

SC Farm Bureau
Ag in the Classroom
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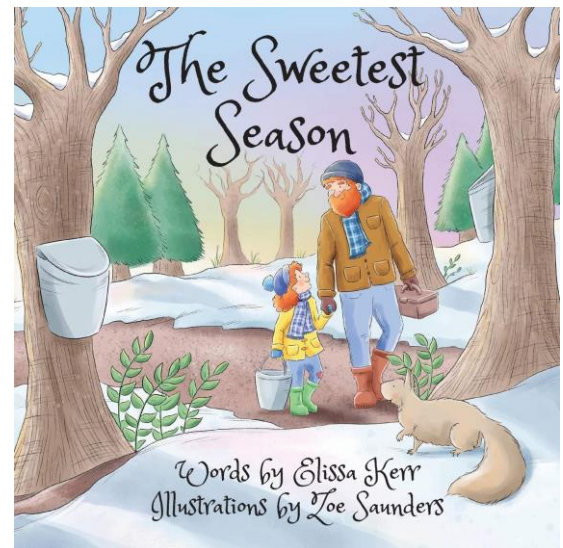
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March 2021 *The Sweetest Season*

By: Elissa Kerr

“It’s early springtime in the forest. The snow is melting, and the sweet maple trees are budding. That can only mean one thing; it’s time to collect the sap and make some delicious maple syrup.”¹

Note: There are some antiquated practices in this book. Please refer to the **Companion Resources** section for videos to see how maple syrup operations produce maple syrup today.



Did You Know? (Ag Facts)

- Maple syrup is typically produced in cooler regions of the United States, such as Vermont and parts of New England.²
- It takes about 40 gallons of sap to make one gallon of syrup.³
- In 2017, 4.27 million gallons of maple syrup were produced in the United States. Vermont leads the nation in maple syrup production.³

Discussion Questions

- In what season did the story take place? Why?
- How is sap made into syrup?
- Tell about a time when you have had maple syrup.

Grade Level(s): K-2

Purpose: Students will recognize how geography and climate allow for the growth of maple trees and the process of making syrup. They will identify the characteristics of maple trees that produce the best sap for making maple syrup and name the steps in the process of creating syrup from sap.

Vocabulary:

- **climate:** the weather conditions over a long period time
- **evaporate:** to lose or cause to lose moisture; to cook until most of the liquid is vapor
- **maple syrup:** a thick, sweet liquid made by dissolving the sugar found in the sap of a maple tree by boiling
- **maple tree:** a type of tree with lobed leaves and colorful autumn leaves used for timber or syrup
- **natural resources:** materials found in nature that can be used to make useful products
- **sap:** the fluid made up mostly of water with dissolved sugars that circulate inside a plant or tree
- **sugar house:** a building with equipment to turn maple sap into syrup
- **sugaring season:** when maple syrup is made
- **tap:** the hole put in a tree to extract sap

Background Agricultural Connections: ³

Maple trees are a **natural resource** that are found almost anywhere but are most prevalent in the Northern Hemisphere. They are hardy but prefer, and are found, mostly in cool, wet **climates**. They like well-drained soil that is sandy or clayey with loose texture. There are at least one hundred species of maple trees. Fourteen species are found in the United States, with the majority of them found in the northeast and midwest sections of our country. Maple syrup can be made from any species of maple tree. Most **maple syrup** is made from the sugar maple due to its high sugar content. Generally, the ratio of **sap** to syrup for the sugar maple is 40 to 1 (40 gallons of sap yields one gallon of syrup).

Sugar maple trees grow abundantly in the northeastern United States and is the state tree for New York, Vermont, West Virginia, and Wisconsin. Sugar maples grow to a height of 60-75 feet and a spread of 40-50 feet at maturity. They can grow 12-24 inches a year and can live for over 400 years. The sugar maple leaf can be identified by its five distinct coarsely toothed lobes connected by shallow U-shaped notches. Leaves measure 3-5 inches at maturity, are medium to dark green, and turn yellow, burnt orange, and red in the fall.

A maple tree should be at least 10-12 inches in diameter before it is **tapped** for sap. A tree this size would be about 30-40 years old. Tapping a tree does not damage or endanger its health, although it does create a wound. This wound can recover by growing over its tap hole within the next year. Some producers will alternate tapping trees each year. A tree with a 21-27 inch diameter can support two taps, and those with a greater than 27 inch diameter can support three taps. Sugarmakers begin tapping trees in February. A taphole is drilled and a spout is placed in the hole and tapped into place. Most commercial operations attach tubing to the spout, but smaller or historical farms will place a bucket under the spout.

Weather is an important factor for a successful maple syrup harvest. The best weather for production is when the temperature reaches 40 degrees during the day and 20 degrees during the night. This thawing and freezing cycle creates pressure changes inside the tree that causes sap flow. Sugar is stored below ground in the root system over the winter, and pressure changes transfer the sap above the ground. If it is too cold, the sap will take longer to run, and if it is very cold, the sap might not run at all. The average **sugaring season** (when sap is collected and maple syrup is made) is between 4-6 weeks, but can be as short as two weeks or as long as two months. The best sap is tapped in the early part of the sugaring season.

As the sap flows from a taphole, it is either drawn through tubing to storage tanks in the **sugar house** using a vacuum or it is collected in buckets and gathered by hand. From the storage tanks, the sap is often put through a reverse osmosis machine which takes some of the water from the sap. The sap is then put into an evaporator where it is boiled. As the water in the sap **evaporates**, the sap thickens and the sugar caramelizes. When the temperature reaches 219°F, the syrup is ready to be drawn off, filtered, adjusted for density, and graded for flavor and color.

The Sweetest Season ³

Materials:

- *The Sweetest Season* by Elissa Kerr
- Sticky notes
- Soil samples (Contact your local Soil and Water Conservation, as they usually have soil samples they can present or provide. You can also purchase sand and clay samples from National Agriculture in the Classroom.)
 - Sandy soil (<https://agclassroomstore.com/soil-sample-sand/>)
 - Clay soil (<https://agclassroomstore.com/soil-sample-clay/>)
 - Rocky soil
 - Dense soil
- Tub or vessel to hold soil samples
- Class schema map (included below)

Procedures:

1. Provide the students with a sample of maple syrup (without telling them what the sample is) to observe. Encourage them to taste it and consider how they would describe it, name it, and use it. Ask the students to think about how it was made.
2. Have students discuss their observations with a partner.
3. Record any schema (or things they think they already know) on the schema map using sticky notes.
4. Read the book *The Sweetest Season* by Elissa Kerr to the class.
5. Ask the following questions to help students recall information about how the maple syrup was made.
 - a. In what season did the story take place? (*Winter turning into spring.*)
 - b. What was the weather like the morning? (*snowy*)
 - c. What did they need to go into the woods? (tools and pails/buckets)
 - d. Where did the sap come from? (*From small holes that Dad drilled into the maple trees.*)
6. Show the students the soil samples—sandy or clayey soil; dark, wet soil; and rocky soil. Have the students feel and observe the different soil samples and predict which soil they think would be best for growing maple trees by placing a sticky note with their initials on the tub they choose. Clarify that maple trees grow best in sandy or clayey soil that is well-drained and loose. Compare the sandy or clayey soil to the soil in your area. Is it similar or different?
7. Using the information from the *Background Agricultural Connections*, discuss what kind of climate and temperatures are best for collecting sap for maple syrup. Ask the students if the climate in South Carolina is similar or different from the climate needed for harvesting sap from maple trees.
8. Ask the students, "Would our climate and soil be good for making maple syrup? Why or why not?"
9. Review what was learned about maple syrup and have students share their connections and suggest any new ideas they want added to the schema map.

Sugar Maples³

Materials:

- USDA Natural Resources Conservation maps for [sugar maple](#), [black maple](#), [red maple](#), [silver maple](#), and [box elder](#) trees
- Leaves from sugar maple, black maple, red maple, silver maple, and box elder trees or *Maple Tree Leaves* drawings, 1 leaf from each tree for every 2-3 students
- *Maple Tree Labels*
- *Sugar Maple Cross Section* photo
- 12"X18" brown construction paper, 1 piece per student
- Rulers, 1 per student
- Scissors, 1 per student
- Schema map

Procedures:

1. Using the United States Department of Agriculture (USDA) Natural Resources Conservation Service maps, identify where [sugar maple](#), [black maple](#), [red maple](#), [silver maple](#), and [box elder](#) trees grow in the United States. Determine which maple trees grow in your state.
2. Organize the class into groups of 2-3 students. Provide each group with leaves from sugar maple, black maple, red maple, silver maple, and box elder trees and the *Maple Tree Labels*. Use either real leaves that you have collected or the *Maple Tree Leaves* drawings. Ask the groups to match each leaf with the type of maple tree and review their matches as a class.
3. Ask the students which maple tree they think is most often used for harvesting sap to make maple syrup. Clarify that although maple syrup can be made from the sap of any maple tree species, most maple syrup is made from the sap of sugar maples due to its high sugar content.
4. Project the *Sugar Maple Cross Section* photo onto a large screen. Ask the students if they know how to tell how old a tree is. Show the tree rings on the photo and explain that one way to tell the age of a tree is to count the tree rings. Each ring shows a years worth of growth. A sugar maple needs to be between 10-20 inches in diameter before it is ready to be tapped. Trees of that size are usually about 30-40 years old.
5. Provide each student with a piece of 12"X18" brown construction paper, a ruler, and a pair of scissors. Have each student create a tree cross section (also known as a cookie) with a 10-12 inch diameter by measuring and marking a horizontal line 12 inches long in the middle of the paper. Find the center mark on their line (6 inches) and measure and mark a vertical 12" line through that mark (forming a +). Connect the outside points of each line by drawing a curved line between them to make a ring. Cut this out. This "tree cookie" shows the diameter of a sugar maple tree that is ready to be tapped.
6. Draw 30-40 tree rings on the tree cookie to represent the age of a tree that is ready to be tapped.
7. Review what was learned about sugar maple trees, and have students share their connections and suggest any new ideas they want added to the schema map.

Sap to Syrup³

Materials:

- *Sap to Syrup Timeline Cards* (cut apart), 1 set per group
- [How to Make Maple Syrup](#) video
- Schema map

Procedures:

1. Organize the class into groups of 4-5 students. Provide each group with a set of *Sap to Syrup Timeline Cards*. Have the groups work together to put the cards in the order they think is correct for making syrup from the sap of a sugar maple tree.
2. Show the video [How to Make Maple Syrup](#).
3. After viewing the video, allow time for groups to make any necessary adjustments to their timeline. As a class, review the steps and check that the group timeline cards are in the following order:
 - a. Tap a sugar maple tree
 - b. Collect the sap in buckets or in tubes
 - c. Store the sap in a storage tank in the sugar house
 - d. Boil the sap to let the water evaporate and create syrup
 - e. Filter the syrup
 - f. Bottle the maple syrup
4. Review what was learned about making maple syrup, and have students share their connections and suggest any new ideas they want added to the schema map.

Extension Activities:

- Contact a local nature center, naturalist, or maple syrup producer to follow-up with a presentation showing a sap sample, tools used, and share more details about the production and use of maple syrup. Schedule a visit to a site to experience tapping trees firsthand.
- Conduct a taste test to compare pure maple syrup to other types of syrup available for purchase at local grocery stores. Look at the ingredients listed on the labels to compare and contrast.

Suggested Companion Resources:

- [At Grandpa's Sugar Bush](#) (books)
- [Maple Syrup from the Sugarhouse](#) (book)
- [Sugar Snow](#) (book)
- [Sugarbush Spring](#) (book)
- [Sugaring](#) (book)
- [Sap in the Sugar Maple Tree](#) (video)
- [Tapping Into The Maple Tradition](#) (video)
- [Additional Lesson Plans from New Hampshire Agriculture in the Classroom](#)
- [Additional Lesson Plans from New York Agriculture in the Classroom](#)

Sources/Credits:

1. Kerr, Elissa. *The Sweetest Season*, Scenic Route Publishing, 2019.
2. North Carolina Ag in the Classroom
3. Minnesota Ag in the Classroom

Suggested SC Standards Met:

English/Language Arts:

- K.RL.5.1 With guidance and support, ask and answer who, what, when, where, why, and how questions about a text; refer to key details to make inferences and draw conclusions in texts heard or read.
- K.RL.5.2 With guidance and support, ask and answer questions to make predictions using prior knowledge, pictures, illustrations, title, and information about author and illustrator.
- K.RL.6.1 Describe the relationship between illustrations and the text.

- K.RL.7.1 With guidance and support, retell a familiar text; identify beginning, middle, and end in a text heard or read.
- K.RL.7.2 Read or listen closely to compare familiar texts.
- K.RL.8.1 With guidance and support, read or listen closely to: a. describe characters and their actions; b. compare characters' experiences to those of the reader; c. describe setting; d. identify the problem and solution; and e. identify the cause of an event.
- 1.RL.5.1 Ask and answer who, what, when, where, why, and how questions to demonstrate understanding of a text; use key details to make inferences and draw conclusions in texts heard or read.
- 1.RL.5.2 Make predictions using prior knowledge, pictures, illustrations, title, and information about author and illustrator.
- 1.RL.6.1 Describe the relationship between the illustrations and the characters, setting, or events.
- 2.RL.5.1 Ask and answer literal and inferential questions to demonstrate understanding of a text; use specific details to make inferences and draw conclusions in texts heard or read.
- 2.RL.5.2 Make predictions before and during reading; confirm or modify thinking.
- 2.RL.8 Analyze characters, settings, events, and ideas as they develop and interact within a particular context.

Social Studies:

- K.G.2 Utilize sources of geographic information (e.g., digital sources, maps, or photographs/images) to define and identify cultural and/or natural features.
- 1.G.2 Identify and describe the geographic location of South Carolina in relation to the rest of the United States through the use of various maps and geographic tools.
- 2.G.1 Identify the geographic location of the U. S. in relation to the rest of the world.
- 2.G.3 Explain how the distribution of human features, physical features, and natural resources within the U. S changes over time and impacts economic activity.

Science:

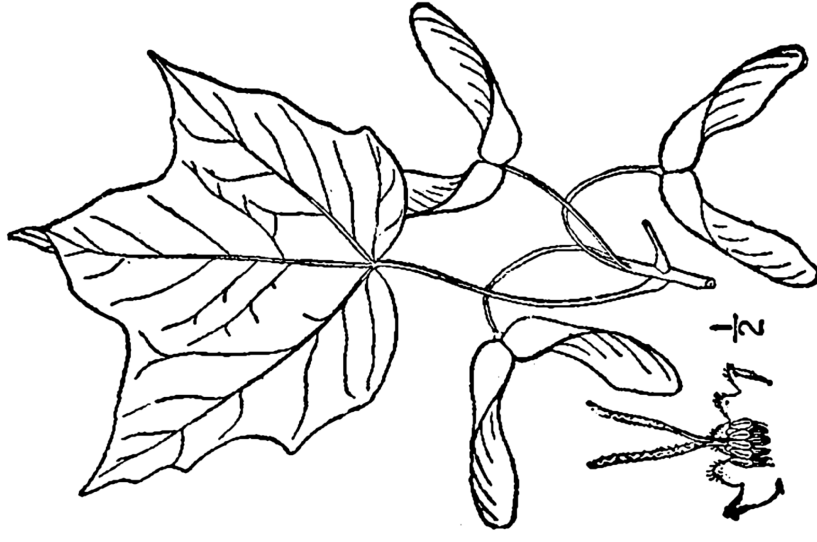
- K.L.2A.1 Obtain information to answer questions about different organisms found in the environment (such as plants, animals, or fungi)
- K.E.3A.3 Obtain and communicate information to support claims about how changes in seasons affect plants and animals.
- 1.E.4A.1 Analyze and interpret data from observations and measurements to compare the properties of Earth materials (including rocks, soils, sand, and water).
- 1.L.5B.2 Develop and use models to compare how the different characteristics of plants help them survive in distinct environments (including deserts, forests, and grasslands).
- 2.E.2A.2 Analyze local weather data to predict daily and seasonal patterns over time.

Schema

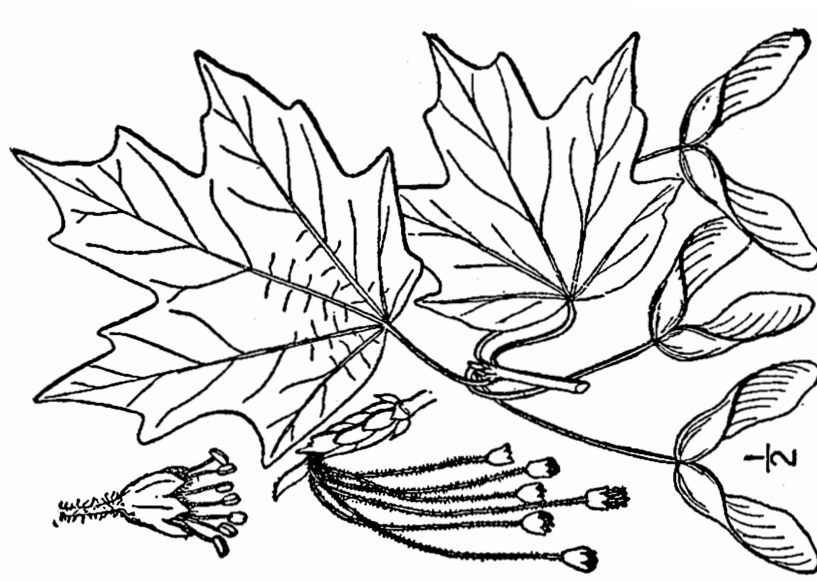
Misconceptions

New Learning

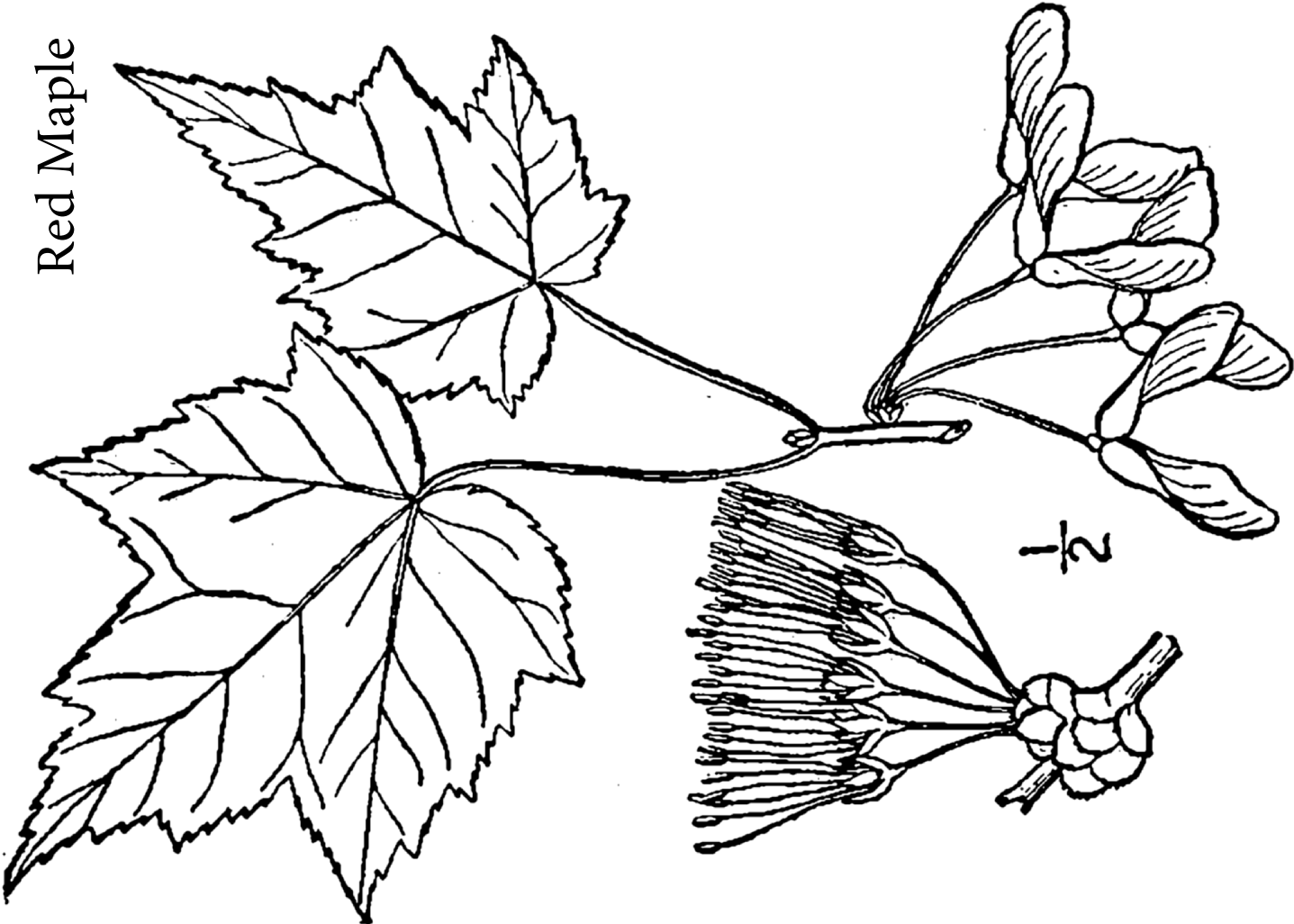
Black Maple



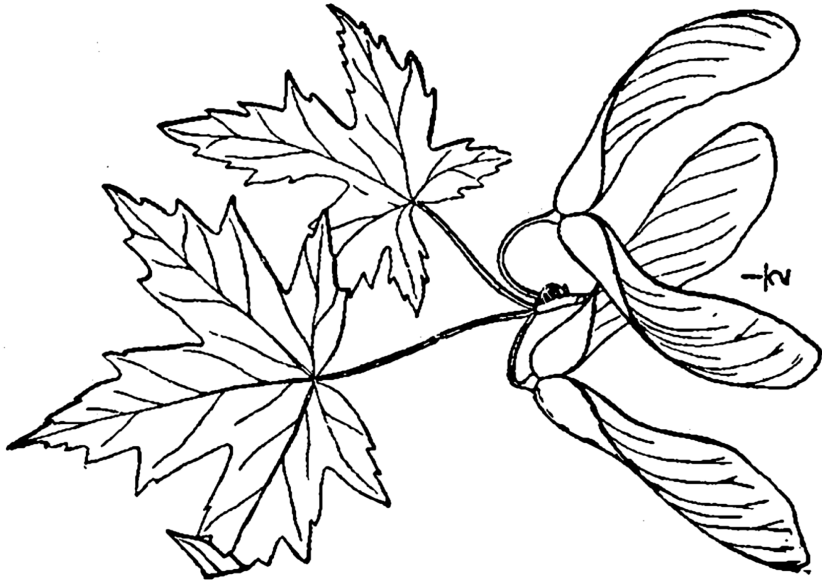
Sugar Maple



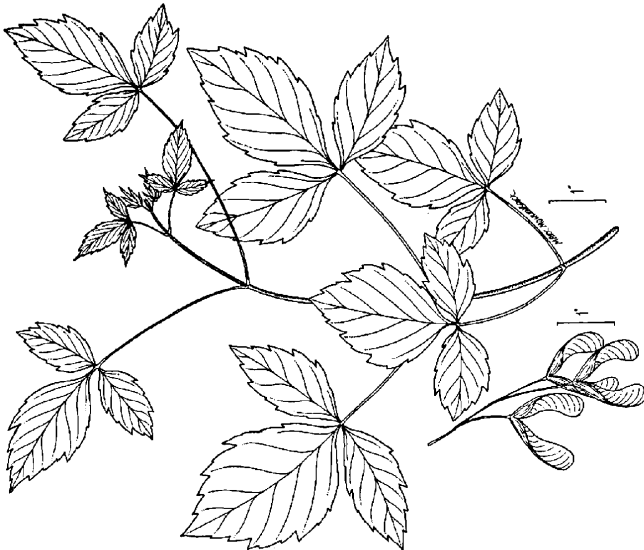
Red Maple



Silver Maple



Box Elder





Sugar Maple



Black Maple



Red Maple



Silver Maple



Box Elder

Sugar Maple Cross Section





Tap the sugar maple tree



Collect the sap in buckets or tubes



Store the sap in a storage tank in the sugar house



Boil the sap to let the water evaporate and create syrup



Filter the syrup



Bottle the maple syrup