Seed Ya Later!

Predicting the Movement of Trees in a Changing Climate

Meet the Scientists!

Dr. Neilson
bioclimatologist
(**bī** ō **klī** mə **tə** ō jist):

I became a bioclimatologist because I like to be in the woods. Bioclimatologists study the relationship of living things to their climate. Climate is the average weather of an area over a long period of time. This can be months, years, or hundreds of years. As a young scientist, I began to compare different plants with their climate. I asked this question: How do different kinds of plants grow, reproduce, and die, while living where they do? After about 15 years, I began to build models to better understand where plants live. Models are representations of something. In this case, my models were built on a computer. My models, unlike model cars or airplanes, were built from numbers. I compared different kinds of plants with the climate of their area. You will learn about these kinds of models in this article.

By building computer models, I can better understand and predict what might happen to plants as their climate changes. It is great to be able to spend my time learning about the woods!

Dr. Fragoso, ecologist (ē **kə** lō jist):

As an ecologist, I study the relationships of living things with each other and with their environment. One of my favorite science experiences was flying my ultralight airplane over the Amazon rain forest. While flying, I learned to identify trees from the air. I also learned how the animals I radio-tracked moved over many miles from one patch of trees to another.
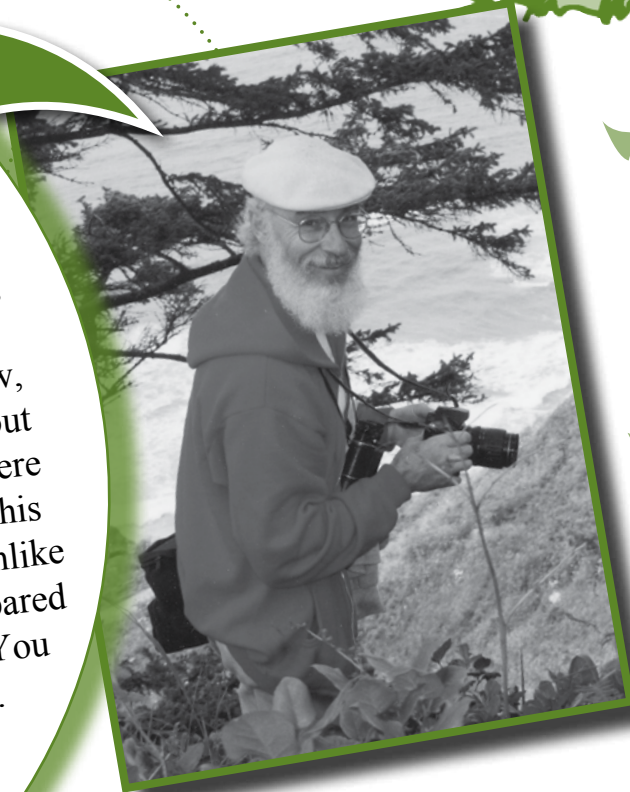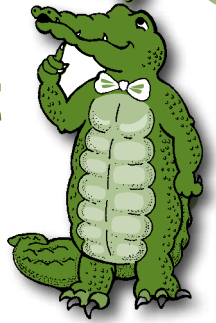
Thinking About Science

You probably hear a lot about scientific models. Scientists use models to examine how systems look and behave. In your school, you may have a model of the solar system. This model shows how the planets revolve around the sun. This is a model of the relationship of the planets to each other and to the sun. Scientists also use mathematics to create models. These models use numbers to represent real or possible relationships.

In this research, the scientists wanted to improve their models. Their models showed where on Earth different kinds of trees might grow. As the climate changes, the places different trees can grow will change. The scientists were interested in how and where different types of trees might grow as the climate changes. They wanted the models to show how the seeds of trees move away from the parent tree. If they could include how seeds move, this would improve their models. They could do a better job of predicting where different types of trees might grow in the future.

Dr. Thompson,
plant ecologist:

I'm very interested in the wildlife of gardens. My favorite project was one that showed just how much wildlife lives in a typical private garden. For me, however, the best moment in science is when you show that what everyone believes to be true is actually wrong!

Thinking About the Environment

How do trees move? You know that trees do not have legs and feet. A single tree cannot move to a new location. Trees use a different process to move. Trees move through their seeds. By having its seeds move away, a type of tree can move to a new location.

Seeds move away from the parent tree in four ways. First, wind can blow the seeds away. Second, water can move the seeds downstream. Third, animals can carry seeds to new places. They do this when they eat seeds and later poop away from the tree. Animals can also carry seeds in their fur or they carry seeds in their mouth and drop them by mistake. Fourth, people can move seeds. Seeds, for example, can get stuck in car tires or on clothing.

Scientists have words to describe how far seeds move away from the parent tree. When a seed does not move far away from its parent tree, scientists say it has stepped from the tree. When a seed moves far away from its parent tree, scientists say it has jumped away from the tree.
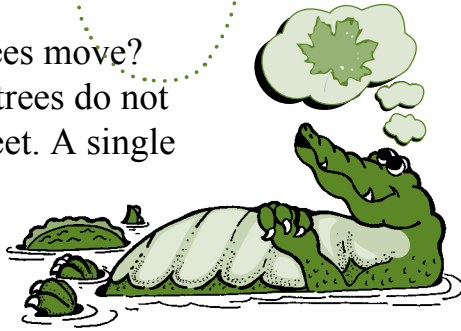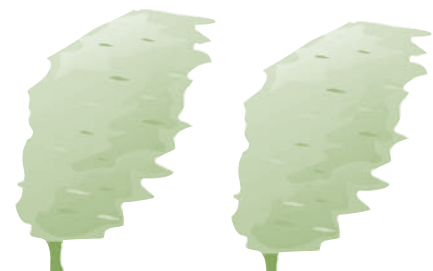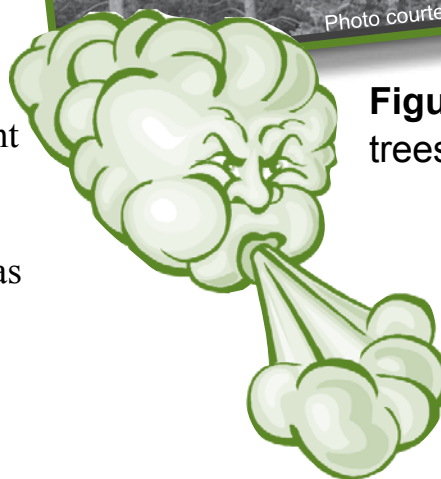
Introduction

Scientists use models to predict what might happen in the future. Some scientists would like to predict the movement of trees as they respond to a changing climate. The scientists knew in what kind of areas different kinds of trees like to grow. They knew what temperatures different types of trees must have to grow **(figures 1a, 1b, and 1c)**. The models needed improvement, however, because they did not include the different ways and rates that plants move. The scientists in this study wanted to answer this question: What is the best way to include the movement of tree seeds into their models?

Photo courtesy of Babs McDonald, USDA Forest Service

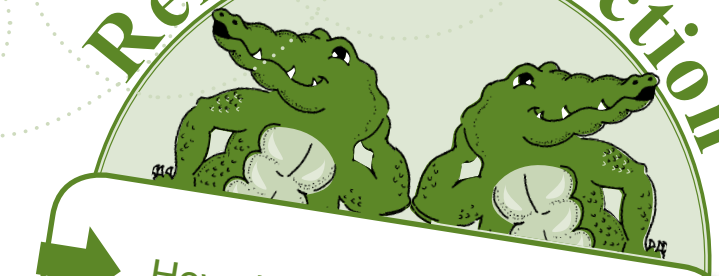**Figure 1a**. Boreal (**bör** ē əl) trees grow in cold climates.

Figure 1b. Palm trees grow where it is warm all year.

How does a tree move to a new location?

Why do you think the scientists in this study wanted to include the movement of tree seeds into their models? (Hint: Reread the first two sentences in the "Introduction.")


Figure 1c. Oak trees grow in both warm and cool climates.

Method

The scientists identified what information they needed about how trees move. They collected information about how seeds move **(figure 2)**. They learned not only how seeds move, but how far they can move **(figure 3)**. The scientists also collected information about how trees grow in new areas **(figure 4)**. They examined how this information could be included in their models.

The scientists identified whether a seed was more likely to step or jump to a new area. They also considered how long it would take the different types of trees to grow in a new area. They put all of this information into one of their computer models.

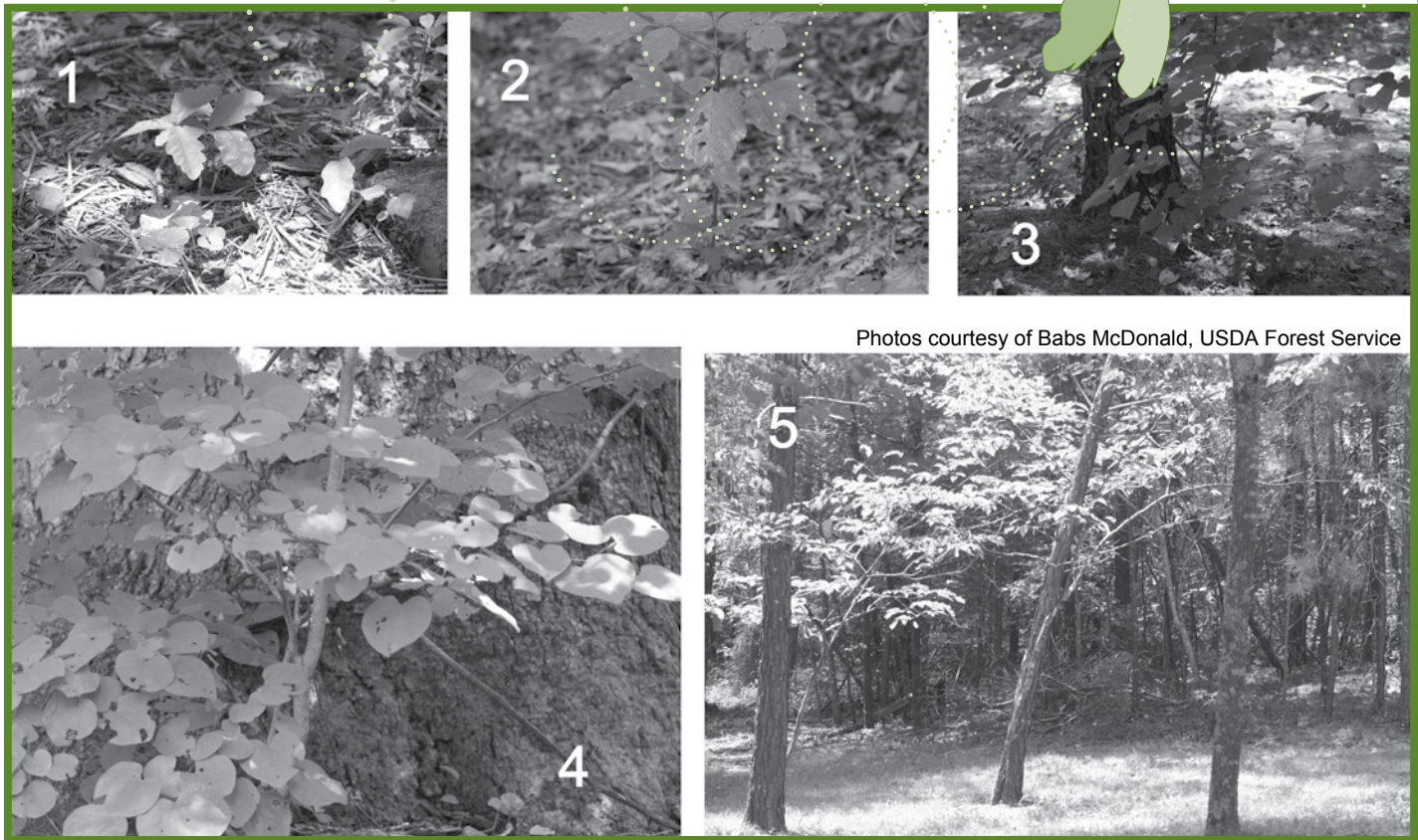**Wind**

Water

Humans

Animals
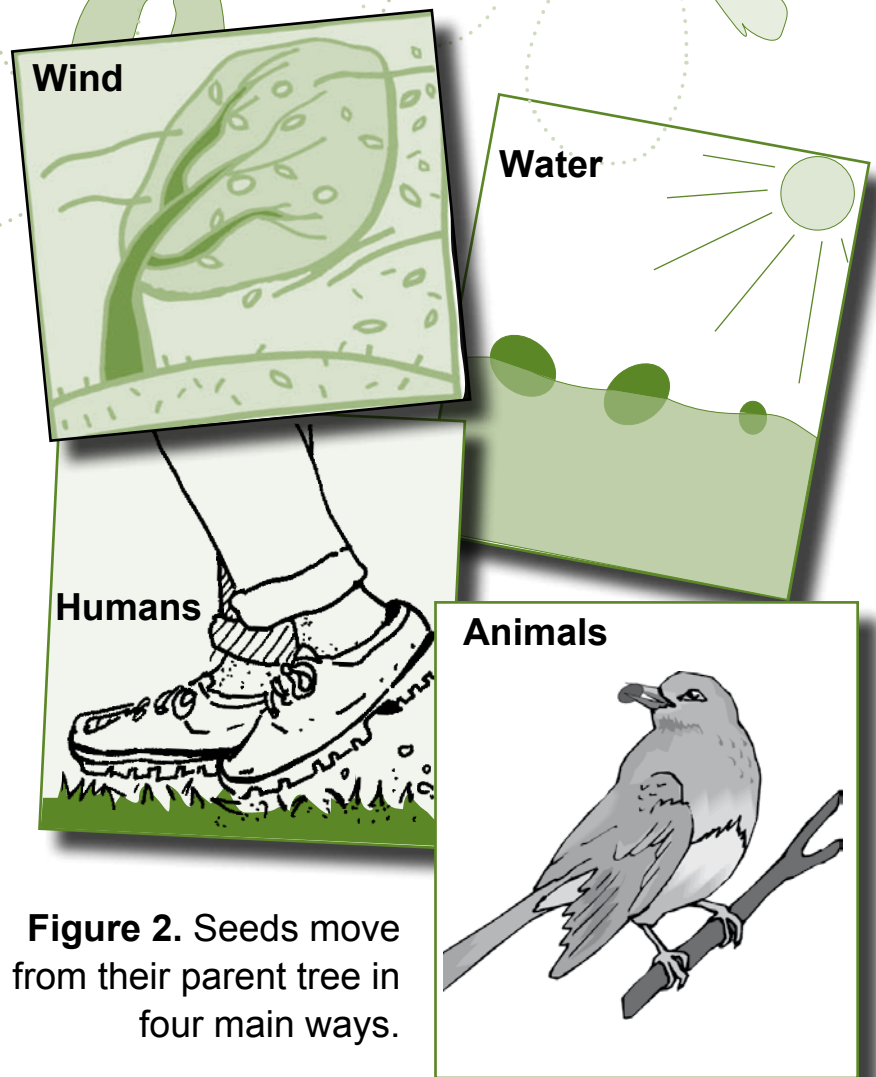
Figure 2. Seeds move from their parent tree in four main ways.

Seed drops; it has stepped from the tree.

Seed is carried away by a bird and dropped; it has jumped from the tree.

Figure 3. Seeds either "step" or "jump" away from their parent tree.

Photos courtesy of Babs McDonald, USDA Forest Service

Figure 4. Seedlings need time to become established as healthy trees. Although these photos show different species of trees, you can see how a tree grows from a seedling (no. 1) to an established tree (no. 5). A tree can take 5 or more years to become established.
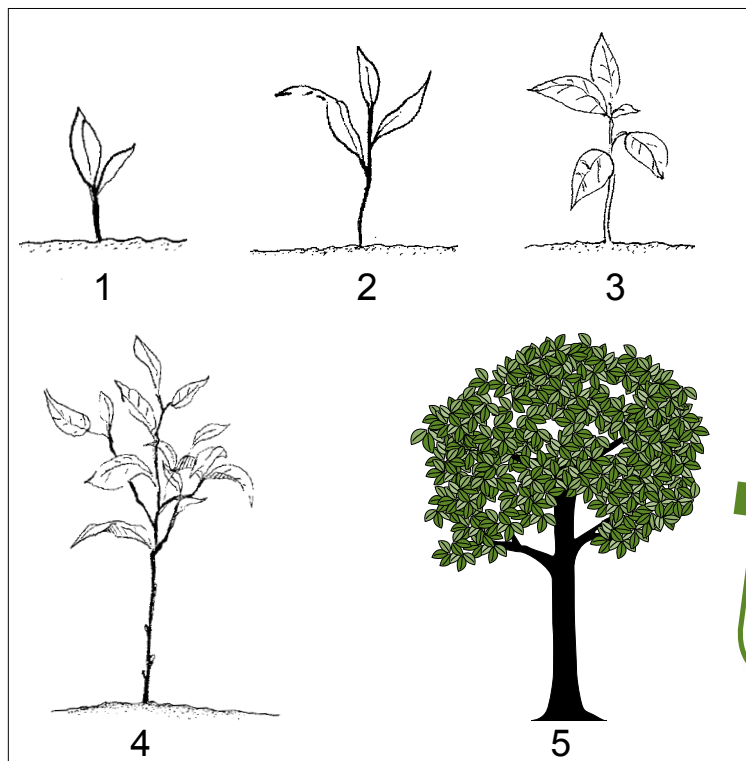
Reflection Section

Why is it important for the scientists to know how far and how fast seeds can move?

Why was it important to know which tree seeds step and which ones jump?

Findings

The scientists placed different types of trees in categories by how their seeds were most likely to move. For example, maple, ash, and elm seeds have wings and are most likely to be blown by the wind **(figure 5)**. Oak trees have acorns that would most likely be moved by squirrels and other animals **(figure 6)**. Birds may carry seeds and drop them by mistake.

The scientists found that it was easier to predict the movement of some trees over others. Wind direction and speed are easier to predict than the movement of people and animals. The scientists found that they could better predict the movement of trees that have wind-blown seeds.

The scientists believe that the climate might change too fast for some trees to successfully move to new areas. As the climate changes, other types of trees will come in and take the old trees' places. If the trees cannot successfully move to new areas, they might not survive.

Figure 5. Winged seeds are most likely to move by being blown.

Photo courtesy of Steve Baskauf, http://bioimages.vanderbilt.edu

Figure 6. Animals may carry seeds away from their parent tree. How do you think this seed travels with an animal?

Photo courtesy of Steve Baskauf, http://bioimages.vanderbilt.edu

Reflection Section

As the climate warms, do you think different types of trees will be more likely to move north or south? Why?

The scientists found that it was easier to predict the movement of trees with wind-blown seeds. Do you think it was also easier to predict the movement of trees whose seeds can float downstream? Why or Why not?

Discussion

As the climate changes, the distance and speed of tree movement will affect how well a type of tree can survive. To better understand and predict the future, scientists need to include the movement of seeds in their models. Some types of trees will be able to move as the climate changes. Others will not be able to move successfully. If some trees cannot move successfully, other types of trees will likely take their place.

Reflection Section
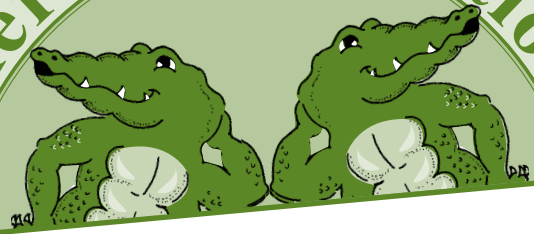
➤ If a type of tree is able to successfully move to a new location, what else might move with it?

➤ Could the types of trees growing near your home change over the next 100 years? Why or why not?

FACTivity

Time needed: Two class periods (possibly more if you want students to create a model rather than draw one).

Materials

- Six pieces of 8 ½ x 11 paper to make cards
- Pictures of fruit and seeds (p. 27)
- Blank paper for students to draw models
- Materials to create models (such as leaves, grass, twigs, art supplies, etc., optional)

The questions you will answer in this FACTivity are:

What are the different ways that seeds move?

How can models help us better understand how something happens?

The method the class will use to answer this question is:

1. First, the teacher will introduce the different ways that seeds can move. An 8 ½ x 11 card can be made with each of the following titles:
   a. **Wind**
   b. **Water**
   c. **Animals**
   d. **Explosive** (The fruit "explodes" sending the seed a small distance from the tree.)
   e. **Bounce or roll**
   f. **Humans**

Discuss each of these briefly as you hold up each card.

2. In small groups, students will look at the figures accompanying this FACTivity. Students will discuss each picture and figure out how the seeds are moving. Each small group will make a list. After 5 minutes, each group will take a type of seed and tell the class how it moves away from its parent tree. For answers to this activity, please visit our Web site at www.scienceinvestigator.org and click on educator resources.

3. Once students have completed this part of the activity, they will draw or create a model of what it might look like as the seed moves. These models can be displayed in the classroom.

If you are a Project Learning Tree-trained educator, you may use activity #43 "Have Seeds Will Travel" as an additional resource.

SEED PHOTOS

Figure 1.

Figure 3.

Figure 2.
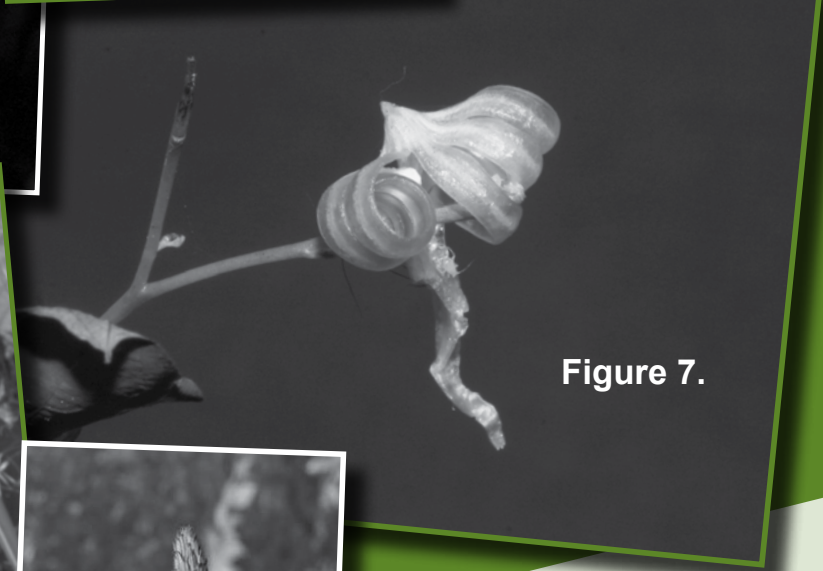

Figure 4.

Figure 5.

Figure 7.

Figure 6.

Figure 8.

Web Resources

**Environmental Education for Kids—
Seedy Characters**
http://www.dnr.state.wi.us/org/caer/ce/eek/
cool/seedy.htm

**University of Georgia Savannah River
Ecology Lab's Helicopter Seed Activity**
http://www.uga.edu/srel/kidsdoscience/
kidsdoscience-copters.htm