



Educator's Guide

The Wisconsin Farm Bureau Foundation and Wisconsin Ag in the Classroom Program present a companion lesson and activity booklet for the 2016 Book of the Year. Order forms can be found at www.wisagclassroom.org.

Wisconsin Ag in the Classroom
Wisconsin Farm Bureau Foundation
P.O. Box 5550
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Standards Alignment

Activity	Common Core Standards	Next Generation Science Standards	Agriculture, Food and Natural Resource Standards
Tree Identification			NR1.b.1.e
How Does it Flow?	RI.4.3	4-LS1-1	PS2.c.1.e
Making Wisconsin's Sweet Treat	RI.4.2 RI.4.3	4-LS-1	FPP1.a.1.e NR3.a.1.e
Taste the Difference	RI.4.5 W.4.9		FPP2.c.2.e FPP3.a.4.e FPP3.a.5.e
Maple Syrup RAFT	W.4.3		PS3.e.2.e

The History of Maple Syrup

Early explorers and settlers in North America learned to make maple syrup and sugar from the Indians, who celebrated the “maple moon” as the return of spring. Sugar making was a gala affair among the Indians and everyone took part—even the Indian braves helped collect the sap and stir the sugar. Many Indian tribes used maple syrup and sugar as their chief seasoning in cooking.

The Northeastern colonists counted on “Indian Molasses” as an everyday food. Until 1860, maple sugar cost less than white sugar. Then prices changed rapidly and by 1875 maple syrup had become a luxury. For many years, one gallon of maple syrup was worth a day’s wages for one man.

The birch bark containers, moose skin vats and hollowed out logs, in which the Indians gathered, stored and boiled the sap gave way to wooden buckets and iron or copper kettles in colonial days. In the modern twentieth century, syrup producers collect sap in pails, plastic bags, and pipeline via a plastic tubing set up to the sugar house. Here it goes from the storage tanks to an evaporator and the finished syrup is filtered before it is marketed.

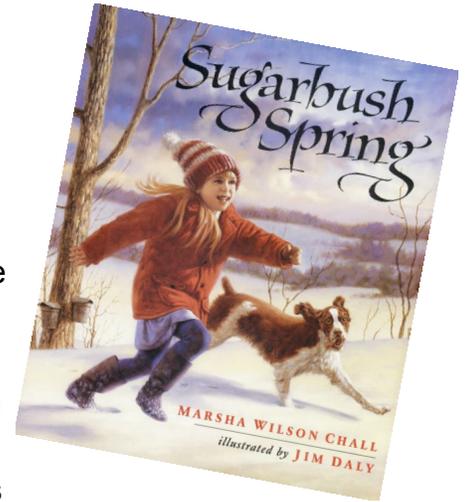
Wisconsin ranks fourth in the production of maple products in the United States. Perhaps no more than 15-20% of the tapable trees are presently utilized for syrup making, which indicates the potential for the industry.



(Source: Wisconsin Maple Syrup Producers Association)

About Sugarbush Spring

Chall's timeless story and Daly's glowing paintings invite children to share in the pleasure of making maple syrup--a process that's the same today as it was two hundred years ago. In the month of the Maple Sugar Moon, icicles rain from Grandpa's porch roof and something is stirring in the woods. It's sugarbush spring-time to tap the trees, then gather round the cook fire to roast marshmallows and tell stories while the cold sap thickens and boils to make maple syrup. In the month of the Maple Sugar Moon, icicles rain from Grandpa's porch roof and something is stirring in the woods. It's sugarbush spring-time to tap the trees, then gather round the cook fire to roast marshmallows and tell stories while the cold sap thickens and boils to make maple syrup. (source: Amazon.com)



Vocabulary

Hydrometer—indicates the sugar content of sap or syrup by how high it floats in a cup of sap or syrup.

Maple Sugar Moon—The March full moon is the Sugar Moon because it rises at the height of sugaring season.

Maple Syrup—the concentrate made from the sap of sugar maple trees. Sap flows for approximately 6 weeks in the spring, is collected and concentrated into syrup by boiling.

Sap—(food) A watery solution that circulates through the tree's sapwood.

Sapwood—the most recently formed layer of wood (not visible). Sapwood is made of thick-walled cells that transport water and minerals through the tree (similar to a circulatory system).

Spile—a spout inserted (tapped) into a tree to drain sap.

Sugarbush—a stand of sugar maple trees that are tapped and used to make maple syrup

Tap—the act of drilling a hole into a maple tree to collect sap

Did You Know?

The sugar maple was selected as the state tree by school children in a statewide vote in 1893. Oaks, pines, and elms were also favorites, but the maple won out. A second vote of school children in Wisconsin's centennial year in 1948 reaffirmed support for the sugar maple.

(source: WI DNR)



Identifying the Sugar Maple Tree

The sugar maple is the official state tree of Wisconsin and is abundant throughout the state. Every year, these trees yield thousands of gallons of maple syrup. They have a high-grade wood that is used for furniture, flooring and fuel and in the fall, they will have bright red, yellow and crimson foliage.



Photo: Paul Wray, Iowa State University,
www.forestryimages.org



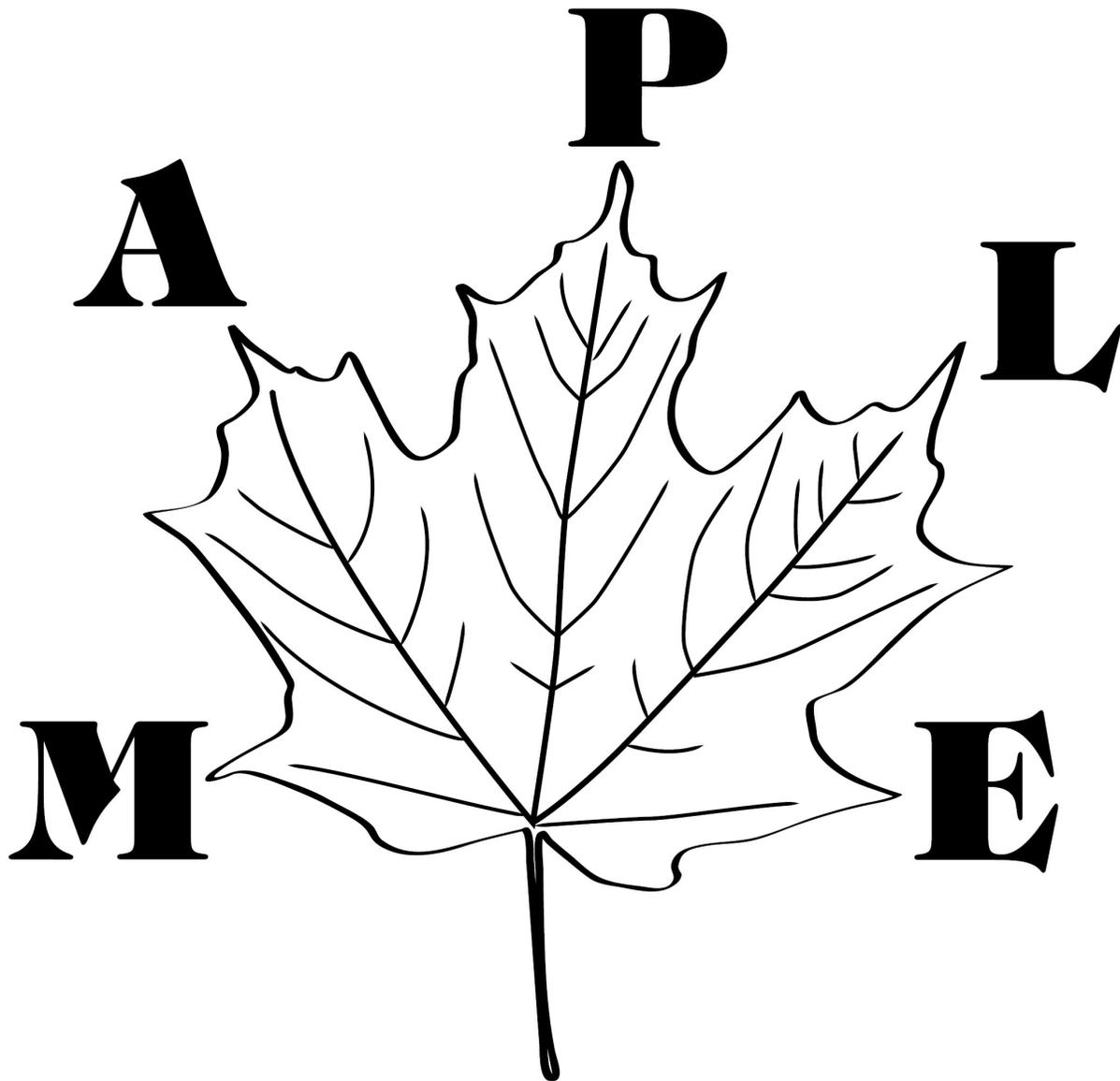
The easiest way to help identify trees is using a Dichotomous Tree Key. Check out these tree keys from Wisconsin.

Wisconsin DNR: <http://dnr.wi.gov/eeek/veg/treekey/index.htm>

University of Wisconsin– Stevens Point LEAF: www.uwsp.edu/cnr/leaf

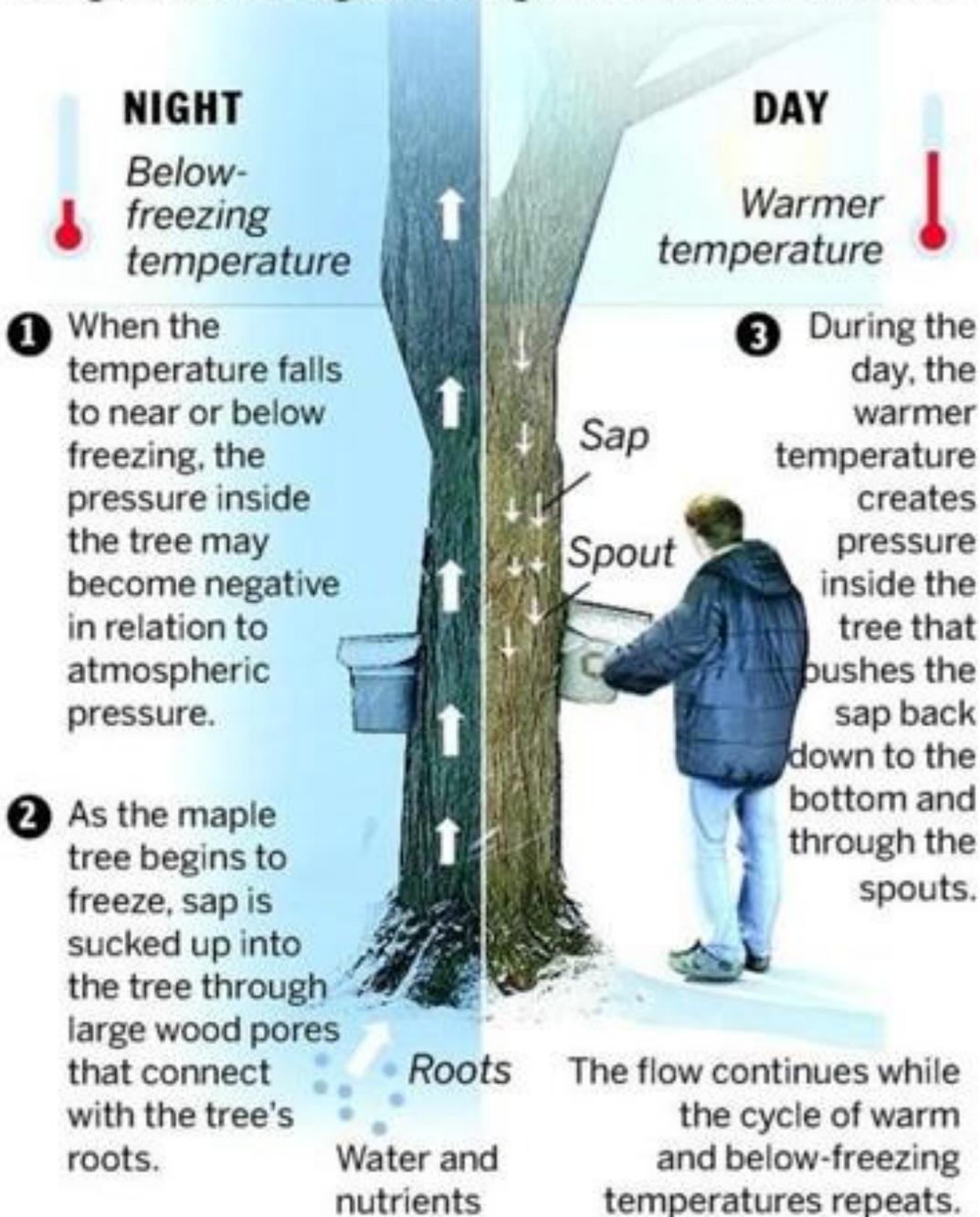
Sugar Maple Leaf Identification

A sugar maple leaf has five lobes. You can remember this by thinking of the word “maple,” which has five letters.



How the sap flows

Sap flow from sugar maples is an entirely temperature dependent process. How it works:



SOURCE: Massachusetts Maple Producers Association

Javier Zarracina/GLOBE STAFF

How Does it Flow?

Sap is food made by the tree's leaves during the summer and is stored in its roots during the winter. Sap is generally 98% water and 2% sugar. Stored sap (food) is used by trees to grow new branches and leaves in the spring. In later winter and early spring, when the days become longer and warmer, the stored sap begins to flow. The sap travels from the roots up the sapwood in the tree's trunk to the branches. The sap flow lets the tree know it is time to begin another growing season.

Materials Needed:

- Knife
- Celery stalk
- 2 clear plastic cups
- 2 different colors of food coloring (red & blue work best)
- Spoon

Directions:

Trim away part of the bottom of the celery and slice halfway through the center of the celery stalk with a knife. Fill 2 glasses at least 1/2 full with water and then add one color dye to one glass and the other color dye to the other glass. Add enough dye to make a very strong dark solution and mix well. Place the 2 glasses next to each other. Put one end of the cut celery stalk into one glass and the remaining end into the other glass. Start this activity in the morning and let the celery remain in the dye all day. During the day, check to see how the different dyes have travelled up the celery stalk to the leaves. Before throwing the celery away, cut a cross-section of the stalk and let the student observe the pieces.

Ask students:

1. How does the dye moving up the celery stalk compare to how sap flows throughout a tree?
2. Is there anything that would make the dye flow differently throughout the celery?



Making Maple Syrup

Wisconsin's Sweet Treat

The sweet truth of maple syrup is that it is made from the sugary sap of the sugar maple tree and in Wisconsin, the hillsides are rolling with beautiful sugar maples.

The sugarmaker is the farmer of the maple trees. The sugarmaker watches the weather, waiting for the right temperatures before he or she will start collecting the tree sap. The tree sap will begin to flow in the later winter and early spring, when the nights are below freezing and the days are mild.

When it is time, the sugarmaker will drill a hole $\frac{7}{16}$ of an inch wide and 3 inches deep into the trunk of the maple tree. He will fit a spout, also called a spile, into the drilled hole. This is called tapping. The maple tree should be at least 10 inches wide before it can be tapped. Then, the sugarmaker attaches a covered bucket or bag to collect the sap as it flows through the tree and out of the spout. Sugarmakers who have many trees to tap will use a rubber tube system instead of buckets or bags. Sap is vacuumed out of the tree, through the tubes, into a collecting tank at the bottom of a hill.

The sugar collecting season lasts from four to six weeks, depending on how the weather is. This means that there is a very short time period to collect sap and make maple syrup. Sugarmakers could collect as much as 10 gallons of sap per hole in that time. More holes can be made in one tree if the diameter is big enough.

The sap is clear and watery. In fact, sap is made up of 98% water and only 2% sugar. The sap is taken to the sugar house to be made into syrup. The sap is placed in big evaporation pans on top of a stove heated by a fire.

The heat from the stove causes the water in the sap to become steam, rising out of the sugar house through a vent in the roof. As the water leaves, the sap becomes thicker and sweeter since there is less water to dilute the sugar.

When sap is 33% water and 67% sugar, it is ready to be filtered and bottled as maple syrup. The syrup can be evaporated further to make a butter-like maple cream, evaporated more to make toffee, and even more to get hard candy and then the grainy sugar itself.

Making Wisconsin's Sweet Treat

Teacher's Note: Cut pieces of the maple syrup making process apart. Have students arrange pieces in order of the maple syrup making process. Students may work individually or in teams.

<p>Wait until the nights are below freezing and the days are mild.</p>	
<p>Find trees that are at least 10 inches in diameter.</p>	
<p>Drill a hole 7/16 inches wide and 3 inches deep.</p>	
<p>Insert spile into the tree</p>	
<p>Attach collecting bucket or vacuum tube system</p>	
<p>Collect sap and place in evaporation pan and heat with wood fire.</p>	
<p>Heat the sap to 219 degrees Fahrenheit.</p>	
<p>Filter the maple syrup.</p>	
<p>Bottle and label.</p>	



**40 Gallons
of Sap**



**1 Gallon
of Syrup**

Tools for Making Maple Syrup



Drill—used to create a hole in the sapwood of the tree.



Spile—a spout inserted (tapped) into a tree to drain sap.



Bucket or Bag—
Used to collect the sap that comes out of the spile/spout.



Evaporator Pan—Pan where sap is cooked down in to maple syrup.



Hydrometer—tool used to indicate the sugar content of sap or syrup by how high it floats in a cup of sap or syrup.



Filter—Once the sap is boiled down to maple syrup, the syrup must go through a filter.



Bottles—once the maple syrup has been filtered, it is bottled and ready to head to your breakfast table.

TASTE THE DIFFERENCE

In this activity, students will compare and contrast the taste and look of real maple syrup and store bought maple syrup.

Prior to beginning this short activity, discuss the following questions with the class:

- How many of you have had maple syrup?
- How many of you like maple syrup?
- How many of you have had real maple syrup?
- What is a word that you would use to describe maple syrup?

Procedure:

1. Pour a small sample of each type of maple syrup into a cup. You will want a sample of each type of maple syrup for each student. Make sure that each sample is adequately labeled.
2. Explain to students that they will be using their senses to compare and contrast the different types of maple syrup in front of them.
3. Pass out the student activity sheet - "Taste the Difference"
4. Instruct students to look at, smell and then slowly sip their syrup samples. As they do so, have them compare and contrast the samples in the venn diagram. Students can also compare and contrast the nutritional value of each of the samples.
5. Allow students 5-10 minutes to fill out the worksheet and then discuss their answers as a group.



VS.





PURE Maple Syrup

Natural and Nutritious

Pure Maple Syrup is a natural, nutritious and delicious sweetener and a smart choice as a sweet topping or as a flavorful ingredient in baking and cooking. *Maple Syrup* has a delightful and flavorful maple bouquet and has varied taste intensities to suit different consumer preferences.

Unlike many syrups and sugars *Maple Syrup* is 100 percent natural and unrefined, retaining the inherent nutritional value of the sap obtained from the maple tree.

Important Nutrient Source

Pure Maple Syrup is a valuable source of mineral nutrients.

Maple Syrup delivers more nutrition than all other common sweeteners and has one of the lowest calorie levels. *Maple Syrup* contains mineral nutrients and vitamins which are an essential part of the daily diet in higher levels than other sweeteners.



Nutritional Value for Various Sweeteners

% of Recommended Daily Value (DV) Per ¼ cup (60 ml)

	Maple Syrup		High Fructose Corn Syrup		Honey		Brown Sugar		White Sugar	
	(1/4 cup / 80 g)		(1/4 cup / 78 g)		(1/4 cup / 85 g)		(1/4 cup / 55 g)		(1/4 cup / 51 g)	
	% DV	mg	% DV	mg	% DV	mg	% DV	mg	% DV	mg
Riboflavin	37	0.59	1	0.01	2	0.03	0	0.0	1	0.01
Thiamin	1	0.01	0	0.0	0	0.0	0	0.0	0	0.0
Manganese	95	1.89	4	0.07	4	0.07	2	0.04	0	0.0
Zinc	6	0.58	0	0.02	2	0.19	0	0.02	0	0.0
Magnesium	7	16.5	0	0.0	1	1.75	2	5.0	0	0.0
Calcium	5	58.0	0	0.0	0	5.0	4	45.8	0	0.48
Iron	1	0.09	0	0.02	3	0.36	3	0.39	0	0.03
Selenium	1	0.4 µg	1	0.55 µg	1	0.66 µg	1	0.65 µg	1	0.3
Potassium	5	167	0	0.0	1	44.0	2	73.3	0	0.96
Calories	216		220		261		216		196	

Source: USDA Nutrient Database and Canadian Nutrient File

Notes: The values shown are the overall minimum values for the minerals and nutrients and the overall maximum values for the calories reported by the USDA Nutrient Database and the Canadian Nutrient File. The percent daily values (% DV) were calculated using the Health Canada recommended daily intake values for an average 2,000 calorie diet.

The Original Sweetener

Native North Americans were the first to recognize

Pure Maple Syrup as a source of nutrition and energy. Researchers have since documented that maple syrup has a higher nutritional value than all other common sweeteners.



Other Health Considerations

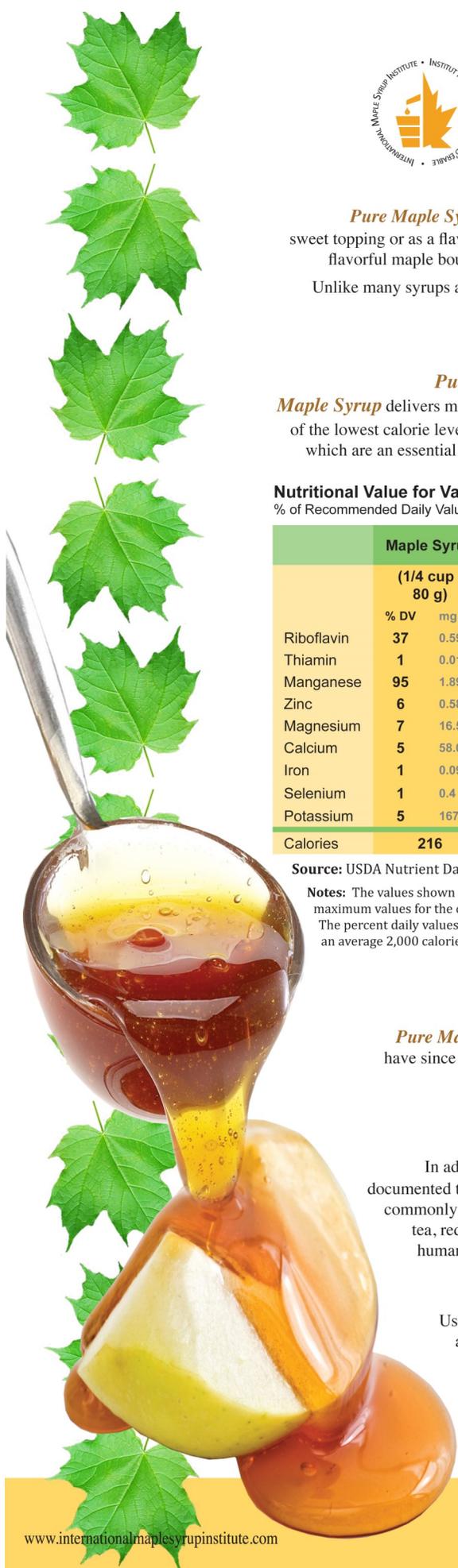
In addition to its remarkable nutritional content, researchers have documented that *Maple Syrup* contains numerous phenolic compounds, commonly found in plants and in agricultural products such as berries, tea, red wine and flax seed. Some of these compounds may benefit human health in significant ways. For example, researchers have documented the natural presence of abscisic acid (ABA) in *Maple Syrup*, a compound thought to stimulate insulin release by the pancreas.



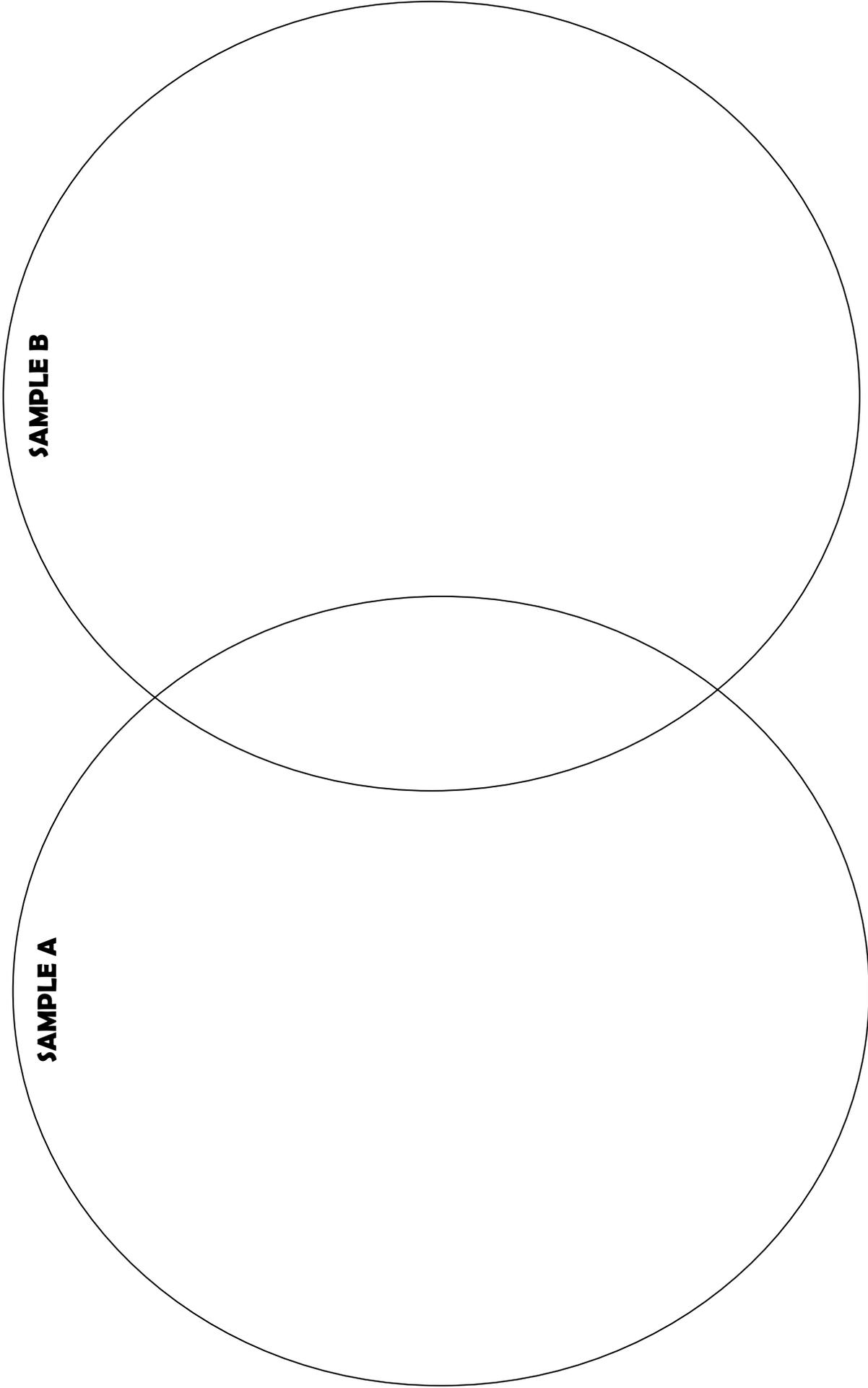
Use of *Pure Maple Syrup* as an alternative to refined sugar can also add to the antioxidant content of the diet, similar to replacing refined grains with whole grains.

With its wholesome, natural flavour *Pure Maple Syrup* has one of the lowest calorie levels of common sweeteners.

Maple Syrup is also a natural product with no additives or preservatives.



TASTE THE DIFFERENCE



A Day in the Life of a Drop of Maple Sap

Imagine if you were a drop of sap being made into maple syrup. Complete a diary entry or entries sharing your travels from sap to maple syrup.

Role: Drop of Maple Sap	Audience: 4th & 5th Grade Students
Format: Diary Entry (or multiple entries)	Topic: How sap is made in to maple syrup
Writing Assignment:	

Additional Resources

Books About Maple Syrup

From Maple Trees to Maple Syrup by Kristin Thonnes Keller

From Maple Tree to Syrup by Melanie Mitchel

Maple Syrup Season by Amy Purmell



Websites to Learn More

Wisconsin Maple Syrup Producers

wismaple.org

Wisconsin Ag in the Classroom

wisagclassroom.org

WIAITC Pinterest Page

pinterest.com/wiagclassroom

Wisconsin Maple Syrup by the Numbers

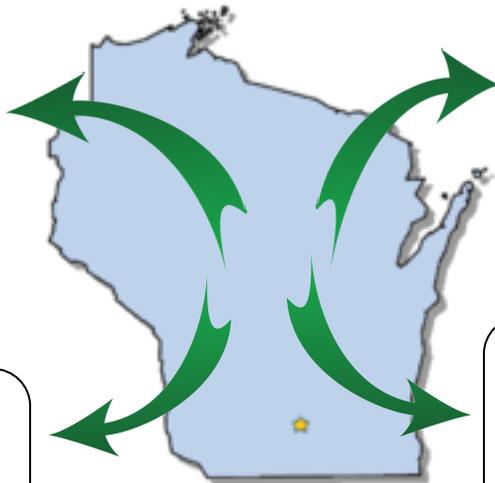
(June 10, 2015 data from USDA NASS)

A total of 215,000 gallons of maple syrup were produced in 2015.

In 2015, there were a total of 760,000 taps and each tap yielded 0.28 gallons of maple syrup.

The 2015 maple syrup season started early on February 28 and ended around April 15.

Wisconsin ranks 4th in the production of maple syrup in the United States.



Farm Bureau's Ag in the Classroom program provides teachers and students K-12 with an understanding of how their food is produced. The program seeks to work within existing curricula to provide basic information on our nation's largest industry: Agriculture. Wisconsin's Ag in the Classroom program is carried out by a network of local educators, volunteers and representatives from agricultural organizations and businesses. The goal of the program is to help students gain a greater awareness of the role of agriculture in the economy and society, so that they may become citizens who support wise agricultural policies.

