



## RAIN FOREST TEACHING CURRICULUM



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## Welcome to Rain Bird's Rain Forest Teaching Curriculum!

The Rain Bird Rain Forest Teaching Curriculum features “I can relate to that” science learning tools for teachers, students, and parents. The following is a list of answers to some frequently asked questions about the Rain Bird Rain Forest Teaching Curriculum:

### What is it?

Rain Bird's Rain Forest Teaching Curriculum is an online educational tool for teachers to use and find specific lesson plans and related course work for kindergarteners through high school seniors. This content is also available online at [www.rainbird.com](http://www.rainbird.com).



### What is its purpose?

To teach natural history, ecology, biology, physics, and chemistry through demonstrations, experiments, and classroom activities. Rain Bird and California State Polytechnic University, Pomona (Cal Poly Pomona) designed the program content, which focuses on endangered tropical rain forests in Latin America, South America, Africa, and Southeast Asia as the basis for teaching science through fun, hands-on things children already do and like—art projects, outdoor activities, and classroom demonstrations. The curriculum motivates kids to think about the part each of them plays—or the actions they can take—in preserving and protecting the environment.

### Who should use it?

Teachers and parents. Teachers who are seeking a new, fun and engaging resource to teach children about science. Parents who are looking for friendly, but educational how-to's on “bringing science home.” But most of all, it offers something for just about anyone and it's just plain fun for kids, no matter what their age.

### Is the information easy to use?

Yes! The information is well organized and self-explanatory. The curriculum is arranged with grade-appropriate material (K-1, 1-2, 2-3, 3-4, 4-5, 6, 7, 8, and 9-12). As appropriate, each grade level contains projects that integrate science with art; data gathering, observation, and inference; analysis of physical matter; in-class demonstrations to be performed by teachers for students; and at-home projects that illustrate scientific principles in a manner both understandable and meaningful to school-age children.

## Why the focus on rain forests?

Rain Bird has always supported and educated its consumers on the importance of the “Intelligent Use of Water.” The curriculum ties into this philosophy because rain forests provide oxygen and consume carbon dioxide, playing a pivotal role in the climate control of our planet. This affects wind, rainfall, humidity, and temperature worldwide. Rain Bird is deeply concerned about the environment and has always promoted stewardship of Earth’s resources, of which water is among the most precious. Some 30 million species of plants and animals—a majority of all things living on Earth—exist interdependently in tropical rain forests. In addition, rain forests are rich with plants vital in creating modern medicines.

## What has the response to the curriculum been?

Thousands of online visitors each month learn about the important role tropical rain forests play in the world. And, because the information is being so well received, Rain Bird has expanded its commitment to university-level education through its partnership with California State Polytechnic University, Pomona. Jointly, they will unveil in 2002 three Rain Bird Learning Centers at Cal Poly Pomona’s BioTrek Project, located on the Cal Poly campus.

## About Rain Bird

Rain Bird Corporation, based in Glendora, California, USA, is the world’s largest manufacturer of sprinkler and drip irrigation equipment. Founded in 1933, Rain Bird offers the industry’s broadest range of irrigation products to golf courses, sports arenas, amusement parks, farms, and commercial and residential developers in more than 130 countries. For more information, visit Rain Bird’s web site at [www.rainbird.com](http://www.rainbird.com).

This workbook is brought to you through a partnership between:



Rain Bird, Azusa, California

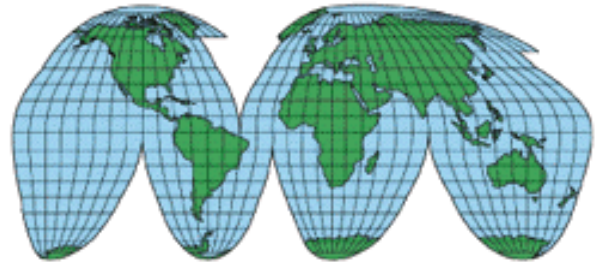


Science IMPACT, College of Science,  
California State Polytechnic University, Pomona

## The Rain Forest: An Introduction

### What is a tropical rain forest?

A tropical rain forest is a forest that receives 4 to 8 meters of rain each year.



### Where are tropical rain forests located?

Rain forests are located within a narrow region near the equator in Africa, South and Central America, and Asia.

### Why are tropical rain forests important to our earth?

Rain forests play an important role in the climate control of our planet by having an affect on the wind, rainfall, humidity, and temperature. Within the rain forest, water, oxygen, and carbon are recycled. This natural recycling helps to reduce flooding, soil erosion, and air pollution.

The rain forests support over one half of the plant and animal life on Earth, even though they cover only 2% of the Earth's surface.



Approximately one fourth of the pharmaceuticals (medicines) we use come from plants of the tropical rain forests. According to the National Cancer Institute, 70% of the plants from which we make medicines and that are effective in the treatment of cancer can only be found in the rain forests.

### What is happening to our rain forests?

27 million acres of the Earth's rain forests are destroyed each year due to man. The activities which threaten the rain forests are: agriculture, clearing and developing of land, beef cattle ranching, logging, and the building of dams and hydroelectric plants. This results in a loss of 100 acres of rain forest per minute and 80% of the rain forests in the world are now gone. The destruction of the world's rain forests at this rate causes 10,000 plant and animal species to become extinct each year.

## Grades K-5 Activities Overview

Curriculum materials are divided into grade level segments. Within the segments for grades K-5, there are four components of curriculum materials:

- ❑ **Science Through Art** – These activities integrate science and artistic skills, such as coloring, drawing, painting, and printmaking.
- ❑ **Interactive Science Activity** – These activities are experimental in nature, requiring students to take data, make observations of the data and, at higher grade levels, to make inferences from the data.
- ❑ **Outdoor Activity** – These activities allow students to gather materials from the field and perform scientific analyses, appropriate to their grade level, on the materials that they bring in from their excursion to the outdoors.
- ❑ **In-Class Demonstration** – These activities are demonstrations to be performed for the students by the teacher, using commonly available materials, and primarily related to physical science aspects of rain forest phenomena.





## **Grades 4-5 Activities At a Glance**



- ❑ **Science Through Art: Crystal Flower Garden**
- ❑ **Interactive Science Activity: Light Affects the Growth of Plants**
- ❑ **Outdoor Activity: Ultraviolet (UV) Light**
- ❑ **In-Class Demonstration: Magnetic Fields and Bees**

## Grades 4-5 Science Through Art Activity: Crystal Flower Garden

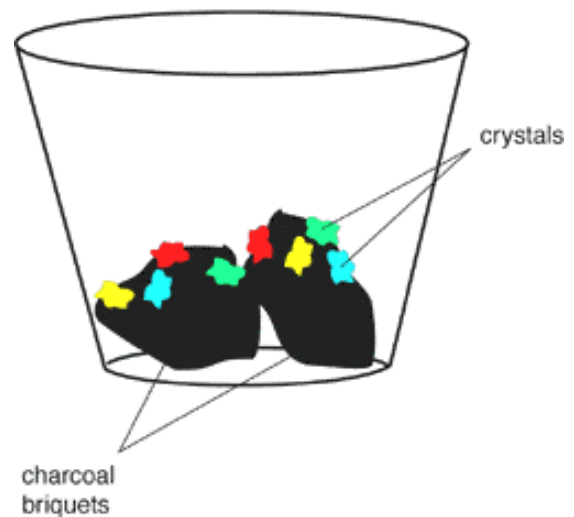
In this project students get to learn a little chemistry (the formation of a precipitate) while growing a Crystal Flower Garden.

### Materials:

2 charcoal briquettes, 2 teaspoons of household ammonia, 4 teaspoons of water, 2 teaspoons of table salt, 4 teaspoons of laundry bluing, 2 plastic or glass containers.

### Procedure:

1. Place 2 charcoal briquettes in the plastic or glass container.
2. In another container, mix a solution of ammonia, water, salt, and laundry bluing. Pour this solution over the briquettes.
3. Drop several drops of different food colors over the briquettes. Crystals will appear in several hours.



### Resource Information:

If you are unfamiliar with laundry bluing, it is available at the grocery store in the laundry detergent section. Small, clear plastic drinking cups work well for this project. Students may also select a small, clear glass container from home in which to grow these attractive crystal formations. The crystals, if left undisturbed, will last for a long time.

As the liquid evaporates, a layer of crystals forms on the surface of the briquettes. The process continues as the liquid evaporates and additional layers of crystals form. The appearance of the salt crystals is very "flower-like", especially with the final addition of the food coloring.



## Grades 4-5 Interactive Science Activity: Light Affects the Growth of Plants

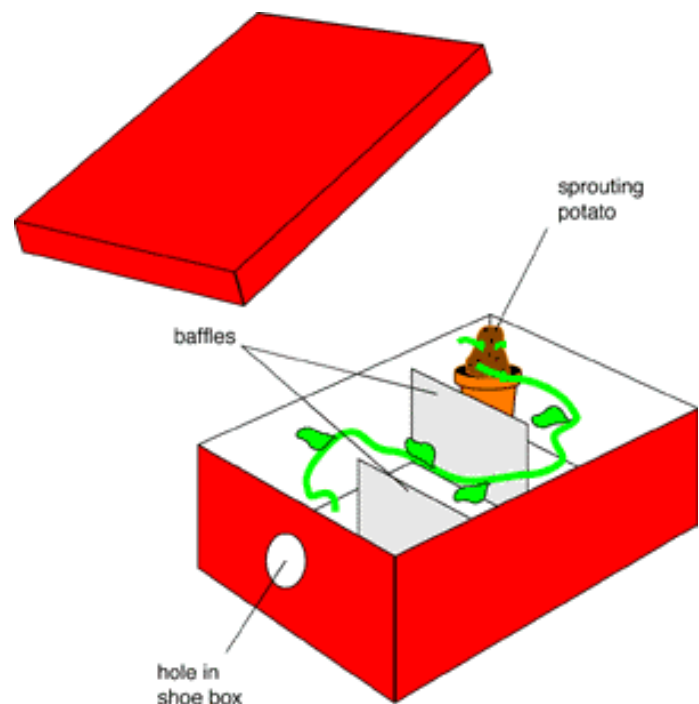
The tropical rain forests are very lush and dense with foliage. All of the plants that make up this dense foliage need adequate amounts of light to grow. This activity mirrors what happens in the tropical rain forest as plants compete for light in order to grow.

### Materials:

Shoe box, a sprouting potato, small flower pot or plastic cup (large enough to hold the potato), potting soil, water, 2 pieces of poster board or large index cards to fit inside the shoe box (see diagram below), tape (clear or masking), scissors or blade, space near a window or other source of light.

### Procedure:

1. Obtain a shoe box (with lid) and cut a hole (caution students to be careful, or do it for them), about 6 cm across in one end of the box.
2. Inside, place 2 cardboard or index card baffles (see diagram below).
3. Place a sprouting potato in a small cup or pot with a little potting soil and water and place it behind the baffle, farthest from the light source.
4. Place the lid on the box and place near source of light.
5. Lastly, have one sprouting potato out of a box and in the light for comparison.



Students can do this activity individually, in pairs, or in groups.

### Questions for Students:

1. Sketch your plant and the plant that was grown outside of a box. Describe the differences.

2. Which plant looks healthier? Support your opinion.
3. In crowded living conditions, such as the plants experience in the tropical rain forests, do you think that some plants have adapted to survival with different amounts of light? Or do you think that all plants thrive on the same amount of light? Support your opinion.
4. Try to be very patient and leave your experiment set up long enough to see if the potato plant can grow all of the way out of the hole in the end of the shoe box. If you do this, sketch and describe what occurs. Offer your best explanation of what happens when the stem reaches the outside of the box.

## Grades 4-5 Outdoor Activity: Ultraviolet (UV) Light

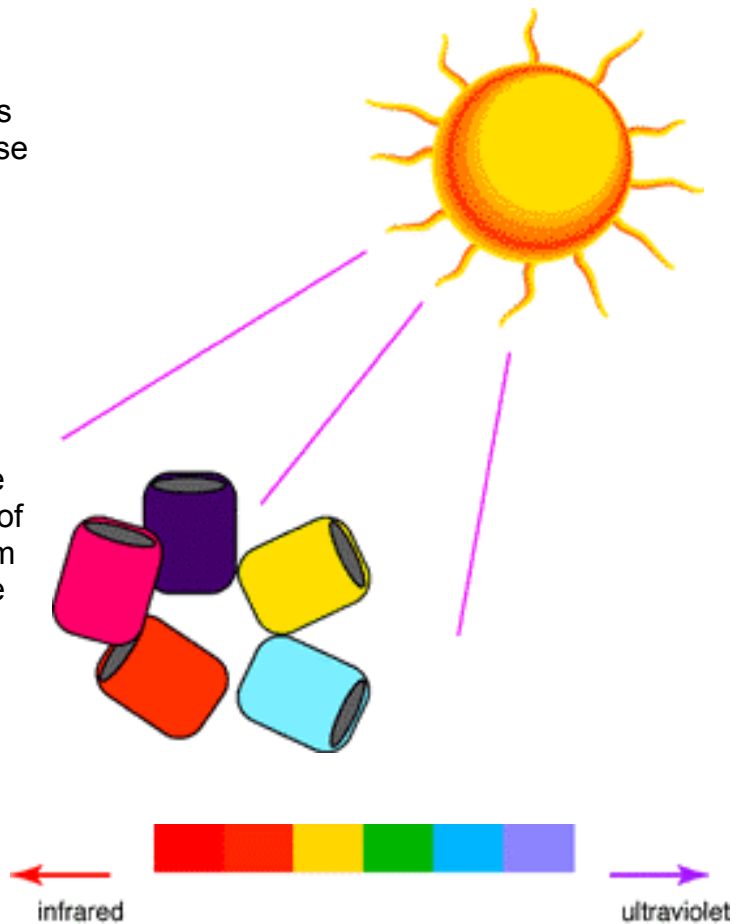
There are many wavelengths of light, some of them visible to us and others not. Those wavelengths of light that are visible to us are not necessarily visible to all life forms capable of sight. At the same time, there are life forms other than ourselves that are capable of seeing wavelengths of light that we cannot. Ultraviolet light is an example of a type of light that humans cannot see but is important in the vision of other species.

Many flowers have markings on them that we cannot see without special equipment. These are markings that reflect ultraviolet light wavelengths. Bees can see this wavelength of light and these special markings on some flowers aid bees in locating the sweet nectar of the flower on which they feed. Bees, however, cannot see the wavelength of light that we identify as red!

In the tropical rain forests, as in other areas around the globe, plants have evolved elaborate mechanisms to entice the pollinators. Bees are one such type of pollinator needed to carry the pollen from one flower to another flower of the same species. It is the pollination process that eventually leads to the production of viable seed to ensure the survival of the species.

Another important aspect of ultraviolet light is the great hazard it presents in terms of the health of our skin. Aside from painful sunburns from overexposure to the sun, ultraviolet light ages our skin prematurely and can cause many types of skin cancer.

The following activity uses some very inexpensive, plastic beads that are treated with a special pigment that is sensitive to ultraviolet light. When exposed to this wavelength, they change color.



### Materials:

Ultraviolet detecting beads available from Educational Innovations, 203/629-6049 (phone), e-mail [info@teachersource.com](mailto:info@teachersource.com), or at [www.teachersource.com](http://www.teachersource.com) (Allow about a week for delivery).

All of the beads are white in color, but when exposed to ultraviolet light, they turn red, yellow, orange, purple, or blue (depending on which ones you select). There are 240 beads, each about 1/4 of an inch in diameter, per package at a cost of \$6.95 per package. This is more fun if you have at least 2 colors of beads.

The only other element you need is a sunny day!

### Procedure:

1. While still indoors, give each student as many beads as you wish. Tell them to hold them in their hands with their hands tightly closed until everyone is outdoors.
2. Once outdoors in full sunlight, ask the students to open their hands and observe the beads. Do not tell them that the beads turn color in ultraviolet light—see if they make the connection between sunlight and the change in the color of the beads.
3. Once the connection between the sunlight and the color change is made, have the students check the effectiveness of sunglasses and sunscreen lotions that claim to block ultraviolet light. This can be done by simply holding the glasses over the beads and noting if the beads remain white or change color. The sunscreen lotion can be rubbed on the beads and the same observation can be made.
4. Students can then use the beads as their personal UV detectors by making a bracelet or by stringing them on the ties of a jacket. As the beads turn color and become brighter, they will know its time to apply an effective sun screen lotion!

## Grades 4-5 In-Class Demonstration: Magnetic Fields and Bees

Bees live in almost all parts of the world, including the tropical rain forests. In addition to producing honey and beeswax, bees provide an important service to plants by carrying pollen from one flower to another, which is an important link in the reproductive cycle.

Bees are able to navigate over surprisingly large distances. Many experimental studies have shown that bees have magnetic material in their bodies and that their navigation is based partly on the interactions of these magnetic materials with the magnetic field of the Earth.



This demonstration allows an image of a magnetic field to be presented to the class on an overhead projector.

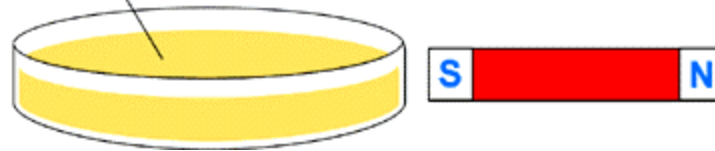
### Materials:

Petri dish, mineral oil or baby oil, fine steel wool, strong magnet.

### Procedure:

1. Cut the fine steel wool in very small pieces and separate the individual filaments so that they are no longer connected with each other.
2. Fill the petri dish two-thirds full with mineral oil or baby oil. Place the steel wool pieces in the oil and mix them in.
3. Place the petri dish on the stage of the overhead projector and turn on the lamp.
4. Place the magnet at the side of the petri dish and watch the steel wool pieces line up along the magnetic field lines.

mineral or baby oil  
with steel wool pieces



### Questions for Students:

1. What will happen to the steel wool pieces if the magnet is turned over and brought near the petri dish again?
2. From your observation of the magnetic field pattern, can you determine if a north pole or a south pole is closest to the petri dish?
3. Where is the magnetic north pole of the Earth?
4. How could the lining up of a piece of magnetic material help bees in the rain forest to navigate?