Tree Ring Exploration Teacher Guide

Driving Question: What paleoclimate evidence do tree rings provide?

In this activity your students will:

1. Understand that trees add rings annually with lighter and darker layers that represent summer and winter growth.
2. Understand that the width and shape of the tree ring is dependent on environmental conditions.
3. A record of tree ring measurements is a paleoclimate proxy.

Background Information

Tree ring dating, or dendrochronology, is a very accurate indicator of long-term climate change. It is a very accurate indicator of climate change on the decadal (tens of years) to millennial (thousands of years) time scales. Trees grow well when local weather and climate conditions are favorable, and grow poorly when they are not. Most trees add one annual growth ring each year. New rings are the result of new growth in the cambium layer just below the bark. The rings in the middle of the tree are oldest and the outer rings nearest the bark are the youngest.

A tree ring is composed of two layers:
• A **light colored layer** that grows in the spring and early summer.
• A **dark colored layer** that forms in late summer and the fall.

The cambium produces large cells in the spring when water is abundant and growing conditions are generally good. This is the **light part** of the tree ring. As the climate becomes **drier** later in the summer and the growing season ends in the fall, the cambium produces smaller cells that have thicker walls. This is the **dark part** of the tree ring. In the northern hemisphere, in late autumn, tree growth stops.

The width of the ring is dependent on the precipitation available to the tree. Trees produce **wide rings** during **wet and cool** years. Tree rings are **narrow** during **hot and dry** (drought) years.

By combining living and dead tree records, scientists can extend tree-ring paleoclimatology records back hundreds to thousands of years. Scientists cross-reference climate data by matching patterns from several trees. Tree rings can provide evidence of natural events including volcanic eruptions, earthquakes, fire, lightning strikes, and insect, fungal or bacterial infestations. Growth patterns can also be altered by human actions such as pruning, root disruptions caused by tilling or construction, and even periods of air pollution and acid rain.

Equipment List

Each student should receive a copy of the Tree Ring Student Handout.

Activity Description

1. Ask students what they can learn from a tree and discuss student responses.
2. Distribute the **Tree Ring Exploration Handout**.
3. Instruct students to review the background text on the first page of their handout.
4. Instruct students to turn to the second page of their handout.
5. Tell students they will examine a tree ring record to explore a tree's history.
6. Display the tree ring record image on the handout to the front of the class. Show students how to interpret the tree ring record image. Each dark and white layer represents one complete year of growth. The distance between two dark lines represents one annual layer (or one year) of growth.
7. Tell students that the outer ring of this tree grew in 2011.
8. Instruct students to answer questions #1-5 on their Exploration Handout.