Young Naturalists

Teachers Guide

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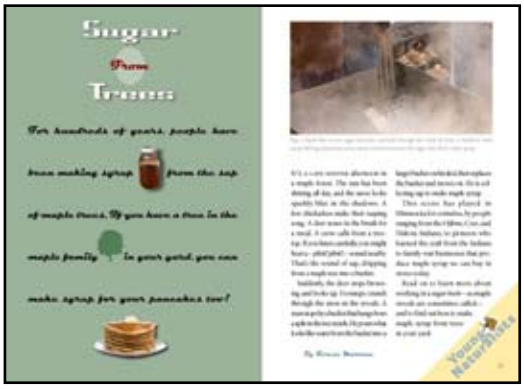
"Sugar From Trees" Multidisciplinary Classroom Activities

Teachers guide for the Young Naturalists article "Sugar From Trees" by Teresa Marrone. Published in the March–April 2009 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/maraprog/syrup.

Young Naturalists teachers guides are provided free of charge to classroom teachers, parents, and students. This guide contains a brief summary of the article, suggested independent reading levels, word count, materials list, estimates of preparation and instructional time, academic standards applications, preview strategies and study questions overview, adaptations for special needs students, assessment options, extension activities, Web resources (including related Conservation Volunteer *articles), copy-ready study questions with answer key, and a copy-ready vocabulary sheet and vocabulary study cards. There is also a practice quiz (with answer key) in Minnesota Comprehensive Assessments format. Materials may be reproduced and/or modified a to suit user needs. Users are encouraged to provide feedback through an online survey at www.mndnr.gov/education/teachers/activities/ynstudyguides/survey.html. Please note that if you are downloading articles from the Web site only the Young Naturalists article is available in PDF.*



Summary

"Sugar From Trees" describes collecting maple sap to make syrup and sugar from colonial America and from the territory that is now Minnesota. The reader will also learn what trees may be tapped, how trees produce sap, and how to collect and process sap.

Suggested reading levels:	third through middle grades
Total words:	2,210
Materials:	Paper, poster board, pencils, pens, markers, and print resources from your media center, pure maple syrup and/or maple sugar candy
Preparation time:	One to two hours, not including time for extension activities

Estimated instructional time:

Two to three 50-minute class periods (not including extensions)

Minnesota Academic Standards applications:

"Sugar From Trees" may be applied to the following Minnesota Department of Education standards:

Language Arts
I. Reading and Literature
A. Word Recognition, Analysis and Fluency
B. Vocabulary Expansion
C. Comprehension
II. Writing
A. Types of Writing
B. Elements of Composition
C. Spelling
D. Research
E. Handwriting and Word Processing

III. Speaking, Listening and Viewing
A. Speaking and Listening
B. Media Literacy

Science
Grades 3 and 4
IV. Life Science
B. Diversity of Organisms
C. Interdependence of Life

Grades 5 and 8
IV. Life Science
F. Flow of Matter and Energy
Grade 7
IV. Life Science
F. Flow of Matter and Energy

Social Studies
Grades 4–8
II. Minnesota History
A. Pre-contact to 1650: The student will demonstrate knowledge of Minnesota's indigenous peoples.

V. Geography
D. Interconnections: The student will describe how humans influence the environment and in turn are influenced by it.

Arts
All grades
Artistic Expression
D. Visual Arts

Complete Academic Standards are available at www education.state.mn.us. Teachers who find other connections to academic standards are encouraged to contact *Minnesota Conservation Volunteer.*

Preview

Bring a bottle of imitation maple syrup (made from corn syrup) and pure maple syrup and small containers for tasting. If maple sugar candy is available it may be substituted for syrup. It is likely that many students have never tasted real maple syrup or candy. Ask students to compare the flavors.

Use the KWL strategy (Ogle, 1986) to find out what your students already know (K) about where maple syrup comes from, what (W) they would like to learn, and eventually, what they learned (L) while reading the article and related materials and through participating in extension activities. You might begin by asking small groups to brainstorm their ideas. Then combine the groups' data to make a class list. Display your K and W ideas on poster board or paper (see Vocabulary preview). Add to your L list as you read and discuss the article. See www.teach-nology.com/web_tools/graphic_org/kwl for a KWL generator that

Preview continued

will produce individual organizers for your students. Individual organizers may be useful as students read the article for answers to W questions. KWL also gives you the opportunity to introduce interdisciplinary connections you will make during extension activities. For example, if you plan to use the article during social studies, science, or art, you may ask students to review their KWL for concepts that are specific to those disciplines.

If you have a school forest or are within walking distance of a wooded area, walk through the woods. Identify different species of trees. Could any of the trees you identify be tapped? During your walk add items to the K and W categories.

Vocabulary preview

See the copy-ready vocabulary list included in this guide as well as italicized words in the article. You may wish to modify the list based on your knowledge of your students' needs. 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).

Connections to vocabulary in the article may also be made during KWL. If students are not familiar with some of the terms, include them in the W list. Other terms may be added to the W list as they read the article. Eventually they can be moved to the L list. You may write vocabulary from the article in green ink, while other ideas are written in black. Notes: Some of the words in the vocabulary list definitions may require further explanation. Also, preview the study questions for unfamiliar terms.

You may wish to use the study cards found at the end of this guide. Cut along the horizontal line; 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 that 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 entire guide 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 1, 2, 7, 8, 9 and the Challenge 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) Students may write an essay describing the maple sugaring process. (2) Students may write multiple-choice, short answer, or true-false questions to test their classmates' understanding of the story. Student-generated questions may be then used as an alternative to study questions. (3) Copy the illustrations on page 59 without the labels. Ask students to identify the tree that each represents. (4) Have students make poster presentations that illustrate how trees are tapped, sap is collected, sap is boiled, and sap is turned into syrup or candy.

Extension activities

1. If there is a sugar bush near you, plan a field trip during the sap run. Many state parks and local nature centers tap trees in the spring. For a list of state park opportunities, check out the state park events calendar at www.mndnr.gov or call 651-296-6157 or toll-free 888-646-6367. For contact information for nature centers in your area, see www.seek.state.mn.us/partner.cfm.
2. Invite a DNR forester to your classroom. Possible topics include tree identification, distribution of maple species across Minnesota, and how and why trees make sap.
3. Celebrate your YN experience with a pancake breakfast in your classroom or cafeteria with real maple syrup on your flapjacks. Maple syrup is a tasty topping for ice cream or yogurt, too.
4. To help students understand the relationship of American Indians with trees, read the Ojibwe legend *Ininatig's Gift of Sugar* (ISBN 13: 978-0-8225-9642-4/ISBN 10: 0-8225-9642-3), available from your library or from Lerner Publishing (www.lernerbooks.com/cgi-bin/books.sh/lernerpublishing.p?navaction=f6_title.w&navvalue=0822596423).
5. Students may be interested in learning more about other traditional American Indian foods, such as wild rice, fry bread, and venison. Contact a tribe near you (www.indianaffairs.state.mn.us/tribes.html) to inquire about guest speakers.
6. Investigate the phenomenon that makes sap flow in maple trees (See www.massmaple.org/flow.html). It is a mystery that will intrigue your students and provide opportunities for critical thinking.
7. Research where maple trees are found in Minnesota and why. Explore the threats Minnesota's maples face, including development and global warming. What can we do to make sure maple trees are around for future generations?
8. Have students write a poem or essay describing what it would be like to be a maple tree in early spring, as sap begins to flow.

Web resources

Maple Syrup
www.mnmaple.org
www/northamericanmaple.org
www.massmaple.org/myo.html
www.maplegrove.com/maple-syrup-story.asp
homecooking.about.com/od/foodhistory/a/maplehistory.htm

Minnesota DNR Division of Forestry
www.mndnr.gov/forestry/index.html
www.mndnr.gov/faq/mnfacts/forests.html

Web resources continued

Minnesota State Parks
www.mndnr.gov/state_parks/index.html

University of Minnesota Forestry
www.forestry.umn.edu/

Urban Forestry
www.forestry.umn.edu/extension/urban_com/index.html

Native Americans and Trees
www.nativetech.org/brchbark/brchbark.htm
www.native-languages.org/houses.htm
www.umaine.edu/hudsonmuseum/tree.htm
www.kstrom.net/isk/food/maple.html

DNR Teacher Resources
www.mndnr.gov/education/teachers/index.html

Related articles

Many related *Minnesota Conservation Volunteer* articles are available online at www.dnr.state.mn.us/volunteer/articles/index.html, including:

March–April 1999
"Tremendously Marvelous Trees" (YN article with Teachers Guide)
www.mndnr.gov/young_naturalists/trees/index.html

March–April 2000
"One Sweet Time"
www.mndnr.gov/volunteer/marapr00/maple_syrup.html

November–December 2004
"Home for the Holidays"
www.mndnr.gov/volunteer/novdec04/holidays.html

November–December 2007
"Walks in the Old Woods"
www.mndnr.gov/volunteer/novdec07/old_woods.html

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

Teachers guide for the Young Naturalists article "Sugar From Trees" by Teresa Marrone. Published in the March–April 2009 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/syrup.

Name_____Period_____Date_____

1. In the first paragraph of this story the author writes, "It's late-winter afternoon in the maple forest. The sun has been shining all day, and the snow looks sparkly blue in the shadows." Why are sunshine and snow on the ground important conditions for collecting maple sap? _____

_____

_____

2. How do you think Native Americans discovered maple syrup?_____

_____

_____

3. If you do not have a calendar, how might you decide it is time to collect maple sap? _____

_____

_____

4. Maple sugar was popular with Indians and settlers because it was _____

_____.

5. Why did Quakers and other abolitionists prefer maple sugar to cane sugar? _____

_____

_____

6. Explain why trees need sap. _____

_____

7. Why is maple sap sweet? _____

_____

_____

8. Finished syrup typically boils at _____ degrees Fahrenheit.

9. It takes about _____ gallons of sap to make one gallon of maple syrup.

10. Put these maple syrup-making tasks in the correct order.

Collect the sap.	1. _____
Gather tapping tools.	2. _____
Boil the sap to about 2 cups.	3. _____
Put syrup on pancakes.	4. _____
Keep sap cool until you have 3 to 4 gallons.	5. _____
Tap the trees.	6. _____
Boil the sap to about 2 quarts.	7. _____

11. Why is it important to understand "aproning" if you are boiling sap? _____

_____

_____

12. How many different ways can you think of to eat maple syrup or maple sugar? _____

_____

_____

_____

Challenge: Compare and contrast the traditional American Indian method of collecting and processing maple sap with other methods. If you wish, use a Venn diagram. _____

_____

_____

_____

_____

Study Questions Answer Key

Teachers guide for the Young Naturalists article "Sugar From Trees" by Teresa Marrone. Published in the March –April 2009 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/syrup.

1. In the first paragraph of this story the author writes, "It's late-winter afternoon in the maple forest. The sun has been shining all day, and the snow looks sparkly blue in the shadows." Why are sunshine and snow on the ground important conditions for collecting maple sap? **This will take some digging. You may suggest that students wait to answer this item until they have read further. In order for sweet sap to flow, trees must be exposed to temperature variations, warm days and cold nights. That is why maple syrup is made in early spring.**

2. How do you think Native Americans discovered maple syrup? **Answers will vary. Encourage imaginative thinking. Perhaps a young child noticed sap running from a maple, and as children are apt to do, licked a sap-covered finger.**

3. If you do not have a calendar, how might you decide it is time to collect maple sap? **Natural signs, such as crows or eagles returning north, might tell you it's the right time of the year to collect sap.**

4. Maple sugar was popular with Indians and settlers because **it was it was easy to store and to transport.**

5. Why did Quakers and other abolitionists prefer maple sugar to cane sugar? **They opposed the slave labor of the sugar cane industry in the southern states.**

6. Explain why trees need sap. **Sap carries nutrients up to buds that will become new leaves or needles.**

7. Why is maple sap sweet? **Maple wood has more sugar than other species of trees.**

8. Finished syrup typically boils at **219 degrees Fahrenheit.**

9. It takes about **40** gallons of sap to make one gallon of maple syrup.

10. Put these maple syrup-making tasks in the correct order.

1. Gather tapping tools.

2. Tap the trees.

3. Collect the sap.

4. Keep sap cool until you have 3 to 4 gallons.

5. Boil the sap to about 2 quarts.

6. Boil the sap to about 2 cups.

7. Put syrup on pancakes.

11. Why is it important to understand "aproning" if you are boiling sap? **When the sap runs off the spoon in a small sheet, the syrup is done.**

12. How many different ways can you think of to eat maple syrup or maple sugar? **Answers will vary. Encourage creative thinking.**

Challenge: Compare and contrast the traditional American Indian method of collecting and processing maple sap with other methods. If you wish, use a Venn diagram. **Answers will vary, but should include these differences: both tapped trees, but Indians cut the bark instead of tapping trees as is practiced today; both funneled sap into containers, the traditional Indian method uses plant materials, such as sumac, cedar, or birch bark to funnel the sap instead of plastic or metal spiles; both collected sap in containers, but the traditional Indian method uses birch bark instead of plastic or metal buckets; both boiled the sap, but Indians used clay or birch-bark containers to boil the sap over a fire or immersed hot rocks in the sap containers instead.**

Minnesota Comprehensive Assessments Practice Items

Teachers guide for the Young Naturalists article "Sugar From Trees" by Teresa Marrone. Published in the March–April 2009 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/syrup.

Name _____Period _____Date_____

1. How did fur traders help Indians make maple syrup?

A. Fur traders knew the best trees to tap.

B. Fur traders brought metal pots to boil the sap.

C. Fur traders knew when to tap the trees.

D. Fur traders knew how to cook with maple sugar.

2. How can you tell the difference between a red maple and a box elder? _____

_____

_____

3. A large maple can produce _____ gallons of sap a day.

A.1

B. 2

C. 3

D.10

4. Why is sapping season over once the temperature stays above freezing and buds appear? _____

_____

_____

5.Maple forests are sometimes called _____.

A. sugar plantations

B. sugar concentrations

C. sugar bush

D. none of the above

Minnesota Comprehensive Assessments Answer Key

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1. How did fur traders help Indians make maple syrup? **B. Fur traders brought metal pots to boil the sap.**
2. How can you tell the difference between a red maple and a boxelder? **Boxelders have a more rectangular profile. Red maple leaves are broader and grow singly, while boxelder leaves grow in clusters.**
3. A large maple can produce C. **3 gallons of sap a day.**
4. Why is sapping season over once the temperature stays above freezing and buds appear? **The sap no longer drips freely and doesn't taste as good.**
5. Maple forests are sometimes called **C. sugar bush.**

Vocabulary

Teachers guide for the Young Naturalists article "Sugar From Trees" by Teresa Marrone. Published in the March–April 2009 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/syrup.

abolitionists people who opposed slavery

atmospheric pressure also called barometric pressure; the weight of the atmosphere

dormant an inactive state, when growth stops

nutrients substances that provide nourishment, for example, the minerals a plant needs to grow

Quakers a religious group, the Society of Friends, which is opposed to slavery and war

Vocabulary Study Cards

Teachers guide for the Young Naturalists article "Sugar From Trees" by Teresa Marrone. Published in the March–April 2009 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/syrup.

Cut along the horizontal lines, fold on the dashed vertical line and tape or staple. Blanks are provided to allow you or your students to add new words or phrases.

Who were the **abolitionists?**	FOLD HERE	What were **people who opposed slavery** called?
When a plant is **dormant it**	FOLD HERE	When a plant **enters an inactive state, and its growth stops** it is
What are plant **nutrients?**	FOLD HERE	**Substances that provide nourishment (for example, the minerals a plant needs to grow)** are

Vocabulary Study Cards

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Cut along the horizontal lines, fold on the dashed vertical line and tape or staple. Blanks are provided to allow you or your students to add new words or phrases.

Who are the **Quakers**?	**A religious group, the Society of Friends, that is opposed to slavery and war** is called the
What is **atmospheric pressure**?	**The weight of the atmosphere** is

FOLD HERE

Vocabulary Study Cards

Teachers guide for the Young Naturalists article "Sugar From Trees" by Teresa Marrone. Published in the March–April 2009 *Minnesota Conservation Volunteer*, or visit www.mndnr.gov/young_naturalists/syrup.

Cut along the horizontal lines, fold on the dashed vertical line and tape or staple. Blanks are provided to allow you or your students to add new words or phrases.

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