



**Play. Plant. Grow.**  
**Selby Gardens Rainforest Field Studies Grades 3-5**

**Content Activities:**

Reading/Writing  
Math  
Science  
Art

**Sources:**

- <http://philip.greenspun.com/cr/rara/> ("Journey through the Rain Forest" included)
- [http://www.ehow.com/video\\_9374\\_make-terrarium.html](http://www.ehow.com/video_9374_make-terrarium.html)
- <http://www.brainpop.com>
- <http://rainforests.mongabay.com/0405.htm>
- <http://www.exploringnature.org>
- <http://www.cpalms.org>
- <http://www.pbs.org>
- <http://www.rain-tree.com/facts.htm>
- Biomes of the World: Rainfall in Different Ecosystems  
<http://www.mobot.org/MBGnet/sets/temp/whats.htm>
- Amazon Interactive: Rainfall in the U.S.  
<http://www.eduweb.com/rain/rainfall.html>
- <http://kids.mongabay.com/elementary/002.html>
- [http://www.youtube.com/watch?feature=player\\_embedded&v=C1Ib0-BIBKU](http://www.youtube.com/watch?feature=player_embedded&v=C1Ib0-BIBKU)
- Fairchild Tropical Botanic Garden: <http://www.fairchildgarden.org>
- LEARN NC: <http://www.learnnc.org>
- Eden Project: <http://www.edenproject.com>
- Scholastic: <http://teacher.scholastic.com>

**Resources (literature):**

- "Layers of the Rainforest" Article, Vocabulary Worksheet and Venn diagram (included)
- Welcome to the Green House by Jane Yolen
- Nature's Green Umbrella by Gail Gibbons
- The Rainforest Grew All Around by Susan K. Mitchell

Jessica Gardner Grades 3-5

- “Products of the Rainforest” worksheet (included)
- Ingredients for the “Rainforest Cookies” (included)
- Where the Forest Meets the Sea by Jeanine Baker
- The Lorax by Dr. Seuss (book & film)
- The Great Kapok Tree: A Tale of the Amazon Rain Forest by Lynne Cherry
- “Amazon Rainforest Food Web” (PDF available through Selby Gardens)

### 3<sup>rd</sup> Grade

#### **Tree-mendous Selby Vocabulary**

**Biodiversity** - Variety among and within plant and animal species in an environment.

**Canopy** - a thick, overhead layer of the rainforest formed by the branches and leaves of the tall trees. It is the “ceiling” of the forest.

**Condensation** - when water changes from a gas to a liquid.

**Conservation** - protection of natural resources from waste, loss or harm.

**Decomposer** - organisms, such as bacteria, fungi and insects, that break down dead plant and animal materials to be recycled and reused.

**Drip tip** - the end of a leaf that comes to a point, allowing rainwater to drip off.

**Ecosystem** - a community of animals, plants, and microscopic life that interact together in the environment.

**Equator** – an imaginary line on the Earth's surface equidistant from the North & South Poles, dividing the Earth into the Northern & Southern Hemispheres.

**Emergent** - the tallest layer of trees in a rainforest, they typically break through the canopy and can reach up to 200’.

**Epiphyte** - a plant that lives on the surface of another plant, especially the trunk and branches. It does not typically harm its host plant.

**Evaporation** - when moisture changes from liquid to gas.

**Forest Floor** - the ground layer of the rainforest, made up of tree roots, soil, decaying matter and decomposers.

**Habitat** - the natural environment of an organism.

**Humidity** - the amount of water vapor in the air.

**Interdependence** - the concept that everything in nature is connected to each other, and cannot survive without the help of other plants, animals and abiotic factors (i.e., sun, soil, water and air).

**Leaf Litter** – dead plant material.

**Precipitation** - the forms in which water falls to the ground as rain, sleet, snow and hail.

**Transpiration** - the loss of water from plant surfaces (usually leaves).

**Tropics** - hot, humid zone between the Tropic of Cancer and the Tropic of Capricorn.

**Understory** - the layer growing under the canopy and above the forest floor, made up mostly of young trees and shrubs.

**Water Cycle** - the circulation of earth’s water.

### 3<sup>rd</sup> Grade

#### **Pre Visit Activity:**

#### ***Life in the Layers***

#### **Objective**

Students will:

- Understand that rain forests have four distinct layers: forest floor, understory, canopy, and emergent.
- Study the different animals and plants that live in each layer.
- Create a (vertical) class mural showcasing the distinguishing features of each layer in the rain forest

**NGSSS:** SC.3.L.14.2, SC.3.L.15.1, SC.3.L.14.1, SC.3.L.17.2, SC.3.L.15.2, VA.3.S.1.2, VA.3.S.2.2, VA.3.S.3.1

**CC:** LACC.3.RI.1.1, LACC.3.RI.2.4, LACC.3.RF.4.4, LACC.3.SL.1.1, LACC.3.SL.2.4, LACC.3.W.1.3

#### **Materials:**

- Copies of “Layers of the Rainforest” (below) Article, Vocabulary Worksheet and Venn diagram.
- Paints, brushes, scissors, four large pieces of paper or cardboard, images of rain forest animals and plant life
- Resource materials (Internet, encyclopedias, newspaper articles, etc.)

#### **Procedure:**

1. Introduce key vocabulary: *habitat, forest floor, understory, canopy, emergent, epiphyte, leaf litter, liana, decompose.*
2. Have students read the “Layers of the Rainforest” article (individually or in pairs) and fill in the vocabulary worksheet.
3. Ask the students to think of animals and plants that live in the different layers. Have them fill in the Venn diagram.
4. Divide students into four groups. Tell them that each group is responsible for depicting one layer of the rain forest on the class mural. They should label all plant and animal life for identification.
5. After each group has completed their layer of forest, put each piece in order and hang the mural in the classroom.

#### **Extension:**

6. Ask the students to choose a plant or animal that lives in their layer of the rainforest and write a story from the point of view of the animal or plant. Their stories will be fictional, but should include facts about the rainforest and details about the layer where the plant or animal lives.
7. Ask student groups to read their stories to the class and allow time for questions and answers. Which layer would students like to live in?

## Layers of the Rain Forest

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Did you know that rain forests are home to over half of the world's plants and animals?

The trees of the tropical rain forest provide shelter for many animals, such as birds, monkeys, cats, butterflies, insects, snakes, and frogs. Because most trees in the rain forest are very tall, they are equipped to hold many different animals. Some animals live at the bottom of the trees, where it is dark and damp. Others live towards the top of the trees where it is light.

Picture a tree in the rain forest and divide it into four layers: the bottom layer is the **forest floor**; the second layer is the **understory**; the third layer is the **canopy**; and the fourth is called the **emergent layer**.

The **emergent layer** is where the treetops join together to form the roof of the forest. This is where trees soak up the most sun. The harpy eagle lives and hunts here. Other animals, such as the toucan, sloth, macaw, and parrot can be found here as well.

The **canopy** is a bright and colorful place, full of animals and plants. That's right; there are plants that grow on trees! These plants are called **epiphytes**. Epiphytes grow along the branches of a tree. They dangle their roots and collect moisture from the damp air; they also get nutrients from decayed leaves, algae, and moss.

The canopy is also home to many wonderful creatures such as howler monkeys, spider monkeys, orangutans, sloths, and fruit bats. These animals love to eat the sweet fruit that grows in the canopy. Other animals that live in the canopy are tree frogs, parrots, hummingbirds, butterflies, toucans, and bees.

The **understory** is darker than the canopy as it is farther away from the sun. Boa constrictors, emerald tree snakes, anole lizards and monkeys cling to **lianas**. Lianas (thick, woody vines) grow up trees and act as ladders for animals to climb up from the forest floor to the understory. Many cats, such as the jaguar, leopard and ocelot, hide in the branches of the understory waiting to pounce on their prey below.

The **forest floor** is the darkest and dampest part of the forest. Not much sunlight penetrates through here, so little plant life grows. The soil is covered by **leaf litter** (decayed leaves), which provides nutrients for tree roots. Leaf cutter ants, spiders, termites, mice, anteaters, jaguars, leopards, panthers, and gorillas live here.

Now we know how just one tree in the rain forest can provide many different habitats for various animals and plants to live.

## Layers of the Rain Forest Vocabulary

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Draw a line from the definition that best describes the word to the right.

Woody vines that grow up a tree and act as ladders for above. Snakes, monkeys, and cats can be found here.

CANOPY

This is the bottom and darkest layer of the rain forest, home to insects and fungi, rotting leaves, tree trunks, and roots.

LEAF LITTER

Underneath these decaying leaves is thin soil with few nutrients. Tree roots grow shallow to the ground so that they can suck the nutrients from this top layer of the forest floor.

FOREST FLOOR

Plants that grow along branches of a tree and let their roots dangle in the air. These plants get nutrients from moss, algae, and decayed leaves.

EPIPHYTES

The particular environment in which a plant or animal usually lives.

EMERGENT LAYER

HABITAT

This is the top layer, or "roof," of the rain forest. It is home to the harpy eagle.

This is the second highest layer of the rain forest, home to monkeys, sloths, birds, butterflies, insects, and lizards.

UNDERSTORY

This is the layer beneath the canopy and above the forest floor. It is shaded from the sun by the leaves

LIANAS

## Layers of the Rain Forest Venn diagram

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Draw three circles that intersect at the center. Label one **Forest Floor**, the second **Understory**, and the third **Canopy**. Write in the animals where they belong on the Venn diagram. Remember, some animals live in more than one layer of the rain forest.

boa constrictor  
parrot leaf cutter  
ants lianas fungi  
orangutan  
anteater  
passion flower butterfly  
leaf litter fruit bat

toucan leopard  
emerald tree snake  
anole lizard  
epiphytes tree  
frog  
sloth spider  
monkey  
jaguar ocelot

### 3<sup>rd</sup> Grade

#### **Pre Visit Activity:**

#### ***Experiencing the Rain Forest through the Senses***

#### **Objective**

Students will:

Read a journal describing life in the rain forest, with its many sights and sounds. A Journey through the Rainforest by Sandy Wiseman

- Identify descriptive words in the journal and create their own rain forest poems or journals.

**NGSS:** SC.3.L.17.2, SC.3.L.17.1, SC.3.L.15.2, SC.3.L.15.1, SC.3.L.14.2,

**CC:** LACC.3.RI.1.1, LACC.3.RI.2.4, LACC.3.L.1.1, LACC.3.SL.1.2, LACC.3.L.2.3, LACC.3.SL.2.4

#### **Materials:**

- Internet access to site <http://philip.greenspun.com/cr/rara/>
1. Share a printout of the “Journey through the Rain Forest” from the site above with your class. Ask students to read the journal about the photographer’s experience in the rain forest, underlining descriptive phrases. (With younger children, you may want to read the journal as a class or in small groups, and then have them write down descriptive phrases.)
  2. As a class, review the words and phrases they noticed and write them on the board. How does the author use the different senses, such as sight, hearing, and smell, to describe the rain forest? Identify the different words you listed on the board. Label them as nouns, verbs, adjectives, or adverbs. What new things have you learned about the rain forest?
  3. After the discussion, have students write their own poem or journal about the rain forest using some of the descriptive words they identified. Have students share their poems or journals with the class.

#### **Extension:**

4. Take the class on a nature walk around the campus to record what they see, hear, smell, and feel and describe their campus environment. Label them as nouns, verbs, adjectives, or adverbs. How are their descriptions of the campus environment different than that of the rain forest environment?
5. After the discussion have students write another poem or journal about their campus environment using some of the descriptive words they identified.

### 3<sup>rd</sup> Grade

#### Post Visit Activity:

#### *Observing Life in a Terrarium or Itty Bitty Biome*

#### Objective

Students will:

- Create a terrarium model to observe plant growth.
- Record observations on how plants respond to environmental conditions.
- Observe the water cycle in an enclosed environment.

**NGSS:** SC.3.L.14, SC.3.L.14.2, SC.3.L.15.2, SC.3.L.17.2, SC.3.N.1.1, SC.3.N.1.2, SC.3.N.1.3, SC.3.N.1.6, SC.3.N.3.2, SC.3.N.3.3

**CC:** LACC.3.RI.1.1, LACC.3.RI.2.4, LACC.3.RI.3.9

#### Materials:

- Venn diagram
- a large clear plastic container or jug
- gravel
- small plants (suited to your growing conditions)
- rocks, branches, moss
- plastic wrap
- screen or stocking
- science journal
- Internet access to the following site: [http://www.ehow.com/video\\_9374\\_make-terrarium.html](http://www.ehow.com/video_9374_make-terrarium.html)
- Welcome to the Green House by Jane Yolen and Nature's Green Umbrella by Gail Gibbons.

#### Procedure:

1. Introduce key vocabulary: terrarium, water cycle, condensation, precipitation, evaporation, habitat
2. Introduce the lesson by reading Welcome to the Green House by Jane Yolen and Nature's Green Umbrella by Gail Gibbons. Discuss the different habitats and the animals described in both picture books.
3. Use a Venn diagram to compare the rain forest habitat in Welcome to the Green House to the habitats described in Nature's Green Umbrella. Display the diagram on a smart board, projector, or make copies for students to use and fill in information. Tell the students that they will be making a terrarium to observe plant life....
4. Divide your students into 4 cooperative learning groups to create a diverse mix of students.
5. Watch a video on eHow on how to prepare a terrarium.
6. Model, step by step, the addition of materials into the terrarium:
  - a) Add a layer of pebbles to provide drainage at the bottom of the container.
  - b) Cover pebbles with about two inches of topsoil.
  - c) Add the leaf litter, which acts as a source of food (if you are adding worms or insects).
  - d) Place a few rocks in the terrarium.
  - e) Add branches, moss and small plants (i.e.: small succulents or epiphytes, ferns – a good local source is Tropiflora).

- f) Can add action figures, small plastic animals, glitter, bright pebbles, etc...
  - g) Slightly moisten the terrarium with water (Be careful not to use too much water.)
  - h) Cover the opening with a piece of plastic.
  - i) If you plan to add worms or insects to the terrarium, cover the top with a screen to let air through.
  - j) Mist the soil with the water from the squirt bottle. Place in an undisturbed area for daily observation.
7. Mist the soil every few days. You should be able to see the worms forming tunnels in the soil. You should also be able to observe the water as it evaporates, condenses and falls back to the ground.
  8. Have the students write in their science journals about the process and their daily observations.
  9. After a one week period, have students pair up with a member of a different team to compare plant growth observations.
  10. After a two week period, have students meet and discuss their final observations and discuss differences among the terrariums and the possible variables that caused the differences.

4<sup>th</sup> Grade

**Tree-mendous Selby Vocabulary**

**Buttress roots** – large roots on all sides of a shallowly rooted plant. Typically they are found in nutrient-poor rainforest soils and do not penetrate to deeper layers.

**Bromeliad** – any of numerous, usually epiphytic tropical American plants, having long, stiff leaves and showy flowers.

**Canopy** - the highest level of plant growth in a forest.

**Consumer** - an organism that feeds on plants and/or animals.

**Decay** - the slow break down (decomposition) of plant material.

**Ecosystem** - a community of animals, plants and microscopic life that interact together in the environment.

**Epiphyte** - a plant that grows on another plant or tree; it derives its nutrients from the rain and debris that fall into it.

**Erosion** - the wearing away of the land by water or wind.

**Exotic** - having been introduced to an area where the organism *Epiphyte on tree* would not naturally be found.

**Food Web** - a series of interconnected food chains that show predator-prey relationships.

**Hammock** - an area of higher ground that supports a community of plants that are different from those in lower elevations.

**Native** - the area where an organism originated; plants that have lived in South Florida for hundreds of years and were not introduced to the area by humans.

**Orchid** – any epiphytic plant of temperate and tropical regions, having usually showy flowers.

**Producer** - an organism that produces its own energy, such as photosynthetic plants.

**Understory** - the plant layer growing under the canopy, made up mostly of young trees and shrubs.

## 4<sup>th</sup> Grade

### **Pre Visit Activity: *Dramatic Food Chains***

#### **Objective:**

Students will:

- Act out food chains
- Understand the transfer of energy through the food chain
- Construct their own rainforest food chains
- Write an explanatory paragraph to explain the flow of energy in their food web

**NGSS:** SC.4.L.17.3, SC.4.L.17.2

**CC:** LACC.4.W.1.2, LACC.4.L.3.6, LACC.4.SL.1.1

#### **Materials:**

- Internet access:
  - <http://www.brainpop.com>
- Resource materials on the rainforest
- Food Chain Planning Sheet

#### **Procedure:**

1. Show the class a video on food chains through BrainPOP-*Food Chains*.
2. Have students complete the supplemental activity titled “Categorize the Organisms” either whole group using the Activboard, or print the activity and have students complete it in pairs.
3. Explain that the most important part of the food chain is the sun. Go over this simple food chain with the students. “The sun’s energy is used by the grass to PRODUCE its own food, that’s why the grass is a producer. Then it is eaten by the grasshopper, who is CONSUMING it, that’s why it’s a consumer. Then the grasshopper is CONSUMED by the frog, which is CONSUMED by the snake, which is CONSUMED by the hawk. The hawk isn’t consumed by anything, but when it dies, bacteria will break down its body to join the soil again, where a new plant will grow to start a whole new food chain!” Then point out that the hawk is still getting its energy from the sun, because he’s getting his energy from the snake, which got it from a frog, which got it from the grasshopper, which got it from the grass, which got it from the sun.” Review that a few times if necessary.
4. Ask for a volunteer to come up and “act” as the sun. After getting them in place, ask for a volunteer to be the grass. Tell the student to “wave their blades” toward the sun to get its energy. Next ask for a volunteer to be the grasshopper to come “nibble” on the grass. Then ask for a frog to come gobble up the grasshopper. Then ask for a snake to “slither in and attack the frog.” Finally, ask for a hawk to “swoop in and catch the snake.” Students will have fun acting it out. When everyone is in place, start with the beginning and review the transfer of the sun’s energy as they all act out their parts. Thank your volunteers and have them sit down.
5. Explain to the students that there are many different types of food chains that exist in each type of habitat. The food chain they just practiced as a class was a grassland habitat food chain and now groups will be focusing on rain forest food chains.
6. Hand out the “Planning Sheet” worksheet (attached) to the students as well as various reference materials on the rain forest to each team. Tell them that each group will have fifteen minutes to plan and draw out their rain forest food chain on the planning sheet and practice “acting out” their food chain.

7. Circulate and assist groups in deciding who will be who in the food chain, and how to act out each part.
8. After all groups have practiced and have completed the first half of the worksheet, have all students return to their desks for the “performances.” Have each group act out their food chain. After each group finishes, review their food chain aloud, pointing out the energy transfer from the sun through each food chain from beginning to end.
9. Display the “Amazon Rainforest Food Web” (pdf available as attachment from Selby Gardens) up on the Activboard, or print a copy of the worksheet for each student. Tell students they are about write a paragraph about the sun's energy transfer through a rainforest food chain. Remind students that while working on an explanatory writing piece, you want it to be to the point, use time-order words such as "first, next, then, last," and should be reread and edited before being turned in.
10. Remind students the paragraph must have a topic sentence and concluding sentence.

**4<sup>th</sup> Grade**

**Pre Visit Activity:**

***Products of the Rainforest***

**Objective:**

Students will:

- Identify products made with materials that originate in the world's rainforests.
- State why plants in the rainforest are important.
- Explain the different components of a rainforest ecosystem.

**NGSS:** SC.4.L.17.4

**CC:** LACC.4.RL.1.1, LACC.4.L.2.3, LACC.4.L.3.6, LACC.4.SL.1.1

**Materials:**

- Brazil nuts
- The Rainforest Grew All Around by Susan K. Mitchell
- “Products of the Rainforest” worksheet (below)
- Ingredients for the “Rainforest Cookies” (below)

**Procedure:**

- 1) Distribute several handfuls of nuts around the classroom. Ask students if they know where "nuts" come from. (Do they grow underground, on trees, in the water, etc.?) Have they ever seen or tasted this particular nut? Inform students that this nut is called a Brazil nut. Explain that the Brazil nut is one of many products that come directly from the rainforests of the world.
- 2) Read The Rainforest Grew All Around. Before reading, ask kids if they know what a habitat or ecosystem is then help them to define it. A habitat is an area with all the things a particular animal needs to survive (food, shelter, water, and space). An ecosystem includes all the living and non-living parts of a habitat. After reading, ask kids what made up the ecosystem in the book. Be sure to key in on the products that come from the rainforest that we use-like the Brazil nut.
- 3) Use the recipe at the end of the book to bake “Rainforest Cookies” They include ingredients such as bananas, coconut, and different nuts. While mixing the dough, talk to the kids about all the things that we get from the rainforest. Mention medicines, foods, and timber.
- 4) While the cookies bake, hand out the “Products from the Rainforest” worksheet. Go over the contents. Instruct students to go through the list marking which products they have used at least once in their lives.
- 5) Direct students to highlight the five products that are most important to them. (THINK)
- 6) Have students work in pairs (PAIR) to compare and contrast their choices. Circle the products they had in common. Which were the same, which are different? (SHARE)
- 7) Take a short hike to a nearby tree. When you arrive at the tree, have the kids brainstorm how it is similar to the tree in the book. List animals (squirrels, birds, etc.) that would live in the tree or rely on it in some way. Ask what things we might get from this tree. Ask what would happen if the tree were removed from the ecosystem.
- 8) When you are back in the classroom, handout a copy of the recipe and a “Rainforest Cookie” to each student to eat and enjoy!

**Extension Activities:**

1. Many spices come from plants that grow in the rainforest. These spices come from different parts of the plants. Have students create a spice collage using the following spices:
  - Roots - ginger
  - Leaves - basil, oregano, rosemary, tarragon, sage
  - Fruit - allspice, pepper
  - Seeds - mustard, caraway, dill, poppy seeds, sesame seeds
  - Flowers - cloves, saffron

## “Rainforest Cookies”

Enjoy these delicious cookies that contain several ingredients that originate from our tropical rainforests. We are sure that you will enjoy eating them as much as we enjoyed making them!

### *Ingredients*

- 2 to 2 ¼ cups all-purpose flour
- 1 tsp. baking soda
- 1 tsp. salt
- 1 tsp. cinnamon
- 1 stick butter (1/2 cup), softened
- 1 medium ripe banana
- ½ cup granulated sugar
- ½ cup brown sugar
- 1 tsp. vanilla extract
- 2 eggs
- ¼ cup sweetened coconut flakes
- 4 cups (12 oz.) chocolate chips
- 1 cup chopped cashews

### *Directions*

1. Preheat oven to 375° F.
2. Combine 2 cups flour, baking soda, salt, and cinnamon and set aside.
3. Beat butter, banana, and sugars until creamy.
4. Beat in eggs and then add the coconut flakes.
5. Gradually add flour mixture using extra flour if needed.
6. Stir in the chocolate chips and cashews.
7. Drop by rounded tablespoon onto an ungreased baking sheet.
8. Bake 10 to 12 minutes until golden brown.

## Products from the Rainforests

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Chewing gum (chicle)          | <input type="checkbox"/> Macadamia nuts        | <input type="checkbox"/> Allspice   |
| <input type="checkbox"/> Varnish, printing ink (copal) | <input type="checkbox"/> Tapioca               | <input type="checkbox"/> Cayenne red pepper   |
| <input type="checkbox"/> Varnish, laquer               | <input type="checkbox"/> Tea                   | <input type="checkbox"/> Chili pepper   |
| <input type="checkbox"/> latex (used to make rubber)   | <input type="checkbox"/> African violet        | <input type="checkbox"/> Chocolate  |
| <input type="checkbox"/> (Erasers)                     | <input type="checkbox"/> Aluminum plant        | <input type="checkbox"/> Cocoa  |
| <input type="checkbox"/> (foam rubber)                 | <input type="checkbox"/> Christmas cactus      | <input type="checkbox"/> Cloves   |
| <input type="checkbox"/> (Tires)                       | <input type="checkbox"/> Orchids               | <input type="checkbox"/> Ginger   |
| <input type="checkbox"/> Coconut                       | <input type="checkbox"/> Rubber plant          | <input type="checkbox"/> Nutmeg   |
| <input type="checkbox"/> Lime                          | <input type="checkbox"/> Bamboo (furniture)    | <input type="checkbox"/> Paprika  |
| <input type="checkbox"/> Patchouli                     | <input type="checkbox"/> Jute (rope, burlap)   | <input type="checkbox"/> Turmeric   |
| <input type="checkbox"/> Rosewood                      | <input type="checkbox"/> Ramie (knit clothing) | <input type="checkbox"/> Vanilla  |
| <input type="checkbox"/> Sandalwood                    | <input type="checkbox"/> Rattan (furniture)    | <input type="checkbox"/> Sugar  |
| <input type="checkbox"/> Brazil nuts                   | <input type="checkbox"/> Avocado               | <input type="checkbox"/> Curare (muscle relaxant for surgery)                                 |
| <input type="checkbox"/> Cashew nuts                   | <input type="checkbox"/> Banana                | <input type="checkbox"/> Diosgenin (arthritis, asthma)  |
| <input type="checkbox"/> Coffee                        | <input type="checkbox"/> Grapefruit            | <input type="checkbox"/> Ouabain (heart medication)   |
| <input type="checkbox"/> Insect Repellant (camphor)    | <input type="checkbox"/> Guava                 | <input type="checkbox"/> Quinine (malaria, pneumonia)   |
| <input type="checkbox"/> Papaya                        | <input type="checkbox"/> Lemon                 | <input type="checkbox"/> Emetine (bronchitis, dysentery)                                      |
| <input type="checkbox"/> beef (from cattle)            | <input type="checkbox"/> Mango                 | <input type="checkbox"/> Vincristine/Vinblastine (Hodgkin's Disease, leukemia, other cancers) |
| <input type="checkbox"/> Tangerine                     | <input type="checkbox"/> Lime                  | <input type="checkbox"/> Petroleum (used to make gasoline)                                    |
| <input type="checkbox"/> Black pepper                  | <input type="checkbox"/> Orange                | <input type="checkbox"/> Pineapple  |

### Credits

"Rainforest Resources/Facts" at <http://www.rainforest-alliance.org/>

Braus, Judy (ed.) "Rainforest: Tropical Treasures." Ranger Rick's Nature Scope, National Wildlife Federation, 1989. Pg. 46.

**4<sup>th</sup> Grade**  
**Pre Visit Activity:**  
***Hang Tough***

**Objective:**

Students will:

- Learn about special adaptations of rainforest plants.

**NGSS:** SC.4.L.16.2

**CC:** LACC.4.RL.1.1, LACC.4.L.2.3, LACC.4.L.3.6, LACC.4.SL.1.1

**Materials:**

- Where the Forest Meets the Sea by Jeanine Baker
- Science journals
- Internet access

**Procedure:**

1. Begin the lesson by asking the students to brainstorm all the names of rainforests that they have heard of. Show them the rainforest in the book, North Queensland, Australia, on a world map.
2. Ask the students to name common plant needs (sunlight, water, nutrients, space). Explain that as you read the book, they will be looking for the different ways the rainforest plants receive their plant needs. Remind them that because the rainforest is so densely packed, plants struggle for sunlight exposure.
3. Read Where the Forest Meets the Sea by Jeannie Baker. Point out the twisted roots of the rainforest trees in the story. Also point out that the wide, wavy roots are called *buttress roots* and that the long thin roots are called *stilt roots*.
4. Have students brainstorm possible reasons why rainforest trees have such roots.
5. Explain to students that those types of roots provide extra support. The soil in the rainforest is very thin and has very little nutrients because it rains daily and the nutrients in the soil are washed away. Rainforest trees have to absorb what they can quickly and then store the nutrients in their roots.
6. Also point out the *epiphytes* and vines on the rainforest trees in the story, a plant that grows on top of, or is supported by another plant but does not depend on it for nutrition.
7. Introduce three types of epiphytes common to the rainforests of the Americas (bromeliad, orchid, and fern) and describe their characteristics. A great resource can be found at <http://rainforests.mongabay.com/0405.htm>
8. Take the class outside to compare the roots of nearby trees to those in the rainforest. Have them sketch and label root descriptions in their science journals. What similarities and differences do they notice between the trees around them and the trees of the rainforest? What differences in each habitat account for the different roots? If possible, also have the students look for and name different types of epiphytes described in the lesson.

**Extension Activity:**

1. Grow a bromeliad. Cut off the top of a pineapple, leaving about three inches of fruit. Let it dry for two days, and then cut off the soft fruit, leaving the core. Put a layer of gravel in the bottom of a planting

container and moisten. Plant the pineapple top with the core in the soil and the leaves out. Cover with a large, clear plastic bag and put in a warm, sunny place. Watch it grow!

### **Tree-mendous Selby Vocabulary**

**Abiotic** - the absence of life, or living organisms.

**Adaptation** - the state of being adapted; adjusted.

**Biome** - a complex biotic community made up of distinctive plant and animal species that interact together in an environment.

**Biotic** - pertaining to life.

**Botany** - the scientific study of plants.

**Botanical Name** - the scientific name of a plant used internationally, as opposed to its common name which can vary from place to place.

**Botanist** - one who studies plants; a plant biologist.

**Canopy** - a thick, overhead layer of the rainforest formed by the branches and leaves of the tall trees. It is the "ceiling" of the forest.

**Ecosystem** - a community of animals, plants, and microscopic life that interact together in the environment.

**Emergent** - the tallest layer of trees in a rainforest, they typically break through the canopy and can reach up to 200'.

**Epiphyte** - a plant that grows attached to another plant or object, not rooted in the ground. Epiphytes obtain nutrients from the rain and debris that fall into it, and are often found growing on the branches and trunks of trees. They do not typically harm the plants they grow on.

**Fern** - a primitive plant that reproduces using spores instead of flowers and seeds.

**Flower** - the blossom of a plant that contains reproductive organs.

**Forest floor** - the ground layer of the rainforest, made up of tree roots, soil, decaying matter and decomposers.

**Fruit** - the part that develops from a flower and contains seeds.

**Inflorescence** - a flowering structure that consists of more than one flower.

**Leaf** - the part that uses solar energy to produce food for the plant.

**Leaf Scar** - a mark left on the plant stem or trunk where a leaf was attached.

**Niche** – the position, or function, of an organism in a community of plants and animals.

**Palmate** - a leaf with leaflets or veins all coming out from a center point, shaped like your hand with the fingers extended.

**Photosynthesis** - the process that plants use to make their own food.

**Pinnate** - a leaf with leaflets or veins along a central stalk, thus having a feather like appearance.

**Root** - the part that holds the plant in place and takes in water and nutrients from the soil.

**Stem/Trunk** - the part that carries water and nutrients throughout the plant, while providing structural support.

**Understory** - the layer growing under the canopy and above the forest floor, made up mostly of young trees and shrubs.

**5<sup>th</sup> Grade**

**Pre Visit Activity:**

***Deforestation in the Rainforest***

**Objective:**

Students will:

- Identify the effects of deforestation.
- Demonstrate an understanding that trees are a resource that people and animals need in order to survive.
- Compare and contrast the authors' messages in The Lorax and The Great Kapok Tree.
- Create a visual that will inform, persuade, and convey a message to protect rain forests and stop deforestation.

**NGSS:** SC.5.L.15.1

**CC:** LACC.5.RI.2.4, LACC.5.RL.3.9, LACC.5.SL.1.1, LACC.5.SL.2.5

**Materials:**

- The Lorax by Dr. Seuss
- The Great Kapok Tree: A Tale of the Amazon Rain Forest by Lynne Cherry
- Chart paper
- Poster board, construction paper, markers, colored pencils, crayons, etc.

**Procedure:**

*Part One*

1. Tell the students that the class will be learning about the negative impact humans can have on the earth. Begin by reading The Lorax aloud to the class.
2. After page 49, ask the students to discuss the positive and negative effects of chopping down the Truffula Trees. Create a T-chart on the Activboard, or on chart paper to record the students' responses. Label one column of the T-chart "Positive effects" and the other column "Negative effects." Encourage students to give specific examples from the text.
  - a. Positive effects of chopping down the Truffula Trees might include: job-creation, making money, and expanding business.
  - b. The students should be able to identify the negative effects of chopping down the trees, including: the animals have to migrate because they do not have enough food or shelter and it pollutes the environment.
3. Finish reading the story. Ask the students what message Dr. Seuss wanted them to receive from the following statement: "Unless someone like you cares a whole awful lot, nothing is going to get better. It's not." Give students time to discuss this statement and the message with a partner sitting next to them.
4. Ask the students to think of places where they have seen or heard of humans destroying environments similar to the way the Once-ler did. Give students time to share their thoughts with the class. The students' answers may vary, but they should be connected to ways that we cut down trees, pollute our earth, or participate in deforestation.
5. Ask the students: "Is deforestation a global issue, or does it only occur here in the Temperate Deciduous Forest?" Allow students to discuss this and share their understanding of deforestation around the world.

6. Ask the students why humans often cut down trees. Record students' answers on chart paper, or the Activboard.
7. Ask the class to think about and discuss why chopping down trees can be positive and negative. Have students share their thoughts and record them on a T-chart on chart paper or on the Activboard. Label one column "Negative effects of cutting down trees" and the other column "Positive effects of cutting down trees."
8. Wrap up the lesson by reviewing what the students have learned and connections that they made between our world and *The Lorax*. Inform that they will be learning more about why deforestation in the rain forest is a problem that many people are concerned about it.

### Part Two

1. Ask the students to recall the information they learned in the previous lesson. Revisit the T-charts you created in order to activate their prior knowledge.
2. Ask the students: "Why are rain forests such special environments?" Have them share what they already know about rain forests. Record this information on chart paper or the Activboard.
3. Display the following facts about rain forests and/or read them aloud to the students. Depending on how much time you have, you could have students research this topic to gather their own information, or you can provide them with the facts below (taken from <http://www.rain-tree.com/facts.htm>):
  - a. "Rainforests represent a store of living and breathing renewable natural resources that for eons, by virtue of their richness in both animal and plant species, have contributed a wealth of resources for the survival and well-being of humankind. These resources have included basic food supplies, clothing, shelter, fuel, spices, industrial raw materials, and medicine for all those who have lived in the majesty of the forest."
  - b. "The Amazon covers more than 1.2 billion acres, representing two-fifths of the enormous South American continent, and is found in nine South American countries: Brazil, Colombia, Peru, Venezuela, Ecuador, Bolivia, Guyana, French Guiana, and Suriname. With 2.5 million square miles of rainforest, the Amazon rainforest represents 54 percent of the total rainforests left on Earth."
  - c. "Rainforests once covered 14% of the earth's land surface; now they cover a mere 6% and experts estimate that the last remaining rainforests could be consumed in less than 40 years."
  - d. "Nearly half of the world's species of plants, animals and microorganisms will be destroyed or severely threatened over the next quarter century due to rainforest deforestation."
  - e. "There were an estimated ten million Indians living in the Amazonian Rainforest five centuries ago. Today there are less than 200,000."
4. Have students share their reactions to the facts about rain forests. Then ask the students why it is important to protect our rain forests from deforestation.
5. Introduce the book *The Great Kapok Tree: A Tale of the Amazon Rain Forest* by Lynne Cherry. Inform the students that as they read this book, they will learn many different reasons why we should protect rain forests.
6. Begin reading the book. As you read, invite the students to share why people should not cut down trees in the rain forest. Record these reasons on chart paper or the Activboard.
7. Discuss with the students the message that they received from *The Great Kapok Tree*. Compare this message to the message in *The Lorax*.
8. Have students create a visual product that persuades others to stop deforestation in rain forests. You may have students use posters, construction paper, markers, crayons, etc. for this project. Their final product should:

- a. Send the same message as these books, that saving the rain forests and protecting the resources we have is important.
- b. Persuade others to help save rain forests and stop deforestation.
- c. Provide factual information about deforestation and rain forests.

### 5<sup>th</sup> Grade

#### **Pre Visit Activity:**

#### ***How Much Rain in a Rain Forest?***

#### **Objective:**

Students will:

- compare the annual rainfall of the world's major ecosystems
- Create a bar graph comparing the annual rainfall of the Amazon rain forest to the annual rainfall in different regions of the United States.
- Apply graph skills to see how rainfall varies in different ecosystems and parts of the world.

**NGSS:** SC.5.E.7.6

**CC:** LACC.5.RI.2.4, LACC.5.RI.3.7, LACC.5.SL.1.1, MACC.5.MD.2.2

#### **Materials:**

- Graph paper
- Pencils
- Coloring pencils, markers, crayons
- Internet access to the following sites:
  - **Biomes of the World: Rainfall in Different Ecosystems**  
<http://www.mobot.org/MBGnet/sets/temp/whats.htm>
  - **Amazon Interactive: Rainfall in the U.S.**  
<http://www.eduweb.com/rain/rainfall.html>

#### **Procedure:**

1. In preparation for this activity, using a world map, ask the students to locate the Equator, Tropic of Cancer and Tropic of Capricorn. Explain that tropical rainforests are distributed around the world and are found between the Tropic of Cancer and the Tropic of Capricorn. The tropics support a large number of species. This results in rainforests being home to over half of the species on our planet, and having a high measure of biodiversity. Within the rainforest, there are different layers and each is influenced by environmental factors that affect plant and animal growth, which impacts biodiversity.
2. Review the definition of *ecosystem* with your students. (If your class has not studied ecosystems, you could use the term *environment*.) An ecosystem is a group of living things—plants and animals—and the environment in which they live. Explain that the rain forest is a type of ecosystem, like the grasslands, the desert, or the tundra.
3. Tell the class that one way in which rain forests are unlike other ecosystems is the amount of rain they receive every year.
4. Explore the “Biomes of the World” site, which compares rainfall in different ecosystems, or biomes. How much rain does the tropical rain forest receive compared with the temperate deciduous forests?

(Deciduous forests are like those in the eastern United States, with trees that change colors in fall, lose their leaves in winter, and bloom again in spring.) Which two ecosystems receive the least amount of rainfall every year?

5. Now have students go to the “Amazon Interactive” site and find out how much rainfall your region of the country receives every year. Click on the nine different U.S. regions and use the data to create a bar graph comparing the rainfall of different regions of the United States and the Amazon rain forest. Which area of the U.S. receives the most rainfall each year? How does this amount compare with the Amazon rain forest’s annual rainfall?

**Extension:**

6. Have the students research other global rainforests and use the data to create a bar graph comparing the rainfall of different rainforests.

**5<sup>th</sup> Grade**  
**Post Visit Activity:**  
***Rain Forest Adaptations***

**Objective:**

- begin to develop an understanding of the rainforest ecosystem
- describe the challenges faced by plants living in the rainforest
- explain how various adaptations help the plants thrive in this extreme ecosystem

**NGSS:** SC.5.L.15.1, SC.5.L.17.1

**CC:** LACC.5.RI.2.4, LACC.5.SL.1.1

**Materials:**

*Part One:*

- 2 large plastic containers
- Three different size sponges
- Water
- A measuring cup
- Science logs

*Part Two:*

- Junk materials for making models, such as boxes, buttons, colored acetate, ribbons, pipe cleaners, foam, shower hoses, bottle tops, fabric offcuts, materials, colored cards and paper, pipes, old bottles. You could pay a visit to your nearest scrap store to collect the materials you need, or you could get the students to bring these things in.
- Masking tape, Sellotape
- Plasticine
- Scissors
- Computer, projector, speakers
- Internet access to site:
  - <http://kids.mongabay.com/elementary/002.html>
  - [http://www.youtube.com/watch?feature=player\\_embedded&v=C1lb0-BIBKU](http://www.youtube.com/watch?feature=player_embedded&v=C1lb0-BIBKU)
- Chart paper
- Markers

**Procedure:**

*Part One:*

1. Write this on the board: *Where do we find the world's Tropical rainforests? Can you name any?* They can think about this as they walk in and settle. Once they are settled get some feedback. Tropical Rainforests are found between the Tropic of Cancer and Tropic of Capricorn (e.g. Amazon, Congo, Borneo etc.). You could show this using the site: [world map of rainforests.](#)

2. Explain to the students that many plants in the rainforest have very large leaves. Large leaves are helpful because they have more surface area. The more surface area a leaf has the more sunlight it can absorb. We can't measure the amount of sunlight that a leaf absorbs, but we can make a model to show how a larger surface area lets a sponge absorb more water.
3. Complete the following steps as a class, or in teams:
  - Put the measuring cup in the empty container.
  - Fill one container  $\frac{1}{2}$  full of water.
  - Squeeze the smallest sponge under the water so that all the air bubbles escape.
  - Let the sponge fill up with water.
  - Take the sponge out of the water.
  - Squeeze the sponge over the measuring cup, so that the water in the sponge goes into the measuring cup.
  - Record the amount of water in the measuring up in your science log.
  - Repeat steps 1-7 for the next two sponges.
4. Which sponge held the most water? Least? How would the surface area of leaves be a beneficial adaptation at the different levels of the rainforest?

*Part Two:*

5. Organize the students into pairs. Give each pair a piece of chart paper and markers.
6. Explain to the students that they are going to watch a short [Eden Project video](#) about the adaptations that plants have evolved to survive in the rainforest. Encourage the pairs of students to record key bits of information as they watch. For example – the main challenges the plants face and perhaps some of the adaptations that the plants have.
7. After the video, collect feedback on what the main challenges for the plants are, making a note of these challenges on the board. You could also record any other information about plant adaptations that the students feel is important.
8. For higher ability students you could underline in different colors - those challenges presented by the living (biotic conditions) and those presented by the non-living aspects of the environment (abiotic conditions).
9. At this point you could extend this into a conversation about how the abiotic conditions change at different layers of the rainforest. For example, the forest floor is dark, hot, humid, sheltered and wet. As you move higher the amount of sunlight increases; it is drier and there is more exposure to strong wind, heavy rainfall and storms. The biotic conditions also change in the different layers of rainforest strata. These changing conditions result in a myriad of different niches which can be occupied.

**Extension:**

10. Challenge students to make a 'junk' plant that they think would be well adapted to life in the rainforest. Use the mind map on the board to help you design adaptations that would give your plant the edge. Each pair makes one plant model. Things for the students to consider:
  - Where does it live in the rainforest? Remember, the challenges on the forest floor will be different to those found higher up in the understory, canopy and emergent layer.
  - What are conditions like there? What are the main challenges? What adaptations has it evolved to meet those challenges?

11. Divide the class into four groups. Each group should have around four pairs of students in it. Get the students to present their plant to the rest of their group clearly explaining where it lives (habitat), its set of adaptations and why they are important.

## Acting Out a Food Chain Planning Sheet

Name: \_\_\_\_\_

Draw out your group's food chain below. Begin with the sun. Label each organism either a producer or a consumer.



Who will you be “playing?” \_\_\_\_\_

How will you “act” as this organism? \_\_\_\_\_

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