

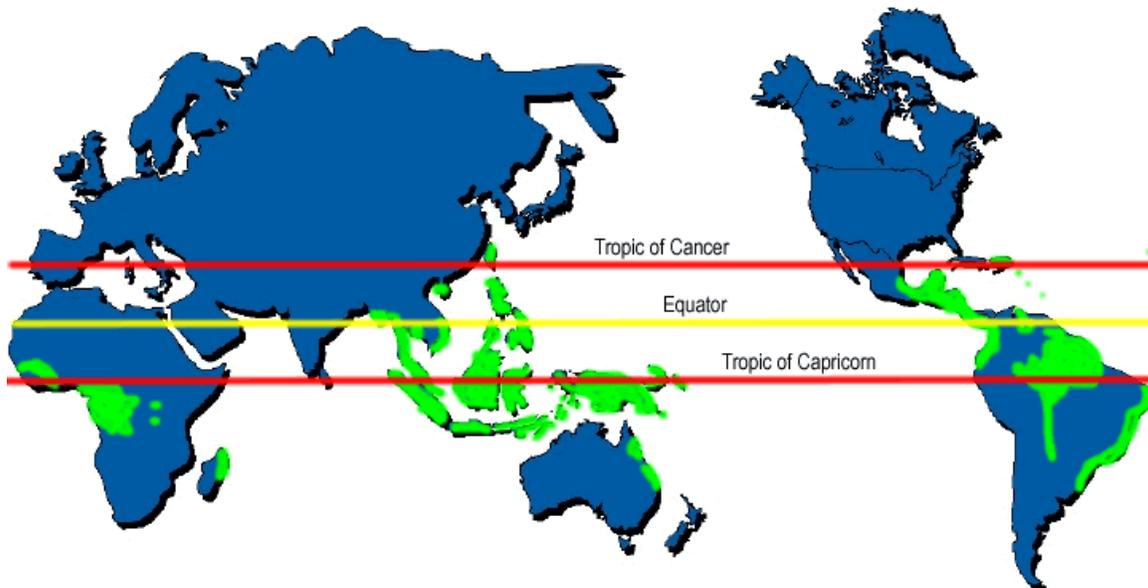
The Earth's Rain Forests



The Lungs of the World

What is a Tropical Rain Forest?

In a tropical rain forest, it is always warm, and you can count on it raining for at least part of the day. Tropical rain forests are areas of huge trees, found in humid climates around the equator. Tropical rain forests are home to millions of species of plants, trees, animals, and birds. In fact, there are more animals found in the earth's tropical rain forest than in all the other forests on earth combined! The map below shows all of the Earth's tropical rain forests.



The Earth's Tropical Rainforests (shown lighter)

Tropical rain forests can be found near the Earth's equator, generally between the Tropic of Cancer and the Tropic of Capricorn. Tropical rain forests cover about only about 7% of the Earth's land mass. The temperature in the tropical rain forest is usually about 80°F (26.6°C) all year long. This is the prime area for the amount of rainfall and sunlight needed. Because the tropics are located in the middle of the Earth, the sun shines for 12 hours each day, giving all the trees and plants ample sunlight needed for growing. There are only two seasons (wet and dry) in the tropical rain forests, so these plants and trees don't have to adapt to the seasonal changes plants elsewhere might have to.

Tropical rain forests can be found in over 50 countries. Yet, over half of the world's tropical rain forests can be found in only three of those countries: Brazil, the Republic of Congo, and Indonesia. Can you find each of those countries on the map above?

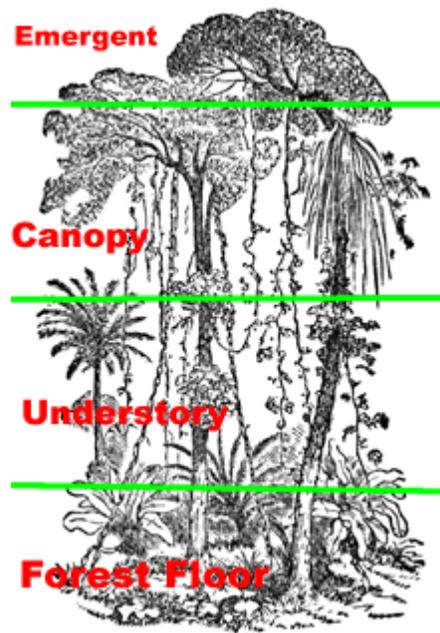
What makes a Rain Forest a Rain Forest?

A tropical rain forest receives a lot of rain each year. At least 6 feet of rain falls in the rain forest each year. Yet, in most tropical rain forests it rains nearly 21 feet per year! In comparison, Chicago receives only a meager 34 inches of rainfall each year! It only takes a little over a month for it to rain 34 inches in a tropical rain forest.

Trees found in tropical rain forest require much more water than trees found in other biomes. When the rain falls in the rain forest, much of the water is absorbed by tree roots. The water then travels up the tree trunks to the tree's leaves. The water is then given off the leaves in the form of water vapor, which eventually goes into the air to create clouds. The clouds grow heavy with all of the water vapor, which is then dropped back down to Earth in the form of rain. This cycle, known as the water cycle, repeats itself.

What are the parts of a rain forest?

Generally, a rain forest is divided into four layers. Each of these layers is home to its own distinct plants, animals, and biological processes.



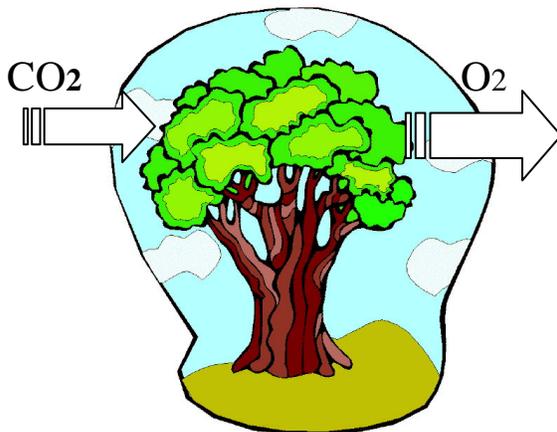
The Forest Floor is the ground level of the rain forest. Here it is quite dark, because the other layers of the forest block out most of the sunlight. Ferns, small plants, seedlings, and many types of fungi live on the forest floor. Many of the rain forest's large mammals call the forest floor home. Jaguars, ocelots, anteaters, pumas, and tapirs are only a few of the hundreds of animals that live primarily on the forest floor.

The rain forest's understory reaches up about 65 feet off of the forest floor. This area of the forest receives more light than the forest floor, but is still relatively dark. Like the forest floor, the understory is hot, humid, and damp. Many of the understory's animals are nocturnal, meaning they are only active during the night time. Yet the understory is home to many of the rain forest's monkeys and birds, making it very noisy at times.

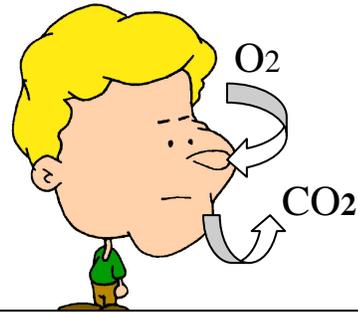
Above the understory is the rain forest's canopy. Trees in the canopy rise from 115 to 150 feet above the ground. The canopy acts as a shield for sunlight, keeping the forest levels below shrouded in a dark, humid veil. The trees in the canopy must grow rapidly if they are to compete with other trees for sunlight. A single large tree can be home to many hundreds of species of animals. In fact one scientist in Brazil found 43 different species of ants in one rain forest tree. Most animals that live in the rain forest's canopy never see the ground for their entire lives! They make their home in the canopy to avoid predators and to find fruit and other foods. Squirrel monkeys, kinkajou, tree frogs, sloths, keel billed toucans are just a few of the animals who live in the forest's canopy. The emergent layer is reserved for the tallest tree tops. Many birds roost in the emergent tree tops.

Why are Rain Forests so important?

Rain forests are sometimes referred to as the Earth's lungs. There are so many trees in the rain forest that much of the Earth's carbon dioxide can be absorbed by these trees, which is then converted into oxygen. Most living creatures need oxygen to survive.



Trees Take in Carbon Dioxide and Give Off Oxygen



People Take in Oxygen and Give Off Carbon Dioxide

Take a deep breath. What you are breathing in is oxygen (O₂). Now exhale. What you are breathing out is carbon dioxide (CO₂). We need both carbon dioxide and oxygen to live. If there are not enough trees to convert the world's exhaled CO₂ in to O₂, we will not be able to breathe. This is why we must do everything we can to protect the trees of the rain forest.

Did you know that about half all animal species on Earth live in the rain forest? Imagine an area that only covers 7% of the Earth's surface containing half of the Earth's animals! In area measuring 4 square miles in Costa Rica, the rain forest could be home to 125 mammal species, 400 bird species, 100 reptile species, 60 amphibian species, and nearly 40,000 insect species. Wow! When an area has this many different types of animals living so close together, it is said to have a high rate of biodiversity. In an area where not

many species of animals live, such as the Arctic, the area is said to have a low rate of biodiversity.

The rain forests are the most biologically diverse areas on the planet. Biologists from all over the world have made careers out of studying the different types of animals that call the rain forest home. But, there's still work to be done! Each day new species of insects, butterflies, and other animals are "discovered" by scientists.

The same is true with the plants of the rain forest. The Earth's rain forests are home to 90,000 of the 250,000 identified plant species. Scientists estimate that there are at least 30,000 undiscovered plants, most of which are rainforest species. These undiscovered species of plants may hold the secrets to curing illnesses such as cancer or AIDS.

What's happening to the Earth's Rain Forests?

Huge areas of tropical rain forests are being cut down each day. In fact 2.4 acres of the Earth's rain forests are being cut down every second. That's the equivalent of 2 football fields. This equates to an area the size of New York City that's being cut down and destroyed each day.

The rain forest holds a great deal of natural resources that people need and want. Timber and ore deposits are plentiful in almost every acre of rain forest. As the human population increases, the need for space and resources increases. This means that many areas of thick rain forest are being cut down to make room for roads, houses, and livestock pastures.

Yet, when areas of the rain forest are clear-cut, animals lose their habitats. Many of the rain forest's animal species are facing extinction. Some scientists estimate that 137 animal species become extinct each day. This is 40,000 species per year that will never return to Earth.

What about the people who live in the rain forest?

In addition to millions of plant and animal species that call the rain forest home, there are nearly 200 million people who live in the Earth's rain forest. Most indigenous, or native, rain forest people live in small groups which are quite isolated from the rest of the world. Indigenous people rely on the rain forest for everything they need: food, medicine, clothing, shelter. Many people hunt animals throughout the forest, while some groups of people rely on self-sustaining agriculture.

Destruction of the rain forest isn't only affecting the animals and plants, but also the indigenous people. Loss of habitat and resources are major problems for people who have not had regular contact with the outside world. The traditional medicine and food of the native people is disappearing as well, causing them to die at a younger age. Without these people, the world is losing a priceless group of teachers who have a profound knowledge, understanding, and appreciation of the rainforest.

What can I do to help the Earth's rain forests?

The rain forest desperately needs your help!

The easiest way to help save the rain forest is to educate yourself. Get smart about the rain forests, and you'll begin to understand the important role they play in the Earth's balance.

Learn what products come from the rain forest, and find ways to avoid using them. Such as, don't buy furniture made from rain forest woods, like teak and mahogany. Avoid hamburgers from fast-food restaurants that raise cattle on deforested rain forest.

Even though you might not be able to vote for a couple of years, write your elected officials, explaining to them how important the rain forests are. Send them a letter, or write them an email. Each year there are several laws passed to protect the world's rain forests, but we have to let our elected officials know that these laws are being appreciated.

If the Earth's rain forests are destroyed, they cannot be replaced. It is up to all of us to do our part to save them.

IDEAS FOR THE CLASSROOM

Title: Write a Member of Congress or a Senator

Objective: Students will better understand the political process by actively writing a formal letter to a member of Congress or Senate requesting legislation to protect rainforest habitat, using the components of a persuasive essay.

State Standards Met:

3.A.2 Write paragraphs that include a variety of sentence types; appropriate use of the eight parts of speech; and accurate spelling, capitalization, and punctuation.

3.B.2b Establish central ideas, organization, elaboration, and unity in relation to purpose and audience.

3.B.3a Produce documents that convey a clear understanding and interpretation of ideas and information and display focus, organization, elaboration, and coherence.

3.B.3b Edit and revise for word choice, organization, consistent point of view and transitions among paragraphs using contemporary technology and formats suitable for submission and/or publication.

3.C.2a Write for a variety of purposes and for specified audiences in a variety of forms including narrative, expository, and persuasive writings.

3.C.2b Produce and format compositions for specified audiences using available technology.

3.C.3b Using available technology, produce compositions and multimedia works for specified audiences.

Method: Students will use the United States Senate web site <http://www.senate.gov> or US House of Representatives <http://www.house.gov> to locate their state's Senators' and Representatives' contact information. Students will then decide on an issue that is relative to preserving tropical rainforest throughout the world by using <http://www.nrdc.org/action/default.asp> (deforestation, cattle imports, greenhouse emissions, indigenous human rights violations). Students must then refer to the Friendly and Business style of letter formatting. <http://www.smcps.k12.md.us/mbms/writing/ltrforms.html>. Review all necessary parts of the letter (Heading, Greeting, Body, Closing, Signature). Students must also decide which format to compose their letter in. Students will create a rough draft of their letter, exchange letters for peer review, and complete their letter using a word processing application.

Extensions: Students can research the names and addresses of people on Global Response, <http://www.globalresponse.org>, who are affecting the rainforest and send them letters. (Use the Kids and Teachers section)
Students can research organizations who are making a difference in the rain forests of the world. Write them a letter of appreciation using the same format. Use the What's Happening section of <http://www.rainforestweb.org> as a tool for researching conservation organizations.

Title: Who Lives Where in the Rain Forest?

Objectives: Students will gain a better understanding of living organisms and their relationships to their surroundings in a particular biome.

State Standards Met:

12.A.2a Describe simple life cycles of plants and animals and the similarities and differences in their offspring.

12.A.2b Categorize features as either inherited or learned.

12.A.3c Compare and contrast how different forms and structures reflect different functions.

12.B.2a Describe relationships among various organisms in their environments. (e.g. predator/prey, parasite/host, food chains, and food webs.

12.B.2b Identify physical features of plants and animals that help them live in different environments.

12.B.3a Identify and classify biotic and abiotic factors in an environment that affect population density, habitat and placement of organisms in an energy pyramid.

12.B.3b Compare and assess features of organisms for their adaptive, competitive, and survival potential

Method: Students will research the layers of rainforest (canopy, understory, forest floor), making sure to note the biodiversity in species relative to each layer. Students will then pick three animals from each forest layer, noting habitat, sleep cycle (nocturnal, diurnal), what they eat (herbivore, carnivore, omnivore), lifespan, and population (threatened, endangered, prolific, etc). Students must identify natural relationships between animals and their respective habitats, noting adaptation, camouflage, symbiosis, and predator-prey models.

Resources: Who Lives Where Worksheet (attached)

An Amazon Adventure web site: <http://jajhs.kana.k12.wv.us/amazon/animal.htm>

Amazing Rainforest Animals

<http://asterix.ednet.lsu.edu/~edtech/rainfor/index.htm>

Dr. Blythe's Rainforest Tour <http://www.rainforesteducation.com/>

Name: _____

Who Lives Where in the Rain Forest?

Directions: Use the following web resources to research 9 nine different animals. Three animals must live in each the canopy, understory, and forest floor. It is your job to discover some of the interesting relationships between these animals and their surroundings.

**WEB
RESOURCES**

An Amazon Adventure web site:
<http://jajhs.kana.k12.wv.us/amazon/animal.htm>
Amazing Rainforest Animals
<http://asterix.ednet.lsu.edu/~edtech/rainfor/index.htm>
Dr. Blythe's Rainforest Tour <http://www.rainforesteducation.com/>

1. Animal _____
2. What layer of the forest floor does this animal live in? _____
3. Classification (mammal, reptile, bird, amphibian, insect) _____
4. What does this animal eat? _____
5. Is this animal an herbivore, carnivore, or omnivore? _____
6. When is this animal active? Is it nocturnal or diurnal?

7. How long does this animal live? _____
8. Is this animal threatened or endangered? If not, what is the outlook for its population in the future? Identify biotic or abiotic factors that help or hurt this animal's survival.

9. What is interesting about this animal's habitat? What type of trees/plants does this animal prefer to live in?

10. Describe a unique relationship this animal has to its habitat. This may include camouflage, symbiotic relationships to plants or other animals, biological adaptations, and physical characteristics that make this animal well suited to its habitat.

Title: Simple Things to Save the Rain Forest

Objective: Students will take an active role in learning what they can do to be stewards of tropical rainforests and other biomes.

State Standards Met:

12.E.2c Identify and classify recyclable materials.

12.E.3c Evaluate the biodegradability of renewable and nonrenewable natural resources.

13.A.2d Compare the relative effectiveness of reducing, reusing, and recycling in actual situations.

13.A.2f Analyze how specific personal and societal choices that humans make affect local, regional, and global ecosystems.

13.A.3e Identify advantages and disadvantages of natural resource conservation and management programs.

13.A.3f Apply classroom-developed criteria to determine the effects of policies on local science and technology issues (e.g. energy consumption, landfills, water quality).

Method: Students will actively participate in some of the activities designed to save the Earth at the following web sites:

http://www.ran.org/kids_action/s01_seven.html. - 7 Steps to Save the Rain Forest

<http://members.aol.com/Ramola15/help.html> - 20 ways to save the Earth

<http://www.acnatsci.org/kids/10things.html> - What YOU can do to help the Earth

Students may also choose to click on <http://rainforest.care2.com> to help save one acre of rainforest each day.

Students must try to implement energy conservation, recycling, or waste reduction programs at their homes.

Students must account for their actions by keeping a journal of all of the instances of conservation they have performed.

Questions for the Chat Room

Topic: The Earth's Rain Forests

Where are the Earth's rain forests? What defines a tropical rain forest?

What do the tropical rain forests offer to humans?

What is biodiversity?

How many animals live in the rain forest?

How many types of plants and trees are there in the rain forest?

What would happen if all the rain forests were to be cut down?

How do animals adapt to changes in the environment and their specific habitat?

Can people and animals of the tropical rain forest co-exist?

What are the layers of the rain forests called?

At what rate are the rain forests being deforested?

What are some of the causes for deforestation?

What can I do to help protect the rainforest?

Are there any similarities between the boreal forest and a tropical rain forest?

What's it like in the rain forest?

How many animals do you see in the rainforest? Are they shy?

What people live in the rain forests? How do they survive?

Are animals from the rainforest becoming extinct? At what rate?

How can I visit a rainforest? Are there opportunities to become a scientist and study the rainforest?

How can I help to educate other people about the impact of their decisions on the rainforest and the Earth as a whole?

What is Costa Rica doing to help protect their rainforests? Is Costa Rica the only country to preserve such large sections of rainforest?

GLOSSARY

Adaptation– *n.* An alteration or adjustment in structure or habits, often hereditary, by which a species or individual improves its condition in relationship to its environment.

Biodiversity- *n.* 1. The number and variety of organisms found within a specified geographic region.
2. The variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.

Biome- *n.* A major regional or global biotic community, such as a grassland or desert, characterized chiefly by the dominant forms of plant life and the prevailing climate.

Canopy- *n.* The uppermost layer in a forest, formed by the crowns of the trees.

Clear-Cut- *v. tr.* To remove all of the trees in (a tract of timber) at one time.
2. *v. intr.* To log an area by removing all of the trees at one time.
3. *n.* A tract of timberland that has been clear-cut.

Convert – *v.* 1. To change (something) into another form, substance, state, or product; transform: *convert water into ice.* 2. To change (something) from one use, function, or purpose to another; adapt to a new or different purpose: *convert a forest into farmland.*

Ecosystem – *n.* An ecological community together with its environment, functioning as a unit.

Emergent- *n.* One that is coming into view or existence: “The giant redwoods... outstrip the emergents of the rain forest, which rarely reach two hundred feet”

Extinct - *adj.* 1. No longer existing or living: *an extinct species.*
2. No longer burning or active: *an extinct volcano.*
3. No longer in use: *an extinct custom.*

Forest Floor- *n.* The dark, bottom layer of a forest. Home to large mammals, insects, and many species of ferns, seedlings, small trees, and shrubs.

Habitat- *n.* 1. The area or environment where an organism or ecological community normally lives or occurs: *a marine habitat.*
2. The place where a person or thing is most likely to be found.
3. A structure that affords a controlled environment for living in extremely inhospitable locations, such as an underwater research laboratory.

Indigenous- *adj.* 1. Originating and living or occurring naturally in an area or environment.
2. Native to an area or environment.

Natural Resources- *n.* A material source of wealth, such as timber, fresh water, or a mineral deposit, that occurs in a natural state and has economic value.

Nocturnal- *adj.* Of, relating to, or occurring in the night.

Tropics – *n.* 1. Either of two parallels of latitude on the earth, one $23^{\circ}27'$ north (Tropic of Cancer) of the equator and the other $23^{\circ}27'$ south (Tropic of Capricorn) of the equator, representing the points farthest north and south at which the sun can shine directly overhead and constituting the boundaries of the Torrid Zone. 2. The region of the earth's surface lying between these latitudes.

Understory- *n.* An underlying layer of vegetation, especially the plants that grow beneath a forest's canopy.

Water cycle- *n.* The cycle of evaporation and condensation that controls the distribution of the earth's water as it evaporates from bodies of water, condenses, precipitates, and returns to those bodies of water.

Water vapor- *n.* Water in a gaseous state, especially when diffused as a vapor in the atmosphere and at a temperature below boiling point.

Web Resources:

Dr. Blythe's Rain Forest Education Web Site

<http://www.rainforesteducation.com/>

Take a tour of each layer of the rain forest with photos and sound.

Global Volunteers

<http://www.globalvolunteers.org/1main/costarica/conservation.htm>

Learn more about what you can do to help protect Costa Rica's rain forest. Check out the People and Land section for a wealth of information about Costa Rica's people, history, and geography.

66 Costa Rican Rain Forest Facts

http://www.pbs.org/tal/costa_rica/facts.html

Pretty self-explanatory.

RAN: The Rainforest Action Network:

http://www.ran.org/info_center/teacherstudent.html

A great resource to learn more about the Earth's rain forests and learn what you can do to protect them. Great lesson plans and activities to do with students.

The Rain Forest Alliance

<http://www.rainforest-alliance.org/>

Great Rain Forest information for learners of all ages. Check out the Teachers and Students section for a great list of activities to get you pro-active!

Take a Walk in the Costa Rican Rain Forest

http://www.pbs.org/tal/costa_rica/rainwalk.html

A great virtual tour of Costa Rica's La Selva biological reserve.

World Rainforest Information Portal

<http://www.rainforestweb.org/>

A wonderful resource full of rain forest facts and photos, and ways to get active in saving the Earth's rain forests.

5th Grade Rain Forest Web Quest

<http://falcon.tamucc.edu/~edtech/summer.5310.1999/mflores>

A really well-conceived web quest that is ideal for 5th graders, but could be used in a variety of classroom settings.