



The Book Planter



Ag in the Classroom

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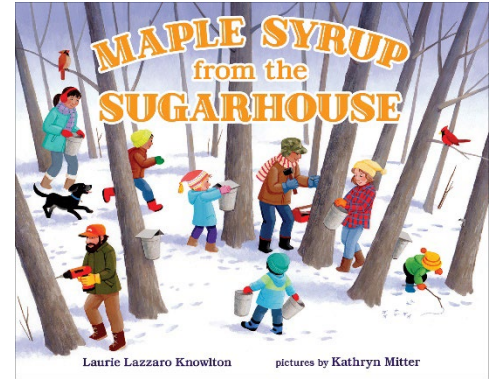
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Maple Syrup from the Sugarhouse

By: Laurie Lazzaro Knowlton

Maple syrup starts as sap from trees. But what happens next? Kelsey and her father begin harvesting sap from sugar maple trees. Join their family and friends in this farm-to-table process of turning sap into maple syrup.

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



Fun Facts

- Maple syrup is made by boring holes, or tapping, into maple trees and attaching tubes that siphon sap out of trunks.¹
- In cold climates, maple trees store their starch in their roots for the winter. When spring comes, the starch is converted into sugar and flows upward from the roots through the trunk to feed the canopy. Maple syrup producers must catch the sap on the move!¹
- Maple syrup is typically produced in cooler regions of the United States, such as Vermont and parts of New England.²
- Moravian Settlers settled in the Piedmont region of North Carolina in the mid-eighteenth century and produced maple syrup; however, Native Americans in the region had been producing maple syrup long before the settlers arrived.²
- There are maple syrup orchards and sugarworks across all regions, in about 26 counties of North Carolina.³

Vocabulary

Sugar bush: a group of Sugar Maples. Sugar bushes can range in size from as little as fifty trees to as large as thousands of trees.

Sugarhouse: a building where maple syrup is made.

Acer saccharum: the botanical name of a Sugar Maple.

Hydrometer: a gauge used to measure the density of the maple syrup by determining how much water is in the maple syrup. In the book, this is referred to as a “sugar gauge.”

Evaporate: to lose or cause to lose moisture; to cook until most of the liquid is vapor.

Evaporator pan: the structure used to boil the tree sap in order to remove water from it.

Tap: the hole put in a tree to extract sap.

Sap: the fluid made up mostly of water with dissolved sugars that circulate inside a plant or tree.

Sugarworks: places or farms that produce maple syrup and/or products made from maple syrup.

Interest Approach—Engagement⁴

1. Provide 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. Organize the students into pairs. Invite the students to work together to create a digital recording or video of their observations and inquiry ideas using [Seesaw](#) or an iPad or tablet. Their recordings should:
 - a. Show a picture of their sample.
 - b. Record their voice explaining their observations and ideas about maple syrup, its uses, and its origin. They will share their video with another group to compare observations and ideas, and brainstorm more details about their sample.
3. Identify the sample as maple syrup. Using the *KWL Chart* ([Links](#)), create a class KWL chart about maple syrup.

Activity 1: *Maple Syrup from the Sugarhouse*⁴

Materials:

- *Maple Syrup from the Sugarhouse* by Laurie Lazzaro Knowlton
 - 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 in the [Soil Samples \(Soil Texture\) Kit](#) from National Agriculture in the Classroom.)
 - Sandy soil
 - Clay soil
 - Rocky soil
 - Dense soil
 - Tub or vessel to hold soil samples
 - KWL Chart from **Interest Approach—Engagement**
1. Read the book, *Maple Syrup from the Sugarhouse* by Laurie Lazzaro Knowlton.
 2. Ask the following questions to help students recall the information about how maple syrup was made.
 - a. In what season did the story take place? (Winter turning spring...the snow is starting to melt.)
 - b. How is sap made into syrup? (Daddy boils the sap.)
 - c. Where did the sap come from? (From small holes drilled into the Maple trees.)

3. Show students soil samples—sandy or clay soil; dark and 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 Maples grow best in sandy or clay soil that is well-drained and loose. Compare the sandy or clay soil to soil in your area. Is it similar or different?
4. Tell students, “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.”
5. Ask students, “What is the climate like where we live?” Discuss if the climate is similar or different from the climate needed to harvest sap from Maple trees.
6. Ask, “Would our climate and soil be good for making maple syrup? Why or why not?”
7. Review what was learned about maple syrup and have students share their connections and suggest any new ideas they want added to the KWL chart from the **Interest Approach—Engagement**.

Activity 2: Sugar Maples⁴

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 (within activity)
- 12"X18" brown construction paper, 1 piece per student
- Rulers, 1 per student
- Scissors, 1 per student
- K-W-L chart from **Interest Approach — Engagement**

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 year's 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 KWL chart from the **Interest Approach — Engagement**.



Activity 3: Maple Math⁶

Background Knowledge:

- Sugar Maples average about 1ft. of height growth and 0.2 in. of diameter growth each year for the first 30 – 40 years.
 - After about 140 – 150 years, height growth ceases and radial growth slows greatly.
 - It can live as long as 300 – 400 years.
 - Individual trees range from 70 – 110 ft. tall with diameters at breast height (dbh) of 20 – 37 in.
1. Your school is planting 3 sugar maple trees. They will use them to teach students about a sugarbush. The trees are each 3-inches in diameter. A tree must be 12-inches in diameter to tap. When will the trees be large enough to tap?
 2. It takes approximately 40 gallons of maple sap to produce 1 gallon of maple syrup. How much maple syrup is made from a gallon of maple sap?
 3. You intend to give 4 neighbors each a quart of homemade maple syrup. How many gallons of sap will you need to collect?

What other math problems can students create with the data shared? Organize a Think-Pair-Share, and have students work with a partner to create new math problems for the class to solve.

Other Enriching Activities:⁴

- 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.
- A legend is a very old, unverifiable story passed down from one generation to the next. Share [The Legend of Chief Woksis](#), an Iroquois legend about the discovery of maple syrup, with the class. Ask the students if they think the story could have actually taken place.
- 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.

Recipe: Microwave Maple Pudding⁵

2 cups maple syrup

1 cup milk

1 egg

3 heaping teaspoons cornstarch

Mix syrup and egg well together. Dissolve the cornstarch in the milk. Mix together well and put into a microwave bowl. Cook for 10 minutes at Level 8 (medium-high level), stirring every 3 minutes.

Links

- Maple Syrup: How It's Made (video)
<https://www.youtube.com/watch?v=sLkp6lkQuo>
- FarmHer Episode with Erica Welch visiting NY maple syrup farm (videos)
 - Part 1: <https://www.youtube.com/watch?v=45XEXB2WDWM>
 - Part 2: <https://www.youtube.com/watch?v=ASSn3Fps2m8>
 - Part 3: <https://www.youtube.com/watch?v=ONfbSdZ4DxU>
- How to Make Maple Syrup: Ask This Old House (video)
<https://www.youtube.com/watch?v=sZ-xrBc3GwY>
- *KWL Chart*
<https://drive.google.com/file/d/1UtJF6nC7RCgSo8ExsGqwFKPji4CCTvCv/view?usp=sharing>

Sources

1. https://journalnow.com/lifestyles/food/making-maple-syrup-flow-down-south/article_b30e1f9c-e49e-5643-b856-d2dcb46c6c89.html
2. <https://www.ncpedia.org/maple-syrup>
3. <http://maplesyrupfarms.org/NC.php>
4. <https://www.agclassroom.org/matrix/lesson/672/>
5. <https://maplesyrupfest.com/fun/>
6. https://www.dec.ny.gov/docs/lands_forests_pdf/sugarmaplemath.pdf

K-5 Subject Areas

Reading, Writing, Speaking and Listening, Science, Social Studies, and Math

NC Standard Course of Study

Reading

- **RL.K.1** With prompting and support, ask and answer questions about key details in a text.
- **RL.K.2** With prompting and support, retell familiar stories, including key details.
- **RL.K.3** With prompting and support, identify characters, settings, and major events in a story.
- **RL.1.1** Ask and answer questions about key details in a text.
- **RL.1.2** Retell stories, including key details, and demonstrate understanding of their central message or lesson.
- **RL.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
- **RL.4.1** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- **RL.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text
- **RI.K.1** With prompting and support, ask and answer questions about key details in a text.
- **RI.K.2** With prompting and support, identify the main topic and retell key details of a text.
- **RI.1.1** Ask and answer questions about key details in a text.
- **RI.1.2** Identify the main topic and retell key details of a text.
- **RI.2.1** Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.
- **RI.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
- **RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea.
- **RI.4.1** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- **RI.4.2** Determine the main idea of a text and explain how it is supported by key details; summarize the text.
- **RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

Writing

- **W.K.6** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question
- **W.1.6** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
- **W.2.6** Recall information from experiences or gather information from provided sources to answer a question.
- **W.3.6** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

Speaking and Listening

- **SL.K.1** Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups.
- **SL.K.2** Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.
- **SL.K.3** Ask and answer questions in order to seek help, get information, or clarify something that is not understood.
- **SL.K.4** Speak audibly and express thoughts, feelings, and ideas clearly.
- **SL.1.1** Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. a. Follow agreed-upon rules for discussions. b. Build on others' talk in conversations by responding to the comments of others through multiple exchanges. c. Ask questions to clear up any confusion about the topics and texts under discussion.
- **SL.1.2** Ask and answer questions about key details in a text read aloud or information presented orally or through other media.
- **SL.2.1** Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups. a. Follow agreed-upon rules for discussions. b. Build on others' talk in conversations by linking their comments to the remarks of others. c. Ask for clarification and further explanation as needed about the topics and texts under discussion.
- **SL.2.2** Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.
- **SL.2.4** Tell a story or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent and complete sentences.
- **SL.3.2** Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
- **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly in complete sentences at an understandable pace.
- **SL.4.2** Paraphrase portions of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
- **SL.4.4** Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; adjust speech as appropriate to formal and informal discourse.
- **SL.5.2** Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
- **SL.5.4** Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; adapt speech to a variety of contexts and tasks.

Science

- **K.P.2** Understand how objects are described based on their physical properties and how they are used.
- **1.E.2** Understand the physical properties of Earth materials that make them useful in different ways.
- **1.L.1** Understand characteristics of various environments and behaviors of humans that enable plants and animals to survive.
- **3.L.2** Understand how plants survive in their environments.
- **5.P.3** Explain how the properties of some materials change as a result of heating and cooling.
- **5.E.1** Understand weather patterns and phenomena, making connections to the weather in a particular place and time.
- **5.L.2** Understand the interdependence of plants and animals with their ecosystem.

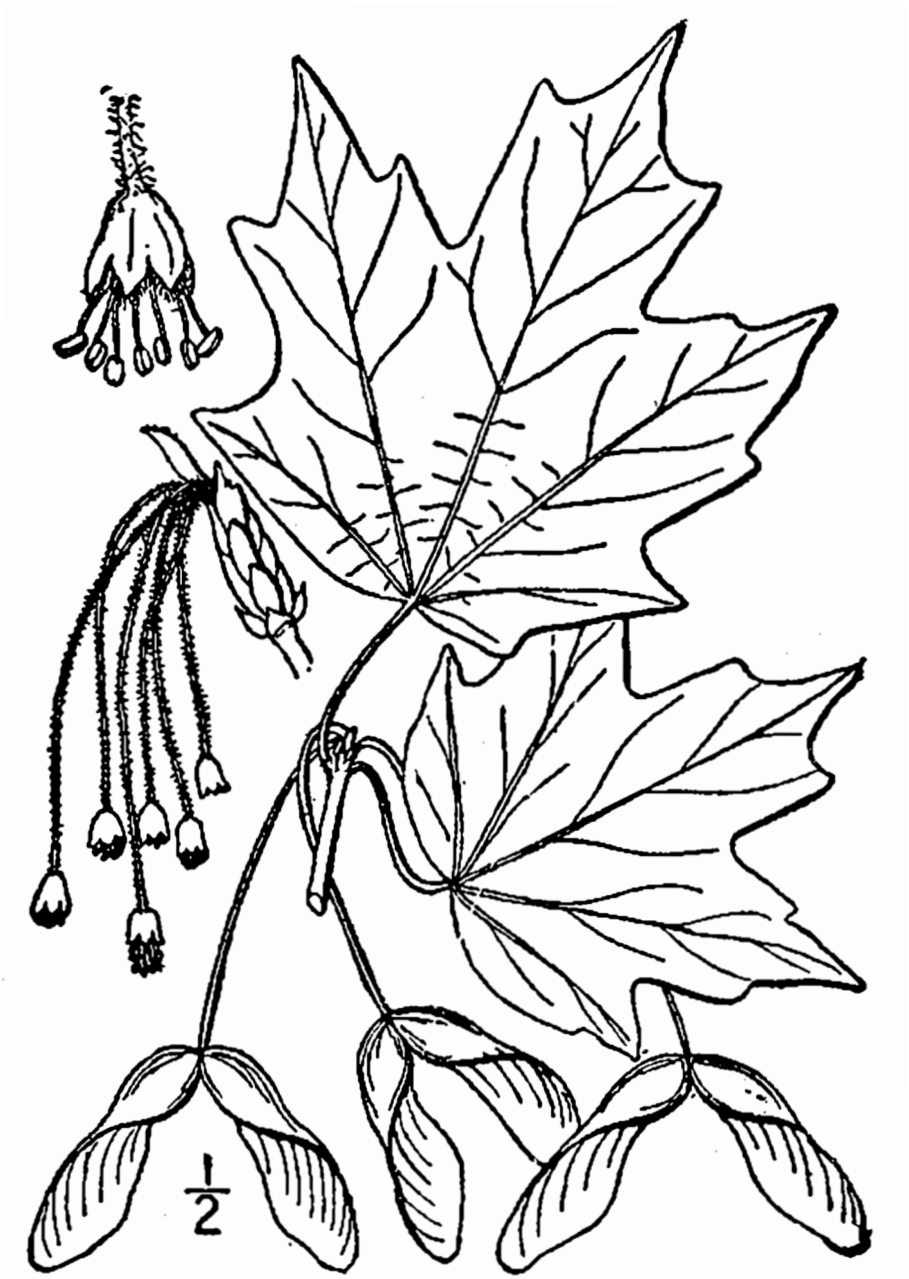
Social Studies

- **K.G.2** Understand the interaction between humans and the environment.
- **1.G.2** Understand how humans and the environment interact within the local community.
- **2.G.2** Understand the effects of humans interacting with their environment.

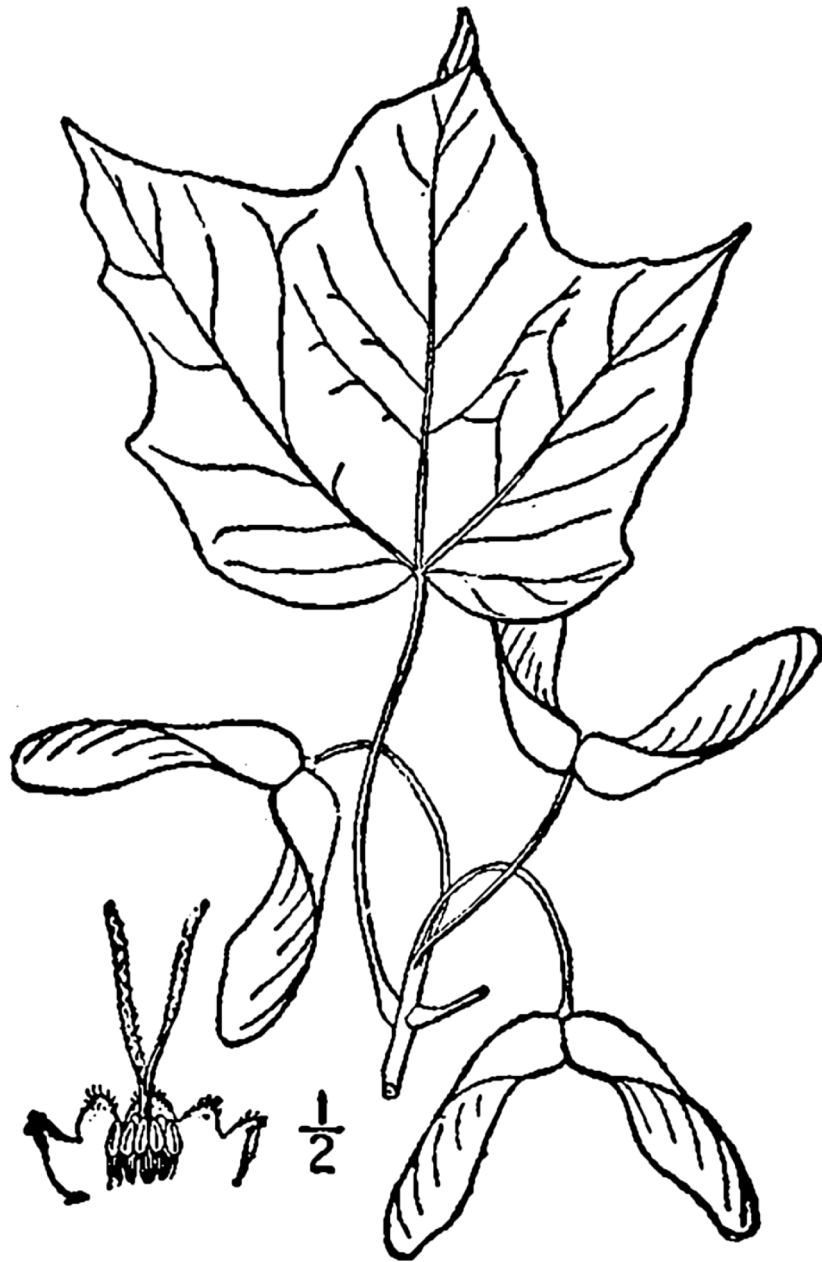
Math

- **K.MD.1** Describe measurable attributes of objects; and describe several different measurable attributes of a single object.
- **NC.K.G.5** Model shapes in the world by:
 - Building and drawing triangles, rectangles, squares, hexagons, circles.
- **NC.1.OA.1** Represent and solve addition and subtraction word problems, within 20, with unknowns, by using objects, drawings, and equations with a symbol for the unknown number to represent the problem, when solving:
- **NC.1.OA.3** Apply the commutative and associative properties as strategies for solving addition problems.
- **NC.1.OA.4** Solve an unknown-addend problem, within 20, by using addition strategies and/or changing it to a subtraction problem.
- **NC.2.MD.1** Measure the length of an object in standard units by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
- **NC.3.MD.2** Solve problems involving customary measurement.

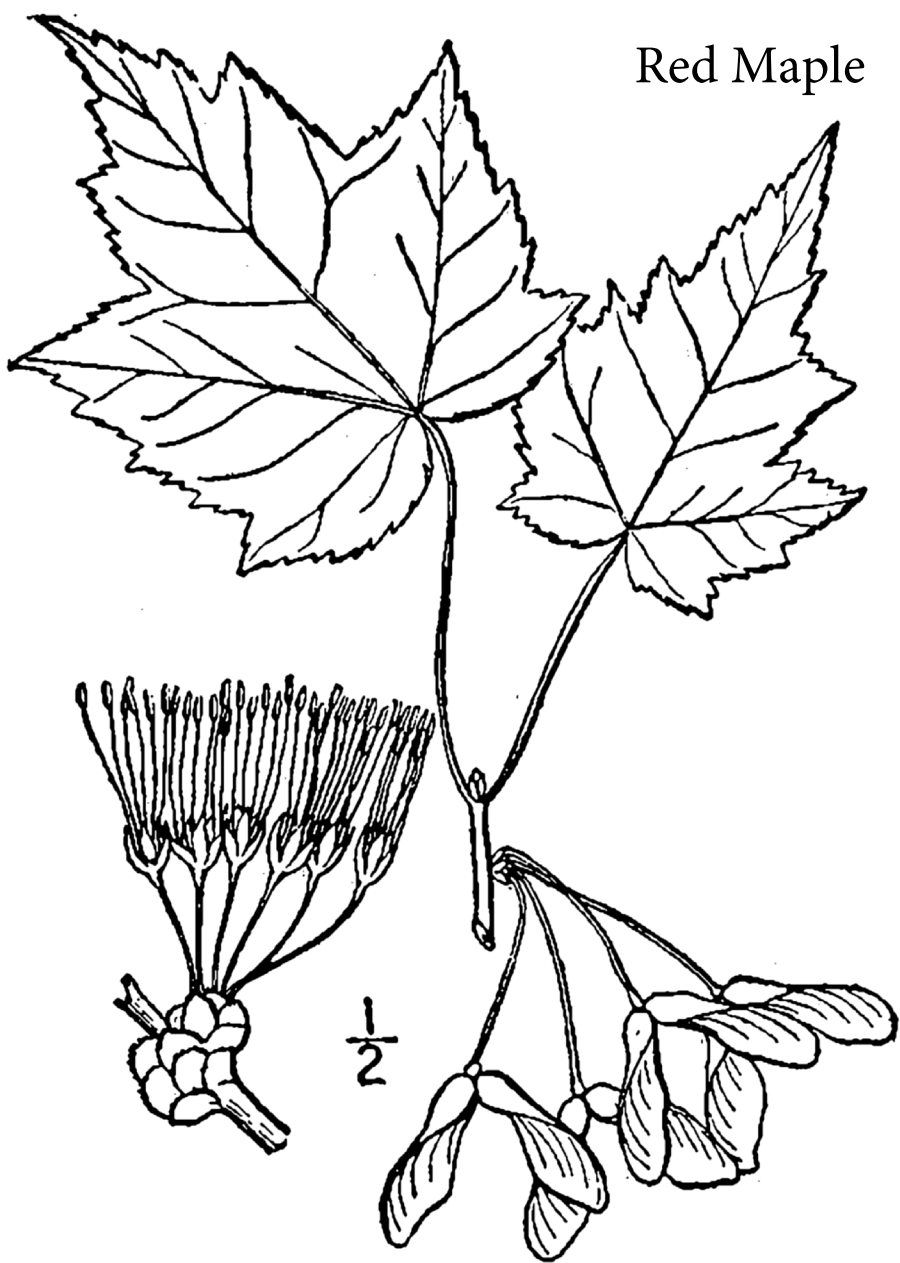
Sugar Maple



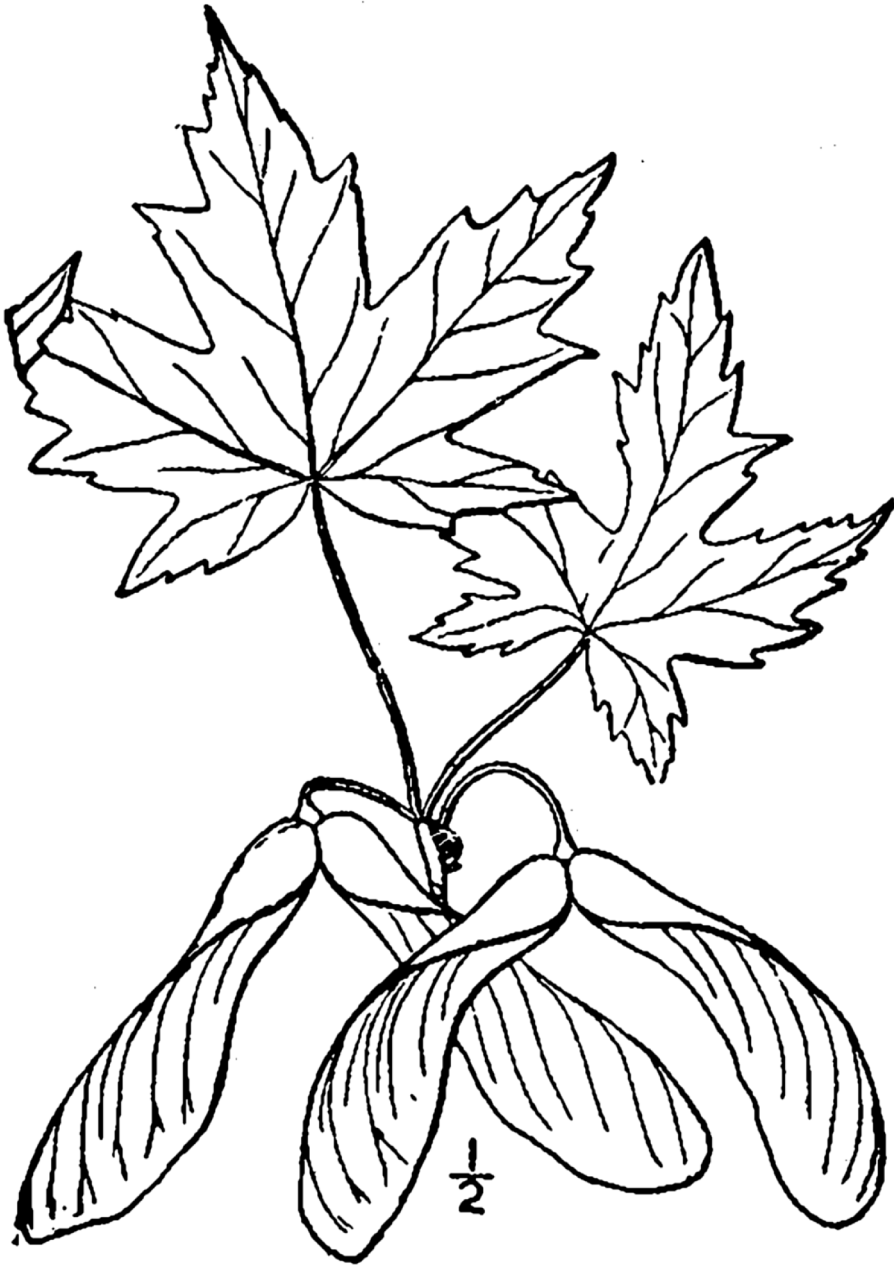
Black Maple



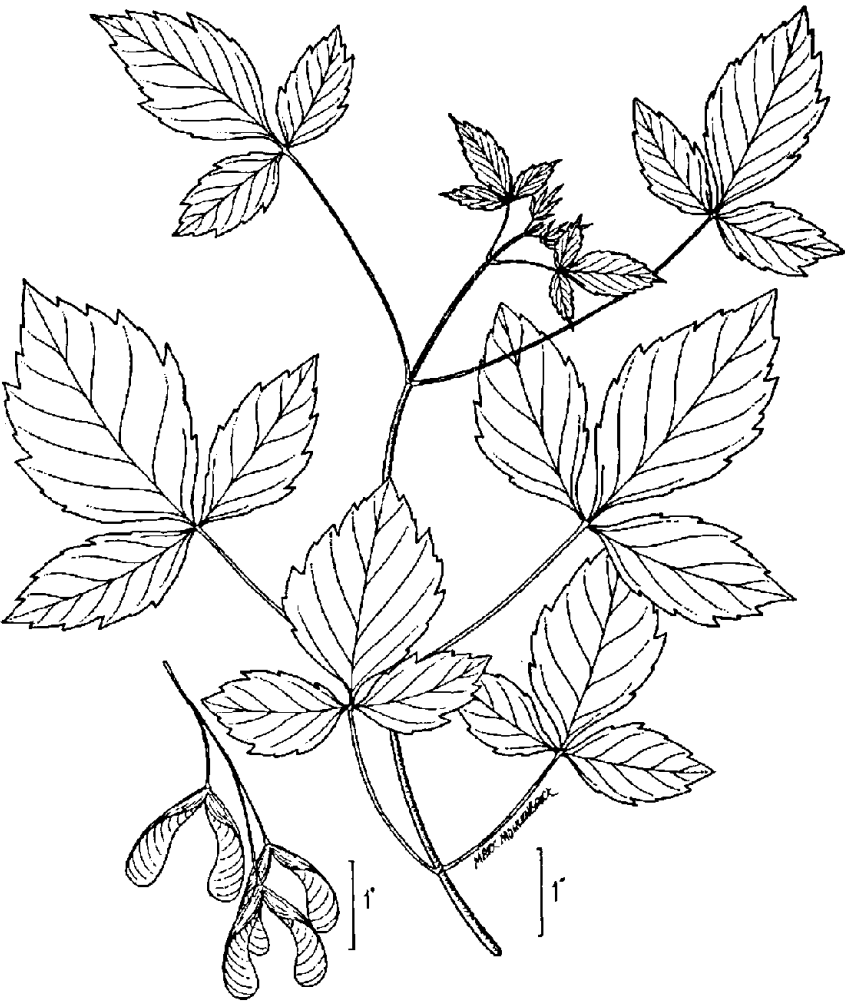
Red Maple



Silver Maple



Box Elder





Sugar Maple



Black Maple



Red Maple



Silver Maple



Box Elder