

Tree Transpiration

The movement of water in trees

Science Activity | Grades 3-5

Standards: 4-ESS2-1 (Earth's Systems,
Connection Mathematics MP.2)

3-LS3-1 & 3-LS3-2 (Heredity: Inheritance & Variation of Traits)

5-ESS2.C (The Role of Water in the Earth's Surface,
Connection Mathematics - MP.2)



Overview:

Water is the fluid within a tree that carries nutrients where they are needed. When the water reaches the leaves it evaporates supplying water for our atmosphere. Students will learn about this process, called **Tree Transpiration**.

Materials:

A clear plastic bag for each student, a twist tie or pipe cleaner or string for closing the bag around the branch.

Alternative: This experiment can also be done indoors if you place a cut tree branch in a water filled vase. If done indoors, be sure to place the tree branch in a sunny window or under a bright lamp to encourage water movement.

Why do trees need so much water? A large tree uses approximately 80 gallons (160 large soda bottles) of water a day! The underside of each leaf has lots of tiny holes called *stomata*. These holes let air in and out of the leaf so the plant can take in carbon dioxide and give off oxygen. Stomata also let water out to cool the tree (like sweat does for us). As water *evaporates* (changes from a liquid to a vapor) from the leaves, more water is pulled up from the roots; as the water moves up it carries nutrients with it. When water then evaporates, the nutrients are left in the leaves where they are needed. All that water going into the air serves a purpose. It is a major part of the water cycle.

- Place a baggie over the tip of a branch so that it contains at least one leaf. The best results will be seen on a hot, sunny day. Encourage students to try bagging different parts of trees and different species of tree to cover a range of situations.
- Use the twist tie or string to close the baggie around the branch to hold it closed.
- Make predictions about what will happen. Wait 15 minutes and check the bag. See anything? Try again in 1/2 an hour. Anything?
- Pour the water from the bag into a measuring cup. Record your findings. Include details like number of leaves in your bag, species (if known), and how high the bag was in the tree.



Once you have taken measurements throughout your desired time frame, compile your data as a class. Ask your students to think about the information they collected:

- Were there any differences between different parts of the tree?
- Different kinds of trees?
- Using one leaf or many leaves?
- What do you think would happen if we did this same experiment at night? On a cloudy day? On a windy day?

Tree Tidbit:

Did you know that almost twice as much water enters the atmosphere through plants as through the surface of the oceans?

Additional Activities: Tree Measurement

How far does water have to travel from the roots to the top of the tree? Let's measure the height of a tree! Choose from two different ways or try both.

Additional Materials: yard sticks or tape measures, paper and pencils.

1) In pairs or small groups have students bend over and look through their legs moving away from the tree until they can see the top of the tree through their legs (which will be a 45 degree angle); use a yard stick or measuring tape to measure from that spot to the base of the tree. This will give you the trees height.

2) Make a fist with the thumb pointing up. Begin to move away from the tree. When the tree base is at the bottom of your fist and the tree top is equal with the tip of your thumb then turn your hand to the left and have a friend stand parallel to the tree so that you can see her at the tip of your thumb. Measure from tree base to your friend which will give you the height of the tree. (If this doesn't make sense look at: How to measure a tree by BenedictRUK on YouTube. Sept. 10, 2007 2 minutes.)

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