Forest Journey

Educator's Guide

Dear Educator,

Welcome to the Educator's Guide for the traveling exhibit "Forest Journey"! We hope that you and your class will enjoy your trip. Our goal is to help students realize why they should care about forests and that they can make a difference. To that end, the activities in this guide are arranged to support the following idea:

Forests are a crucial part of the global ecosystem. The resources are not infinite, and humans need to make choices about managing and caring for forests because they have a major effect on them.

The guide is grouped into two sections that discuss and support this idea:

- Forests are a vital part of the global ecosystem
- Making decisions about forests

The sections build on concepts taught in previous sections, but you can mix and match the sections and activities to adapt the guide to your own classroom. Each of these sections has relevant **National Science Education Standards, pre-trip activities (with extensions), during trip activities, and post trip activities (with extensions).** We also have a **reproducible student trip sheet** and an **annotated list of books and websites.**

Note: many of these activities require access to a living tree or preferably, a forest; however, if you do not have access to a tree, you may still do many of the activities in the guide.

Happy trails!

The Franklin Institute

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Description of the traveling exhibit *Forest Journey*

Forest Journey is divided into five sections.

1.
Botany: describes of trees, such as the tree life cycle, tree reproduction, components of trees, and different types of trees.

2.
Forests: deals with the forest as a whole, such as the different types of forests, the forest as habitat for animals, the effects of erosion, and successful conservation efforts.

3.
History: talks about forests in the past, including historical uses of trees and tree evolution.

4.
Cultural: discusses the products we get from trees and the reasons for deforestation.

5.
Science Connections: explores the science behind forests, including photosynthesis, leaf color changes, carbon stabilization, and the greenhouse effect.

Forests Are a Vital Part of the Global Ecosystem

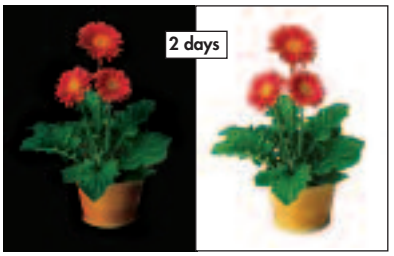
9-12

Standards: Content Standard C: Life Science

Pre-Trip Activity: Photosynthesis

Objective: To learn that plants take the sun's energy and convert it into food.

Materials: Plants (try Coleus and geraniums), petri dishes, test tube, hot plate or bunsen burner, forceps, 20% iodine solution (dilute iodine from drug stores), safety goggles, water, ethanol, large cardboard box, sunny location, microscopes and slides (optional).



Compare the leaves of the plant kept in the dark to the one kept in the light.

Things to Discuss:

Before the Activity: Discuss products we get from plants' photosynthesis.

After the Activity: What are the connections between photosynthesis and starch production? What about plants and their role in the global food chain?

Things to Do:

1. 48 hours before activity, place one plant in dark and one in sunny place.
2. Harvest leaves from each plant.
3. To remove chlorophyll from leaves immerse them in boiling water for 30 sec. Then put 300 mL of ethanol and each of the leaves in test tubes. Set test tubes in just boiled water for 4 min. (caution: do not use open flames near ethanol). The ethanol will turn green as chlorophyll is drawn out of the leaf.
4. Rinse off leaves by dipping them in hot water for 30 sec. Place leaves in petri dishes and cover with iodine solution for 2 min. (Iodine can test for the presence of starch).
5. Rinse leaves, and look for dark patches indicating presence of starch. Compare leaves from the plant that was kept in the dark and the plant that was kept in light. Examine under a microscope (optional).

Extensions:

- Perform chromatography experiments on leaf pigments to see colors present in leaves. http://www.geocities.com/CapeCanaveral/Hall/1410/lab-B-02.html

During Trip Activity to *Forest Journey* (see trip sheet)

Suggested exhibits: Photosynthesis, Forest as Habitat, Carbon Cycle.

picture of carbon cycle found at http://www.physicalgeography.net/fundamentals/9r.html

Post-Trip Activity: Model The Carbon Cycle

Objective: Forests play a major role in the global cycles of our planet.

Materials: A large room

Things to Discuss:

Before the Activity: Discuss things that take place in the carbon cycle. What will the paths for carbon molecules be? Discuss the role of carbon and how it is stored in each section of our world.

After the Activity: Talk about human interventions in the carbon cycle. Where does this extra carbon go when deforestation or burning of fossil fuels occurs?

Things to Do:

1. Divide the room into 6 areas: atmosphere, forests, underground (fossil fuels), animals, soil, and oceans.
2. Place students as carbon molecules in the areas, proportional to carbon levels present in each area. Place more students in the ocean and less in the atmosphere.
3. Ask students to model the path of carbon. Ex. Atmospheric carbon turns into sugar in trees = a student in the atmosphere going to the forest.
4. Have students draw a diagram of the carbon cycle.

Check out http://www.physicalgeography.net/fundamentals/9r.html for more information about the carbon cycle

Extensions:

- Ask students to research trends in the carbon cycle, the causes of increased levels, and the results.
- Examine a graph of atmospheric carbon concentrations over time (http://www.whrc.org/science/carbon/carbon.htm).

Forest Decisions

9-12

Standards: Content Standard C: Life Science, Content Standard A: Science as Inquiry

Pre-Trip Activity: Forest Walk

**Note: if you do not have access to a forest, use the post-trip activity*

Objective: To learn about the greenhouse effect and how deforestation contributes to global warming.

Materials: For each lab group: unshaded lamp (optional if sunny), 2 plastic soda bottles with tops cut off and labels removed, two strips of thin 1" X 2" cardboard, four cups of potting soil, one piece of 20" X 20" plastic wrap, rubber band, masking tape.

The greenhouse effect is natural and needed to keep the earth warm enough for life. Greenhouse gases (such as CO2) trap heat in the atmosphere. Too much in the atmosphere can lead to increasing temperatures, or global warming. Deforestation contributes to global warming because trees store carbon and take in CO2 from the atmosphere. Check out http://www.epa.gov/global-warming/kids/index.html.

Things to Discuss:

Before the Activity: What are causes and effects of the greenhouse effect? Explain that the plastic wrap on the bottles simulate increased levels of CO_2 in the atmosphere.

After the Activity: What do the findings say about increased levels of CO_2 in the atmosphere? How does deforestation contribute to global warming? What are differences between the greenhouse effect and global warming?

Things to Do:

1. Tape cardboard strips to the backs of the thermometer bulbs. Tape thermometers inside each bottle.
2. Put two cups of soil in each bottle. Make sure the thermometers are not covered by the soil.
3. Cover one of the bottles with plastic wrap and secure with rubber band. Place the wrapped bottle and the unwrapped bottle equal distances from the lamp or a sunny window.
4. Take temperature readings every two minutes for thirty minutes. Graph the results.

Extensions:

- Research the differences between the greenhouse effect and the hole in the ozone layer.
- There are many conflicting opinions about the greenhouse effect and global warming. Have students research the different points of view, and discuss why there are differing opinions.

During Trip Activity to *Forest Journey* (see trip sheet)

Suggested exhibits: Greenhouse effect, Benefits of plants and trees, Erosion, Contemporary deforestation

Post Trip Activity: Case Study of Rainforest Deforestation

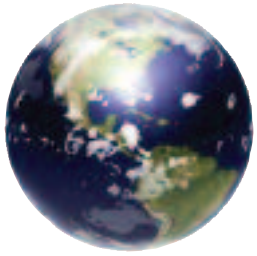
Objective: Critically analyze causes and impacts of deforestation through a case study of deforestation.

Materials: Printouts of a rainforest deforestation case study (http://ublib.buffalo.edu/libraries/projects/cases/amazon.html).

Things to Do and Discuss:

Day 1: Imagine the world without trees. Make a list of the effects on a personal level and a global level. Ask students to read the case study of deforestation in the Amazon.

Day 2: Conduct a debate about the case study.



- Students will represent logging, environmental, or farming points of view. Have students research views, issues, and arguments of their group and then write up the supporting arguments.
- Conduct a debate between the various interest groups. Each group will present their findings. The groups will then ask questions of each other and present rebuttals to opposing arguments.
- After debate, the class will vote on a course of action.
- Reflect on the debate. What can students say about deforestation and the conflicting interests that are involved? Is there anything the students can do themselves to make a difference?

Forest Journey Trip Sheet

1. Find a consequence of deforestation. How might this affect you in your own life?

2. Find a group that either uses the forest, its products, or saves the forest in the exhibit. Write their point of view (You may use a historical group).

3. Find a way forests help our planet. How is this an integral part of our global ecosystem?

Additional Resources

Books:

Blashfield, Jean F. and Black, Wallace B. *Recycling.* (1991). USA: Children's Press, Inc.
Grades 5-12
This insightful book describes the magnitude of our garbage problem, what happens to our garbage, and what the we can do to reduce our garbage. It also describes the carbon cycle and composting solutions, the methods, benefits, and issues of recycling various materials. Students are challenged to think about the consequences of their decisions, by presenting issues in their everyday lives.

Hughes, Meredith Sayles. *Hard to Crack: Nut Trees.* (2001). Minneapolis: Lerner Publications Company.
Grades 5-12
Beautiful illustrations and photographs complement information about a variety of nuts including pecans, walnuts, and macadamias. Readers learn how each nut grows, historical context, nutritional facts, how the nuts are harvested, modern day uses for the nuts, and delicious recipes such as Pistachio Pasta Salad.

Perlin, John. *A Forest Journey: The Role of Wood in the Development of Civilization.* (1991). Cambridge, MA: Harvard University Press.
Grades 9-12
This is a sweeping history about our historical relationship to wood and the resulting deforestation.

Web links:

http://yosemite.epa.gov/oar/globalwarming.nsf/content/index.html
This site from the EPA has solid resources for educators and students about global warming.

http://www.ems.psu.edu/~fraser/Bad/BadGreenhouse.html
This website discusses some of the alternate views of the greenhouse effect.

http://www.whrc.org/science/science.htm
The Woods Hole Research Center has an excellent website about carbon cycles and forests, complete with satellite pictures of deforestation and clearly written explanations of current issues.

http://www.worldwildlife.org/forests/forest.cfm?sectionid=184&newspaperid=17
Discusses ways students can conserve in their own lives.

http://www.omsi.org/visit/life/forestpuzzles/management/four/
This website presents different views on forest management.

http://www.americanforests.org/resources/howtoplanttrees/.
This website gives directions on how to plant a tree.

www.arborday.org
This website contains good information about trees, including a tree identification guide, benefits about trees, and tips to celebrate Arbor Day. Best of all, for a $10 membership fee, you can receive 10 free trees to plant.

www.enature.com
The National Wildlife Federation offers an excellent resource to discover the plants and animals in your own neighborhood. You may search for trees by zip code or perform an advanced search. Detailed pictures and descriptions make tree identification easy.

http://na.fs.fed.us/spfo/ce/content/for_teachers/index.cfm
The USDA Forest Service offers a wealth of curriculum to teachers. Here, you can find many detailed, well-written graded lessons about forests.