



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.

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.

This workbook is brought to you through a partnership between:



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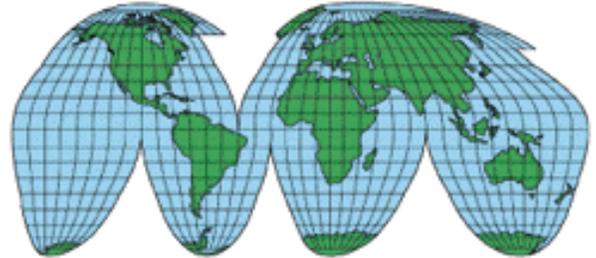


Science IMPACT, College of Science,
California State Polytechnic University, Pomona

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 3-4 Activities At a Glance



- ❑ **Science Through Art: Sachet Jar**
- ❑ **Interactive Science Activity: Roots Grown from Different Parts of the Same Plant**
- ❑ **Outdoor Activity: Drying Flower Petals for Use in a Sachet**
- ❑ **In-Class Demonstration: Cloud in a Bottle**

Grades 3-4 Science Through Art Activity: Making a Sachet Jar

This project allows students to use some products (renewable ones!) from the tropical rain forests to create an aromatic sachet jar. A component of this project is tied to the outdoor activity at this grade level.

Materials:

1/2 teaspoon of ground cloves, 1/2 teaspoon of all-spice, 1/2 teaspoon of cinnamon (powdered), 1/2 teaspoon of vanilla extract, about a quart of dried flower petals (such as rose), mixing container (bowl or small bucket), small glass jar with lid or cork top.

Procedure:

1. Place all of the powdered spices and the liquid vanilla extract in a container and mix thoroughly.
2. Add this mixture to the dried flower petals and mix again (gently), then place the spice and flower mixture in a glass container and replace the lid. When the lid is removed, the fragrance emerges.



Resource Information:

See the outdoor activity for the collection of the flower petals. The students can bring a container from home in which to place their sachet. Reusing an old container is a great way to recycle! The amount of sachet created in this activity is enough for at least 2 sachet jars and this activity lends itself well to working in pairs.

The lids of the jars can be painted, covered with colorful cloth and ribbon or decorated in any fashion desired. This makes a great take-home gift for holidays such as Valentines' Day and Mother's Day.

The primary scientific phenomenon that can be observed in this project is diffusion. The students should notice that the fragrance of the sachet is stronger the closer they are to it,

as they move away from it, the fragrance becomes more faint. This is due to diffusion, the mixing of the sachet molecules with air molecules. As this mixing occurs, the fragrance becomes more and more dilute. They may also notice that as the temperature of the air in the room rises, the sachet fragrance becomes more intense. This is due to the faster-moving molecules in the warm air increasing the diffusion process.

It is important to note that diffusion is the movement of molecules of a substance from an area of high concentration (the sachet jar) to an area of low concentration (the space surrounding the sachet jar). Many students confuse diffusion with osmosis. Osmosis is the movement of water molecules from a higher to a lower concentration. A good example of osmosis is in the produce department of the grocery store. The produce is sprayed with water periodically to make it "plump up". This occurs because the water is in a higher concentration on the outside of the produce than it is on the inside. This causes the water to move into the produce and the fruits and vegetables appear fresher!

Grades 3-4 Interactive Science Activity: Roots Grown From Different Parts of the Same Plant

Plants have evolved many specialized mechanisms to ensure their survival. They have adapted to their environments in many ways, such as surviving wet or dry weather, soil conditions, and attracting bird, insect, or other animal pollinators. One other way many plants ensure the survival of their species is by being able to generate roots from various parts of themselves if they are broken apart by severe weather conditions, damaged by a falling boulder or neighboring tree, or trampled by animals.

In the crowded, dense conditions of the tropical rain forests, the ability to readily sprout roots and continue growth is very important. Some species, like the rubber tree plant, even send down roots from higher up on the stem to reach the nutrients of the soil below.

The nutrient layer of the soil in the tropical rain forests is not very deep, as the dead plants and animals which decompose to yield rich soil are used up very quickly by the abundance of organisms of all types, including bacteria and fungus. Therefore, soil nutrients are not available deep in the ground, so sending more root growth into the lower soil levels is not efficient. Also, due to the high amount of rainfall in this environment, roots are not needed deep in the ground to search for water, as they are in drier environments.

In this activity, students have the opportunity to model this special adaptation of plants.

Materials:

Box (shoe box lined with plastic wrap or aluminum foil, or plastic box), sand, water, a hand lens if available, and a variety of any of the following:

- Bulbs (tulip, daffodil, etc.)
- Sections of potato with eyes
- Onion
- Cutting of plants such as begonias or geraniums
- Beet, radish, or carrot tops with a little of the root still attached
- Sugar cane or bamboo (cut with a joint near the end)
- Stem of an iris

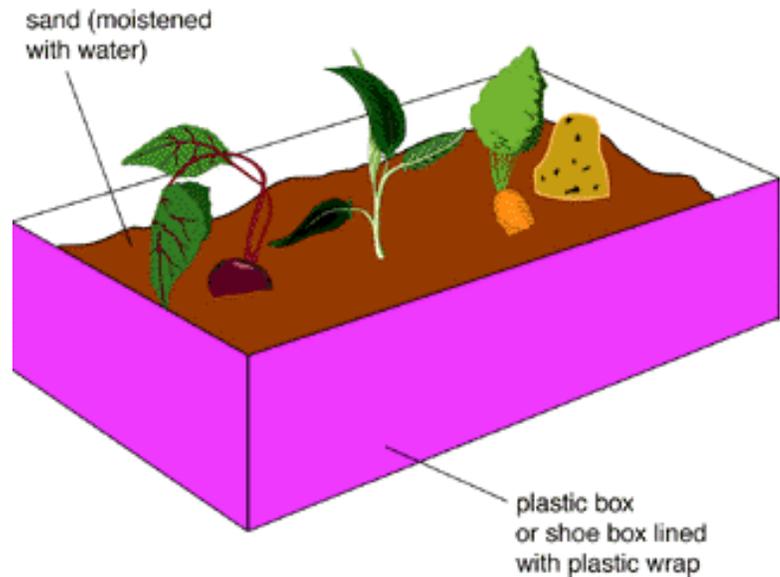
Procedure:

1. Place sand in a box (line the box first with plastic wrap or aluminum foil if the box is made from cardboard) to a depth of 7-8 cm.
2. Moisten the sand well with water, and plant a variety of specimens.

3. Keep the experimental setup out of direct sunlight.
4. Check on the specimens over a period of one week.

Questions for Students:

1. Sketch the root development of each of your specimens. Make certain to label each specimen in each sketch.
2. Use a hand lens if available and closely examine the roots of each specimen and sketch what you see. Write down similarities and differences.
3. Count the number of roots of each specimen. Which specimen had the most root growth?
4. Which specimen had the least root growth?
5. How is the ability to sprout roots from different parts of the plant a survival advantage?



Grades 3-4 Outdoor Activity: Drying Flower Petals for Use in a Sachet

Go out of doors either at home or at school and collect flowers. These will be used to make the sachet in the Science through Art activity. Supermarkets and florists are also often willing to give away old flowers for school projects. This project does not require that the flowers be at their freshest! For this project, rose petals are best, as they retain some fragrance. Other petals can be incorporated for color.

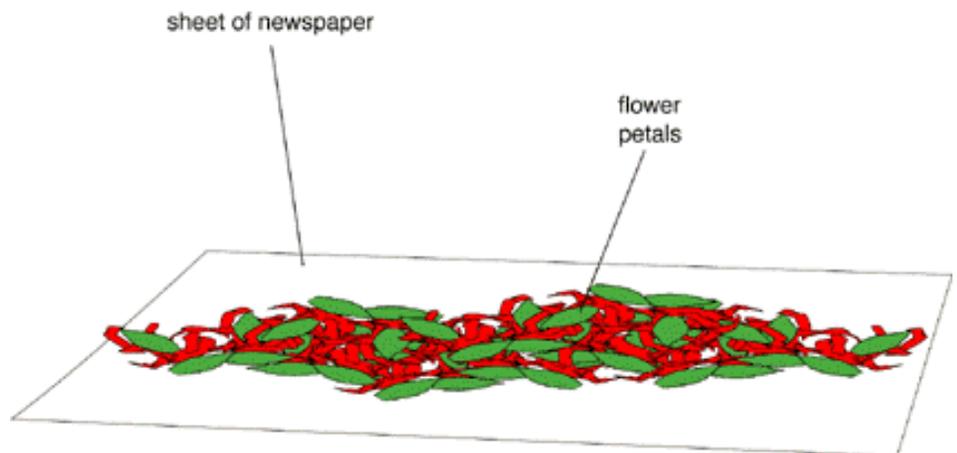
By taking the flowers apart to remove the petals, students can observe the different structures of the flowers and note their similarities and differences. Materials and information located on this website at the 2-3 grade level under "Flower Construction" in the Science through Art section would be helpful and a good review of the flowering structures of plants.

Materials:

Plastic or paper sack, newspaper, dry environment, flower petals.

Procedure:

1. Collect flower petals in a sack (or obtain from supermarket or florist discards).
2. Spread flower petals out in a thin layer over newspaper in a dry environment.



3. Depending on the humidity in the room and the type of flowers, the flower petals will dry in 1 to 4 days. They are now ready to be made into the sachet.
4. Ask the students why the petals appear darker in color when they are dry. They should be able to conclude that the loss of water during the drying process causes the color (pigment) of the petals to be darker because the pigment is now more concentrated without the water. Oxidation from the air has also occurred, however, one would not expect students at this grade level to have this knowledge!

Grades 3-4 In-Class Demonstration: Cloud in a Bottle

The tropical rain forest is a cloudy place, as much rain must fall to maintain this steamy environment, which is teeming with life. Have you ever wondered how clouds form? This demonstration allows us to witness cloud formation before our very eyes!



Materials:

One liter, clear plastic bottle with cap, water, and a match.

Procedure:

1. Place a small amount of water in the bottle (just a splash is sufficient).
2. Light a match and drop it in the bottle and quickly cap the bottle.
3. Squeeze the bottle 6 or 7 times (more squeezing may be necessary) and watch the cloud form!

Resource Information:

In order for water droplets to form and make a cloud, they need particulate matter (small particles) around which to form. This is the purpose of the smoke from the smoldering match. The cloud forms when the air cools as it expands, thereby reducing the temperature in the bottle below the dew point. The moisture then condenses as a cloud. Clouds on Earth form when warm air rises and its pressure is reduced. The air expands and cools, and clouds form as the temperature drops below the dew point.

In this demonstration you were able to make the air in the bottle compress and expand simply by squeezing the sides of the bottle and increasing and decreasing the air pressure.