International Zoological Expeditions

Blue Creek Rainforest Station

Rainforest Ecology and Expedition Curriculum

Table of Contents

The following activities are only a part of your whole field course. The activities are meant to guide you through your exploration of the various components that make up the rainforest ecosystem.

Evening lectures will interpret the complexity and diversity of the rainforest that you have seen and experienced throughout each day.

In addition to the ecological components you will also experience, through the guides and their families, the culture of the Mayan people. If you choose you can observe the Mayans' traditional arts, family life, and different means of subsistence.

Resource books and testing kits, when available at the station, will help with identification, collection and recording exercises.

The whole of your experience will provide you with both physical and mental challenges. Your stay, at the very least, will be an unforgettable learning experience.

We look forward to your visit!!

Classroom Lecture Notes

Please bring this book with you each evening to the lectures and fill in appropriate information.

I. Facts about tropical rainforests.
   a. location

   b. precipitation

   c. plant growth

II. Why are the tropical rainforests wet?

III. Buttresses and Prop Roots

IV. Trunks and Crowns

V. Leaves

VI. Epiphytes
   a. Settlement

   b. Stresses

c. methods of water loss reduction

d. food chain occurrences

e. tree defense against epiphyte

VII. Vines
a. location

b. locomotion

c. lianas

d. leaf shape

e. danger to trees

VIII. Seed Dispersal
a. Diaspores

b. free dispersal

c. fruit dispersal

d. K-strategists versus r-strategists

IX. Biodiversity
a. definition

b. stability

c. speciation

X. Deforestation
a. rates

b. causes

c. effects

d. possible solutions

Recommended Clothing and Equipment List

Dan and Dianna,

Please insert the Recommended Clothing and Equipment List from the Student Handbook I created in the autumn.
It lists all activities along with the Iguana "Hunt" I asked you to add on the email, as well as the clothing and equipment needed for participation in each activity.

Thanks, Maura

Monkey Walk

This hike is designed to allow students to view/hear the Howler Monkeys. These howlers have prehensile tails and bearded faces. These animals are named for their ferocious voices which echo throughout the rainforest at sunrise and sunset. The males have an enlarged throat sac and tracheal cartilage that together act as a resonator, dramatically amplifying their calls. Their howls mark troop territory and the sounds carry about a mile. Males are approximately 30% larger in body size than females. This difference along with vocal apparatus suggests strong sexual selection. An average clan consists of 3 adult males, seven to eight females and varying numbers of juveniles. Clans vary in size from four to thirty five. Males are dominant over females and young animals tend to be dominant over elder members. Howlers live in many forest types. They live on a diet of leaves. Flowers and fruits make up only 30.7% of their diet. Because they rely so heavily on leaves they tend to have fairly small territories.

1. The walk to the approximate site where we usually view the monkeys provides an opportunity to talk to your Mayan guide regarding education, religion and employment/livelihood and how the rainforest is involved in these areas. It also gives you the opportunity to discuss any other aspects of the Mayan culture that interests you. What was your guide's name?
<u>Howler Monkey Observations:</u>

<u>Education:</u>

<u>Livelihood:</u>

Religion:

Observe rainforest, jungle and secondary forests:

Other:

Short Cave

This activity gives students a view of an environment not usually thought of when envisioning the tropical rainforest. Participants need to bring a reliable light source with extra batteries and good, treaded shoes. The group will follow their guide on a path which meanders through the rainforest and up a steep incline to an entrance of the Blue Creek Cave. Once inside, students will continue to follow their guides walking, crawling and slithering through various parts of the cave. Please do not touch, handle or take any stalagmites or stalactites.

1. What was your guide's name?

2. When you enter the cave your group will notice many changes with their senses. Please make a mental note of all sensations.

3. At some point your guide will have everyone turn off the light sources. Make a mental note of changes and observations you experience now.

4. Your group will see or hear organisms while in the cave. Remember what they are and record them.

5. Try to figure out as a group how the organisms live in the darkness and what they live on.

6. What is the difference between the stalagmites and stalactites?

7. If anyone would like, they may make drawings of some of the more interesting cave formations.

Iguana "Hunt"

This activity provides students an opportunity to view up close and personal the prehistoric looking Common Iguana. Your guide will lead you down to the village and you will follow the Blue Creek River through an area with many fruit trees and Mayan homes.

1. What was your guide's name?

2. What trees did your guide point out to you?

3. Were any of them fruiting?

4. What observations did you make about the Mayan homes you saw?

5. What color were the iguanas? Why?

6. How long were the iguanas found that you were able to view up close?

7. Describe the head, face, claws, scales and tail of the iguanas you saw today.

Long Cave

This activity is a thorough expedition of the Blue Creek Cave. It is a very rigorous activity. Please take this opportunity to journal on your caving experience within a few hours of when you finish. Some items you may wish to describe are: **guide's name, group members, cave entrance, cave climate, degree of difficulty, organisms you came across, any artifacts you may have seen, highlight of the expedition, etc…**

Jungle Hike

This activity brings you up the side of one of the mountains behind the camp. It is a very strenuous activity requiring endurance on the climber's part. There are distance bands of vegetation, called ecotypes, each encircling the mountain within certain altitudes.

1. What was your guide's name?

2. Describe the changes in vegetation you see on your climb.

3. Describe the changes in climate you experience as you climb.

4. Did you see any wildlife or evidence of wildlife?

5. Take this opportunity to journal on your climbing experience.

Bird Walk

This early morning walk provides an opportunity to view many neotropical birds. Your guide will take you down to the road in the village for the walk.

1. What was your guide's name?

2. What birds did you see? Use the bird book at the station for any you were unable to identify.

3. What types of trees were the birds in?

4. Were any birds you spotted migratory birds? Use the bird book at the station to help.

5. What colors were the birds you saw?

6. Did you see any bird's nests? Describe.

Ethnobotany

This activity is a look into the medicinal and culinary uses of the local herbs, plants and trees of the tropical rainforest we are in. You will see many different herbs, plants and trees and even taste a few. You may even have the chance to try a remedy if you are an unlucky candidate for mosquito bites, spider or scorpion bites, itchy, jungle rashes, fever, etc...

1. What was your guide's name?

2. List some of the herbs, plants or trees you learned about.

3. List some remedies you remember being described.

4. Which ones had you heard of before you entered the forest?

5. Which herb, plant or tree made the biggest impression?

6. If you could take home any remedy with you, which would it be? Why?

Farm Demonstration

This activity gives the students a first-hand look at the crops the Mayans harvest. Some of the crops you might see are avocados, citrus, cocoa, mango, cashews, rice, beans, etc… Depending on the time of year you will see different crops at different stages. Your guide will explain how they plant the seeds and give you the opportunity to do so. Ask your guide to show or explain to you the difference between a milpa and mechanized farm.

1. What was your guide's name?

2. What crops did you see?

3. Where any in season?

4. Were you able to taste any fruits, nuts, etc…?

5. Which seeds were you given the opportunity to plant?

Cave Dive

This activity involves walking along the river's edge to the mouth of the Blue Creek Cave. The activity is actually a swim into the mouth of the cave and continues up a channel inside the cave.
You will definitely need an underwater flashlight. Headlamps are best so both of your hands will be free to discover obstacles under the water's surface.

1. What was your guide's name?

2. Compare the temperature of the water in the cave versus the temperature where we swim in front of the lodge.

1. Describe the surface of the underwater rocks.

2. Did you view any stalactites or stalagmites?

3. How did the inside of the cave where you swam differ from the inside of the Short Cave expedition?

4. Describe any organisms you saw.

Night Walk Worksheet

During your stay you will experience a night walk. There is much to see and hear so your walk shouldn't be rushed. Most nocturnal creatures possess a reflective layer behind the eye. If you are wearing a headlamp or holding your flashlight at eye level the reflection will reflect back to you and the creatures' eyes will glow or sparkle.
Spiders usually have green or blue shines and vertebrates have orange or red shines. Make sure to shine your flashlight into the canopy above you. If you come upon a set of orange eyes they might belong to the kinkajou. Remember to shine your lights in the buttresses of the trees, hollow logs, nooks and crannies in the rock formations and anywhere else a creature might be.
Spiders, scorpions, insects, walking sticks, toads, land crabs, bats, and snakes to name a few are all possible to view at night. If you should be lucky enough to find a snake do not keep your light pointed at it. Some snakes are aggressive towards lights and have a tendency to attack.

1. Observations during night walk:

2. What organisms were you able to see?

3. Did you see any difference in any of the plants or trees at night?

4. What different noises did you hear at night?

Bat Worksheet

All bats are nocturnal. There are approximately 750 bat species in the world. Bats use echolocation; they emit high pitched vocalizations (humans cannot hear them) that bounce off objects of approximately the same size as the wavelength of the emitted sound.
Bats are very important mammals in the tropical community. Bats are seed-dispersers, pollinators of plants, predators and prey.
Bats feed at several trophic levels, meaning they have several dietary habits. They are more diverse in diet than any other mammal group. There are insect eating bats, insectivores, flower and fruit eating bats, frugivores, nectar and pollen eating bats, nectarivores, other vertebrate eating bats, carnivores, fish eating bats, piscivores and blood eating bats, sanguivores.
In the space below record which bats you have observed using one of the field guides at the station. For each bat describe the distinguishing characteristics, size, food source, and any other information you may find interesting.

Scavenger Hunt

A scavenger hunt will be held after the groups have had some time to familiarize themselves with their tropical rainforest surroundings. This activity will help students apply the knowledge they have gained throughout this course. It will also allow students to practice their identification skills. Great care must be taken when participating in this activity to minimize impact on the forest environment as well as to ensure personal safety. You will be divided into groups and each group will need a pair of gloves, a small knife and a plastic or paper bag. Good luck!

- feather
- fresh water shell
- piece of gumbolimbo bark
- piece of allspice leaf
- piece of give and take palm leaf
- waree palm nut
- catch something alive from the forest (insect, fish…)
- spot a bird and identify
- spot an iguana/lizard and identify, describe location
- the most unusual "find"

Self-Guided Tree Exploration

The following is an exercise to familiarize yourself with common tropical rainforest trees, plants and vines. In the space below each tree description you will be asked to describe the characteristics of its roots, bark and leaves. The map begins at the entrance of the station where you originally entered.

1. Bay Cedar (*Guazuma ulmifolia*)
Named by the English cabinetmaker 'Chippendale' after Belize's early name 'The Bay Colony' and 'Cedar' because it resembled the lustre, color and quality of cedar. The bark is used as a tea for dysentery, stomach aches and diarrhea.
Describe roots:

Describe bark:

Describe leaves:

2. Strangler Fig (*Ficus sp.*)
Looking to your right back against the hill you will see a strangler fig in the process of encasing and eventually killing its host. Strangler figs begin as epiphytes up in the canopy, send down roots until they reach the ground where they take root and begin secondary growth around their victim.
Describe roots:

Describe bark:

Describe leaves:

3. Waree Palm (*Acrocomia vinifera*)
Displays stiletto-like spines to protect the tree from herbivores and vines. The spines also protect the nuts by stopping any hungry animal from butting the tree at the bottom. Each of the spines carries lichens and microbes which can quickly cause an infection if punctured into the skin.
Describe roots:

Describe bark:

Describe leaves:

4. Water Vine

To your left, a few feet from the trail you will find what looks like a tree trunk growing along the ground. Follow the trunk growing along the ground. Follow the trunk along and up as it makes its way into the canopy. This vine is well known to bushmen as a source of fresh, pure water when cut. On one of your hikes your guide will let you drink from one if you wish.

Describe roots:

Describe bark:

Describe leaves:

5. Breadnut Tree (*Brosimum alicastrum*)

An important staple food to the ancient Maya who used the fruits for eating, leaves and nuts as fodder for animals and wood for construction. A single tree has the potential to yield 2,200 pounds of fruit per year.

Describe roots:

Describe bark:

Describe leaves:

6. Hog Plum (*Spondias mombin*)

Again, an important tree for the Maya who consumed the wild fruit and used the leaves and bark for an astringent. The boiled bark was also used as a tea for diarrhea and gonorrhea.

Describe roots:

Describe bark:

Describe leaves:

7. Redman Wood

Describe roots:

Describe bark:

Describe leaves:

8. Provision Tree (*Pachira acquatica*)

Used as a tea to build blood, treat animals and low blood pressure.

Describe roots:

Describe bark:

(Provision Tree, cont'd)
Describe leaves:

9. Monkey Apple Tree
This tree is host to a myriad of vines and epiphytes. Many of which you will recognize as plants you have seen in malls and other indoor places. Several species of philodendron grow on this tree including *Monstera deliciosa* which produces a delicious fruit.
Describe roots:

Describe bark:

Describe leaves:

10. Philodendrons (*Monstera sp.*)
This vine is a bole climber. The seeds on the ground send out a tendril toward shade. The tendril grows up the tree trunk, supported by aerial roots and anchors on the tree.
Describe roots:

Describe bark:

Describe leaves:

11. Cockspur Acacia (*Acacia cornigera*)
This tree is an example of mutualism in the rainforest. Ants live in the thorns and emit formic acid that discourage vines, plants and animals from growing on the tree. The tree in turn produces 'Beltian Bodies', small orange globules on the tips of leaflets which feed the ants. Medicinally, the bark and root when chewed prevent snake venom from quickly entering the bloodstream.
Describe roots:

Describe bark:

Describe leaves:

12. Santa Maria Tree
This is host to a huge bromeliad. Bromeliads have 'tanks' at their centre where mosquito larvae, frogs and salamanders live. The waste from these organisms feeds the plant itself.
Describe roots:

Describe bark:

Describe leaves:

13. Bromeliad
Sharply, pointed, dagger-like leaves. Bromeliads are abundant epiphytes in al Neotropical moist forests. Leaves are arranged in an overlapped pattern to form a cuplike tank that holds water and detrital material. Bromeliads provide a source of moisture for many canopy dwellers like tree frogs, mosquitoes, flatworms, snails, salamanders, etc…
Describe roots:

Describe bark:

Describe leaves:

14. Royal Palm
Describe roots:

Describe bark:

Describe leaves:

15. Poinsettia
Describe roots:

Describe bark:

Describe leaves:

16. Pheasant Tail (*Anthurium crassineruium*)
This plant normally grows as an epiphyte and can be seen growing on mature trees. The leaves were used for herbal steam baths which alleviated the aches and pains of arthritis and rheumatism. Bruising a piece of the leaf will produce the pungent aroma which permeates the bath.
Describe roots:

Describe bark:

Describe leaves:

17. Trumpet Tree (*Cecropia sp.*)
This tree also demonstrates mutualism. Ants live in the hollow stems and attack vines, bug and animals. Here the tree provides nectar for them at the base of their leaf petioles. The Maya use the leaves as a tea to reduce high blood pressure and much research on this aspect is ongoing.
Describe roots:

Describe bark:

Describe leaves:

18. Banana Tree
Bananas are very important to residents of the tropics. They are one of the largest cash crops in all of Central America.
Describe roots:

Describe bark:

Describe leaves:

19. Heliconia sp.
On your left you will find the Heliconia shrub. Its yellow and scarlet flowers attract hummingbirds, which pollinate it. They have large populations in successional areas.
Describe roots:

Describe bark:

Describe leaves:

20. Begonia sp.
The limestone rocks on your right are host to the original species of tuberous begonia from which all others have been hybridized. The flowers are a creamy white.
Describe roots:

Describe bark:

Describe leaves:

21. Quamwood Tree (*Schizolobium paraybum*)
Looking to your right a few yards off the trail you will see a tree that grows right up through the canopy. This is known as an emergent. The Quamwood is a softwood and was favored for dugout canoes and the making of furniture from its white wood.
Describe roots:

Describe bark:

(Quamwood Tree, cont'd)
Describe leaves:

22. Gumbolimbo Tree (*Bursera simaruba*)
Easily identified by its red, peeling bark. This bark is used for rashes and burns and is used for the antidote for the poisonwood tree rash. The peeling bark keeps the tree epiphyte and vine free.
Describe roots:

Describe bark:

Describe leaves:

23. Cohune Palm (*Orbignya cohune*)
Abundant in the rainforest this graceful palm provides thatch roofing for houses. The 'heart of palm' is traditionally eaten during Holy Week. Ask some of your guides for the Mayan uses of this palm.
Describe roots:

Describe bark:

Describe leaves:

24. Lianas
At the end of the forest trail on your right is a magnificent display of twisting, looping lianas. Lianas are woody vines belonging to the grape, honeysuckle, cucumber or morning glory families. Their leaves and fruit are up in the canopy and they literally tie the canopy together.
Describe roots:

Describe bark:

Describe leaves:

25. Cabbage Bark (*Andira enermis*)
This tree produces an extremely hard wood for bridges, gym floors, etc…
Describe roots:

Describe bark:

Describe leaves:

26. Wild Coffee Tree (*Rinorea sp.*)
Describe roots:

Describe bark:

Describe leaves:

27. Allspice Tree (*Pimenta officinalis*)
Another tree with peeling bark which keeps vines from attaching themselves to it. This tree on the edge of the creek produces the berries from which the popular spice is derived.
Describe roots:

Describe bark:

Describe leaves:

28. Maidenhair Fern (*Adiantum tenerum*)
This beautiful delicate fern is used as an expectorant. The tea also has antiparasitic qualities. The plant itself was used to decorate ancient Mayan altars.
Describe roots:

Describe bark:

Describe leaves:

29. Jippy Jappa
Palm-like plant used by the Maya for basket weaving and brooms. To make baskets the Maya boil, dry and comb part of the frond before it is ready to be woven.
Describe roots:

Describe bark:

Describe leaves:

30. Give and Take Palm
This palm also displays stiletto-like spines to protect the tree from herbivores and vines. Each of the spines can cause an infection if punctured into the skin. The frond encases a fibrous material helpful in extracting any spines that do enter your skin.
Describe roots:

Describe bark:

Describe leaves:

31. Buttonwood Tree (*Piper amalago*)
This tree has multiple medicinal uses; herbal baths, swellings, skin conditions, first aid for snakebites, headaches and as a sedative. The leaves are used in a tea for the above. The root is mashed and applied to the gum to alleviate a toothache.
Describe roots:

Describe bark:

Describe leaves:

32. Pidgeon Plum
The fruit of this tree is much sought after by birds and other animals, especially flocks of parakeets.
Describe roots:

Describe bark:

Describe leaves:

33. Ironwood (*Dialum guianense*)
This tree produces a very hard and heavy wood which, among other things, is prized for carving as it produces a shiny, dark lustre.
Describe roots:

Describe bark:

Describe leaves:

Map of Trees

Dan and Dianna,

Please insert a copy of Map of Trees. I am sending a hard copy through the mail and also sending one with Tom P. who I will be seeing this weekend. It is the map with all the buildings at Blue Creek as well as numbered trees #1-33.

Thanks