Back in Time:

Investigating the history of a forest

Objectives:

The learner will:

-observe tree rings in a wood cookie of a conifer and explain the meaning of the light and dark portions of a tree ring.

-determine the age of the tree by counting the tree rings.

-measure the width of the tree rings and graph the results.

-explain how the width of tree rings relates to a tree's growth.

-describe three factors that affect the growth of a tree including factors such as drought, crowding (competition), fire, disease, damage, and insect damage.

-reconstruct the history of the tree using the graph as a tool.

Materials:

7 medium-sized wood cookies plus one large wood cookie collected from fallen trees in CSNM.

Duration: about 1 hour

Oregon Standards:

4.2L.1 4.3S.1 4.3S.2 4.MP.1 4.MP.2 4.MP.3 4.MP.6
5.2L.1 5.3S.1 5.3S.2 5.MP.1 5.MP.25.MP.3 5.MP.6
6.2L.2 6.3S.1 6.3S.2 6.3S.3 6.MP.1 6.MP.2 6.MP.3 6.MP.6

Overview: Fire in southern Oregon Forests:

Fire has been an integral part of southern Oregon and northern California forests for thousands of years. Native Americans used fire to clear undergrowth and promote game and edible plants. Before that lightning coupled with our typically hot dry summers, meant fire was a regular player shaping our forests.

Recent studies have revealed that low intensity fires once occurred at a given spot every 8-24 years. These fires burnt duff and litter as well as shrubs and young saplings. Fires were cool enough that they left the mature trees largely unaffected. The nutrients released by these low intensity fire actually spurred growth in mature trees.

Stand replacing fires, often characterized as "catastrophic" and "devastating" by newspaper accounts, are actually normal events in our forests. Fuel loads would build up in areas that by chance were missed by low intensity fires. When fires did eventually occur, even the mature trees would burn. Biological succession would be set back to an earlier stage and the land would gradually recover through an orderly sequence of vegetation types until the forest was re-established. Stand replacing fires typically occurred every 200-250 years in our area. Many of our plants and animals are adapted to these earlier stages in succession and require stand replacing fires to provide space in which to flourish for a time.

Background Information:

Tree rings tell a story about the history of a tree including the good times and the bad. Each growth ring records the growing conditions and health of the tree for one year in the life of the tree. Rings can tell of droughts and forest fires as well as those perfect growing seasons with moderate temperatures and abundant precipitation.

A small fire burning only the fallen needles and twigs may release nutrients to the soil causing a burst of growth (wider rings). An intense

fire may harm the tree and slow the growth (narrow rings) or even leave a scar. An insect infestation or drought may be recorded in narrow growth rings.

You can also tell what was happening with the neighboring trees. Growth rings of different size can indicate a growing forest where the trees are getting larger and becoming more crowded (gradually narrowing rings) or a storm that opened up the forest letting more light in (a sudden increase in the width of rings).

First, consider a tree ring. Each ring is composed of a lighter portion and a darker portion. The lighter portion represents the rapid growth of spring. The vessels that make up the light-colored wood have a large diameter allowing the tree to conduct water from the soil to the needles. As growth slows with the heat of summer, the diameter of the vessels gets smaller. The dark, thick-walled vessels of summer are more for support than conducting water. In fall and winter no growth takes places and there is a pause until the following spring.

The wood cookies in this kit were recovered from trees on the Cascade-Siskiyou National Monument that had fallen across roads during the winter of 2010-2011.

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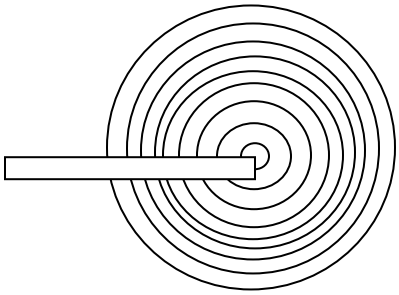
Procedure

In this activity you will be examining a "wood cookie." A wood cookie is a slice from the trunk of a tree. Notice the difference between the texture and color of the bark and wood. Take a closer look at the wood and examine the tree rings. Each ring represents one year in the life of the tree. Some rings will be wider than others. Wide rings tell us that the tree grew a lot that year. A narrow ring may tell of a drought or other poor growing conditions.

The oldest rings are located at the center of the tree. They become younger as you move out towards the bark. A new ring is added each year just under the bark by a thin layer of cells called **cambium**.

1. Note the difference between the wood and the bark. New growth rings are added each year by a thin layer of cells where the wood meets the bark called **cambium**. The youngest tree ring is next to the bark and the oldest growth ring is at the center of the wood cookie.
2. Using a magnifier carefully inspect a couple of growth rings. Note that each ring is made of a light and a dark layer. The light-colored layer is the rapid growth of spring. The dark-colored layer is the slower growth of summer. Together the light- and dark-colored layers make up one year of growth.
3. Count the number of rings and record the number on the Data page. This was the age of the tree when it died.
4. Place a straight edge such as a ruler or stick on your wood cookie with one end at the center of the tree.



5. Count out five (5) rings from the center and measure the distance along the straight edge. Don't lose your place. Record your data on the table.
6. Measure the distance between the next five (5) rings. Record the data on the table. Continue for every five (5) rings until you can go no further. If you end up with a couple of left over rings, don't worry. Ignore them for now.
7. Create a bar or line graph of your data.

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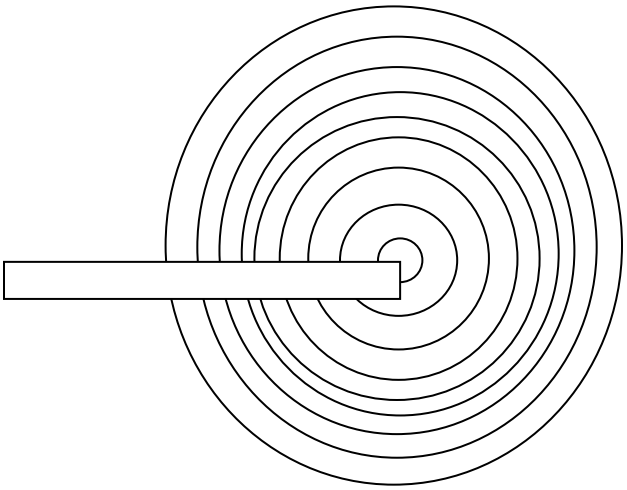
Results

Rings	Distance across 5 rings (cm)
Center to 5th ring	
Rings 6-10	
Rings 11-15	
Rings 15-20	
Rings 21-25	
Rings 26-30	
Rings 31-35	
Rings 36-40	
Rings 41-45	
Rings 46-50	
Rings 51-55	
Rings 56-60	
Rings 61-65	
Rings 66-70	
Rings 71-75	



Approximate age of your tree when it died (total number of rings)

years old

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Questions

1. Examine your wood cookie. Do you see any fire scars or decay? Describe.
2. How old was your tree when it died? (How many rings do you count?)
3. Look at your graph. Did the tree grow at the same rate for its entire life? If not, in which five (5) year period did it grow the fastest? How old was the tree at this time? Remember, you count the rings from the center out to find a tree's age.
4. Why do you think it grew fastest at this time?
5. In which five (5) year period did it grow the slowest? How old was the tree at this time?
6. Why do you think it grew slowest at this time?
7. If your tree was still alive and a neighboring tree fell letting more light reach your tree, what would your tree rings look like for the next five (5) years (narrow or wide rings)? Why?
8. If your tree was still alive and budworms became common and ate many of the needles on your tree, what would your tree rings look like for the next five (5) years (narrow or wide rings)? Why?

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Extension

1. Imagine you were this tree with its different growth rates and maybe scars. Beginning with the seed that drifted down from a cone growing on a tree some distance away, create a story of its life as it is reflected in the wood cookie. (None of the trees from which these wood cookies were made were cut down. They fell in a winter storm.)

Presentation as a science inquiry activity

The activity involving wood cookies can be presented in a different format as a science inquiry activity.

Once students understand the meaning of tree rings and where new growth rings are formed, the students can be asked to pose some question about the growth of a tree. For example, a student might ask “When in the life of a tree does it grow the fastest?” or “Do trees grow at the same rate each year?” or “Can fire or drought be identified by examining tree rings?”

At this point students will need to form a hypothesis (an untested explanation that attempts to answer their question). Upon examining a wood cookie, they will then design a procedure for collecting data from a wood cookie that will assist them in answering their question. Measuring the width of tree rings in some meaningful way should allow them to construct a graph from which they can evaluate their hypothesis.