

# From Sap to Syrup



Four 25 to 30-minute class periods

Grades K-2

## Purpose

In this lesson, students will recognize how the geography and climate in Minnesota allow for the growth of maple trees and the process of making syrup. They will also identify the characteristics of maple trees that produce the best sap for making maple syrup, and name the steps in the process to create syrup from sap.

**Teacher Note:** This lesson would work well within a learning focus on the history of Minnesota. This Minnesota learning focus can be divided into six essential topics: climate, land/resources, jobs, wildlife, symbols, and famous people. Set up small groups to research each topic. This From Sap to Syrup lesson could be used after the groups researching climate and land/resources have presented their research to the class. Maple syrup is one of our state's products because we have the climate that allows for the growing of the maple trees (natural resource).

## Academic Content Standards

### MN K-12 Academic Standards and Benchmarks

#### Social Studies

- 2.3.4.9.1** Identify causes and consequences of human impact on the environment and ways that the environment influences people.

#### Science

- 2.1.1.2.1** Raise questions about the natural world and seek answers by making careful observations, noting what happens when you interact with an object, and sharing the answers with others.
- 2.4.1.1.1** Describe and sort plants into groups in many ways, according to their physical characteristics and behaviors.

### Common Core Connections

#### Reading

##### CCSS.ELA-LITERACY.RI.2.3

Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.



## Speaking and Listening

### CCSS.ELA-LITERACY.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.

### CCSS.ELA-LITERACY.SL.2.1.B

Build on others' talk in conversations by linking their comments to the remarks of others.

### CCSS.ELA-LITERACY.SL.2.2

Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

## National Agricultural Literacy Outcomes

### Agriculture and the Environment

- Identify natural resources (T1.K-2 c)
- Provide examples of how weather patterns affect plant and animal growth for food (T1. K-2 d)

### Plants and Animals for Food, Fiber & Energy

- Explain how farmers/ranchers work with the lifecycle of plants and animals (planting/ breeding) to harvest a crop (T2.K-2 a)
- Identify examples of feed/food products eaten by animals and people (T2.K-2 c)

## Materials

A PowerPoint Presentation that can be used to support all of the lesson activities can be found at: <https://minnesota.agclassroom.org/educator/sclb.cfm>

### Interest Approach/Engagement:

- Locally grown maple syrup (enough for each student to have a small portion on a plate or cup)
- Paper plates or cups for each student (to hold the syrup sample)

### Activity 1:

- Devices (ipad, tablet, etc.) for individual recording of observations
- Large chart paper and markers (class chart) and/or small paper or notebooks and pencils (individual student charts)

### Activity 2:

- Sugar Snow audio (*My First Little House Books Series*) by Laura Ingalls Wilder using link accessible at <https://minnesota.agclassroom.org/educator/sclb.cfm>
- 3 tubs of soil: 1 - sandy or clayey soil, 2 - wet "black dirt" soil, 3 - rocky soil
- Post-It notes (1 for each student)
- Chart made in Activity 1
- Map of the U.S. to show other states that match our climate (optional)



### Activity 3:

- Resource book or website that shows maple trees and their characteristics. Information on identifying maple trees can be found on the University of Minnesota's Extension website focusing on gardening: <http://www.extension.umn.edu/garden/>
- Leaves from a sugar maple tree, a red maple, a silver maple, and a boxelder (these should be dried and preserved if lesson is not done when leaves are on trees) OR leaf patterns that match these characteristics made from paper material. (1 leaf from each tree for every 2-3 students)
- Brown paper
- Rulers
- Pencils
- Scissors

### Activity 4:

- Paper or small whiteboards
- Large chart paper, SMARTboard, or class white board
- How to Make Maple Syrup video at <https://minnesota.agclassroom.org/educator/sclb.cfm>
- Pencils, markers, and crayons
- The tree ring made in Activity 3

## Vocabulary

**Natural Resource** – materials found in nature that can be used to make useful products

**Climate** – the weather conditions over a long period time, like throughout the year

**Maple** – a type of tree with lobed leaves and colorful autumn leaves used for timber or syrup

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

**Process** – a series of steps or actions taken in order to achieve a particular end/result

**Stile** – a small wooden peg put in a hole drilled into a tree and used to draw out liquid (sap)

**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

## Culture, Society, Economy & Geography

- Identify plants and animals grown or raised locally that are used for food clothing, shelter, and landscapes **(T5.K-2 d)**
- Trace the sources of agricultural products (plant or animal) used daily **(T5.K-2 f)**

## Background — Agricultural Connections

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 cooler, wetter climates. They like soil that is sandy or clayey with loose texture and is well-drained. There are at least a hundred species of maple trees, and fourteen of these are found in the United States with the majority of them found in the Northeast to Midwest sections of our country. In Minnesota, the four types of maple trees that grow and are used for making maple syrup are the sugar maple

(hard maple), the red maple (soft maple), silver maple, and the boxelder. Most maple syrup is made from the sugar maple due to its higher sugar content. The sugar content in the other species is usually lower so it takes approximately twice as much to yield the same amount of syrup as from the sap of the sugar maple.

A maple tree should be at least 12 inches in diameter to be tapped for sap. A tree this size would be about 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 by the next year. However, 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 handle three taps.

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 daytime and 20 degrees during the nighttime hours. This thawing and freezing cycle creates pressure changes inside the tree that makes sap flow. Sugar is stored below ground in the root system over the winter, and pressure changes transfers 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 is 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.

The first maple syrup production is often credited to the indigenous tribes living in the Northeast. Although there are differing ideas about if they actually used the process of creating syrup by boiling the sap down into syrup, it is believed that the early European





explorers learned the technique for making syrup from the Native Americans. There are many legends about the first discovery of maple syrup with a famous one from the Northeastern Iroquois tribe.

Almost every person enjoys maple syrup in their diet. Agriculture, through the growth of maple trees, is the means by which we get this tasty addition to our pancakes, waffles and other food. It is important that we all respect and take care of our planet so that there are places for trees to be planted. Also, so that the climate needed for this growth is not changed to affect the growth of maple trees and the production of maple syrup and other farm products. We take care of our natural resources so that we may continue to enjoy agricultural products long into the future.

## Did you know?

- It takes about 40 gallons of sap to make 1 gallon of syrup.
- In 2013, over 3 million gallons of maple syrup were produced in the United States. Vermont led the nation by producing 40% of the United States' production of maple syrup.
- The First American Tribes of the Northeast region are credited with making the first maple syrup.

## Interest Approach - Engagement

Students will be given a sample of maple syrup (without telling them what the sample is) to observe using their senses. Encourage them to taste it and, in their mind, describe it, name it, give their preference for how they like to use it, and begin to think about how it was made.

## Procedures:

### Activity 1

### Sharing observations and connections to maple syrup

1. Begin with the Interest approach - engagement activity.
2. Students will create a digital recording of their observations and inquiry ideas (from the engagement activity) using Seesaw (<https://web.seesaw.me/>) or video on iPad to both:
  - 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 a buddy to compare observations and ideas, and brainstorm more details about their maple syrup sample.
3. Identify the sample as maple syrup. Create a class chart, or students could make their own individual chart. Include the headings below (this can serve as a type of K-W-L activity). Record the information volunteered by students in this chart.

#### Maple Syrup

Descriptions

Uses

What we KNOW

## Activity 2

### Using literature to introduce what is needed to make maple syrup

1. Class will listen to *Sugar Snow* (My First Little House Books Series) by Laura Ingalls Wilder using the link at <https://minnesota.agclassroom.org/educator/sclb.cfm>

**Teacher Note:** *If using this lesson as part of a Minnesota history learning focus, this book can integrate Laura Ingalls Wilder as a famous author in Minnesota history. You can provide a brief explanation about her family's travels and settling here for a period of time, as well as her recollection of her early life in the Laura Ingalls Wilder historical fiction book series. You can also use map skills to have students locate Walnut Grove, where the Ingalls family lived, and share about historical site and annual pageant performed there. <http://walnutgrove.org/pageant.html>*

2. Use this information to introduce Minnesota's **climate** (or, if already introduced earlier in a Minnesota or weather unit, review the meaning of **climate** and what our weather is like throughout the year) taking ideas from the students as you reinforce our seasons and the weather (temperature, precipitation) during each.

**Teacher Note:** *In our classroom, I have the students divide into groups and give each an essential topic about Minnesota and its history to research and report to the class (Ex: climate, land and resources, jobs, symbols, wildlife, and famous people); so at this time, I would have the climate group lead this discussion/review).*

3. Ask questions to help students recall Pa's information from the *Sugar Snow* story about how the maple syrup and sugar was made and what was needed (eg. snow, maple trees, etc.).
4. Share information about good temperatures for collecting sap (see information in Background: freezing temperatures of 20 degrees at night with 40 degree temperatures in the day) and relate this to our late winter/early spring climate.
5. Show samples of soil in tubs: sandy and clayey soil, soil that is mostly wet black dirt, and soil that is very rocky.
  - a. Share that maple trees grow best in sandy and clayey soil that is well-drained and loose.
  - b. Have students feel and observe the different soil samples and predict which might be best for growing maple trees by placing a Post-It note with their initials on the tub they choose
  - c. Discuss why the sandy-clay soil might be best and compare it to the soil they may know from their yards or gardens
6. Ask students:
  - a. Would our climate allow for making maple syrup based on Pa's explanation in *Sugar Snow*? Ask students for a show of hands or hand gestures to show agreement or disagreement. Have students share their reasons and help them come to the conclusion that our climate has snow and changing temperatures in late winter and early spring to allow for this.



- b. What other areas or states might you live where you could make maple syrup?
7. Review what was learned today about maple syrup and have students share their connections and suggest any new ideas they want added to the chart made earlier and add them.

### Activity 3

### Gaining facts about maple trees

1. Ask students to recall the resources named in yesterday's story that are needed to make maple syrup. Focus on the type of tree used to make the syrup (the **maple tree** as a **natural resource** that likes sandy soil and cooler climates), what they know about this type of tree, and any connections.

**Teacher Note:** Here again, if the students have done research on the land and resources found in Minnesota, the group of students who focused on this topic would share about the forests/trees as one of our main natural resources and why they grow well here.

2. Introduce the 4 different types of maple trees found in Minnesota (sugar, red, silver, and boxelder) and show the characteristics that help identify them. Information on identifying maple trees can be found on the University of Minnesota's Extension website focusing on gardening: <http://www.extension.umn.edu/garden/> You can also use a reference book on trees to show each and the leaf characteristics).
3. Use either real leaves that you have collected earlier and preserved OR paper patterns of the shape of each leaf to have students identify each leaf with the type of maple tree.
4. Share the fact that the sugar maple is the type of tree that is best used to create maple syrup. Have students find a leaf pattern that identifies the sugar maple. Have students describe the leaf and the sugar maple's other characteristics to a buddy.
5. Have each student create a tree ring with a 12" diameter by giving each a piece of brown paper. They will measure and mark a horizontal line 12" long in the middle of the paper. Find the center 6" mark on their line 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.
6. Sketch a sugar maple leaf on one side of the ring (can draw freehand or use one of the patterns you used earlier to identify this tree). Write the characteristics that help identify a sugar maple tree on the leaf.
7. Share that a sugar maple will be close to the size of this tree ring before it is tapped, and this tree will be about 40 years old. Explain that tapping trees for sap does no permanent damage to the tree.

### Activity 4

### Showing the steps used to produce syrup from sap

1. Students work in pairs to recall the **process** relayed by Pa in the book, Sugar Snow, or what they already know about how sap is collected from sugar maple trees. Have them draw these steps in order, in whatever form they choose (list, diagram, web, etc.), on either a small white board or a piece of paper.

## Activity 5

2. Show the video How to Make Maple Syrup. The link is accessible at <https://minnesota.agclassroom.org/educator/sclb.cfm>
3. Focus on the main steps in the process of tapping maple trees for sap and turning it into maple syrup (shown in video). Have students give their input, as you create a class diagram, web, or list that includes:
  - a. identifying and tapping a sugar maple tree with a **stile**
  - b. collecting the **sap** either in buckets or in tubes connected to several trees
  - c. storing the sap in large tanks either in the woods or in storage houses
  - d. boiling the sap to let the water **evaporate** and create the syrup
  - e. bottling the **maple syrup** to be used
4. Have students work with their partner from Step 1 in Activity 4 to review the list, diagram, etc. that they created. Ask the pairs of students to add to this list, diagram, etc. to make sure they have the five main steps from above. The students should use the specific vocabulary (stile, sap, evaporate, maple syrup, etc.) in this list, diagram, etc. that they create.

## Activity 6

### Review

1. Review the steps used in making maple syrup - class diagram made in Activity 4.
2. Review the chart made in Activity 1 and add new information
3. Each student will recreate their sap-to-syrup process steps on the tree ring they made earlier.
4. Students can add a picture with a recording in Seesaw or other video recording technology to their digital portfolio explaining the process and what they have learned or create a Google Slide presentation stating new facts and connections to their learning.

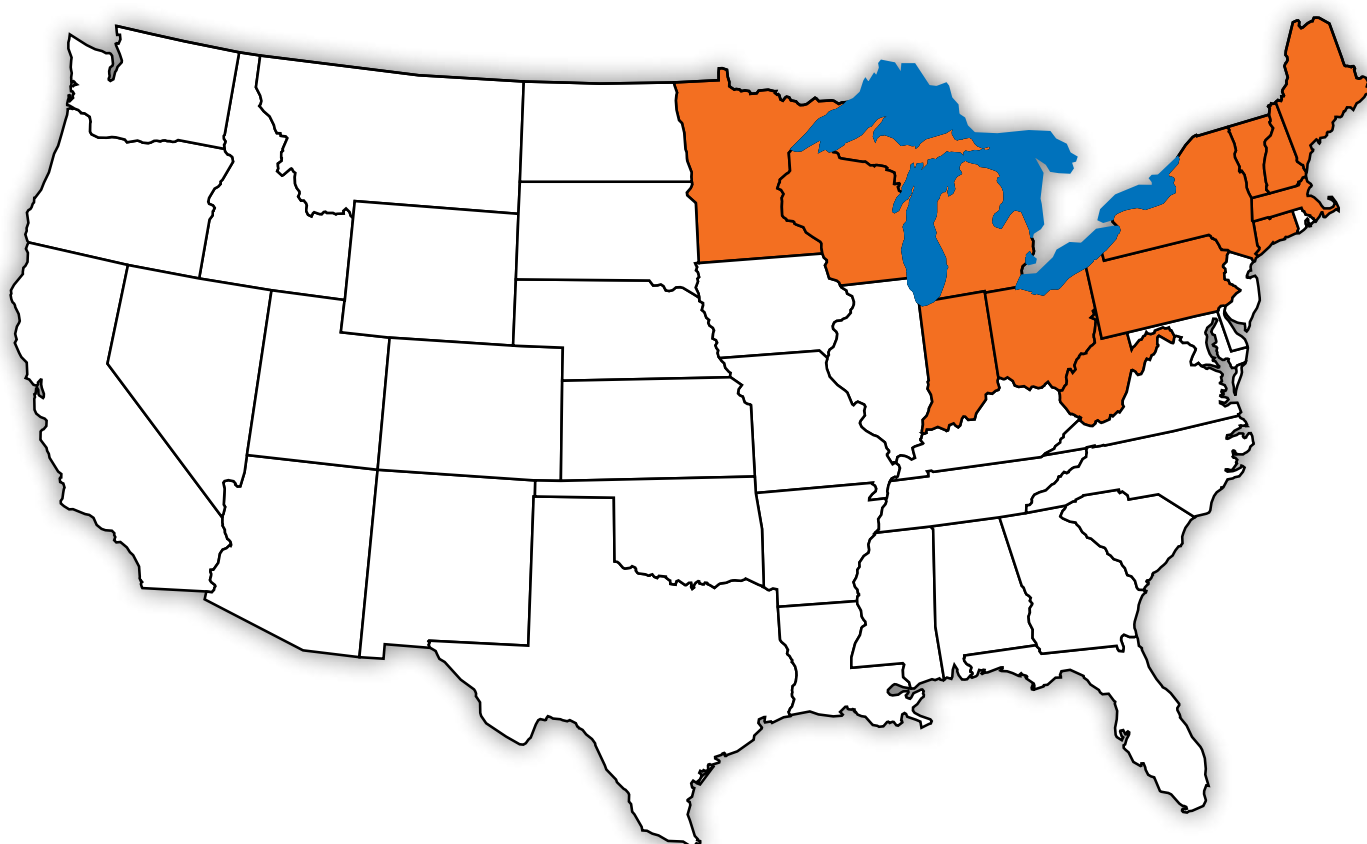
## Enriching Activities



- 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.
- Have a taste test to compare maple syrup to other types of syrup available for purchase at local grocery stores. Look at the ingredients listed on the labels and compare and contrast.

## Fun Fact

**Minnesota is the western-most state to produce maple syrup.**



Orange states are producers of maple syrup.