

**MANABÍ DRY FOREST CONSERVATION PROJECT**  
**YEAR TWO**

**Annual Progress Report for the San Diego County Orchid Society**

**Ceiba Foundation for Tropical Conservation**

prepared by  
Joe E. Meisel

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## I. Introduction

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### A. General Introduction

Ecuador has one of the most diverse orchid floras in the world (ca. 4,250 species) with endemism in excess of 70% (Gentry & Dodson 1987). Outside of the country's national park system, considerable areas of pristine habitat remain on private lands, creating a unique opportunity for local landowners to contribute to orchid conservation (Meisel & Woodward 2005). The Ceiba Foundation for Tropical Conservation has worked since 1997 to protect orchids and other species using private lands conservation in key areas in Ecuador: habitats with high levels of diversity, endemism, or threat of loss. This annual report, covering the second year of funding provided by the San Diego County Orchid Society, summarizes our activities to date in one of these areas, the coastal deciduous forests of northern Manabí, an ecological transition zone between the wet Chocó region to the north and the dry forests to the south.

Deciduous and semi-deciduous forests are the most threatened of terrestrial tropical ecosystems. In Ecuador, less than 2% of this habitat remains (David Neill, pers. comm.). Despite the overwhelming human pressure on this ecosystem, it has received disproportionately little attention from the scientific and conservation community, and many plant and animal species endemic to this biome are now vulnerable to extinction. While most orchidists have focused virtually all of their conservation efforts so far on moist forest ecosystems such as rain forests and cloud forests, there are more orchid species and higher rates of endemism in the deciduous forests of western Ecuador (156 spp. below 300 m) than in the Amazon rainforest of eastern Ecuador (138 spp. below 300 m) in the same land area (IUCN/SSC Orchid Specialist Group 1996). Surveys conducted by Dodson and Gentry (1991) as far back as the 1980's estimated that 27% of 250 orchid species found in western Ecuador were endemic. Unfortunately, natural populations in this diverse orchid habitat may well disappear before their distribution and ecology are completely understood.

Conservation International's selected the Chocó-Manabí Corridor (within the Tumbes-Chocó-Magdalena Hotspot) as a priority site for its Critical Ecosystem Partnership Fund. Their documents highlight the enormous diversity and endemism of the region. "The Chocó-Manabí Conservation Corridor has an extremely high degree of endemism -- by some estimates, one of the highest in the world, possessing several important attributes from a conservation perspective: biogeographically important as a transitional area between two hotspots (Tropical Andes and Chocó); the most floristically diverse region in the Neotropics; habitat for 6,300 species of plants, 20% endemic" (CEPF 2005).

### B. Proposal Summary

The Manabí Dry Forest Conservation Project seeks to protect the tropical deciduous forest habitat in northern Manabí province through a combination of the establishment of forest reserves, environmental education, reforestation and scientific research. Although orchids remain a little-studied feature of coastal dry forests, there is substantial evidence of their diversity in this habitat. Project goals include identification of forested sites that harbor rare or endemic species, followed by negotiation of conservation agreements with landowners of these properties; protection of habitat through reserve management and support for local conservation initiatives; and promotion of sustainable development in the region through environmental education and capacity-building programs. The proposal funded by SDCOS provided support for several distinct aspects of the overall project:

- a. orchid surveys within the Lalo Loor reserve and Manabí forest remnants
- b. create facilities to receive and educate visitors, volunteers and researchers
- c. develop environmental education programs for the reserve and the region
- d. carry out conservation prioritization survey visits to nearby properties

## II. Summary of Progress - Year Two

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We are pleased with the success of our conservation efforts to date in northern Manabí province. The Ceiba Foundation and the Lalo Loor Dry Forest Reserve now are recognized locally not only for the conservation of forested habitat in the region but also for our dedication to the well-being, education and sustainable development of the local communities. We have worked collaboratively with community leaders, local schools, the regional association of tourism operators and the municipal government, not to mention the Peace Corps and scientists from a variety of US and Ecuadorian universities and research organizations.

The Lalo Loor reserve continues to demonstrate that forest conservation carries innumerable benefits to the landowner as well as surrounding communities. Local people are gaining a deeper interest in the natural world, and continue to implement ways to combine business schemes with habitat protection. In the last two years, community members have formed an Ecological Association, begun planning for a federally-sponsored series of naturalist guide training workshops, opened “green” businesses selling locally-produced crafts, and confronted citizens violating laws protecting water and forest resources.

Tourism to the region is increasing, and visitors arrive with an understanding that northern Manabí provides a unique blend of sandy beaches and attractive forests. Birdwatchers, campers, hikers, photographers, and those that just want to get their first look at a howler monkey have been arriving in the region in greater numbers each year. The municipal government realizes that this form of nature tourism represents an important source of revenue for the region, and has been promoting the image of northern Manabí as a nature destination for several years.

By way of further summary, we include below the list of “Upcoming Priorities and Objectives” that was provided in our previous report, along with summaries of the progress made towards each:

1. Conduct orchid inventories in at least one of higher elevation sites: the northeastern corner of the BSLL reserve (up to 420 m), the coastal ridgeline to the east (up to 800 m), or the isolated hill near Jama (up to ca. 500 meters); and coastal citrus grove. *The first two of these three sites were inventoried in 2007.*
2. Monitor orchids marked during the preliminary survey to confirm taxonomic identifications and assess reproductive success. *Several identifications have been made from collected orchids in the BSLL garden.*
3. Sign a conservation agreement to protect the ca. 500 hectare forest patch south of BSLL, a priority site with substantial mature forest and an owner interested in conservation. *Progress continues on reaching this agreement, with Ceiba recently contributing volunteer labor to construct nature trails in the reserve.*
4. Continue the teaching training program in environmental education in the communities of Jama, Tabuga and Camarones. *Peace Corps volunteers, Ceiba student interns, and other volunteers have continued these programs around the calendar.*
5. Begin construction of the Environmental Education Center to house educational displays on dry forest flora and fauna, ecology and conservation. *The center is complete, with installation of displays currently underway.*
6. Continue improvements to the reserve’s infrastructure, including the trail systems and biological station. *New trails have been added, and considerable improvements to the station completed.*

## III. Use of SDCOS Funds

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SDCOS funds for the second year were spent in accordance with the revised proposal budget (see appendix, page 13). Marlon Nuñez’s salary as part-time director of the reserve has been supported, along with purchase of supplies and materials for the biological station. Orchid surveys and other biological inventories were carried with SDCOS funds supporting lodging and transport. Funds for environmental

education display supplies are being spent on final stages of construction of the Lalo Loor EcoCenter and the displays that will occupy the building: signs, mosaics, exhibit panels, display cases, etc. Detailed accounting of all program funds utilized can be provided upon request.

The Ceiba Foundation has made a significant commitment, in terms of personnel and funding, to the Manabí dry forest project, which now constitutes our primary interest in Ecuador. Beginning in June of 2008, we will hire a full-time director of the reserve, as well as a full-time volunteer coordinator. We have expanded our collaboration with the US Peace Corps, which will send a third volunteer to the region in 2009. We initiated in 2008 a new collaboration with the Global Health program from the University of Wisconsin master's program in Environmental Health. This summer, the program will send four graduate students to the region to study the relationship between watershed forest cover and water quality, and conduct baseline surveys of the rural health needs and facilities in the area.

Additional funding proposals for the diverse aspects of the Manabí Conservation Corridor program are planned for the US Peace Corps and USAID, the Overbrook Foundation, Fauna and Flora International, the Orchid Conservation Alliance, the Blue Moon Foundation, and the US Fish and Wildlife Service. We hope that the San Diego County Orchid Society will remain committed to supporting our floristic studies of the area's orchids, environmental education programs, and habitat protection efforts in this biologically diverse and threatened region.

## **IV. Detailed Progress Report**

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### **A. Orchid Surveys & Biological Inventories**

#### **1. Orchid Surveys**

The first qualitative assessment of orchid diversity and relative abundance in the Lalo Loor Dry Forest reserve and surrounding areas was conducted by Dr. Catherine L. Woodward (Ceiba) and Francisco Tobar (Quito Botanical Garden) from March 20-27, 2006. Results of this survey were provided in our previous progress report (April 2006), and included twenty-seven species of orchids in at least 23 genera. Please consult that report for general descriptions of the regional orchid flora, which are only summarized here:

*Dimeranda rimbachii* remains the most abundant epiphytic orchid at BSLL, and for that matter throughout lower elevation areas in region. Its attractive lavender flowers grow on virtually every mature tree within closed-canopy forest; this abundance led us to nominate this species as the County Flower for the canton (county) of Jama, where the reserve is located (see Summary of Progress, below). Other abundant species include *Catasetum expansum*, *Oncidium hyphaematicum*, and *Lockhartia serra* and *Notylia* cf. *replicata*. Attractive species that occur in this region but at lower densities include *Psychopsis kramerianum*, *Huntleya fasciata*, and *Cattleya maxima*.

In 2007 we conducted additional surveys in three locations: the highest (and wettest) portion of BSLL, a neighboring property owned by Mr. Nevardo Loor and managed by his conservation-minded son Leonardo Loor, and a nearby property at higher elevation (ca. 500 m) owned by Mr. Melchior Chica. Participants included Drs. Joe Meisel and Catherine Woodward (Ceiba), Javier Robayo (at that time of the Jocotoco Foundation, currently with Ceiba), and BSLL staff (Máximo Aguinde and two assistants); identifications were made, where possible, with the assistance of Monica de Navarro (Quito Orchid Society), Francisco Tobar (Quito Botanical Garden), and members of the San Diego County Orchid Society.

#### **1a. Bosque Seco Lalo Loor - NE Corner**

The Lalo Loor reserve covers a sloping watershed, with moist forest along the streamsides dominated by *Ficus* trees, and drier forest on stony ground occupying the ridges. However, at the uppermost end of the reserve, the northeast corner, the forest reaches to nearly 250 m of elevation and receives a

considerable amount of moisture from sea breezes pushed up the hillside. Therefore, the habitat in this portion of the reserve is quite distinct from the lower areas, with a greater abundance of epiphytes, mosses, tree ferns and other plants characteristic of wetter conditions.

Orchid surveys were conducted in this area in August of 2007, yielding several species not previously seen (see appendix, pages 1-3). A greater abundance of orchids, and other epiphytes, was noticed immediately upon reaching the higher elevation (200 m) portions of the forest. Although some evidence of prior logging was observed, these steeper slopes of the reserve have remained relatively protected due to the difficulty of extracting timber. Therefore, there are a considerable number of mature canopy trees, offering extensive habitat for epiphytic mosses, ferns, *Piper* species, and certainly orchids.

Commonly occurring in higher-elevation, wetter habitats were one or more species of *Ornithocephalus*. Also abundant, perhaps comprising over 25% of individuals sighted, was *Epidendrum anceps*, which was photographed in flower. An attractive *Notylia* species (sp.1; likely *N. replicata*) also was photographed in flower. We also collected several species without flower, apparently new to the reserve: these included a *Gongora*, a (likely) *Prosthechia*, several unidentified specimens, and what is likely *Pescatoria wallisi*, based on a specimen collected at a nearby property (see below). Several specimens were brought to Quito for identification, but have not successfully flowered.

Climbing *Vanilla pompona* and *V. planifolia* plants, more vigorous than we had observed in the lower areas, reached over 15 m into the subcanopy. On the way down from the survey, we encountered numerous terrestrial *Palmorchis*, which had just completed flowering: dry spikes were in evidence on many specimens. Return surveys are planned for July of 2008 to attempt to collect mature flowers of this species.

We also can happily report that several of the orchids collected within the reserve and installed in the orchid collection came into flower during the past year, allowing us the opportunity to photograph and these species (most of which had been identified already). A sample of these photographs are provided in the appendix (pages 4-5), including an attractive *Notylia* cf. *replicata* inflorescence, a *Lockhartia serra* flower, a fine *Campylocentrum micranthum*, along with better images of *Dimerandra rimbachii* and *Catasetum expansum* (slightly past its prime, unfortunately!) than we were able to provide last year. In addition we include a repeat photograph of the stunning *Psychopsis kramerianum*, and a striking bridal veil mushroom (*Dictyophora* sp.) recently found growing within one of the National Herbarium's phenology plots.

As an interesting aside, we continue to note an apparently low rate of pollination in the orchids at the Lalo Loor reserve: many specimens have been seen in flower, but few with seed capsules. It would be a valuable research project to study whether this low reproductive rate is characteristic simply of dry forest orchids in general, or is more directly related to conditions at Lalo Loor, such as the small size of the forest or, possibly, a reduced abundance or diversity of pollinators.

### **1b. Melchior Chica property**

Surveys of this area were conducted in August of 2007 by Catherine Woodward, Javier Robayo and Joe Meisel. A combination of 4-wheel-drive vehicle, hiking, and horseback brought us to the upper ridgeline (480 m) of an approximately 30 ha property owned by Mr. Melchior Chica. The lower section of the property is a disused, mixed-crop agricultural area, but the upper area contains a very humid forest that connects to the much larger (ca. 500 ha) property of the family of Tito Santos. Winds from the ocean carry moisture up the steep hills of the property, which condenses in a near-perpetual mist along the ridge (for this reason, unobscured satellite imagery of these hilltops has been extremely difficult to obtain). The area is rich in epiphytes, and after examining recent treefall gaps that brought canopy species to the forest floor, we discovered large numbers of orchids, including several species not previously encountered in the Lalo Loor reserve.

We spent several days camping on the ridge, and conducted *ad hoc* sampling of the orchid fauna. Photographs were taken of species in flower, and representative samples were collected of all species. These were later given to members of the Quito Orchid Association for identification, although none have

yielded flowers in the dry and cool climate of Quito. In brief, the survey revealed an additional pool of species for the region, more adapted to the humid, cooler climate of the cloudy ridgelines. As we neither were able to identify many collected specimens, nor did time constraints permit a more exhaustive survey, these upper peaks of the coastal mountain range (some of which reach 700 m) merit further and more intensive study.

Of the species we observed, *Pescatoria wallisi* was photographed in flower, a species not known from within the Lalo Loor reserve, although a specimen collected (see section 1a) without flowers may very well be the same species (see appendix, pages 6-7). *Masdevallia nidifica* also was found in several locations. Another attractive orchid encountered was a terrestrial *Cyclopogon*, only one specimen of which was seen, but photographed in flower. Other identifications to genera included a *Dichea*, and a *Pleurothallis* (see appendix), and what is either a species of *Elleanthus* or *Sobralia*, a *Gongora*, and a putative *Miltoniopsis*. Several specimens of what may be the same *Notylia* species as observed in the Lalo Loor survey also were observed in the Melchior Chica property. We include also several photographs of Araceae specimens, and an attractive flower of a *Heisteria* species (Olacaceae).

### **1c. Nevardo Loor property**

Brief surveys of this large and varied property were carried out in August of 2007 by Joe Meisel and Javier Robayo of the Ceiba Foundation. The property has an extension of some 400 ha, of which approximately 350 ha is a mix of secondary and primary forest. Located directly south of the Lalo Loor reserve, the Nevardo Loor property is of great interest due to its possible role in connecting the reserve to the larger corridor of forest patches in the region (see appendix page 12).

Nevardo Loor is the brother of Lalo, the reserve owner, and father to Leonardo Loor, a young man with a great deal of vision and respect for conservation. Leonardo has constructed several tourist cabins on his portion of the family land, and has expressed interest in working with Ceiba to develop nature trails into the forested portion of the property. Among other attractions, the Nevardo Loor property has several extremely large specimens of *Ceiba trichastandra*, one measuring 11 m in circumference (5.8 feet in diameter)! We continue to explore options with Nevardo and Leonardo exchange Ceiba Foundation assistance in trail construction for a conservation agreement.

Surveys of several of the stream valleys within the property, as well as a line of coastal hills with views overlooking the ocean revealed that the much of the forest is in good condition. Despite evidence of current and past logging, and the presence of a number of small pastures, the property still contains a large amount of late-secondary and some primary forest that harbors a considerable biodiversity of plants and animals. However, orchids that were photographed and collected during this survey have not yet been identified, beyond one specimen that is either a *Mormodes* or *Cynoches* (see appendix, page 8). Many high-quality forest trees were observed, as well as some large specimens of *Zamia lindenii* growing atop the hill to which the landowners wish to develop a hiking trail (see appendix, page 9).

## **2. Bird Surveys**

Mist-net bird surveys were conducted in the reserve in March of 2006, and ongoing inventory work by reserve and Ceiba staff, visiting scientists and others continue to add species to the list, which numbers more than 170 species. Please see our previous progress report for details of the mistnetting results and general comments about the bird fauna. To date, the reserve's avifauna includes 11 species considered by the IUCN to be endangered (en), vulnerable (vu), or near threatened (nt), including:

- Little Tinamou (*Crypturellus soui*) - nt
- Pale-browed Tinamou (*Crypturellus transfasciatus*) - nt
- Gray-backed Hawk (*Leucopternis occidentalis*) - en
- Rufous-headed Chachalaca (*Ortalis erythroptera*) - vu
- Rufous-necked Wood-Rail (*Aramides axillaris*) - lc

Red-masked Parakeet (*Aratinga erythrogenys*) - nt  
Little Woodstar (*Chaetocercus bombus*) - vu  
Orange-fronted Barbet (*Capito squamatus*) - nt  
Guayaquil Woodpecker (*Campephilus gayaquilensis*) - nt  
Pacific Royal Flycatcher (*Onychorhynchus occidentalis*) - vu  
Slaty Becard (*Pachyramphus spodiurus*) - en

New discoveries in the area worthy of reporting include the Rufous-necked Wood-Rail (*Aramides axillari*) within the BSLL reforestation plot, and the confirmation by researchers from BirdLife International of the presence of Esmeraldas Woodstar (*Chaetocercus berlepschi*) in Cerro Nueve, a few kilometers south of the reserve. The Wood-Rail sighting represents the first known observation of this species in the province of Manabí, and only the second record in the country north of Guayas province. This apparent rarity is somewhat misleading, since these birds are difficult to observe in the tall reeds they prefer; however, the sighting at BSLL highlights the lack of studies conducted in this region, where many species have gone unnoticed. We also have documented a number of considerable important range extensions for species at the reserve (e.g., White-throated Spadebill), which further underscore this observation.

The Esmeraldas Woodstar was confirmed in upper-elevation (ca. 400 m) forest near the town of Jama, about 20 km south of the reserve. The occurrence of this species in the region is significant since it is a highly endangered species formerly thought to inhabit only a very restricted range that terminated well north of our area. Moreover, the forest in which it was discovered is similar floristically to the upper reaches of BSLL, and therefore it is quite possible the species may occur within the reserve as well. The range extension may lead to the possibility of acquiring funds through BirdLife International and the Audubon Society for habitat protection in our region.

## **B. Visitor Education & Research Facilities**

### **1. Lalo Loor Dry Forest Reserve Conservation**

Site surveys and conversations with experienced field biologists confirmed that the finest primary forest remnant of tropical deciduous forest in the northern Manabí region was a 200 ha forest owned by Mr. Lalo Loor, near the town of Tabuga (Neill et al. 1999). Negotiations began in 2004, and a formal conservation agreement, establishing the Lalo Loor Dry Forest Reserve, was signed in January of that year between the landowner, the Ceiba Foundation for Tropical Conservation, and the Fundación Jatun Sacha.

Currently Ceiba and Mr. Loor are discussing options for extending and strengthening the agreement, so that the reserve receives recognition at a national level. Three forms of protection are under consideration: a stronger and more detailed private conservation agreement; a full conservation easement, such as was signed by the El Pahuma Orchid Reserve; or establishment of the reserve at the federal level as a Bosque Protector Privado (“Private Protected Forest”). Negotiation and formalization of a new conservation agreement constitute an important priority for the upcoming year.

Indeed, due to the revision of many national laws governing land ownership and tax assessments, there is a considerable interest in the northern Manabí region among owners of large forest tracts to declare those lands under conservation status to avoid their appropriation or excessive taxation by the government. Ceiba is discussing with the Jama municipal government and local landowners the possibility of declaring the entire region as a single, large Bosque Protector Privado, in which zones will be established separating agriculturally productive lands from sustainably managed and inviolable forests. There are numerous examples of such a conservation strategy (e.g., the Bosque Protector of Toachi-Pilatoa, east of Santo Domingo), which can benefit any landowner who wishes to inscribe his or her forest into the agreement.

## **2. Research Facilities**

Facilities to house researchers and volunteers were constructed within the reserve by the end of 2005, financed in part by SDCOS funds. Since that time, significant improvements have been made to the infrastructure, including kitchen upgrades, new showers and bathrooms, and improvements to the roof. The research station now accommodates up to 24 visitors.

The reserve is used by a variety of groups. A fledgling volunteer program has blossomed in the last two years, and BSLL now receives 20 - 25 volunteer\*months per year. Ceiba brings courses to BSLL twice a year, and local school groups visit often (see Environmental Education section below).

Since the reserve was established, numerous investigators have initiated research programs at BSLL, or have announced plans to work there in the near future. These projects include:

Dr. David Neill & Jimmy Cevallos, Ecuador's National Herbarium: permanent phenology plots  
Dr. Kathy Jack, Tulane University: preliminary primate studies on Capuchin monkeys  
Paul Hamilton, ReptileResearch.org: surveys of herpetological diversity patterns  
Karl Berg & Dr. Steven Beissinger, UC Berkeley: Pacific Parrotlet breeding  
Dr. Keith Willmott, University of Florida: patterns of butterfly diversity  
University of Wisconsin's Global Health Program: assessment of rural health services and needs

The reserve's trail system has continued to be expanded and improved. Volunteers in 2007 and 2008 worked hard to install a new trail cutting across the lower portion of the reserve, and to open a perimeter trail that can be used to control reserve boundaries and monitor for incursions. Students in Ceiba's annual semester-abroad program are working in the month of April 2008 to improve the quality and lifespan of all the main trails, through installation of erosion control measures, bridges, handrails, etc.

Our principal focus at the reserve is the self guided trail called the Mariposa (Butterfly) Trail. This trail departs from the newly constructed EcoCenter (see below), and loops through level ground that is accessible to visitors of all levels of ability. The trail was outfitted with informative signs by a Canada Corps volunteer in 2006, highlighting species and ecological processes characteristic of the dry forest, as well as the connections between these forested watersheds and human communities, such as provision of fresh water. Upgrading these signs, by improving their durability and correcting slight taxonomic errors, constitutes another priority for the upcoming year. We believe that the majority of day visitors will be accommodated by this trail, which offers an excellent introductory visit to the dry forest habitat.

## **3. Environmental Center at Lalo Loor Reserve**

In order to provide a rich variety of ecological, cultural, tourism and conservation information to foster local awareness of the Lalo Loor Dry Forest, Ceiba began construction of an Environmental Center (EcoCenter) in 2007. Thanks to the financial support of the SDOCS, and a collaboration between the Ceiba Foundation, the municipal government of Jama, the Association of Tourism Providers of Jama, Fundación Jatun Sacha and Mr. Lalo Loor, the EcoCenter is scheduled to open to the public in June of 2008 (see appendix, page 10). The center will be the first of its kind in the region and will offer visitors, not only to the reserve but also to the northern Manabí area, with an informative and entertaining displays providing introduction to the flora, fauna and cultural that can be enjoyed in the area.

The contents of the EcoCenter will focus on five areas. First, a series of displays will educate visitors about the ecology of the coastal dry forest, and about the biology of the monkeys, orchids, boa constrictors, hummingbirds, palms, anteaters and other charismatic species it supports. Second, maps will orient visitors to the specific activities the reserve has to offer, such as self-guided trails, overlooks of the Pacific Ocean, waterfalls, and more. Third, displays will remind residents and visitors alike that conservation of this ecosystem is a proactive process, requiring the participation of everyone if future generations can enjoy the terrestrial and marine resources of the region. Fourth, visitors will be presented with information about the wide variety of tourism attractions that Jama County has to offer, including



other natural sites and activities (e.g., beaches, waterfalls, whale watching), as well as restaurants and hotels in the vicinity. In this fashion, visitors to the reserve also can contribute much-needed income to locally-run businesses, which in turn can direct their guests to plan a day hiking in the reserve. Finally, the EcoCenter will serve as the county's first public museum of archaeological pieces from the rich pre-Colombian cultures of the Valdivia, Chorrera and Jama-Coaque cultures (flourishing between 1500 BC and 1500 AD). Although the city of Jama has long planned for such a museum, construction still has not begun; however, the municipality and with many local collectors have agreed to loan pieces for display in the EcoCenter, on a rotating basis.

The center is located in foremost section of the reserve, just along the main coastal road. The backdrop for the center (see appendix) is the lush, mountainous forest of the reserve itself, behind which rises another range of even higher coastal mountains. Prior reforestation efforts at Lalo Loor now have succeeded in replacing a hot, dry pasture behind the reserve with a mix of native tree species that we expect will form a closed canopy within the year (current tree heights are between 2-7 m, depending on species and time of planting). The main entrance trail into the reserve departs from the EcoCenter, and passes through the reforestation plot before entering a large area of well-developed secondary forest on level ground, ideal for day visitors of any age and ability. The introductory Mariposa Trail (a 30-minute loop) connects to the rest of the reserve's trail system, along which visitors can explore the intact, primary forest found further inside the watershed.

## **C. Community Environmental Education & Awareness**

### **1. School Programs**

Ceiba began working with the municipal government of Jama in 2005, through a teacher training program funded in part by SDCOS funds. That program has led to more focused efforts in area schools, particularly in the closest town of Tabuga, and the city of Jama. Staff of the foundation, students enrolled in Ceiba's semester abroad program, and two Peace Corps volunteers (see below) have led environmental education classes, assisted with community gardens and other projects, and organized trips to the reserve for students.

In the town of Tabuga, course participants spent the month of April 2007 working with K-12 classes and their teachers. Environmental themes were presented to school children (see appendix, page 10) and training was provided to their teachers to ensure these programs would continue to be implemented. Our students worked closely with Tabuga's Peace Corps volunteer, Andrea Crosby, who continues to improve and expand these activities, including the formation of an Ecological Club for young students.

In the town of Camarones, located behind the Lalo Loor reserve, another semester abroad student worked with the community to teach basic environmental concepts to young (K-8) students and their teachers (see appendix, page 11). This student worked with teachers and other community members to install a small vegetable garden in the school yard, a project proposed by the community and put into action through the combined labor of the local students, their teachers, staff of the Lalo Loor reserve and our semester abroad student. These programs received a boost of support when the Peace Corps awarded the region's second volunteer to Camarones (Paul Harbison); having arrived in April of 2008, the new volunteer will continue working on environmental education and sustainable agriculture projects. Environmental awareness campaigns in this community are important as it is known that the majority of illegal logging and poaching pressure on the Lalo Loor reserve come from residents of Camarones or its vicinity.

### **2. Peace Corps Collaboration**

Since 2007 Ceiba has been building a strong collaborative relationship with the US Peace Corps. The Foundation agreed to assume the role of local coordinator for Corps volunteers in northern Manabí. In April 2007, Andrea Crosby began her two-year term in the town of Tabuga, located by the entrance of the

Lalo Loor reserve. Her assignment is dedicated to environmental education in the schools of Tabuga and more than a half-dozen other communities in the region. She is deeply dedicated to our conservation projects at BSLL, often serving as a staff assistant when large groups arrive, and she has organized many school visits to the reserve as part of her environmental education programs.

In April of 2008 a second volunteer, Paul Harbison, began a two-year assignment in the community of Camarones, located behind the Lalo Loor reserve. Paul is charged also with implementing environmental education programs, but also developing sustainable agriculture and forestry projects for his community. As with Ms. Crosby, Ceiba is serving as Mr. Harbison's coordinating agency: we provided a student volunteer in early April to prepare the community for his arrival, and "jump start" several of the projects that represent joint Ceiba - Peace Corps priorities.

We expect to continue to work with the Corps, not only implementing environmental education programs, but equally importantly promoting sustainable development projects throughout the region. Alleviating the economic hardship of local communities is one of the most important steps towards reducing the pressure of poachers and loggers on local reserves, and we are proud to be working with the Peace Corps to reach these broad goals.

### **3. "Yo Vivo En Jama" Textbooks**

In August of 2007, Ceiba was invited by the Save the Children foundation to participate in the development of a series of texts for local school children: such texts have been created for several other counties in Ecuador, to better focus school instruction on the culture, people, plants and animals that are found locally. Called *Yo Vivo En Jama* ("I Live In Jama"), the books are delightful and well-designed combinations of photos, cartoon artwork and text that cover a great variety of subjects: political structure, natural resources of the region, pre-Columbian archaeological history, and the marine and terrestrial ecosystems (see appendix, page 11). Five versions of the books were produced, each for a different age group; over 3000 texts will be printed this April and distributed to every school child in the county. Ceiba contributed several sections to these books, providing details about the characteristic flora and fauna of the region, the value of the intact ecosystems to wild animals and humans alike, and reasons for conserving the natural areas that still exist in the county. We are pleased to have been offered the opportunity, thanks in part to our past educational work with the municipal government, to spread the message of conservation to such a wide audience.

### **4. Naturalist Guide & Ecotourism Workshops**

In April of 2008, Ceiba staff arranged a series of workshops and presentations about ecotourism potential and naturalist guide training opportunities in the Jama region. We are proud to announce that Rene Lima, the main guide at the El Pahuma Orchid Reserve (Ceiba's other habitat protection progress, to which the SDCOS contributed invaluable support), was the featured speaker (see appendix, page 11). Rene and Cesar Tapia, both of whom are founding members of the Naturalist Guide Association of Nanegalito, gave informative and engaging talks to three communities: Tabuga, Don Juan, and Jama (see appendix, page 12).

The talks described their experience of starting tourism businesses, forming a guide association, and obtaining naturalist guide training workshops from the Ministry of Tourism. The process is one we would like to replicate in the northern Manabí coast. Thus the presentations were designed to encourage local residents to reflect on the considerable value of the natural attractions of their region, and contemplate the possibility of following in Rene and Cesar's footsteps.

The seminars were very well-received, sparking considerable interest in locals to develop ecotourism destinations such as local waterfalls and forest hikes, and organize them into a series of unique tour packages. Particularly animated were the students of the Colegio Ibero-Americano (Iberian-American High School), whose director, Jorge Mendoza, has placed a strong emphasis on ecotourism in the

school's curricula. Mr. Mendoza is excited to continue developing collaborative training and education projects with the Ceiba Foundation.

## 5. County Flower & Animal Nominations

Lalo Loor, in his role as advisor to the mayor of Jama, Alex Cevallos, has asked Ceiba to nominate candidates for a "County Animal" and "County Flower" for Canton (county) Jama, in which the reserve is located. Our suggestions are the Mantled Howler Monkey, and the orchid *Dimerandra rimbachii*, both of which are charismatic and sufficiently abundant to be observed readily. We expect that the nomination of the *Dimerandra* will be accepted, and contribute substantially to the identification of northern Manabí as a place to view unique orchids in the wild. We also suggested nominations for a county tree (*Tabebuia guayacan*), a marine animal (Humpback whale), and a cultural artifact (figurine from the Jama-Cuaque culture). As per Lalo's request, we sketched a crude design for a county insignia (see appendix, page 11).

## D. Conservation Prioritization Surveys

### 1. Ciro Dueñas Properties

Ceiba recently received a letter of interest from Luis Dueñas, the son of Ciro Dueñas, owner of some of the largest remaining forest patches in the county of Pedernales, immediately to the north of Jama County. Although to date we have concentrated our conservation and development efforts in Jama, we are keen to expand our reach to Pedernales. Certainly, in order to connect the proposed Manabí corridor to the Pata de Pajaro reserve near the city of Pedernales (the outline of which appears on the forest fragment map, appendix page 12, east of Coaque), and to the larger and internationally recognized Mache-Chindul Forest Reserve further north, we will need to work with conservation-minded landowners up and down the coast.

Luis Dueñas is seeking Ceiba's assistance for three activities related to the establishment of his 300 ha property as a private reserve: basic inventories of flora and fauna, encouragement of a scientific research program, and planning for reserve design and management. Ceiba staff will meet with Mr. Dueñas in Quito as soon as possible to plan survey trips to the site for August of 2008.

We have not visited the site yet, but based on prior information collected about regional forests, we believe the property will be one of two forest patches located just south of the town of Coaque (see appendix, page 12). If so, then of interest is a previous survey of the eastern patch by a Conservation International Rapid Inventory Team (a program later run by the Field Museum of Chicago), which reported several interesting results (Parker and Carr 1992). A species of *Lockhartia* orchid was observed, along with several species of bromeliads and aroids, including the giant "bird's nest" *Anthurium* that is abundant in the Lalo Loor reserve. As in our own surveys, the CI team found a distinct flora on the more moist upper-elevation ridgeline, including species of *Rinorea* and *Psychotria*. Ted Parker, the team's ornithologist, heard three species of birds which previously had not been known north of the Chone River (over 75 km to the south), two of which are known to occur at Lalo Loor (Gray-and-gold Warbler, *Basileuterus fraseri*, and Gray-cheeked Parakeet, *Brotogeris pyrrhopterus*).

### 2. Third Millennium Alliance Reserve

A small but energetic US nonprofit organization known as the Third Millennium Alliance recently purchased two small tracts of land (total approx. 100 ha) behind the Lalo Loor reserve to establish as a new forest reserve. The reserve is situated on the upper flanks of the Camarones River watershed. According to Jerry Toth, founder of the organization, the highest point on their property is just less than 700 m of elevation, considerably higher than properties previously surveyed by Ceiba.

The Alliance is in the early stages of constructing trails and living quarters, and surveying the property; however, the group does not count biologists among its members, and therefore has asked that

Ceiba staff assist them with surveys of plant and animal communities there. Currently we are developing plans to conduct an orchid inventory of their reserve, particularly from the highest portion of the forest, which we believe will yield additional species in the region.

In addition, the Alliance has expressed interest in assisting with reforestation efforts to connect the Lalo Loor reserve to the Cordillera Costanera (Coastal Mountain Chain), on which their reserve is located. This opportunity may represent an important step in expanding our conservation efforts and plans to create a contiguous Manabí conservation corridor. Ceiba plans to seek funding for targeted land purchases, which also may be provided by the Alliance, and for reforestation programs to connect forest patches. Reforestation funding also may be obtained through USAID and other grants available specifically to Peace Corps volunteers: the new volunteer in the town of Camarones, Paul Harbison (see below), is interested in participating in the project by seeking these funds.

## **V. Priorities and Objectives for Year Three**

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Based on our current assessment of progress and needs in the region, and the overall goals of the Manabí Dry Forest Conservation Project, we have set the following priorities for the upcoming year (June 2008 – May 2009):

1. Conduct orchid inventories in properties of Luis Dueñas and the Third Millennium Alliance
2. Continue to monitor orchids collected or marked during preliminary surveys to confirm taxonomic identifications.
3. Sign a new conservation agreement with Mr. Lalo Loor to strengthen the long-term protection of the Dry Forest reserve, potentially establishing the site as a national Bosque Protector Privado
4. Sign a conservation agreement with Luis Dueñas to protect his family's 300 ha property.
5. Discuss options with the Jama municipal government and local landowners for the establishment of a single conservation area (Bosque Protector Privado) to cover all forests in the region.
6. Complete the creation and installation of environmental exhibits in the EcoCenter at the Lalo Loor reserve, and place orchid specimens on display along the principal visitor trail.
7. Officially inaugurate the EcoCenter in the summer of 2008, and open the reserve to day visitors.
8. Continue the environmental education programs in the communities of Jama, Tabuga and Camarones, through direct education of students and training programs for teachers.
9. Work with the Peace Corps to send a third volunteer to the region.

## **VI. Supporting Documents**

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Attached, in digital format, are the following supporting documents:

- Photographs from orchid surveys of Lalo Loor Dry Forest Reserve
- Photographs from orchid surveys of Nevarado Loor property
- Photographs from orchid surveys of Melchior Chica property
- Photographs of Lalo Loor EcoCenter construction progress
- Photographs of regional environmental education programs
- Map of forest fragments of interest near the Lalo Loor reserve
- Revised budget (slight modifications in January 2008) for use of SDCOS funds

## VII. References

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Parker, TA. and Carr, JL., eds. 1992. Status of forest remnants in the Cordillera de la Costa and adjacent areas of Southwestern Ecuador. Conservation International, RAP Working Papers 2.

Critical Ecosystem Partnership Fund. 2005. Text from:

[http://www.cepf.net/xp/cepf/where\\_we\\_work/choco\\_darien/full\\_strategy.xml](http://www.cepf.net/xp/cepf/where_we_work/choco_darien/full_strategy.xml) (accessed March 2008). Additional materials *In*: Critical Ecosystem Partnership Fund. December 11, 2001 (updated: December 2005). *Ecosystem Profile: Chocó-Manabí Conservation Corridor*. Conservation International.

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Meisel, J.E. and C. Woodward. 2005. Andean orchid conservation and the role of private lands: A case study from Ecuador. *Proceedings of the II International Orchid Conservation Congress*. Marie Selby Botanical Gardens. May 16-23, Sarasota, FL. *Selbyana*, 26(1,2):49-57.

Neill, D.A., J.L. Clark, H. Vargas, and T. Nuñez. 1999. Botanical Exploration of the Mache-Chindul Mountains, Northwestern Ecuador. Final Project Report submitted to National Geographic Society, Committee for Research and Exploration, for NGS Grant # 5857-97.

# **APPENDICES**

## **MANABÍ DRY FOREST CONSERVATION PROJECT**

### **YEAR TWO**

**Ceiba Foundation for Tropical Conservation**

Manabí Orchid Surveys 2007 - Lalo Loor Dry Forest Reserve



*Ornithocephalus* sp.1



*Epidendrum anceps*

Manabí Orchid Surveys 2007 - Lalo Loor Dry Forest Reserve



*Notylia* sp.1



*Gongora* sp.1



Manabí Orchid Surveys 2007 - Lalo Loor Dry Forest Reserve



*Palmorchis* sp.1



unidentified sp.4



*Prosthechia* sp.1

Lalo Loor Dry Forest Reserve - Orchids



*Catasetum expansum*



*Dimerandra rimbachii*



*Notylia cf. replicata*



*Lockhartia serra*

Lalo Loor Dry Forest Reserve - Orchids and other specimens



*Campylocentrum micranthum*



*Psychopsis kramerianum*



*Dictyophora* "Bridal Veil" mushroom

# Manabí Orchid Surveys 2007 - Sr. Melchior Chica Property



*forest interior, upper region (ca. 480 m)*



*Masdevallia nidifica*



*Pescatoria wallisi*

Manabí Orchid Surveys 2007 - Sr. Melchior Chica Property



*Cyclopogon* sp.1



*Dichea* sp.1



*Pleurothallis* sp.1

# Manabí Orchid Surveys 2007 - Sr. Nevarado Loor Property



Nevarado Loor property, southern portion

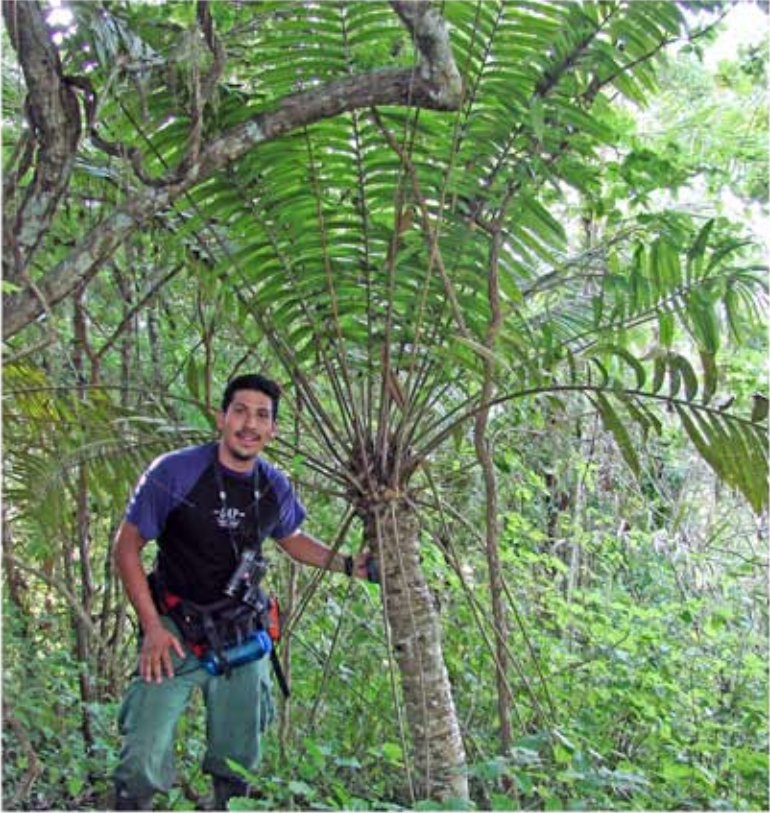


*Mormodes* or *Cycnoches* sp.1



unidentified sp.1

## Manabí Surveys 2007 - Additional Specimens



*Zamia lindenii*, Nevardo Loor property



Araceae sp.1, Melchior Chica property



*Heisteria* sp.1, Melchior Chica property



Araceae sp.2, Melchior Chica property

# Manabí Dry Forest Conservation Project - Environmental Education and Lalo Loor Reserve EcoCenter



EcoCenter ground-breaking Ceremony - May 2007  
(lower left to right) Alex Cevallos, Mayor of Jama;  
Sergio Berrios, President of Association of Tourism  
Providers; Catherine Woodward, Ceiba Foundation;  
and Lalo Loor, reserve landowner



EcoCenter construction - July 2007  
(view to the West)



EcoCenter construction - April 2008  
(view to the East)



Environmental awareness program, Tabuga school,  
led by Ceiba Foundation semester student



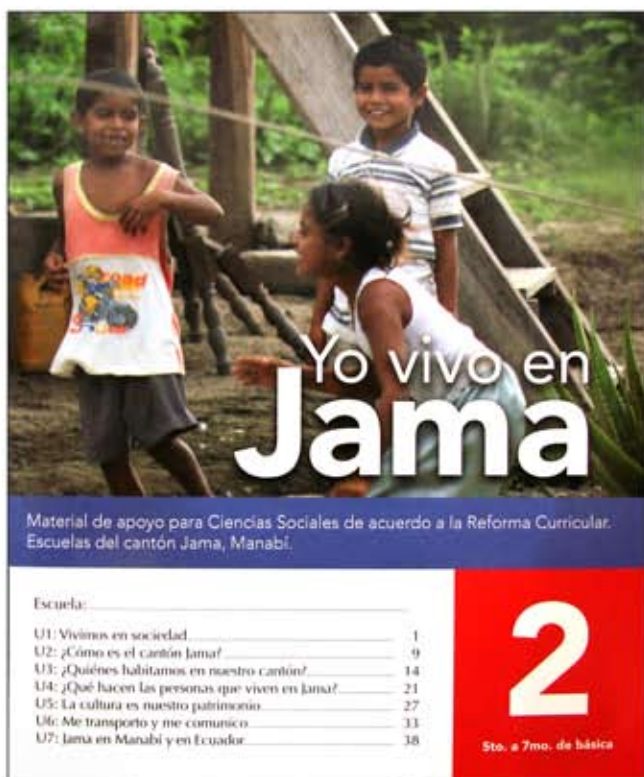
# Manabí Dry Forest Conservation - Environmental Education & Awareness



Community garden plot, Camarones school, led by Ceiba semester student and Lalo Loor Reserve staff (Maximo Aguinde)



Lecture in Tabuga by Rene Lima, El Pahuma Orchid Reserve: "10 Years On the Road of Ecotourism"



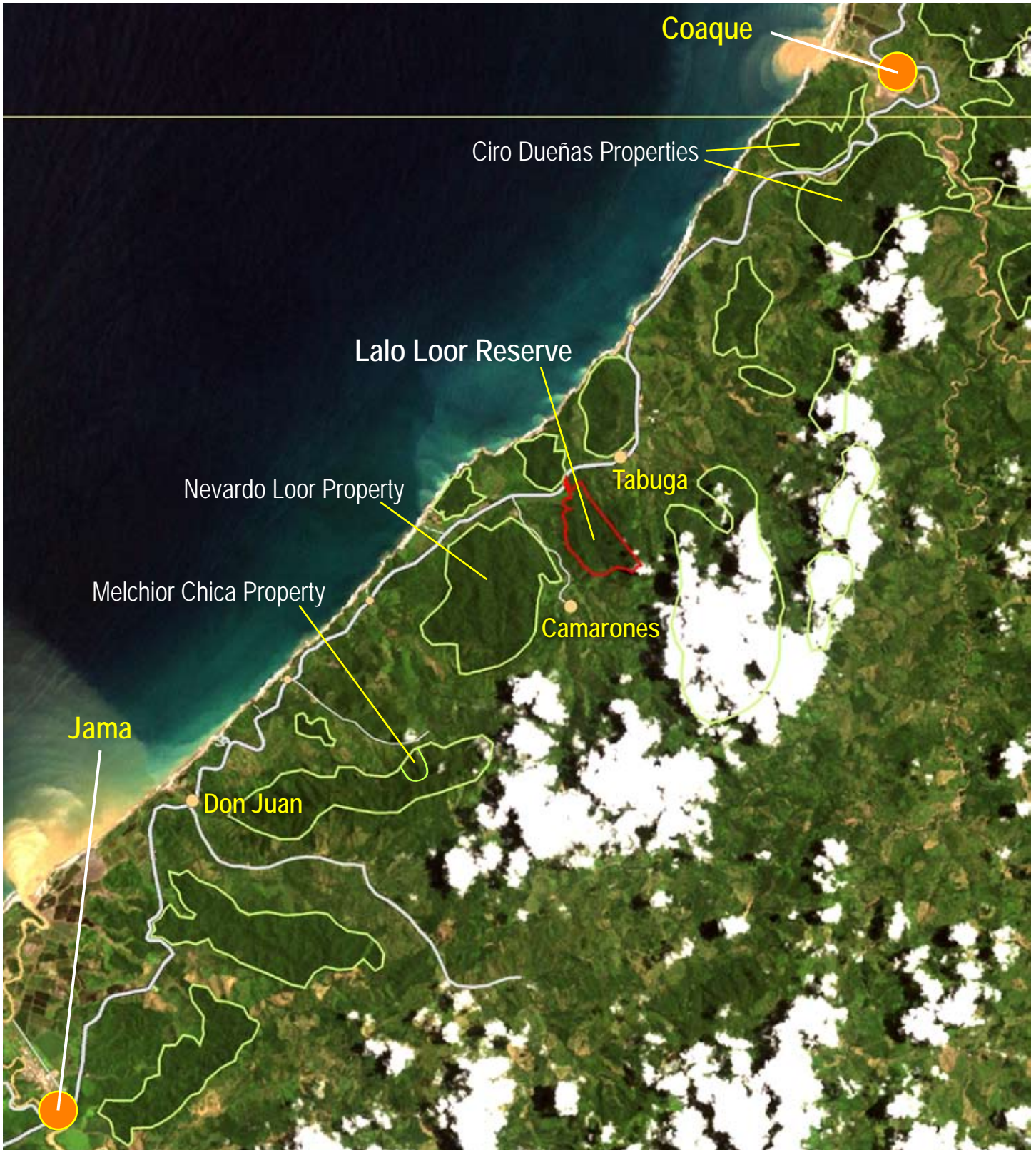
Cover of "I Live In Jama" text for local schools



Rough sketch of proposed Jama County insignia: *Dimerandra rimbachii*, Mantled Howler monkey, Guayacan tree (*Tabebuia guayacan*), Jama-Cuaque period figurine, and Humpback whale

# Manabí Dry Forest Conservation Corridor

Forest Fragments in the vicinity of the Lalo Loor Dry Forest Reserve



map created by Joe E. Meisel  
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**Ceiba Foundation for Tropical Conservation**  
**Two Worlds Dry Forest Corridor - Manabi, Ecuador**  
 San Diego County Orchid Society Proposal

**Partial Budget - Phase One : 3 years**  
*Budget revised to reflect reduced amount awarded (\$6000)*

updated January 2008

EXPENSE ITEM	Year	Item Cost	Yearly Qty	Item Subtotal	Year 1	Year 2	Year 3	NOTES
<b>Reserve Management</b>								
Reserve Director - Salary (25%)	1-3	\$224.00	12	\$2,688.00	\$2,688.00	\$2,688.00	\$2,688.00	plus 25% CFTC, plus 50% FUS
Management supplies & expenses	1-3	\$20.00	12	\$240.00	\$240.00	\$240.00	\$240.00	phone, fax, net, paper supplies
Reserve supplies	1-3	\$300.00	1	\$300.00	\$300.00	\$300.00	\$300.00	construction & maintenance costs
<b>Subtotal</b>				<b>\$3,228.00</b>	<b>\$3,228.00</b>	<b>\$3,228.00</b>	<b>\$3,228.00</b>	
<b>Environmental Education</b>								
Display supplies	1	\$400.00	2	\$800.00	\$800.00	\$500.00		3 displays, volunteer design & install
Display program coordination supplies	1	\$75.00	2	\$150.00	\$150.00	\$300.00		installation labor, copies, fax
Local creation of ecological display	1-3	\$500.00	1	\$500.00	\$500.00	\$500.00		support Manabi residents
Display replacement & maintenance	2-3	\$100.00	3	\$300.00			\$300.00	
Curriculum development supplies	2-3	\$700.00	1	\$700.00	\$200.00	\$200.00	\$700.00	printing, research, distribution
On-site education program supplies	2-3	\$100.00	4	\$400.00	\$200.00	\$200.00	\$400.00	4 site visits per year
<b>Subtotal</b>				<b>\$1,450.00</b>	<b>\$1,700.00</b>	<b>\$1,900.00</b>	<b>\$1,900.00</b>	
<b>Biological Inventory</b>								
lodging	1-3	\$10.00	16	\$160.00	\$160.00	\$160.00	\$160.00	4 people * 4 nights * 1 sites
transport (vehicle rental)	1-3	\$60.00	4	\$240.00	\$240.00	\$240.00	\$240.00	truck: 4 days * 1 visit
transport (gas)	1-3	\$20.00	4	\$80.00	\$80.00	\$80.00	\$80.00	gas: 4 days * 1 visit
meals	1-3	\$10.00	16	\$160.00	\$160.00	\$160.00	\$160.00	4 people * 4 nights * 1 site
supplies	1-3	\$300.00	1	\$300.00	\$300.00	\$300.00	\$300.00	1 site
Program coordination supplies	1-3	\$250.00	1	\$250.00	\$250.00	\$250.00	\$250.00	1 site
<b>Subtotal</b>				<b>\$1,190.00</b>	<b>\$1,190.00</b>	<b>\$1,190.00</b>	<b>\$1,190.00</b>	
<b>ANNUAL BUDGET TOTALS</b>					<b>\$5,868.00</b>	<b>\$6,118.00</b>	<b>\$6,318.00</b>	
<b>TOTAL BUDGET: YEAR 1-3</b>					<b>\$18,304.00</b>			