1999

An interpretive trail in Amazonian Ecuador

Bruce Evan Farnsworth

AN INTERPRETIVE TRAIL IN AMAZONIAN ECUADOR

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in

Education: Environmental Education Option

---

by

Bruce Evan Farnsworth

September 1999

AN INTERPRETIVE TRAIL IN AMAZONIAN ECUADOR

A Project

Presented to the

Faculty of

California State University,

San Bernardino

---

by

Bruce Evan Farnsworth

September 1999

Approved by:

[redacted]

Dr. Darleen Stoner, First Reader

July 28, 1999

Date

[redacted]

Dr. Gary Negin, Second Reader

ABSTRACT

Conceptual and physical development of an interpretive trail and visitor guide in Amazonian Ecuador, emphasizing the multiple values of the region's native flora, is addressed. The project demonstrates concern for environmental pressures, local educational needs and the potential role of small wilderness parks in terms of the promotion of local resource awareness, sustainable forest management and community image in the region. The project design includes an overview of the conceptual and physical development of a self-guided trail with accompanying visitor guide. The author suggests that interpreters go beyond simple information in Amazonian Ecuador, and share timely topics in a culturally appropriate manner. Discussion topics include personal reflections on the interpretation of indigenous knowledge and the differing interpretive environments of the United States and Ecuador. References are drawn primarily from work referring to the country of Ecuador.

ACKNOWLEDGEMENTS

The author is especially grateful to Angel Alvarado, lowland Quichua and Director of the Center for the Conservation of Amazonian Plants near Tena. During the project he provided a welcome lowland Quichua perspective, new plants and technical advice for the trail, and review of the draft trail guide. The author is grateful to the maintenance staff of Parque Amazónico with whom he worked (Luis, Leonel, Franklin, and Edgar) and the students of Colegio Domingo Savio in Tena who helped in the construction of the self-guided trail.

DEDICATION

To Dad

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

People have been attracted to nature and botanical displays for centuries. The gardens of the ancient Egyptian nobility, the walled gardens of Persian settlements in Mesopotamia, and the gardens of merchants in medieval Chinese cities indicate that early urban societies invested considerable effort in maintaining contact with nature and botanical displays (Hongxun, 1982; Shepard, 1967). Over the last two centuries, the idea that exposure to nature promotes psychological well-being, reduces urban stress, and improves physical health has been instrumental in the establishment of parks and other nature sites in cities and the preservation of public wilderness areas in many countries (Parson, 1991; Ulrich, Dimberg & Driver, 1991).

World concern for the destruction of natural areas, especially in tropical countries such as Ecuador, has generated a great interest in the conservation of biological diversity, also known as biodiversity. EcoCiencia (1994, p. 5) defines biodiversity as the "variety of ecosystems, species and genetic resources that exist in a specific place, and is complemented with cultural and ethnic diversity, which is demonstrated by a great quantity of languages, customs, ways of relating with nature and traditional land management practices."

Padua and Jacobson (1993, p.30) developed rural environmental education in Amazonian Brazil and described the critical "two-fold" need for conservation education and efforts such as the present project in Amazonia, writing "First, because of the rapid rate of deforestation, time is running short for educators to contribute to the protection of

the planet's natural diversity; second, funding for education programs is limited, particularly in developing countries, where, ironically, the biodiversity is so rich."

In keeping with this urgency, this project targets a small 50-acre community wilderness park in rural Amazonia. The Center for the Interpretation of Amazonian Ecuador (CIPAE) was established as a urban refuge and education center. The site offers an important community resource of unrealized potential. Professionally planned and executed, the self-guided interpretive trail described in this paper is now increasing resource awareness in park visitors and improving both park and community identity.

Our Tropical Garden is a self-guided botanical trail and accompanying visitor guide that the author conceived, wrote and constructed for this project (English and Spanish editions of the guide are found in Appendix B of this report). The subject matter is the native plant diversity of the upper Napo River region of Ecuador, a recognized world hotspot of biological diversity. As its underlying theme, this trail promotes the native flora of the upper Napo river region as both a global and community resource which provides ecological, economic, medicinal and aesthetic benefits to the region and the world. Berkmuller (1981, p.27) affirmed the importance of value systems in teaching resource appreciation, stating "Education about the rain forest attempts to influence personal and societal value systems by promoting the values which are compatible with the continued existence of the rain forest."

Perhaps most significantly, this project is designed in close coordination with Ecuadorians, using culturally appropriate methods to improve resource awareness among the park's visitors. According to Ecuador's leading biological research organization,

EcoCiencia, "Only through education and visits to natural areas will we value the fact that, despite being one of the smallest countries on our continent, Ecuador possesses one of the greatest diversities of animals and plants of the world" (1994, p.13).

Site of the Center for the Interpretation of Amazonian Ecuador (CIPAE)

The project area is located in a biologically diverse transition zone between western Amazonia and eastern Andean foothills. The author worked under the auspices of the municipal government of Tena (pronounced "tey-naw"), capital city of Ecuador's Napo province. Tena is the capital city and a major district of Ecuador's Napo province. Maps showing the position of Ecuador in South America, and the location of Tena at the western limits of Amazonia, are included in Appendix A. The Napo River, which originates close to Tena, is a major tributary of the Amazon River and joins it 530 miles downstream from Tena.

The entire province, stretching some 350 kilometers from the crest of the eastern range of the Andes to the Peruvian border, occupies the greater part of Amazonian Ecuador. Within the Tena jurisdiction, an area of 5,184 square kilometers, reside about 50,000 inhabitants, of which 60 percent live in rural areas. Over 60 percent of the population are indigenous lowland Quichua, the largest ethnic group in Ecuador, who live primarily in rural and forested communities outside the Tena city limits (Shiguango, S., personal communication, Tena, February 10, 1999). The remaining population are mostly colonists. Together, these two groups form the local audience of this project.

This project represents the first interpretive facility and publication of the Center for the Interpretation of Amazonian Ecuador (CIPAE). The Center is actually located in

Parque Amazonico, a progressive community-development project conceived by the city of Tena and built in 1992. Situated on a peninsula at the junction of the Tena and Pano rivers, CIPAE is isolated by water from the city center. Accessed by a suspension bridge over the Pano River, twenty-two of the park's 50 acreas are developed and open to the public. Park infrastructure includes a network of walking trails, a botanical garden, a nursery, a small zoological park, five artificial lagoons, a 20 meter lookout tower, reception and conference buildings, two shoreline swimming and diving areas, and a picnic area. The park was originally designed by a landscape architect associated with the Missouri Botanical Gardens (USA) and features the traditional architectural motif and materials used by the indigenous lowland Quichua of Amazonian Ecuador.

The most popular and widely known features of the park are the zoo and the botanical garden. The park is lushly vegetated. Approximately 40% of the parkland is occupied by secondary forest. The diverse vegetation is dominated by plants and shrubs from the families Fabaceae, Moraceae, Verbenaceae, Euphorbiaceae and Araceae. Soils are red, yellow and gray clays with alluvial soils along the riverine terraces (Paz y Miño & Farnsworth, 1997).

The project region corresponds with Very Moist Tropical Forest in the Holdridge life zone system. The common phrase "rain forest" is used in this report, with the understanding that it is synonymous with very moist tropical forest receiving over 100 inches of precipitation annually (Berkmuller, 1984). Incidentally, tropical *dry* forest does exist on Ecuador's west coast. Annual precipitation in the project area is 160 inches, with over 200 days of annual precipitation (Jatun Sacha, 1991). The high humidity is

attributed to the presence of Andean foothills that block the flow of saturated air masses moving west across the Amazon, forming clouds and blocking solar radiation. August and December are the dry months, while April and June are the wettest (Jatun Sacha, 1992).

In terms of landscape architecture, CIPAE is wonderful. However, since the site's opening in 1992, the park had been managed only as green space for local residents and the occasional tourist. The park had no mission, no goals or objectives, no educational programs or facilities and no promotion.

In August of 1996, the mayor acquired a management team of three who would plan the conversion of the park to CIPAE. The author joined two Ecuadorian biologists, assigned as park director and coordinator of environmental education. This author served as the coordinator of environmental interpretation. The planning team quickly established a mission and a goals statement for the Center. While the Center clearly needed a master interpretive plan, the decision was made by the team that some form of interpretive infrastructure and publication was needed first in order to meet visitor needs and promote the park outside Tena. Those discussions were the genesis of this project.

CIPAE Mission Statement

The mission of the Center for the Interpretation of Amazonian Ecuador (CIPAE) is to create a unique educational environment in which the people of the Napo region can share with the world the region's great natural, cultural and recreational values.

CIPAE Goals

- To establish CIPAE as a center of environmental education and environmental and cultural interpretation of wet tropical rain forest (see Definitions of Terms, p. 44)
- To preserve and protect park resources while fully exploiting the park's recreational opportunities with minimum environmental impact.
- To create a leading educational institution which utilizes effective teaching strategies and cultural activities, to strengthen the interest of the people of Napo in the park.
- To convert CIPAE into a symbol of Tena and establish a model of ecotourism for Amazonian Ecuador (see definition of "ecotourism", p. 31).
- To provide opportunities for Ecuadorians to contribute to the educational objectives of the park as volunteers and through volunteer and student projects.
- To stimulate pride in Ecuadorians for their natural heritage and emphasize the need to be conscientious owners of their local natural communities.

STATEMENT OF NEED

Based on an investigation of the literature and this author's personal contacts in Ecuador, several pre-existing problems were identified which justify the current project. Issues presented here include environmental impacts; Ecuadorian government participation in conservation; the need for local partners in interpretation, the need for interpretive training, infrastructure, and educational materials in parks. The studies presented in this section, many of them Ecuadorian, testify to the status of the environment in Ecuador and the relative infancy of conservation education in the country.

Environmental Impacts: Amazonia in Peril

Ecuador's diverse flora is also among the most threatened floras in the world. Ecuador has one of the highest rates of deforestation worldwide, estimated at over 840,000 acres, or 2.3%, annually. Reforestation is attempted at a rate of only 1 hectare (2.477 acres) for every 15 to 20 hectares destroyed (Luzuriaga's study as cited in Buitron, 1999). Ecuador is the most densely populated country in South America (44.7 persons per square kilometer), with one of the highest growth rates at 1.93% annually (Ecuador on the World Wide Web (www), 1999). With its high biological diversity, rate of habitat loss and population dynamics, Ecuador is among the most critical areas in the world for conservation and environmental education.

The Tena region was first contacted when Spanish conquistador, Captain Juan Velasco, visited the area in 1579. However, not until the early 1960's did migration occur to the area, mostly from the Sierra and coast of Ecuador. The massive colonization was spontaneous, unplanned and without government control. Economic factors, such as

the buy-out of small Sierran farms by single landholders, and agricultural downturns due to drought in the highlands also induced immigration. Epic colonization began in the 1970s, with the discovery and exploitation of oil in the Pastaza, Sucumbios and eastern Napo regions. The expanded job frontier led to massive highway construction and impromptu patterns of civilization which, without any zonification, took place in areas incompatible with existing soil conditions, biodiversity and traditional indigenous ways of life. The national government promoted large scale deforestation with the 1978 Ley de Colonización de la Region Amazónica (Law for the Settlement of the Amazon) which provided land titles to public forest to any colonist who could show agricultural and/or cattle production on these lands (Davis, 1993; Hicks, et al., 1990). In 1962, there were 73,900 inhabitants of Amazonian Ecuador, most of them indigenous people. By 1974, there were 173,500 residents, and by 1982, there were 263,800 people – an increase of more than 250 percent in only 20 years (Davis, 1993).

Timber extraction accelerated at the pace of colonization. It has been estimated that between 400 and 2,400 acres of rainforest may be cleared for every two to twelve kilometers of new road constructed in Amazonia (McColm, 1993).

Since its colonial period, the history of Ecuador has been characterized by the exploitation of natural resources for foreign markets, now primarily oil and timber. The result has been a decrease in the country's natural forest cover with little improvement in social and economic conditions. Ecuador has assigned higher priority to certain forms of production which at first glance appear more profitable, while not attributing to those resources their fair and corresponding values. Rural tree cutters are often paid no more

than the equivalent of five dollars for rare hardwood trees whose raw timber value on the world market may exceed $500, as in the case of copal trees (*Dacryodes cupularis*) cut north of Tena (Davis, 1993).

Timber extraction has only been government-regulated since the early 1980s, and the permit and reforestation system is plagued with corruption. Also, for every truck hauling illegal timber which is apprehended at police and military checkpoints, many more trucks pass through with restricted species hidden under legally harvestable species (personal communication, Anonymous, March 2, 1999).

Environmental impacts in Ecuador are many. Colonization, expansion of the agricultural frontier and the shrimp industry (mangrove swamp loss), mining exploration and extraction, industrial development, over-fishing, and air, land and water pollution are the principal impacts to the Ecuadorian environment (EcoCiencia, 1994; Hicks, et al., 1990). More forests are cut to create new farming lands and replace those that were abandoned for loss of nutrients. Low soil fertility combined with the lack of agricultural technology in the face of continued timber extraction and petroleum activity are the principal causes of forest loss in Amazonian Ecuador.

Certain national parks and nature reserves, such as the Cuyabeno Wildlife Reserve and the Yasuní National Park & World Biosphere Reserve in Ecuador's Amazon basin, have been heavily impacted by petroleum exploration and extraction activities, clearing for non-native African oil palm (*Elaeis guineensis*), and other forms of land development contrary to their public mandates (Kimerling, 1989). Several sites in Amazonian Ecuador which would have been suitable for nature tourism have been ruined

by dynamite fishing, poaching and overhunting, and encroachment by forest squatters (Wilson & Laarman, 1988).

In the forests of Amazonia, such as the upper Napo valley region, have been seated native Quichua communities which have used the biological resources for their benefit for many generations. The Quichua, one of ten indigenous groups in Ecuador (Moya, 1997) and a major focus of this project, have traditionally lived by swidden polycrop (similar to rotating multiple crop) agriculture, subsisting on crops such as manioc, plantain, and native Chonta palm (genus *Bactris*) fruits for carbohydrates. Hunting and fishing, supplemented by the collection of invertebrates such as snails and grubs, provides protein (Kohn, 1991). The distribution of the major ethnic groups of Ecuador is illustrated in Appendix A.

Intense colonization has provoked not only the loss of biological diversity, but also the loss of traditional knowledge and the integration of Quichua into the modern market economy (Davis, 1993; Fundacion Jatun Sacha, 1992). Lowland Quichua are now producing coffee (*Coffea arabica*), cacoa palm fruit (*Theobroma* spp.), rice and corn, however problems due to infertile soils, lack of technical assistance and low local market prices have reduced income, and crop sales are increasingly supplemented with timber extraction. A culture crash of sorts has resulted, and many young Quichua in the upper Napo river region have more contact with the city, and less interest in the traditional use of plants and animals (personal communication, Alvarado, S., January 20, 1998; Davis, 1993). This project aims to promote traditional Quichua values among the young local Quichua who visit CIPAE, as well as with tourists.

Many anthropologists, sociologists and ethnobiologists affirm that modern societies no longer exist as part of nature, but more apart from nature, which is owed to a rapidly expanding global economy. Due to this expansion and the disturbance of natural environments, many species of plants and animals are in danger of extinction or have already gone extinct; equally, the societies and cultures which utilize this information (Oldfield & Alcorn, 1991).

History of Resource Conservation in Ecuador

Formal resource conservation is a relatively recent phenomenon in Ecuador. Much like the United States, the formation of the national park system in Ecuador seemed to herald the participation of the Ecuadorian government in conservation.

The 1981 Law of Forestry and Conservation of Natural Areas and Wildlife established the National Patrimony of Natural Areas and created the agency in charge, the Ecuadorian Institute for Natural Resources and Wildlife, known simply as INEFAN. This law established 18 different parks, reserves and recreation areas on 15% of Ecuador's national territory. The parks were essentially created on paper, and not until the early 1990s would management plans be written for most park units. Several plans have yet to be written and approved.

The following summary of conservation precedents in Ecuador is adapted from Davis (1993); MEC (Ecuador Ministry of Education), UNESCO (United Nations Environment) and EcoCiencia (1994) and Ecuador on the www (1999).

Ecuador participated in the Conference of Sustainable Development held in Brazil in 1992. At this "Earth Summit", Ecuador ratified the Biodiversity Convention, the

Climatic Changes Treaty, the Forest Declaration. Ecuador signed on to the principles of the Rio Declaration and the programs of Agenda 21. Agenda 21 requires that Ecuador implement an environmental plan of action by the year 2000 (Ecuador on the www, 1999).

In June 1994 (Executive Decree 1802), the Ecuadorian government established seventeen basic environmental policies and principles. These policies refer to subjects such as: "ethics, personal obligations, domestic and foreign relations, strategies, efforts to apply existing laws within the capabilities of the country, project approvals, impact assessment and mitigation, environmental problems and focus areas" (Ecuador on the www, 1999).

In 1996, the government of Ecuador created the Ministry of the Environment to "provide oversight on resource management, obtain funds, improve the institutional framework and legislation for conservation, and exercise leadership in government toward the protection of the Ecuador's natural resources "(Ecuador on the www, 1999).

Ecuador is a member of several international conservation assemblies, including the Global Environment Facility (GEF); the Commission on Sustainable Development, the International Union for Nature Conservancy (IUCN), the United Nations Program for the Environment, and the United Nations Program for Development, among others (Ecuador on the www, 1999).

Ecuador has signed the following international conservation conventions: Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES) of 1973; Convention on Wetlands of International Importance and Waterfowl

Habitat (RAMSAR) of 1971, the International Tropical Timber Agreement of 1983, and the Amazon Cooperation Treaty, among others (Ecuador on the www, 1999).

The Infancy of Environmental Education in Ecuador

The involvement of the Ecuadorian government in environmental education is recent and typified by a series of policy statements which are contradicted by destructive resource extraction activities and the lack of government funding. Private Ecuadorian organizations such as Fundación Jatun Sacha, Fundación Natura and EcoCiencia are the leaders in conservation and environmental education in Ecuador.

Fundación Natura (Nature Foundation) created the country's first environmental educational materials in 1984 and placed student and teacher manuals in grades 1-6. More than 1 million texts were produced for primary grades, and by 1988, over 34,000 teachers had received training workshops (MEC, et al., 1994).

EcoCiencia (Ecuadorian Foundation for Ecological Studies) is a private Ecuadorian conservation organization that works in the fields of investigation, education and communication related to conservation and biodiversity (MEC, et al, 1994). They have developed over a dozen different teaching kits in various themes, including tropical lowland rain forest, petroleum activity, and plant and wildlife of Ecuador. They are key players in management plans for protected areas, and projects for sustainable community development in buffer areas around designated reserves. Since 1990, they have maintained agreements with international organizations to implement training courses and seminars for Ecuadorian park staff and resource managers (MEC, et al., 1994).

In 1992, the Ecuadorian Ministry of Education and Culture created the Department of Environmental Education, and proposed to place offices in the 21 provinces of Ecuador, with the intention of integrating environmental education into all levels of the Ecuadorian school system. To date, the office is poorly funded, with typically only one or two employees occupying each provincial office. These staff are poorly trained in environmental issues and learning theory (MEC, et al, 1994).

The Ecuadorian Agenda of Education and Environmental Communication for Sustainable Development (MEC, et al., 1994), a planning document written by Ecuador's Ministries of Education and Agriculture and EcoCiencia, attributed the absence of environmental education in Ecuador's public schools to several factors, among them the following:

1. The poor capacity of national government and civilians to confront environmental problems and a chaotic legal and institutional framework to allow such action.
2. The absence of a national political emphasis on conservation and the exploitation of biological diversity.

MEC, et al. (1994) stated that there exist few individuals in Ecuador who are trained in learning theories, and who can conduct environmental education, realize systematic planning and programming of environmental education, or create texts and materials which meet scientific, conceptual, technical and aesthetic requirements.

Official Ecuadorian government sources interviewed in MEC (1991) indicated the following as the basic critical factors in poor national education:

1. Insufficient geographical coverage of educational services.

2. Low abilities of graduating students.
3. Poor training of teachers.
4. Deterioration and neglect of rural schools.
5. Inefficient administrative structure.

MEC, et al. (1994, p.76) noted additional problems that underlined the need to improve public education in Ecuador, among them:

1. Low capacity of the government to generate curriculum sets that respond to the expectations of a population differentiated by ethnicity, social class and geography.
2. The lack of attention to preschool education.
3. The irrelevance of material learned.
4. The lack of teaching resources.
5. Unstimulating learning environments in the classroom.

In MEC, et al. (1994), the Ecuadorian government recognized the training of environmental educators as a priority to respond to the immediate needs of environmental education and sustainable development. However, the report went on to clarify why the educational system lacked the appropriate resources, learning methodologie, skill development strategies for environmental education:

1. Environmental education materials are not outlined in plans and programs.
2. Lack of financial resources.
3. Few available specialized technicians.

4. Focus areas of curriculum are not adequate according to modern concepts of environmental education.

In MEC, et al. (1994, p.17), the Ministry of Education required the intensification of public education and information in environmental subjects through the use of "new technologies of communication and information." This provides further justification for the CIPAE project and the present interpretive trail project.

In 1995, as the Ministry of Education and Culture published their Policy Regulations for Environmental Education, Training and Communication (Ministerial Accord No. 2188, April 25, 1995), which authorized the infusion of environmental education into plans and programs, the private Fundación Natura began writing manuals for the infusion of environmental education into the subject areas of language, mathematics, social science, natural science, and arts (MEC, et al., 1994). The introduction of environmental content and activities in school curriculums by Fundación Natura was significant. As of 1993, about 40% of teachers were trained in this area (MEC, et al., 1994).

While the official programming of Ecuador's Ministry of Education is now contemplating the cross-curricular infusion of environmental education, those themes are not yet integrated into schools. Government educational efforts are characterized by a history of various policy statements with an absence of actual implementation. This is due largely to the lack of government funding and field activities. (MEC, et al., 1994). Despite improvements in the basic quality of education and retention, on average Ecuadorian students still drop out in their sixth year of school. This illiteracy further

limits access of Ecuadorians to science, technology and written information (MEC, et al., 1994). Refer to "Culturally Appropriate Interpretation (p. 39) for more on this topic.

In 1996, Ecuador's state-sponsored Central University opened the country's first university degree program in environmental education (several Ecuadorian biologists with management level positions in leading Ecuadorian conservation organizations have obtained advanced degrees in natural science or education at universities in the United States and Europe).

It is interesting to note that in 1998, Ecuador's Ministry of the Environment created a national directory of all the institutions operating in the country that maintained environmental offices. This list includes over 200 Ecuadorian foundations; 65 federations, unions and popular organizations; 46 international organizations; six organizations of the Catholic church; and four private companies – all dealing with the environment in some way (Ministerio de Medio Ambiente, 1998). The remarkable number of organizations working in the "environment" is misleading, and does not reflect a widespread conservation ethic. There are precious few dedicated to rural conservation issues in Amazonia apart from petroleum industry-related impacts. It is interesting to note that foundation, or non-profit status, is easy to obtain and offers both a significant tax shelter and access to international assistance funds.

The private Ecuadorian organizations Fundación Jatun Sacha, Fundación Natura, EcoCiencia, CIPAE, the Union International for the Conservation of Nature (UICN) and Traffic International continue to be among the most active in conducting important biological investigations, providing community environmental education in Amazonia.

They have been instrumental in helping to acquire and better manage areas of biological and cultural significance in Amazonian Ecuador.

Ecuador's National Parks Need Local Interpretive Partners

In the United States, national parks are well funded and able to maintain and protect their resources while also meeting educational and promotional objectives. However, many Ecuadorian parks lack clear-cut legislation or boundaries and suffer from a lack of funding, management plans, training and personnel. Such areas are under tremendous pressure from development, subsistence farming, extractive industries, and premature ecotourism ventures (Ham & Enriquez, 1987; Wilson & Laarman, 1988).

Wallace (1993) argued there is an urgent need for first-world management assistance to Latin American wildland stewards, in the areas of resource inventories and monitoring, visitor and concession management, and interpretation.

In their review of the national park service, Ham and Enriquez (1987) noted that there did not exist sufficient centers of information with scientific concepts or techniques of environmental education. They found that interpretive services were irregular and limited by the availability of trained personnel and economic resources. They also noted a general lack of equipment and basic self-guided services in most of the areas. Training needs in national park settings included outdoor signs, exhibits, and presentation methods.

Wilson and Laarman (1988), in a survey of ecotourism offerings in Ecuador, commented that infrastructure such as access roads, visitor centers and museums, and nature trails, etc. were largely missing at national parks and reserves. The national park

service has built interpretive centers on the coast (Galapagos, Machalilla), and in the Sierra (Cotopaxi, Cotocachi, El Boliche, etc.), yet only one small visitor center in Amazonia. CIPAE is one of three small interpretive parks in Amazonia, all of which are operated privately on minimal funding. They are CIPAE, OMAERE (an ethnobotanical park three hours south of Tena in Puyo, and FATIMA (a naturalistic zoo investigating the captive breeding of large native rodents as an alternative meat source).

Environmental education is virtually inaccessible to the inhabitants of Amazonian Ecuador. Public interpretive programs inside the national parks of Amazonian Ecuador do not exist and public schools (and their teachers) cannot afford educational field trips of this scae. A few private Ecuadorian conservation organizations have produced wonderful educational materials and have established outdoor education programs at several reserves, but most are located in the more populated north of Ecuador. Unique local and municipal ventures such as CIPAE, and the facilities of the Center for the Conservation of Amazonian Plants (CCAP) featured on p. 37 of the current report are the leading ventures working to build resource awareness in Amazonian Ecuador.

In the United States, most people have cars and enjoy good access to national parks. In the parks, visitors enjoy free programs supported by tax revenues. In Ecuador, access to the national parks of Amazonian Ecuador, such as the 2,426,489 acre Yasuní National Park & Biosphere Reserve and the 1,490,932 acre Cuyabeno Wildlife Reserve, is highly privatized. Except for a few huts in Cuyabeno and Limoncocha, the only legal public access to national park sites is through expensive, multi-day tour packages offered by private lodge concessions and these are orientated primarily to international tourists.

The interior of Yasuní is accessible only to petroleum workers, INEFAN employees, ethnic Quichua and Huaorani, and a few researchers. Ironically, while more people need to see the beauty and the impacts in Yasuní and Cuyabeno, such restricted access and isolation also protect undisturbed forests and indigenous people from the impacts of full-scale colonization and tourism development. Thus, CIPAE is an ideal site. The Center offers a quiet, semi-wilderness environment within easy access of a major Amazonian population center. The park grounds are spacious enough to accommodate visitation, yet localized enough to be manageable by its limited staff.

Typical "Jungle Lodge" Interpretation

It has been this author's experience as well as that of Wilson and Laarman (1988) that tourists at jungle sites in Amazonian Ecuador rarely receive a well-planned, holistic interpretive experience. Wilson and Laarman commented that many of these jungle hotels typically hire local indigenous guides to show and describe customs of the native people, including the use of plants and animals in daily life. This is good ecological tourism, as the indigenous guides make the resources interesting, have the opportunity to share their perspectives, and benefit from good jobs in the tourism economy. However, as Wilson and Laarman noted, these guides often know the indigenous names for species, but have little scientific knowledge of the local flora and fauna, and do not speak English. Tour operators sometimes attempt to compensate for this problem by sending bilingual guides to accompany the Quichua guides. Although this helps to address language barriers, these guides typically lack adequate training in biology and interpretive methods.

Need for Local Interpretive Publications

By far and away, the most common visitor comments received by park staff regarded the lack of information provided about the plants and animals found in CIPAE. Park visitors wanted reading material to take with them. The majority of visitors were first-timers and commented on the array of interesting trees, shrubs and ornamental plants accented by traditional Quichua plant-based architecture.

A small number of books describe the country's geography, indigenous communities, and aspects of natural history. However, many of these books are out of print, not available in languages other than Spanish, and not of suitable size and format for travelling tourists. While Spanish language plant books are sometimes available through a few special outlets, they are generally difficult to locate and obtain (Laarman & Wilson, 1988). These authors also noted that apart from the Galapagos cruises and a science center, few of the private operations which host nature tourists offer maps, bird lists, plant lists and identification references. This author noted that natural history brochures offered by area jungle lodges were too technical, boring and/or outdated.

The present trail guide is the first quality interpretive booklet dedicated to interpreting the multiple values of the flora of the upper Napo river region. It is designed for local and international visitors to be affordable, water-resistant, available in Spanish and English, and fit in a shirt pocket. CIPAE planned to produce a Quichua language edition of the trail guide.

Need for CIPAE Promotional Material

Ingram and Durst (1989) determined that image and marketing were the greatest challenges facing operators of nature-oriented tours in developing countries. In 1988, Wilson and Laarman noted that the country of Ecuador had little or no image in key world tourism markets. At that time, tourism was the third largest economy in the country, yet the national government spent only $45,000 to promote it. High-end jungle hotels of Amazonian Ecuador, where international tourists pay over $700 for a four-day package, have staff devoted to attracting visitors. On the other hand, the three-person management team of CIPAE handled the multiple responsibilities of maintenance, resource management, interpretation and promotion.

The park needed a publication that would serve as both an educational tool and a promotional piece. Minimally, the park had great potential as a weekend tourism destination for Ecuadorians, and as an orientation site for foreign tourists headed to jungle lodges, but it had no written material that could be carried off the site. At the same time, the municipal government, facing a budget crisis, had decided to begin weaning the park off city funds. The city of Tena would only pay staff salaries. The park would now have to cover all maintenance and park improvements from entry fees, souvenir sales and special event revenues. During the preparation of this report, the non-profit support organization Fundación Amazónico (FUNAMA) was formed to seek corporate sponsors for the park. The trail guide is being utilized as an attractive promotional piece].

SIGNIFICANCE OF THE PROJECT

The Importance of Tropical Rain Forests

Conservationists have focused increased attention on the tropical rain forests for two main reasons. First, although these habitats cover only 7% of the Earth's land surface, they contain more than half the species in the world. Secondly, rain forests are being destroyed so rapidly that most of them will disappear during the 21st century, taking with them hundreds of thousands of species into extinction (Myers, 1988; Wilson, 1988).

The Amazon basin contains by far the largest area of tropical forest in the world, covering 2.3 million square miles in nine different countries. Sixty-percent of the basin is in Brazil, and the rest is in French Guiana, Surinam, Guyana, Venezuela, Colombia, Ecuador , Peru and Bolivia (Collins, 1990).

In addition to sustaining native populations and providing a habitat for millions of plant and animal species, tropical forests supply many products that we take for granted. Timber, fruits, vegetables, spices, nuts, and medicines, as well as oils, latexes, waxes, rubber, fibers, resins, and other industrial goods are derived from tropical forests (Collins, 1990; Guía de Parques Nacionales, 1998; Neill, 1996; Peters, Gentry and Mendelsohn, 1989).

EcoCiencia (1994) stated that the biological and cultural diversity of Amazonia are essential to improve the production of foods and natural fibers, as raw materials for scientific and medical innovation, and to maintain options for the rational use of natural resources. To this end, the conservation of natural and cultural resources and the

diffusion of information regarding these ends is an essential element of any form of development which is environmentally sound and socially just (Ecociencia, 1994).

The Biodiversity of Ecuador

Ecuador, about the size of the state of Oregon, encompasses contrasting ecosystems as varied as any in the world. Twenty-five of the thirty tropical life zones in the Holdridge life zone system are represented in Ecuador (Neill, 1993). Ecuador's ecosystems range from the ice-covered slopes of the Antisana volcano (5,758 meters) to the high Andean grassland habitat of "paramo" (3,400-4,500 m) to orchid-rich cloud forests (2,500-3,400 m), lower montane forests (600-2,500 m) and finally to the wet tropical forests of lowland Amazonia occurring below 600 meters (Wesche, 1995).

Ecuador is a major center of biological diversity as demonstrated by EcoCiencia (1994), Myers (1984, 1988) and Neill (1996). Recent studies on the biodiversity of Ecuador are surprising and reveal that Ecuador has the greatest number of species per unit area of any nation in South America (EcoCiencia, 1994, INEFAN/GEF, 1998). Ecuador occupies only 0.2% of the earth's land area, yet is one of the richest half-dozen countries in the world in terms of biological diversity (Neill, 1996).

Marine currents and rain patterns have interacted with the extraordinary geography of Ecuador to create a multitude of microhabitats and niches. Prance (1985) and Vanzolini (1973) theorized that during Pleistocene glaciations, the world climate fluctuated from cool to warm, changing the distribution of vegetation. During this period, tropical forests persisted intact only in certain places called "refugia" where local climate variations maintained a warm humid climate suitable for rain forest. The Refugia

theory maintains that diversity thrived in isolated surviving forests. The upper Napo river basin is one of 20 such refugia indicated by independent studies of plant and animal diversity across the entire Amazon basin.

The flora of Ecuador contains between 20,000-25,000 species of vascular plants, which equals some 10% of the world's total (Neill, 1996). Ecuador is also the richest orchid nation in the world, with over 2,725 species (Guía de Parques Nacionales, 1998) or 11% of all known species. For comparison, the native flora of the continental United States includes about 16,500 species, in an area 33 times the size of Ecuador (Neill, 1991).

Vertebrate diversity in Ecuador is phenomenal: 706 species of fish, over 400 species of amphibians (fourth place in the world), approximately 400 species of reptiles (4% of the world total), 320 species of mammals (8% of the world total), and more than 1,550 species of birds (18% of the world total) (EcoCiencia, 1994; Guía de Parques Nacionales, 1998).

Every major botanical expedition in Ecuador leads to the discovery of at least one new species (personal communication, D. Neill, March 15, 1999). This author has been witness to the discovery of new species in the rainforests of Amazonian Ecuador. This sensation of discovery, realized through hands-on involvement with research in Amazonia, is a motivating force for scientists and interpretive specialists, and an exciting notion for visitors who know the regions great biodiversity. This author tried to design a self-guided trail and visitor guide which would elicit emotional responses from visitors and allow them to make personal discoveries.

Plant Diversity of the Upper Napo River Region

The forests of northwestern Amazonian Ecuador are one of ten world "hotspots" of biodiversity indicated by Myers (1984, 1988). Two other hotspots occur in Ecuador's northwestern coastal slope rainforests, and Ecuador's Cordillera ranges.

CIPAE is located in Ecuador's upper Napo river region within 20 kilometers of the Andes. At 500 meters of elevation, the Tena area lies in a transitional zone between the steeply cut foothills of the Andes and the central Amazonian basin. The scenery is punctuated by a north-to-south chain of three volcanoes: El Reventador (3,562 m), Pan de Azúcar (3,482 m), Sumaco (3,900 m) and the Galeras range (up to 1,1589 m). Within these features are a series of eroded foothills, each with their own micro-topographies of ridges and valleys (Fundacion Jatun Sacha, 1992). Such diversity of topography and habitat offers conditions amenable to a diverse flora.

The Missouri Botanical Garden began a botanical inventory of the upper Napo region in 1985 concentrating on four square kilometers of forest reserve at the Jatun Sacha Biological station. Botanists identified over 1,500 plant species, with the total flora estimated at about 2,000 species. A one-hectare plot identified nearly 250 tree species in one hectare (all specimens equal or greater than 10cm in diameter at breast height) (Neill, 1991; Neill and Palacios, 1989). Since 1986, over 50 new species of plants have been discovered (Neill, D., personal communication, March 18, 1999).

These results confirm those of Gentry (1988) in Peru who demonstrated that the rain forests of the upper Amazon basin are the most species-rich in the world. (Neill, 1991).

Lowland Quichua Plant Culture

The lowland Quichua people of Amazonian Ecuador are the largest of ten indigenous groups in Ecuador (Moya, 1997). Their traditional plant culture is a major interpretive focus of CIPAE and supports several themes within the present trail and guide project. The Quichua population of Amazonian Ecuador is approximately 60,000 distributed in Ecuador's Sucumbios, Napo and Pastaza provinces In the greater Tena area, the Quichua number more than 50% of the population. Censusing is difficult as most Quichua are distributed among more than one hundred rural and forest communities.

They are referred to in ethnographic literature as the Yumbos, Quijos Quichua, or lowland Quichua. It may be most appropriate to use the word Runa, meaning person, because this is how these people refer to themselves. (Kohn, 1991).

With their own world view and extensive knowledge of their local environment, Quichua live in a world rich with myths and legends. The forest is the center of their culture and depend on many plant resources for food, medicine, ceremony, building supplies, etc. (Kohn, 1991; Alvarardo, A., personal communication, January 8, 1997).

The native Quichua of the upper Napo river region have a rich tradition of ethnobotanical knowledge. Within communities of 100-200 individuals, Quichua medicinal practicioners know their clients personally and provide physiological and psychological therapy. (Alvarado and Harvey, 1994; Kohn, 1991). They maintain informal inventories of forest resources and local geographical features. Botanical knowledge is passed orally through generations and by experience. As children, Quichua

learn such details such as plant habitats, flowering and fruiting seasons, and the preparation and use of a wide variety of plants. While the actual plants used vary between communities and within families, it is well-documented that the lowland Quichua of Amazonian Ecuador utilize over 300 plants as medical and spiritual remedies (Alvarado. A.A., personal communication, September 5, 1996; Alvarado & Harvey, 1994; Kohn, 1991; Grefa, G., personal communication, October 8, 1997). Remedies may be ingested or the plants may be applied topically. The variety of preparations includes pastes, vapors, fluids, and complex multi-step processes (Alvarado & Harvey, 1994; Kohn, 1991; Shihuango, S., personal communication, October 8, 1997).

Kohn (1991) cautions against viewing the Quichua stereotypically as "keepers of an ancient medicinal plant knowledge." They are active experimenters who take advantage of their tremendous floristic resources and horticulture abilities to respond to health circumstances that change with increased contact with western societies. Extensive use of medicinal plants by the Quichua, Kohn suggested, may have originated as their adaptive response to epidemics introduced by conquistadors. Ecuador's lowland Quichua have always lived within reach of the Napo river, an historic route into the Amazon basin. This has made them susceptible to the diseases of white missionaries, merchants and explorers.

Modern cultures are fascinated with the work of the shaman. Ritualistic shamanism, utilizing plant preparations with hallucinogenic properties, is passed through generations and requires a rigorous initiation by practiced shamans. Herbalism, practiced by many individuals, and without hallucinogenic plants, is more commonly practiced.

The choice of medicinal plants by the lowland Quichua has both biological and morphological explanations. The use of a certain plant of the genus *Heliconia* based on its morphological characteristics is described in station four of the present trail guide (See Appendix B). The medical effectiveness of tradition remedies throughout Amazonia is a popular subject among those interested in rainforest conservation. Ethnobotanists are specialists who study the cultural use of plants, and in many cases their work has led to the production of modern medicines, perhaps the rainforest's most heralded value. Marles, Neill and Farnsworth (1988) conducted an ethnopharmacological study of the Quichua of the Napo province. They found that combined pharmacological and chemical information supported the effectiveness of 28% of the traditional uses for the plants collected. Calculating that the probability of correlation between any given plant and biological activity was 10%, this study found that the correlation between traditional Runa medicines and the supporting pharmacological and chemical literature was therefore two to three times higher than correlations due to chance alone. Despite the clear potential of developing modern medicines based on indigenous use, Farnsworth (1978), a noted pharmacologist, found that fewer than 1% of the plant extracts used in effective indigenous medicines worldwide have ever been subjected to pharmacological and chemical tests to determine the nature of their active components and their potential in modern medicines.

In preparing the themes and text for this project, the author consulted regularly with Mr. Angel Alvarado, a local Quichua and expert in Quichua medical plant use. The author took great pains to discuss cultural plant use with Quichua in a sensitive manner.

The discussion section of this paper includes this author's reflections on his integration with local Quichua and the observations of Nelson (1993), who lived with North American Eskimos and gained fascinating insights into American indigenous knowledge.

Popularity of Nature Tourism in Ecuador

Ecuador is a small but highly diverse nation that combines nature, culture and adventure. Ecuador is divided into four geographic regions: the Galapagos islands, the Pacific coast lowlands, the Sierra highlands, and the Amazon basin (known locally as the "Oriente" (pronounced or-ee-en-tay).

EcoCiencia (1994) determined that tourism was the fourth economy in the country following petroleum, banana production and coffee exports. Nature tourism is a major component of national tourism; however it is oriented primarily to tours of a few private reserves, jungle lodges and national parks, reserves and recreation areas.

Visitation to Ecuador's national parks, reserves and recreation areas has increased tremendously. In 1977, Cotopaxi National Park, in the Sierra, received 25,419 visitors and Galapagos National Park received 7,788. In 1995, those same parks received 59,654 and 55,786 visitors respectively (INEFAN, 1996).

Tourism in the upper Napo river region is very important to the region's economy. Tourism started here in the early 1970s when oil companies extended the highway from Tena to the nearby Napo river port town of Misahuallí (pronounced miss-ah-why-yee). On these shores sprung up the first jungle lodges and guide services. There has been an incredible expansion of tour enterprises since the late 1980s. Drumm (1991) found that 23,562 tourists visited the Oriente in 1990. Visitors to the upper Napo

river region stayed an average of three and a half days and spent an average of $225.00, not including international airfares and expenditures on tours is other regions of Ecuador. Almost one-half of all tourists were native English speakers.

A typical tour at an Amazon jungle lodge includes forest hikes and canoe excursions. The most expensive sites offer competent guides for bird watching, plant studies and nature photography. Other activities in the region include cave exploration and diving, kayaking and demonstrations of indigenous life-ways. Popular craft items include animal forms carved from "balsa" wood (*Ochroma lagopus*), pottery, articles woven from natural fibers and jewelry made from natural seeds and plant materials.

Ingram and Durst (1988) found that of the various nature-oriented activities promoted by tour operators in developing countries such as Ecuador, those promoted most often included wildlife viewing, hiking, bird watching, and botanical study. The present project capitalizes on tourist interest in plant study.

Ecotourism refers to progressive, educational travel which conserves the environment and benefits local communities (Drumm, 1991). CIPAE joins other responsibly operated site which meet the criteria of ecotourism as defined by Weshe (1991, p.11).

1. Ecotourism should promote positive environmental ethics. Nature is accepted on its own terms (biocentric) as opposed to something altered for convenience (homocentric).
2. First-hand experience of nature and wildlife is another essential element. Success is measured in terms of the educational value added to the experience.

3. Ecotourism must benefit the environment and local communities. Local residents are reminded of the heritage value of their area, and the community controls tourism in the area.

The Tena Movement: Creation of CIPAE

The story of CIPAE began in 1992 when the municipal government of Tena, led by current mayor Alex Hurtado Borbúa, proposed to implement projects in the areas of health and education. These projects included Parque Amazónico as well as a children's playground, an ecological club, and city-sponsored weekend wilderness trips for young people. Tena's youth programs earned the respect of the United Nations International Children's Education Fund (UNICEF) which now sponsors Tena as a model city for sustainable development in South America.

With a population of just over 50,000, the Tena district had no green space park for the passive recreational needs of adults and children. Mayor Hurtado envisioned converting a 50-acre semi-wilderness site on the edge of town into a combined park, education center and tourist destination. Design and construction funds soon came from the Institute for the Eco-Development of Amazonian Ecuador (ECORAE), an agency of Ecuador's Ministry of the Environment, Ecuador's Jatun Sacha Foundation, and other sources. Parque Amazónico was built on the site and opened in 1992.

But by mid-1996, the park director was not realizing the site's intended use, and the mayor acquired a team of three biologists in charge of administration, education and environmental interpretation. This author was in charge of environmental interpretation (See Definitions of Terms). Starting with a mission and goals statement, the team began

the conversion of Parque Amazónico into the Center for the Interpretation of Amazonian Ecuador (CIPAE). While a master interpretive plan to include a visitor center, guided programs and outdoor exhibits was clearly needed, the present project was undertaken as an emergency response to the sheer lack of interpretive infrastructure and resource-related publications at the park.

Today, the park is credited in part with having transformed Tena from a mere rest stop on the Quito-Puyo highway into a legitimate tourist destination. The park now offers visitors a beautiful sampling of local natural and cultural resources managed professionally for reflection, recreation and the formation of values compatible with their conservation.

Tena is arguably one of the best-planned and cleanest rural municipalities in Ecuador. This author truly sensed a unique community spirit in Tena and was proud to have improved educational and open space recreational opportunities for the residents.

Interpreting the "Essence of Amazonia"

The introduction to the visitor guide Our Tropical Garden (1998, p.1) starts "...in these vast treasure houses of life, plants provide countless life-forms with food, water and shelter....tropical vegetation is a global resource." New visitors to Amazonia are most fascinated by the luxuriant vegetation.

More than simply describing the ecological role of plants, this trail presents several miniature stories of interesting plants from Amazonian Ecuador. The text at each station is written in a way that elicits personal responses from readers. "Communicate the essence of the place..." is the recommendation of interpretive experts Beck and Cable

(1998, p. 138). Moving beyond the presentation of facts, the current trail guide creates personal connections between readers and local rainforest resources. The text at each station is designed to focus, explain and connect the theme to the reader as recommended by Ham (1992). Visitors realize how much of their common history and experience is linked to these plants. In deciding what to write about, author Kingsolver (as cited in Beck and Cable, 1998, p. 138) advised writers that "it's emotion, not event, that creates a dynamic response in the mind of the reader....the artist's job is to sink a taproot in the reader's brain that will grow downward and find a path into the readers soul and experience, so that some new emotional inflorescence will grow out of it."

Improving a Community Resource

This author has already stressed the need for local interpretive sites which accessible to rural Ecuadorians. This self-guided trail and visitor guide improved the park's local image as an educational site. Before the new CIPAE management team arrived, the local community always knew the park existed, but rarely visited. Now, park improvements and educational outreach to local schools have garnered interest. The park is also used to teach interpretation to national park service employees and tourism students at the local Ecological Institute of Tena.

Improvement of the CIPAE botanical garden through the present project meets the criteria of Roth and Lockwood (1979) for a well-designed community educaiton site:

1. The trail provides a stimulating set of learning environments to motivate interest of youth in local flora. The fascinating colors, forms and scents of native plants in the garden draw their interest.

2. The trail uses interest and concern of the near-at-hand to develop thought and consideration of the linkage between individual behavior and global resources. Captivating story-like illustrations enhance the interpretation.
3. The trail provides a site for practicing and implementing real skills to the benefit of the very community that is helping support the teaching of these skills. The trail is used as a resource for training national park service guards and students studying ecotourism who will work at area jungle lodges.
4. The trail involves more aspects of the local community in the education of its youth. Beyond the practical information for forest management presented in the guide, the trail is being used to build skills in diverse sectors of the community. Again, the trail is also used in new environmental interpretation coursework by students of Tena's Ecological Training Institute enrolled in the two year ecotourism degree program. The trail is used in technical training of national park service "rangers." High school students have volunteered in maintaining and interpreting the trail in fulfillment of their environmental project requirements. Teachers from the area have used the trail with their students, and have adapted parts of the trail guide for classroom activities.
5. The trail can multiply the learning experience by involving parents and other community members in a cooperative learning process. Families are a major user group in the park. Staff have observed how the interesting plant themes have generated discussions between parents and children on the trail.

Increased interest in the park has provided an incentive for the municipal government to continue funding staff salaries despite the country's current inflation and poor transfer of funds to municipal governments. CIPAE provides both a social and economic for the municipal government and the community to support the park.

Interpretation in Amazonia: Beyond Information to Solutions

The native plants of Amazonian Ecuador are appreciated by many. Those values may be realized in traditional Quichua fashion, or through the exploitative and non-sustainable extraction of forest resources. Studies indicate that some communities in Ecuador may depend upon up to 80% of a given forest's river, wildlife and plant resources for their daily survival (EcoCiencia, 1994). Today, in Latin America, where tremendous biodiversity is overlaid by great poverty, long term solutions require that we move away from the purist stance of classic conservation and focus more attention on the condition of the person or group (EcoCiencia, 1994; Padua & Jacobson, 1994).

Sharing New Information on Rain Forest Resource Use

The growing world preoccupation with the deforestation and degradation of the tropical rain forests has fed an important flow of human and financial resources to the search for models of sustainable development of these regions which harmonizes the objectives of conservation with the needs of the local communities. Faced with these circumstances, scientific investigations of biological resources are critical to the development of Ecuador (EcoCiencia, 1994).

Sustainable Development has been defined as the use, application and transformation of natural resources to satisfy the necessities of humans and improve the

quality of life, without damaging the environment in the process (EcoCiencia, 1994). Basically, under this concept of development, humans can satisfy the necessities of today without putting in danger the opportunities of the future. It's a type of development that respects nature.

In MEC, et al. (1994), a priority for education in Ecuador was the need for natural resource management training in rural communities. During recent years, the interest of rural Tena area residents in alternatives to traditional destructive agriculture has grown noticeably. Cattle ranches and cropping are only productive for about 5 years. The topsoil is already nutrient poor. When vegetation is clearcut, unsupported topsoils soon crumble under the impact of cattle and large-scale erosion results. Ranchers and farmers have come to CIPAE asking for help to improve their productivity, to establish nurseries for important timber trees, and to restore cleared forest. The present trail guide shares preliminary results from botanical and forestry investigations underway in the upper Napo region. The Center for the Conservation of Amazonian Plants (CCAP) operated by Fundación Jatun Sacha, is located about 16 miles east of Tena. At CCAP, experiments are underway in silviculture, agroforestry, mixed cropping systems, and reforestation. Agroforestry exploits beneficial tree characteristics such as shade cover, nitrogen-fixing bacteria associations with roots, and leaf litter mass to increase agricultural yield (Borel, 1989; EcoCiencia, Centro Fatima, Jatun Sacha & Omaere, 1996).

Traditional tree crops, such as cacao (cocoa palm, *Theobroma* spp.) and robust coffee (*Coffea arabica*), are not profitable locally due to market prices and disease. Plantation trials with species that provide economically valuable materials such as timber,

latex, fruits and fibers are underway at the CCAP. The CCAP is one of eight sites in South American studying the dynamics and productivity of the latex-producing tree *Croton lechleri* (common names: Sangre de Drago (Spanish) Blood of the Dragon (English)), and members of the legume genus *Inga,* a promising plant for restoration, agroforestry and food production (See stations five and 12, respectively in the trail guide). Partners in CCAP projects include the Kew Botanical Gardens of London, and the Missouri Botanical Gardens (USA). In all, over 20 experimental plots in silviculture and agroforestry are under investigation (Estación Biológica Jatun Sacha, 1998, Neill, 1991, 1996).

One study which was co-written by the late Alwyn Gentry, pioneering tropical botanist (Peters, et al., 1989) calculated that the most immediate and profitable way of combining the goals of development and conservation in new world tropical rain forest is through the long-term harvesting of non-timber products, such as fruits and latexes. Non-timber products were found in that study to bring two to three times greater revenue than commercial logging or clearing of the forest for cattle ranching. However, the authors cautioned that research is still needed and that results would vary depending on a site's particular inventory of plant products and the local market conditions (Peters, et al.).

Another major focus of the center is forest restoration. The center is experimenting with the planting of different groupings of native tree species in disturbed sites to determine which combinations best replicate the natural succession of young rain forest. The Center's nursery produced over 40,000 seedlings in 1998 for use in various

agroforestry and restoration projects (Alvarado, A., personal communication, November 18, 1998).

Our Tropical Garden calls local farmers' attention to the problems of traditional land use and shares preliminary results of the CCAP and a source of technical assistance. While final results for many of the CCAP studies will not be available for two to four years, Jatun Sacha is conducting field trials with local Quichua and colonists. However, EcoCiencia, et al. (1996) cautioned that these new agricultural technologies may never replace timber sales and cattle ranching entirely, but may be significant in reducing local forest loss by providing alternative and sustainable supplements to local incomes.

The research of Jatun Sacha, as exemplified by investigations into Sangre de Drago and trees of the genus *Inga*, are just two examples of how the messages on this trail have moved beyond information to solutions.

Culturally Appropriate Interpretation

"Efforts to produce educational materials for the use of rural and urban communities in Ecuador, merits the support of all the organizations and persons interested in contributing to a better management of our environment" Landazuri (as cited, in Chiriboga, 1985, p. 1). Medina (1989) brought to light an important realization for environmental educators wishing to assist in the growth of environmental education in developing countries. Beyond teaching concepts and respect for nature, education programs must demonstrate economically viable alternatives to destructive land uses. Medina continued to state that families in those countries, especially the children, must learn now how to make their living from natural resources without destroying the

biological systems that provide them. Medina stated that environmental education in developed countries like the United States has not adopted this stance because our problems are different than those faced by developing countries. The visitor guide introduces residents of the region to local non-timber plant resources and pilot agricultural strategies which may improve their standard of living, all in a format which is entertaining and easy to read.

Our Tropical Garden, the trail and visitor guide, was developed in close communication with Ecuadorians, recognizing their specific needs and limited resources. Traditional United States based environmental education models are not transferable to Amazonia, because the message is not matched to the culture. During my time in Ecuador, I met several North American teachers who had brought copies of teaching materials produced in the United States to Ecuador, in the hopes of delivering them to rural schools. Two teachers suggested I that I adapt their lessons about the rainforest to my trail project in Tena Ham (1989) and Ham and Meganck (1994) suggested that a superior strategy to exporting U.S. materials to other countries is to collaborate with the host country to develop their own approaches to environmental education, as was accomplished in this project. Ham cautions that the "exporting" of U.S. teaching methods and curriculum materials may be inappropriate in several ways. Ham (1989, pp.401-402) stated that "such admirable efforts are based on an underlying assumption that language differences are the only real obstacle to implementation of these materials in other countries." He also noted that these materials typically use north American plant and animal life as examples, which may lead children to learn that "...wildlife lives in

other places". Jansen (1977, p. 21) coordinated U.S. Peace Corps environmental education in Chile. She said, "...cultural differences must be accounted for." Accordingly, the manner of presentation and items of interest and concern vary in Chile from those in the U.S. She stated, "What works in the States may not work as well here".

Ham (1989) went on to state that educational materials in the United States assume teachers have college education and solid reading, comprehension and computer skills. North American curricula typically assume that teachers have access to photocopiers to make student handouts, and that students have paper, scissors and string with which to complete the activities. Ham (1989, p. 402) concludes "....combined with the culture-dependent descriptions, examples and analogies typically contained in such environmental education guides, this difference in education could render many U.S. based materials difficult to comprehend if not culturally distant, regardless of how well they may be translated."

The public education experience is short-lived for many children in Latin America. MEC, et al. (1994) found children stay in school an average of six years. Many of these children are simply needed to help the family with agricultural or ranching activities, and daily subsistence. Ham (1989) found similar results in Honduras, where children stayed in school an average of five years. Ham stated that modular environmental education systems from the U.S. are typically based on grade levels and will miss many children by grade 6. These programs gradually move from awareness and basic environmental concepts onto problem-solving skills in higher grades. These studies on student permanence in public education indicate that many

Ecuadorian students would never receive the "action" phases of such modular teaching systems. CIPAE can continue to foster young environmentalists and maintain their interest in local forest habitats long after they have left the formal school system.

Precisely on this note, one Ecuadorian visitor to CIPAE commented on the trail, stating "...the work done by the municipal government of Tena and the technicians in charge of Parque Amazónico is fundamental because it has created ways in which most people, especially grade school and high school students, have the ability to understand and get to know local plant and animal life."

Indirect Economic Benefits of Community Wilderness Parks

Ingram and Durst (1989), Wilson and Laarman (1988), and Wesche (1991) have noted how nature-based tourism generates needed revenue for nearby local economies. An improved park provides a better reason for visitors to stay longer in the Tena area, and tourist patronize areas hotels, restaurants and purchase other goods and services. Indirectly, this activity leads to new employment.

Wilson and Laarman (1988) suggested that local ecotourism sites with open space managed under a framework of environmental interpretation are valuable tourism resources, providing an economic justification for municipal governments and communities around the sites to support them. Wilson and Laarman stated that nature tourism should be encouraged because it attracts desirable visitors and directs economic activity to remote communities, like Tena. As noted in the "Project Evaluation" section of this paper beginning on page 77, the challenge for CIPAE is to establish connections with the tourism industry in major cities such as Quito and Guayaquil in order to attract

to promote their facilities and programs and attain a higher profile in an increasingly competitive Ecuadorian tourism market.

DEFINITIONS OF TERMS

Many of the following definitions are significant because they were co-written by Latin Americans for application in Latin America and reflect the special conditions, needs and themes involved in development of this self-guided interpretive trail at CIPAE.

Environmental Education

During the 1992 Earth Summit in Rio de Janeiro, Brazil, the following definition of environmental education was established by the non-governmental organizations attending the Global Education Forum for Sustainable Societies and Global Responsibility. It is excellent because it clearly accounts for the dilemma faced by Amazonia and was written with the participation of many Latin American countries. Environmental education, they determined, " is a permanent learning process for sustainable societies and global responsibility based in respect for all life forms and a stimulant for the formation of a socially just and ecologically developed society" (Duran, as cited in MEC, 1994, p.32). The organizations attending the Global Forum subscribed to several guidelines (Tierra, et al., as cited in MEC, 1994, p. 33) of which the following are especially relevant to the current project:

- Environmental education must have a holistic perspective, focusing on the relation between humans, nature and the universe in an interdisciplinary form.
- Environmental education must recover, discover, respect, reflect on and utilize indigenous history and local cultures, in this way promoting cultural, linguistic and ecological diversity.

- Environmental education must promote cooperation and dialogue between individuals and institutions.
- Environmental education must integrate knowledge, aptitudes, values, attitudes and actions. It must convert every opportunity possible into educational experiences for sustainable societies.

The author and CIPAE's coordinator of environmental education wrote this definition in an early funding proposal for the park. "Environmental education is a process directed to the development of a population with a general world consciousness of the environment and associated problems; this education provides abilities, skills, motivation and commitment to resolve these problems (Paz y Miño & Farnsworth, 1998, p. 3).

The hallmark report often cited in this paper, the Ecuadorian Agenda of Environmental Education and Communication for Sustainable Development (MEC, et al., 1994, p.77) recognized the importance of environmental education, and thereby the merit of the current project, when it stated:

- Environmental education offers, also, the opportunity to channel the energy of young people, confronting several current problems, and integrate the diversity of human, ethnic and generation groups in a shared task (relates to community park).
- It is important that educators see...the possibility to renew their methodology introducing new work systems....and active techniques : observation,

interpretation, investigation, experimentation, representation, projection, creation, etc. (relation to this project).

Environmental Interpretation

Interpretive facilities, programs and educational materials are enjoyed by millions each year in parks, cultural sites and protected areas. Interpretation includes naturalist talks, exhibits, demonstrations, audiovisual programs, labeled nature trails, publications, and other facilities and services which are provided to help people enjoy and understand the natural and cultural resources of the areas they visit (Field & Wagar, 1973).

Interpretation is not only the process of translating one language to another. Ham (1992, p. 3) said that environmental interpretation " involves translating the technical language of a natural science or related field into terms and ideas that people who aren't scientists can readily understand." Sharp (1982a, p.5) stated that "Interpretation is the communication link between the visitor and these resources." Acuña, et al. (1982, p. 4), who worked in Chile, provided this author's favorite definition. He wrote that "...Interpretation is a blend of communication, art, sensitivity and the ability to transmit information through different media while taking individual interests into account."

While the term "interpretation" is somewhat novel in Ecuador, the discipline of interpretation is not new. Enos A. Mills (1870-1922), naturalist and founder of Rocky Mountain National Park, is regarded as the founder of interpretation (Reigner, Gross and Zimmerman, 1992). Freeman Tilden (1957) wrote Interpreting Our Heritage, the first book dedicated to defining the profession of interpretation. His definition of interpretation is still the most widely recognized. He wrote that " interpretation is an

educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand experience, and by illustrative media, rather than simply to communicate factual information (Tilden, as quoted in Regnier, Gross & Zimmerman, 1992, p. 3).

In Interpreting Our Heritage, Tilden (as quoted in Regnier, et al., 1992, p. 4) provided these six universal principles of interpretation which the current project has incorporated into its design.

1. Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile.
2. Information, as such, is not interpretation. Interpretation is revelation based upon information. But they are entirely different things. However, all interpretation includes information.
3. Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art is in some degree teachable.
4. The chief aim of interpretation is not instruction, but provocation.
5. Interpretation should aim to present a whole rather than a part and must address itself to the whole man rather than any phase.
6. Interpretation addressed to children (say, up to the age of 12) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best, it will require a separate program.

Today, the National Association of Interpretation (NAI) is the discipline's largest organization with over 3,500 professional members. Since 1980, the NAI has published the Journal of Interpretation. Member sections include Cultural Interpretation and Living History; Environmental Education; Zoos, Wildlife Parks and Aquaria; Nature Center Directors and Administrators; Resource Interpretation - Heritage Tourism; African - American Experience; and Visual Communications. Graduate degree programs in interpretation are now offered at several major universities in the United States, Canada and Great Britain.

This author thinks of interpretation as a way of putting fun into environmental education. Creativity is encouraged. As Mullins (1984, p.4) said "...interpreters must find ways to entice visitors to their facilities and program. The lure is effective communication. Certainly interpreters have fascinating content to interpret; what is sometimes lacking, however, is imagination – a magic in the message delivered..."

Relationship of Environmental Interpretation to Environmental Education

The fields of environmental interpretation and environmental education have a similar end goal – to produce a citizenry that can make responsible environmental decisions and action (Knapp, 1995, as cited in Knapp, 1997). However each field has different characteristics. The education coordinator at CIPAE welcomed my contributions as the interpretive member of the team, yet we often had conversations on this very topic, wanted to clearly define our roles and not duplicate efforts. Environmental education is associated with formal instruction that requires students to participate in a sequential learning process. Interpretation on the other hand, is typically

provided in recreational settings and participation is voluntary. While the interpretive program is always educational, it must make its points more quickly and less formally than traditional education. Most interpretive experiences last only an hour or two. On the other hand, "environmental education is based on the idea that students invest time in studying issues," said Knapp (1997, p.10). Knapp continued, "People need time to attain sensitivity, knowledge, and attitudes necessary for a positive environmental ethic. Time is certainly one characteristic that an interpretive experience lacks."

"Interpretation does not achieve the ultimate goal of environmental education. Despite our best efforts, a two-hour interpretive experience does not accomplish behavior change in an individual regarding his or her actions toward the environment," said Knapp (1997, p.11). Knapp (1997) continues "On the other hand, an interpretive experience can be an essential and successful aid in achieving this behavior change goal. If an interpreter has only two hours, what key environmental variables should be addressed? (Knapp, 1995, as cited in Knapp 1997, p. 12) said the best idea is "the promotion of ecological knowledge and not changing visitor attitude or behavior."

REVIEW OF THE RELATED LITERATURE

Interpretation Supports Conservation and Ecotourism Objectives

Several authors have commented on the value of interpretation in the improvement of resource conservation awareness in third - world sites. Maranda (1992), who worked in Chile, stated that interpretation as practiced in U.S. national parks is recognized as one of the best means to develop environmental awareness in Latin America. In situations where visitation is increasing, but economic and human resources are lacking, the basic services of interpretation offer significant support to the development of ecotourism without converting this tourism into an agent of destruction in protected areas (INEFAN, 1996).

Interpretation is recognized as a key component in planning ecologically based tourism sites. Boo (1990, p.195) stated that park managers are encouraged to "create effective trail systems and interpretive programs" and to "evaluate the effectiveness of interpretive materials and adjust them if necessary." David L. Andersen (1993), an internationally known architect of ecotourism facilities states "the goal of designers and developers of ecotourism facilities should be to minimize the human intrusion on the ecosystem, to educate travelers and to enhance the spiritual experience in nature that fosters respect and stewardship. In a review of interpretive services offered in Ecuador's national park system, Ham and Enriquez (1986) noted that park superintendents saw interpretation as a key strategy for improving their ability to sensitize park visitors to conservation problems.

INEFAN (1996, p. 4) gathers the reflections of several recognized experts in the field of environmental interpretation as to how interpretation contributes to the conservation of protected areas and the growth of ecotourism in Ecuador's national park system:

- Interpretation contributes to the enrichment of the visitor experience
- Interpretation may broaden the visitor's horizons beyond the park boundary, giving them a better understanding of the total natural resources picture.
- Interpretation informs the public and an informed public may make wiser decisions on matters related to natural resource management.
- Interpretation may reduce the unnecessary destruction of park property, resulting in lower maintenance and replacement costs.
- Interpretation provides a means of moving people subtly from sensitive areas to sites that can better sustain heavy human impact, thus protecting the environment.
- Interpretation leads to improved public support for park sites.
- Interpretation may instill visitor pride for a region's natural and cultural heritage.
- Interpretation may assist in the successful promotion of parks where tourism is essential to an area's economy.
- Interpretation may be effective in preserving a significant historic site or natural area by arousing citizen concern.
- Interpretation may motivate the public to take action to protect their environment in a sensible and logical way.
- Provides emotional health to visitors and thereby increases their capacity to learn.

Selection of Self-guided Media

After three years in operation and one year with new administration, the park still had no interpretive infrastructure or written materials for education and park promotion. This became an immediate need and the master-planning document would take second priority to "emergency" interpretive development.

Faced with a lack of interpretive staff and poor volunteer retention, the park sought a non-personal, or self-guided (Ham, 1992), form of interpretation as opposed to a guided form of interpretation to begin developing the park as an interpretive center. The park management team was typically not available to guide visitors in the park, as they were preoccupied with administration, park operations and interpretive development. The only remaining park staff was the zookeeper and his assistant, and three groundskeepers. The park was experiencing difficulties with volunteer retention and reliability.

The principal advantages of self-guided activities are that they do not require personnel for interpretation, cost less, and allow visitors to enjoy local resources at their own convenience (Field & Wagar, 1973 ; Propst & Roggenbuck, 1981; Sharpe, 1976).

Self-guided interpretation is also well suited to the erratic visitor flow into CIPAE. The park receives approximately 20,000 visitors annually, of which 70% originate from outside the Tena region in other provinces and countries. The majority of visitors to the park find the park during rest stops on trips destined for, or returning from, target destinations with family or jungle lodges in the region.

Selection of the Self-Guided Trail Strategy

Self-guided nature trails have long been recognized as one of the best strategies or activities available for inducing learning through involvement with the local community. (Beck & Cable, 1998; Berkmuller, 1981; Ham 1992; Sharp, 1982b; Kuehner, 1976; Trapp, Gross and Zimmerman, 1994). The aforementioned authors all provide excellent treatments on the conceptual and physical development of a self-guided interpretive trail.

The self-guided trail provides a means of connecting a variety of interesting elements together under a unifying theme while offering visitors an interactive and recreational activity (Sharpe, 1982b). On a self-guided trail, visitors walk unattended for the entire length of the trail to learn about and develop some appreciation for the different resources encountered along the way. Like a guided tour, the self-guided trail leads people through a pre-planned sequence of stops, each one presenting aspects of a central theme. Self-guided tours are commonly used to show people things that they would otherwise not see, or which the untrained eye probably would not notice (Ham, 1992). Self-guided interpretive trails are linear corridors designed to conduct visitors to sites of great interest, while reducing to a minimum their impact to the resources (Enriquez, et al., 1989). Tourists from outside the Amazon basin are often bewildered by the lush vegetation of the region, or the "world of green" as one park visitor commented. This self-guided trail certainly helped visitors to isolate the most interesting greenery.

The self-guided trail is still an under-utilized educational strategy in tourist destinations in Ecuador. Wilson and Laarman (1988), in a survey of tours and attractions in the Pacific, Sierra and Amazon regions of Ecuador, identified potential for the use of

self-guided trails in Amazonia in two destination categories they described as "excursions" and "landscapes," categories into which CIPAE would be included.

Selection of the Botanical Garden Site

For the present project, two self-guided trails were under consideration. The first was a general trail guiding visitors past various natural features along the perimeter of the park. The second was a tighter, thematic approach interpreting interesting plants in the botanical garden. The botanical garden was chosen based on considerations for audience, organizational goals and site characteristics.

The botanical garden was chosen as the site CIPAE's first interpretive facility based on considerations for visitor interests, park goals, and location in the park.

Visitor Interests

By far and away, the most common visitor comments reflected the lack of signs and information about park flora. First-time visitors to CIPAE are immediately captivated by the lush and colorful array of trees and ornamental shrubs and herbaceous l plants accented by facilities built in traditional Quichua architecture using native palms.

Ingram and Durst (1988) found that of the various nature-oriented activities promoted by tour operators in developing countries such as Ecuador, those promoted most often include wildlife viewing, hiking, bird watching, hunting and fishing, and botanical study. This author's conversations with CIPAE visitors and tourists returning from jungle lodges in the region revealed a tremendous need for interpretive handouts featuring interesting information about flora. Goward (as cited in MacKinnon, 1985) asserted that park visitors experience four levels of interpretation (from basic to highest):

recreation, orientation, information, and finally, inspiration. Informal conversations with CIPAE visitors from the capital city of Quito, a significant and well-educated visitor group, were seeking information and inspiration. They were often eager to realize connections with historical plants. Many of them knew of the story of Amazonian cinnamon and its role in the story of the discovery of the Amazon, but had never seen or smelled its historic leaves.

Meeting Park Goals

Since its construction in 1992, the botanical garden had been organized according to plant use, with sections dedicated to ornamental, timber, fruit-producing and medicinal plants. To this author, native plants really represent the essence of Amazonia. Within the small botanical garden, a wide variety of themes could be interpreted creatively. The site would be developed, supporting two principal park goals (see p.6):

1. Establish the park as a tool of education and environmental and cultural interpretation of wet tropical rainforest
2. Stimulate pride in Ecuadorians for their natural heritage and emphasize the need to be conscientious owners of local natural communities.

Ulrich, Dimberg, and Driver (1993) recommended that attempts to promote public appreciation for tropical rain forests will be more successful if visual images and other images about the appealing characteristics, or "biophilic" properties of rain forests are also given prominent attention. These biophilic properties included such rain forest elements as verdant vegetation, flowers, and attractive animals such as birds.

Location Considerations

Considering the park's limited financial resources, the site was ideal. Since the garden is situated within view of the park's administrative offices, it can be easily monitored and maintained. The self-guided trail is positioned close to the park entrance, and clearly marked beside the park's main entry trail. Many park visitors who upon arriving had only intended to make a tour of the facilities, decided to purchase the visitor guide when they learned that the trail was neatly placed near the park entrance. A related consideration was the choice of the trail's configuration (Ham, 1992; Trapp, Gross & Zimmerman, 1994). The botanical garden was too small for an entire loop trail. A one-way trail would take advantages of existing garden trails and lead visitors to within view of a giant 35 meter Ceibo tree (*Ceiba pentandra).* Built around the trunk was a 20 - meter wooden lookout tower, which was to become the park's second interpretive facility. The tower's four levels would be converted into four interpretive stations on an innovative vertical self-guided trail describing the vegetative "layers" of the rain forest. The tower was eventually dismantled in 1998 for safety reasons.

Selection of the Brochure and Marker Method of Self-guided Trail Interpretation

Three different classes of self-guided trails have been identified by experts in the field of interpretation (Cable & Beck, 1995; Ham, 1992; Knudson, Propst & Roggenbuck, 1981; Sharpe, 1982b; Trapp, et al., 1994). Self-guided trails may utilize messages inscribed in signs at different stations, brochures or booklets with text keyed to each station, or routes interpreted by pre-recorded messages.

Trapp,et al. (1994) said that brochure and marker trails are seldom effective because it is unnatural to read an abstract message as you venture down a trail of happenings. However, Ham (1992) stated that no study yet existed which proves conclusively which one is better, and maintained that the decision must depend on each park's unique combination of visitor and site characteristics, and the goals of the institution.

Few decisions generate as much discussion among interpretive professionals as the choice of an interpretive strategy. In order to compare two methods, the brochure and marker method and the sign-in-place strategy, the CIPAE management team established the areas of concern within which both methods would be evaluated. Main concerns of CIPAE included visitor needs, park budget, park impact and Center recognition. Table 1 illustrates that the brochure and marker method performs best.

Table 1: Performance of brochure and marker method of self-guided interpretation in the botanical garden of CIPAE, Amazonian Ecuador.

MAIN PARK CONCERNS	ADVANTAGES OF BROCHURE METHOD
Visitor Needs	Offers text in both Spanish & English High demand for resource-related literature Content suited to diverse audience Allows better illustrations, enhancing retention Information available rain or shine Easier to read on small trail area Teachers can use offsite, in classrooms
Park Budget	Souvenir value: produces income Lower maintenance: only markers exposed to 200 inches annual rain and high UV Avoids theft of large wooden sign panels (Hi-tech engraved/silkscreen methods expensive)
Park Impact	Minimal visual impact to small trail Occasional guided tours not distracted by signs (Non-littering: brochure is sale item)
CIPAE Recognition (Publicity)	Park also needed an attractive promotional piece Visitors can interpret the park off site Brochure includes map, mission statement and invitation for corporate sponsorship

DESIGN OF PROJECT

Conceptual Development of the Self-guided Trail

This review of the conceptual and physical development of a self-guided trail and visitor guide is adapted from manuals written by leaders in the field of environmental interpretation (Berkmuller, 1981; Ham, 1992; Kuehner, 1976; Sharp, 1982b; Trapp, et al.,1994). Kuehner provides particularly good insight. Ham (1992) refers readers to Spanish texts that would be ideal for native Latin American workers. Both the English and Spanish versions of the trail guide Our Tropical Garden are located in Appendix B.

Apart from periodic consultations with park colleagues, local experts and visitors, the entire process of conceptual development was carried out by the author. Altogether, this author invested over 800 hours in the research, design, writing and construction of this self-guided trail and the accompanying visitor guide while in Amazonian Ecuador. In the following description of the design process, only those aspects which this author felt especially useful or specific to the working conditions of Amazonian Ecuador are reviewed. Otherwise, future workers are encouraged to consult the design manuals previously mentioned. Step number one in the entire design process was to determine exactly what CIPAE wanted from the self-guide trail and visitor guide.

Goals of the Self-guided Trail

For the Organization (CIPAE):

- To introduce and model new teaching technologies, ideas and experiences.
- To create much-needed interpretive infrastructure.
- To improve park promotional with an interpretive publication.

For the Community:

- To enhance a community resource.
- To help create an attractive, economically viable park site.
- To sustain traditional Quichua plant-based values.

For the Visitors:

- To provide a unique educational experience for park visitors.
- To develop text which interests the parks broad audience.
- To interpret historically and culturally important plants of the region.
- To promote conservation and stimulate interest in sustainable forest use.

Information Gathering

The subject matter interpreted in Our Tropical Garden was gathered from a variety of sources, including personal observations, interviews and research. The author's favorite libraries in Ecuador are listed on page 72. Information was gathered for this project using the following steps adapted from Ham (1992) and Trapp, et al. (1994).

1. Immersion in the site. During this phase, the author visited the garden at different times of day, during rain and sunshine, to see the play of light along the trail. The author noticed the feeding activity of hummingbirds at plants of the genus *Heliconia*, and eventually identified one common visitor, the Glittering-throated hummingbird (*Amazilia fimbriata*) (see station four of the visitor guide in Appendix B).
2. Investigate facts and legends. Plants already located in the garden, such as Amazonian cinnamon (*Ocotea quijos*) and cocoa plant (*Theobroma cacao*) provide interesting stories for both Ecuadorian and international visitors.

4. Visitor viewpoints. These were gathered informally by meeting with visitors. There was great interest in historical and medicinal plants, and plants that held some personal connection with visitors. The author interviewed several interesting park visitors, including an anthropologist, a forestry engineer, a writer, and two physicians.
5. Interview local experts. Experts who contributed to the text included:

- Angel Alvarado, Director of the botanical garden of the Center for the Conservation of Amazonian Plants (CCAP). Angel is a lowland Quichua and expert in their medicinal use of plants. He was a tremendous help both creatively and technically, suggesting interpretive themes, providing accurate details of Quichua culture, and recommending plants with good survivability.
- Filimon Aguinda, a master Quichua canoe crafter, provided accurate information regarding canoe construction from the tree Chuncho (*Cedrelinga cataeniformes*).
- Dr. David Neill, former Executive Director of the Jatun Sacha Foundation and Associate Curator with the Missouri Botanical Garden assigned to Ecuador.
- Jorge Zuleta, forestry engineer, was on-site supervisor for the final design and construction of Parque Amazónico in 1992 and provided historical information.

6. Brainstorm. This was a matter of sketching out ideas as they come to me, and seeking out creative people who enjoyed bouncing these ideas around a bit.
6. Record colors, textures, prominent materials and odors. (self-explanatory).
7. Photograph. Quality photographs were made, and specimens collected from off-trail areas, to provide reference material for final artwork.
8. Making Self-Guided Trails More Dynamic. My ideas to mark different orchids and

install the sniff box at Amazonian cinnamon were motivated by Ham (1992).

9. Tentative Map. A map was sketched showing the location of several interesting plants in the botanical garden which had good interpretive potential.

10. Prepare Bibliography.

The bibliography for the preparation of the visitor guide is featured in Appendix C.

Theme Selection

Self-guided trails do not interpret everything in their path, but rather isolate selected r main ideas or sub-themes that support a central theme. Research has shown that people remember themes but forget facts. When people know the theme at the beginning of a presentation, exhibit, or trail, attention is enhanced and users comprehend and remember more of the information (Beck & Cable, 1998).

Themes are statements, best expressed in a single sentence, of what the interpreter wants the audience members to understand and take away with them. Ham (1992, p. 112) recommended that interpreters preparing intepretive trails identify their theme by completing this sentence: "After people walk this trail, I'd like them to know, think or appreciate..."

Trail Theme

"The flora of the upper Napo river region is a global and community resource of significant ecological, economic and therapeutic value to society".

Main Ideas

1. Plants and animals in the lowland rain forest ecosystem of Amazonian Ecuador live in a web of interdependence in which each species contributes to the function of the overall ecosystem (stations 1,3,4,12 of the trail guide in Appendix B).
2. Plants play an important role in Quichua and Ecuadorian history (all stations).
3. The lowland Quichua have a complex medicinal plant culture based on their extensive and intimate knowledge of local rain forest flora (stations 4-7, 9-11, 13).
4. Botanists and forestry engineers are applying science daily and developing alternative local economies based in the sustainable use of local forest resources (stations 5, 12).
5. Humans have a responsibility to consider the effects of their activities on the natural environment (stations 3, 12-13, end page).
6. Plant appreciation is an emotionally satisfying form of outdoor recreation.

Making a Thematic Map

Ham (1992) recommended that self-guided trails have thematic station titles and not simply topic names. Ham also emphasized that no more than five main ideas be presented on a trail and that every station must support the trail's central theme. The sequence may be adjusted according to the evolution of the theme. A conceptual drawing or "thematic map" (Ham, p. 332) can be sketched of the trail configuration which shows the individual stops and helps the designer to visualize the development of the theme as visitors move down the trail. The recommendations of Ham help the interpreter to better visualize the emerging chain of ideas and how they relate back to the central trail theme.

The 13 thematic station titles follow in the order in which they are presented on the trail.

1. Biodiversity
2. Two Scoops from Amazonia
3. The Orchids of Amazonian Ecuador
4. The Bird of Paradise
5. Blood of the Dragon
6. The Shaman's World
7. A Spicy Tradition
8. The Land of Cinnamon
9. Quichua Snake Bite Kit
10. The Lady Spirit of Chiriguayusa
11. Who Done It? (playing on the classic mystery series)
12. New Foods for the World
13. The Canoe Tree

While there is no consensus on the number of stations which should be included in a self-guided interpretive trail, Ham (1992, p. 319) suggested that 10-15 is a good number. His stated that the goal of intepretive trails is to "keep interest high and fatigue low", so that even those visitors who are not fond of hiking will enjoy the trail.

Get Comments on Mockup Version

An early version of the text, complete with rough drafts of the illustrations, was was given to selected visitors in the park who agreed to comment on the upcoming intepretive trail and guide. Among the visitor reviewers were two botanists, a forestry engineer, two prominent Quichua leaders in the Tena area, two physicians, a writer and an anthropologist. Their comments improved the guide's clarity and effectiveness.

Physical Development of the Trail

Mapping the Park and Botanical Garden

The first step in the physical development of the trail was to create a scale map of the botanical garden and the entire park. The trail guide would include this map, complete with symbols indicating trails and facilities, on the its back cover. Using only a 25-meter tape measure and compass, this author precisely mapped the park, including buildings, animal enclosures, lagoons and over four kilometers of primary and secondary foot trails at CIPAE. Individual segments making up an entire trail were identified by extending the tape measure down the centerline of the trail until a change in direction was noted. The segment length and bearing were recorded on half-centimeter graph paper (10 meters trail: 1 centimeter paper). This method proved very accurate as the start and end points in large loops usually met up with a only a couple feet of error. An entire day of trail data could be recorded on just a couple sheets of graph paper. Finally, individual maps from the different parts of the park were reduced on a copying machine, and then joined to construct the final map. This author had recently installed a park-wide system of international signage (directional, informative, regulatory, safety, services) yet

symbols were still needed for a few facilities. These were devised before the guide was printed. Here are two suggestions for future low-budget map makers. Make note of minor trail features and plants when mapping between trail junctions. In the event a portion of the trail is overlooked, it will be much easier to find and recover the missing data. When making photo-reductions of the rough data, make sure that your copier reduces equally in all three directions: horizontally, vertically and diagonally.

Trail Construction

This self-guided trail measures no more than 100 meters in length and required little new trail construction. To the contrary, the garden had been built with too many trails, careless visitors had created others, and so they needed to be reduced. Unwanted trails should always be removed or obscured as early as possible. To close the unwanted trails, the now compacted soils were tilled and planted with a fast-growing groundcover of the peanut family (*Mani forahero*). Branches and debris were cast in the area during the two to three months the plants required to establish themselves. By isolating the self-guided trail, the garden now appears larger, plants are less impacted by wandering visitors, and visitors can enjoy the self-guided trail without interruption. Finally, the actual path of the self-guided trail was widened to four feet according as recommended by the California Trails Manual (1991) for interpretive walking trails.

The project area receives 4000 mm (160 inches) of precipitation annually. Wet trails discourage visitor use if not handled properly. Tread surfaces in low-lying, mud prone areas of the trail had to be built up using the drainage lens strategy illustrated in Appendix D. First, low- lying sections of the self-guided trail route were noted after

rainstorms. With the soil still damp, the trail was excavated to about eight inches. A felt-like geotextile fabric was laid down and covered with a layer each of two-inch rock, pea-gravel and fine, compacted sand. The use of geotextile fabric keeps tread material from being lost into wet base soils and prevents the pumping of mud up onto the trail surface. To further prevent water from gathering along the trail, the surface was sloped slightly to the downhill side.

This author opted for one major trail structure that now carries visitors through station number four which features the Bird of Paradise plant (genus *Heliconia*). When flooded by rain, this depression, with several species of the colorful plants, resembles the wet, marshy habitats that *Heliconia* prefer. The idea was to adapt an interlocking staircase design from California parks, so that visitors could walk through this area and experience the sensation of *Heliconia* habitat without getting their feet wet (refer to the diagram in Appendix D, p. 146 and the photograph in Appendix E, p. 149). The steps in this "self-draining" staircase are actually a chain of boxes set on top of geotextile fabric and filled with the same layers of material used in the drainage lens application. Today, this self-draining staircase remains dry along its tread surface, even though rainwater may flood the ground surrounding the Bird of Paradise plants. Rainwater actually passes from step to step through the fill material, so that water never overflows onto, or erodes, the tread surface.

The construction of this staircase was labor intensive. Large beams measuring 12 centimeters x 8cm x 2meters of a local hardwood known by the Quichua name "yuyun" (*Terminalia oblongo*) were used. They were found gathering dust at the Tena city supply

yard and supplied all of the wood necessary for the steps and trail signage. No new forest wood was used during this project. The park had no power tools. To cut the heavy sections, each weighing about 100 pounds, they had to be hauled out of the park by hand to waiting taxi, then to the lumberyard, and back again. After fitting the staircase together, it was disassembled. The individual section had to hauled out of the park two more times to be drilled for the rebar which holds the entire staircase together. Before final assembly, this and all wood used on the trail were treated for rot resistance with a 50/50 mixture of used diesel oil and wood preserver as recommended by Ham (1992).

Labor during construction was a resource as precious as the plants to be interpreted. One park groundskeeper worked with me full-time for almost two months to renovate the trail, construct the staircase, and assemble the trail markers and directional signage (see lower photograph in Appendix E, p. 148). Student volunteers contributed over 350 hours of labor on the trail. A group of four to eight boys from a nearby Catholic high school contributed three hours of labor every Monday morning for about three months. Recognizing the park's mission and a sense of obligation to give something back to the students, the author provided the young volunteers with 10-15 minutes of interpretation on the trail's natural features before work began each day.

Visitor safety considerations in the trail construction included trimming dead or dying branches, low limbs, removing spiny or irritating plants and rehabilitating mud-prone areas. The trail project was projected for six months, but lasted fifteen. The challenges of trail work in the park included rain, limited staff and the absence of power tools.

Working with Plants

In the dynamic environment of Amazonia, the most significant risk is the risk of change. There is always the chance that feature plants will die, rotten trees will fall on them, or they may get eaten or parasitized, suddenly causing a discrepancy between the trail guide and actual trail resources. Feature plants were regularly checked for parasitic insects, fungus and plants. Almost all of the plants interpreted in Our Tropical Garden are common herbs, shrubs and fast-growing trees. All of the feature plants can be found in nearby forest and can be transplanted with good survivorship. Unfortunately, during the preparation of this report, the "Sangre de Drago" tree in station five died. A sapling of about five feet will be planted there so that the brochure can remain accurate.

New plants for the trail were collected from nearby forests. They included several species of "Bird of paradise" (genus *Heliconia*), two small climbing orchids (*Vanilla* spp.), two varieties of the chili pepper bush (*Capsicum frutescens*), and a plant from which local Quichua prepare a snake and spider bite remedy (*Cordia nordosa*).

New plants were installed well in advance of the trail's inauguration, so that they could adapt to the new soil. It is not uncommon to see a newly planted specimen soon turn brown and appear to be dead; then after a couple weeks, begin to green up again. Care was taken to maintain some distance between the interpretive trail and the base of an attractive g. Cuya tree, whose roots, the author was told, are sensitive to trampling.

Writing an Effective Trail Guide

This author consulted Beck (1995), Ham (1992), and Zehr, et al. (1994) during the writing of the trail guide. Beck stated that the three most important considerations in

writing an effective interpretive publication are to know the project's purpose, the visitors and the resource. Goals for the self-guided trail were established early in the process.

Know the visitor

A major goal of this project was to present a variety of ideas in a format accessible to the diverse audience of CIPAE. The different education levels of vistors was the obvious concern, and the guide incorporated active language and captivating illustrations to improve retention by those with less literacy. However, Field and Wagar (1973, p.12) emphasized that interpreters consider "visitor values, preferences, attitudes, perceptions, and the social group within which [the visitor] is participating". Informal interviews and observations by the author found a variety of value systems and perspectives which visitors brought with them to the park.

As Padua and Jacobson (1993) found in Brazil, this author found that most colonists in Amazonian Ecuador are familiar with many plants of the region, but when asked to name one, their choices are typically trees with timber value. The present self-guided trail encourages Ecuadorians to contemplate the other values of native flora.

Field and Wagar (1973, p.12) also mentioned that these "values, preferences, attitudes and perceptions" of visitors "...in turn depend upon [the visitor's] past associations and experiences with natural areas." New visitors to Amazonian Ecuador sometimes enter the park with the illusion that they are entering real jungle, and are wary about "walking off the beaten path." While that attitude can reduce park impacts, it can also prevent visitors from obtaining the benefits of the interpretive experience. Ulrich, Dimberg, and Driver (1991) asserted that attempts to promote public appreciation for

tropical rain forests will be more successful if visual images and other images about the biophilic [author: biologically appealing] properties of rain forests are given prominence. These elements include such elements as colorful or aromatic flowers, and benign animals such as birds. Plants may be an ideal vehicle to promote rain forest appreciation. The current trail guide includes one notable exemption the recommendations of Ulrich, Dimberg and Driver. Drawing reader attention to station number seven and a Quichua remedy for snake and spider bites is the dramatic illustration of a local venomous snake.

Field and Wagar observed that "visitors arrive as social groups rather than as individuals ...the social group is an important vehicle (or format) for the transmission of interpretive messages. One of the important aspects of group behavior is the shaping of information to the level of understanding for children of different ages. At the same time, group members who assume leadership roles as teachers or interpreters, rather than passive learners or listeners, tend to gain improved understanding of the information they present.....we must also consider opportunities for the group to gather to share information being received."

The most common visitor groups at CIPAE are families. The author observed on more than one occasion as one member of a group would buy a brochure at the park entrance and provide an enthusiastic narration to the entire group. Several times, this author observed parents, as well as other adults acting as seemingly self-appointed spokespersons for their group, enthusiastically adapting and sharing the trail's concepts with children in their groups. At first glance, this seems to support the words of Field and Wagar. Perhaps non-parent members of groups visiting interpretive programs

sometime do realize improved learning if they share concepts with children, but this author has another explanation. Self-guided interpretive trails are a very new phenomena in Ecuador. This combined with the captivating design of the current visitor guide and the new information presented are enough to spark the interest of many visitors. Many may be so excited that they choose to share it with others by reading the guide aloud to members of their group. Formal studies might provide more insight into the appeal of self-guided interpretive trails.

Know the Resource

This author of this project brought to Ecuador a general knowledge of new world tropical rain forests and excellent reference materials on environmental education, interpretation and the natural history of Amazonia. Since the author lived in the Tena area for six months prior to beginning the present project at CIPAE, he was able to locate several references based on botanical and biological investigations completed in the upper Napo river basin region. A major asset of Our Tropical Garden is that it addresses issues which are current and important to the residents of the region. The author capitalized on a tremendous amount of site-specific resources available locally. Access to the researchers and the preliminary results of plant investigations at the Jatun Sacha Biological Station and the CCAP was invaluable. The author's access to investigators and on-going research at the nearby Jatun Sacha Biological Station and the Center for the Conservation of Amazonian Plants (CCAP) ensured that the information presented in the trail guide reflected the most current data available at the time of publication. In Quito, the National Herbarium, the conservation group EcoCiencia, and the Documentation

Center of INEFAN (Ecuador's national park service) maintain excellent libraries in natural history and conservation. The Abya Yala library and bookstore in Quito is the single best source of information on the ethnic groups of Ecuador. The bibliography used in the preparation of the trail guide is featured in Appendix C.

Connecting the Visitors with the Resource

The real task was to present the information gathered in a manner that would become personally relevant to a variety of trail users. The trail guide has three parts, starting with an introduction, a body with interesting plants that support the trail theme, and concluding with reinforcing remarks on conservation.

Following Ham (1992), the text for each station was written to:

1. Focus visitors immediately on the observable using catchy illustrations, thematic titles and a good opening sentence.
2. Explain the plant's use or importance.
3. Connect the stop's theme to the overall theme and offer one or more aspects of the plant that may be personally relevant to the reader. Active verbs and familiar, non-technical language was used. (1992).

The trail guide was conceived with story-like illustrations for the cover and each of the interpretive stations to grab visitor attention and elicit personal connections with the different station topics. The last four pages of Appendix B show the author's conceptual drawings beside the final art for the illustrations used in stations one, five, 12 and 13 of Our Tropical Garden, the visitor guide.

Finally, Ham (1992) suggested making technical information more entertaining by linking science to human history. This technique is used with the story of the "Land of Cinnamon." The low density at which the trees of *Ocotea quijos* occur naturally dashed the conquistadors' hopes of obtaining a new and commercially viable spice for the world market. However, deep into the expedition, Captain Francisco Orellana and a team of men led a search for food and supplies and accidentally discovered the course of the Amazon river, navigating the watershed all the way to the Atlantic coast of Brazil.

Final Layout, Design and Printing

The author found many ideas for the design of the cover and interior pages in Zehr, et al. (1994). This book presents full color samples of different publication types and examples of the basic design principles of balance, sequence, contrast, simplicity and proportion. Before meeting with your printer, it is very helpful to have a simple mock-up of the brochure you have in mind, complete with the paper sized and folded according to your choice of format. Once the printer was confirmed, the author presented the printer with both the English text and translated Spanish texts, and his conceptual drawings for the cover and interior illustrations. The following list includes the publication characteristics which were most important to the printer in estimating the cost of this job.

What Your Printer Needs to Know

1. Number of colors on cover.
2. Number of colors inside.
3. Number of pages of text.
4. Paper type inside and out.

* water resistance

* recycled paper may be expensive

5. Number of copies per language?

6. Collating, folding and stapling needed (often included)?

7. Preferences for typestyles and readability

8. Is artwork camera ready or will artist services be needed?

11. Are symbols and legends ready for the park map?

12. Will the text wrap around the illustrations?

13. Are decorative borders desired on the pages?

14. Who will be the contact(s) at CIPAE for draft reviews?

One-thousand copies were printed in English, and another 1,000 in Spanish. The total cost for final layout, design and printing (including collating, folding and stapling) was 5,000,000 sucres. Considering the exchange rate at the time of printing in early 1998, that was the equivalent of about $700.00 U.S. In order to recover the costs of production, the brochure is sold to visitors. The price for foreign visitors originating outside Latin America is $6.00. The price for all other visitors is 6,000 sucres or 60 cents at an exchange rate of 10:1.

Additional Recommendations for Interpreters

The author offers a few more suggestions based on his experiences in Ecuador which may be helpful to future interpreters..

1. Ecuadorian conservation organizations are the best source of referrals for printers of environmental publications. Make sure that the printer's artist can do biological illustrations or the style of art you're looking for in your publication.
4. An attractive mockup of the trail guide should be made as soon as possible, because it can be used effectively to solicit funds to cover printing costs.
5. Provide artists with an actual sample of the plant or an excellent photograph. Avoid other illustrations, as were used with the Glittering-throated hummingbird (station four in the trail guide). A better plan would have been to accompany the artist to the specimen collection at Ecuador's Museum of Natural Sciences in Quito.
6. Most graphic designers and printers in Quito use MacIntosh computers. If you use a PC system, check with your printer early in the planning process to be sure they can convert your PC files to the MacIntosh format.

PROJECT EVALUATION

The interpreter accomplishes a key goal when a visitor gains understanding of the reasons that a natural or cultural resource are important to the person, the community, or the world. The author and CIPAE are pleased that the trail and booklet are contributing to the educational and promotional goals intended. The trail is connecting Ecuadorians with their plant heritage and enhancing public perception of CIPAE outside the Tena area. Appendix E features photographs from Parque Amazónico and the self-guided trail.

The author's review of the park journal facilitated an informal assessment of the trail's effectiveness. Since the trail's construction, park vistors have been encouraged to record their observations and comments in a large hardcover album placed at the park entrance on departure. Visitors are often happy to contribute their thoughts, perhaps eager to leave something of themselves with the park.

The author accepted another work assignment and was unable to complete a formal evaluation of the trail's effectiveness. However, the following visitor observations are typical of those who have experienced the trail and provide an indication of the trail's wide appeal and usefulness.

The first two comments are from indigenous Quichua teachers working in rural, predominately Quichua, grade schools who utilized the park as an informal outdoor classroom with their students. The third comment is from a Quichua man working in Tena as the liaison between an international aid organization and Quichua communities throughout the upper Napo river basin. His offered his comments in both Spanish and his native language of Napo Runa Quichua. Finally, a United States tourist offered his

reaction upon his return from a Napo river jungle lodge located three hours by motor canoe east of Tena. His comments are similar to those received by other international visitors and indicate that the park must establish a working relationship with tour agencies in Quito, where most foreigners organize and prepay their tours into Amazonian Ecuador. An English translation follows each of the Ecuadorian comments.

1. Comments of Mr. Venancio Cerda, fifth and sixth grade teacher at the Carlos Augusto Rivadeneyra school, Shiripuno community, Canton Tena, November 27, 1998, after visiting the park with his students:

Spanish verbatim:

"Es muy gratificante que existan personas que se preocupen por cuidar la naturaleza, además es de mucha ayuda el autoguiado del sendero por que nos facilita conocer algunas cosas nuevas de la zona."

English translation:

"It is very gratifying that people exist who are preoccupied with preserving nature and, furthermore, the self-guided trail is very helpful because it helps us to understand new things about the region."

2. Comments of Mr. Alberto Shiguango, sixth and seventh grade teacher at the P. César Bertoglio school, Atahualpa community, Canton Tena, December 5, 1998, after visiting the park with his students:

Spanish verbatim:

"Bueno nuestro mayor experiencia y lo que siempre anhelamos conocer

muy de cerca las ... plantas medicinales, muchas otras variedaes de plantas, con el apoyo del autoguiado que es de mucha importancia, por lo tanto agradecemos a la persona que haya elaborado este autoguiado."

English translation:

"Our experience was very nice, and what we had always wanted to do, to know first-hand about the...medicinal plants, many other varieties of plants, with the support of the self-guided trail, which is very important, and for which we are grateful to the person who developed this self-guided trail."

3. Comments of Samuel Shiguango, lowland Amazonian Quichua and Community Liason for the Tena, Ecuador offices of the Spanish aid organization, Ayuda en Acción (Help in Action):

Spanish verbatim:

"Desde la perspectiva indígena es muy importante que este sendero autoguiado, con su respectivo folleto, enseña varios tipos de plantas y muchas asuntos mas de la zona, ya que esto permite a que gente de diferentes lugares conozen y sean mas conscientes en la preservación del medio ambiente."

English translation:

"From the indigenous Quichua perspective, this self-guided trail is very important, with its respective booklet, teaching about various types of plants and many other topics of the area, permitting people from different places to know and be more conscientious of the preservation of this environment."

Napo Runa Quichua verbatim:

"Cai sami nambi ashka valin, cai yurasami, animalsami, pangasamigunara riksinara munak runagunaguna cai kilkata rikusha paikuna mas yachanauchu nukanchi amazonia valiskata, shinallara paiguna mana yachashka riksishka samikuta yachasha rinaun."

4. Comments of Matt Terry, professional kayaker, from Columbia, Missouri:

"I really enjoyed the self-guided trail. The information on the Quichua's use of medicinal plants is fascinating! The brochure is like a class in tropical botany and a great souvenir to show my family. I never realized how important botanists are to the preservation of the rain forest. I only wish I had visited your park before I got to my jungle hotel... you answered a lot of questions which were never answered at the lodge."

It is interesting to note that since the park brought a small food and beverage concession into the park, visitation has increased, and so has interest in the self-guided trail. Perhaps the hierarchy of needs created by Maslow (as cited in Knudson, et al. (1995) explains this new activity. Maslow asserted that individuals who cannot meet basic physiological needs (e.g. hunger, thirst, rest) will not focus attention on higher level needs such as social connection or esteem. This is only speculation.

Many of CIPAE's foreign visitors pass through Tena on the way to, or returning from jungle lodges in the region. Only when their tour bus makes a rest stop do they find the park. A common observation of tourists is that the park provides them with a better introduction to the regional natural and cultural history than they received at their jungle

lodge. Clearly, the foundation now representing CIPAE must consider tourism and establish partnerships in Quito with the agencies that organize tours into the upper Napo river region. Today, most agencies in Quito are still unaware that the park exists or that it now operates as the Center for the Intepretation of Amazonian Ecuador.

DISCUSSION

Personally, this project really began to unfold as I became better adapted to, and accepted by, the rural Amazonian community in which I worked. Improving my Spanish was only the first step in that process. Language allowed me to build bridges with people in the area, but only with patience did I slowly integrate with the indigenous lowland Quichua of the region. Honest effort was rewarded with friendship and, ultimately, a very accurate interpretation of Quichua plant culture.

In preparing this report, I sought out literature from previous workers in Latin America who had encountered similar issues of acculturation and interpretation of indigenous knowledge. What I found was an enlightening retrospective on my time in Amazonian Ecuador.

My Local Resource in Amazonian Ecuador

Certainly, it's a great opportunity for any biologist or environmental educator intepreter, when he or she can live beside the biologically diverse rain forests of the upper Napo River region and intepret them as a local resource. During the 15 months of this project, I hiked extensively in lowland Amazonian rainforest and learned from local guides, forestry engineers, biologists, botanists and indigenous lowland Quichua.

Even though I was located five hours and a grueling bus ride south of Ecuador's capital city, I found a wealth of interesting information at the Jatun Sacha Biological Station and the Center for the Conservation of Amazonian Plants, and as previously mentioned, great access to current botanical investigations. A variety of hands-on experiences with researchers in the area were invaluable. In Quito, the libraries of the

Herbario Nacional (National Herbarium), the Ecuadorian conservation organization EcoCiencia, and the Documentation Center of INEFAN (Ecuador's national park service) provided the majority of my references for the text of the visitor guide.

Contrasting Interpretation at CIPAE with Parks in the United States

Diverse Audience at CIPAE

The author's experience in Ecuador agree with the observations of Maranda (1993) who noted that the stratification of park users in Latin America is much greater than one encounters in the United States. In Latin America, visitors vary greatly in age, education, cultural backgrounds, and experiences and this presents a challenge to the interpreter. The diverse audience of CIPAE presented a similar challenge. The promotional objectives of the trail guide were directed mostly at international tourists and those arriving from the captal city. The educational objectives of the trail guide were oriented mostly to residents of the Napo region. This was reflected in the choice of local plants, conservation topics and the ample use of illustrations in the text.

Opportunities and Challenges at CIPAE

Before going to Ecuador, the author worked as a seasonal interpretive park ranger for the United States National Park Service (USNPS). At USNPS sites, as well as most state and county parks, there is a tremendous demand for interpretive facilities, programs and services. To efficiently manage the many tasks involved and put specialists where they are most qualified to work, there is a strict hierarchy and division of function in these organizations. Teams are created and their products are excellent. As a result of this efficiency and the availability of qualified people, front-line field interpreters usually

don't have access to the conceptual design and planning phases. Conversely, interpretive planners are confined indoors to meetings and yearn to get their hands dirty like the old days. It is a rare opportunity to conceive an idea and follow it through design and implementation. With this project in Amazonian Ecuador, I finally had the opportunity to conceive, design and implement an entire project. It was really exciting to have such creative freedom in choosing trail ideas, writing the guide and combining the text with imaginative illustrations. While at times frustrating, the newfound independence was still very refreshing and satisfying. However, staffing was limited and only in the mornings did I have the help of a groundskeepers. At CIPAE, big goals are realized by small staff, and planners must also be their own labor force.

The author initially planned the project schedule for days in advance. However, the author soon relented, realizing that this was the rain forest and he would work outdoors when the weather let him. Conceptual development and writing were handled on rainy days. When the sun came out, I did fieldwork.

Cultural Interpretation in the Upper Napo River Region of Amazonian Ecuador

Be Flexible for Cross-Cultural Encounters

Jansen (1977, pp. 18-19), reflecting on her work as a U.S. Peace Corps coordinator of environmental education in Chile, stated "regardless of my background in interpretation, I must first grow to understand the people I am working with before I can adequately provide assistance... I learn something new everyday from the Chilean people..." A good friend of the author in California, a former United States Peace Corps volunteer, commented on how similar my experiences were to his two years abroad.

While in Ecuador, the author developed friendships with two Peace Corps volunteers working in the Tena area. On two occasions, I led interpretive tours at CIPAE for new Peace Corps recruits to Ecuador,as part of their in-country orientation to the biological and cultural diversity of Ecuador. In 1998, there were over 160 Peace Corps volunteers working in Ecuador in the disciplines of resource management, health and nutrition, and youth development. Anyone working in Ecuador is encouraged to meet Peace Corps volunteers to share ideas and common experiences.

I found the following excerpts from the 1976 Peace Corps Volunteer Handbook (pp. 22-33) when I returned from Ecuador. I was surprised at how closely this manual, published 23 years ago, echoed many of the same situations I experienced while adapting to the distinctive political, social and business constructs of Ecuadorian society. They certainly reminded me that many people over the years have met the challenges of living in a different culture.

1. ...be prepared to adjust to any circumstances...
2. ...Going from the ordered routine of training to an unstructured job overseas has sometimes been compared to running off the end of a pier. Suddenly, there is no solid footing underneath...and it's up to you to sink or swim.
3. The ways people do things in your new environment may not be what you hoped for or expected and may prove exasperating....keep in mind that they....will be working in the host country long after you have left...demonstrated competence will usually win your co-worker's respect, and genuine interest in people and surroundings is usually reciprocated by host country people.
4. a chief source of frustration for volunteers is the preconception of the job overseas often as a result of....overzealous enthusiasm...most frequently they expect some galvanic response to their efforts, a swift gathering of ardent spirits, a new energy and enthusiasm among the communities or co-workers. But volunteers soon collide with a rhythm of movement and response in the host country which may be conspicuously different from their own...
5. you may arrive on the job and plunge into it with all the zeal and ability you command; but instead of inspiring the admiration of your co-workers you

seem to engender their resentment...they think you are putting on airs of superiority.

6. As [frustrations] mount, your success will depend on your determination, your patience and your ability to find another road when one is blocked ...

Author's Experiences Integrating with Local Lowland Quichua

The current project required an accurate interpretation of cultural plant use by the largest indigenous population in Ecuador, the lowland Quichua. While this author had a general awareness that the Quichua have an intimate knowledge of their rain forest habitat, as do most indigenous Amazonians, becoming conversational with the Quichua took some time. I struggled initially, innocently breaking cultural taboos, such as speaking too loudly, or shaking hands too firmly, both steadfast characteristics of my north American upbringing. Although most lowland Quichua today are fairly integrated into modern culture by virtue of their activity in local economic markets (e.g. plantain, manioc, cocoa, coffee, corn, etc.), and most speak Spanish in addition to their native language of Quichua, it would be several months before any Quichua would be accessible to me on a personal level.

As an interpretive specialist, I needed to better understand the Quichua and their perspective on the area's natural resources. I began reading the studies of north-American researchers who had studied Quichua culture and traditional plant use, but I really needed to know Quichua people on a more personal level. It would be irresponsible to incorportate any aspect of Quichua culture into the trail project with without the advice and consent of recognized Quichua experts. I feel cultural interpreters must establish some personal connection with the people that wish to interpret, if this is at all possible. The most knowledgeable Quichua accessible to me were those working as

guides and employees in local jungle lodges. In retrospect, it is not surprising that my conversations with these guides were mostly superficial. My Spanish skills were still poor, and I may have been viewed as just another North American tourist, who would soon be moving on.

Perhaps the local Quichua had good reason to maintain personal distance. Soon after my arrival, I learned that a few Quichua community leaders and shamans living in remote communities had unfavorable experiences with North American ethnobotanists and plant investigators. The after-effects of those contacts spoiled more than one conversation I attempted with local Quichua. Apparently, the researchers had taken many plant samples, photographs and information pertaining to medicinal and hallucinogenic plant practice, but never returned reports or photographs to the contributing Quichua communities as they had promised. Even though the camera is an important tool for biologists and environmental educators, and I usually carry one, I soon learned to minimize my photography until I achieved personal trust with local Quichua. Gradually, I met more Quichua and even helped in traditional Quichua "minigas" or work parties. Most recently, I enjoyed promoting the work of Jatun Sacha's CCAP while strengthening relations with local Quichua. The CCAP is now purchasing the freshly fallen seeds of several rare and important tree species from local people for restoration and reforestation projects. I have passed the CCAP list of desired tree species to several local Quichua who live in good primary forest, so that they can look for fruits and, hopefully, participate in this new, sustainable market. selected trees in deep forest. After

several months in the area, I became recognized as an active resident of Tena and began to enjoy more frequent and more personal conversations with lowland Quichua.

Angel Alvarado is a respected young Quichua and expert in Quichua medicinal plant use. He is the director of the botanical garden at CCAP and a good friend. During the preparation of this guide, I spoke to him at length about more than the culture plant use, but also the future of traditional Quichua culture in an increasingly modernized world. Angel recognizes me as a conservationist and an educator. Looking back on my process of adaptation to Ecuador, I probably required a good year to learn the pace, the language and to feel integrated enough into Quichua culture that I could intepret it responsibly.

Interpreting Indigenous Knowledge

Nelson (1993, pp. 201-228) studied the hunting society of the Inupiaq Eskimo people. In his work, he contrasts indigenous knowledge with modern scientific perspectives. Lowland Quichua culture cannot be compared with Eskimo culture, however, the simple, personal reflections of Nelson helped me to better understand my own experiences with lowland Quichua still living primarily in the rain forest. I was fortunate enough to see everyday Quichua life away from the city and accompany Quichua friends on forays to fish or collect medicinal plants. The remarks of Nelson may provide enlightenment to others who work closely with American indigenous groups. In the following excerpt, Nelson decribes how he learned to trust indigenous knowledge.

> ...Traditional Inupiaq hunters spend a lifetime acquiring knowledge – from other members of their community and from their own experience and observation. This interest is not surprising, because their survival depends on a large body of absolutely dependable information. When I first went to live with the Eskimo

people, I often doubted things they told me or had difficulty taking them seriously. Somehow I had learned that Western knowledge, embedded in our own scientific tradition, carried a more substantial weight of truth than what was often termed 'folk knowledge'. But the longer I stayed, the more I trusted their assertions, because experience so frequently showed them right.

Nelson elaborates on the phenomena of oral tradition, noting that indigenous knowledge is acquired through a variety of family activities:

...these stories illustrate the way hunters accumulate knowledge through patient observation and close interaction with their surroundings...throughout the year, hunting activities and environmental phenomena are constant topics of discussion. They often dominate the conversation ....in this way, information is exchanged.

Indigenous knowledge is a different kind of knowledge. Nelson makes the important point that although indigenous knowledge may be intangible to many in our modern society, it is equally rich, and unfortunately, endangered:

...outsiders tend to underestimate the knowledge of indigenous people like the Eskimos.. Little of this knowledge has been written down, so it remains largely invisible and inaccessible. Yet I believe the expert Inupiaq hunter posesses as much knowledge as a highly trained scientist in our own society, although the information me be of a different sort....comparative bodies of knowledge existed in every Native American culture before the time of Columbus. Since then, even in the far north, Western education and overall culture change have taken a serious toll. Children now spend most of their time in school, not out on the tundra and sea ice. Television has come to the villages. Imported food diminishes the subsistence imperative. And introduced technology, such as firearms and snowmobiles, reduces the amount of knowledge and the range of techniques necessary for successful hunting...as technology become more sophisticated and complex, there is a corresponding decrease in the sort of knowledge we're discussing here.

Nelson compares the observation techniques of the Inupiaq with those of our society:

...like other Native Americans, the Inupiaq acquired their knowledge through gradual accretion of naturalistic observations – year after year, lifetime after lifetime, generation after generation, century after century. In Western Science, we often use other techniques – specialized full-time observation, controlled experiments, captive animal studies, and technological devices such as radio

collars or electronic monitoring. These methods allow us to gather similar information, but much more quickly.

During his time in Ecuador, as he sought more personal relationships with local indigenous Quichua, author Farnsworth realized how important it is that first-time interpreters in Amazonian Ecuador understand their own cultural perspective before they can focus appropriately on a new environment and the indigenous perspectives native to that region.

CONCLUSION

Images of verdant rain forest and the plant-based culture of indigenous peoples are icons of Amazonian Ecuador. The Center for the Interpretation of Amazonian Ecuador (CIPAE) now uses Our Tropical Garden, a self-guided botanical trail with accompanying visitor guide, to share the multiple values behind that icon with Ecuadorian and international visitors. Building on the progressive atmosphere created by Tena mayor Alex Hurtado Borbúa, this author's work became the first interpretive facility and visitor publication in the emerging CIPAE.

Environmental interpretation in Amazonian Ecuador must be culturally appropriate, and designed in close consultation with local residents, investigators and educators. This project demonstrated sensitivity to the host country educational system, environmental pressures, and the dependence of rural community economies on forest resources.

Our Tropical Garden was designed to improve value systems for rain forest appreciation. This attractive self-guided trail continues to grow in popularity with local teachers as an outdoor classroom and is now being used to train teachers, jungle guides, and national park service rangers in the interpretation of local flora. The management of parks can play an expanded and positive role in developing nature tourists as an educated, active, and influential supporter of the world's parks and their conservation goals in the coming century (Giannecchini, 1992).

As for the big picture, environmental education and technical assistance to local farm families is important for the future of natural Amazonian Ecuador for two reasons.

First, after some 30 years of colonization, the region is faced with heavy erosion and the loss of native soils. Grassroots voices are now stirring among local farmers and cattle ranchers who are looking for alternatives. Community-based organizations such as CIPAE and Jatun Sacha are increasing resource awareness and developing alternative economies. Amidst the struggle for daily survival, the marginalized populations of rural Ecuador have few options to improve their lives solely through education.

Secondly, the people of Amazonian Ecuador are a distant voice to the politicians in Quito who decide the fate of public forests. Padua and Jacobson (1993, p. 32), referring to petroleum development in Brazil, a dilemma which is now facing the people of the upper Napo region, stated that "these type of projects result from government decisions that seldom receive adequate review because the region is located far from the state capital and because the local population is socially, economically and educationally disadvantaged. Therefore, enhanced environmental awareness and empowerment of the local populations seems crucial if the region's unique characters are to be conserved."

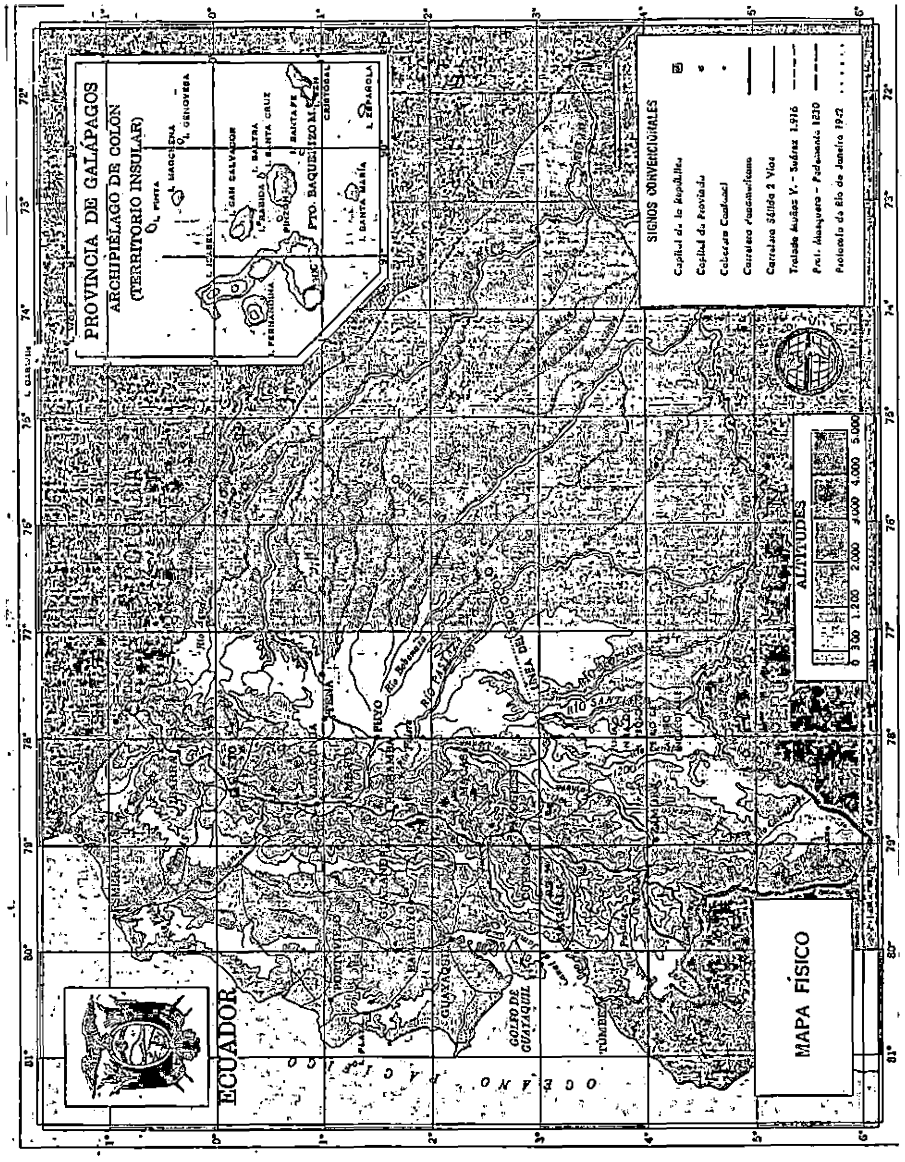
The Center for the Interpretation of Amazonian Ecuador (CIPAE) is joining a select few private conservation organizations who are bringing natural resource education to rural Amazonian Ecuador. Ecuador's Ministry of Education and Culture recognized these regional efforts, when they determined in MEC (1994, p.51) that to establish environmental education in elementary and high schools across Ecuador, the Ecuadorian government must better "...establish mechanisms of cooperation and information between those entities that development non-formal education and other dedicated to environmental investigation."

APPENDIX A

Maps

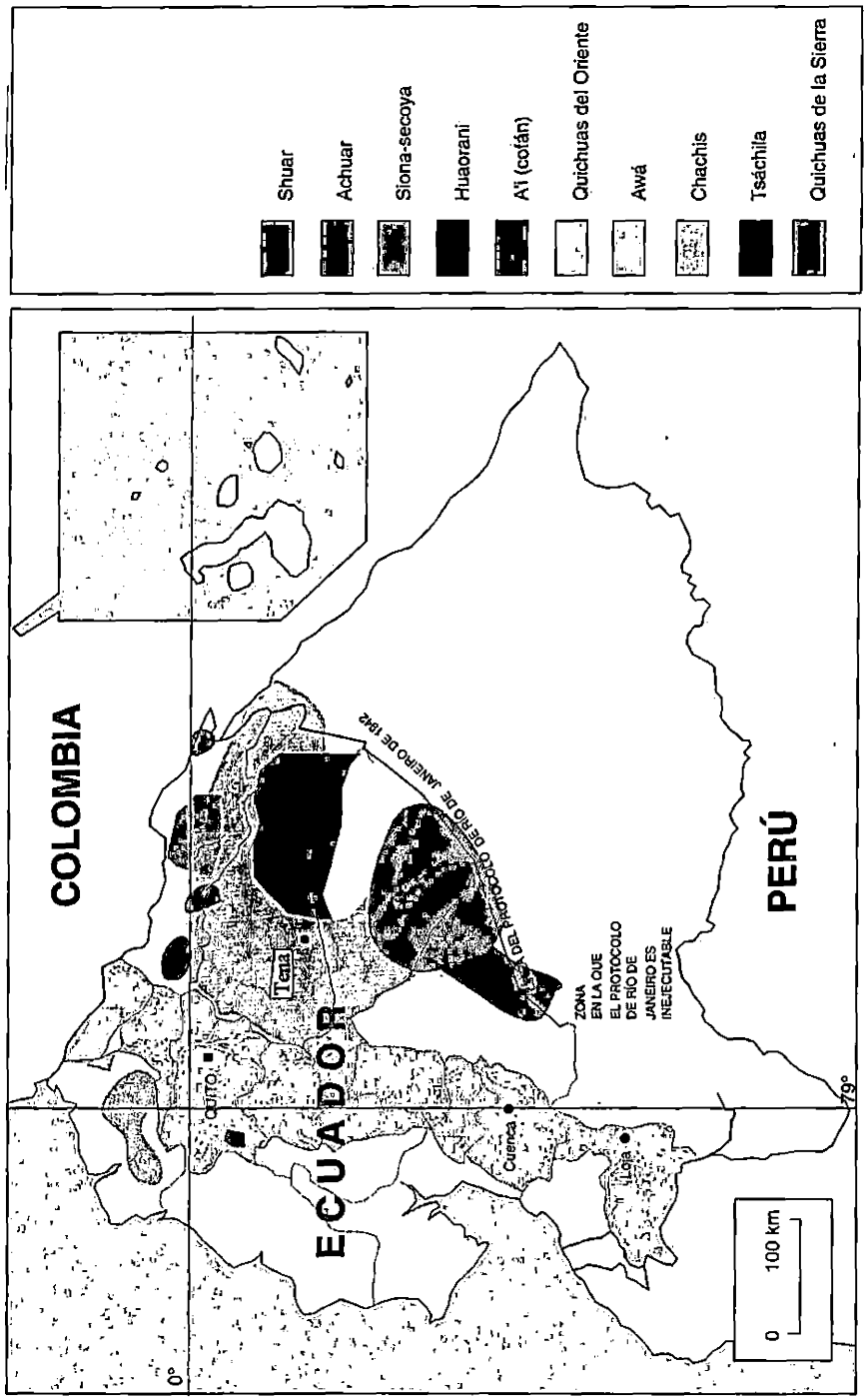
Outline map of South America
(Ecuador shown in black)

Geopolitical map of Ecuador



The project site of Tena, near one-degree south longitude and 78 degrees west latitude, at the western limits of the Amazon basin. Tena is situated beside the Tena River, which flows into the Napo River, a major tributary of the Amazon River shown at lower right. The four geographic regions of Ecuador (Coast, Galapagos Islands, Sierra and Amazon region) are indicated. Note the cities of Quito and Puyo which are referenced in the text.

Distribution of the Major Ethnic Groups of Ecuador



(From Moya, A. (1997). Etnos, atlas etnográfico del Ecuador [Etnos, ethnographic atlas of Ecuador]. Quito: Proyecto de Educación Bilingue Intercultural. (Reproduced with permission of Proyecto de Educación Bilingue).

APPENDIX B

The Trail Guide:

Our Tropical Garden (English Version)
Nuestro Jardín Tropical (Spanish Version)

Author's Concept Sketches with Final Art
for Stations Five, 12 and 13

OUR TROPICAL GARDEN...

A SELF-GUIDED TRAIL INTERPRETING OUR RELATIONSHIP WITH THE PLANTS OF AMAZONIAN ECUADOR

ENVIRONMENTAL EDUCATION SERIES.
MUNICIPAL GOVERMENT OF TENA
CIPAE - PARQUE AMAZONICO

Author
Bruce Farnsworth

Edition and translation
Juan José Espinosa

Design and Printing
AH/editorial, (593-02) 567557

Illustrations
Unique

The publication of this visitor guide was made possible by the generous support of the United Nations Children's Education Fund (UNICEF).

INTRODUCTION

In the rainforests of Amazonian Ecuador exist one of the world's greatest natural resources: tropical plants. In these vast treasure houses of life, plants provide countless lifeforms with food, water and shelter. Tropical vegetation is a global resource which produces much of the oxygen we breathe and, through a grand cycle of evaporation and condensation, regulates the earth's climate. Visitors from around the world marvel at the beauty of these rainforests.

Certainly, native Amazonians appreciate the value of tropical plants. For millenia, they have lived sustainably off this land. Through oral tradition and experimentation, the indigenous Quichua have created an impressive natural pharmacy from their local forests. With many of these remedies, belief is an essential element in their curing powers. Today, the Quichua utilize over 400 species of plants for food and medicine, tools and weapons, crafts, construction and costume.

Great botanical displays are thriving in the green gardens of Amazonian wilderness. Many popular ornamental plants, like the philodendrons and the "Birds of Paradise", occur naturally in the rainforest understory. Amazonia provides wonderful spices, flavoring extracts, essential oils, fibers and valuable hardwoods.

Recent studies confirm the natural wealth of Ecuador. No other country in the Amazon basin has a greater diversity of plant and animal life for unit of land area! Within the borders of Ecuador lie 10% of the world's vascular plants: some 25,000 species have been identified so far. Parque Amazónico belongs to the upper Napo river basin, one of Amazonia's richest areas with over 4,000 species of plant life. High annual rainfall (over 4,000 mm/160 inches), a year-round growing season, and fertile volcanic and riverine soils combine to make this land beneath the Andes one of the most biologically diverse in the world!

Give yourself an hour to enjoy *Our Tropical Garden*. Yours will be a journey through the tremendous ecological, medicinal, economic and

aesthetic values of Ecuador's tropical flora. *Our Tropical Gàrden* is also a trail of hope, announcing recent plant dicoveries and promising plant-based alternatives to destructive traditional agriculture. Please protect *Our Tropical Garden*. Take only pictures; leave only footprints.

Welcome to Parque Amazónico - Center for the Interpretation of Amazonian Ecuador. (CIPAE).

Small signs placed at ground level, featuring this bird of paradise flower, mark each of the 13 interpretive stations in "Our Tropical Garden".

STATION

1

Squirrel monkeys *(Saimiri sciureus)* often find tasty insects in the bases of bromeliads.

BIODIVERSITY

In the everpresent warmth and rain of the tropics, plants have evolved fascinating forms and strategies to survive amidst crowd of plants competing for light and nutrients. We begin with a lesson in tropical botany.

You are probably marvelling at the amount of plant life in this Cuya tree *(Crescentia cujete)*, actually a native to coastal rainforests. Small plants have a big problem in the jungle. It's dark on the forest floor, and they can't grow tall like trees to reach the light. So what do they do? They grow on branches where the light shines through.

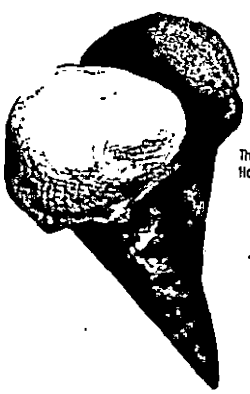
This Cuya tree is covered in bromeliads, ferns, orchids and mosses. All of them are epiphytes, "plants that grow on other plants". These epiphytes can be a real burden for the host tree.

On occasion, our staff takes a load off the back of this Cuya by trasplanting excess epiphytes. Looking something like green bowling balls, the huge Cuya fruit grows on a short stem for support. The Quichua carve large drinking vessels from their sun-dried shells. When mature, these fruit will fall to the ground to be eaten by small mammals.

BROMELIADS

The bromeliads above you, with their sword-like leaves, are abundant in the tropics. These epiphytes create worlds of their own because the leaves form cups that catch and hold rainwater. These "tanks" support an ecosystem of bacteria and insects. Maybe even a frog or salamander, too. Be a naturalist as you walk through Parque Amazónico. You may discover one of our resident Common Squirrel Monkeys *(Saimiri sciureus)* or Saddle-backed tamarins *(Saguinus fuscicollis)* looking into a bromeliad for its next meal.

Tropical plants are the stage for some of the world's most complex and fascinating plant and animal interactions. Amazonian rainforests have developed into the earth's richest habitats. Just look at the many roles played out on the branches of a single Cuya tree. This variety and abundance among living organisms, and among the ecological systems in which they occur, is known as Biodiversity.



The New World Tropics:
Home of Chocolate and Vanilla.

STATION 2

TWO SCOOPS FROM AMAZONIA

Native to forests of the Andean foothills, cacao (*Theobroma bicolor*) has been in cultivation for hundreds of years. The Mayan and Aztec people made the first beverage from the seeds of this plant and called

it the "Food of the Gods" or *Theobroma* in latin. Chocolate was actually created when early European explorers added sugar and milk. The Quichua use the white powdery fungus growing on cacao fruits to treat white spots on the skin. The bark provides a treatment for diarrhea. The seeds are also eaten.

Spiralling its way up the guaba tree to your left is the Vanilla orchid (*Vanilla odorata*). Vanilla is the only orchid cultivated for reasons other than its flowers. The flowers of the vanilla orchid give way to an elongated fruit or "bean". True vanilla flavoring is extracted from the seeds by alcohol fermentation. Vanilla is also one of the world's largest orchid. A climbing vine, the vanilla orchid may one day grow 30 feet as it reaches for the sun.

Welcome to the New World Tropics...
Home of Chocolate and Vanilla.

STATION 3

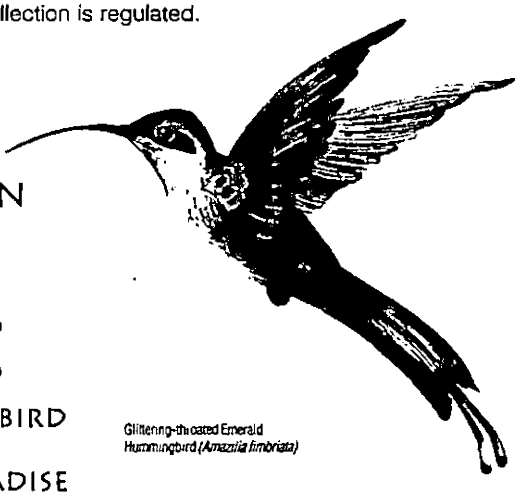
Funnel-shaped orchid flowers, like this Vanilla, form chambers for pollinating bees and wasps.

THE ORCHIDS OF AMAZONIAN ECUADOR

Often delicate, yet always beautiful, the orchids are the largest group of flowering plants in the world. Growing from the arctic tundra to the jungles of Amazonia, over 25,000 species have been recorded. Ecuador is the richest orchid nation in the world with over 3,500 representatives. The Amazon region alone is home to over 600. To help you appreciate this orchid diversity, several *arboreal* orchids growing above you have been marked with red circular tags. Growing at the base of this tree is a selection of *terrestrial* orchids.

The variety of orchids reflects a variety of strategies used to attract pollinators such as bees and wasps. Enticing scents, extra nectar sources born on the flowers, even images of potential mates cast in UV light – attract the pollen-collecting visitors. It's symbiosis. The flower finds a courier for its pollen, while the insect gets its sweet reward ... or simply gets fooled!

Theirs is a special environment nurtured by continual rainfall, organic debris, animal waste and the nutrients of other plants. Orchid seeds cannot germinate without tiny fungus which invade the seed and bring nutrients. And so, orchid habitat is very delicate and can be difficult to reproduce. For these reasons and the rarity of many species, all wild orchids are protected by international law and their collection is regulated.



Glittering-throated Emerald Hummingbird (*Amazilia fimbriata*)

STATION

4

THE BIRD OF PARADISE

Gathered around you are natives plants of the genus *Heliconia* - beautiful, sun-loving residents of river edges, swamps and forest openings. You may know the Heliconia inflorescence as the "Bird of Paradise" They are commercially important in Ecuador's growing industry of ornamental tropical flower and leaf production. Fifteen species are known to the forests of the upper Napo river valley. The colorful *Heliconia* produce an abundance of nectar, attracting hummingbirds -important plant pollinators in the tropics.

Each of the *Heliconia* species in our garden depend on a distinct group of hummingbirds. Like keys to a lock, bill shape and size determines access to the flower's rich nectar reward. The flower cluster hangs away from the plant to give the hovering hummer better access. Just a dust of pollen to the forehead or body of the visiting hummingbird assures that the flower's genetic material will move through the forest. Illustrated here is the Glittering-throated Emerald Hummingbird (*Amazilia fimbriata*), one of our favorite garden visitors.

The *Heliconia* are equally attractive to the Quichua. Growing beside the marker is Iliquiri siqui panga. That's Quichua for "the leaf that divides". (*Heliconia aemygdiana*). A tea made from the leaves is given to women to ease childbirth. In this theory of Quichua medicine, plant form dictates function.

STATION 5

A Quichua with feather in hand, applying the healing sap of Sangre de Drago.

BLOOD OF THE DRAGON

Named for its red healing sap, Sangre de Drago (*Croton lechleri*) is one of Amazonian Ecuador's most valuable trees. The Quichua apply the latex sap to wounds, sometimes with a feather, to speed healing. The raw sap is also used to treat canker sores and relieve toothaches. Diluted in water, the

sap becomes a Quichua tonic for anemia, kidney ailments and stomach pain.

The indigenous use of Sangre de Drago sap has become a subject of international interest. One United States. based drug company, has patented two antiviral drugs based on Sangre de Drago latex. This company collects their plants, and continues with field trials in several developing Quichua community plantations in the Napo province.

Sangre de Drago is just one Amazonian plant which yields non-wood products which are marketable here and internationally. Tremendous market demand for the latex now lies in Europe and the United States. However, pharmaceutical companies must always recognize the contributions of local indigenous communities to the research and development phases of their products and return to them a share of the profits.

STATION

6

Ayahuasca... native rainforest vine and source of the powerful hallucinogen.

THE SHAMAN'S WORLD

The medical culture of the quichua people goes beyond that which can be explained in practical terms. According to their belief system, there are two types of illness -those that occur naturally and others which are sent by "brujos" or evil witches. Natural illnesses are treated with medicinal plants, typically prepared and

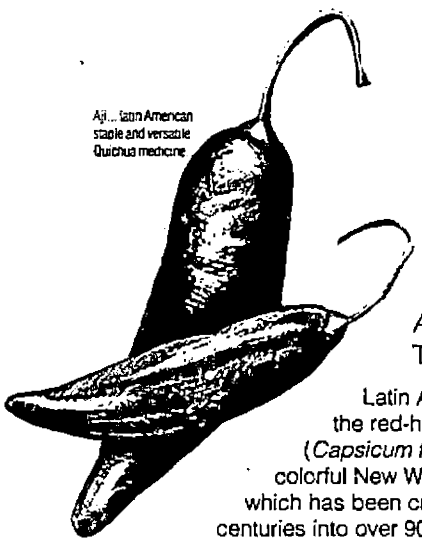
administered by family members. The inflictions of witchcraft, however, are not curable by plants alone. These situations require the abilities of the shaman or "yachac".

Shamans are responsible for curing supernatural illnesses using plant- based hallucinogens and narcotics. Hallucinogenic plants are the shaman's first device for making contact between members of his community and the spirit world. In order to communicate with the spirits of the forest, or divine the forces behind acts of sorcery, the Quichua shaman may chose a decoction of Ayahuasca (*Banisteriopsis caapi*) and Amiruca (*Psychotria viridis*).

The Quichua believe that supernatural illnesses penetrate the victim's body on a piece of wood or metal or with a snakebite. Under the effects of the Ayahuasca decoction, the attending shaman talks with spirits, which reveal to him the exact cause and location of the evil curse. The Quichua further believe that Ayahuasca enables the shaman to know everything about the patient he is treating, including past, present and future events. The shaman chooses the companion hallucinogen Amiruca to give color and greater clarity to his visions.

The Ayahuasca vine is also used medicinally by the Quichua, as a remedy for eye infections. The leaves and bark of the vine are washed in hot water and crushed to extract these "eye drops".

Shamans earn their role in the community. Candidates must undergo grueling training, drinking copious amounts of hallucinogenic beverages before walking deep into the forest at night to encounter evil spirits. Ultimately, only those men who successfully cross from the human realm into the domain of the forest spirits will attain the title of "yachac".



STATION 7

A SPICY TRADITION

Latin American staple, the red-hot chili pepper (*Capsicum frutescens*) is a colorful New World spice which has been cultivated over centuries into over 90 different varieties. These glossy peppers ranging from bright yellow to red to deep purple are known in Spanish as Aji. Displayed here are several varieties from the Napo valley.

For the Quichua, Aji is much more than a spice. Aji is both a medicine for the body and a remedy for the spirit.

Quichua frequently burn the fruit as incense, inhaling the fumes to cleanse the body of contaminateing spirits. Aji burned around the house provides an extra measure of protection by creating a distinctly human environment. As aji smoke fills the house, Quichua reclaim the home from invading wilderness spirits. On the other hand, Shamans, in their efforts to maintain a close interaction with the spirit realm, follow a strict diet that avoids aji.

A versatile Quichua medicine, the juice of aji leaves and fruits is used to treat a range of disorders such as coughing, stomach aches and canker sores. Heated leaves may be applied to relieve burns or rubbed over the patient to ease liver pain. The bulb-like root is chewed to calm toothaches. An infusion is taken to counter snake bites.

Finally, aji is a favorite disciplinary tool of Quichua parents. When children need to be taught to overcome pain and be strong, the juice may be squeezed into their eyes.

Surely, the iron-clad conquistadors of Pizarro's 1542 expedition enjoyed a few moments of tea-tasting in the Amazon.

STATION

8

THE LAND OF CINNAMON

Known to the Quichua as "Ishpingo", *(Ocotea quixos)* may be the most historic plant in Amazonian Ecuador. From the dried leaves and fruit is brewed a popular cinnamon-like tea. Our "sniff-box" gives you a chance to enjoy the aroma without injuring our demonstration plant.

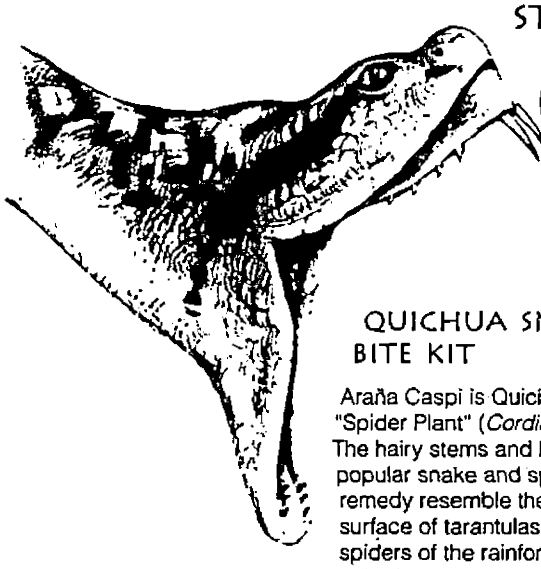
Spanish explorers came to South America in the 16th century, motivated by the commercial value of tropical spices. In 1542, Gonzalo Pizarro left his post as commander of the new city of Quito to journey deep into Ecuador's Amazon basin. On reports of vast fields of wild cinnamon, he ventured forth with over 200 conquistadors, 300 horses and uncounted Quichua slaves.

Pizarro and his men found "cinnamon". Historian Oviedo wrote in 1543 that "they were quite pleased as regards its taste and good quality, being very fine cinnamon", though it differed from the Asian leaves exported to Spain and Italy. What they really found was Ishpingo. True cinnamon comes from the bark of *Cinnamomum zeylanicum*, a tree native to south India and Sri Lanka. A sharper-flavored *Cassia cassia* is the common store variety sold in the United States and Europe.

Pizarro found those Ishpingo trees few in number and widely scattered over rugged country. Certainly not a profitable venture, but a scene very typical of tropical trees. With tree diversity often exceeding 200 species per hectare in the upper Amazon basin, two of a kind are often very far apart.

Shortly thereafter, the expedition fell short of rations. General Pizarro sent his captain Francisco Orellana and 50 men ahead in search of food. Orellana's party continued east to discover the Amazon River and become the first explorers to successfully navigate its mighty course all the way to the Atlantic coast of Brazil.

STATION 9



The Fer-de-lance viper (*Bothrops atrox*)

QUICHUA SNAKE-BITE KIT

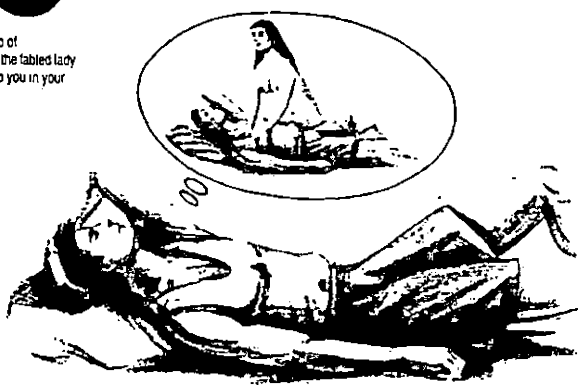
Araña Caspi is Quichua for "Spider Plant" (*Cordia nodosa*). The hairy stems and leaves of this popular snake and spider-bite remedy resemble the body surface of tarantulas, the largest spiders of the rainforest. The soaked roots or bark are boiled until a concentrated syrup is obtained. Half a cup is consumed. The other half is used to massage the bite area. Leaves placed directly on the bite reduce swelling. The Quichua believe that the presence of angry people or expectant women near the victim can intensify the venom's power, so a friend is often sent home ahead of the victim to ensure the house is safe.

Living intimately with the forest means the constant risk of snakebite for the Quichua. The deadly Fer-de-lance viper (*Bothrops atrox*) is one such animal. It's know locally as "Equis" for the X-shaped markings running the length of its body. The plant Araña Caspi, and other natural "snake-bite kits", are always grown close to the back door.

STATION

10

With a bedtime sip of Chiriguayusa tea, the fabled lady spirit may come to you in your dreams.



THE LADY SPIRIT OF CHIRIGUAYUSA

Chiriguayusa (*Brunfelsia grandiflora*) is one of the most common Quichua medicines. Its pretty lavender flowers can be found bordering the trails of our botanical garden.

Chiriguayusa is the Quichua's first choice for physical therapy. Ecuadorans enjoy a sooting, aromatic bath oil made from the leaves. Crushed leaves placed directly on the skin reduce swelling and muscle pain. Heated scrapings of bark relieve itching.

Quichua legend maintains that one need only sip a cup of chiriguayusa tea at bedtime to rid oneself of unwanted spirits or a "bad attitude". What comes next is dizziness and chills, finally ending in a deep sleep. Then, sometime in the night, the "Lady Spirit of Chiriguayusa" massages the mind and body, leaving the spirit at ease.

However, according to the Quichua, if one drinks too much of this tea, or an infusion too rich, nightmares result.

STATION 11

The beauty of the Huanduj blossom belies its shamanic power.

WHO DONE IT?

Huanduj (*Brugmansia insignis*) is a beautiful plant in flower with its pendulous, bell-shaped white blossoms. Beautiful, but deadly. Huanduj is the source of a powerful hallucinogen used by Quichua shamans which can cause unconsciousness or death in sufficient doses.

Quichua families who have been burglarized often turn to Huanduj to find out "who done it". A small amount of bark scrapings is used to prepare the infusion, giving the Shaman his power to find the thief or curse. The Quichua believe that a shaman, under the effect of Huanduj, can find stolen goods, recall past events, and even forecast the future.

The power of Huanduj assures the shaman a powerful role in his community. However, the plant is rarely used. Shamans recognize its toxicity and associate it with evil spirits. Huanduj is the shaman's last resort for those suffering from terminal illness. If it cannot be cured with Huanduj, the patient is thought destined to die.

STATION

12

Conservation

NEW FOODS FOR THE WORLD

Botanists discovered *Inga ilta* recently, working in rainforest close to Tena. Native only to Amazonian Ecuador and Peru, it was identified as part of a continuing botanical inventory of Ecuador. This *Inga* rings a promising note for rainforest restoration. *Inga* trees are legumes, with special bacteria living among their roots which grab hold of airborne nitrogen and other nutrients, and transfer them to nearby plants. The *Ingas* are fast growers which drop many soil-enriching leaves which also cast a blanket of shade on competing weeds. *Inga ilta* grows well in poor soils, while improving life for neighboring plants.

One of the challenges of reforestation is finding trees which grow well in the eroded, compacted and generally acidic soils of heavily used farmland. *Inga ilta* gives hope. Experimental trials are underway at the Jatun Sacha Biological Station (30 kilometers east of Tena) using several *Inga* species as "companions" in native tree plantations. One potential partner is native mahogany (*Swietenia macrophylla*), perhaps the most commercially valuable wood in the world and difficult to grow. Raw logs of mahogany are worth close to $1,000 (U.S.) per cubic meter on the world market, which makes these mixed-species plantations an attractive economic alternative for the Napo region.

Inga Ilta is an excellent choice in rainforest restoration projects, and it produces an edible fruit. When cooked, the fleshy, oil-rich seed covering is highly nutritious. It is hoped that one day *Inga* cultives may provide a solution to famine.

Quichua craftsmen practiced the art of canoe carving on the shores of the Napo river.

STATION 13

THE CANOE TREE

Chuncho (*Cedrelinga cataneiformis*) is one of Amazonia's true giants. The young tree growing here is only a few years old. Mature trees inhabit the highest (*emergent*) layer of the rainforest, reaching over 30 meters in height.

Chuncho is one of Amazonia's most popular hardwoods, and a Quichua favorite for dugout canoes. Those who ride the Napo river often travel by chuncho canoe. A ten-man team of craftsmen may spend two weeks carving a large 15 meter motor canoe from a single tree. The final task of carrying the heavy canoe from riverside workshop to water's edge requires 50 men!

Today, very few Chuncho trees are riding high in the rainforest. Very few canoes are being carved. Chuncho is facing "local extinction" in the Napo region due to overcuting, so harvesting is currently regulated by INEFAN, Ecuador's national resource protection agency.

We hope you have enjoyed *Our Tropical Garden, the self-guided trail.*

Thank you for visiting Parque Amazónico-Center for the Interpretation of Amazonian Ecuador.

The rainforests of Ecuador are a precious resource; their value to humans is untold. These are the world's greatest botanical gardens where new medicines and economic alternatives await only our patience. New species are discovered weekly! Let's heed the word of tropical botanists by reducing our impact to rainforest resources and sharing the conservation message. Through conservation the plants of Amazonia can continue to provide refuge for wildlife and benefit mankind.

Botany, the study of plants, is expanding our awareness of Amazonian plant values on a daily basis. Credit is due the many hardworking botanists, ethnobotanists and forestry engineers who are dedicated to the collection and identification of new species, and the discovery of new plant uses. These professionals may be found climbing trees to examine their flowers or fruit, or compiling regional inventories, or floras, of plant diversity throughout the Amazon basin. The findings of tropical botanists are the single greatest force driving rainforest conservation programs today.

Parque Amazónico welcomes individual and corporate sponsorship of its educational programs and facilities. We will gladly recognize substantial donors through promotional statements and/or signage. Please contact us for further information.

OUR TROPICAL GARDEN

OUR MISSION

To create a unique educational environment in which the people of the Napo Province can share with the world their region's great natural, cultural and recreational values.

Parque Amazónico awaits you in Tena, gateway to the upper Amazon basin. Twenty-two hectares nestled on a peninsula between two rivers, our expansive rainforest and garden setting with meandering trails, zoological park, and full services creates an wonderful environment for seminars, conferences and special events. Park hours are flexible for organized groups. Please contact us for reservation information.

PARQUE AMAZONICO

Center for the Interpretation of Amazonian Ecuador
A Project of the Municipal Government of Tena

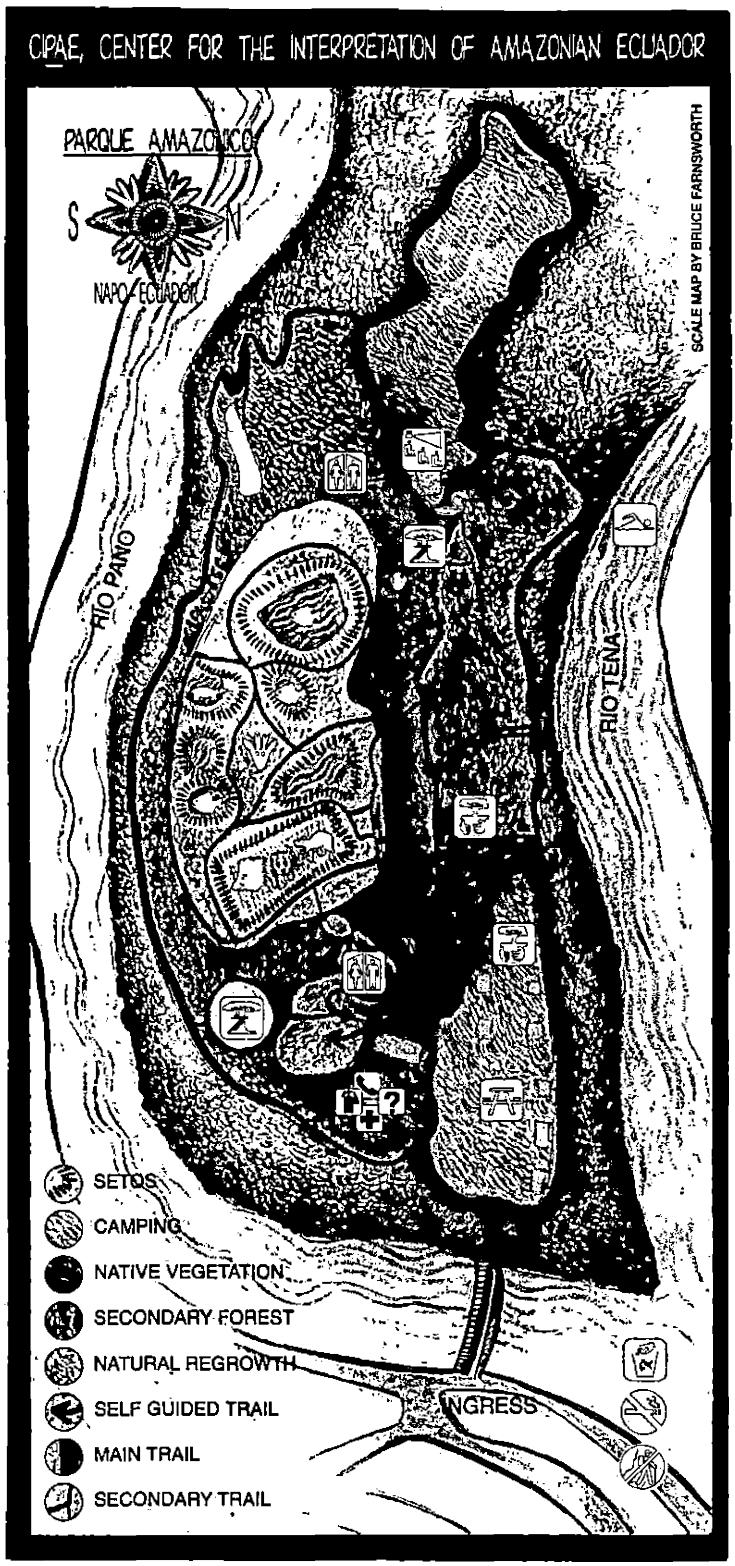
HOURS OF OPERATION

Weekdays 10:00 a.m. - 5:00 p.m.
Weekends and Ecuadorian Holidays
9:00 a.m. - 5:00 p.m.

Telephone (593-06) 887597
FAX 886401
E mail muntena@uio.satnet.net

Mailing address:

Parque Amazónico CIPAE
Gobierno Municipal de Tena
Av. Juan Montalvo y Abdón Calderón
Tena - Napo
Ecuador


CIPAE, CENTER FOR THE INTERPRETATION OF AMAZONIAN ECUADOR
PARQUE AMAZONICO
S
N
NAPO-ECUADOR
RIO PANO
RIO TENA
SCALE MAP BY BRUCE FARNSWORTH
SETOS
CAMPING
NATIVE VEGETATION
SECONDARY FOREST
NATURAL REGROWTH
SELF GUIDED TRAIL
MAIN TRAIL
SECONDARY TRAIL
INGRESS

NUESTRO JARDIN TROPICAL

UN SENDERO AUTOGUIADO QUE INTERPRETA NUESTRAS RELACIONES CON LAS PLANTAS DE LA AMAZONIA ECUATORIANA

SERIE EDUCACION AMBIENTAL
MUNICIPIO DE TENA
CIPAE - PARQUE AMAZÓNICO

INTRODUCCION

En los bosques lluviosos de la Amazonía Ecuatoriana, descansa uno de los más grandes recursos naturales del planeta, las plantas tropicales. En estos inmensos "bancos" vivos, las plantas proveen a incontables formas de vida, de comida, agua y refugio. La vegetación tropical es un recurso global, el cual produce la mayor parte del oxígeno que respiramos y a través del gran ciclo de la evapotranspiración y condensación, contribuye a regular el clima de la tierra.

Los nativos de Amazonía también aprecian el valor de las plantas tropicales. Por milenios, ellos han vivido en forma sustentable en esta tierra. A través de la tradición oral y la experimentación, las poblaciones indígenas a partir de sus bosques han creado impresionantes farmacias naturales. La creencia de que los remedios poseen poderes curativos es esencial para que muchos de ellos actúen. Los indígenas quichuas de la Provincia del Napo, pertenecen a uno de los siete grupos indígenas que ocupan la amazonía ecuatoriana y Nuestro Jardín Tropical enfoca su perspectiva desde el uso que dan ellos a las plantas. Hoy en día los quichuas utilizan más de 400 especies como: alimento, medicina, herramientas, armas, construcción y para rituales.

Fantásticas exhibiciones botánicas prosperan en los verdes jardines de la selva amazónica. Muchas de las plantas ornamentales más populares, como los filodendrons y heliconias, se dan naturalmente en el suelo del bosque tropical. Amazonía es la fuente de maravillosos frutos, nueces y especias, sabrosos extractos, aceites esenciales, fibras y maderas duras. A través de la conservación, las plantas de la amazonía pueden continuar proveyendo de refugio a los animales y beneficiando al género humano.

Estudios recientes confirman la riqueza natural del Ecuador. Sabemos que ningún otro país amazónico tiene semejante biodiversidad de plantas y animales por unidad de superficie. En Ecuador se encuentra el 10% de las plantas vasculares de todo el mundo..... más de 25.000 especies han sido identificadas hasta el momento. El Parque Amazónico pertenece al valle del alto río Napo, una de las áreas más ricas, con más de 4.000 especies de plantas. La alta precipitación anual (sobre los 4.000 mm), la dinámica del bosque y los suelos ribereños se combinan para hacer de esta tierra bajo los Andes, uno de las más diversas biológicamente en el mundo!

Dese a sí mismo una hora para disfrutar nuestro Jardín Tropical. El suyo, será un viaje a través de los maravillosos valores: ecológicos, medicinales, económicos y estéticos de la flora tropical ecuatoriana.

Nuestro Jardín Tropical es también un sendero de esperanza, anunciando recientes descubrimientos botánicos y alternativas promisorias a la agricultura tradicional. Antes de que usted salga del parque, asegúrese de pedir una copia del volante titulado "que puede hacer usted para ayudar a salvar el bosque lluvioso de la Amazonía Ecuatoriana", el cual le mostrará algunas de las acciones locales, nacionales e internacionales.

Estos símbolos, con la forma de una flor de heliconia, identifican cada una de las 13 estaciones interpretativas de *Nuestro Jardín Tropical.*

Por favor, proteja Nuestro Jardín Tropical. Tome solo fotografías, deje solo pisadas. Bien venidos al Centro de Interpretación Para la Amazonía Ecuatoriana - *Parque Amazónico.*

ESTACIÓN 1

Mono barizo *(Saimiri sciureus)* con frecuencia encuentra insectos en el interior de las bromelias

BIODIVERSIDAD

En la omnipresente lluvia y calor de los trópicos, las plantas han desarrollado fascinantes formas y estrategias para sobrevivir rodeadas de una multitud de otras plantas que compiten por luz y nutrientes. Comenzaremos con una lección de botánica tropical.

Tal vez usted esté asombrado por la cantidad de vida vegetal sobre este árbol de mate o pilche *(Crecentia cujete)*. El suelo del bosque es obscuro y las plantas pequeñas tienen un gran problema ellas no son altas como los árboles y no pueden alcanzar la luz. Así que, ¿qué pueden hacer? Pues ellas crecen en las ramas donde la luz alcanza a llegar.

Esta "cuya" como aquí se la conoce, está cubierta por una variedad de bromelias, helechos, orquídeas y musgos. Todos ellas son epífitas o "plantas que crecen sobre otras plantas". Estas pueden llegar a agobiar al árbol huésped, por esta razón, con cierta frecuencia nuestros jardineros deben trasplantar el exceso. Seguramente usted puede ver algo parecido a pelotas verdes de fútbol que crecen en este árbol, son los inmensos frutos que produce y que son usados por los indígenas para fabricar los conocidos pilches. Cuando estos frutos están maduros, caen al suelo y son comidos por pequeños mamíferos.

Las bromelias sobre su cabeza, con sus hojas como espadas, son abundantes en los trópicos. Estas son epífitas y son un ecosistema por sí mismas! Las hojas forman recipientes que recogen el agua de lluvia. Estos reservorios proveen de un ecosistema a las bacterias e insectos, e incluso a sapos y salamandras. Conviértase en un naturalista mientras camina por el CIPAE. Usted podría encontrar alguno de nuestros monos residentes, como los chichicos (Saguinus fuscicollis) o los barizos (Saimiri sciureus) buscando su comida dentro de las bromelias.

Las plantas tropicales son el escenario de algunas de las más complejas y fascinantes interacciones entre ellas y los animales. El bosque lluvioso Amazónico se ha convertido en el hábitat más rico de la tierra. Esto se nota a simple vista con solo mirar los numerosos papeles que se juegan en las ramas de una sola de estas cuyas. Esta variedad y abundancia entre los organismos vivientes y entre los sistemas ecológicos en los que se desenvuelven se conoce como Biodiversidad.

ESTACIÓN 2

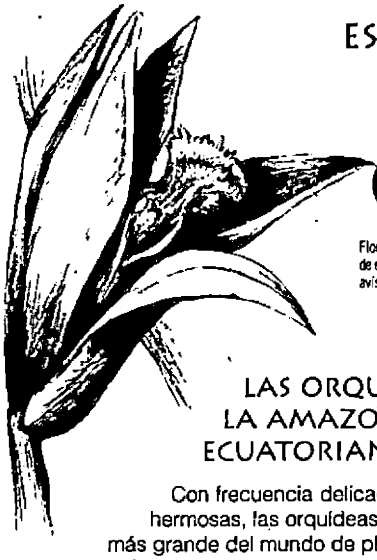
Los trópicos del Nuevo Mundo... Origen de la Vainilla y el Chocolate

DOS HELADOS DE AMAZONÍA

Nativo de los bosques del pie de monte andino, cacao *(Theobroma bicolor)* ha sido cultivado por cientos de años. Los Mayas y Aztecas hacían la primera bebida a partir de las semillas de esta planta y la llamaron "bebida de los dioses", o theobroma en latín. El Chocolate fue realmente creado cuando los primeros exploradores europeos lo mezclaron con leche y azúcar. Los quichuas usan el polvo de los hongos blancos que crecen el cacao para curar las manchas blancas de la piel. La corteza se usa para tratar la diarrea. Y si, come las semillas produce igual efecto.

Rodeando este árbol de guaba en su crecimiento espiral, está nuestra orquídea de Vainilla (Vanilla odorata). La Vainilla es la única orquídea cultivada con otros propósitos que no sean sus flores. Las flores de la vainilla dan origen a un fruto delgado y largo o vaina. El verdadero sabor de vainilla se extrae de este fruto mediante alcohol etílico. La vainilla es también la orquídea más larga del mundo. Una liana trepadora como esta vainilla, podría alcanzar hasta 11 metros en su crecimiento hacia el sol.

Bienvenido a los trópicos del nuevo mundo, hogar del chocolate y la vainilla.



ESTACIÓN

3

Flores de Orquídea con forma de embudos, invitan a avejas y avispas a la polinización

LAS ORQUÍDEAS DE LA AMAZONÍA ECUATORIANA

Con frecuencia delicadas, siempre hermosas, las orquídeas son el grupo más grande del mundo de plantas con flores. Se las encuentra desde la tundra ártica hasta las selvas de la Amazonía, más de 25. 000 especies han sido registradas. Ecuador es la nación más rica del mundo en especies de orquídeas, con más de 3. 500 representantes. La región amazónica es el hogar de más de 600 especies. Para ayudarle a apreciar esta diversidad, algunas orquídeas han sido marcadas con círculos rojos. Alrededor del árbol también puede ver algunas especies terrestres.

La variedad de orquídeas refleja la variedad de estrategias usadas para atraer polinizadores, tales como abejas y avispas. Seductoras esencias, mayor número de nectarios, aún imágenes de potenciales parejas moldeadas por luz ultravioleta - atraen los visitantes colectores de polen. Esto es simbiosis. Las flores encontraron un correo para su polen mientras el insecto obtiene un dulce premio... o simplemente es engañado!

Para criar las orquídeas se necesita de un ambiente especial, nutrido por la continua caída de agua, restos orgánicos, desechos animales y nutrientes de otras plantas. Las semillas de las orquídeas no pueden germinar sin un pequeño hongo, el cual invade la semilla y le ayuda a descomponer los nutrientes más rápido. Por esto el hábitat de las orquídeas es muy delicado y difícil de reproducir. Por estas razones y la rareza de muchas especies, todas las orquídeas silvestres están protegidas por leyes internacionales y su colección está regulada.

Uno de nuestros visitantes *(Amazilia fimbriata)* se alimenta de el Ave del paraíso (Heliconia rostrata)

ESTACIÓN

4

EL AVE DEL PARAÍSO

Congregadas a su alrededor están las plantas nativas del género *(Heliconia)*, hermosas amantes del sol, residentes de las orillas de los ríos, pantanos y aperturas de los bosques. Tal vez usted las conozca como platanillos o heliconias. Son comercialmente importantes para la creciente industria de flores ornamentales del Ecuador. Quince especies se conocen en los bosques del valle del alto río Napo. Las coloridas heliconias producen abundante néctar que atrae a los colibrís - importantes polinizadores en los trópicos.

Cada especie de *(Heliconia)* exhibida aquí, depende de un distinto grupo de colibrís. Como la llave a la cerradura, la forma del pico y el tamaño determina el acceso al sabroso premio de néctar de la flor. El grupo de flores cuelga separado de la planta para dar un mejor acceso a los flotantes aleteadores. Solamente un poco del polen en la frente o el cuerpo del colibrí asegura que el material genético de la flor será transportado a través del bosque. Ilustrado aquí se encuentra el colibrí *(Amazilia fimbriata)*, uno de nuestros visitantes favoritos.

Las heliconias son igualmente atractivas para los quichuas. Creciendo junto a la señal, esta *Heliconia aemygdiana* o Iliquiri siqui panga. Que en quichua significa "la hoja que divide". El té hecho de estas hojas se lo da a mujeres embarazadas para facilitar el parto. Según la teoría quichua del uso de las plantas medicinales, "la función sigue a la forma".

Con una pluma en la mano, un Quichua aplica la saludable savia de Sangre de Drago

ESTACIÓN

5

SANGRE DE DRAGO

Nombre dado por su abundante y curativa savia roja, Sangre de Drago (Croton lechleri) es uno de los más valiosos árboles de la amazonía ecuatoriana. Los quichuas aplican esta savia en heridas, algunas veces con una pluma para acelerar la cura. La savia pura se usa también para tratar herudas cancerosas y aliviar el dolor de dientes. Diluída en agua, la savia se transforma en un tónico quichua para la anemia, dolencias renales y dolor de estómago.

El uso indígena de la Sangre de Drago se ha convertido en un asunto de interés internacional. Una compañía farmacéutica internacional, asentada en los Estados Unidos ha patentado dos medicinas antivirales basados en la savia de Sangre de Drago. Esta compañía colecta la savia y continua con ensayos de campo y asistencia técnica, en algunas plantaciones en desarrollo en comunidades quichuas en la provincia del Napo.

Sangre de Drago es solamente una de las plantas amazónicas que provee de productos no maderables, que es comercializable tanto nacional como internacionalmente. Actualmente existe una inmensa demanda de este látex en Europa y en los Estados Unidos. Sin embargo compañías farmacéuticas deben siempre reconocer la contribución de las comunidades indígenas locales en la investigación y las fases de desarrollo de sus productos y compartir con ellas las ganancias. . .

ESTACIÓN 6

Ayahuasca... liana nativa del bosque tropical y fuente de un poderoso alucinógeno

EL MUNDO DEL SHAMÁN

La cultura médica de los quichuas va más allá de lo que puede ser explicado en términos prácticos. De acuerdo a su sistema de creencias, existen dos tipos de enfermedades- aquellas que ocurren naturalmente y otras enviadas por "brujos" o brujas. Enfermedades normales son tratadas con plantas medicinales, típicamente preparadas y administradas por miembros de la familia. Las brujerías en cambio, no son curables solamente con plantas. Estas situaciones requieren de las habilidades del Shamán o "Yachac"

Los Shamanes son los responsables de la curación de enfermedades supranaturales, utilizando alucinógenos y narcóticos extraídos de plantas. Las plantas alucinógenas son el primer instrumento del shamán para hacer contacto entre los miembros de su comunidad y el mundo espiritual. Con el propósito de comunicarse con los espíritus del bosque, o fuerzas divinas, tras el embrujo, el shamán prepara una cocción de Ayahuasca *(Banisteriopsis caapi)* y Amiruca *(Psycotria viridis)*.

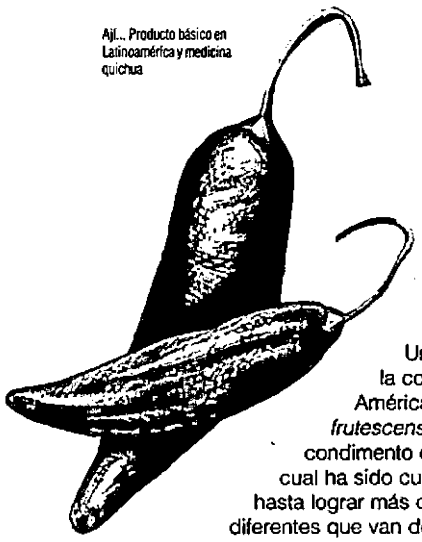
Los quichuas creen que en las enfermedades supranaturales, el cuerpo de la víctima es perforado por una pieza de madera o metal o por una mordedura de serpiente. Bajo los efectos de la Ayahuasca, el shamán habla con los espíritus, los cuales le revelan la causa exacta y localización de la herida. Así él puede extraer el mal y curar a la víctima.

Los candidatos a Shamán deben someterse a un fuerte entrenamiento, beben copiosas cantidades de alucinógenos antes de adentrarse en la selva, en busca de los espíritus a los que enfrentarán. Finalmente solamente aquellos que crucen con éxito el umbral entre el mundo humano y el espiritual, obtendrá el título de "yachac"

ESTACIÓN

7

UNA TRADICIÓN PICANTE



Ají... Producto básico en Latinoamérica y medicina quichua

Un elemento esencial de la comida en Latino América, el ají *(Capsicum frutescens)*, es un colorido condimento del nuevo mundo, el cual ha sido cultivado durante siglos hasta lograr más de 90 variedades diferentes que van desde el amarillo brillante hasta el rojo profundo. Aquí se exhiben algunas de las variedades del Alto Napo.

Para los quichuas, el ají es mucho más que un condimento. El ají actúa como medicina y como un remedio para el espíritu.

Los quichuas frecuentemente queman los frutos como incienso, e inhalan el humo para limpiar el cuerpo de malos espíritus. El ají quemado alrededor de la casa provee de una medida extra de protección, al crear un ambiente distintivamente humano. Mientras el humo llena la casa, los quichuas recobran su hogar de los malos espíritus. Por otro lado, los shamanes en sus esfuerzos por mantener una cercana interacción con el mundo espiritual, siguen una estricta dieta que rechaza el ají.

Es también una medicina versátil: el jugo de las hojas y frutos se usa para tratar un amplio rango de desordenes, tales como tos, dolor de estómago y tumores cancerosos, las hojas calentadas podrían ser aplicadas para aliviar quemaduras o frotadas sobre el paciente para los dolores de riñón, las raíces bulbosas calman el dolor de muelas, una infusión se toma para evitar las mordeduras de serpientes.

Finalmente, el ají es una herramienta disciplinaria usada por los padres quichuas. Cuando los niños, a criterio del padre, son débiles física y espiritualmente, el zumo del fruto se pone en los ojos del niño, de esta manera el niño crecerá física y espiritualmente robusto.

Seguramente los conquistadores españoles de la expedición de Pizarro en 1542, disfrutaron del té de ishpingo en la amazonia ecuatoriana

ESTACIÓN 8

EL PAÍS DE LA CANELA

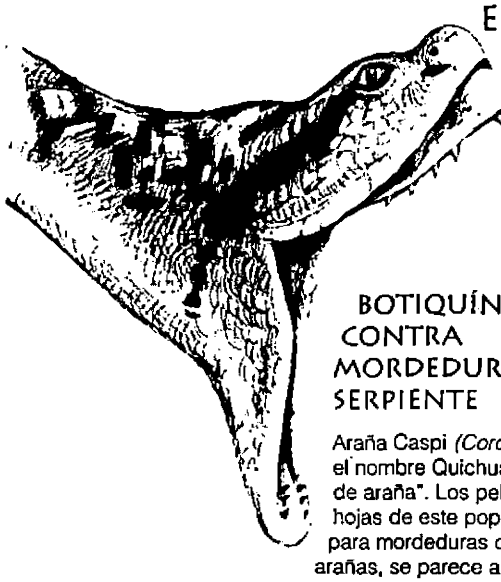
Los quichuas lo llaman "Ishpingo" *(Ocotea quixos)*, podría ser la planta más histórica de la amazonía ecuatoriana. De las hojas secas y frutos se prepara una popular bebida parecida en olor y sabor al té de canela. Nuestra "caja de olor" le permitirá disfrutar el aroma de la planta, sin lastimar a la que se encuentra en frente suyo.

Los exploradores españoles vinieron a Sudamérica en el siglo 16, motivados por el atractivo comercial de las especias tropicales. En 1542, el general Gonzalo Pizarro dejó su puesto como comandante de la nueva ciudad de Quito para realizar una expedición a lo profundo de la planicie amazónica. Basado en reportes de vastos campos de canela silvestre, se aventuró, junto con otros 200 españoles, 300 caballos, e incontables esclavos quichuas, hacia esas tierras desconocidas.

Pizarro y sus hombres encontraron "canela". El historiador Oviedo escribió en 1543 que " estuvieron muy complacidos al comprobar su sabor y buena calidad", a pesar de ser diferente de las hojas asiáticas exportadas a España e Italia. Lo que ellos realmente encontraron fue "Ishpingo". La canela verdadera viene de la corteza de *Cinnamomum zeylanicum*, un árbol nativo del sur de la India y la isla de Sri Lanka.

Pizarro encontró que los árboles de Ishpingo eran muy escasos en número y muy separados unos de otros en una topografía muy accidentada. Ciertamente era una aventura no muy rentable, pero que patentiza una escena muy típica con los árboles tropicales. Con una diversidad forestal en el Alto Napo que frecuentemente excede las 200 especies por hectárea, dos árboles de la misma especie están con frecuencia muy separados uno del otro.

Poco después, la expedición quedó corta de raciones. El general Pizarro envió a su capitán Francisco de Orellana y 50 hombres en busca de comida. El grupo nunca regresó con Pizarro. Mas bien, Orellana y sus hombres continuaron hacia el este hasta descubrir el río Amazonas, convirtiéndose en los primeros exploradores blancos en navegar con éxito la poderosa corriente hacia la costa atlántica de Brasil.



La serpiente equis
(Bothrops atrox)

ESTACIÓN 9

BOTIQUÍN QUICHUA CONTRA MORDEDURAS DE SERPIENTE

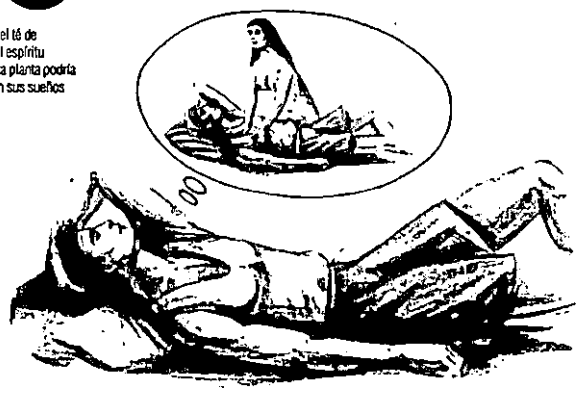
Araña Caspi *(Cordia nordosa)* es el nombre Quichua para "planta de araña". Los peludos ápices y hojas de este popular remedio para mordeduras de serpiente y arañas, se parece al cuerpo de las tarántulas, que son las arañas más grandes del bosque lluvioso. Las raíces o cortezas remojadas en agua, se hierven hasta obtener una taza de un concentrado espeso. Media taza se bebe y media taza se usa para masajear el área de la mordedura. Las hojas puestas directamente en la mordedura, reducen la hinchazón. Los quichuas creen que la presencia de personas con mal humor o enojadas, así como mujeres embarazadas cerca de la víctima, pueden intensificar el poder del veneno. Por esta razón una persona se adelanta a la casa de la víctima, para asegurarse de que esto no pase.

Vivir íntimamente con el bosque significa para los quichuas, un constante riesgo de mordeduras de serpiente. Araña caspi y otros "primeros auxilios " naturales siempre crecen cerca de la casa para tratar las mordeduras de serpientes.

ESTACIÓN

10

Con un sorbo del té de Chiriguayusa, el espíritu femenino de esta planta podría llegar a usted en sus sueños



EL ESPÍRITU FEMENINO DE LA CHIRIGUAYUSA

La Chiriguayusa *(Brunfelsia grandiflora)* es uno de las más comunes medicinas quichuas. Las hermosas flores lilas se pueden apreciar bordeando los senderos del jardín botánico.

Chiriguayusa se usa también como medicina, las hojas aplastadas y puestas directamente sobre la piel, reducen la hinchazón y el dolor muscular. Pedazos de corteza caliente alivian el comezón.

Las creencias quichuas mantienen que un sorbo de chiriguayusa tomada a la hora de dormir, produce un poco de mareo y frío, finalmente termina en un profundo sueño. Entonces, algún momento durante la noche, el espíritu de la Chiriguayusa, que es una mujer, le da a uno un masaje mental y corporal, dejando el espíritu aliviado. Sin embargo, si se toma demasiado de este té, o una infusión muy fuerte, se obtienen pesadillas.

ESTACIÓN 11

La belleza de las flores de huanduj ocultan tras una máscara su poder shamánico

¿QUIÉN LO HIZO?

Huanduj *(Brugmansia insignis)* es una hermosa planta con flores pendulantes en forma de campana, color blanco. Hermosa pero mortal. Huanduj es el origen de un poderoso alucinógeno, usado por los Shamanes quichuas. Este puede causar la pérdida del conocimiento o la muerte en dosis suficientes.

Familias quichuas que han sido víctimas de robos frecuentes, piden al Shamán que use Huanduj para saber quién lo hizo. Los quichuas creen que bajo el efecto de este alucinógeno, puede encontrar cosas robadas, conocer el pasado y aún pronosticar el futuro.

El poder del Huanduj, asegura el poderoso rol del Shamán en la comunidad. Como sea, la planta es usada raramente, los Shamanes reconocen su toxicidad y la asocian con espíritus diabólicos. El Huanduj es el último recurso para quienes sufren de enfermedades terminales. Si no puede ser curado con Huanduj se piensa que el paciente está destinado a morir.

ESTACIÓN

12

Conservación

NUEVOS ALIMENTOS PARA EL MUNDO

Trabajando en el bosque de la Estación Biológica Jatun Sacha, un botánico descubrió recientemente *Inga ilta.* Esta planta, de la misma familia de las «guabas», se encuentra solo en la amazonía ecuatoriana y peruana, fue identificada como parte de un continuo inventario botánico del Ecuador. Esta guaba, podría convertirse en un elemento prominente en la restauración de los bosque amazónicos. Los árboles de ilta son leguminosas, con bacterias especiales viviendo en el interior de sus raíces, las mismas que fijan nitrógeno a partir del aire y lo transfieren a las plantas cercanas. Las Iltas crecen rápido y dejan caer una cantidad impresionante de hojas que enriquecen el suelo y dejan una sábana de sombra sobre las competitivas malas hierbas. Inga ilta crece bien en suelos pobres a la vez que mejora la vida de las plantas vecinas.

Uno de los retos de la reforestación es encontrar árboles que crezcan bien en suelos erosionados compactados y generalmente acidificados de las tierras de cultivo. *Inga ilta* nos da esperanza. Ensayos experimentales se llevan a cabo en Jatun Sacha, usando algunas especies del género *Inga* como «compañeros» en plantaciones de caoba *(Swietenia macrophylla)*, una de las más valiosas maderas de mundo, con un costo de US $ 1.000 m3 en el mercado internacional, lo que hace de estas plantaciones mixtas una atractiva alternativa económica.

Por otro lado *Inga ilta* produce una semilla comestible, con alto contenido de nutrientes, los indígenas quichuas las usan para hacer sopas, de la misma forma que se usan las habas en la sierra. Se espera que algún día, los cultivos de Inga ilta provean una solución a las hambrunas.

ESTACIÓN 13

La construcción de canoas es una forma de arte quichua practicado en las orillas de los ríos de la amazonía

EL ÁRBOL PARA LAS CANOAS

Chuncho *(Cedrelinga cataeniformis)* es uno de los gigantes de la amazonía. Creciendo aquí tenemos un árbol joven, solamente de un par de años. Los árboles maduros son parte de la capa más alta (emergente) del bosque lluvioso, llegando a crecer a más de 30 metros de alto.

El chuncho es también uno de las más populares maderas duras de la amazonía y el favorito de los quichuas para la confección de canoas. Quienes navegan el río Napo, frecuentemente lo hacen en canoas de chuncho. Un grupo de diez hombres podría construir una canoa de 15 metros, de un solo tronco, en dos semanas. La labor final es llevar la canoa, del lugar de trabajo hacia el río, esto requiere del trabajo de 50 hombres!

Hoy día muy pocos árboles de chuncho llegan alto en el bosque tropical. Muy pocas canoas están siendo construidas. El chuncho está enfrentando la "extinción local" en la provincia del Napo, causada por la sobre explotación, así, su explotación está actualmente restringida por INEFAN.

Los árboles más cercanos, se encuentran a más de 40 kilómetros de Tena, a lo largo del río Huambuno.

Esperamos que haya disfrutado de Nuestro Jardín Tropical. Tome un momento para relajarse y reflexionar sobre sus experiencias en la amazonía.

Gracias por su visita al Centro de Interpretación para la amazonía ecuatoriana. *Parque Amazónico*

El bosque lluvioso de Ecuador es un recurso precioso: su valor para los humanos es incalculable. Algunos científicos estiman que el 90% de las plantas amazónicas aun no han sido descubiertas! Estos son los más grandes jardines botánicos del mundo, donde nuevas medicinas y alternativas económicas esperan solamente nuestra paciencia. Redzcamos nuestro consumo de recursos naturales no renovables y compartamos el mensaje conservacionista. Asegúrese de pedir una copia de nuestra hoja informativa titulada "Que puede hacer usted para salvar al bosque tropical de la amazonía ecuatoriana", el cual le provee de consejos para acciones locales, nacionales en internacionales.

El estudio de las plantas (Botánica) está aumentando nuestra conciencia de los valores de las plántas amazónicas casi a diario. Debemos dar crédito a muchos esforzados botánicos, etnobotánicos e ingenieros forestales que se han dedicado a la colección e identificación de nuevas especies, y el descubrimiento de nuevos usos para la plantas. Estos profesionales pueden encontrarse trepando árboles para examinar sus flores o frutos, o compilando inventarios regionales de "flora", a través de la llanura amazónica. Los descubrimientos de los botánicos tropicales son la mayor fuerza tras los programas de conservación del bosque tropical.

El CIPAE requiere su ayuda. Donaciones individuales y corporativas son bienvenidas; ayude al mantenimiento de nuestros animales y conviértase en un socio activo de la conservación.

Contáctenos para mayor información.

NUESTRO JARDÍN TROPICAL

NUESTRA MISIÓN

Crear un ambiente educativo único, en el cual la gente de la Provincia del Napo pueda compartir con el mundo, sus grandes valores naturales, culturales y recreacionales.

El Parque Amazónico lo espera en Tena, Ecuador- puerta de entrada a la alta llanura amazónica. Veintidós hectáreas asentadas en una península entre dos ríos, nuestro creciente bosque y jardines complementados con senderos, zoológico y todos los servicios, crean un maravilloso ambiente para: seminarios, conferencias, foros, eventos especiales. Las horas de atención son flexibles para grupos organizados. Por favor contáctenos para reservaciones e información.

PARQUE AMAZONICO

CIPAE Centro de Interpretación para la Amazonía Ecuatoriana. *Parque Amazónico*

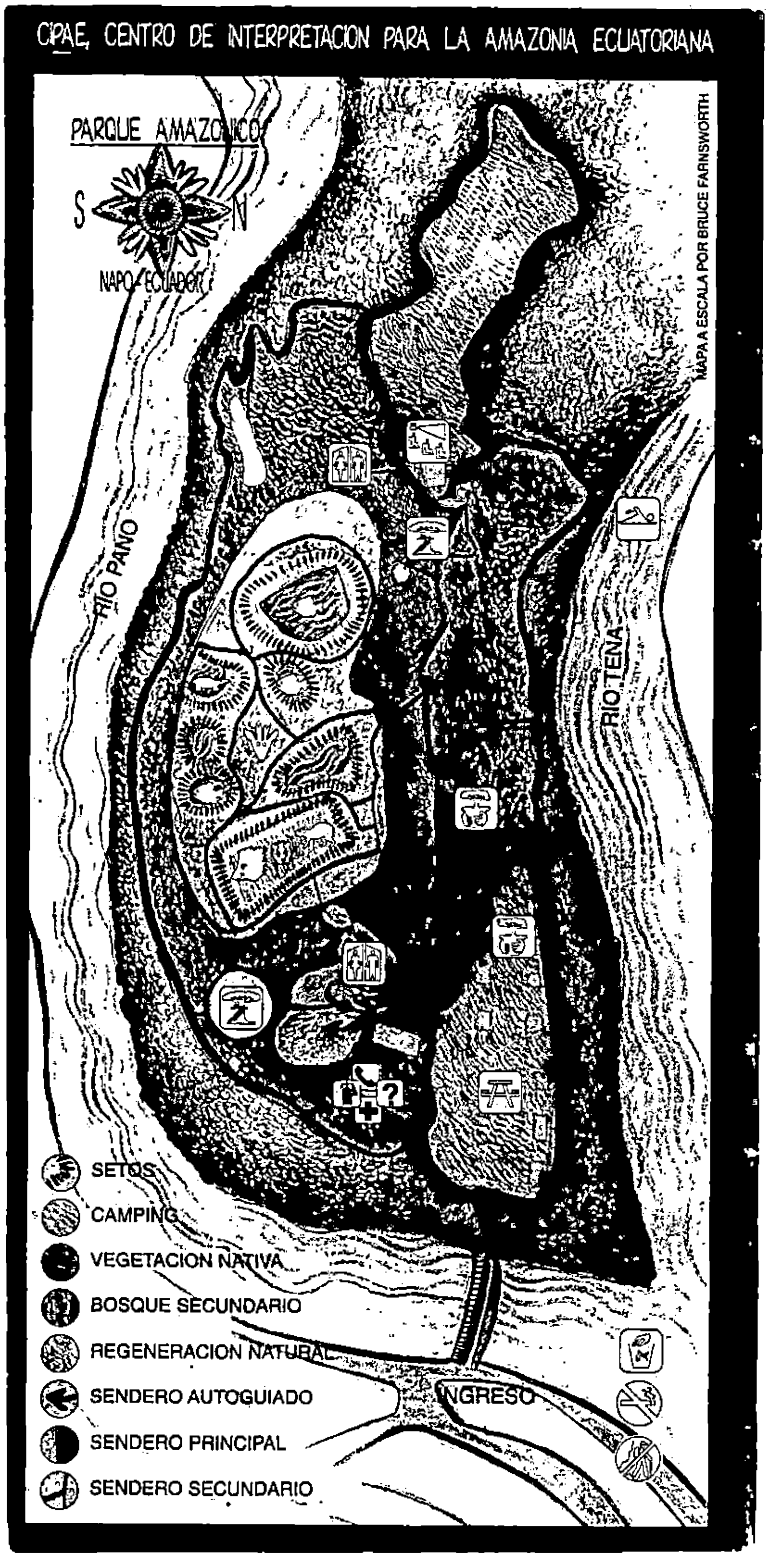
Un proyecto del Municipio de Tena

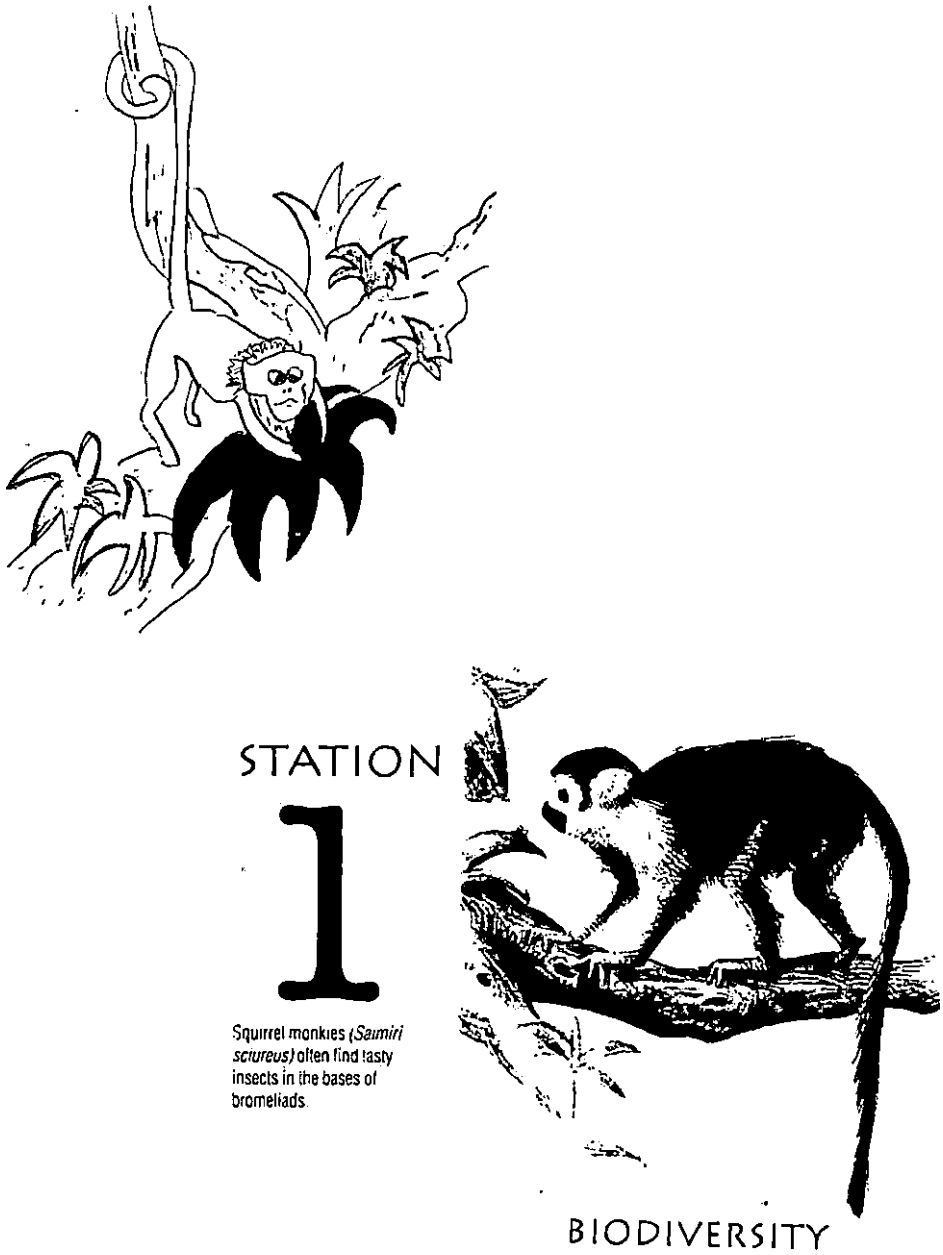
Gobierno Municipal de Tena
Av. Juan Montalvo y Abdón Calderón
Tena - Napo
Ecuador

HORAS DE ATENCIÓN

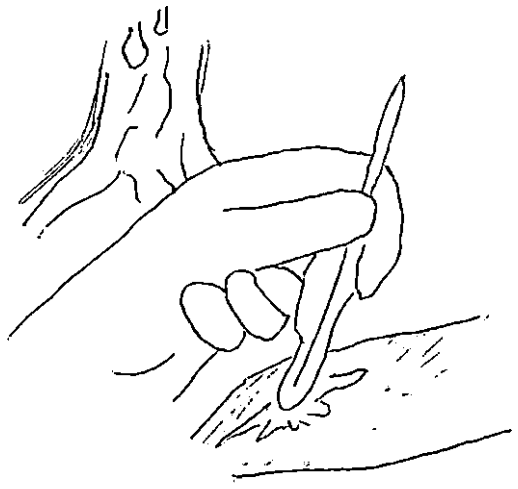
Lunes a Viernes 10:h00 - 17:h00
Fines de semana y días feriados de 9:h00 - 17:h00.

Teléfono (593-6) 887-597
Fax (593-6) 886-401
e-mail muntena@uio.satnet.net


CIPAE, CENTRO DE INTERPRETACION PARA LA AMAZONIA ECUATORIANA
PARQUE AMAZONICO
S
N
NAPO-ECUADOR
RIO PANO
RIO TENA
MAPA A ESCALA POR BRUCE FARNSWORTH
SETOS
CAMPING
VEGETACION NATIVA
BOSQUE SECUNDARIO
REGENERACION NATURAL
SENDERO AUTOGUIADO
SENDERO PRINCIPAL
SENDERO SECUNDARIO
INGRESO

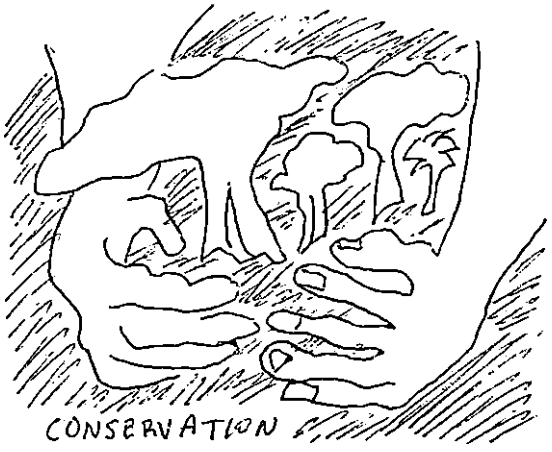


Author's conceptual drawing for Station One: "Biodiversity" with final art

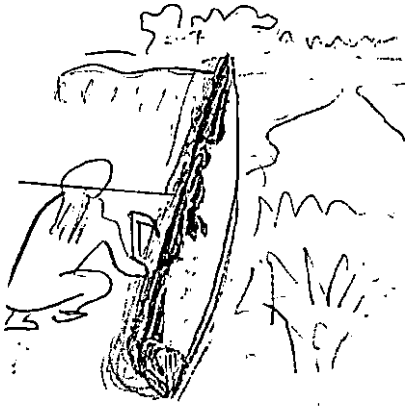


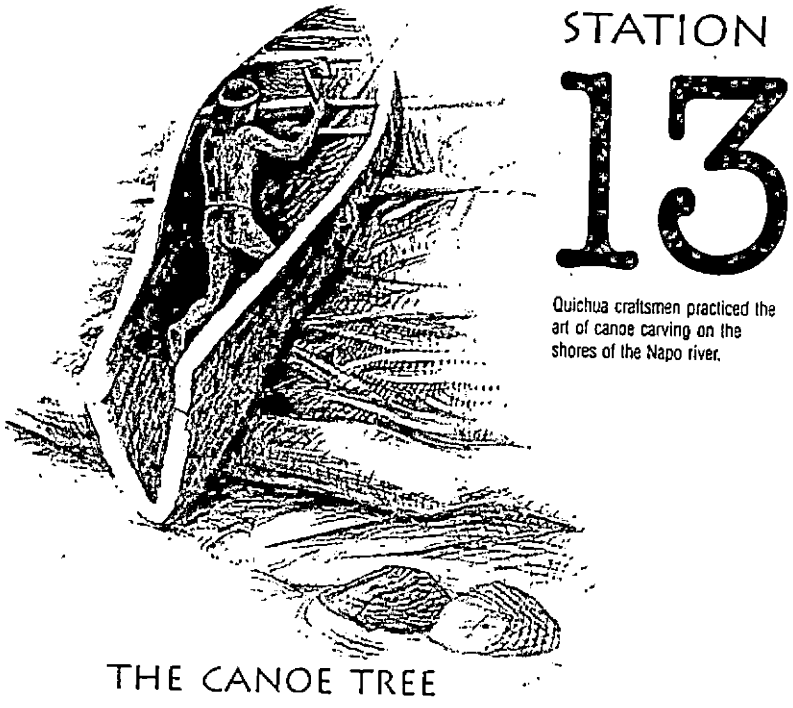
A Quichua with feather in hand, applying the healing sap of Sangre de Drago

Author's conceptual drawing for Station Five: "Blood of the Dragon" with final art



Author's conceptual drawing for Station 12: "New Foods for the World" with final art





Author's conceptual drawing for Station 13: "The Canoe Tree" with final art

APPENDIX C

Bibliography for the Trail Guide,

Our Tropical Garden

Bibliography for the Trail Guide

Alvarado, A., & Harvey, C. (1994). Guide to the medicinal plant garden. Quito, Ecuador: Jatun Sacha Foundation.

Blumenschein, U., Clemenz, B. & Schleinkoker, K, & Wurtz. S. (1994). Observations of hummingbird-pollinated flowers; *Heliconia* spp. and *Centripogon* spp. at Jatun Sacha. (Report submitted to the Jatun Sacha Biological Station). Tena: Jatun Sacha Biological Station.

Dodson, C. (1994). The orchids of Ecuador. Medellin, Colombia: Editorial Colina.

Dresler, R. L. (1981). The orchids, natural history and classification. Cambridge, MA: Harvard University Press.

Emmons, L. H. (1990) Neotropical rainforest mammals – a field guide. Chicago, IL: University of Chicago Press.

Especies: Se conoce solo el 50 por ciento [Species: Only 50 percent are known]. In El Comercio (Seccion C: Sociedad, p.6). Quito, Ecuador: El Comercio.

Farnsworth, N. R. (1978). Screening plants for new medicines. In E O. Wilson (Ed.), Biodiversity (pp. 83-96). Washington DC: National Academy Press.

Fernandez de Oviedo, G. (1542). Historias de las indias. In J. T. Medina (Ed.), The discovery of the Amazon. (pp. 383-448). New York: Dover Publications.

Garay, L. A. (1978). Flora of Ecuador (No. 9, Orchidiaceae). Stockholm, Sweden: Swedish National Science Research Council.

Gentry, A. H. (1988). Tree species richness of upper Amazon forests. Proceedings of the National Academy of Sciences, 85, 156-159.

Gibbons, B. The plant hunters, portrait of the Missouri botanical gardens. National Geographic, 188 (1), 125-131.

Gutierrez, U. F. (August 30, 1996). Nuevo listado de especies en proceso de extincion [New list of species in process of extinction]. (Resolution 046 en Memorandum No. 088). Tena, Ecuador: Instituto Ecuatoriana Forestal y de Areas Naturales y Vida Silvestre, Distrito Forestal de Napo.

Hilty, S. L., & Brown, W. L. (1986). A guide to the birds of Columbia. Princeton, NJ: Princeton University Press.

Kohn, E. O. (1991). Medical culture of the Runa of eastern lowland Ecuador. (Honors thesis). Oberlin, OH: Oberlin College.

Kopp, G. E. (1994). Exploring the tropics. St. Louis, MO: Missouri Botanical Gardens.

Missouri Botanical Gardenns. (1992). Tropical rainforest suitcase science kit – a tropical feast (Card No. 31). St Louis, MO: Missouri Botanical Gardens, Education Division.

Moffett, M. W. Leafcutters, gardeners of the ant world. National Geographic, 178 (2), 98-111.

Neill, D. A. (1996). Program in experimental restoration of tropical wet forest. (Progress report submitted to the Swedish International Development Agency and Barnen Regnskog: Childrens Rainforest Network, Sweden). Quito, Ecuador: The Jatun Sacha Foundation.

Neill, D. A, & Palacios, W. A. (1989). Arboles de Amazonía [Trees of Amazonia]. Quito, Ecuador: Ministerio de Agricultura y Ganaderia, Dirección Nacional Forestal.

Plotkin, M. (1978). Outlook for new agricultural and industrial products from the tropics. In E.O.Wilson (Ed.). Biodiversity (pp. 106-113). Washington DC: National Academy Press.

Schultes, R. E., & Ruffauf, R. F. (1980). The healing forest – medicinal and toxic plants of northwest Amazon. Portland, OR: Discorides Press.

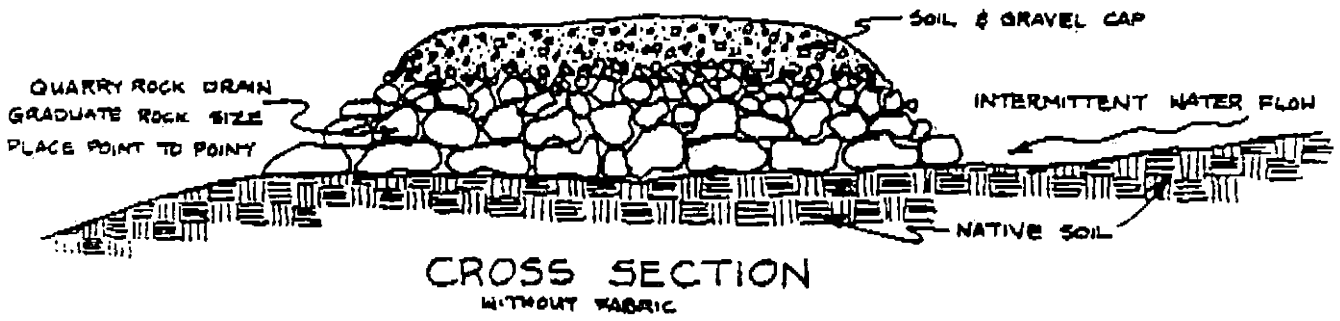
Smithsonian Institution (1988, October). Going, going, gone? Tropical rainforests...How they work, what they do for us, and what's being done to save them. In B. Eisendrath (Ed.), Art to Zoo. (p. 4). Washington DC: Smithsonian Institution, Office of Elementary and Secondary Education.

Zurate, C. G. (1993). Cambio ambiental y appropriación del espacio en la historia de la alta Amazonía Ecuatoriana [Environmental change and appropriation of space in the history of upper amazonian Ecuador]. In L. Ruiz (Ed.), Amazonía: Escenarios y Conflictos [Amazonia: scenes and conflicts] (p. 21). Quito, Ecuador: CEDIME.

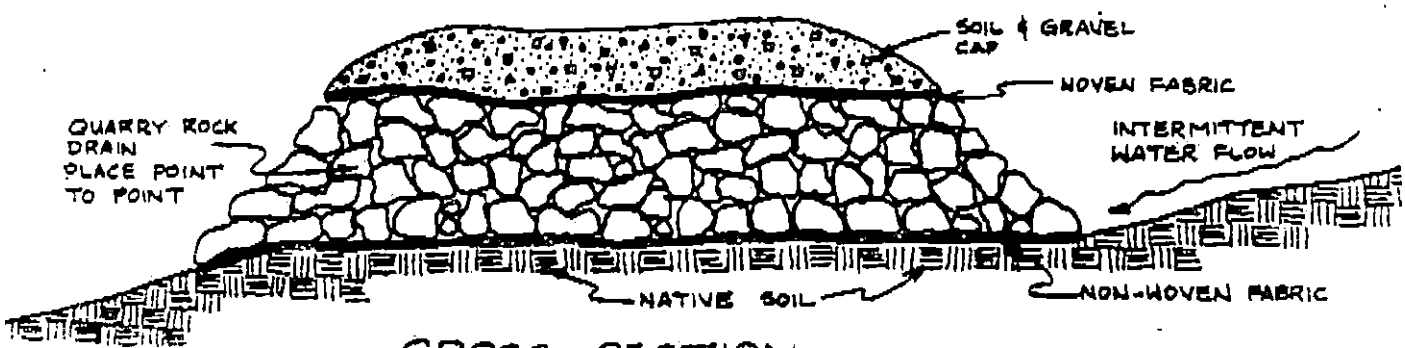
APPENDIX D

Trail Construction Applications for Wet Environments

"Drainage Lense" Treatment for Walking Trails



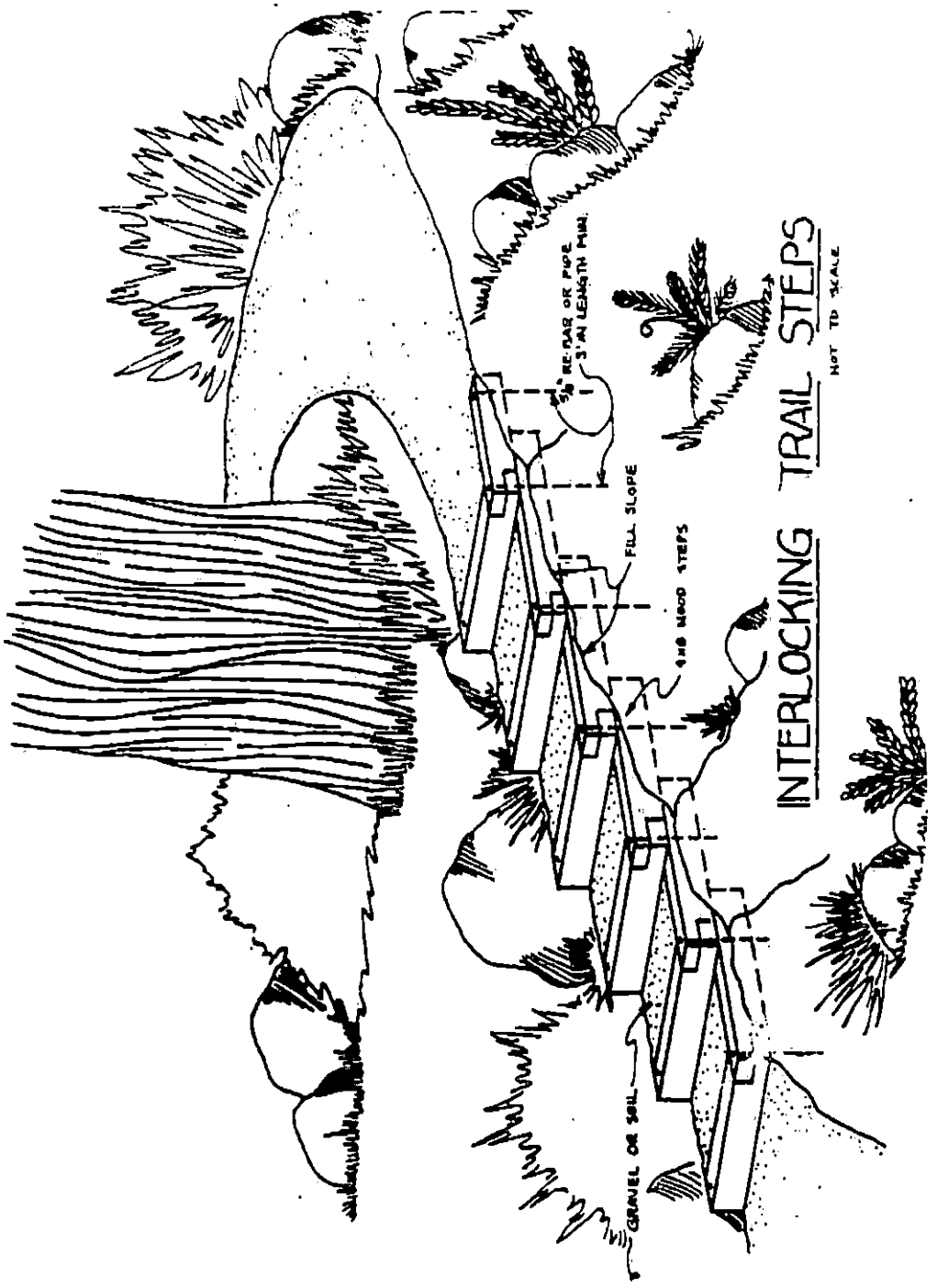
CROSS SECTION
WITHOUT FABRIC



CROSS SECTION
WITH FABRIC

(Figure 9.12 in Recreation Trail Construction and Maintenance, 1991)

"Interlocking Trail Steps" Treatment for Walking Trails



(Figure 11.5 in Recreation Trail Construction and Maintenance, 1991)

APPENDIX E

Author's Photographs from the Trail

Top: Author with Common squirrel monkey (*Saimiri sciureus*) depicted in trail guide. Bottom: Young Tena resident Daniel Cisneros Cardenas, age nine, examines the giant Cuya fruit interpreted at station one. Station markers feature g. *Heliconia* flower design.

Interlocking trail step construction (note rock fill) at Station 4: "The Bird of Paradise".

REFERENCES

Acuña, E. P., et al. (1982). Plan de interpretación y educación ambiental para el parque nacional Manuel Antonio, Canton de Aguirre, Quepos, Costa Rica [Interpretation and environmental education plan for Manuel Antonio national park, municipality of Aguirre, Quepos, Costa Rica]. Turrialba, Costa Rica: Centro Agronómico Tropical de Investigación y Ensenanza (CATIE).

Alvarado, A., & Harvey, C. (1994). Guide to the medicinal plant garden. Quito, Ecuador: Jatun Sacha Foundation.

Andersen, D. L. (1993). Developing ecotourism destinations: Conservation from the beginning, a framework for developing ecotourist facilities within a regional context. Minneapolis, MN: The Anderson Group Architects, Ltd.

Beck, L., & Cable, T. (1998). Interpretation for the 21st century: Fifteen guiding principles for intepreting nature. Champaign, IL: Pergamon.

Berkmuller, K. (1981). Guidelines and techniques for environmental interpretation. Gland, Switzerland: International Union for the Conservation of Nature (IUCN).

Berkmuller, K. (1984). Environmental education about the rain forest. (p. 27). Ann Arbor, MI: University of Michigan, School of Natural Resources, Wildland Management Center. (ERIC Document Reproduction Service No. ED2745580)

Boo, E. (1990). Making ecotourism sustainable: Recommendations for planning. In T. Whelan (Ed.), Nature Tourism (pp. 187-199). Washington, DC: Island Press

Borel, R. (1989). Interraciones en sistemas agroforestales: hombre – arbol – cultivos – animal [Interractions in agroforestry systems: man – cultives – animal]. In J.W. Beer, H.W. Fassbender, & J. Heuveldop, Avances en la investigación agroforestal [Advances in agroforestry investigation]. San Jose, Costa Rica: CATIE (Centro Agronómico Tropical de Investigación y Enseñanza) y GTZ (Deutche Gesellschaft fur Technishe Zusammenarbeit).

Buitrón, X. (1999). Ecuador: uso y comercio de plantas medicinales, situación actual y aspectos importantes para su conservación. [Ecuador: use and commerce of medicinal plants, current situation and important aspects for their conservation]. Quito, Ecuador: UICN/Traffic International.

Chiriboga, D. S. (1985). La vida del bosque - sendero de educación ambiental. parque nacional Sangay [the life of the forest - trail of environmental education. Sangay national park]. (Brochure) Quito, Ecuador: Cuerpo de Paz/Ministerio de Agricultura y Ganaderia.

Cho, K. J. (1996). Key issues for interpretation in developing in developing countries. Proceedings of the National Interpreters Workshop, pp. 288-291. Fort Collins, CO: National Association for Interpretation.

Collins, M. (1990). Introduction to Amazonia. In M. Collins (Ed.), The last rainforests – a world conservation atlas. (pp. 110-129). New York: Oxford University Press.

Davis, S. H. (Ed.) (1993). Indigenous views of land and the environment. (World Bank Discussion Papers No. 188). Washington DC: The World Bank.

Drumm, A. (1991) An Integrated Impact Assessment of Nature Tourism in Ecuador's Amazon Region. London: University of Greenwich, School of Environmental Sciences.

EcoCiencia, (1994). Parques nacionales y otras areas protegidas del Ecuador: Una esperanza para el futuro [National parks and other protected areas of Ecuador: A hope for the future]. (pp. 5, 13). Quito, Ecuador: EcoCiencia.

EcoCiencia, Centro Fatima, Jatun Sacha, Omaere. (1996). Manejo de recursos en el bosque tropical: lecciones aprendida [Management of resources in the tropical forest: lessons learned]. Quito, Ecuador: EcoCiencia.

Ecuador on the World Wide Web (Updated May 16, 1999). Government, the Environment, Law & International Relations. Site: http://www.ecuador.org/law&government.htm#Environment

Ecuador on the World Wide Web (Updated May 16, 1999. History, Geography & Statistics. Site: http://www.ecuador.org/infoecuador.htm

Enriquez, J. R. (1981, December). Generalidades sobre interpretación ambiental [generalities on environmental interpretation]. (Document presented during park ranger training at Galapagos National Park, December 5-22, 1981) (Copy available from Ministerio de Agricultura, Departamento de Areas Naturales y Areas Protegidas, Centro de Documentación, Quito, Ecuador)

Enriquez, J.R., et al. (1989). Plan de interpretación ambiental del parque nacional Cotopaxi [plan of environmental interpretation of the Cotopaxi national park]. Quito, Ecuador: Ministerio de Agricultura y Ganaderia (MAG), Dirección Nacional Forestal, Departamento de Areas Naturales y Recursos Silvestres.

Estación Biológica Jatun Sacha. (1998). Centro de conservación de plantas Amazónicas (CCPA) [Center for the conservation of Amazonian plants] (1998). [Brochure]. Quito, Ecuador: Fundación Jatun Sacha.

Farnsworth, B. E. (1998). Our tropical garden: A self-guided trail interpreting our relationship with the plants of Amazonian Ecuador. Quito: UNICEF (Available in English and Spanish editions from Parque Amazónico, Centro para la Interpretación de la Amazonía Ecuatoriana (CIPAE), Tena – Napo, Ecuador).

Farnsworth, N. R. (1978). Screening plants for new medicines. In E.O. Wilson (Ed.), Biodiversity (pp. 83-96). Washington D.C.: National Academy Press.

Field , D. R., & Wagar, A. (1973). Visitor groups and interpretation in parks and other outdoor leisure settings. Journal of Environmental Education, 5 (1), 12-17.

Fundación Jatun Sacha. (1992, July). Proyecto de Apoyo a Comunidades Cercanas a La Estación Biológica [Project of support to the communities close to the biological station] (Report to the Biological Station). Quito, Ecuador: Author.

Gentry, A. H. (1988). Tree species richness of upper Amazon forests. Proceedings of the National Academy of Sciences, 85, 156-159.

Giannecchini, J. (1992, February) Parks and tourists: An evolving partnership. Paper presented at the IVth World Congress on National Parks and Protected Areas, Caracas, Venezuela. (Ecotourism: An Annotated Bibliography for Planners & Managers, Abstract No. 88, Available from the Ecotourism Society, North Bennington, VT).

Guía de parques nacionales y areas protegidas del Ecuador [Guide to the national parks and protected areas of Ecuador]. 1998. Quito, Ecuador: Proyecto de Instituto Nacional Ecuatoriana de Forestal y Areas Naturales (INEFAN) y Fondo Mundial de Medio Ambiente GEF) para la Protección de la Biodiversidad.

Ham, S. H. (1989). Problems in transferring U.S. environmental education models to developing countries: A case study from Honduras. In Proceedings of the national interpreters Workshops, 401-407. Fort Collins, CO: National Association for Interpretation.

Ham, S. H. (1992). Environmental interpretation – A practical guide for people with big ideas and small budgets. Golden, CO: North American Press.

Ham, S. H., & Enriquez, J. (1987). Review and recommendations for interpretive planning, programming and training in Ecuador's national parks and equivalent areas. Moscow, ID: University of Idaho, Department of Wildland Recreation Management.

Ham, S. H., & Meganck, R. A. (1994, Winter). Environmental interpretation in developing countries: crossing borders and rethinking a craft. Legacy, 5(1), 18-19.

Hicks, J. F., et al. (1990). Ecuador's amazon region - development issues and options. (World Bank Discussion Papers No. 75). Washington DC: The World Bank.

Hongxun, Y. (1982). The classical gardens of China. Translated by W.H.Min. New York: Van Nostrand Reinhold.

INEFAN (Instituto National Forestal y De Area Naturales y Vida Silvestre). (1996, November). La interpretación ambiental como una herramienta para el fomento del ecoturismo en areas protegidas del Ecuador [Environmental interpretation as a tool for the growth of ecotourism in protected areas in Ecuador]. Quito, Ecuador: Ministerio de Agricultura y Ganaderia (MAG), Dirección Nacional Forestal, Departamento de Areas Naturales y Recursos Silvestres.(Photo reproductions available in the Ministerio de Medio Ambiente, Centro de Documentación, Quito, Ecuador).

Ingram, C. D., & Durst, P. B. (1989). Nature-oriented tour operators: Travel to developing countries. Journal of Travel Research, 28 (2): 11-15.

Jansen, C. (1977). Interpretación, que lo que es en Chile? [Interpretation, what is it in Chile?]. The Interpreter, 10 (1), 18-19.

Kay, M. B. (1991). Linking rural development with biological conservation: a development perspective. In M. L. Oldfield, & J. B. Alcorn (Eds.). Biodiversity – culture, conservation and ecodevelopment. (pp. 295-316). Boulder, CO: Westview Press.

Kimerling, J. (1989). Petroleum development in Amazonian Ecuador. Environmental and socio-cultural impacts. Washington DC: Natural Resources Defense Council.

Knapp, D. (1997). The relationship between environmental intepretation and environmental education. Legacy, 8(3), 10-13.

Knudson, D. M., Cable, T. T., & Beck, L. (1995). Interpretation of cultural and natural resources. State College, PA: Venture Publishing, Inc.

Kohn, E. O. (1991). Medical Culture of the Runa of eastern lowland Ecuador. Honors thesis, Oberlin College, Oberlin, OH.

Kuehner, D. (1976). Self-guiding interpretive trails: A design process for better relating the visitor to various environments. The Intepreter, 8 (4), 4-10.

MacKinnon, L. (1985, September). The orientation role of visitor centers in national and historical parks. Research paper submitted in partial fulfillment of the Masters of Museum Studies. University of Toronto, Canada.

Maranda, J. M. (1992). Manual para la interpretación ambiental en areas silvestres protegidas [Manual for environmental interpretation in wild and protected areas]. (Documento Tecnico No. 8, Proyecto FAO/PNUMA FP 6105-85-01). Santiago, Chile: Oficina Regional de la Organización de las Naciones Unidas para la Agricultura y La Alimentación (FAO) para America Latina y el Caribe. (Photo reproductions available in Ministerio de Medio Ambiente, Centro de Documentación, Quito, Ecuador).

Marles, R. J., Neill, D. A., & Farnsworth, N. R. (1988). A contribution to the ethnopharmacology of the lowland Quichua people of Amazonian Ecuador Revista de la Academia Colombiana de Ciencias Exactas, Fisicas y Naturales, 16 (63), 111-120.

McColm, M. (1993). Save the Rainforest Course Manual. (Brochure). Quito, Ecuador: Jatun Sacha Foundation.

McCoy, M. (1977). Interpretation in Nicaragua. The Interpreter, 10 (1), 19-20.

MEC, UNESCO, & EcoCiencia. (1994). Agenda Ecuatoriana de educación y comunicación ambiental para el desarrollo sustenable. Lineamientos de Politicas y Estrategias [Ecuadorian agenda of education and environmental communication for sustainable development. political and strategic guidelines]. Quito, Ecuador: EcoCiencia, Centro de Publicaciones.

Medina, G. (1989). Campesinos and conservation. Joining forces through environmental education. Washington DC: World Wildlife Fund.

Ministerio de Educación y Comunicación (MEC). (1991). Situación de la educación Ecuatoriana. Taller nacional de discusión de la Agenda educación para el siglo XXI [Situation of Ecuadorian education. National workshop to discuss the educational agenda for the 21st century]. Quito, Ecuador: Author.

Ministerio de Medio Ambiente, (1996). Lista de organizaciones gubernamentales y nogubernamentales que cuentan con departamentos del medio ambiente [Directory of government and non-government organizations with environmental offices]. (Available from the Ministerio de Medio Ambiente, Centro de Documentación, Quito, Ecuador)

Moya, A. (1997). Etnos, atlas etnográfico del Ecuador [Etnos, ethnographic atlas of Ecuador]. Quito: Proyecto de Educación Bilingue Intercultural .

Mullins, G. W. (1984). The Changing Role of the Interpreter. Journal of Environmental Education 15, (4), 1-5.

Myers, N. (1984). The primary source: Tropical forests and our culture. New York: W. W. Norton.

Myers, N. (1988). Threatened biotas – hot spots in tropical forests Environmentalist, 8, 1-20.

Myers, N. (1988). Tropical rainforests and their species: Going, going...?" In E. O. Wilson (Ed.), Biodiversity. (pp. 28-35) Washington, DC: National Academy Press.

Neill, D.A. (1991, September). Ecuador forest sector development project – flora of Ecuador sub-project. (Final report). St. Louis, MS: Missouri Botanical Garden.

Neill, D.A. (1996). Program in experimental restoration of tropical wet forest. (Progress report submitted to the Swedish International Development Agency and Barnen Regnskog: Childrens Rainforest Network, Sweden). Quito, Ecuador: The Jatun Sacha Foundation.

Neill, D. A, & Palacios, W. A. (1989). Arboles de Amazonía [Trees of Amazonia]. Quito, Ecuador: Ministerio de Agricultura y Ganaderia, Dirección Nacional Forestal.

Nelson, R. (1993) Searching for the lost arrow: Physical and spiritual ecology in the hunter's world. In S. R. Kellert & E. O. Wilson (Eds.), The biophilia hypothesis (pp. 201-228). Washington, DC: Island Press.

Padua, S. M., & Jacobson, S. K. (1993). A comprehensive approach to an environmental education program in Brazil. Journal of Environmental Education, 24 (4), 29-36

Paz y Miño, R. & Farnsworth, B. E. (1997) Propuesta para convertir al parque amazónica "La Isla" en un centro de interpretación para la Amazonía Ecuatoriana (CIPAE) [proposal to convert Amazon park "the island" to a center for the interpretation of Amazonian Ecuador] (Funding proposal). Tena, Ecuador: Municipal Government of Tena.

Peters, C. M., Gentry, A. H., & Mendelsohn, R. O. (1989). Valuation of an Amazonian rainforest. Nature 339, 655-656.

Prance, G. T. (1985). The changing forests. In G. T. Prance, & T. E. Lovejoy (Eds.), Amazonia (pp. 146-163). New York: Pergamon Press.

Propst, D. R., & Roggenbuck, J. W. (1981) A guide to cultural and environmental interpretation in the U.S. Army Corps of Engineers. (Instruction Report R-81-1). Vicksburg, MS: U.S. Army Engineers Waterways Experiment Station.

Recreation trail construction and maintenance. (1991). (unpublished manuscript). Eureka, CA: State of California, Department of Parks and Recreation, Klamath District.

Regnier, K., Gross, M., & Zimmerman, R. (1992). The intepreter's guidebook: techniques for programs and presentations. Stevens Point, WI: University of Wisconsin- Stevens Point Foundation Press, Inc.

Roth, C.E., & Lockwood, L.G. (1979, December). Strategies and activities for using local communities as environmental education sites. Columbus, OH: Ohio State University, College of Education and School of Natural Resources. (ERIC Document Reproduction Service No. EDR 194349, available at DYN-EDRS, Inc., Springfield, VA (800) 443-2852).

Sharpe, G. W. (1982a). An overview of intepretation. In G. W. Sharpe (Ed.), Interpreting the environment. New York: John Wiley & Sons, Inc.

Sharpe, G.W. (1982b). Self-guided trails. In G. W. Sharpe (Ed., Interpreting the environment. New York: John Wiley & Sons, Inc

Shepard, P. (1967). Man in the landscape: A historic view of the esthetics of nature. New York: Knopf.

The Peace Corps Handbook. (1978). US Government Printing Office Stock No. 056-000-00020-8). (pp. 4-20). Washington DC: US Peace Corps.

Trapp, S., Gross, M., & Zimmerman, R. (1994). Signs, trails and wayside exhibits. Connecting people and places. (2nd edition). Stevens Point, WI: University of Wisconsin-Stevens Point Foundation Press, Inc.

Ulrich, R. S., Dimberg, U., & Driver, B. L. (1991). Pyschophysiological indicators of leisure benefits. In B. L.Driver, P. J. Brown, and G.L. Peterson (Eds.), Benefits of leisure. State College, PA: Venture.

Vanzolini, P. E. (1973). Paleoclimates, relief, and species multiplication in equatorial forests . In B. J. Meggers, E. S. Ayensu, & W .D. Duckworth (Eds.), Tropical forest ecosystems in Africa and South America: A comparative review. Washington DC: Smithsonian Institution Press.

Wagar, A. J. (1978). Why interpretation? Meeting the challenge. Journal of Interpretation, 3 (1), 6-10.

Wallace, G. (1993). Wildlands and ecotourism in Latin America – investing in protected areas. Journal of Forestry, 91 (2), 37-40.

Wesche, R. (1991). The Ecotourist's Guide to Amazonian Ecuador (Napo Province). Quito, Ecuador: Feprotur.

Wilson, E. O., (1988). The current state of biological diversity. In E. O. Wilson (Ed.), Biodiversity. (pp. 3-18). Washington, DC: National Academy Press.

Wilson, M. A., & Laarman, J. G. (1988). Nature tourism and enterprise development in Ecuador. World Leisure & Recreation, 28 (1), 22-27.

Zehr, J. M., Gross, M., & Zimmerman, R. (1994). Creating environmental publications - a guide to writing and designing for interpreters and environmental educators. Stevens Point, WI: University of Wisconsin – Stevens Point Foundation Press.