

Determining the Age and Benefits of a Tree

Grades: 6-8

Illinois State Science Standards:

- **11.A.3a** Formulate hypotheses that can be tested by collecting data.
- **11.A.3c** Collect and record data accurately using consistent measuring and recording techniques and media.
- **13.B.3e** Identify advantages and disadvantages of natural resource conservation and management programs.

Overview:

- It is possible to determine an estimated age of a tree without looking at tree rings. During this activity, students will determine the approximate age of a tree. They will then investigate the benefits of the tree based on the tree species and size.

Time:

- One 45-minute class period

Supplies:

- Tree to measure
- Measuring Tape
- Estimated Age of Urban Trees chart
- Access to the internet

Instructions:

1. Select your tree.
 - The proper way to measure a tree trunk is at 4 ½ feet from the base of the tree. This is known as diameter at breast height or DBH. However, if your tree trunk is split or a branch is coming out of the trunk at 4 ½ feet from the base of the tree, measuring is more complicated. When you select your tree, try to find one that has a trunk that without these complications.
 - Noticing details about a tree can help students connect to nature and notice things they otherwise would not observe. When you select your tree, try to choose one that the students see regularly.

Adopt your tree for a full school year, a season or a month. Visit the tree regularly and have students write scientific observations in a journal. This is a great way to incorporate non-fiction writing into your science class!

- Have the students hypothesize about the age of the tree based on its size. This hypothesis can be determined by the whole class or by individual students. Write down your predictions so you can compare these to the estimated age you determine for your tree after you complete your measuring.

2. Identify your tree.

- Different tree species grow at different rates. An American elm with a diameter of 15 inches is about 38 years old but a Red oak with the same diameter would be 75 years old – knowing the species is very important to this activity.
- Ask the students why they think trees grow at different rates. There can be many answers... but some trees, like the Downy hawthorn (*Crataegus mollis*) have a mature height of 20 – 30 feet; the biggest tree on record for this species is 35 feet tall. While other trees, such as the Giant Sequoia (*Sequoiadendron giganteum*) have been measured as tall as 311 feet. Our state tree, the White Oak (*Quercus alba*) has been measured at 86 feet tall!



3. Measure 4 ½ feet from the base of the tree.

- Have one student hold the measuring tape at the base of the tree.
- Have a second student hold the measuring tape vertically in a straight line up the tree.
- Have a third student put their finger – and hold it very still – marking 4 ½ feet up from the base of the tree.

4. Measure the circumference of the tree.

- Have the third student continue to keep his/her finger on the tree.
- Have a fourth student wrap the measuring tape around the tree.
- Several other students can assist in making sure that the measuring tape is flat and straight.
- The fourth student (wrapping the measuring tape around the tree) should determine the circumference of the tree in inches. You will need to round to the closest ¼ inch.

5. Determine the diameter based on your circumference measurement.

- Diameter can be determined by using the equation:

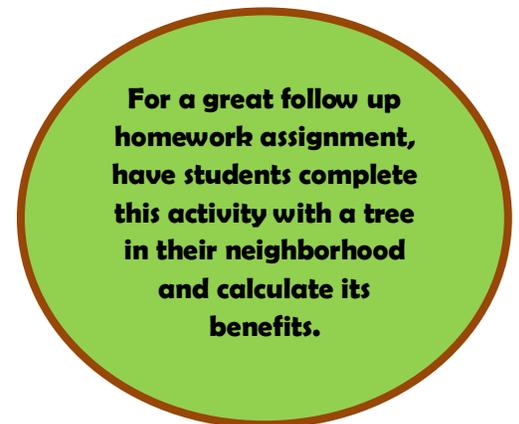
$$\text{Diameter (d)} = \text{circumference (c)} / \text{pi where pi} \approx 3.14$$

$$\text{or } d = c/3.14$$

- For example, if your circumference is 31.5 inches, your equation would be:

$$d = 31.5''/3.14 \quad \text{which means} \quad d = 10.03''$$

- Round your number to the closest inch. With the above example, your DBH is rounded to 10 inches.



6. Determine the age of your tree.
 - Determine the age of your tree by using the Estimated Age of Urban Trees by Species and Diameter at Breast Height chart. (For example, if you have a white pine with a 10” diameter, your tree is estimated at 26 years old.)
7. Calculate the benefit of your tree.
 - Go to the following website: <http://www.treebenefits.com/calculator/>
 - Enter your zip code and click the “submit” button.
 - Double check that the zip code and city are correct. Enter your tree information in the boxes on the left side of the screen.
 - Read and discuss the information provided for your tree. Clicking the tabs at the top of the page will describe the benefits of your tree in more detail.

White Oak Images from The Morton Arboretum



White Oak - Tree



White Oak - Leaf



White Oak - Fruit



White Oak - Bark

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Estimated¹ Age of Urban Trees by Species and Diameter (DBH)

Species	Tree diameter (DBH) in inches									
	5"	10"	15"	20"	25"	30"	35"	40"	45"	50"
	Estimated tree age in years									
American elm (4)		27	38	48	58	67	77	86	95	104
Siberian elm (4)		24	32	39	46	53	59	65		
Hackberry (7)		14	29	50	77	109				
Honeylocust (4)		29	41	52	63	73	84	94		
Pear (3)	6	15	24	34						
Green ash (4)		27	45	63	83	104	126	148	171	194
White ash (3)	6	14	21	28	35					
Silver maple (7)		9	18	31	46	65	86	110	136	
Boxelder maple (4)		23	36	50	64	78				
Sugar maple (4)		33	51	70	88	107				
Red maple (6)	13	23	34							
Black maple (7)		20	39	64	94	127				
Norway maple (4)		28	40	52	63					
London plane (3)	7	16	25	33						
White oak (3)	11	24	36							
Swamp white oak (3)	9	20	31							
Red oak (4)		55	75	94	112	130	146	162		
Bur oak (4)				134	140	144	148	152		
Pin oak (4)		28	38	46						
Lindens (6)	12	21	31	41	53					
Basswood (7)		16	31	51	76	104				
Ginkgo (3)	12	24	35							
Black walnut (6)	14	26	41							
Kentucky coffeetree (3)	9	23	36							
Catalpa (3)	6	13	21	28	36					
Baldcypress (3)	7	18	29							
Poplar (10)	15	28	41	52	61	69	77	84		
White pine (6)	15	26	38							
Scotch pine (4)		52	68	82	95	107	119			
White spruce (6)	21	39	61							
Blue spruce (6)	17	30	45							

¹ Estimates are approximate given the significant variation in the growth rates of individual urban trees.

(#) = source of information for the species. See accompanying page of citations.

Citations for the Table “Estimate age of urban trees by species and diameter (DBH).”

1. de Vries, Roelof E. 1987. A preliminary investigation of the growth and longevity of trees in Central Park. Unpublished MS Thesis, Rutgers University, New Brunswick, NJ.
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3. Dwyer, John F. 2010. Unpublished data on the growth of planted street trees in selected suburbs of Chicago. The Morton Arboretum, Lisle IL.
4. Dwyer, John F. 2009. How old is that tree? *Illinois Trees*: The quarterly publication of the Illinois Arborist Association. Vol. 24, Issue 6, Fall 2009 p. 13.
5. Fleming, Lynn E. 1988. Growth estimates of street trees in central New Jersey. Unpublished MS Thesis, Rutgers University, New Brunswick, NJ.
6. Frelich, Lee E. 1992. Predicting dimensional relationships for Twin Cities shade trees. Unpublished paper. Department of Forest Resources, University of Minnesota –Twin Cities, St. Paul MN.
7. Iakovoglou, Valasia. 2001. Trees examined along a rural-urban gradient and by local land use in the Midwestern US: An investigation of factors related to tree growth. Unpublished MS Thesis. Iowa State University, Ames Iowa.
8. Iakovoglou, Valasia; Thompson, Janette; Burras, Lee and Rebecca Kipper. 2003. Factors related to tree growth across urban-rural gradients in the Midwest, USA. *Urban Ecosystems* 5: 71-85.
9. Iakovoglou, Valasia; Thompson, Janette and Lee Burras. 2002. Characteristics of trees according to community population level and land use in the U.S. Midwest. *Journal of Arboriculture* 28, 59-69.
10. Nowak, David J. 1994. *Atmospheric carbon dioxide reduction by Chicago's urban forest*. pp. 83-94 In: Chicago's urban forest ecosystem: Results of the Chicago Urban Forest Climate Project. GTR NE-186. Radnor PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 201 p.