

# Sweetness of Spring: Tap a tree

By Dulce Ben-East

## Materials

- Tapping spouts
- Corks
- 1-2 gallon containers (milk jugs or large Ziplocs will work but 2-gallon buckets are best)
- Markers
- Colored Pencils
- Paper
- Electric hot plate
- Cordless drill with 7/16" bit
- 4-cup glass measure cup
- 8 oz. glasses or clear plastic cups
- cloth tape measure

## Objectives

Students will learn about an important Alaskan resource – birch trees and the “crop” that is harvested in the spring.

## Suggested grade levels

K-3, 4-6

## Alaska Content Standards

Science B1, D1

Math A2-4,6 B3,6,7



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visit

[www.agclassroom.org/ak](http://www.agclassroom.org/ak)

Note: This activity must be done in mid to late April. You might want to “test-tap” several trees before you start the activity. It will work best a few days after sap flow begins.

## Skills

Data collection, measuring, graphing, observation and analysis.

## Introduction for students

Did you know that you can make a delicious, sweet syrup from trees growing in your own back yard? That’s right! It’s those birch trees, with their peeling, white bark. In the springtime there is sap flowing up the trunks of the birch trees to nourish the new growth of leaves – this is called the “sap run.” The sap “runs” for only two to three weeks in the spring. When the leaves appear on the trees, there will be no more sap in the trunk. The birch sap is sweet because it has a bit of sugar in it. You may have tried or heard of maple syrup. It is made by boiling down the sap of the maple tree until it becomes thick and syrupy. In Alaska, we do the same thing with birch sap. Because there is just a small amount of sugar in the birch sap, it takes a lot of boiling to get it to syrup. The boiling evaporates the water from the sap and concentrates the sugar, making it sweet. Boiling also makes the sap darken, so it gets a nice caramel-like color. Because birch sap has so little sugar (1 - 1.5%) it takes about 100 gallons to make 1 gallon of syrup! That’s the same as turning six 1-gallon milk jugs of sap into one cup of syrup. It’s a lot of work! In this activity, you will be able to discover the sweetness of birch in your very own tree.

## Activity

- Have each student select a healthy birch tree (not less than 6” diameter breast height or “dbh”) in a good birch stand convenient to your school. (You may have students work in pairs, if desired). Have students sketch their tree, and write a short description. Do you think your tree is young or old? What color is the bark? Is the crown (top) big and healthy, or are there broken branches? Measure the diameter of the tree at 4 feet from the ground. Younger students may enjoy coloring and naming their tree back in the classroom.
- Help each child tap their tree with a 7/16” drill bit, at a height not above the child’s head. The hole should be 1-1/2” deep, and drilled on a slight upward angle (Hint: Mark the bit at 1-1/2” so that you do not tap deeper than that). With a hammer, gently pound the spout into the tree until it feels firm. You don’t want to put the tap too deep – you can split the wood. Hang a bucket on the spout by the bail, or put a hole in the milk jug to slip over the spout. If you are using Ziplocs, be sure to reinforce the hole with duct tape. Have each child put their name on the container.
- Have each child record if there is sap dripping from the tap. Have them

## **Terms to Define**

boiling point  
evaporate  
dbh  
diameter  
concentrate

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“time” their drips, counting “one-and, two- and” between drips. (You could also use a watch with a second hand). Record the number of seconds between drips.

## **Next Day**

- Return to the birch trees at approximately the same time the next day and measure the sap in the containers by pouring it into the measuring cup. Have children record the quantity of sap their tree produced on their data sheet. It is possible that some containers will be overflowing. If that is the case, have them mark the full capacity of the container as their quantity. Let the kids taste the sap. Have them describe what it tastes, looks, smells, and feels like to them. Collect some of the sap from each child’s bucket to bring back to the classroom. Have children “time” the drips again, and record their findings.
- In the classroom, fill a 1-gallon pot with sap, cover, and let heat to a boil. (Set some sap aside). Boil on high heat for 1/2 hour, then:
  - Measure how much sap is left. Help children figure out how much has boiled away.
  - Let cool and taste the sap. Does it taste different? Compare it to the uncooked sap.
  - Set some aside in a glass or clear plastic cup. Has the color changed?

Continue boiling for another 1/2 hour. Repeat above steps. Taste, observe, compare. (Note: You may continue this procedure several more times, or until you have syrup, if desired. However, if you wish to take it to syrup, you will want to use a larger quantity of sap to start. Warning!! It could take a long time and may be very dark and burnt!!).

## **Extended activity**

If possible, continue checking the sap in your containers for up to two weeks. The following activities can be done with older children, and provide great opportunities for data collection and graphing.

- Have each child, or team, graph the data points for their tree. Put “Day 1, 2, 3, etc.” (or actual date) across the horizontal axis, and Quantity of sap in cups on the vertical axis.
- Total the sap collected from all trees for each day of collection. Using these numbers as a set of data points, have students create a graph of total stand production. Have students compare this graph with their own tree’s production. Did their tree follow the general curve of the stand? Discuss the differences and why there might be differences.

## **Questions and Discussion**

- Why do you think we wait until springtime to tap trees for sap? (The sap comes up the tree in the springtime to nourish the leaves. Otherwise there is no sap in the tree)
- Why does the sap darken as it is boiled? (Heat cooks, or “caramelizes” the sugars in the sap)



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- Do you think it is important to check the sap in your container at the same time each day? Why or why not? What would happen if you were 3 hours early? Three hours late? (To see how much sap your tree produces in a given period, these periods must be consistent. If you checked the sap 3 hours early, there would be less sap; if you checked 3 hours later there would be more sap. Note: older children can figure out what fraction, or percentage more or less there would be).
- Does the size, age, or health of the tree seem to affect sap quantity? Have children compare their trees from their original description, and see if there is any relationship between size, health, and sap production.
- Do you notice a relationship between the number of seconds between drips and the quantity of the sap in the containers?
- For those classes who continued to collect sap for up to 2 weeks: Did your tree's sap flow increase or decrease throughout the sap run? Did the stand's sap flow increase or decrease throughout the sap run?
- What do the words "evaporate" and "concentrate" mean? (You might look these up in a dictionary). How do they relate to the production of birch syrup? How do they relate to each other? (As the water is evaporated from the sap, the sugars become concentrated).
- Why do you think we put corks in the holes after we remove the spout? (It prevents disease and keeps the sap wood of the tree healthy for future tapping.)
- Is birch sap an agricultural product? Is it a forest product? (Technically, birch sap/syrup is neither. It is categorized as a "non-timber forest product, along with wild berries, edible mushrooms, and other foods harvested from the woods).

### **End of the Activity**

When you are finished collecting sap, use your hammer to pull the taps from the trees. What do you observe at this point? Has the quality or color of the sap changed? (If it is close to the end of the sap run and the weather has been warm, you may begin to see yeast molds. The sap may turn white and milky, and a pink yeast growth may be visible). Fit the small cork into the hole and tap it in firmly until it is flush with the tree. Be sure to thank your tree for its sweet sap!

### **Related books to read**

[From Maple Trees to Maple Syrup](#) by Kristin Thoennes Keller

[Sugarbush Spring](#) by Marsha Wilson Chall, illustrated by Jim Daly

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