

# Costa Rica's Sustainable Coffee

## EXPEDITION BRIEFING

Team I: July 1 - 15, 2006

Team II: November 4 - 18, 2006

Team III: February 3 - 17, 2007

Team IV: April 14 - 28, 2007

Greetings Volunteers!

Welcome to the *Cost Rica's Sustainable Coffee* expedition! You are about to embark on an exciting journey into the realm of agro-ecology. The partnership between two of civilizations' most essential sciences, agriculture and ecology, has led towards much remarkable advancement in conservation and economic development. Coffee, which touches almost all our lives on a daily basis, has been a pioneer crop for exploration into the tropical agro-ecosystem. In the forefront of this discovery process is the movement, disease, diversity and ecology of tropical butterfly, bee, ant, bird, and bat species in coffee plantations.

You will have a unique opportunity to participate in a study that takes place within some of the most species rich coffee farms of Costa Rica. The farmers of Finca La Bella were recipients of a land grant which stipulated that all agricultural production be "in harmony with the environment." A typical coffee farm in other regions of Costa Rica has only one or two different species of trees to shade the coffee plants, whereas in Finca La Bella the typical farm has 20 or more trees species!

I thank you in advance for your support in my project. Your assistance will supply important data to move further towards determining what components and ecological linkages are most important to maintain healthy ecosystems in an agricultural landscape. Your participation will offer hope and motivation to the coffee growers of Finca La Bella, who live in an impoverished region of a developing nation.

Valerie Peters  
Principal Investigator

# Costa Rica's Sustainable Coffee

## Table of Contents

<b>GENERAL INFORMATION.....</b>	<b>3</b>
<b>THE EXPEDITION .....</b>	<b>4</b>
1. PROJECT OVERVIEW .....	4
2. RESEARCH AREA .....	4
3. PROJECT STAFF.....	7
<b>DAILY LIFE IN THE FIELD.....</b>	<b>9</b>
4. TEAM ITINERARY.....	9
5. DAILY SCHEDULE AND TASKS .....	10
6. VOLUNTEER FIELD TRAINING AND ASSIGNMENTS.....	10
7. ACCOMMODATIONS .....	12
8. FOOD .....	13
<b>TRAVEL PLANNING .....</b>	<b>14</b>
9. BEFORE YOU LEAVE .....	14
10. PROJECT CONDITIONS .....	17
11. HEALTH INFORMATION .....	19
12. PACKING CONSIDERATIONS .....	20
13. RECOMMENDED READING.....	21
14. EMERGENCIES IN THE FIELD .....	22
15. HELPFUL RESOURCES .....	22
<b>THE RESEARCH .....</b>	<b>24</b>
16. BACKGROUND, OBJECTIVES AND METHODS.....	24
17. RESULTS AND OPPORTUNITIES.....	28
18. LITERATURE CITED.....	30
<b>EXPEDITION PACKING CHECKLIST .....</b>	<b>31</b>

# GENERAL INFORMATION

PRINCIPAL INVESTIGATOR: **Valerie Peters**

POSITION/TITLE: Doctoral Candidate

AFFILIATION: University of Georgia, Institute of Ecology

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PROJECT TITLE: **Costa Rica's Sustainable Coffee**

RESEARCH SITE: Ec lodge San Luis and Research Station

RENDEZVOUS POINT: Alejuela, Costa Rica (just outside San José)

TEAM DATES IN FIELD:

Team I:	July 1 – 15, 2006
Team II:	November 4 – 18, 2006
Team III:	February 3 – 17, 2007
Team IV:	April 14 – 28, 2007

TEAM SIZE: Minimum: 5    Maximum: 10

MINIMUM AGE OF PARTICIPATION: 16 (see Section 9 '*Before You Leave*' for important information)

# THE EXPEDITION

## 1. PROJECT OVERVIEW

Globally, over 100 million people are dependent upon the production of coffee for their income. In the United States alone, 80% of the population consumes coffee on a daily basis. Coffee has been traditionally grown under a canopy of shade trees. These canopy trees may provide floral and fruit resources to organisms like birds and bees that are responsible for essential ecosystem services such as pollination and fruit dispersal. However, the food resource constancy hypothesis holds that a minimum critical diversity of plant species is required to provide the year-long resources to support a healthy assemblage of pollinators and dispersal agents. Shaded coffee farms offer a unique opportunity to test the role of the resource constancy hypothesis. Through two experimental treatments, one the removal of a key shade tree species, *Sapium glandulosum*, during peak fruiting season, and the other an experimental creation of a one-month resource shortage, this study aims to determine how constant resource availability affects bird and bee species richness in shade grown coffee plantations. Volunteers will help in the experimental removal of fruit and flowers as well as in conducting bird transect surveys and bee visitation surveys in both control and experimental plots. You will also participate in floral and fruit abundance surveys and in stigma slide preparation. All volunteers will have an opportunity to work closely with coffee farmers in the San Luis region and bilingual volunteers may assist with environmental education.

## 2. RESEARCH AREA

On the way to the Ecolodge San Luis after the team meets in Alejuela, you will have an opportunity to observe the physical and cultural environment in which this research project takes place. To the north of Alejuela/San José is a range of active volcanoes in the Cordillera Volcanica Central. To the south are the mountains of the Talamanca range, which are far more ancient and no longer have any volcanic activity. Chirripo, which is farther south in the Talamanca range and not visible from the Central Valley, is Costa Rica's highest mountain, at some 13,000 ft. Glaciers carved out the landscape at the top of Chirripo during the last ice age.

The Central Valley was the first region in Costa Rica to be settled by European colonists, and today houses around half of Costa Rica's four million inhabitants. European colonists left the Caribbean coast for the Central Valley for several reasons. With elevations around 3,250 ft, the Central Valley enjoys a more comfortable, moderate climate. The area was largely free of the insect-borne tropical diseases that plagued the Caribbean lowlands at that time. And the young, rich, volcanic soils of the Central Valley were excellent for agriculture. Cartago, at the extreme eastern end of the Central Valley, was the nation's first capital. After a brief armed struggle among partisans of the most important settlements in the area, the capital was permanently moved to San José.

The trip to the Ecolodge begins on the Pan-American Highway, passing through the Central Valley. The landscape of the western part of the Central Valley is a mosaic of forest, pasture, and farmland, dotted with houses and crisscrossed with rivers. From the highway you can see

sugarcane, a tall, bushy grass with thick, jointed stems, and coffee, a shrub 2-7 ft in height with shiny, dark green leaves. Depending upon the season, the coffee branches may be laden with fragrant white flowers (April-May), small green berries (May-September), or ripe red berries (October-February). During the harvest season, Costa Ricans with large woven baskets can be seen passing through the fields, picking the ripe red coffee berries by hand.

Many of the households we will pass have flags on tall bamboo poles as statements of political preference. The two major parties in Costa Rica, the National Liberation Party and the Social Christian Unity Party (PUSC), are relatively moderate in their politics, with the Liberation party slightly to the left on social and economic issues and the PUSC slightly to the right. Costa Ricans are justifiably proud of their democratic tradition, and take it very seriously. Voter turnout in presidential elections typically exceeds 90%.

Additionally, the national literacy rate for Costa Ricans over 15 years of age is around 90%, and is equal for men and women. Health care is provided free of charge for all Costa Rican citizens and life expectancy in the country is second highest in the western hemisphere, after Canada. The US is currently in third place. In contrast to Central American countries to the north and south of Costa Rica, which suffer from high endemic levels of tropical diseases such as malaria, cholera, amoebic dysentery and a myriad of other intestinal complaints, Costa Rica has essentially eradicated these diseases and maintains a constant alert against their possible reintroduction. Pure water is available to households everywhere in the country. One should always exercise care and avoid drinking from streams, however.

Continuing the drive towards the Ecolodge, we will pass an active geological fault zone with deep depressions in the roadbed. Costa Rica's frequent earthquakes come from three sources: movement of local faults, tremors caused by volcanic activity, and quakes caused by collisions between the three major continental plates which come together underneath Costa Rica. The most powerful earthquake in recent years was centered near Limon on the Caribbean coast and registered a tremendous 7.5 on the Richter scale. This quake knocked out bridges, damaged roads, caused a number of buildings to collapse, and raised the coastline a full meter, leaving coral reef formations high and dry. Fortunately, the number of fatalities in the quake was extremely low. Costa Rica's building code is designed, especially in urban areas, to minimize potential for earthquake damage.

The last stretch of the journey to the Ecolodge heads toward the Monteverde cloud forest, where there is a canopy walk and zipline. From this point on, the road is unpaved and bumpy, and the going is slow, allowing for better concentration on the close-up views of Costa Rican rural life. The physical surroundings become more similar to what will be found at the Ecolodge San Luis. Picturesque farmlands with small holdings of cattle are speckled with delicious tropical fruit trees. The most notable are coconut, papaya, mango, cashews, bananas, and plantains. The cattle in these low elevations are a Brahma-Zebu cross, with long ears, long faces, and a hump. They are exceptionally disease-resistant and can withstand periods of poor forage during the dry season. Many Costa Rican small farmers, like the ones with which the volunteers will have an opportunity to work, have chickens, pigs, horses, goats, and geese – and always a profusion of brilliantly colored flowers. Popular ornamentals are bougainvillea, hibiscus, lantana, heliconia, impatiens, tecoma, oleander, ginger, begonias, wild orchids, and any number of small plants collected from the forest and planted around the house.

A smile and a wave will be warmly received by everyone. The appropriate greeting in much of Central America is "Adios." Although it technically means "Goodbye," "Adios" is the greeting of choice if you are passing by quickly and really means "Hello and goodbye." You would only say

“Hola” (Hello) or “Buenos dias” (Good morning) if you were planning to stop and chat for a moment.

The road to the Ecolodge is lined with shade trees of many kinds. The huge spreading crowns most often belong to figs, ceibo or silk cotton trees, cenízaro (a kind of legume tree with woody seed pods), and guanacaste (the national tree of Costa Rica, also a legume). Fence lines are planted with rows of slender trees used as living fence posts, which unlike ordinary posts need never be replaced. Many have their branches cut repeatedly as a source of firewood.

Although villages and towns in Costa Rica are generally quite small, they always have public telephones, electricity, schools, bullfighting rings, and post offices. Every domicile in Costa Rica has mail delivery service and every small gathering of homes also has a soccer field. You will notice that even the most isolated houses often have television antennas, yet people still spend much of their leisure time away from the TV screen, socializing with family and friends, sitting in the open air, or playing sports.

The village of San Luis is the closest village to the Ecolodge. San Luis coffee farmers have formed a cooperative called the “Cooperativa Santa Elena.” Producers deliver their coffee to the processing station here, where it is weighed and processed. Each grower receives his proportion of the total annual net profits, after deducting costs of operation, transport, marketing, and so on. Cooperatives are the most common type of economic structure for agricultural production, whether for coffee, sugarcane, fruit, flowers, or vegetables. Small growers share costs proportionally with larger growers, and are not at a disadvantage against huge agribusiness concerns. Indeed, small family farms remain a very successful and significant feature of the Costa Rican economy.

A right turn from the village will lead to the Ecolodge San Luis and Research Station. Virgin tropical cloud forests cover the mountains above the Ecolodge. These forests belong partly to the Ecolodge San Luis and Research Station, to the Monteverde Cloud Forest Reserve, and to the Children’s International Rainforest. The mountains at the head of the San Luis Valley are the Cerros Centinelas (Sentinel Mountains) which mark the continental divide, separating the Pacific slope from the Caribbean slope. The warm moisture-laden tradewinds blow from the Caribbean side and drop mist into the upper San Luis Valley, supporting a lush growth of cloud forest vegetation. The weather in these mountains can change dramatically with little notice. On any given day, there may be crashing thunderstorms whipping the rain with tremendous force, heavy clouds obliterating the view entirely, light mists pouring through the gorges with wisps of clouds clinging to the treetops, brilliant sunshine illuminating the scenery, or spectacular rainbows reaching from one side of the valley to the other.

Nestled amidst green trees with leaves of every size, shape and shade of green are the buildings of the research site, all with red roofs and walls of white plaster and mahogany. Life at the research station will be exciting. There are always a myriad of visitors, volunteers, and students around, and the environment will be dynamic, with visiting scientists, tourists and locals to engage in conversation.

### 3. PROJECT STAFF

Principal Investigator Valerie Peters, as well as the five Ecolodge support staff members listed below, are currently scheduled to be present for all four Earthwatch teams. However, note that staffing schedules are tentative and are subject to change.

#### Principal Investigator

**Valerie Peters** has over 10 years of experience with environmental education and ecological research. Highlights include the study of frog physiology in Costa Rica, assessing scrub jay population decline in Florida, and creating and implementing a Science Fair Saturday Program focused on teaching children how to conduct science fair experiments on questions leading to a more sustainable environment. Valerie graduated from Pennsylvania State University with a B.S. in Ecology. A strong interest in community development and conservation led her to spend her first two years after graduation volunteering with Americorps and the next two years with US Peace Corps, where she pioneered efforts for the conservation of a 10,000 hectare reserve in San Marcos de Colon, Honduras. Currently a doctoral candidate at the University of Georgia's Institute of Ecology in Athens, Georgia, Valerie spent six months last year in Ecuador working with the Maquipucuna Foundation, a local non-profit organization, to assist coffee growers with shade tree selection. Earlier this year, she created several visual presentations to be used by the Georgia State Botanical Gardens to educate children and adults on the importance of shade-grown coffee to migratory bird populations in Ecuador and developed a children's environmental education program for the Atlanta Botanical Gardens.

Fluent in both written and oral Spanish, Valerie maintains an active role within the immigrant Hispanic community in Athens, Georgia while pursuing her doctorate. She teaches local American Red Cross First Aid and Safety courses in Spanish and leads zoo tours in Spanish as needed. She also worked for one year as a medical Spanish language interpreter and two years as the public library Spanish storyteller.

#### Support Staff

**Fabricio Camacho Céspedes**, 25 years old, is the General Director of Operations at Ecolodge San Luis. He currently lives in San Luis de Monteverde and was born in La Esce de Perez Zeledon, a small coffee town in southern Costa Rica. During his childhood he spent many hours walking through the coffee farms and forests, and it was then that he fell in love with nature, especially trees. When Fabricio was 10 years old, his parents moved to Heredia to live in the city so that his father could find work. Fabricio went to high school there, but he never got used to city life. Every summer he would return to his hometown to walk the coffee plantations and study the trees. He has never and will never lose his love, respect and admiration for the trees. That is why Fabricio is currently studying to become a Forestry Engineer. He is also currently co-authoring a book called "The Common Trees of the Cabo Blanco Reserve." He is planning to continue his studies, travel to other countries, and establish a program for integrated resource management on his farm. Fabricio speaks both English and Spanish.

**Virgilio Brenes Cambroner** is the Business Manager at the Ecolodge San Luis and Research Station. Virgilio was born and raised in the San Luis community. He comes from a farming family and has seven brothers and one sister. He is 33 years old and worked for the Monteverde Institute for 11 years before beginning employment at the Ecolodge. Virgilio is the Treasurer for the Integrated Development Association for his community in his spare time. He is passionate about soccer, and also likes to read, write, and nature hike. He has traveled to the US, Mexico, Guatemala, Nicaragua, Panama, Cuba and Brazil.

**Guadalupe Cruz Rodríguez** works at the Ecolodge San Luis as a waitress and helps the administration with the gift shop, reception of telephone calls and other activities. She is 28 years old and is trying to graduate from high school through a special program where one can study at home and then take exams in a nearby city. Lupe is a very honest, responsible, and intelligent woman who provides a great deal to the staff at the Ecolodge.

**Geovanny Rodríguez Cruz**, 19 years old, works as a waiter and helps the administration with the gift shop, reception of telephone calls and other activities. Geovanny graduated from the San Luis public school in 1999 and went for two years to the high school in Monteverde. He is an enthusiastic, fun person and dances very well; he occasionally leads dancing workshops for Ecolodge visitors.

**Amalia Rodríguez** is the head of the cleaning department at the Ecolodge. She is married and has three children who attend school and work. Amalia is known in San Luis for always trying to raise funds and help people in the area as well as in other parts of Costa Rica who are going through difficult financial periods in their lives. She is very organized and always willing to help at the station.

### **Visiting Scientists and Guests**

**Sonia Hernandez** from the University of Georgia will be present during July and possibly November to give a talk on disease in wildlife populations.

**Lindsay Stallcup**, also from the University of Georgia, will be present in July and may lecture on organic matter in mountain streams.

**Diana and Milton Lieberman**, both professors, will be at the Ecolodge in November conducting a field ecology course.

**Drs. Sandy and Jim Whitney**, scientists in the areas of anthropology and geology, respectively, will be present in February.

Additionally, the University of Georgia offers four programs at the Ecolodge throughout the year, as well as other satellite programs that visit Costa Rica and use the Ecolodge as one of their destinations. During these programs, there will be visiting lecturers as well as full-time course lecturers.

# DAILY LIFE IN THE FIELD

## 4. TEAM ITINERARY

Below is a tentative itinerary for all teams, however, note that activities will vary by team (see Section 6 *'Volunteer Field Training and Assignments'* for more information). All teams will have a break from fieldwork on Day 8 and an end of program fiesta on the night before departure.

- Day 1:** Rendezvous and proceed to Ecolodge San Luis (4 hours), settle in and unpack, optional volleyball game, dinner at the Student Union, orientation
- Day 2:** Observations at fruiting trees to learn frugivorous (fruit-eating) birds of the region, "Birds and Coffee" presentation, visit coffee cooperative Finca La Bella for training in fruiting and flowering surveys in coffee subplot, lunch, language and culture orientation, arthropod sampling practice (Teams I and II), training in bee identification and sampling techniques (Team IV), Monteverde slide show
- Day 3:** Coffee subplots orientation, identify transect locations, practice bird transect survey with team, lunch at Student Union, pollen count orientation and slide assignments (Teams I and II), fruit and flower removal training and practice (Teams III and IV), stigma slide preparation training (Team IV)
- Days 4-7:** Bird transect surveys, fruit and flower surveys, pollen counts (Teams I and II), fruit and flower removal (Teams III and IV), stigma collection and slide preparation (Team IV), bee surveys (Team IV), data entry, visiting guest lectures, occasional opportunities to accompany other researchers in the field, visits to farmers' homes
- Day 8:** Waterfall hike, zipline or hanging bridges, visit to Santa Elena for dinner
- Days 9-14:** Bird transect surveys, fruit and flower surveys, pollen counts (Teams I and II), fruit and flower removal (Teams III and IV), stigma collection and slide preparation (Team IV), bee surveys (Team IV), data entry, visiting guest lectures, occasional opportunities to accompany other researchers in the field, visits to farmers' homes, end of program fiesta
- Day 15:** Return to Alejuela/San José for departure

## 5. DAILY SCHEDULE AND TASKS

The tentative daily schedule below includes information for all teams. Note that volunteer assignments and the timing of activities will vary by team and that schedules can and do fluctuate. Weather and work conditions can also affect the daily schedule. Should this situation arise, your cooperation and understanding are appreciated.

<b>5:30 am:</b>	Breakfast
<b>6:00 am:</b>	Hike to coffee subplots
<b>7:00 am:</b>	Bird survey transects
<b>10:00 am:</b>	Environmental education activity with farmers or communities (Team II), fruit and flower removal in subplots or bird survey transects (Team III), bee surveys and <i>Sapium</i> inflorescence removal (Team IV)
<b>12:00 pm:</b>	Lunch in field or Student Union (Team II)
<b>1:00 pm:</b>	Lunch in field (Teams I and III), fruit and flower abundance surveys (Team II)
<b>2:00 pm:</b>	Fruit and flower abundance surveys (Teams I and III), lunch in the field (Team IV)
<b>3:00 pm:</b>	Return to Ecodge (Team II), fruit and flower abundance surveys and stigma collection (Team IV)
<b>4:00 pm:</b>	Return to Ecodge (Teams I and III)
<b>5:00 pm:</b>	Return to Ecodge (Team IV)
<b>6:30 pm:</b>	Dinner at Student Union, daily briefing
<b>8:00 pm:</b>	Data management, guest lectures, pollen counts, recreational events

## 6. VOLUNTEER FIELD TRAINING AND ASSIGNMENTS

### General Training

The Principal Investigator (PI) and Ecodge staff will provide volunteer research training on potential hazards and how to stay safe in the field, as well as on the history and culture of San Luis and Costa Rica. Earthwatch teams conducting flower and fruit removal will receive an afternoon demonstration and training on how to use equipment safely.

The Ecodge San Luis and Research Station is a dynamic environment with many visiting scientists and students of various interests and backgrounds. Lectures may include the following topics: biology, ecology, plant systematics, zoology, arthropods, biostatistics, geography, modern geology, hydrology, soils, climate, sustainability, conservation, forestry, sustainable agriculture, medicinal plants, ethnobotany, agroforestry, and ecotourism.

Earthwatch volunteers will conduct bird, fruit, bee, and flower surveys. Skills such as hiking, bird identification, bee identification or tree climbing may be helpful, but no special skills will be necessary. Accurate bird and bee identification can be ensured through use of reference materials and collections. If needed, participants will receive special training in bird identification. Additionally, 10 focal frugivorous bird species can be selected to facilitate bird identification in coffee plantations. Volunteers on Team III will also assist with flower-fruit removal, and those on Team IV with the removal of *Sapium glandulosum* flower. With the correct equipment, tree-climbing can be made safe and easy. This aspect of the project may bring added interest for some Earthwatch volunteers because it offers an opportunity to explore canopy activity, an often difficult to access and poorly investigated segment of the tropical forest.

### **Bird Transect Surveys**

The best way to quickly learn the frugivorous birds of any region in the tropics is to find a fruiting tree to observe for a few hours. Each team will spend the first morning at the study site observing a fruiting tree for bird visitation. This will give team members an opportunity to interact and learn bird species, while directly observing them in the field. Volunteers will be provided with basic bird identification training and field guides will be available for reference. If, however, team members find this task too difficult, 10 focal frugivorous birds will be chosen.

This study involves 16 subplots which will be surveyed by 100 m transects for birds for 3 hours daily in November and April and 6 hours daily in July and February. Volunteers will begin transects either in an experimental or a control subplot of the coffee plantation and then switch subplot type for their second transect. Depending upon the number of volunteers per team, each volunteer will be assigned one or two coffee plantations per day.

### **Bee Surveys**

Bee pollination surveys will only be conducted by volunteers joining the project in April (Team IV). Volunteers will use a reference bee collection to learn common bee species which may be found visiting coffee flowers. Volunteers will be trained in bee identification and will have the reference collection available for comparison throughout the study. All Team IV members will spend 4 hours a day observing bee visitation at coffee plants, rotating between this task and inflorescence removal. Each volunteer will randomly choose three coffee plants along each 100 m transect to observe for 10 minutes.

### **Experimental Flower-Fruit Removal**

February and April teams (Teams III and IV) will be responsible for the experimental manipulation task of this study. Team III will be assigned four subplots of 1 hectare each in which all bee-pollinated flowers and bird-dispersed fruits will be removed from individual plants. Team IV will be assigned subplots in which inflorescences will be removed from all *Sapium glandulosum* individuals. For both of these removal experiments volunteers will be trained in how to use safety equipment, and we will conduct all fruit and flower removals in groups of four or five team members. In April, team members will either conduct bee surveys or removals, depending on level of comfort with using a pole-saw and tree-climbing ladders. If all team members are comfortable, then they will rotate each day between these two tasks. All team members in February will conduct fruit and flower removals, unless uncomfortable with this task, in which case you will be assigned the task of continuing bird surveys. Fruit and flower removal will be conducted 4 hours each day unless removal is completed.

### **Fruit Availability Surveys**

A fruit availability index will be used to calculate fruit availability per subplot twice during each team. Each individual tree's fruit crop size will be scaled from zero to six by a pair of volunteers to avoid observer bias. Each Earthwatch team will practice estimating fruit crop size by counting 10 randomly chosen branches and extrapolating values to the entire tree. This training will take place in the afternoon of the first full day onsite.

### **Bee-Pollinated Flower Surveys**

The number of plant species possessing open bee-pollinated flowers will be calculated per subplot twice during each team. In the afternoon on the first full day onsite, volunteers will be trained in the assessment of flowers for pollinator syndromes. Additionally, you can observe questionable plant individuals during surveys for pollination activity.

Volunteers will be randomly paired and assigned one subplot to evaluate each afternoon. This task is estimated to take approximately 2 hours of the afternoon. Farmers may accompany you during this time to assist in the exploration of each subplot, as all fruiting and flowering plants will need to be included for these surveys.

### **Stigma Slides**

During April (Team IV), stigmas from 40 coffee flowers per subplot will be collected using tweezers and carried in holding cells to the lab where they will be placed onto microscope slides using a lab burner and fuschin jelly. Volunteers will be given training on how to remove stigmas without disturbing pollen, and how to carefully prepare slides of the stigmatic surface using the fuschin jelly. These activities will be worked on for about 1 hour each day.

### **Pollen Counting**

Volunteers will not collect and prepare slides, but will be assigned the task of counting pollen grains on each slide. This task will require use of a compound microscope, for which training will be provided. Volunteers will also be trained to differentiate pollen grains from other materials, like insect hairs, which may be found on the stigmatic surface. You can also use grids underneath the slides to count pollen grains in quadrants. Each April collection of stigmas will produce 640 slides. Each volunteer may be assigned a number of slides to count (50-75), and will be allowed to work freely on them throughout the expedition. This way you can determine when you wish to have free time by choosing to work on the slides for 30 minutes each day or for a few hours (approximately 4-5 hours) over a couple of evenings.

## **7. ACCOMMODATIONS**

Teams will stay at the Ecolodge in cabinas, bungalows, or the bunkhouse, depending on availability and the number of volunteers in each team. All facilities have either single, double or bunk beds with bedding and towels provided, and all have bathrooms with hot water showers and flush toilets. Bathrooms may be shared or private depending upon room availability at the Ecolodge. Facilities at the Ecolodge are equipped with 110 watt voltage electricity, and there are two outlets per room.

The cabinas are spacious and nestled among the trees with private baths, balconies, and a covered terrace overlooking the San Luis River gorge. Twelve cabina rooms sleep three, four, or five people each. Cabinas are located an 8 minute walk along a country road from the dining hall, classroom, and other lodgings.

Bungalows are comfortable, roomy lodgings with private baths and a covered veranda. Four bungalow rooms sleep four or five people each. They are located close to the bunkhouse, dining hall, and classroom.

Finally, the bunkhouse is made of mahogany paneled dorm rooms with bunk beds and shared baths in separate bath houses. It is divided into four rooms and sleeps a total of 30 individuals. It is located close to the bungalows, dining hall, and classroom.

Couples who would like to have a separate room will need to pay US\$12 extra per night for a bungalow and US\$35 extra per night for a cabina room, payable directly to the Ecolodge (prices subject to change). Please let your Earthwatch Expedition Coordinator know as soon as possible if you wish to have couple's accommodations.

Other facilities at the Ecolodge San Luis and Research Station include:

- *Student Union:* The Student Union is the heart of the Ecolodge. Students, faculty, staff and visitors gather here for their meals and planning activities. The dining hall can serve original Costa Rican meals to up to 80 people at once. It also has a reception area, a small library and internet laboratory. This beautiful space can be used for conferences, lectures and special activities such as *bailes* (dances) and fiestas.
- *Indoor classroom:* “Casa Celeste” is the original name of this building. Fifteen years ago it was the farmhouse of this former dairy farm. For nine years it functioned as the dining hall of the Ecolodge. Nowadays students and visitors receive lectures in this comfortable space.
- *Outdoor classroom:* An open-air classroom and meeting hall is used for lectures, slide presentations, seminars, and a variety of hands-on activities.
- *Wet laboratory:* A fully equipped air-conditioned laboratory has been specially designed for short-, mid- and long-term research and academic programs. It can also work as a classroom and indoor activities area. Storage space is provided for mid- to long-term researchers and academic programs coordinators.

## 8. FOOD

The Ecolodge serves only traditional Costa Rican food that is ordered fresh from the farm and/or local providers and prepared by kitchen staff. The kitchen staff includes four cooks, two waiters and one department head. Typical foods and beverages served at the Ecolodge include fruit juice, rice, beans, boiled eggs, baked tortillas, rice, steamed vegetables, salad, and meat. Vegetarian options are also available and may include avocado, cheese, and soy protein. There is always coffee, tea, cookies and/or homemade bread available at the dining hall. Desserts are homemade and might be rice pudding, homemade cakes or breads, fruit cocktails, etc. Special diets such as vegetarian or food allergies can be accommodated with advance notice.

Here is a sample menu with food you might expect to be served at the Ecolodge. Please bear in mind that variety depends on availability. This list is intended to provide a general idea of food types, but it is very important that volunteers be flexible.

**Breakfast:** Gallo Pinto (rice and beans), eggs, toast, tortillas, empanandas

**Lunch:** Gallo Pinto, vegetables, potatoes or rice, beef, chicken or pork

**Dinner:** Gallo Pinto and vegetables or pasta with fresh Monteverde cheese

**Dessert:** Rice pudding, carrot cake, brownies, arepas

**Beverages:** Coffee, tea, fresh juices, water (all tap water in Costa Rica is safe for consumption)

### Special Dietary Requirements

Please alert your Earthwatch Expedition Coordinator to any special dietary requirements as soon as possible (e.g. diabetic, lactose intolerant, etc.). Accommodating special diets is not guaranteed and can be very difficult due to availability, location and local conditions.

**Special note to vegans and strict vegetarians:** Please be aware that it is often difficult to accommodate strict vegetarians and vegans. A meatless option is always provided for vegetarians, however vegans and strict vegetarians may have a problem avoiding animal products altogether.

# TRAVEL PLANNING

## 9. BEFORE YOU LEAVE

For a listing of useful websites for passport and visa requirements see Section 15 *'Helpful Resources.'*

### Passport Information

Most volunteers traveling from outside the host country will require a passport valid for at least six months beyond the dates of travel. Passports for US citizens must be valid for 30 days beyond the intended stay. Tickets and documents are required for return or onward travel.

### Visa Information

Currently citizens of the US, Argentina, Brazil, Canada, Israel, Japan, Panama, South Korea, Uruguay, the UK, France and most other Western European countries do not need a visa to enter Costa Rica for a stay of 90 days or less. Citizens of Australia, Iceland, Ireland, Mexico, New Zealand, Russia, South Africa, Vatican City and most of Eastern Europe and Latin America can stay 30 days without a visa. If you do require a visa, please read the information in the chart below. Note that no special permission or visas are required for volunteers to work at the research site.

### **Essential Information for Volunteers Requiring Visas**

<b>Type of Visa</b>	You must get a <b>TOURIST VISA</b> .
<b>Where to Get a Visa</b>	Contact the nearest <b>embassy or consulate</b> of the country to which you are traveling to find out how to apply for your visa. Please note that this process can take weeks or more. If you have less than six weeks or wish to save yourself trouble, we strongly recommend using a <b>visa agency</b> , which can both expedite and simplify the process. See below for a list of visa agencies.
<b>Required Information</b>	You will need to send your <b>passport</b> (valid for at least six months beyond your stay), a <b>Visa Application and Immigration Form, 2-4 passport-size photos plus payment</b> to the embassy or visa agency (if applicable). Please be sure that your passport is valid for at least six months beyond your stay.
<b>Cost of a Visa</b>	Generally between US\$40-100, but varies from country to country and can potentially cost <b>up to US\$180</b> . A visa agency will charge an additional fee (depending on the amount of time it takes to process the application), which you can inquire about directly.

**Reminder:** The purpose of your visit is for vacation, holiday or travel. Foreign immigration officials do not always understand the concept of a “working vacation” or even “volunteering.” Words such as “working”/“volunteering,” “research” or a “scientific expedition” can raise questions concerning the country’s foreign labor laws and/or prompt questions about official scientific research permits and credentials, etc., to which volunteers on their own will not be equipped to respond. All required research permits for the project are in place and have been approved by the proper authorities.

## Visa Agencies

IN THE UNITED STATES	IN EUROPE	IN AUSTRALIA
PassportVisaExpress.com 1911 North Fort Myer Drive, Suite 503 Arlington, VA 22209 Tel: +1 888 596-6028, +1 703 351-0992 Fax: +1 703 351-0995 Email: <a href="mailto:info@passportvisaexpress.com">info@passportvisaexpress.com</a> Web: <a href="http://www.passportvisaexpress.com">www.passportvisaexpress.com</a>	The Visaservice Tel: +44 (0) 8708 900 185 Fax: +44 (0) 20 7278 8464 Web: <a href="http://www.visaservice.co.uk">www.visaservice.co.uk</a>  Thames Consular Services Ltd Tel: +44 (0)20 8995 2492 Fax: +44 (0)20 8742 1285 Web: <a href="http://www.visapassport.com">www.visapassport.com</a>	Ask your travel agency if they can send your visa application on your behalf.

## Volunteers Under 18 Years of Age

### *Entry to Foreign Countries*

In an effort to prevent international child abduction many governments have initiated procedures at entry/exit points. Many countries require all persons under the age of 18 to have a notarized letter from all legal guardians stipulating that the person under 18 can travel unaccompanied or in the presence of only one guardian. This letter must give an explanation for why only one parent or someone other than a parent is signing the letter. For example, if one parent is deceased, only one parent has legal guardianship, or someone other than the parents are legal guardians, the letter should state that.

In addition, airlines may also have documentation requirements for unaccompanied minors. Parents of minors are responsible for checking with each airline that their child will be flying to ensure that sufficient documentation is provided. This could include a copy of a birth certificate or a notarized letter stating that the minor has his or her parent's permission to travel alone.

**Note:** Requirements by specific countries and airlines vary and change frequently. You MUST keep informed of the requirements on your own to avoid problems at immigration. If a letter is not available, the volunteer under 18 can be refused entry into the country. There is nothing Earthwatch Institute can do to help in this circumstance.

### Cancellation Insurance

We highly recommend trip cancellation insurance, which will help cover your airfare if you are unable to travel. Earthwatch does not reimburse airfare or costs associated with cancelled flights. Check with your travel agent to find out how to obtain trip cancellation insurance.

Earthwatch Europe volunteers can purchase Additional Cancellation Cover for £10 as a supplement to the main premium that covers non-refundable travel expenses should your team be cancelled.

### International Evacuation Insurance

The travel medical and evacuation insurance, coordinated by CEGA Group, is mandatory for Earthwatch volunteers while on an Earthwatch expedition anywhere in the world. The insurance covers volunteer travel medical risk, including medical expenses and medical evacuation, while traveling with Earthwatch overseas or on an expedition within your home country. CEGA Group will also facilitate evacuation from the project site in the event of an emergency. Without insurance, the costs of such measures can be on the order of US\$20,000 to \$50,000.

CEGA Group provides a 24-hour emergency hotline for the use of insured persons under the Earthwatch program and can help with medical emergencies, doctor and hospital selection,

obtaining additional medical options or medical translation problems. CEGA Group is backed by International SOS and Global Medical Management, who provide emergency medical evacuation and rescue services. The Earthwatch policy certificate number is US 0113. In addition, each individual policy is identified by the volunteer's Earthwatch ID number, shown above your name on your team list.

In an emergency - If you are calling from **outside of the US**, the number to call is: +44 (20) 8762 8015. You may call this number collect/reverse charges.

In an emergency - If you are calling from **inside the US**, the toll-free number to call is: +1 888 422-4747.

Basic coverage is valid in the country of your Earthwatch expedition and during international travel to and from your expedition. If the expedition takes place in your home country, coverage begins when your group forms for the expedition and ends when the group disbands, and is incremental to your existing health insurance. Options are available for volunteers who would like to extend the period of coverage, increase insurance amounts or purchase additional cancellation or baggage insurance.

A detailed description of the Volunteer Medical and Evacuation Insurance Program policy will be sent with this briefing. **Please note that policies are specific to each Earthwatch office.**

### **Travel Agencies**

Contact your local travel agent or use the web to find the lowest rates to make your travel arrangements. Be sure to give your rendezvous details to your travel agent as soon as possible so they can plan your trip accordingly. The following agency is familiar with Earthwatch projects and can assist you in making travel arrangements and booking hotels:

- Exito - Latin America Travel Specialists  
108 Rutgers St.  
Ft. Collins, CO 80525  
Tel: 800 655 4053, ext. 8507 (toll free US and Canada, ask for Isaac Hilpman)  
Email: [isaac@exitotravel.com](mailto:isaac@exitotravel.com)  
Fax: +1 510 868-8306 (worldwide)  
Web: <http://www.exitotravel.com>  
Code: EARTH

### **Other Advice / Information**

- *Local currency:* Costa Rica Colones (CRC)
- *Language:* Spanish
- *International dialing code:* 506
- *Electricity:* 110 volts
- *Time zone:* GMT/UTC -6
- *Personal funds:* While in the field there will not be much opportunity to spend money. The Ecolodge San Luis, however, does sell phone cards, internet service, snacks, sodas, and souvenirs. You will also need money if you wish to take a taxi to the closest city, Santa Elena. It would be a good idea to bring about US\$100 worth of CRC (just over CRC50,000) to Costa Rica because it may be difficult to change money between arrival in the airport and arrival at the Ecolodge. However, in both the rendezvous city, Alejuela, and the closest city to the Ecolodge, Santa Elena, there are cash machines/ATMs where volunteers can directly

withdraw CRC from their bank accounts. The easiest way to exchange money in Costa Rica is to use a debit card at an ATM machine. Another option for money exchange is via any bank. The benefit of exchange at a bank versus an ATM machine would be assurance of a secure transaction. In Costa Rica there have been reported incidents of tampering with ATM machines. The PI has used ATM machines in both San Jose and Santa Elena without incident. ATM machines and banks are the best way to ensure correct exchange rates. Many restaurants and shops in Santa Elena will allow customers to use US dollars for purchases, with CRC given as change. This would be another option for money exchange. Note that credit cards can be used in Santa Elena for purchases, dining, internet cafes, and recreational activities.

## 10. PROJECT CONDITIONS

*Please show this section to your physician when he/she is completing your health statement. Be sure to discuss inoculation requirements with your physician well in advance of your departure date. See Section 11 'Health Information' for inoculation information.*

### **To the examining physician:**

Your patient has volunteered to join a field research team that has specific physical demands of which you and your patient should be aware. **We need your accurate evaluation of your patient's ability to meet the conditions detailed below in order to safeguard his/her health and safety and ensure that he/she can participate fully and effectively.**

### **General Conditions of the Research Site**

Costa Rica is a small mountainous country, and the terrain is generally steep. The climate at Ecolodge San Luis and Research Station is usually mild. It is 1,000 m above sea level and average daily temperatures are around 71°F (22°C). During the rainy season, from late April to December, nights can be chilly. Average rainfall is 1,960 mm and temperature ranges from 64°F to 80°F (18°C to 27°C).

Temperature range	55°F/13°C	to	80 °F/27°C
Altitude	3,300 ft/1,000 m	to	3,900 ft/1,200 m
Rainfall	118 in/ 300 cm	per	year

### **Physical Demands**

Although coffee plantations are all within a few miles of the Ecolodge, hiking to and within the plantations can be physically demanding due to steep terrain. Cardiovascular and leg strengthening exercises, such as running or hiking, can help you prepare for this in advance.

Using binoculars to visually identify birds can be strenuous on the neck. Volunteers can do head rolls to balance and stretch tight neck muscles in between transects. Special harnesses (instead of neck straps) can also help to alleviate neck strain, and can be purchased at various online stores, including [Amazon.com](http://Amazon.com).

The information provided below is as accurate as possible, but please keep in mind that conditions may change once in the field and the project could potentially be more or less strenuous than the chart indicates.

<b>Activity</b>	<b>Workload/Intensity</b>
Sitting	3-4 hours per day
Bending	1 hour per day

Walking	2 mi/4 km per day on uneven terrain for 3-4 hours per day
Carrying	Light equipment every day Ladders, safety gear and pole saws on 2-8 days (Teams III and IV only)
Ladder climbing	2 hours per day on 2-8 days (Teams III and IV only)

### **Potential Hazards**

<b>Potential Hazard</b>	<b>Associated Risks and Precautions</b>
Transportation	Teams will be transported to the research station in vans by hired drivers with good driving records and who are trusted by the Ecolodge. However, transportation risks due to poor roads are increased in developing countries, including Costa Rica.
Walking/Hiking	Costa Rica is mountainous and rocky. The plantation transects are relatively flat, but you should avoid walking around areas that are beyond transects such as descending into streams via steep cliffs. Risks include tripping over rocks or holes and slipping on wet surfaces. You should be constantly aware of where you are about to step and walk slowly when unsure of footing.
Fruit and flower removal (Teams III and IV only)	Using ladders to climb trees and a pole saw to remove fruits and flowers from branches could be potentially hazardous, however we will conduct all removals in groups and use safety equipment.
Animals/Plants	There are four species of venomous snakes in Costa Rica and three are only mildly venomous. One can be fatal, but it is not aggressive towards people. Be aware of where you place hands and feet to avoid touching venomous snakes and avoid touching unfamiliar plants or animals, including stray dogs and insects. For example, a fuzzy caterpillar may appear cute but if touched the hairs can be extremely painful. Costa Rica also has several species of ants with painful bites.
Climate/Weather	Heavy rain and winds can be uncomfortable in the rainy season (April to December). A warm jacket or fleece is an essential item for all teams.
Water	Recreation activities may include visits to waterfalls or streams. The wet rocks are dangerous and caution should be taken when stepping on them.
Personal security	San Luis is a very safe place with little risk to personal security. Volunteers who arrive early and spend time in San Jose, however, should be aware that there are many professional thieves in the city. Avoid traveling in San Jose at night, unless by taxi and with others.

### **Medical Conditions of Special Concern**

You should be in relatively good physical condition to participate in this project, and must be able to walk 2 mi per day on sometimes steep and/or rocky terrain. Therefore, those with limited mobility or respiratory conditions should reconsider participation. Volunteers with knee problems might be more comfortable wearing knee braces while hiking. Participants on Teams III and IV will be asked to climb ladders for fruit/flower removal; however, volunteers with a phobia of heights can be assigned alternative tasks.

# 11. HEALTH INFORMATION

## Routine Immunizations

All volunteers should make sure they have the following up-to-date immunizations required by your home country: DPT (diphtheria, pertussis, tetanus), polio, MMR (measles, mumps, rubella) and varicella (if you have not already had chicken pox). Other standard immunizations common in some countries may include HIB (haemophilus influenza), pneumococcal, meningococcal, influenza and hepatitis B.

## Project Inoculations

The following are recommendations only. Medical decisions are the responsibility of each volunteer. Note that health conditions around the world are constantly changing, so keep informed and consult your physician, a local travel health clinic, the US Center for Disease Control ([www.cdc.gov](http://www.cdc.gov)), the World Health Organization ([www.who.int](http://www.who.int)) or the resources in Section 15 'Helpful Resources' for the latest health information for travelers.

**Note:** Malaria is NOT present at the research site but is found elsewhere in the country. Speak with your doctor if you plan on traveling before or after the expedition.

	Required for Entry	Recommended for Health Reasons
Typhoid		X
Yellow fever	X - If traveling from countries or region where it is endemic, a Certificate of Vaccination is required.	
Hepatitis A		X
Cholera	*	
Hepatitis B		X

\* Cholera may be present in the research area. In 1973 the World Health Organization (WHO), recognizing that immunization cannot stop the spread of cholera among countries, deleted from the International Health Regulations the requirement of cholera immunization as a condition of admission to any country. In 1990 the WHO stated that immunization against cholera was not effective and they do not recommend it. In 1991 the WHO confirmed that certification was no longer required by any country or territory.

The WHO also estimates that one-third of the world's population is infected with the bacterium (*M.tuberculosis*) that causes tuberculosis (TB). Incidence of tuberculosis is higher in developing countries, particularly in Asia, Africa, the Caribbean and Latin America. In general, approximately 10% of persons infected with *M. tuberculosis* are at risk for developing active TB during their lifetimes. TB is considered highly treatable with medications that are of relatively low toxicity and cost. Volunteers returning from developing countries are encouraged to have a (PPD)-tuberculin skin-test to screen for potential infection.

These recommendations are for this project site only. Please consult your physician for guidance on inoculations if you intend to travel to other parts of the country. Inoculation requirements and suggestions are subject to change. Be sure to consult a public health organization prior to travel to ensure that you have the most current inoculation information.

## 12. PACKING CONSIDERATIONS

**PLEASE SEE THE PACKING CHECKLIST AT THE BACK OF THIS BRIEFING AND REMEMBER TO TAKE YOUR BRIEFING WITH YOU ON YOUR EXPEDITION.**

### General Considerations

Do not bring more luggage than you can carry and handle on your own. Field clothes should include long pants and both long- and short-sleeved shirts. Volunteers will be able to have clothing washed at the Ecolodge (US\$8 per load), so it is not necessary to bring enough clothing to last for the entire expedition. We recommend that you also pack a carry-on bag with an extra set of field clothing and personal essentials in the event that your luggage is lost and/or takes several days to catch up with you.

**Note:** Be sure to carry your own luggage to your taxi upon leaving the airport. There are professional thieves at the airport who may offer to carry your luggage to the taxi for you and then disappear with your things.

### Weather Considerations

Please take into consideration the weather conditions during your team when packing for your expedition. Climate information can be found in Section 10 '*Project Conditions.*' Although there are distinct dry and rainy seasons, the weather at any time of the year can change rapidly from very hot to cold and rainy. Volunteers on all teams should bring clothing items that are appropriate for both cold and warm weather as well as rain gear (this is especially important for Teams I and II).

### Cultural Considerations

Be aware that Costa Rica is a conservative country. Even in warm months, rural Costa Ricans do not wear shorts and tank tops. Volunteers should respect the Costa Rican culture by dressing appropriately and avoiding shorts and tank tops.

Additionally, you will be working closely with the farmers of Finca La Bella and their families. If you wish to bring gifts, suggestions include Spanish language reading books, children's activity books and games, souvenirs or postcards from your home country, chocolates or other snacks, wool socks, or any other token of appreciation for these families who have agreed to participate in this research project.

### Essential Items

**Make sure to bring your Earthwatch Expedition Briefing with you!** It includes essential information to which you may need to refer during your expedition, as well as during your journey to and from the project site.

Additional essential items that you must bring with you include: a rain coat or poncho, a fleece or sweater, a pair of waterproof boots, waterproof binoculars, a water bottle, a day pack and a flashlight.

**Please see the Expedition Packing Checklist for a complete list of what you will need to take with you.** We recommend going through the list with a pen or pencil and marking off each required item right before you leave for your expedition. This list conveniently tears out from the briefing, so you can take it with you when shopping and preparing for your expedition. Make sure to bring the list with you on your expedition so you can check it again before you return home!

## 13. RECOMMENDED READING

### Scientific Media

- Perfecto, I., Rice, R., Greenberg, R. and Van der Voort, M. 1996. Shade Coffee: A Disappearing Refuge for Biodiversity. *Bioscience* Vol. 46, No. 8. Available at:  
<http://nationalzoo.si.edu/Publications/ScientificPublications/pdfs/fcc2413e-fcbe-41fe-a21f-8e573a34e51f.pdf>
- Ricketts, T.H. 2004. Tropical forest fragments enhance pollinator activity in nearby coffee crops. *Conservation Biology* 18: 1262-1271
- Carlo, T.A., J.A. Collazo and M.J. Groom. 2004. Influences of fruit diversity and abundance on bird use of two shaded coffee plantations. *Biotropica* 36: 602-614.

### Popular Media

- Van der Voort, M. and Greenberg, R. *Why Migratory Birds are Crazy for Coffee*. Smithsonian Migratory Bird Center, National Zoo, Washington, DC. Available at:  
[http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/Fact\\_Sheets/fxsht1.pdf](http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/Fact_Sheets/fxsht1.pdf)
- *Coffee Slide Show*. Smithsonian Migratory Bird Center webpage. Available at:  
<http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/Coffee/Slideshow/>
- Hilty, Steven L. 2005. *Birds of Tropical America: A Watcher's Introduction to Behavior, Breeding and Diversity*. University of Texas Press.
- Palmer, Steven P. and Jimenez, Ivan M. 2004. *Costa Rica Reader: History, Culture and Politics*. Duke University Press.
- Kricher, John C. 1999. *A Neotropical Companion: An Introduction to the Animals, Plants, and Ecosystems of the New World Tropics* (Second Edition). Princeton Book Company Publishers.
- Skutch, Alexander F. 1989. *Life of the Tanager*. Cornell University Press.
- Skutch, Alexander F. 1983. *Nature through Tropical Windows*. University of California Press.
- Stiles, Skutch and Gardner. 1991. *Guide to the Birds of Costa Rica*. Cornell University Press.

Many of these media can be purchased online through popular vendors. See Section 15 'Helpful Resources' for vendor websites (e.g. [Amazon.com](http://Amazon.com)).

## 14. EMERGENCIES IN THE FIELD

In the event of an emergency, the PI is able to provide CPR (Cardiopulmonary Resuscitation) and First Aid as necessary. Injured or ill volunteers requiring further medical attention will be taken to a nearby medical clinic in Monteverde or to the hospital in Puntarenas depending on severity. The Ecolodge has a vehicle for emergency situations and trained drivers will be available at all times.

Staff certified in safety training	Valerie Peters is certified in CPR and First Aid and has been an American Red Cross First Aid and CPR instructor since 1997. Ecolodge employee Lucas Ramirez is a certified Wilderness First Responder.
Nearest clinic and hospital	Clinica de Santa Elena Monteverde Tel: + 506-645-5076  Hospital de Puntarenas Monseñor Sanabria, Puntarenas Tel: + 506-663-0133 2-2.5 hours away by vehicle

## 15. HELPFUL RESOURCES

### **Project-related and Principal Investigator Websites**

- Ecolodge San Luis and Research Station: [www.ecolodgesanluis.com](http://www.ecolodgesanluis.com)

### **Useful Visa Information**

- General: <http://www.embassyworld.com>
- For Japanese citizens: [http://www.rainbowt.jp/travel/visa\\_top.html](http://www.rainbowt.jp/travel/visa_top.html)
- For Australian citizens: <http://www.travel.com.au>
- Passport Visa Express (for US volunteers): <http://www.passportvisaexpress.com>
- The Visaservice: <http://www.visaservice.co.uk>
- Thames Consular Services Ltd: <http://www.visapassport.com>

### **Travel Guidebooks and Booksellers**

- Lonely Planet travel guidebooks and online travel site: <http://www.lonelyplanet.com>.
- The Rough Guide travel guidebooks and online travel site: <http://travel.roughguides.com/>
- Amazon: <http://www.amazon.com>
- Barnes and Noble: <http://www.bn.com>
- Airport Codes Worldwide: <http://www.logisticsworld.com/airports.asp>

### **Travel and Airline Resources**

- TravelNotes.org: <http://www.1800-fly.com>
- World Travel Guide: <http://www.worldtravelguide.com>
- Cheap Flights (worldwide): <http://www.travelix.com/> or <http://www.discountair.com/>
- Airport Codes Worldwide: <http://www.logisticsworld.com/airports.asp>
- Third World Traveler - offers many links for useful travel information:  
[http://www.thirdworldtraveler.com/Travel/Travel\\_Links.html](http://www.thirdworldtraveler.com/Travel/Travel_Links.html)

- STA Travel (US): <http://www.statravel.com>  
Tel: +1 800 781-4040
- STA Travel (UK): <http://www.statravel.co.uk>  
Tel: +44 (0) 1865 792800  
Fax: +44 (0) 1865 792911  
Email: [manager.oxford@statravel.co.uk](mailto:manager.oxford@statravel.co.uk)  
Quote code: EWE01/02
- Wexas International (Europe): <http://www.wexas.com>  
Tel: +44 (0) 20 7581 8761  
Fax: +44 (0) 20 7581 7679  
Email: [southern@wexas.com](mailto:southern@wexas.com)  
Quote code: EWE01/02
- UK Foreign Office travel advice: <http://www.fco.gov.uk/travel>
- Travel website for Australia: <http://www.smartraveler.gov.au>
- Exitto Travel (Latin American travel): <http://www.exitotravel.com>

### **Country Information**

- Country Reports - country information from around the world:  
<http://www.countryreports.org>
- National Geographic Map Machine: <http://plasma.nationalgeographic.com/mapmachine>
- U.S. State Department: <http://www.state.gov/>
- World Time Server: <http://www.worldtimeserver.com/> (time worldwide with GMT/UTC) or <http://worldbuddy.com>
- Currency Converter: <http://www.xe.com/ucc/>
- Telephone dialing from and to anywhere: <http://kropla.com/dialcode.htm>
- Online Unit Conversions: <http://www.onlineconversion.com>
- Worldwide Weather: <http://www.worldweather.com> or <http://www.wunderground.com>
- ATM Locator:  
<http://visa.via.infonow.net/locator/global/jsp/SearchPage.jsp>  
<http://www.mastercard.com/atmlocator/index.jsp>
- Heat Index (temperature, dewpoint and relative humidity):  
<http://www.weatherimages.org/data/heatindex.html>
- Exhaustive List of Weather Resources: <http://cirrus.sprl.umich.edu/wxnet/servers.html>

### **Health Information**

- US Travel Clinic Directory: <http://www.astmh.org/scripts/clinindex.asp>
- Travel Health website: <http://www.mdtravelhealth.com>
- Center for Disease Control: <http://www.cdc.gov>  
Tel: +1 800 311-3435 or +1 888 232-3228
- World Health Organization: <http://www.who.int>
- Disease Outbreaks: <http://www.who.int/csr/don/en/>
- Hospital for Tropical Diseases Healthline (UK)  
Tel: 0906 1 337733 (within UK)  
(calls are charged at 50p per minute)
- MASTA Travelers' Healthline (UK)  
Tel: 0906 8 224100 (within UK)

# THE RESEARCH

## 16. BACKGROUND, OBJECTIVES AND METHODS

### Background

In 1991, The Smithsonian Migratory Bird Center (SMBC) was created to investigate the causes of migratory bird population declines in both the northern temperate breeding grounds and the tropical wintering grounds. Through research carried out by the scientists working with the SMBC, the potential for shade-grown crops, such as coffee and cacao, to be grown in forest-like conditions that would support animal species conservation was elucidated (Perfecto *et al* 1996). Much more research, however, is needed to understand how exactly these multi-species croplands can be restored to benefit both impoverished coffee farmers and conservation efforts. The restoration of the ecological services which nature provides should be the primary focus in the development of plantation guidelines because these services inherently benefit both humans and the environment. Ultimately, this research project will aid in the overall efforts to understand how croplands can be restored or enhanced to protect ecological services.

Coffee is one of the world's most heavily traded commodities. In 2002 coffee had a retail value of US\$70 billion, which surpasses the forecast of \$56 billion for *total* US agricultural exports for 2003 (Vega *et al.* 2003). The overproduction of coffee and subsequent price decline has reduced the amount of funding that international coffee agencies can designate to essential coffee research. With an estimated 100 million people dependent on coffee for income, research addressing sustainable coffee production is imperative. Coffee research offers a unique opportunity to understand how croplands can be restored to take advantage of important ecological services, such as pollination and seed dispersal, because high quality coffee requires a polyculture system. Native tree species can be incorporated into coffee plantations as shade cover not only to enhance coffee quality and provide alternative products for farmers, but also to provide year-round floral or fruit resources to sustain populations of important pollinators and seed dispersers.

Animal pollinators are needed for the reproduction of 90% of flowering plants and one-third of human food crops (Buchmann and Nabhan 1996). Native bee populations are suffering severe declines in the United States and are being replaced rapidly in degraded habitats of the Neotropics by non-native honeybees (Ricketts 2004). Even those Neotropical bee species which appear to be abundant have been found to be at risk due to the prevalence of sterile diploid males in the population (Roubik 2004). A group of 20 field scientists concerned with the pollinator crisis concluded that crucial research should address the effects of habitat fragmentation on wild pollinator populations in and near croplands as well as the habitat requirements for management of pollinator diversity and how these habitat requirements can be used in restoration plans of croplands in order to stabilize or improve crop yields (Allen-Wardell *et al.* 1998)

Roubik (2002) showed that social honeybees can boost coffee crop yields by 50%, thus demonstrating that coffee plants would benefit from being grown in habitats suitable for sustaining valuable pollinators. Klein *et al* (2003) found that coffee fruit set could be predicted by the number of bee species visiting coffee flowers, ranging from 60% seed set with three bee species to 90% seed set when 20 bee species visited. Although evidence suggests that solitary bee species are more efficient pollinators than social honeybees, the habitat requirements for these species and particularly the affect of shade tree diversity remains poorly studied (Klein *et al.*

2003). One study in Costa Rica, however, was particularly intriguing. Ricketts (2004) examined bee diversity and pollen deposition rates in a 1,100 hectare coffee plantation at five distance classes (50, 100, 300, 800, 1600 m) from a nearby forest. Bee species richness and pollen deposition rate were all significantly higher in sites within approximately 100 m of forest. The shade component of the coffee plantation studied was composed of a single, synchronous flowering eucalyptus species. The author suggests that a more diverse shade tree cover in coffee plantations over 100 m from any forest or forest remnant would best support native bee populations due to the constant availability of floral resources.

Shade tree species composition in coffee plantations is highly variable (Miguel and Toledo 1999). Higher diversities of shade tree cover in coffee plantations, such as those associated with rustic coffee production systems (e.g. coffee grown under natural forest) have been shown to better support animal communities (Miguel and Toledo 1999, Greenberg *et al.* 1997, Perfecto *et al.* 2003). Planted shade tree species and tree species which are permitted to grow in coffee plantations differ in the quality of resources which they may provide to animals (Johnson 2000, Carlo *et al.* 2004). Tree species may be especially important if they provide resources during periods of fruit scarcity, if individuals fruit and flower asynchronously, or if they are used by a wide animal assemblage (Peres 2000, Wunderle and Latta 1998). Depending upon when and which resources are available in coffee plantations and nearby forest, animal species may depend more upon food resources found within the coffee plantation than those found in the nearby forest (Carlo *et al.* 2004). It is important to understand how shade tree diversity and shade tree species composition in coffee plantations can determine how plant resources, such as fruit and nectar, are available to animals. From a conservation perspective, it is crucial to assess at what level of shade tree diversity in coffee plantations bee species and bird species abandon coffee plantations because there is no longer sufficient resources available to sustain these populations throughout the year. Furthermore, if floral and fruit resource availability determines animal usage or persistence in coffee plantations, then farmers interested in the conservation of bird and/or bee species diversity can select shade tree species with differing flower phenologies.

Despite the fact that experimental studies are known to be the only way to determine direct cause and effect relationships conclusively, studies testing how habitat characteristics affect animal abundances have been mostly based on correlations. Recently, several exemplary field studies have used experimental removal treatments and controls in subplots to directly test how bird abundances change with treatments. For instance, Moegenburg and Levey (2003) experimentally removed fruits from a keystone palm species in Brazil to test how frugivore abundances and diversity are affected by changes in fruit availability. In treatments where 75% of ripe fruits were experimentally harvested, frugivorous bird abundances significantly declined by 29%. Additionally, more than half (11 out of 20) of the frugivorous bird species changed visitation patterns in the plots where palm fruits were removed, six species ceasing visitation completely. Another study, conducted in coffee plantations, experimentally removed epiphytes from all trees within a 3 hectare plot (Cruz-Angón and Greenberg 2005). Eighteen forest bird species were determined to be significantly more abundant in the control plots, and resident birds which nest in epiphytes were also shown to be directly affected by their experimental removal. Manipulative experiments can be set up to decrease or avoid the confounding influences usually associated with mensurative studies. These studies and knowledge of the coffee shade system support the idea that an experimental study manipulating tree-produced resources at different times of year is the most efficacious way of testing the resource constancy hypothesis. It is such an experiment that we will be to conducting during this study.

## **Research Objectives and Methods**

In this study, we will use two different experimental treatments to understand how resource constancy affects bird and bee populations. Eight 2 hectare coffee plantations will be selected for this study. Each plantation will be divided in half so that 1 hectare will receive one of the two contrasting experimental flower-fruit removal treatments and 1 hectare will serve as a control to the treatment. In the dry forests of northwestern Costa Rica, most trees produce flowers late in the dry season (March-April) and fruit at the beginning of the rainy season (May-June). Therefore, February is an ideal month to experimentally create both a flower and fruit resource gap. We will use pole saws in conjunction with ladders to remove the fruit and flowers from individual plants in both experimental treatments.

The first treatment will involve the experimental creation of an artificial resource shortage during the dry season month of February when overall resource production is typically low. During this month, any individual tree or shrub species bearing bird-dispersed fruits and bee-pollinated flowers will be experimentally removed from four randomly chosen subplots.

To contrast the effects of resource shortage with the effects of resource removal during peak seasons for flowering and fruiting, the second experimental treatment will involve the removal of only one shade tree species. The keystone plant resources concept hypothesizes that a plant's resource can be considered "keystone" if it offers consumers a high nutritional reward, has low consumer specificity, produces a dependable resource or provides resources at times of overall scarcity (Peres 2000). These criteria were used to select a shade tree species which could be a potentially critical resource during times of resource abundance. *Sapium glandulosum* is a common, naturally-occurring shade tree species which produces fruits with a high lipid content that are consumed by a wide assemblage of animal species. It is both bee-pollinated and bird-dispersed and ranges from Mexico to Argentina. *Sapium* produces fruits during July and August, both months of heavy rainfall in the San Luis region when the majority of plant species produce fruits. In the month of April, during peak flowering, the inflorescences of *Sapium glandulosum* will be experimentally removed. Inflorescence removal in April will consequently remove fruits from *Sapium* individuals during the peak fruit month of July.

In this study, eight coffee plantations with different shade tree diversities and compositions will be evaluated throughout the year for bird and bee species richness. Each coffee plantation will receive one of the two experimental treatments, either a removal of *Sapium glandulosum* flowers and consequently fruits, or a 20-day artificial flower and fruit resource shortage during the dry season month of February.

Specific objectives and methods are described below.

### **Objective 1**

The first objective of the project is to determine if constant resource availability increases bee diversity in shade-coffee plantations. Recent research indicates that pollinator diversity and especially solitary bee presence may increase coffee yields. Pollination is an important ecological service that can benefit farmers directly through better quality coffee and an increased coffee harvest. If results from this portion of the study indicate that bee diversity in shade-coffee plantations can be conserved by choosing shade tree species which provide bees with year-round nectar resources then farmers may be more willing to increase shade tree diversity on their farms.

### **Method 1: Bee Surveys**

In order to determine the effect of flower removal on bee populations using coffee plantations, bee activity will be observed at coffee flowers in subplots during April 2006 (pre-flower removal) and April 2007 and 2008 (post-flower removal). Three coffee plants will be randomly selected for bee activity observations in each subplot along 100 m transects at approximately 30 m intervals. Each bee visit, defined as a bee landing on a flower and collecting resources, will be recorded during a 10 minute observation period at each coffee plant. Additionally, each visiting bee will be identified to morphospecies using reference materials, and number of flowers visited will be recorded.

### **Method 2: Flower Surveys**

To determine floral resource availability in each subplot, the number of individual plants with open, bee-pollinated flowers will be recorded twice during each 15-20 day study period. During floral and fruit surveys volunteers may have the opportunity to interact more closely with the coffee farmers who may be better able to guide you through their own plantations. Because each farmer manually harvests the coffee from his own coffee plantation, they generally have an excellent knowledge of all shade tree species on the farm.

### **Objective 2**

The second objective is to determine if constant bee-pollinated flower availability increases pollen deposition on coffee flower stigmas in shade-coffee plantations.

### **Method 1: Stigma Collection**

Pollen deposition rates will be measured by collecting the stigmas of 40 randomly selected coffee flowers from each subplot after allowing natural pollination to occur for 24 hours. As flowers first begin to appear on coffee plants in April 2007-2009, 40 flowers in each hectare will be tagged. After a period of 24 hours, the stigma of each flower will be removed using a tweezers. Stigmas will be placed carefully in a holding tray and taken to the laboratory. In the lab, each stigma will be mounted on slides using fuschin jelly. Pollen deposition will be determined using a compound microscope to count the number of pollen grains attached to the stigmatic surface.

### **Objective 3**

Thirdly, we will address whether or not constant fruit availability increases frugivorous and partially frugivorous bird abundances in shade-coffee plantations. Previous studies have shown that shade grown coffee increases bird abundances over sun-grown coffee, however the amount of increase varies with the composition of the shade layer. More specific information is needed, however, to understand how shade tree management influences bird populations, especially bird species which disperse seeds. Frugivorous birds are often species which are especially important for nature tourism because these birds often display the bright coloration people have come to expect in tropical birds. Frugivorous birds may be especially affected by deforestation because they may depend wholly or partially on fruit resources throughout the year. Farmers with coffee plantations which can support populations of birds that consume fruit may not only receive higher prices for their coffee through certification programs, but they may also add income through nature tourism.

### **Method 1: Bird Surveys**

In order to determine the effect of fruit removal on bird populations using coffee plantations, bird surveys will be conducted in both experimental and control subplots of the eight coffee plantations in July, November, February, and April. Each survey will consist of an observer

walking slowly along a 100 m transect through the middle of each subplot of the plantation. Two observers will begin on opposite ends of the plantations and allow 45 minutes for each 100 m transect.

During *Sapium glandulosum* peak fruiting season and the experimental month of resource shortage (February), bird survey transects will be conducted more intensively. Transects will be walked continually, completing each 100 m transect in 45 minutes. Each bird species observed will be classified as frugivore, partial frugivore, granivore, or insectivore based on literature reports. Opportunistic observations on individual bird activity will also be recorded as foraging on fruits, foraging on insects, or other non-foraging activity.

### **Method 2: Fruit Availability**

Fruit availability in each subplot will be estimated by recording the number of individuals bearing ripe fruits and crop size during the 15 day bird survey period. Fruit crop size will be determined using a fruit availability index where 0 = no ripe fruits, 1 = 1-10 ripe fruits, 2 = 11-100 ripe fruits, 3 = 101-1,000 ripe fruits, 4 = 1,001-10,000 ripe fruits, 5 = 10,001-100,000 ripe fruits and 6 = more than 100,000 ripe fruits. In order to avoid observer bias, two observers will estimate ripe fruits by counting the number of fruits on 10 randomly selected branches and extrapolating this value to the number of branches.

## **17. RESULTS AND OPPORTUNITIES**

Farmers in the Neotropics are generally interested in preserving the biodiversity found on their farmlands and forests, but often are uninformed about restoration practices and species' habitat requirements. Homeowners in the United States may be more exposed to "backyard wildlife" outreach material, such as posters, that display pictures of tree and bird species' associations so that interested conservationists can plant tree species which best protect biodiversity. One goal of this research project would involve the creation of similar posters which coffee farmers could use as guidelines in choosing shade tree species. Knowing which tree species attract which bird species and their usefulness will allow coffee farmers to choose whether or not they will take the necessary actions for creating a sustainable environment in their lands.

The results of this study will be extremely useful for coffee and cacao growers in all regions of the world. Every Latin American coffee growing country has a national association of coffee producers with technicians who provide support to coffee farmers. The results from this study will be distributed to these coffee organizations. Both the poster publication and study results will be circulated locally and nationally by the PI, and potentially through a new Smithsonian Migratory Bird Center brochure, as the research concludes, most likely in 2009.

An ultimate goal of this research project will be to encourage farmer participation in long-term bird and bee population monitoring. Farmers may not have a lot of time to dedicate to this project, but will be curious about the research activities taking place on their land and will be offered the opportunity to participate and learn throughout the field season. All farmers involved in the study will be educated about research methodologies, potential result benefits, and how they can best participate before the first group of Earthwatch volunteers arrives. Each field term will end with a community meeting in which Earthwatch volunteers will present the results of the study. Although this would not be enough time for proper data analysis, preliminary qualitative results will be presented, which will further encourage farmer participation and excitement. Farmers may even hold mini-competitions for whose farm will have the highest bird

or bee species diversity during each 15 day field term and Earthwatch volunteers can award a prize to the winners.

Dr. Celia Harvey, a host country national scientist and one of the most well-known tropical agro-ecologists, will lend support and advisement for this research project. Dr. Harvey of CATIE, one of the leading universities in Latin America for tropical agricultural research, recently published a study on the important role that windbreaks can play in the conservation of tropical forest trees. Dr. Harvey will also select two host country national students from CATIE University who will be local research assistants during the field season. Additionally, the University of Georgia study abroad programs and courses at the Ecolodge San Luis encourage student interaction with the local communities.

This research project is being undertaken in collaboration with the Smithsonian Migratory Bird Center (SMBC), an international organization. Dr. Russell Greenberg, a co-advisor on the project, is the director and founder of SMBC and his research has paved the way for conservation biologists to conduct studies in agro-ecosystems. The combination of environmental education and scientific studies conducted at SMBC relates directly with the mission statement of Earthwatch Institute.

SMBC educates both rural farmers in the Neotropics as well as the general public of the Americas in bird conservation issues. The results from this study will be used by the Smithsonian to improve guidelines for their Bird-Friendly Coffee certification program. Currently, the criteria for Bird-Friendly Coffee require that farmers manage a diversity of at least 10 shade tree species per hectare. These criteria have been developed based on previous studies, and will continue to benefit from studies that can more specifically inform coffee and cacao farmers on best management strategies. In addition to these immediate contributions to the coffee-conservation efforts, the results from this study will also be published in scientific journals, such as *Ecological Applications*.

The Mission of the Ecolodge San Luis and Research Station is to provide excellence in academic program and research opportunities while serving as the best equipped social, cultural, environmental and international facility of the University of Georgia. The Ecolodge's vision is to work under the principles of environmental, cultural, social and economic stability, as well as to serve as an example of sustainability to the academic and non-academic communities of Costa Rica, Latin America and the rest of the world. The opportunities for education and training for both Earthwatch volunteers involved with this research project and local community members are endless.

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# EXPEDITION PACKING CHECKLIST

## Essential Items

- This Expedition Briefing
- Photocopies of your passport, flight itinerary and credit cards in case the originals are lost or stolen; the copies should be packed separately from the original documents
- Visa and/or passport (if necessary)
- Certification of inoculation (if necessary)

## Required Items

### *Clothing/Footwear for Fieldwork*

**Note:** Volunteers can have clothes laundered at the Ecolodge for a small fee.

- Lightweight, quick drying, long-sleeved shirts and pants/trousers
- Hiking boots
- Waterproof or rubber boots (Teams I and II)
- Rain gear (poncho and/or umbrella)
- Socks that can be pulled up over pants
- Hat

### *Field Supplies*

- Small daypack/rucksack
- Drybag or plastic sealable bags (good for protecting equipment such as camera from dust, humidity and water)
- Insect repellent spray
- Water bottles (minimum of two 1-liter bottles)
- Headlamp or flashlight/torch or with extra batteries and extra bulb
- Field watch (inexpensive digital watch with seconds display; stopwatch function can come in handy, but is not necessary)
- 7 x 35 or 8 x 40 binoculars to ensure data reliability (will cost approximately US\$250)
- Field notebook with plastic bag (Rite in the Rain brand is great for humid conditions)

### *Clothing/Footwear for Leisure*

- One set of clothing to keep clean for end of expedition, the fiesta, and for visits into town
- Warm jacket, fleece or sweatshirt (it will be cold in the mountains)
- Sandals to wear around the Ecolodge grounds and facilities
- Spare shoes to change into when the others are wet and muddy
- Night wear (for chilly night weather)

### ***Bedding and Bathing***

**Note:** Towels and bedding are provided by the Ecolodge.

### ***Personal Supplies***

- Personal toiletries (we recommend bringing biodegradable soaps and shampoos)
- Antibacterial wipes or lotion (good for “washing” hands while in the field)
- Personal first-aid kit (e.g. anti-diarrhea pills, antibiotics, antiseptic, itch-relief, pain reliever, bandages, blister covers, etc.) and personal medications
- Sunscreen lotion with SPF 30 or higher

### ***Miscellaneous***

- Spending money (cash can be used most easily in and around the research station, and debit/credit cards can be used in Santa Elena)

### **Optional Items**

- Earplugs
- Camera, film, extra camera battery
- Swimsuit/bathing costume
- Field guide on the birds of Costa Rica
- Binocular harness (can be found at [Amazon.com](http://Amazon.com)) to reduce neck strain
- Spanish/English dictionary
- GPS receiver
- Personal reading material
- Portable, personal music player with headphones (IPOD, CD player, radio, etc.)
- Candies or chocolates (be sure to bring enough to share!)
- Gifts for local families (see *Cultural Considerations* in Section 12 for suggestions)