



13-1. My Tree Autobiography: Seeing History through Trees' Growth Rings

Lesson Overview: In this activity, students examine a fire-scarred tree cross section (sometimes called a “tree cookie”) and a display that shows tree growth rings. Then they record their own personal histories using growth rings as a metaphor.

Lesson Goal: Students will understand how growth rings form and how they record a tree’s history.

Objective:

- Students understand how tree growth rings are formed well enough to sketch their own histories using personal “growth rings” – one ring for each year of their lives.

Subjects: Science, Mathematics (counting), Writing



Duration: One half-hour session

Group size: Whole class

Setting: Classroom

Vocabulary: *autobiography, earlywood, estimate, growth ring, latewood*

Standards:		1st	2nd	3rd	4th	5th
CCSS	Writing	2, 7, 8	2, 7, 8	2, 7, 10	2, 7, 9, 10	2, 7, 9, 10
	Speaking/Listening	1, 2, 4, 6	1, 2, 4, 6	1, 2, 4, 6	1, 2, 4, 6	1, 2, 4, 6
	Language	1, 2, 4, 6	1, 2, 4, 6	1, 2, 3, 4, 6	1, 2, 3, 4, 6	1, 2, 3, 4, 6
NGSS	From Molecules to Organisms: Structure and Processes	LS1.A, LS1.B		LS1.B		
	Engineering Design		ETS1.B		ESS1.C	ETS1.B
	Earth’s Systems			ESS2.D		
	Earth’s Place in the Universe		ESS1.C		ESS3.B	
EEEGL	Strand 1	A,B,C,E,F,G				A,B,C,E,F,G

Teacher Background: In temperate ecosystems, tree growth rates vary throughout the year: In winter, trees are dormant and don’t produce any new xylem cells. In spring and early summer, when trees have plenty of moisture, they usually grow rapidly and produce very large xylem cells with thin walls. These large cells form a light-colored band in the wood, which is called earlywood. Trees usually grow more slowly in late summer and fall, when they have less moisture, so they produce much smaller xylem cells. These cells form a dark-colored band

called latewood. With a microscope, you can see the relative sizes of the earlywood and latewood cells. Without a microscope, you can still see the bands of wood. The combination of a light-colored band and a dark-colored band is a growth ring, and it represents one year's growth – usually. We will make that assumption in this activity.

However, you should know that trees are not entirely reliable at recording their history in one growth ring per year. Stress can affect their growth and hence the development of rings. In a stressful year, a tree might not produce a growth ring at all, or the ring might not go all the way around the tree's circumference. If summer growth slows down due to stress and then accelerates again, the tree might produce a "false ring." We will not address any of those possibilities in this activity, but it may be helpful for you to know about them.

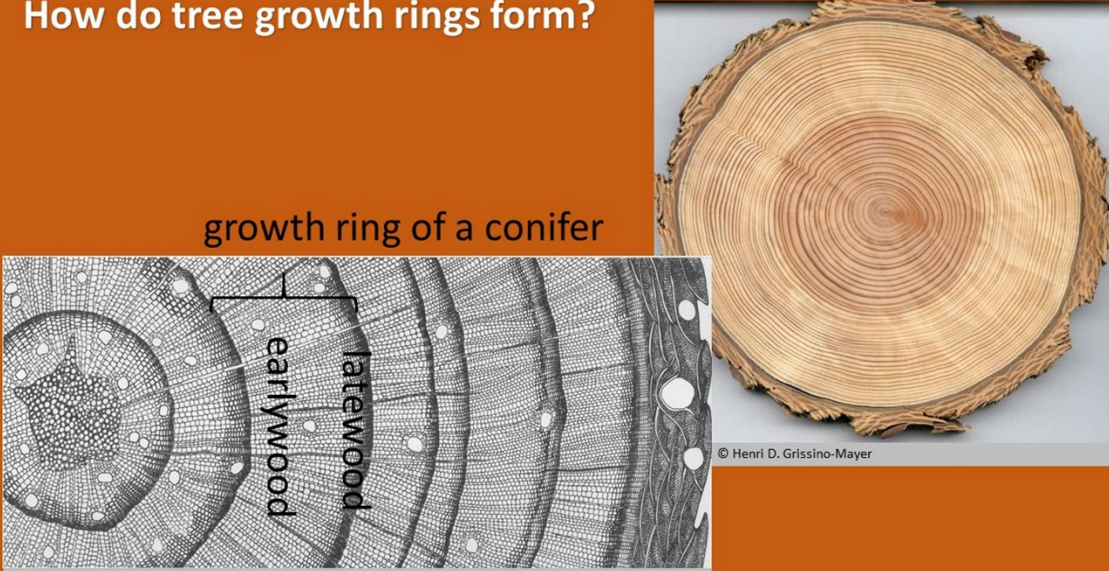
Even if a tree has produced false rings or has had some years without growth rings, scientists can determine exactly what year a growth ring was formed using dendrochronology. Lots of information about dendrochronology is available at <http://ltrr.arizona.edu/about/treerings>. If you would like to delve into this field and teach dendrochronology in your classroom, look for materials at <http://ltrr.arizona.edu/educators>.

Materials and preparation:

- Decide how much detail to ask for in the students' autobiographies (see **Assessment** below.) If you want much detail, you could introduce the project a day or two ahead and have students talk to their families about when various things happened in their lives.
- Download and project **GrowthRingsForm.pptx**.

How do tree growth rings form?

growth ring of a conifer



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From Stokes, Marvin A.; Smiley, Terah A. 1996. An introduction to tree-ring dating. Tucson: University of Arizona Press. 73 p. Courtesy of Laboratory of Tree-Ring Research.

- If you have a FireWorks trunk, get out all tree cross-sections so students can examine them in detail. If you don't have a trunk, you might be able to obtain a few cross-sections locally.

Procedure:

1. Explain: In this activity, we're going to learn how trees grow and compare that to the ways in which we humans grow.
2. Ask: How is your body different now from when you were a baby? When the students describe obvious changes (**taller, heavier, more hair, teeth...**), try to get them to describe how those things happened. For example, how did your legs get longer? **My bones grew longer & I put more muscle on them....** How did your head get bigger? **My skull grew and I kept filling it with new brain cells.**
3. Ask: Trees get taller and heavier too as they grow up. They also get wider and grow more branches. Do they do it just like we humans do, by growing longer bones and adding muscle cells, brain cells, etc? **No, trees grow mainly by producing new rings of wood every year and adding length to their top, branches and roots.** Refer to **GrowthRingsForm.pptx** and any real tree cookies that you can pass around. Explain: Scientists Chris Baisan and Rex Adams obtained the "tree cookie" that's shown in this photo from a Douglas-fir tree in New Mexico. They used it to learn about how old the tree was and how it grew. How do you think they did that? **They counted its growth rings to estimate the tree's age.**
4. Can you see growth rings in the tree cookie? Explain, referring to the microscope photograph shown in the **GrowthRingsForm.pptx** display. **In spring and early summer, when trees have plenty of moisture, they usually grow rapidly and produce very large xylem cells. These large cells form a light-colored band in the wood, which is called earlywood. In late summer and fall, trees usually grow more slowly because they have less moisture, so they produce much smaller xylem cells. These small cells form a dark-colored band called latewood. The combination of a light band and a dark band is a growth ring, and it represents one year's growth.**
5. Ask: In the cookie shown in **GrowthRingsForm.pptx**, what is the brown ring on the outside? **The brown ring is bark, which protects the tree but doesn't get counted as a growth ring because it stays outside the tree's growing wood as it produces new rings from year to year. Bark is a little bit like our skin, which stays on our outside as bones and organs on the inside get bigger. Like our skin, a tree's bark fits perfectly around its insides.**
6. Review with students: We can count growth rings to estimate the age of a tree and learn other things about its history, like when the tree had an especially good or difficult year. Ask: How do you think the ring from a very dry, stressful year might look? **Probably narrow.** What would the ring from a perfect year look like – plenty of water, plenty of sunshine, plenty of space and nutrients? **Probably wide.**

7. **OPTIONAL:** Explain that COUNTING growth rings can only give us an estimate of a tree's age, because sometimes trees grow in unusual ways. Once in a while, they grow two rings in one year, or a partial ring, or no ring at all! For now, we will assume that every ring represents one year of growth.
8. We're going to use some imagination now. We'll pretend that we have growth rings, just as trees do, and we'll use these growth rings to show our autobiography. Explain: You must know the year of your birth to do the activity. (Help them figure that out if they don't know.)
9. Give each student a sheet of drawing paper. Have them write their names and "My Tree Autobiography" at the top. Have them fold their paper in half the "short way," then unfold it. Explain: The left side is for drawing their growth rings, and the right side is for writing an autobiography. (See the example below. Note that it was prepared with PowerPoint though. Don't expect your students to all draw tidy circles!)

Assessment: Have students begin together as you demonstrate the first few steps. Then have them complete the activity individually:

- In the center of the left half of the page, draw a small star, since you ARE the star of this story. Draw a small circle around it. Write your birth year inside the circle.
- On the right half of the page, near the top, write your birth year and add, "I was born!"
- Draw another circle around the first one. Write the next year in the circle. On the right half of the page, write that year under the first. Add "I had my first birthday."
- Draw and label another circle and write the date on the right.
- Continue to draw circles and list dates until you get to the current year. If you remember an especially good year for you, make the ring wide. If you remember that as a hard year, make it narrow. On the right half of the paper, when you get to the current year, write "This year I am in third (or fourth or whatever) grade." Then draw a ragged circle around all of the circles to represent the tree's bark.
- Take your diagram home OR work with the teacher to find out something important about at least 5 of the years during your lifetime. Write each of these facts on the right half of the page next to the year when it happened. Use a complete sentence for each fact. You might include the birth of a brother or sister, the year you started school, or when you went on a special vacation or moved to a new home. You could include the arrival or loss of a pet, or an illness or death or other difficult time.

TEACHERS, it might be fun to post the students' autobiographies, but be cautious about this. Some may not want to share their histories, or they may record sensitive, personal events that should not be shared.

Evaluation:	Full credit	Partial credit	No credit
Drawing	Student drew a reasonable likeness of a tree cookie, with 1 growth ring for every year of his/her life.	Student drew a reasonable likeness of a tree cookie, with several growth rings.	Student's diagram did not resemble a tree cookie.
Writing	Student listed all the years of his/her life and used a complete sentence to identify something special about at least 5 years.	Student listed most of the years of his/her life and identified something special about 3-5 years.	Student listed only a few years of his/her life and identified something special about fewer than 3 years.

Example Tree Autobiography

- 2007 - I was born.
- 2008 – In this year, I had my first birthday.
- 2009 – My sister was born.
- 2010 – We went to the ocean. I found seashells.
- 2011 –
- 2012 – My dog Sadie was born.
- 2013 – I started Kindergarten.
- 2014 – My cousin stayed at our house.
- 2015 –
- 2016 – This year I am in 3rd grade.

Fold paper in middle.

