Every Tree For Itself

What do trees need so they can grow? Some of their needs are the same as those of people and other animals. For example, trees need plenty of water. They also need plenty of nutrients, which they get from food. But trees and people don't get food in the same way. Plants make their own food by using energy from the sun.

If trees don't get enough water, nutrients, or sunlight, they may grow slowly or die. Growth rings show this graphically. In general, wide rings indicate good conditions for growth (plenty of nutrients, water, and sunshine), while narrow rings often indicate less favorable conditions for growth (drought, insect damage, lack of nutrients, or competition).

Getting Ready

1. Cut two 3" x 3" (7.6 cm x 7.6 cm) squares out of blue, yellow, and green construction paper for each student. To save time, you could use colored poker chips or milk caps. These work much better than paper if you're doing the activity outdoors on a breezy day.

Doing the Activity

1. Pass out cross-sections from several trunks or branches (tree cookies), and have your students examine the growth rings. (If you don't have an actual cross-section, draw a big one on the chalkboard.) Explain that the number of rings indicates a tree's age.

2. Give a large piece of paper (at least 8.5" x 11" or 22 cm x 28 cm) or a white paper plate to each student.

3. Tell students to imagine that they are trees. Have them draw a cross-section of themselves, representing their age in growth rings. (You might laminate these drawings for durability.)

4. Have students stand about three feet (91 cm) apart on their cross-sections.

5. Equally distribute the colored squares (or poker chips) on the floor around the students so the squares are about one to two feet (30 - 61cm) apart.

6. Tell students that they'll be playing a game called "Every Tree for Itself." The object of the game is for the "trees" to gather as many squares as they can. Explain that each colored square represents a tree requirement. Blue represents water, yellow represents sunlight, and green represents a nutrient
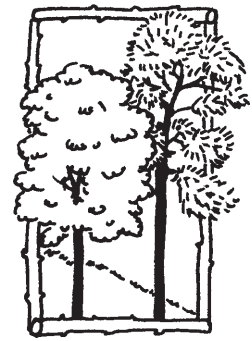
Method
Students become trees competing for water, sunlight, and nutrients.

Key Concepts
The earth's atmosphere, water, soil, climate, and geology vary from region to region, thus creating a wide diversity of biological communities.

Organisms are interdependent; they all depend on nonliving components of the Earth.

Altering the environment affects all life forms—including humans—and the interrelationships that link them.
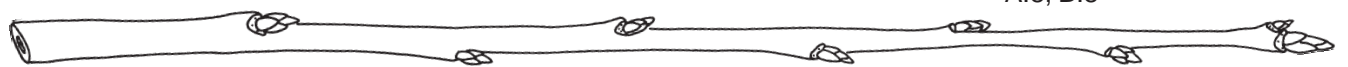
Objectives
- simulate how trees compete for their essential needs

- describe how varying amounts of light, water, and nutrients affect a tree's growth

Subjects & WI Academic Standards
Science:
A.4, C.4, F.4
A.8, C.8, F.8

Math:
A.4, B.4
A.8, B.8

Standards cont.

English/Language Arts:
B.4, C.4
B.8, C.8

Environmental Education:
A.4, B.4
A.8, B.8

Materials

- 8.5" X 11" pieces of paper or paper plates
- pieces of blue, yellow, and green paper or 3 colors of poker chips or milk caps
- markers or crayons
- tree trunk or branch cross-sections showing annual growth rings (optional)

## Preparation Time

15 minutes

Activity Time

1 50-minute class period

Setting

classroom or outdoors

such as nitrogen, oxygen, or carbon dioxide. Make appropriate adjustments if you use poker chips.

7. Give a signal to start the first round. Have student trees reach with their roots and branches (arms and legs) to gather their requirements. Tell students that one foot (their tap root) must remain planted on their cross-section at all times. They are not allowed to slide their cross-section along the floor or step off it; they will be disqualified for doing so.

8. Allow student trees to gather these requirements for one 30-second round. (They can either collect all types of requirements at once or one type of requirement each round.) Have students use a notebook to record how many of each color requirement they gathered. Use the following questions to discuss the results of the first round:

   ❧ How many requirements did each tree get?

   ❧ Do any trees lack a particular requirement?

   ❧ What might happen to a real tree that lacked one of its requirements? (It might grow slowly or eventually die. Point out to the students, though, that different species of trees have different requirements.)

   ❧ Is there such a thing as too much water, sunlight, or

nutrients? (Yes, every species has optimum levels beyond which the tree becomes stressed.)

9. Have students stand on their cross-sections in groups of three to five. Gather the colored squares and spread them around the room again. Play another round and have student trees record their results.

10. Compare the results of this round with those of the first. In most cases, students will notice that each tree gathered fewer requirements. Ask if they can reach any conclusions about trees that grow close to each other. (Such trees compete for requirements. Often they don't grow as well as trees that are more widely separated from one another.) Ask if any trees "died" because they couldn't get a particular requirement. (You can allow trees to fall down or look tired and droopy if they haven't received their vital requirements.)

11. Ask students how foresters might use their knowledge of competition in caring for a stand of trees. (Foresters plant trees a certain distance apart so the trees will be able to get enough nutrients. The distance varies depending on the species of the tree. Foresters also thin young stands of trees).
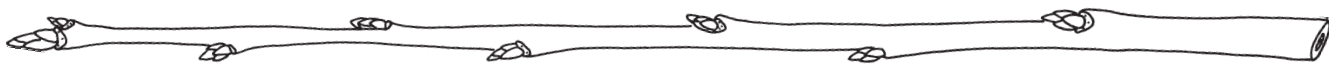
12. Try several more rounds, comparing the results each time. Here are suggestions for additional rounds:

   ✤ Have all of the students stand closer together.

   ✤ Put students closer together, but have only half of the class participate.

   ✤ Use fewer water squares (representing a drought).

   ✤ Use fewer sunlight squares (representing lack of sunlight for young trees because of overcrowding).

   ✤ Use fewer nutrient squares (representing poor quality soil).

As before, each student should examine his or her results in each round. Older students can record those results and later graph or chart the results of each round and draw conclusions.

Providing Enrichment

For a visual way to portray water absorption by roots, try the following:

1. Explain that, for many species of trees, the diameter of the spread of the tree's roots is roughly equal to the tree's height. Have students measure themselves and then make a circle (using chalk or string) with a diameter equal to their height.

2. Play the tree game with each student standing in the center of his or her circle. Tell the student trees they can gather water squares only within their circle of roots.

3. Play the game again using root circles, but this time have trees stand in clumps. Afterward, discuss the results of root competition.

Assessing Student Learning

Assign values to the amounts of requirements the students gather. For example, a collection of three or more of each requirement could represent superior growth. Two of each requirement could represent average growth. And one or fewer of each could represent poor growth. Using these values as a basis, have students record the numbers of trees that are growing very well, fairly well, and poorly for each round. Older students can use graphs to show results.
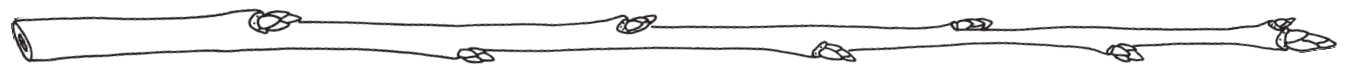
Extending the Learning

Plant a Tree

What if you wanted to plant a tree outside your school? What kind of tree would you plant? What would you need to consider? With your students, brainstorm a list of the needs of trees. Here are some things you should include in your list: soil conditions, sun exposure, moisture, and space (i.e., how big the tree will be when it is full-grown).

Now look at potential planting spots around your building. Where is there room to plant a tree? What obstacles to growth are present (e.g., locations of sidewalks and power lines)? For a small fee, you can even have the soil tested by the **Soil and Plant Analysis Lab**, 5711 Mineral Point Road, Madison, WI 53705, (608) 262-4364, (http://uwlab.soils.wisc.edu).

Now take a look at some trees you might plant. Make a chart so that you can compare their advantages and disadvantages on your particular site. Down one side, list the trees you are considering. Across the top, list the qualities and requirements you are comparing. Columns might include: soil conditions; sun exposure; moisture; hardiness in winter; height when mature; width when mature; resistance to pests, diseases, pollution, or salt; and comments (e.g., lovely spring flowers or breath-taking fall foliage).

Divide into groups and allow each group to choose one or two trees to research. Provide your students with references on selecting the right tree for the right spot. You'll find some good ones in **Finding Out More!** later in this lesson. When the chart is complete, think about your site and circle all the matches. For example, if your site is in the full sun, circle all the places in the "sun" column that say "full sun." When done, look at the chart. Which trees are best suited to be planted on your site? In other words, which trees have the most circled conditions in their row?

Invite a local arborist or landscape specialist to talk to your class about how to choose a tree. Ask him/her to share basic information about how cultivars are developed and why people often choose them. If possible, follow through on your project and plant the tree you have chosen. You might ask for donations from a local nursery or raise funds to plant the tree.

Check out the **Tree Musketeers** website (www.treemusketeers.org) for information on how to plant a tree. Don't forget to register your tree in their "One in a Million" campaign.
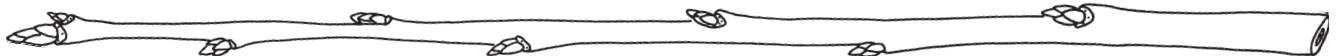
Read a Tree's Rings

Interpreting the growth rings of trees can reveal a lot about the trees' growth and development. Here are several activities that make use of tree cross-sections:

🍁 The **NatureScope: Trees Are Terrific!** activity "Reading the Rings" asks students to match tree ring patterns with the factors that caused them, then to "read" the rings of a tree to solve a mystery. Grades 6 - 7.

🍁 The **Project Learning Tree** activity "Tree Cookies" relates tree growth rings to environmental and historical changes. The assessment for this activity asks students to listen to a story about a tree's life and to draw its cross-section. Grades 3 - 8.

🍁 The **Lessons in a Land Ethic** activity "The Good Oak" uses Aldo Leopold's writings to relate tree growth, environmental conditions, and historical events. Grade 6 and up.
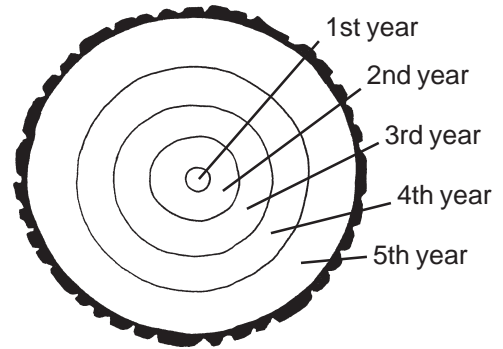
Cross-section of a five year old tree

1st year
2nd year
3rd year
4th year
5th year

Build a Tree

Not sure just how a tree really works? You and your students will understand it better after you've acted out the parts and functions of a tree. See the activity "Build a Tree" in Joseph Cornell's book **Sharing the Joy of Nature**. If you can't find Cornell's book, try finding one of these adaptations of his activity: "Build a Tree" is in **NatureScope: Trees are Terrific** and "Tree Factory" is in **Project Learning Tree**. Grades 3 - 6.

Finding Out More!

Selecting the Right Tree

A Guide to Selecting Landscape Plants for Wisconsin by E.R. Hasselkus. This booklet is available from your county's University of Wisconsin - Extension office. Ask for publication #A2865 or view it online.
www.uwex.edu/ces/pubs/trshrbcat.html

Landscaping for Wildlife by Carrol L. Henderson. This book is available from the Minnesota Department of Natural Resources, 500 Lafayette Road, Box 7, St. Paul, MN 55155, (651) 296-6157.
www.dnr.state.mn.us/information_center/books.html

Minnesota Power Electric - The Right Tree Handbook
www.mpelectric.com/treebook/
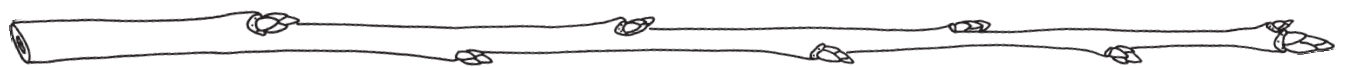
Wildlife and Your Land: A Series About Managing Your Land for Wildlife published by the Bureau of Wildlife Management. The booklet in this series titled "So, What Should I Plant?" gives good information for Wisconsin.

Wisconsin Department of Natural Resources
www.dnr.state.wi.us/org/land/forestry/nursery/order/descriptions.htm

University of Florida - The Right Tree for the Right Place
www.agen.ufl.edu/~foodsaf/dh104.html

Looking for Tree Cookies?

First ask your students if they or their parents cut firewood! Next try a local lumber mill or tree trimming service. You can also order tree cookies from several companies. The purchased cookies can save you time and frustration; they come dried and sealed with varnish, so they rarely crack.

Museum Products Co.
84 Route 27, Mystic, CT 06355
(800) 395-5400
www.museumproductsco.com

Nasco
901 Janesville Ave., P.O. Box 901, Fort Atkinson, WI 53538
(800) 558-9595
www.nascofa.com/prod/home