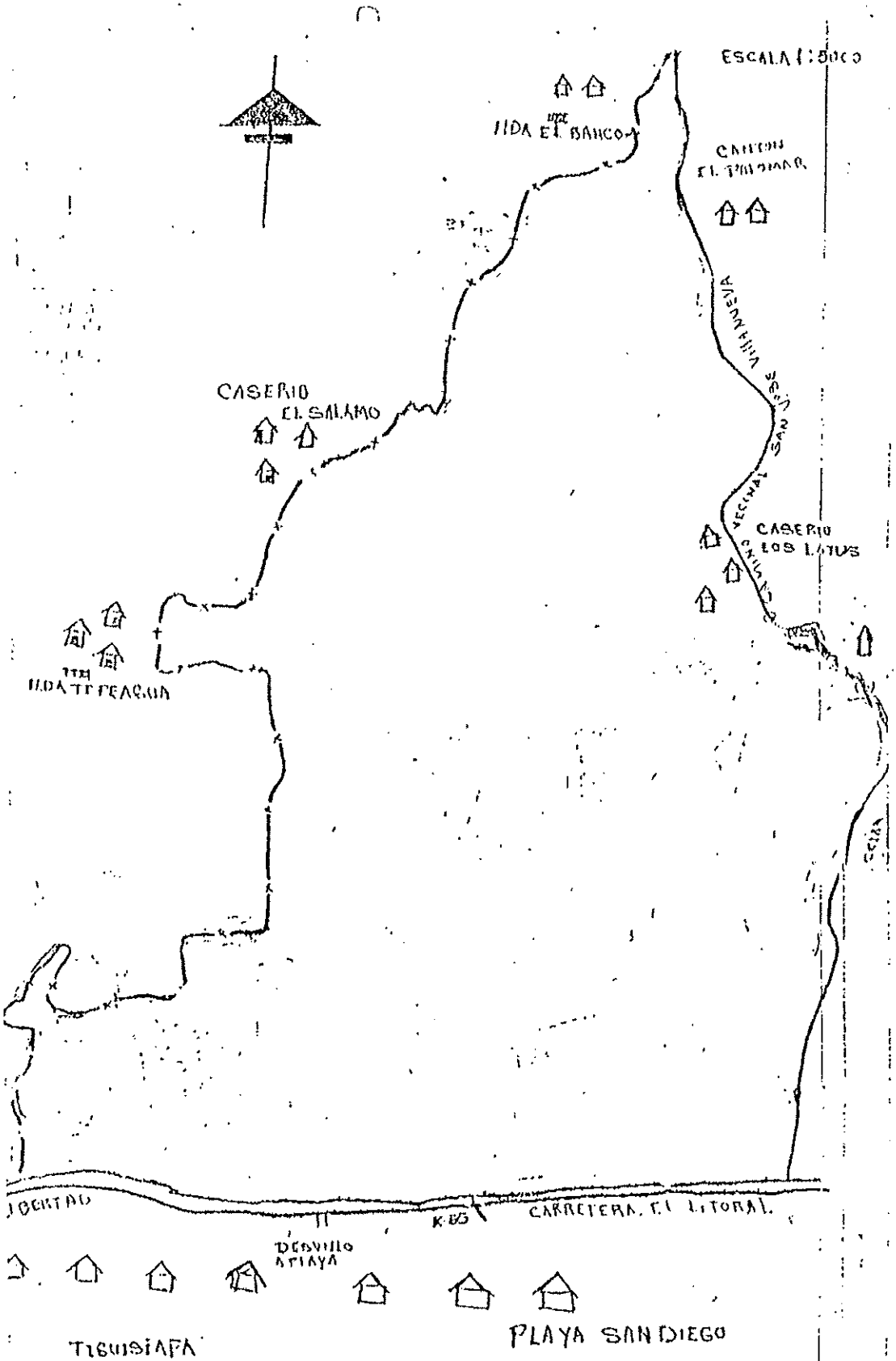

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