Name:

Tree Rings: Recorders of Climate Change

Student Activity Sheet

Part I

Given what you learned by observing the tree rings, explain the following statement:

Trees are recorders of time and climate.

Part II

Counting tree rings:

- Do not count the pith when counting tree rings.
- Each annual ring has two parts:
    1. Early wood - a wide, white area which grows in the spring and summer.
    2. Late wood - a thin, black line, which grows in the late summer and fall.
- The last ring in each core is followed by bark. Don't count the bark when counting tree rings.

This example shows what a simulated tree ring core, including the pith and the bark, for a tree that lived for five years would look like.

The tree core samples were collected from the following sources in a fictional place in the US Midwest called Pinetown:

- Core 1: From a living tree in the Pinetown Forest in the fall of 2018.
- Core 2: From a tree at the Pinetown Christmas Tree Farm a few years ago.
- Core 3: From a log found near the main trail in Pinetown Forest.
- Core 4: From a barn beam removed from Pinetown Hollow.

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Use the four simulated tree core samples (Cores 1-4) and the clues below to figure out how old each tree was, when each core sample was collected, and the year that growth began. Fill out the table with your findings.

Core Sample	Age of Tree	Year Cut or Cored	Year Growth Began
1			
2			
3			
4			

1. Count the number of tree rings in each core sample. That number is the age of the tree in years. Record the age of each tree in the table.
2. Core sample 1 was taken from a tree in the Pinetown Forest in the fall of 2018. Record the year in the Year Cut or Cored column of the table.
3. Count backward along the rings in core sample 1 to determine the year the tree started growing. Write the year in the Year Growth Began column of the table.
4. Place core sample 1 and core sample 2 next to each other. Align the samples by sliding them back and forth until their tree ring patterns line up. Use a piece of tape to hold the core samples in place once you have them matched up. Hint: Though these two trees lived at slightly different times, most of their lives overlapped.
5. Use the known dates for core sample 1 to determine the dates for sample 2. Determine start and end dates for sample 2 by comparing with sample 1, then record these values in the table.
6. Use the same technique to align core sample 3 with sample 2. Determine the year that sample 3 began growing and the year it was cut or cored, and record those values in the table.
7. Repeat this process with core sample 4.

Analyzing the climate.

The thickness of the tree rings gives us clues about the climate during the lifetime of the tree. In this location, years when there was poor tree growth were most likely due to drought (dry conditions).

1. During which years did Pinetown most likely experience drought? Record the years below.

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Part III

Use the tree ring cores from AD 1402-1960 to figure out if the climate has changed from 1402 to present day (which is over 600 years).

Make a hypothesis.

A hypothesis is a statement about how you think something works or how you think something happened. Make a hypothesis about whether the climate has changed since AD 1402. Write your hypothesis in the space below.

Collect and analyze tree ring data.

1. Measure the total length of the tree ring core sample. Make your measurements in millimeters. Write each measurement into the Total Thickness column of the table.
2. Fill in the number of years of each time interval in the Number of Years column.
3. Divide each total thickness measurement by the number of years to get the average ring thickness for each time interval. Use at least one decimal place (example: 2.3). Record in the Average Ring Thickness column.

Time Intervals	Number of Years	Total Thickness (mm)	Average Ring Thickness
Example	50	200	200/50= 4
1402-1449			
1450 -1499			
1500-1549			
1550-1599			
1600-1649			
1700-1749			
1750-1799			
1800-1849			
1850-1899			
1900-1960			

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What Does It All Mean?

1. Based on the ring thickness data, do you accept your hypothesis, or reject it? Why?

2. Based on the ring thickness data, would you speculate that some time intervals were warmer or cooler than others? If so, which was the warmest interval? Which was the coolest interval?

3. How certain are you of your interpretations? What additional type of evidence would help you feel more certain about your interpretations? From which time interval would you wish to see more evidence?

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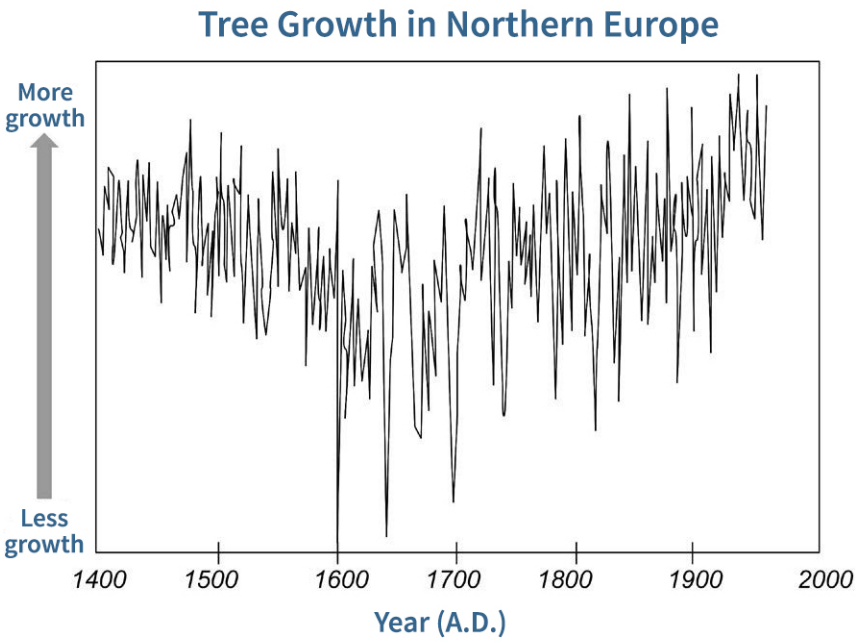
Trees As Recorders of Climate Change

From the years of 1350–1850 was a period known as the Little Ice Age. During this time climate conditions were particularly harsh in the Northern Hemisphere. A combination of decreased solar activity and numerous large volcanic eruptions cooled the Earth, causing glaciers to advance and trees to grow more slowly. In addition, livestock died, harvests failed, and humans suffered from an increase in famine and disease.

The graph below shows tree growth in Northern Europe during the Little Ice Age.



4. Compare the graph above to the tree ring data. What patterns do you notice? How do the two pieces of data complement each other to help us understand the climate from this time period?

5. Our climate has been warming over the past few decades. How does the warming climate affect the length of the growing season in high northern latitude areas where the tree rings from Part III were collected? What kinds of patterns in tree ring data would you expect to see in places like this as a result of our current climate conditions?

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