

# MAPLE SUGARING

## Fourth Grade – Rahr Memorial School Forest

### ENDURING UNDERSTANDING

There is a long history of people using sugar maple trees to make maple syrup in Wisconsin. Wisconsin forests are unique and we need to appreciate their value.

### ASSESSMENT

Explain the different parts of a tree and what each part does. What is maple syrup and how is it made? Describe the history of maple syruping in Wisconsin.

### STATE STANDARDS

C.4.1, C.4.4, D.4.3

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### CLASS OUTLINE

- I. Set-up
- II. Sample schedule
- III. Introduction
- IV. How Trees Work
- V. Maple Sugaring and Tools
- VI. Tree I.D.
- VII. Maple syrup tasting (full day trips only)
- VIII. Conclusion
- IX. Clean-up

Safety

Optional/Rainy Day Activities

Resources

Additional Information

School Forest map

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### MATERIALS

#### **How Trees Work**

Chalkboard

Chalk

#### **Maple Sugaring and Tools**

Maple tree taps

Hand drills

Mallets or hammers

Collecting buckets/ bags

Bottles of maple syrup (real and flavored)

Samples of maple and pine wood

Sample of red, silver, and sugar maple leaves

#### **Tree I.D.**

Bud identification charts/ samples

Tree i.d. books

#### **Maple Syrup Tasting**

Ice cream

Maple syrup

Bowls

Spoons

Napkins

Paper towels

Maple Sugaring video

TV/VCR/DVD

### CLASS PROCEDURES

- I. Set-up

After setting up a date with the School Forest Secretary, teachers are also responsible for filling out and turning in a field trip request form. Teachers should schedule a time

when the School Forest Coordinator can meet with them at school to discuss the visit. Teachers will be asked to teach or co-teach one of the activities while the student groups rotate through the activities during the day. The School Forest Coordinator can also teach at one of the stations during the day if available. Preparation time will be needed to review the activity.

All of the materials for this day can be set-up at the School Forest. Please let the School Forest Coordinator know of the class needs. Teachers should bring a few things from school: first aid kits, emergency contact information, extra clothing, and any additional activities they feel necessary for the class. Students will need to bring a bag lunch (with a drink and nothing that needs a microwave) and adequate clothing for the day.

Before your trip to the School Forest for Maple Sugaring Day, please discuss proper attire for the weather and safety. Also, you may want to have students record the low and high temperatures of the days leading up to the trip. The sap of the maple trees runs best when we have warm, sunny days and nights with freezing temperatures. Have the class make predictions about how much sap we will collect during their day at the School Forest. Students can also make predictions as to how much sap is needed to make a bottle of maple syrup.

## II. Sample Schedule

9:15- 9:30	Welcome and Introduction
9:30- 10:30	Group 1:How Trees Work Group 2:Maple Sugaring and Tools
10:30- 11:30	Group 1:Maple Sugaring and Tools Group 2:How Trees Work
11:30- noon	Lunch
Noon- 12:50	Group 1:Tree I.D. Group 2:Load buses and check on maple trees, eat maple syrup sundaes
12:55- 1:45	Group 1:Load buses and check on maple trees, eat maple syrup sundaes Group 2:Tree I.D.
1:45- 1:55	Conclusion
2:00	Depart
2:30	Arrive at School

## III. Introduction

The history of making maple syrup dates back to Native Americans. The Native Americans used an axe to make a hole into the sapwood and then placed a spout made from an elderberry branch into the slit. At the base of the tree, they would place a birch bark basket (called makuks) or iron kettles to collect the sap as it dripped down the elderberry branch. The early pioneers and colonists learned maple syruping from the Native Americans. Some of the tools have been adapted but the process has not changed in almost 400 years!

Today, students will learn about how trees work, how to make maple syrup, and the tradition of maple sugaring in Wisconsin. Students will also have an opportunity to tap maple trees and collect maple sap.

## IV. How Trees Work

Trees are made up of many different parts working together. The different parts of the tree trunk can be seen in a cross section or tree cookie. Use the chalkboard to draw a diagram of the cross-section and label the parts.

**Heartwood-** the dark non-living wood at the core of the tree’s trunk. This form when the xylem cells plug up with resins and minerals. Heartwood supports the plant.

**Xylem-** transports sap upward from the roots to the leaves. Also known as sapwood.

**Cambium-** the growing layer of cells. The cells divide, producing phloem to the outside and xylem to the inside of the tree.

**Phloem-** tissues in the tree that transport sap down from the leaves to the roots. When phloem dies it becomes bark.

**Bark-** dead, outside covering on trees. The bark protects the trees from excessive water loss, injury, insects, disease, weather, herbivores, etc.

**Roots-** anchors the tree to the ground and absorbs minerals and water to feed the tree

**Branches-** hold leaves out to collect sunlight.

**Leaves-** produce food through photosynthesis

**Flower-** makes seed

**Pollen-** makes seed

**Bud-** leaf package

**Sap-** the sap carries food water and minerals throughout the plant. It is mostly made of water. It can be compared to blood in animals.

**Sugar-** the food found in sap, produced by the plant through photosynthesis

**Trunk-** supports the tree, transports water and nutrients, and grows upward to push branches towards sunlight.

### **Make a Tree activity**

During this activity students will act out the workings of a tree. They will learn the different parts of the tree and what they do. Use the following chart to designate students and their roles. Be creative and modify the sounds, numbers, and actions where appropriate.

<b>Tree Part</b>	<b>Number of People</b>	<b>Action</b>	<b>Sound</b>
<b>Heartwood</b>	1	Stand stiff and straight	“I hold up the tree”
<b>Roots</b>	3	Wiggle fingers and toes	“Glug, glug, glug”
<b>Xylem</b>	2	Raise hands from ground to sky	“Xylem up”
<b>Cambium</b>	2	Wave hand to side and back	“Makin’ cells”
<b>Phloem</b>	2-3	Lower hands from sky to ground	“Phloem down”
<b>Bark</b>	2-3	Look tough and mean	“Bark! Bark!”
<b>Branches</b>	2-3	Arms outstretched away from bark	“We spread out the leaves”
<b>Leaves</b>	2-3	Hold onto branches	“Soakin’ up sunshine”
<b>Flowers</b>	2-3	Look pretty (smile and pose)	“It’s pollen we need to become a seed”

Show a sample of sugar maple wood and pine woods. Compare them. Sugar maple heartwood’s color is light to medium reddish brown in color. The sugar maple sapwood

usually has wide sapwood (xylem) that is near white with pale or reddish color. The pine wood has very distinct growth rings and is darker in color.

#### V. Maple Sugaring and Tools

Collecting maple sap to make maple syrup has been a tradition of Wisconsin for about 400 years. It all started with the Native Americans and has been passed along through the generations. (If you would like to read one of the Native American stories from the Additional Information section, this would be a good time for it.)

To make maple syrup, you must first collect sap from sugar maple trees. The sap is then boiled down to a sugary substance (syrup). It sounds easy, but if you figure that it takes about 40 gallons of maple sap to make 1 gallon of syrup, you can imagine that this is a long project. Compare the real maple syrup to the “maple flavored” syrup.

There are a few main tools that are used in collecting maple sap and making maple syrup. Show students drills, spiles, and mallets. These tools are used to tap the tree. One tap can be placed on a 10” diameter tree and an additional tap for every additional 5” in diameter. Then a bucket or bag is hung from the spile to collect the sap as it goes up the tree. After the sap is collected, the sap must be boiled down to make maple syrup.

Load buses and travel over to sugar maple trees (they are on the west edge of the property, along the road, south of the gate to the pond). Show an example of how to tap the tree. Drill hole and insert spile. Tap in with mallet and hang bucket/ bags. Then have students divide up with adults and tap trees. Be careful with tools and allow each student to take part in tapping a tree.

#### VI. Tree I.D.

There are many different types of maple trees. Today we are studying sugar maple trees but it is also important to know how to identify other maple trees. Sugar maples have a leaf with a “U” shaped notch. The leaf of red maple trees has a “V” shaped notch between the lobes. Silver maple leaves have a very deep notch. Use the handout to show students these differences (see the Additional Information section of this lesson plan). If there are not leaves on the trees yet, use the buds for identification. Compare buds with those on the charts.

Go for a hike and compare maples to oaks and pines.

#### VII. Maple Syrup Tasting (full day trips only)

After a couple of hours, return to the tapped trees to check progress. Discuss how temperature effects sap flow. For example, if the night was cool and the day is warm and sunny, the sap should be flowing well. But if the day is cold, the sap may not flow very well.

Head back to the buildings and serve maple syrup sundaes. Adults will be asked to assist in preparation and clean up.

Show “The Maple Sugaring Story” video. Discuss what students learned from the video.

#### VIII. Conclusion

Students learned how to tap trees, collect syrup, how trees work, and the difference between types of maple trees. As humans, we depend on forests for many different

things. Maple syrup is one of these things and it is an important part of our history. Learning about how maple syrup is made gives students the opportunity to experience what it takes to put the wonderful, sweet stuff on their pancakes. After learning about maple sugaring, students should have a better appreciation for our trees and forests.

#### IX. Clean-up

- Return supplies to building
- Take garbage out to dumpster
- Close windows, shut off all lights, lock doors, shut driveway gate
- Give the School Forest Coordinator feedback on how to make this trip better in the future

### Safety

While at the School Forest, teachers should carry first aid kits. You can bring these from your school or use the ones at the School Forest. The first aid stations can be found in the Ehlert Lodge office, ELC classroom, and upstairs in the Krejcarek Building. Please report any safety issues to the School Forest Coordinator.

Students should be supervised at all times. If you decide to go off trail, go in a clear area where branches cannot swing back and hit someone. Be aware of the plants you are traveling around so as not to pass by thorn covered plants.

While hiking:

- check students for proper attire
- tell students to be careful with branches
- remind them snow needs to stay on the ground

While drilling:

- have adult supervision for all students
- explain tools carefully
- discuss safety while using tools

### Optional/Rainy Day Activities

If the weather is not good, make sure students are prepared with proper clothing. It is encouraged to still go outside for a hike and enjoy the rain if it is a safe thing to do. Please let the School Forest Coordinator know if you will need any equipment or supplies for additional activities. These activities can be used to add on to or replace the outdoor activities and can also be set-up in stations indoors. *They would also make great activities to do back at school.*

#### Evaporation Activity

Enduring Understanding

When water evaporates from a solution, anything that was held in suspension in a liquid (dissolved in the solution) will remain. Only hydrogen and oxygen evaporates.

Materials Needed

Sugar	Pan or shallow dish
Water	Heat source
Bowl	Microscope

Procedure

1. Dissolve a lot of sugar in water.
2. Pour solution into a pan or shallow dish
3. Put on heat source or place in the sun and let the water evaporate
4. Observe the sugar crystals that are left behind.
5. Examine the crystals using a microscope.

6. Discuss what happened to the maple-water mixture once the water evaporated.
7. This is the same procedure that is done with maple sap in order to make maple syrup. The water in the sap is boiled off and leaves behind a sugary substance.

**Maple Sugaring Crossword Puzzle-** This crossword puzzle is from “The Maple Sugaring Story” (look in Additional Information section).

**Maple Sugaring Review-** Use the following review sheet in the classroom as a follow-up activity to your School Forest visit.

## Additional Information

See the following pages.

## Resources

Caduto, Michael J. and Joseph Bruchac. Keepers of the Earth. Fulcrum, Inc. Colorado. 1989.

Coombes, Allen J. Trees. Dorling Kindersley, London. 2002.

Eagle Bluff Environmental Learning Center. Forest Ecology Lesson Plan. Lanesboro, MN. 2002.

Lockhart, Betty Ann C. The Maple Sugaring Story. Perceptions, Inc., Vermont. 1990.

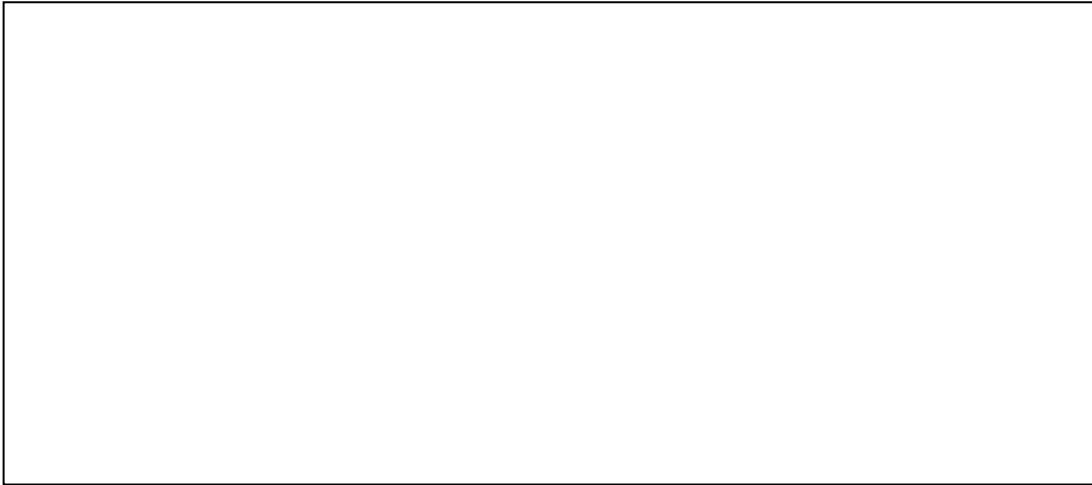
River Bend Nature Center. <http://www.rbnc.org/maplesyr.htm> Minnesota, 2003.

Lesson plan written by Patty Brodeen Maher, School Forest Coordinator, Manitowoc, Public School District, August 2004, revised July 2008.

# Maple Sugaring Review

Name: \_\_\_\_\_

Sketch a sugar maple tree that has been tapped and label the tools used.



What is sap? \_\_\_\_\_  
\_\_\_\_\_

What is diameter? \_\_\_\_\_  
\_\_\_\_\_

What is circumference?  
\_\_\_\_\_  
\_\_\_\_\_

What did you learn about making maple syrup?

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_