

The Botanical Detective

Objectives:

1. Recognize at least 5 trees and their characteristics found in the forests of Panama.
2. Define dry tropical forest (recognize compound leaves and strategies for preventing transpiration).
3. Recognize this area as an important life zone for agriculture and development.
4. Discuss land use, deforestation and conservation in Panama (optional).

Learning Skills: Observation, describing, deduction, relating

Information Base:

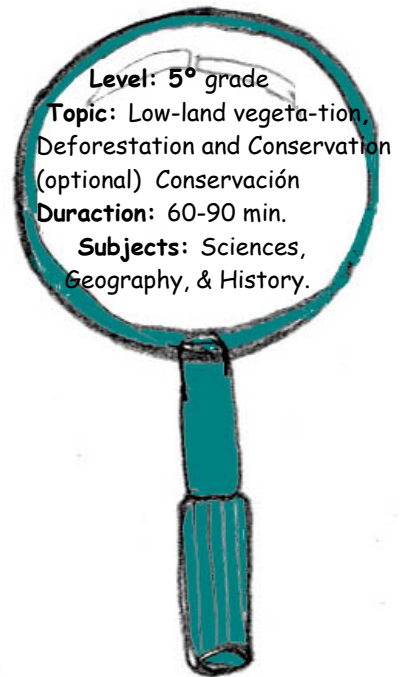
We can define a dry tropical forest as low-land vegetation with a marked dry season of 4-5 month duration with a few deciduous trees (Murphy & Lugo, 1986). Total precipitation varies between 800 and 1600 mm annually.

Included are **savannas** (grassy with few trees), **deciduous**, **semi-deciduous**, and **mangroves**.

Dry tropical forests are common in Africa and on tropical islands. The total annual precipitation is proportionately larger than those observed in temperate regions. The years with little precipitation shape the composition and structure of these dry forests.

Throughout the world, these areas are the most inhabited and are best suited for agriculture. They are being cut down world-wide at an unprecedented rate. In many areas, the practice of clearing the land by burning, prolonged or excessive use of land, elimination of seeds and plants (and the animals that disperse them), formation of **pastures** and through the degradation and depletion of the lands' minerals have rendered it unsuitable for reforestation.

The dry forest is lower and less structurally and taxonomically complex than a rain forest. It contains half or less of the species numbers, and the **deciduous species with compound leaves** are most common. As annual precipitation declines or its length decreases, dry seasons increase. The



trees in the upper canopy become deciduous followed by those of the lower canopy. Many of these trees flower during this period when they lose their leaves.

Dry tropical forests comprised more than half of the forests in Central America. Today, less than 0.1% of the 550,000 km² exists placing them in the category of most **endangered habitat** and near extinction (Janzen, 1986; see map).

Tropical dry forests and the dry mountainous forests occupy 10% of the territory in Panama although there is little left of the original vegetation due to mans preference for this area for settlement.

(Low lands of Panama, Coclé, Herrera, Los Santos, and a small area in the Peninsula of Garachiné).

Characteristic species of the dry tropical forest in Panama (not exclusive) are:

Cedro amargo, cedro espino, caoba, algarrobo, roble, **corotú, jobo**, cabimo, harino, amargo, quira, guachapalí, **cholo pelao, olivo, manca caballo, frijolillo, copa de oro o Copete**; The chumico and nance are found in the most degraded areas and different species of mangroves on the coasts (Tosi, J. 1971).

The species in bold type are found at CEM along with the **white and button mangroves**.

Recognition of these species enables us to become familiar with low-land vegetation which has played an important role in providing sustenance and habitat for Panamanians since before the Spanish conquest.

Learning about their use and relationship with animals help us to understand the consequences of deforestation and misuse of land, which can place animals, habitats and entire ecosystems in danger of extinction.

A little history about deforestation in Panama:

When the Conquistadors arrived they found a lot of "anthropogenic" savannas in the Peninsula de Azuero, the south of Panama and Darien that fed a population of approximately 500,000 indigenous people. The original panamenians sustained the davannas using slash and burn techniques, and rotated the planted areas to allow the land to rest before replanting. Today the anthropogenic savanna covers twice the area found by the sapaniards (except in Darien where it has reverted to forest). Slash and

burn is still practiced but there is a large difference in the agricultural use. Cattle were introduced which trample the ground leaving it unusable and new grasses were introduced to feed them. These grasses, like the "faragua" are hardier than the native grasses which were rapidly displaced. The land is being continuously degraded and depleted and production is becoming harder to maintain. The degraded land is also more difficult to return it to its original state. As a consequence, agriculture has been slowly moving up toward the tropical rain forest, where the soil is not as fertile for agriculture nor is it easy to slash and burn. Erosion has become a problem in areas where there are steep slopes.

Vocabulary:

Low-land vegetation, dry forests, deciduous, perennial and succulent leaves, savanna, simple and compound leaves, latex, resins, fertile land, deforestation, ecosystem, dispersal, pollination, endangered.

Materials:

- ◆ 15-20 clipboards and pencils (15-20 groups of 2-3 children).
- ◆ Each clipboard contains photos of the leaves (and bark) of at least one of the 5 trees at Culebra and a Botanical Detective worksheet.
- ◆ Detective magnifying glass per child
- ◆ A compound leaf of "frijolillo" and a simple leaf from the "guácimo" that we can cut prior to their visit to show as an example.
- ◆ Biographical fact cards of these trees (along with photos).
- ◆ Chalkboard and chalk or poster paper and markers (with the comparison chart of the trees that will be used for today's activity; this should be done in advanced).
- ◆ Map depicting the range of dry forest in Central America before the arrival of man.
- ◆ At least 6 Botanical Detective diplomas for the winning teams (markers to write in the name of each student).

Note: there are 11 prepared fact cards of the trees.

Trees with 3 or more examples: corotú, jobo, guarumo, guácimo, cholo pelao, frijolillo, and copa de oro. Trees with two individuals: olivo. Trees with only one individual: manca caballo, majaguillo de playa, button mangrove.

Procedure:

1. Meet the children at the entrance to the dry forest, in front of the sign. After the welcome and introduction of the docents, ask them if they believe they can live without trees and which trees they know. Later ask the children around you if they have ever heard of a dry forest and what they believe that means. Let them express their ideas (5 minutes).
2. We will discover the answer together; for this propose a game to play called the "Botanical Detective". In this game, we pretend that the earth has been invaded by aliens, There is little forest left after the war ended and they kidnapped all the scientists. The remaining humans on Earth don't know much about trees but want to reproduce them. The first thing that must be done is to find the trees and you will be hired to be the botanical detectives.
3. Each child will receive a clipboard with the only clue (which is the photo of the leaf with its name), and a worksheet to record any observations like "Sherlock Holmes" (with guide questions for them to answer when they find their tree). Additionally, each child will bring a deduction/guessing section which will permit us to know which group is the best "botanical detective".
4. Explain the worksheet, using simple language, of how scientists describe different species by their leaves, flowers, fruit, bark, and the substance they secrete. In this manner we begin to introduce terms such as simple and compound leaves (show an example), latex, resins, bark, and straight or branched trunk. To help us explain, fill out a sample worksheet with one of the leaves from the corotu and one from the frijolillo. Explain that they may write their responses and add any important details and/or drawings (10-15 minutes).
5. Divide the groups into 2-3 and give each a clipboard, pencil, worksheet, a magnifying glass and their clue. The search area will include the entrance to the end of the dry forest. Teachers and docents should disperse among the children to provide assistance and supervision. One search area is the path from the entrance (cholo pelao, olivo, frijolillo, copete, and majaguillo de playa, mangle boton, guácimo, and manca caballo). Another is the entrance to the forest by the sign (frijolillo, copete, guácimo, guarumo, and jobo). The last area is the forest (olivo, corotu, jobo). Take 20 minutes for the field search. Later we will regroup in the classroom to discuss what they found. A good group of trees are corotú (3), jobo (3), olivo (2), guácimo (3), frijolillo (3), and cholo pelao (3). This allows us to make 17 groups of 2-3 children. As each group is given a photo give them a clue as to where they may find their

sample and assign them to a teacher or docent. This allows the groups to work in teams, maintains order, and allows each group to have assistance in their investigation from an adult.

6. After 20 minutes take the children to the classroom. Sit the children in their groups in front of the chalkboard. Summarize the trees that were observed on the chalkboard. Write down the names of the trees and whether they have simple (s) or compound (c) leaves in one column, if they retain or lose their leaves in another column, and a column to denote if they are useful or not. This may be prepared prior to the visit.

Example:

Tree	Leaves	Do the leaves fall during the dry season?	Is this tree useful?
Corotú			
Jobo			
Olivo			
Guácimo			

7. Give each group the biographical fact card for each tree that was investigated. For each tree we will ask for the assistance of one of the investigators to help fill out the information with the help of the fact cards, for each column (read out loud). Ask the children if they know this tree or if they have ever learned about this tree from a family member and/or how it may be used.

8. As they respond, docents and teachers should help each group attain points for correct answers. They should compare the answers they got in the field with the notes from the scientific fact cards and give themselves a point for each correct answer. If the notes coincide and they found the tree they were assigned, the Earth will be saved, as we now have trees and seeds to plant. Thank the group for their help in saving the Earth.

9. The group with the most correct answers is the winner. At the end of the activity, each student will be given a diploma for being Botanical Detectives.

10. In conclusion summarize your findings: "How many trees were there with simple leaves? How many with compound leaves? How many lose their leaves during dry season? How many do not? How many provide benefits to man?"

11. Go back to the topic of dry forest keeping in mind that these trees are characteristic of dry forests in Panama. Allow them to make deductions.
12. Allow them to take the fact cards back to school with a promise that they will use them to make a mural depicting the trees they learned about today.

Suggestions for the Docent:

If the group is small, alert and time permitting, introduce the subject of deforestation and conservation with relation to land use (dry forest) from the times of the conquistadors to the present. You may also use the map with the distribution of dry forests in Central America for this discussion. If the group is large and not as cooperative, it is preferable to emphasize recognition of trees and the concept of trees losing their leaves during the dry season to avoid desiccation through transpiration and becoming dormant like the winter trees in temperate regions.

Suggested Classroom Activities: Create a mural with drawings and information of the trees that they learned about today and/or any other trees they may find interesting.

Evaluation: The definition of dry forest serves as our evaluation. We can also play a guessing game giving them tree characteristics so that they may guess the name.

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The Botanical Detective

Note Sheet

Participants _____

Name of Tree: _____



Is the tree: Big ___
Medium ___
Small ___

Does the trunk have branches? Yes ___ No ___

¿ Is the bark; smooth? ___ rough? ___
Thin? ___ Thick? ___

If you break a leaf or twig
does any substance come out?
Yes ___ No ___

Its leaves are: Simple ___
Compound ___

Does it have spines?
Yes ___ No ___

¿ Does it have
fruit? Yes ___
No ___
Describe them

¿ Does it have flowers?
Yes ___ No ___
Describe them

Look closely. Do you see any
animals in its tree top or trunk?
Yes ___ No ___

Now let's see how many we can answer correctly. Elementary my dear Watson...

1. Do the leaves fall during the dry season? Yes ___ No ___
2. Do animals use it? Yes ___ No ___ As a home? ___ As food? ___
3. Does man use it? Yes ___ No ___ For wood? ___ Food? ___ Medicine? ___ Other? ___
4. Is it good to cultivate? Yes ___ No ___