7. Describe the precipitation, temperature, sunlight, species diversity and soil of a tropical rainforest.
8. What do we know about the emergent level of the rainforest?
9. Describe a few special adaptations of plants and animals that live in the canopy.
10. What makes the canopy layer unique from other levels of the rainforest?
11. Describe a few special adaptations possessed by plants and animals of the rainforest.
12. How are the animals and plants of the rainforest interdependent?
13. Compare and contrast temperate rainforests with tropical rainforests.
14. Why do redwoods grow so large?
15. What is the greenhouse effect?
16. What can be done to stop the destruction of the rainforests?

Follow-up Discussion

Research indicates that students will retain their previous misconceptions about a topic, in preference to new information, until they actively recognize and correct their own errors. Therefore, it is important to have your students re-examine the facts/beliefs they put on their "Everything We Think We Know About…" list. It might also be helpful to review the list by marking each entry with a "+" or "-" to show which facts were correct and which were incorrect.

Discussions that ensue from thought-provoking discussions provide a good way to assess the overall depth of student understanding. The following are some suggested discussion topics.

- Give examples of rainforest animal adaptations that match the specific conditions of their environment, making them dependent on other species for survival.
- Have students explain how climate affects species biodiversity.
- Ask students to explain why preserving diversity is important to human survival.

Follow-up Activities

- After additional research on the human impact on the rainforest biome, students may debate or role play the positions of each of the following characters:
  - The president of a poor country located in a rainforest.
  - An ecologist concerned about the greenhouse effect.
  - A native farmer.
  - An executive of a lumber company.
  - A parrot.
- Based upon their knowledge of the rainforest biome, ask students to write an account of rainforests as they might exist on Earth ten thousand years from now. Encourage students to describe different plant and animal adaptations and changes they envision in the Earth's biomes in the future.

TEACHER'S GUIDE

Suggested Internet Resources

Periodically, Internet Resources are updated on our Web site at www.LibraryVideo.com

- **mbgnet.mobot.org/sets/rforest/index.htm**
  The Evergreen Project Web site discusses temperate and tropical rain forests in the segment "What's It Like Where You Live?".
- **kids.osd.wednet.edu/Marshall/homepage/tropical.html**
  The Rainforest Workshop is a colorful site developed by middle-school students interested in the ecology of the rainforest.
- **www.tnccolorado.org/kids/web.html**
  The "Web of Life" Kid's Page from the Colorado Nature Conservancy asks children to explore the reasons each different kind of plant and animal is vital to the web of life.

Suggested Print Resources

- Forsyth, Adrian. *How Monkeys Make Chocolate.* Firefly Books, Inc., New York, NY; 1999.
- Patent, Dorothy. *Biodiversity.* Clarion Books, New York, NY; 2003.
- Oldfield, Sara. *Rainforest.* MIT Press, Cambridge, MA; 2003.
- Pratt, Kristin J. *A Walk in the Rainforest.* Dawn Publications, Nevada City, CA; 1992.

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TITLES

- **CONIFEROUS FORESTS**
- **DECIDUOUS FORESTS**
- **DESERTS**
- **FRESHWATER ECOSYSTEMS**
- **GRASSLANDS**
- **MARINE ECOSYSTEMS**
- **RAINFOREST BIOMES**
- **TUNDRA**

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P.O. Box 580, Wynnewood, PA 19096 • 800-843-3620
Executive Producers: Andrew Schlessinger & Tracy Mitchell
Programs produced and directed by JWM Productions, LLC

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TEACHER'S GUIDE

Biomes of the World IN ACTION™

Rainforest Biomes

Grades 5–8

Students in grade 5–8 classrooms possess a wide range of background knowledge. Student response to this video program is sure to be varied, so the teachers at these grades need all the help they can get! This guide has been designed to help the 5–8 science teacher by providing a brief synopsis of the program, preview and follow-up questions, activities, vocabulary and additional resources.

Before Viewing: Extensive research tells how important it is for the teacher to discover what the students know — or think they know — about a topic, before actually starting a new unit. Therefore, after prompting discussion with the pre-viewing questions, lead your class to create an "Everything We Think We Know About…" list. You may also wish to preview key vocabulary words, and have students raise additional questions they hope will be answered.

After Viewing: Have your students share video excerpts that fascinated or surprised them, then challenge your students to prove or disprove the accuracy of the facts they put on their "Everything We Think We Know About…" list. Discuss what else they learned and use the follow-up questions and activities to inspire further discussion. Encourage students to research the topic further with the Internet and reading resources provided.

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Program Summary

Biomes are large regions of the world that have similar characteristics, and are often named for the dominant plant life in the area. The rainforest biome is found in regions near the equator that receive from 200 cm (80 in.) to 1200 cm (400 in.) of rain annually. Although millions of years ago tropical rainforests covered much of the planet, today they cover only seven percent. Though greatly reduced in size, rainforests still contain almost half of all the plant and animal species on Earth. Full sun all year, warm temperatures and plentiful rainfall and humidity make tropical rainforests a biome that produces lush vegetation and the greatest diversity of species of all biomes. Millions of different species can exist in one rainforest ecosystem, with as many as 200 species living in one tree!

The highest layer of the rainforest is the emergent level, with treetops rising up to 76 meters (200 ft.) into the sunlight. Below the emergent level is the dense canopy level, where most of the plants and animals live. Each organism is adapted to occupy a unique place in the rainforest. Epiphytes are plants that have aerial roots, allowing them to attach themselves to tall trees high in the canopy to get sunlight, while absorbing moisture out of the humid forest air. Lianas are climbing plants like vines that root in the ground and grow up trees, strangling some in the process. Animals such as monkeys, parrots and sloths spend their entire lives in the canopy. The next level is the understory, which receives only seven percent of the available sunlight, and consists of small trees and shrubs that are adapted to low-light conditions. Plants here typically have broad leaves in order to catch infrequent rays of sunlight and to funnel rain that drips down from above. At this level, many animals, such as snakes, frogs, birds and insects have developed amazing colorful adaptations that allow them to blend in with their surroundings and avoid predators. The forest floor has few plants but plenty of decomposers such as insects, fungi and bacteria that feed on decaying plants and animals and recycle nutrients. The soil of the rainforest is relatively poor in quality because nutrients are immediately absorbed again by plants or washed away by rainfall.

There are a small number of rainforests located in temperate climate zones – such as in the Pacific Northwest, from Oregon to Alaska, and along coastlines of Chile and Australia. The average temperature, sunlight, precipitation and biodiversity are all lower in temperate rainforests than in the tropical rainforests, but some of the oldest and largest living things on Earth are found here.

The dramatic reduction of the world's tropical rainforests through deforestation by humans is a potentially serious problem. Every second, an area the size of a football field disappears to farming and logging interests, along with 130 species of plants and animals. In the past 40 years, half of the world's tropical rainforests have been destroyed, along with 85% of temperate rainforests. Fortunately, many ecologists, governments and local people are working hard to stop the deforestation through new planting programs, education and the creation of new national parks. If the rainforests disappear, we may all pay the price.

Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the video.

biomes — Large regions of the world that have similar characteristics, usually named for the dominant plant life in the area. Biomes contain specific kinds of plants and animals.

ecosystem — A place where communities of living things interact with each other and with nonliving components such as soil and water.

rainforest — An area marked by broad-leaved evergreen trees forming a continuous canopy. Rainforests have an annual rainfall of at least 80 inches (204 centimeters) and are located mostly in tropical climates. Tropical rainforests have the greatest biodiversity of all biomes.

climate — An environment's average weather conditions including temperature and rainfall. Climate is the most important element in determining what kinds of organisms can live in an area.

polar zone — The frigid areas found in bands around the North and South poles, characterized by freezing conditions, minimal sunlight, and low diversity of plant and animal life.

tropical zone — The geographic area found in a broad band around the equator, characterized by the greatest amount of sunlight and annual rainfall and the greatest diversity in plant and animal life.

temperate zone — Large areas located in the bands between the polar and tropical zones, characterized by a climate consisting of a warm season and a cold season.

biodiversity — The number of different plant and animal species in an ecosystem; an indicator of the richness of the environment.

species — Organisms that are similar in appearance and can mate to produce offspring.

humidity — The amount of moisture in the air.

transpiration — The evaporation of water from a plant through tiny openings in leaves.

stomates — Tiny openings in leaves through which moisture passes into the air.

emergent level — The highest plant level in a tropical rainforest. Like open umbrellas, the plants of the emergent level stick out above the "roof" of the forest to 76 meters (200 ft.).

canopy level — The second level in a tropical rainforest, where plants grow to 20 meters (70 ft.). Most rainforest organisms live at this level.

epiphyte — A plant that does not grow in soil but is often found growing high above the ground on another plant. Also called an air plant.

lianas — Climbing plants like the strangler fig vine that grow high into the canopy on other plants to capture sunlight.

prehensile — Adapted for seizing or grasping especially by wrapping around. The prehensile tail of monkeys permits them to swing, cling and leap among branches by using their tails.

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understory level — The layer of the rainforest below the canopy, containing young trees and plants that are adapted to low light conditions. Plants at this level often have broad leaves to capture sunlight and rain that trickles down from above.

interdependent — The term used to describe animals that are reliant on each other for support and survival. All the organisms in an ecosystem are interdependent.

forest floor level — The ground level of a rainforest. This level receives very little sunlight from above so few plants can grow here.

decomposers — Organisms like bacteria, fungi and insects that consume and break down dead plants, animals and waste materials. In this process, energy and nutrients are returned to the soil.

temperate rainforests — Rare rainforests found in areas like the Pacific Northwest of the United States and in coastal areas of Chile and Australia. Temperate rainforests receive between 250 and 430 cm of rain annually. They have cool damp winters and foggy summers, and lower species diversity than tropical rainforests.

deforestation — The destruction of forests through human activity such as slash-and-burn agriculture or logging. Deforestation is happening at a current rate of the area of a football field every second, and is responsible for the extinction of many species of plants and animals each day.

greenhouse effect — The build-up of carbon dioxide, which retains the warmth from the Earth, possibly changing weather patterns and having a negative effect on plants and animals.

Pre-viewing Discussion

Before students generate their list of "Everything We Think We Know About…" for this topic, stimulate and focus their thinking by raising these questions so that their list will better reflect the key ideas in this show:

- What is biodiversity, and why is it important?
- What makes tropical rainforests different from other biomes?
- How do plants and animals adapt to their environment?

After the class has completed their "Everything We Think We Know About…" list, ask them what other questions they have that they hope will be answered during this program. Have students listen closely to learn if everything on their class list is accurate and to hear if any of their own questions are answered.

Focus Questions

1. What is a biome? What factors define a biome?
2. What is an ecosystem?
3. Describe the rainforest biome.
4. In which climate zone are most rainforests found? Why is that so?
5. How does climate affect the organisms in a biome?
6. In which climate zone is there the lowest biodiversity? Why?

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