



RAINFOREST
TRUST®

Rainforest Complexity

Primary Levels: Ages 6 -10



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Primary Levels: 6 – 10 year olds

Standards

- Common Core Standards for English Language Arts/Literacy and Mathematics
- Next Generation Science Standards for Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment: Environmental impacts on Organisms: Matter and Energy in Organisms and Ecosystems

Concepts

- Students will learn about the complex connections between species in the rainforest.
 - When one part of a natural system is impacted how are other parts affected?
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Part 1: Making connections

Idea – In the rainforest plants convert the sun’s energy into life, insects eat the plants, birds eat the insects, a snake eats the bird, a caiman eats the snake, a jaguar eats the caiman and eventually when the jaguar dies its body rots and decays to become nutrients for the soil for other plants to grow and begin the cycle anew.

This is just a very simple example of a food chain in the rainforest. These chains are in turn connected to more chains, forming a food web. In the rainforests food webs are complex and strongly interconnected.

The famous American environmentalist John Muir summed it up best when he said, “When we try to pick out anything by itself, we find it hitched to everything else in the universe.” Students will learn about the interconnectedness of rainforest ecosystems through a simple food web exercise.

Materials –

- Rainforest Food Web Story. Provided in Appendix below (adapt and shorten connections to class size as needed)
- Long ball of yarn or string

Procedure –

1. Arrange students in a circle.
2. Read the Rainforest Food Web Story slowly to the circle. As you get to each underlined plant or animal unroll part of the yarn ball and have the first student hold onto it. Continuing to read the script, pause to let the students read the underlined word while the student with the yarn ball throws the string to a classmate. Each student represents a plant or animal in the script.
3. Adjust the number of connections in the web to your class size. When you are done you should have what looks like a spider web.
4. Use an example to illustrate that interconnections in the food web create balance in the ecosystem. For instance, have the student that is representing the Ceiba tree give a gentle tug on their string. Anyone that felt that tug should give two short tugs back until the whole web has been affected.
5. Ask students what might happen if all the Ceiba trees were cut down? What would happen if other parts went missing too? What would happen to the food web?

Part II: Reading and Discussion

Idea – Have students think about how a missing piece in the ecosystem can upset the balance and survival of the whole system through a reading activity.

Materials –

- The book, *The Great Kapok Tree* by Lynne Cherry
- Art supplies – paper, note cards, crayons, tape, stickers, labels

Procedure –

1. Read Lynne Cherry's *The Great Kapok Tree* aloud and discuss the story with the children.
2. On the blackboard or on a large sheet of paper have the class draw the great kapok tree and each inhabitant included in the book on notecards.
3. One of the lessons of the story is how each of the rainforest creatures depends on the kapok tree for survival. Another lesson is the complexity and interconnectedness of ecosystems.
4. Post each of the rainforest creatures in a circle around the kapok tree and ask students to draw lines between the kapok tree and each inhabitant mentioned in the story. Ask them to think about the effect each has on the other. Is it positive or negative for each individual? Draw a (+) or (-) at each connection. Now do this with all the other species. What do you have?
5. Despite how complex the connections are does the ecosystem seem to be in balance? Ask students to explain what they think John Muir meant by the quote mentioned above.

Part III: Math and Geography

Idea – Students will learn about the difference in species numbers between a tropical forest biome and their own by comparing maps and numbers of species found in different areas.

Materials –

- Internet access to research number of species – vascular plants, birds, reptiles, amphibians, and mammals found in their country compared to tropical rainforest countries like Colombia or Brazil. A helpful link comes from Mongabay.com
http://rainforests.mongabay.com/03highest_biodiversity.htm
- Map of the world with individual maps of the United States, Brazil and/or Colombia to compare area/size

Procedure –

1. Have students determine the number of vascular plants, birds, reptiles, amphibians and mammals in both Brazil and Colombia using the Mongabay link above. Write down numbers.
2. Next have students research the number found in the United States.
3. Have them compare the differences of each plant/animal group between the three countries.
4. Next have students calculate the total area each of the three countries has and compare the total number of all species found per country to the countries' total area.

5. Which country has the largest number of species found per area? Discuss with the students why you think that may be? Review the countries geography from the maps you have and review what you learned about how more habitats give homes to more species.

Part IV: Create

Idea – Create your own mini-ecosystems with terrariums. Students learn about growing plants as well as how a small ecosystem works by manipulating a factor in the ecosystem to compare what affect it has on the greater ecosystem.

Materials –

- Terrarium making instructions
- Assorted glass jars and containers from home or a thrift shop. Alternately you can also use large plastic soda bottles cut in half.
- Scissors
- Potting soil, rocks, activated charcoal (optional)
- Plants and seedlings
- Water

Procedure –

1. Go over the instructions for how to make a terrarium and have students break up into groups to use soil and plants to represent ecosystems. These could be greenhouse plants or plants from your local area, but they should be the same for each terrarium. Each terrarium should have the same amount of soil substrate and plants.
2. When finished creating their terrarium assign each group a different amount of water to give their terrarium as an experiment.
3. Over a two week period each group will water their terrarium with different amounts of water from as little as none at all up to a whole cup for others.
4. At the end of two weeks, students will report on the conditions of their terrariums. Have students discuss how water/rainfall affected the health of the ecosystem. Have them imagine the impact of too little or too much rainfall over a much grander scale in the rainforest. How would the ecosystem change? How would your own area change?

Part V: Present

Idea – Students display their terrariums throughout the classroom and take care of them for the school term.

***Appendix**

Rainforest Food Web Story

All of Earth's energy comes from the Sun. How does it do this? The energy from the sun is converted by plants into food by a process called photosynthesis. Plants use the sun's energy along with nutrients in the soil to make food to grow.

One of the tallest and most majestic trees in the rainforest is the Kapok Tree.

Many creatures eat the leaves of the Kapok Tree, including the Leafcutter Ant.

Other animals in turn eat the leafcutter ants, such as the Giant Anteater.

Not too many things would think to mess with a giant anteater. But even the anteater can be eaten by something even bigger, like an Anaconda! A full grown anaconda has no natural predators. However, when the anaconda grows old and dies it passes its life energy back to the forest providing nutrients that help more plants grow.

Plants like the Lobster Claw Heliconia, an understory rainforest plant that produces bright red and yellow flowers.

The nectar the heliconia flowers produce are one of the favorite foods of the Green Violet Ear Hummingbird, a tiny but dazzlingly bird of the rainforest.

The Eyelash Viper is a well camouflaged venomous snake and likes to wrap itself around heliconia flowers waiting to grab hummingbirds for its dinner.

But it better be careful because the Ornate Hawk Eagle, a large bird of prey specializes on eating snakes! The hawk eagle has few natural predators. However, when it grows old and dies it passes its life energy back to the forest providing nutrients that help other plants to grow.

One such plant is the Wild Avocado. Wild avocado trees have leaves and produce small avocado fruits.

The Resplendent Quetzal is one of the most dazzling and colorful birds in the rainforest. It eats insects and a variety of fruits. One of its favorite foods is the fruit of the wild avocado.

Sometimes the quetzal is hunted and eaten by the Kinkajou, a smaller mammal that is omnivorous and eats almost anything.

But the kinkajou has predators too. The Ocelot, a camouflaged jungle cat stalks the canopy. The ocelot has few natural predators. However, when the ocelot grows old and dies it passes its life energy back to the forest providing nutrients that help more plants grow.

Plants like the Bromeliad, a type of rainforest plant that typically grows on the branches of other trees and collects water in the cavities between its leaves.

The water cavities formed by the bromeliad's leaves create an ideal home for the tadpoles of the Poison Arrow Frog to grow up.

These frogs are brightly colored and protected from predators by poisonous skin, but their tadpoles are defenseless prey for other creatures like the Tarantula.

But tarantula spiders better watch out! The Tarantula Hawk, a giant wasp, hunts for tarantulas to feed to its young.

So, within the tiny water tanks of the bromeliad a mini-food web plays out. But the bromeliad itself is a favorite food of another animal. The Spectacled Bear loves to eat the bromeliad's tender leaves. The bear has no natural predators. However, when it grows old and dies it passes its life energy back to the forest providing nutrients that help more plants to grow.

Plants such as the Strangler Fig Tree use these nutrients. The strangler fig begins its life as a vine that wraps around other trees to grow. The fig trees are one of the most important trees in the rainforest because they provide food and shelter for so many different creatures.

One creature that depends on the fig tree is the Spider Monkey, which eats fruit and loves to snack on wild figs.

Another is the Howler Monkey, which eats the fig tree's leaves and snoozes away the afternoon high in the trees branches.

But they both better stop snoozing! The Harpy Eagle, a large bird of prey, is at the top of the food chain and eats monkeys. It has no natural predators. However, when the harpy eagle grows old and dies it passes its life energy back to the forest providing nutrients that help more plants grow.

Plants such as the Liana Vine use these nutrients. Liana vines wrap around other trees reaching up to the sun and grow well wherever there is a light gap in the forest, like near rivers.

Many small creatures use the vines for food and as highways to move around. Including the Giant Walking Stick, an insect that is camouflaged to look just like a stick.

It still needs to be careful, especially when walking on vines hanging above the river. It might get knocked off and eaten by an Archer Fish, a fish that spits at insects to knock them into the water to eat!

Other fish in turn eat the archer fish, like the Pirahna, a carnivorous fish with sharp teeth and a voracious appetite.

However the Pirahna is just a snack for the Arapaima, a long predatory fish that lives in Amazon rivers and can grow up to 4.5 meters (15 feet) in length!

But even the arapaima can be attacked and eaten by the top predator in the river, the Black Caiman. A full grown black caiman has no natural predators. However, when the caiman grows old and dies it passes its life energy back to the forest providing nutrients that help plants grow.

Like the Cecropia Tree, one of the most common types of rainforest trees.

When the Two-Toed Sloth is not sleeping it loves to eat the leaves and buds of the cecropia tree.

But the sloth better keep one eye open. Because the Jaguar eats sloths!

And so the ancient cycles of life and death, and predator and prey continue to play out in the rainforest. All energy comes from the sun and through a complex web of connections between plants and animals a delicate balance is struck in the rainforest ecosystem.