

TEACHERS GUIDE

TO “HOW BIG IS THAT TREE?”

Multidisciplinary classroom activities based on the Young Naturalists nonfiction story in *Minnesota Conservation Volunteer*, July–August 2015, www.mndnr.gov/mcvmagazine

Minnesota Conservation Volunteer magazine tells stories that connect readers to wild things and wild places. Subjects include earth science, wildlife biology, botany, forestry, ecology, natural and cultural history, state parks, and outdoor life.

Education has been a priority for this magazine since its beginning in 1940. “One word—Education—sums up our objective,” wrote the editors in the first issue. Thanks to the MCV Charbonneau Education Fund, every public library and school in Minnesota receives a subscription. Please tell other educators about this resource.

Every issue now features a Young Naturalists story and an online Teachers Guide. As an educator, you may download Young Naturalist stories and reproduce or modify the Teachers Guide. The student portion of the guide includes vocabulary cards, study questions, and other materials.

Readers’ contributions keep *Minnesota Conservation Volunteer* alive. It is the only state conservation magazine to claim the distinction of being financially supported by contributions from its readers.

Find every issue online. Each story and issue is available in a searchable PDF format. Visit www.mndnr.gov/mcvmagazine and click on *past issues*.

Thank you for bringing Young Naturalists into your classroom!

“HOW BIG IS THAT TREE?”

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SUMMARY. “How Big is That Tree?” gives teachers the opportunity to focus on mathematics standards, especially in seventh grade, where proportionality is emphasized. Students learn how to measure a tree’s height, trunk circumference, and spread of branches (crown). Other topics include calculation of a tree’s volume, school forests, and the power of a tree’s crown.

SUGGESTED READING LEVELS. Third through high school grades

MATERIALS. KWL organizer, paper, poster board, colored pencils, crayons, pens, markers, inch rulers, calculators, clinometer materials (protractors, tape, string, metal washers, drinking straws, and tape measure), print and online resources your media specialist may provide

PREPARATION TIME. One to two hours, not including time for extension activities

ESTIMATED INSTRUCTION TIME. One or two 50-minute class periods (not including extensions)

MINNESOTA ACADEMIC STANDARDS APPLICATIONS. “How Big is That Tree?” may be applied to the following Minnesota Department of Education standards:

LANGUAGE ARTS READING BENCHMARKS INFORMATIONAL TEXT GRADES 3–5; 6–8
Key Ideas and Details, Craft and Structure, Integration of Knowledge and Ideas, Range of Reading and Level of Text Complexity

WRITING BENCHMARKS Text Types and Purposes, Writing Process, Research to Build and Present Knowledge, Range of Writing

READING BENCHMARKS: LITERACY IN IN SCIENCE AND TECHNICAL SUBJECTS

Key Ideas and Details, Craft and Structure, Integration of Knowledge and Ideas, Range of Reading and Level of Text Complexity

WRITING BENCHMARKS: LITERACY IN HISTORY/SOCIAL STUDIES, SCIENCE, AND TECHNICAL SUBJECTS Text Types and Purposes, Writing Process: Production and Distribution of Writing, Research to Build and Present Knowledge, Range of Writing

MATHEMATICS

GRADES 3, 4, 5, 6, 7, AND 8

3.1.2.4; 3.1.2.5; 4.1.1.2; 4.1.1.5; 4.1.1.6; 4.1.2.7; 5.1.1.3; 5.1.1.4; 5.1.2.5; 6.1.2.1; 6.1.2.2; 6.1.2.3; 6.1.2.4; 6.2.1.1; 6.2.1.2; 7.1.2.5

ALGEBRA

3.2.2.1; 3.2.2.2; 4.2.2.1; 4.2.2.2; 5.2.3.2; 5.2.3.3; 6.2.3.1; 7.2.1.1; 7.2.2.1; 7.2.2.2; 7.2.4.1; 7.2.4.2; 7.3.1.1; 7.3.1.2; 8.2.4.1

GEOMETRY AND MEASUREMENT

3.3.2.1; 3.3.2.3; 4.3.2.1; 6.3.1.1; 6.3.1.2

SCIENCE GRADES 3, 5, AND 7

The Nature of Science and Engineering

3.1.3.2.1; 3.1.3.2.2; 3.1.3.4.1; 5.1.3.4.1

Life Science

3.4.1.1.2; 5.4.4.1.1; 7.4.4.1.2; 9.4.3.3.5

ARTS GRADES K–12

1. Artistic Foundations: Visual Arts
2. Artistic Process: Create or Make: Visual Arts
3. Artistic Process: Perform or Present: Visual Arts
4. Artistic Process: Respond or Critique: Visual Arts

Current, complete Minnesota Academic Standards are at www.education.state.mn.us. Teachers who find other connections to standards are encouraged to contact *Minnesota Conservation Volunteer*.

PREVIEW. (1) Take your students outside to observe several trees of varied heights. Pick out three trees (one small, one of medium height, and one tall). Ask your students to guess how many feet tall the trees are. Have them record their guesses for later use. Next ask them to guess how big around each tree is in inches at about 4 to 5 feet from the base of the tree. Explain that

they will learn how foresters measure trees and why it is important to know how big trees are. (2) List several species of trees common to your area and ask students how big the state record tree is for each species. How tall is the tree? How big around is the trunk, and how broad is the crown? The [DNR Big Tree Registry](#) will help you prepare this preview. Write students' guesses on poster board and display for future use. (3) Instead of (or in addition to) previews one and two, you may do a **KWL** (Ogle, 1986) activity. To find out what your students already know about trees (K), divide the class into small groups and have each group brainstorm their ideas. Give each student a copy of the organizer (see www.teach-nology.com/web_tools/graphic_org/kwl) and encourage each to make notes during the small group discussion. Post their ideas on a flip chart or poster board. Repeat step one by asking students what they would like to learn about trees (W). As with the (K) step, post for future reference. As you read and discuss the article you will begin to compile the (L) list, or what they learn while reading the article and related materials, and participating in extension activities. KWL gives you the opportunity to introduce interdisciplinary connections you will make during extension activities. If you use the article in math, science, or art class, you may wish to focus your prereading activity on academic standards that apply for that class. (4) See www.teachervision.fen.com/tv/printables/TCR/0743932080_007.pdf for a brainstorming web download. www.teach-nology.com/web_tools/graphic_org/kwl.)

VOCABULARY PREVIEW. See the copy-ready vocabulary list included in this guide. You may wish to modify the list based on your knowledge of your students' needs or the subject you are teaching. Pretesting vocabulary individually, in small groups, or with your entire class can be an effective vocabulary preview strategy. You may then post-test at the conclusion of this activity (see Assessment section below). Italicized words are not generally included on the list or in the study cards.

You may wish to use the study cards found at the end of this guide. Cut along the horizontal lines; fold in the middle, and tape or staple. Study cards (see Strategic Tutoring, Hock, Deshler, and Schumaker 2000) can be applied to any subject area. On one side of the card, in large letters, write a key word or phrase students are expected to know. In smaller letters, frame the word or phrase in a question or statement. On the other side of the card, in large letters, write the answer to the question. Finally, in smaller letters, frame the answer in a question or statement. Blanks are provided to allow you or your students to add new words or phrases.

STUDY QUESTIONS OVERVIEW. Study questions parallel the story (the answer to the first question appears first in the article, followed by the second, and so on). **Preview the questions with your class before you read the article.** You may wish to read the story aloud and complete the study questions in class, in small groups, or as an independent activity. The questions may be assigned as homework, depending on the reading ability of your students. Inclusion teachers may provide more direct support to special needs students (see Adaptations section). The study questions may be also used as a quiz. Note: Items with an asterisk require varying degrees of critical thinking.

ADAPTATIONS. Read aloud to special needs students. Abbreviate the study questions or highlight priority items to be completed first. If time allows, remaining items may be attempted. Peer helpers, paraprofessionals, or adult volunteers may lend a hand with the study questions. With close teacher supervision, cooperative groups can also offer effective support to special needs students, especially for extension activities.

ASSESSMENT: You may use all or part of the study guide, combined with vocabulary, as a quiz. Other assessment ideas include: (1) Go back outside and measure the trees you observed in the preview. Compare your results with the students' guesses and discuss why accurate measurements are important. (2) Students may write multiple-choice, true-false, or short-answer questions. Select the best items for a class quiz. (3) Poster presentations may supplement or take the place of essays. Students may work in small groups with each group focusing on a big idea from the article.

EXTENSION ACTIVITIES. Extensions are intended for individual students, small groups, or your entire class. Young Naturalists articles provide teachers many opportunities to make connections to related topics, to allow students to follow particular interests, or to focus on specific academic standards.

1. All links to all the articles listed on page 47 of this article and included in the Related Articles section below (with the exception of "Changing Color") have teachers guides and are excellent companion pieces for "How Big Is That Tree?"
2. Make and use clinometers. See Web Resources for instructions.
3. Inventory the trees on your school grounds or in nearby areas. Include species, dimensions, apparent condition (health), and any other interesting details (e.g. presence of nests; proximity to utility lines, buildings, and roads).
4. Trees in the article are identified by their common and scientific names. Introduce your students to taxonomy using the links listed below. Combine with your tree inventory.
5. Take a field trip to your school forest, a park, or a scientific and natural area and study the trees you see there.
6. If your school does not have a school forest, now's the time to start planning. Contact the DNR School Forest program (www.dnr.state.mn.us/schoolforest/sfcontact.html) for support.

WEB RESOURCES

DNR

www.dnr.state.mn.us/trees_shrubs/bigtree/index.html

www.dnr.state.mn.us/trees_shrubs/index.html

www.dnr.state.mn.us/forestry/education/activity_guides.html

www.dnr.state.mn.us/forestry/education/treeforallseasons/nativetrees.html

CLINOMETER

www.instructables.com/id/Using-a-clinometer-to-measure-height/
www.wikihow.com/Make-a-Clinometer

FORESTRY

<https://www.safnet.org/education/forestryfun.cfm>
www.fs.fed.us/kids/

MINNESOTA TREES

www.extension.umn.edu/environment/trees-woodlands/beginners-guide-to-mn-trees/docs/beginners-guide-minnesota-trees.pdf
www.sherburneswcd.org/images_PDF/PDFLinks/Forestry/TreeIDCardPacket.pdf

TAXONOMY

www.biology4kids.com/files/studies_taxonomy.html
<http://files.dnr.state.mn.us/forestry/education/primer/appendixtwo.pdf>

MINNESOTA DNR TEACHER RESOURCES

www.mndnr.gov/education/teachers/index.html
www.mndnr.gov/dnrkids/index.html
www.dnr.state.mn.us/plt/index.html
www.dnr.state.mn.us/schoolforest/index.html

*Note: All websites were active at the time of this guide's publication. However, some may no longer be active when this guide is accessed.

RELATED ARTICLES.

In addition to the related articles listed below, every *Minnesota Conservation Volunteer* article published since 1940 is now online in searchable PDF. See www.mndnr.gov/mcvmagazine. Young Naturalists articles and teachers guides are found at www.dnr.state.mn.us/mcvmagazine/young-naturalists.html.

March–April 1999

“Tremendously Marvelous Trees” (YN article with teachers guide)

http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/trees/trees.pdf

September–October 2000

“Changing Color” (YN article)

https://webapps8.dnr.state.mn.us/volunteer_index/past_issues/article_pdf?id=293

May–June 2006

“Look Down in the Woods” (YN article with teachers guide)

http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/forest_floor/forest_floor.pdf

September–October 2008

“Tree Guardians” (YN article with teachers guide)

http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/tree_guardians/tree_guardians.pdf

January–February 2009

“Ubiquitous Conifers” (YN article with teachers guide)

http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/conifers/conifers.pdf

March–April 2009

“Sugar From Trees” (YN article with teachers guide)

http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/maple_syrup/maple_syrup.pdf

January–February 2010

“Forest Builders” (YN article with teacher guide)

http://files.dnr.state.mn.us/mcvmagazine/young_naturalists/young-naturalists-article/forest_builders/forest_builders.pdf

REFERENCES.

Hock, M.F., Deshler, D.D., and Schumaker, J.B. *Strategic Tutoring*. Lawrence, Kan.: Edge Enterprises, 2000.

Ogle, D.S. K-W-L Group Instructional Strategy. In A.S. Palincsar, D.S. Ogle, B.F. Jones, and E.G. Carr (Eds.), *Teaching Reading as Thinking: Teleconference Resource Guide*, pp. 11–17. Alexandria, Va.: Association for Supervision and Curriculum Development, 1986.

STUDY QUESTIONS ANSWER KEY.

Teachers guide for the Young Naturalists article “How Big is That Tree?” Published in the July–August 2015 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/mcvmagazine.

1. Why were Danae Schafer and Simon Cain in the woods? **They were selecting and marking trees for harvest and sale.**
2. What did they notice that was out of the ordinary? **They noticed a very tall tree.**
3. What happened next? **They measured the black spruce’s height, circumference, and crown. It qualified as the largest black spruce in Minnesota.**
4. *Picea mariana* is another name for **black spruce.**
- *5. How does math help foresters manage forest lands? **Using math, foresters choose when and where to plant trees and which trees to harvest, which leads to good forest management.**

6. What makes trees so valuable? **Trees not only provide wood and paper, they also give shade, prevent soil erosion, give food and shelter to wildlife, and are beautiful to look at.**

7. Can you find the height of a tree without a clinometer? **Yes. You can use the proportional method, which requires a ruler, a partner, and a little math.**

*8. If you are using a 12-inch ruler, your partner appears 3 inches tall on the ruler; and your partner is actually 50 inches tall, how tall is the tree in feet? $12 \times 50 = 600$; $600/3 = 200$; $200/12 = 16.66$; $0.66 \times 12 = 7.92$ (rounded to 8); **The tree is 16 feet, 8 inches tall.**

9. Why do you suppose a forester would want to know a tree's volume? **By knowing how much wood a tree contains, a forester knows how much lumber or paper the tree can produce.**

10. What is a tree's circumference? **A tree's circumference is the distance around its trunk (in inches) at 4.5 feet above the ground.**

*11. If a tree's circumference is 37 inches and it is 200 inches tall, what is its volume? $37/3.14 = 11.78$ (diameter); $11.78/2 = 5.89$ (rounded to 5.9); $5.9 \times 5.9 = 34.81$; $34.81 \times 200 = 6,962$ cubic inches.

12. How many school forests are there in Minnesota? **130**

*13. Imagine you are standing under a white oak tree and you want to calculate the crown spread. At its narrowest point the crown is 17 feet. At its widest point the crown is 37 feet. What is the crown's spread? $17 + 37 = 54$; $54/2 = 27$ feet.

*14. White spruce is also known as *Picea glauca*.

Challenge: The state champion white pine is 103 feet tall and has a circumference of 214 inches and a crown spread of 84 feet. How many points has it earned on the Minnesota Big Tree Registry?

$103 + 214 + 21 = 338$ points.

MINNESOTA COMPREHENSIVE ASSESSMENTS ANSWER KEY.

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1. The smallest school forest in Minnesota is **A. less than one acre**; the largest is **greater than 300 acres**.

2. The state champion white spruce is about as tall as a **B. 12-story building**.

3. The state champion black spruce is **D. 84 feet tall**.

4. What is a clinometer used for? **A clinometer is used to measure the angle from your eye to the top of a tree, which allows you to calculate the tree's height.**

5. The cylinder of a tree's trunk is also known as its **C. volume**.

VOCABULARY ANSWER KEY.

Teachers guide for the Young Naturalists article "How Big is That Tree?." Published in the July–August 2015 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/mcvmagazine.

analyze study something closely and carefully

calculate find a number by using mathematical processes

Department of Natural Resources state agency responsible for management and conservation of Minnesota's land, water, plants, and wildlife

dimensions measurements that describe the size of an object

formula a way to express information symbolically

manage take care of and make decisions about

proportional when two variables have a fixed relationship with each other such that a change in one will result in a corresponding change the other

volume amount of three-dimensional space an object occupies