



# Forest Journey

## Educator's Guide

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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:

**Trees have special traits that help them and the animals around them, including humans, survive. If forests are destroyed everyone and everything can be hurt. Therefore, we can make a difference by conserving forests.**

The guide is grouped into three sections that discuss and support this idea.

- Trees breathe, eat, and drink
- People, animals, and trees depend on each other
- Saving forests and how to make a difference

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), and post trip activities (with extensions).** We also have a **reproducible student trip sheet** and an **annotated list of books and websites.**

Note: some of these activities require access to a living tree or preferably, a forest; however, there are also plenty of activities that do not require you to go outside.

Happy trails!



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## Description of the traveling exhibit *Forest Journey*

*Forest Journey* is divided into five sections.

**1. Botany:** describes the parts and functions 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.



Standards: Content Standard C: Life Science

## Pre-Trip Activity: Tree Walk

**Objective:** Have kids discover structures of a tree while examining a real tree.

**Materials:** A cutting of a branch, a tree, clipboards, paper, pencils.

Optional: magnifying glasses.

### Things to Discuss:

*Before the Activity:* Show the branch cutting. Ask students what they notice about the branch. Can they name the different parts? What parts of the tree are missing? All the parts are important, and the class will figure out their uses.

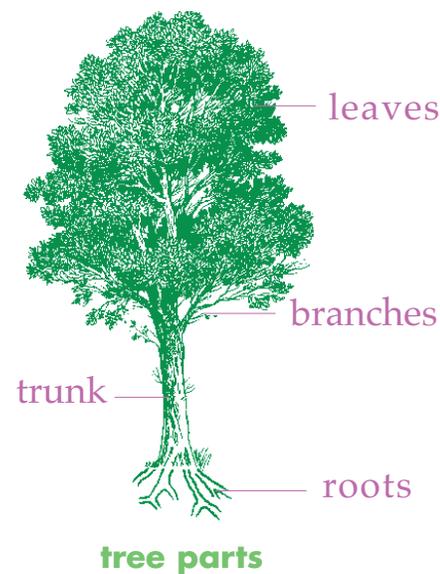
*After the Activity:* Back in the classroom, ask students what they noticed. How do they think each part helps the tree? How can the students test their ideas? Explain that their job is to find out how these parts help trees on their field trip.

### Things to Do:

1. Take students outside to look at a tree.
2. Have students draw and describe individual parts of the tree and the whole tree. Older students should note their questions and observations.

### Extensions:

- Relate each tree function to a human need. Ex. humans eat; trees eat by making food in their leaves.
- Read *Are Trees Alive?* by Debbie Miller, a book that describes how tree parts are similar to a child's body.
- Conduct an experiment to find out what part of the tree breathes by smearing Vaseline on leaves.  
<http://www.domtar.com/arbre/english/respire.htm>



**During Trip Activity to Forest Journey** (see attached trip sheet to guide your visit)

Suggested exhibits:  
Hardwoods and softwoods,  
Parts of tree/transpiration,  
Tree reproduction, Tree life cycle/growth

## Post-Trip Activity: Making a Tree Model

**Objective:** Make a tree model to discover how the parts of a tree fit together.

**Materials:** Tissue paper, construction paper, pipe cleaners, straws, cardboard tubes, yarn, shoebox.

### Things to Discuss:

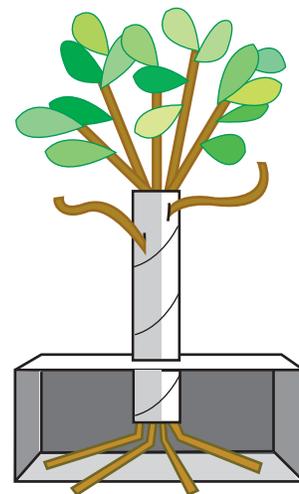
Discuss what they learned on the trip. What was surprising? What was different than what they thought before?

### Things to Do:

1. Have students make tree models that include a trunk, branches, leaves, and roots. They can make branches out of pipe cleaners and roots out of yarn.

### Extensions:

- Read *The Giving Tree* by Shel Silverstein. Discuss the different parts of the tree, and how they help us.



tree model

# People, Animals, and Trees Depend on Each Other

K - 4

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

## Pre Trip Activity: Animals and the Forest

**Objective:** Discover that animals and trees are dependent on each other.

**Materials:** clipboards, pencils, paper, large cloth, a forest (optional), plastic knives, cutting boards, nutcrackers

### Things to Discuss:

*Before the Activity:* How do animals depend on forests? Show students a picture of a forest habitat.

Why do you think animals live in forests? What do animals in the forest eat?

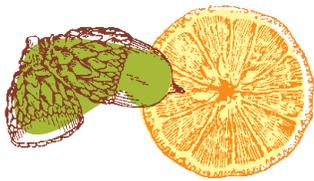
*After the Activity:* Why are seeds and fruits beneficial to animals? What trees did they come from? Why do fruits and seeds taste so yummy? They are nutrient rich to help seeds grow. When animals eat seeds, they enjoy the nutrients too.

### Things to Do:

1. Take the students on a forest walk. Note: start here if you don't have access to a forest.
2. Look for evidence that animals live in trees, such as nests, holes, and half-eaten nuts.
3. Lay a large cloth on the ground, and gently shake a tree to see the insects that come out of the tree.
4. Have students bring in samples of fruits and seeds from trees (caution: certain types of nuts may cause allergic reaction).
5. Cut open fruits and nuts to examine the seeds inside.

### Extensions:

- Play the Web of Life game to discuss how forests and animals are intertwined. Refer to the 5-8 guide.
- Conduct a forest floor dig. A good resource is *One Small Square: Woods* by Donald M. Silver.
- Read an animal and tree story, such as *In the Woods: Who's Been There?* by Lindsay Barrett George



For regional field guides, go to [www.domtar.com/arbore/english/p\\_carte.htm](http://www.domtar.com/arbore/english/p_carte.htm)

### During Trip Activity to Forest Journey

(see trip sheet)

Suggested exhibits: Reproduction, Forest as Habitat, Early American House, Tree Products, Medicinal Plants

### Edible tree products:

Coconuts, walnuts, almonds, hazelnuts, apples, oranges, lemons, peaches, pears, apricots, plums, pecans, chestnuts, cinnamon, maple syrup, figs, cloves, olives, coffee, chocolate, pine nuts...

## Post Trip Activity: People and the Forest

**Objective:** Discover the benefits we get from trees by looking at tree products.

**Materials:** Post-its

### Things to Discuss:

*Before the Activity:* Ask students what they saw on the trip. Were there any products from trees that surprised the students?

*After the Activity:* Discuss the findings. What can students say about the importance of trees in our lives?

### Things to Do:

1. Pass out three Post-its to each student.
2. Have students write their names on each Post-it.
3. Have students stick their Post-its on classroom items that came from trees. Students may not have two Post-its on the same item, and they must each choose three different items (ex. a student can't put Post-its on two desks).

### Extensions:

- Ask the kids to make a list of 5-10 items in their homes that come from trees.

Tree products in the exhibit: cough drops, baseball, chewing gum, chocolate, cinnamon, rayon, toothpaste, Vicks Vapor Rub, medicines

Standards: Content Standard F: Science in Personal and Social Perspectives

## Pre Trip Activity: Trees and Recycling

**Objective:** Students will realize the impact of their own actions on forests.

**Materials:** Waste paper from class, a bathroom scale

### Things to Discuss:

*After the Activity:* Were students surprised by how many trees they used? What are consequences of not recycling? How can they encourage other students to recycle? How they can reduce waste and make a difference at home and school?

### Things to Do:

1. Hold a recycling paper drive in your school by collecting all of the waste paper that would have been thrown away in the school for one week or from just their classroom.
2. At the end of the week, weigh collected paper. How many trees does the paper represent? According to Conservatree, 24 trees are needed to make one ton of office paper, so one pound of paper equals 0.012 trees.

### Extensions:

- Math extension: Calculate how many trees the school uses in a year.
- Read *The Lorax* by Dr. Seuss. Discuss why the trees were cut down and what life would be like in a world without trees.
- Make recycled paper. <http://www.fi.edu/fellows/fellow1/apr99/paper/index.html>



For more information about the amount of trees that are saved by recycling, go to [http://www.conservatree.com/learn/Enviro\\_Issues/TreeStats.shtml](http://www.conservatree.com/learn/Enviro_Issues/TreeStats.shtml).



### During Trip Activity to Forest Journey

(see trip sheet)

Suggested Exhibits:  
Erosion/water regulation,  
Forest as Habitat,  
Contemporary  
Deforestation

## Post trip Activity: Plant a tree

**Objective:** Have students take ownership of the environment by planting a tree.

**Materials:** Tree seedlings, shovel, mulch, water, a place to plant a tree

### Things to Discuss:

*Before the Activity:* Discuss the conditions, including the location you choose, that trees need to survive.

### Things to Do:

\*Note: if you can't plant a tree at school, give students seedlings to take home.

1. Choose a tree seedling to plant, taking into account size of tree, rate of growth, sunlight needed, and soil conditions.
2. Choose a place to plant the tree, factoring in proximity to buildings, sidewalks, and power lines.
3. Dig a hole 3X the diameter of the root ball of the seedling.
4. Place the tree in the hole with the roots joining the stem at soil level. Water the soil as you fill in the hole.
5. Work together as a class to keep the trees alive with watering and mulching.

### Extensions:

- Read a story about Johnny Appleseed, an American pioneer that planted apple trees throughout the west. Suggested: *Johnny Appleseed* by Steven Kellogg.
- Write a tree poem and illustrate it with tissue paper leaves.

To see a list of ways students can conserve in their own lives, go to <http://www.worldwildlife.org/forests/forest.cfm?sectionid=184&newspaperid=17>

For free trees with a \$10 membership, go to [www.arboday.org](http://www.arboday.org)

# Forest Journey Trip Sheet

K-4

1. Find one part of the tree to draw like a leaf, branch, or seed.  
What does the tree use it for?

Name of tree part: \_\_\_\_\_

Use: \_\_\_\_\_

\_\_\_\_\_

2. Draw two products that come from trees. What are they called?

3. What is one bad thing that happens when forests are cut down?

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# Additional Resources

K - 4

## Books for children:

**Burnie, David. *Tree*. (1988). New York: Alfred A. Knopf.**

Grades 3-8

This Eyewitness Book contains all the hallmarks of the series: amazing photographs, detailed, clear, but not overwhelming information, and fun facts. Students can gain a broad overview about many aspects of trees.

**Dorros, Arthur. *A Tree is Growing*. (1997). New York: Scholastic Press.**

Grades 2-5

Detailed, naturalistic, wonderful illustrations help children understand the parts of trees and the cycle of a tree's growth throughout the seasons. The pictures include other animals and plants in the tree's environment, and are clearly labeled to help children place the trees in context of the forest habitat.

**Gallob, Edward. *City Leaves, City Trees*. (1972). New York: Charles Scribner's Sons.**

Grades 1-7

This is a clear, easy to use tree identification book about the most common city trees. It is organized by type of leaf, and has includes pictures of the leaves, seeds, flowers, and fruits of the trees to make matching easy. Even though the reading level is not appropriate for younger children, students will find the pictures useful to identify their trees.

**Hall, Zoe. *The Apple Pie Tree*. (1996). New York: The Blue Sky Press.**

Grades K-2

Children will enjoy hearing about the cycle of an apple tree through the seasons, accompanied by a nesting pair of robins.

**Kalbacken, Joan and Lepthien, *Recycling*. (1991). USA: Children's Press, Inc.**

Grades 2-4

This clearly written book discusses our overflowing landfills, and describes ways we can recycle various materials. Each chapter is devoted to a different material, such as paper, cardboard, and glass and talks about why the material should be recycled, how it is recycled, and how the recycled materials could be used.

**Kessler, Cristina. *My Great-Grandmother's Gourd*. (2000). New York: Orchard Books.**

Grades 3-5

Modern technology in the form of a water pump comes to Fatima's Sudanese village, but she and her grandmother realize that they need to mix old ways with the new and store water in their baobab tree, their tree of life, even though the other villagers laugh at them. Students will appreciate another example of the importance of trees to people.

## Web links:

**[www.arborday.org](http://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](http://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](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.



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**Trees have special functions that help them survive and are a crucial part of the forest ecosystem. Humans need to make choices about managing and caring for forests because they have a major effect on them.**

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

- Forests help trees reproduce
- A forest is more than a bunch of trees
- Saving forests and how to make a difference

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!



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## Description of the traveling exhibit *Forest Journey*

*Forest Journey* is divided into five sections.

**1. Botany:**  
describes the parts and functions 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 Help Trees Reproduce

5 - 8

Standards: Content Standard C: Life Science

## Pre-Trip Activity: Dissecting Flowers and Seeds

**Objective:** Discover how trees reproduce by dissecting flowers.

**Materials:** Scissors, knives (can be plastic), large flowers with well defined reproductive parts (i.e. gladiolas, lillies)

### Things to Discuss:

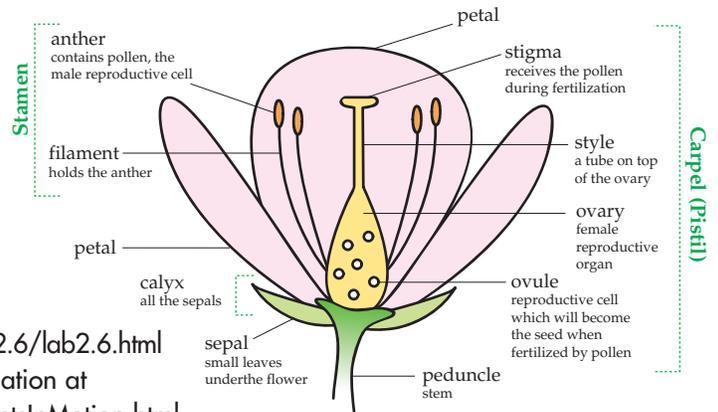
Ask students to bring in samples of flowers. Give examples. Talk about parts of flowers and what they produce. Discuss how flowers, fruit and seeds benefit the forest ecosystem and trees.

### Things to Do:

1. Have students dissect flowers.
  - a) Carefully make a vertical incision to open the flower.
  - b) Pin petals and ovary to keep them open.
  - c) Slice open ovary to find ovules. When fertilized, ovules become seeds.
  - d) Have students draw and label parts of their flowers before, during, and after dissection.

### Extensions:

- To dissect fruit, go to <http://naturalsciences.sdsu.edu/classes/lab2.6/lab2.6.html>
- Watch time lapse movies of flower openings and seed germination at <http://sunflower.bio.indiana.edu/~rhangart/plantmotion/PlantsInMotion.html>
- Cover fruit blossoms on a tree with a plastic bag. Later, compare the flower to adjacent flowers. The covered flower won't produce fruit because it cannot be pollinated.



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

Suggested exhibits: Tree reproduction, Forest as Habitat

## Post-Trip Activity: Making Seed Models

**Objective:** Learn how trees need the forest for reproduction by making seed models.

**Materials:** construction paper, glue, scissors, tape, cardboard, cotton balls, paper helicopter patterns, Velcro, ping pong balls, powder...

### Things to Discuss:

Discuss the exhibit. Were there any surprising seed dispersal or pollination techniques? How does the rest of the forest help, and is helped, by tree reproductive techniques?

### Things to Do:

1. Have students bring in seeds from trees.
2. Have students make a model of a seed or a pollination technique (ex. paper seed helicopter). Have students label their models and describe how their seed or pollination technique works, how it helps the tree, and how it helps the rest of the forest.
3. Students can exhibit their seed models in a "seed museum" or demonstrate their models to the rest of the class.

### Fruits and seeds from trees:

Coconuts, walnuts, almonds, hazelnuts, apples, oranges, lemons, peaches, pears, apricots, pecans, chestnuts, figs, cloves, olives, coffee, chocolate, pine nuts. . .



# A Forest is More Than a Bunch of Trees

5 - 8

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 discover the intricate ecosystem of a forest.

**Materials:** A picture of a tree farm, clipboards, pencils, paper, magnifying glasses, access to a forest

### Things to Discuss:

**Before the Activity:** Talk about the difference between a tree farm and a forest. Unlike tree farms, forests contain a variety of trees and plants and therefore homes and food for a variety of animals. They also have a natural, continuing cycle of decay and growth. [http://www.carolinafraserfir.com/photos/farm\\_475w.jpg](http://www.carolinafraserfir.com/photos/farm_475w.jpg)

<http://www.greenviewtreefarm.com/IMAGES/home01.jpg>

**After the Activity:** Discuss the students' findings, hypotheses, and questions. What can they say about the way all the organisms are a part of the forest ecosystem? What would happen to the forest ecosystem if the trees were chopped down?

### Things to Do:

1. Take your students on a forest walk. Have students to pick a patch of the forest about 3' X 3' with a tree in that area.
2. Have students make detailed drawings of what they see in their squares, noting hypotheses and questions about the relationship between plants and the things around them. Draw their attention to evidence that animals live in the forest, such as nests, holes, droppings, and half-eaten nuts.

### Extensions:

- Have students design experiments to investigate their questions and hypotheses. Ex., they may say that mushrooms grow in dirt; students may want to systematically analyze where and on what mushrooms grow.
- With permission, conduct a forest floor dig. Check out One Small Square: Woods by Donald M. Silver.

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

Suggested exhibits: Tree reproduction, Forest as Habitat

## Post Trip Activity: Web of Life Activity

**Objective:** To realize the interconnectedness of the forest ecosystem.

**Materials:** A ball of yarn, notecards, markers

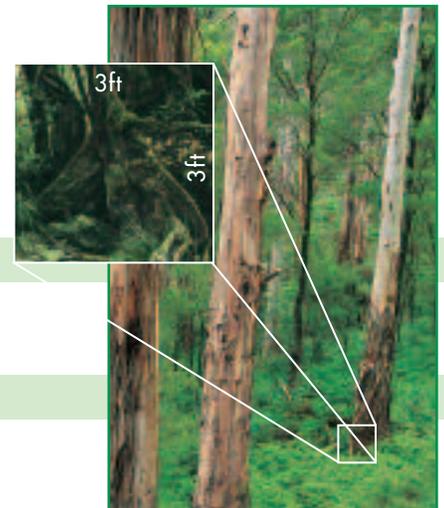
### Things to Discuss:

Discuss findings from field trip.

What were some of the interactions between trees, plants, and animals?

### Things to Do:

1. Brainstorm plants, animals, and trees that live in a forest using the students' trip sheets from the forest walk.
2. Write one organism on each notecard and pass them out to students.
3. Have the class sit in a circle. As the sun, start the activity by wrapping one end of the ball of yarn around your hand. Pass the ball to a student who will wrap the yarn around his hand and pass it on, stating the connection between the sun his organism. Repeat with each student in turn. Have them connect the last organism to their own.
4. Pick one student to tug gently on his string. When the other students feel a tug, they should tug too; students will see that the entire ecosystem is interconnected.
5. Pretend the trees in the forest have been chopped down. Ask students who are trees to drop their strings and the rest of the class to tug gently; students will see that the ecosystem will fall apart.



Have students do a detailed drawing of a 3ft by 3ft section in the forest.

# Saving Forests and How To Make A Difference

5-8

Standards: Content Standard F: Science in Personal and Social Perspectives

## Pre Trip Activity: Forest Management from Different Perspectives

**Objective:** To research various points of view on forest management that will be used in a debate.

**Materials:** None needed

### Things to Discuss:

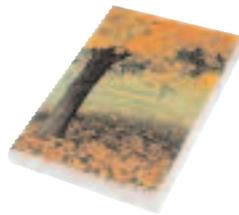
Have students name people or groups that have a stake in how forests are managed, such as environmentalists, recreational users, politicians, and commercial logging companies.

### Things to Do:

1. Research and present an issue facing your own local or regional forest (<http://www.americanlands.org/forestweb/yearbook.htm> for forest issues by state) or use a case study.
2. Pick several of the special interest groups in this specific issue, including a forest management group, and have students choose a group. Have them conduct research about the views, issues, and arguments of their particular groups. The forest management group should research plants, wildlife, and problems. For different views of forest management, check out <http://www.onsi.org/visit/life/forestpuzzles/management/four/>

### Extensions:

- Look at historical and current pictures of neighborhoods and interview long-time residents. How have local forests changed over time?
- Look at satellite pictures of rainforest and US deforestation. <http://earthobservatory.nasa.gov/Newsroom/LCC/>



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

Suggested exhibits: Contemporary Deforestation, Conservation, Tree Products

## Post trip Activity: Forest Management Debate

**Objective:** Critically analyze competing interests in forest management.

**Materials:** None needed

### Things to Discuss:

Reflect on the debate. What can students say about forest management? How can students make a difference in their own lives?

### Things to Do:

1. Before the debate, have each group write a proposal and three points to back up their argument.
2. Conduct a debate between the various interest groups on what should be done. The forest management group first will summarize the issues and their findings. Next, each group will state their proposals and arguments. Students will then ask questions of each other and present rebuttals to opposing arguments.
3. The forest management group will decide on a course of action.

### Extensions:

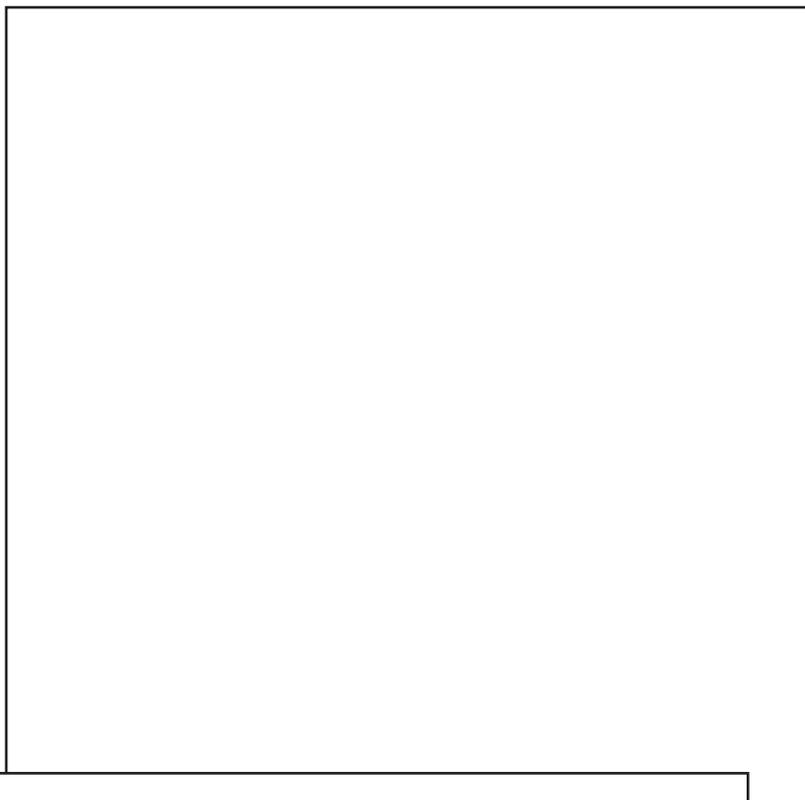
- Compare forest management practices in different countries around the world.
- Plant trees and take care of them as a class.

For ways students can conserve:

<http://www.worldwildlife.org/forests/forest.cfm?sectionid=184&newspaperid=17>



1. Draw a type of tree reproduction, such as a pollination or dispersal technique.



How does the forest help a tree to reproduce this way?

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How does the tree reproduction help or involve other organisms in the forest?

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type of reproduction: \_\_\_\_\_

2. Is there a common wood product people use in the exhibit that surprised you? Why?

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3. What is one bad thing that happens when forests are cut down?

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# 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 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.

**Burnie, David. *Tree*. (1988). New York: Alfred A. Knopf.**

Grades 4-8

This Eyewitness Book contains all the hallmarks of the series: amazing photographs, detailed, clear, but not overwhelming information, and fun facts. Students can gain a broad overview about many aspects of trees.

**Gallob, Edward. *City Leaves, City Trees*. (1972). New York: Charles Scribner's Sons.**

Grades 1-7

This is a clear, easy to use tree identification book about the most common city trees. It is organized by type of leaf, and has includes pictures of the leaves, seeds, flowers, and fruits of the trees to make matching easy.

**Hughes, Meredith Sayles. *Hard to Crack: Nut Trees*. (2001). Minneapolis: Lerner Publications Company.**

Grades 5-12

Beautiful illustrations and photographs complement fascinating information about a variety of nuts that come from trees. Nuts profiled include pecans, walnuts, almonds, pistachios, cashews, and macadamias. Each chapter focuses on a different nut, where readers can find tidbits about 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.

**Overbeck, Cynthia. *How seeds travel*. (1982). Minneapolis : Lerner Publications Co.**

Grades 3-6

Describes the many methods seeds use to move around.

## Web links:

**<http://www.americanforests.org/resources/howtoplanttrees/>.**

This website gives directions on how to plant a tree.

**[www.arborday.org](http://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](http://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](http://na.fs.fed.us/spfo/ce/content/for_teachers/index.cfm)**

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**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).

### Things to Discuss:

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

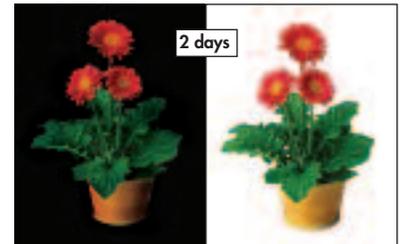
*After the Activity:* What are the connections between photosynthesis and starch production? What about plants and their role in the global food chain?

### 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>



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

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

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

## 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.

### 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>).

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

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

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.

### 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<sub>2</sub> in the atmosphere.

*After the Activity:* What do the findings say about increased levels of CO<sub>2</sub> in the atmosphere?

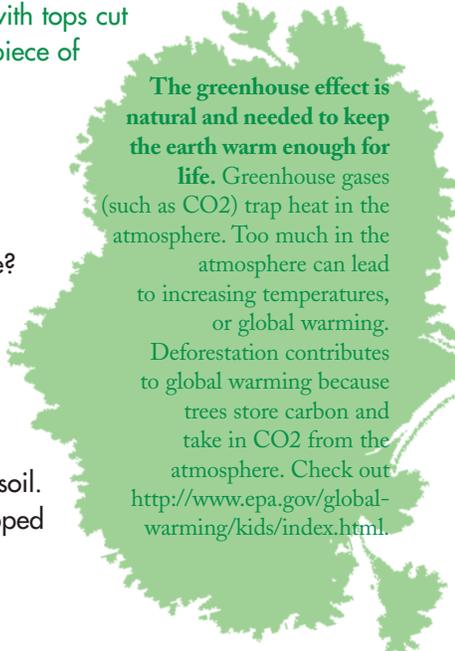
How does deforestation contribute to global warming? What are differences between the greenhouse effect and global warming?

### 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.



The greenhouse effect is natural and needed to keep the earth warm enough for life. Greenhouse gases (such as CO<sub>2</sub>) 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 CO<sub>2</sub> from the atmosphere. Check out <http://www.epa.gov/global-warming/kids/index.html>.

## 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?

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

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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).

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

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## 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 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.oms.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](http://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](http://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](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.