



MAPLE EDUCATION PROJECT

Lesson Title: Looking Back, Thinking Forward

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Grade Level:

- Early Elementary (K – 2nd)
- Upper Elementary (3rd – 5th)
- Middle School (6th – 8th)
- High School (9th – 12th)

What National Agriculture Literacy Outcomes does your lesson address?

<http://www.agclassroom.org/get/doc/NALObooklet.pdf>

T4.3-5abd

T5.3-5f

What Common Core Standards does your lesson address?

CCSS.ELA-LITERACY.RL.3.1
CCSS.ELA-LITERACY.RL.4.1
CCSS.ELA-LITERACY.RL.5.1
CCSS.ELA-LITERACY.W.3.2
CCSS.ELA-LITERACY.W.4.2
CCSS.ELA-LITERACY.W.5.2

Brief Description:

Learn about the maple sugaring process - the equipment and its changes over time, climate, and technology. How has it changed through history and what might it look like in the future?

Time: please estimate the amount of class time necessary to complete the lesson

Click or tap here to enter text.

Materials: Attached documents

Vocabulary:

Sap: water absorbed through the roots of the tree which travels through the growing layer of the tree trunk to transport nutrients and wastes

Spile: a spout or tap used to conduct sap out of the tree

Tapping : the act of cutting a hole into the bark of a tree to reach the sapwood (growth layer) so the sap can flow out of the tree

Evaporator: large metal pans designed to provide as much surface contact with the heat and the maple sap to hasten the process of evaporation

Sugar shack: a small building whose roof is designed to allow all the evaporating sweet steam of the boiling sap to dissipate out into the air

Mokuk: traditional birch bark boxes sewn with elm strips – can be used to store maple sugar

Maple belt: the wide area of land running from southeastern Canada through northeastern US which provides both the necessary soil and climate conditions for the growth of sugar maple trees

Tree migration: due to habitat and climate change, trees that once grew in only a specific geographical area begin to grow in different areas and stop growing in traditional areas

Photosynthesis: light energy is transformed into chemical energy by plants – sunlight and carbon dioxide are absorbed by the tree leaves – chemical reactions occur inside the leaf – the products of the chemical reactions are carbohydrates or complex sugars (stored in the outer layer of the tree trunk) and oxygen (released into the air)

Background:

See attached document

Interest Approach – Engagement:

Discuss how familiar foods might have been discovered.

Talk about how information travels through history - stories, legends, drawings, writings, etc.

Procedures:

Lesson 1: Introduce the Maple Sugar Harvesting Theme utilizing the presentation provided, video references and/or *The Sugar Bush eBook*, and the key question cards for pair/share discussion.

Lesson 2: Divide the class into groups of 3. Provide each student with the Timeline and the Background Basics worksheet of the equipment type that they have selected to research. It can also be advantageous to divide the class into groups of 3 as there are 3 basic types of equipment. Using the jigsaw strategy, each student will become an expert in one type of equipment and can report back to their group what they have learned and designed.

Lesson 3: Research time for the learning more about the chosen type of equipment and completing the “Looking Back, Thinking Forward – History Worksheet”.

Lesson 4: Provide an opportunity for students working on similar research to share their findings and collaborate on the responses. Note – Sharing what they have learned providing opportunity to compare and contrast the different versions of equipment and reasons for changes will provide the necessary foundation for students to think “transformationally” to the future for their device.

Lesson 5: Students work in their groups of 3 to talk about changes to climate, technology and the habitat of the sugar maple tree. Together, they can choose a future decade to design an adapted piece of equipment.

Lessons 6-7: Students complete the activity sheet “Looking Back, Thinking Forward – The Future Worksheet”. Provide time for students to work both within their team of 3 and their common equipment group to share

ideas. Allow time for each team of 3 to share their vision of the future in Maple Sugar Harvesting via strategies such as Speed Dating, science fair type display or class presentations.

Did you know? (Ag Facts):

1. December 17th is National Maple Syrup Day
2. Popular brands such as Aunt Jemima and Mrs. Butterworth are generally labeled “original”, or “pancake syrup” because instead of real maple syrup, they use ingredients like high fructose corn syrup, caramel coloring and cellulose gum.
3. Canada produces about 80% of the world’s maple syrup supply.
4. A ¼ cup of pure maple syrup contains 100 percent of your recommended daily allowance of manganese, as well as 37 percent of riboflavin, 18 percent of zinc, 7 percent of magnesium, and 5 percent of calcium and potassium. Plus, the antioxidant levels are comparable to a banana or a serving of broccoli.

Enriching Activities:

1. Have students create their own birch bark container (makak or mokuk). Discuss how the containers could be improved.
2. Research maple legends. Compare and contrast on the Venn Diagram sheet.

Sources/Credits:

used with permission from Heather Stannard of WestView Learning – taken from Maple Sap to Maple Syrup (<https://www.teacherspayteachers.com/Product/Maple-Sap-to-Maple-Syrup-An-Integrated-Unit-for-Grades-4-1726937>)

Looking Back, Thinking Forward

1540-1900 Maple Timeline

1540

Jacques Cartier writes about the Red Maples along the St. Lawrence in the journal of his exploration.

1557

French monk André de Thevet writes a first person account of the sugaring process

1606

Marc Lescarbot writes about the collection and distillation of maple sap

1780s-1790s

Maple sugar thought as an alternative to white cane sugar produced in the West Indies through slave labour

1810

Wood spiles commonly in use as alternative to the slashing of the bark

1850

Sugar shacks introduced - the sugar 'outhouse'

1858

First evaporator patented in Ohio - D. M. Cook

1860

First metal sap spout patented - Eli Mosher

1864

Metal evaporator pan with 'baffles' patented - David Ingalls

1872

First evaporator with two pans and metal firebox reduces boiling time - H. Allen Soule, Vermont

1875

Metal sap collection buckets introduced

1884

First sugar evaporator patented in Ohio - G. H. Grimm

1888

Major sugar maple equipment company is founded in Vermont - Leader Evaporator Co.

1889

Evaporator pan patented in Quebec with a series of flues (metal fans) that further reduces boiling time by increasing heated surface area contacting with liquid - Small Brothers

Note: In 1919 metal tubing was tried but the metal froze, leaked or easily broke. Plastic tubing was successfully introduced in 1959.

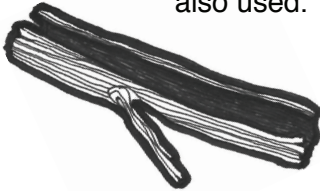
Looking Back, Thinking Forward Equipment Types

Spile: (spout, tap, trough)

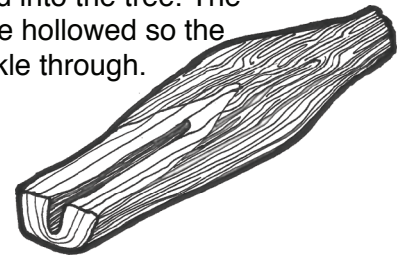
Wood chips, carved branches, carved wooden tubes, metal tubes, plastic forms

When a gash or later a hole was made in the bark of the maple sugar tree, the sap would begin to leak out of the tree and run down the bark. It is very hard to collect sap when it is actually trickling down the trunk of the tree and it can collect bugs and bits of tree in the sap. People quickly learned that keeping the sap clean by guiding the sap away from the trunk of the tree was an important step in collecting the maximum amount of clean sap possible.

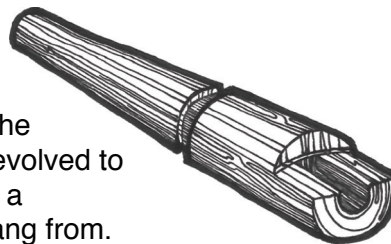
First Nations people used wood chips to guide the sap away from the tree trunk. Twigs that had channels carved in them were also used.



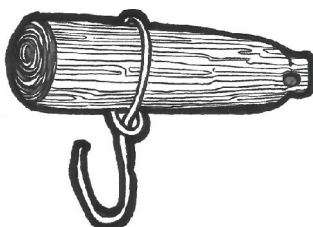
Branches were tapered (narrowed) at one end to fit into the hole drilled into the tree. The branches were hollowed so the sap could trickle through.



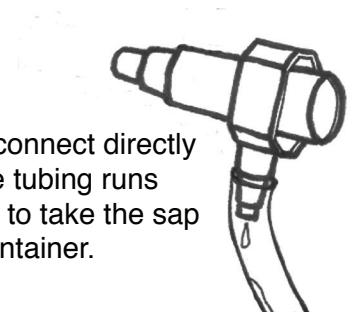
The shape of the wooden spile evolved to have a ring for a container to hang from.



Metal hooks were hung from the spile to hold a bucket. The spile was later made of metal and finally plastic.



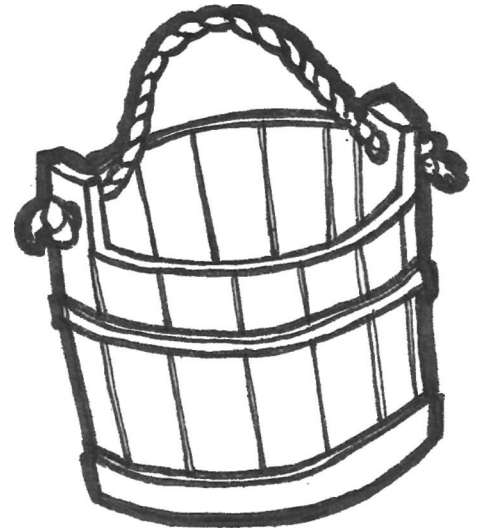
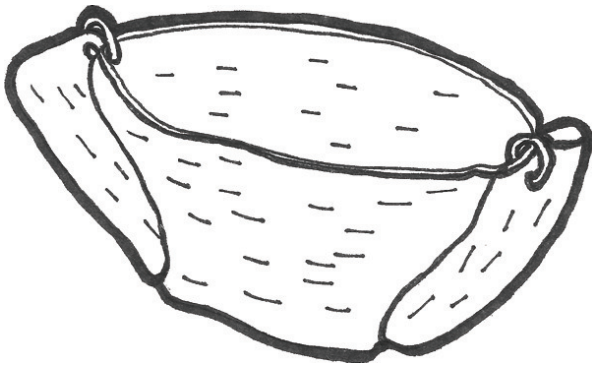
Plastic spiles today connect directly to plastic tubing. The tubing runs between many trees to take the sap back to one large container.



Sap Collection:

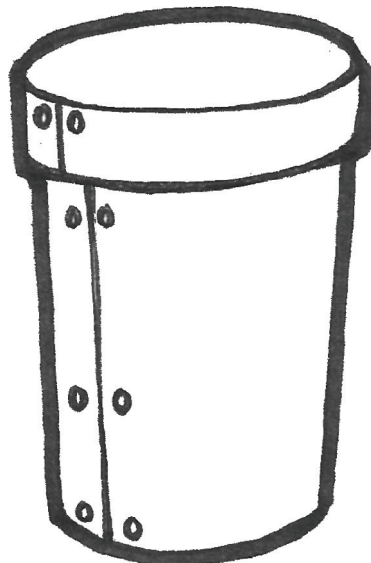
Birch baskets, wooden buckets, metal pails, plastic tubes

First Nations people used birch bark baskets called 'mokuks'. A mokuk was made by pieces of birch bark sewn together with elm strips to hold liquids such as maple sap. Some First Nations groups also used a ceramic type container made from certain muds.

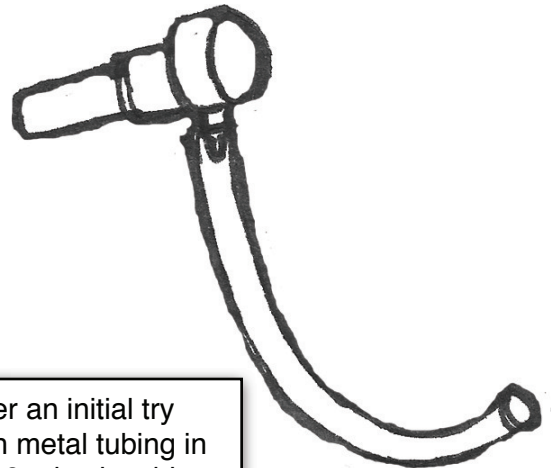


Early settlers introduced buckets that were made from different materials including wood.

Settlers improved the containers through a series of metal pails that would eventually be hung off the spile on the maple sugar tree. Shapes of pails, and fit of lids varied.



After an initial try with metal tubing in 1919, plastic tubing connecting many spiles and trees together in a collection network is now common on larger Maple Sugar farms.

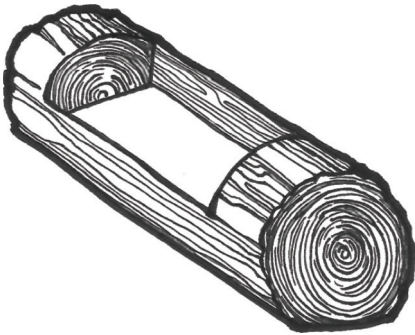


Evaporator:

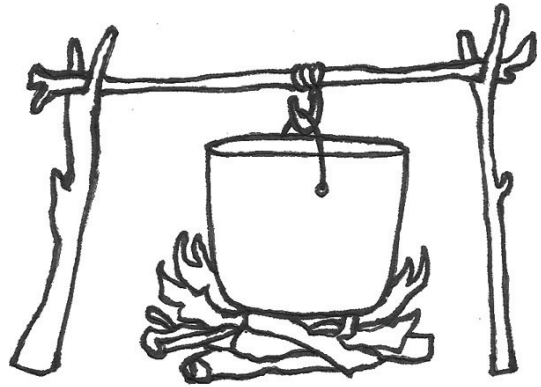
Hollowed log, cast iron kettles, copper kettles, metal pans, pans with baffles

The changes were made for two reasons:

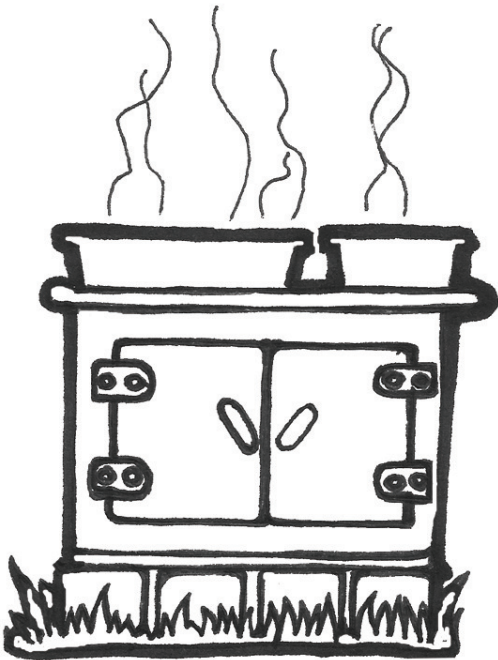
1. To reduce the costs of harvesting, collecting and processing the sap.
2. To collect as much maple sap as possible in a very short period of time with as little sap wasted as possible.



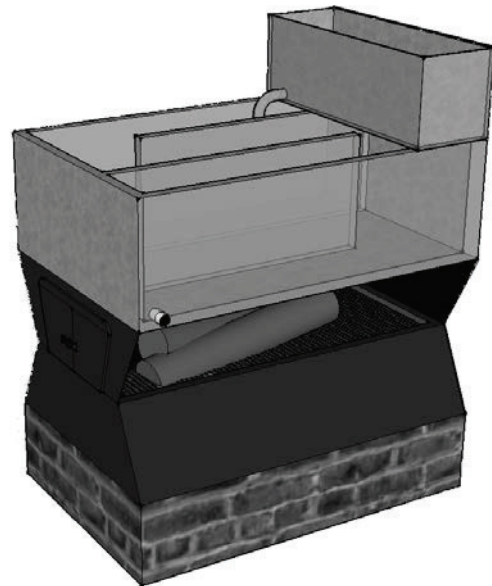
First Nations people used logs that were hollowed to form a container for the sap. Rocks were heated in the fire and then placed in the sap.



Settlers brought knowledge of metal pots. Sap could be cooked directly over a hot fire.

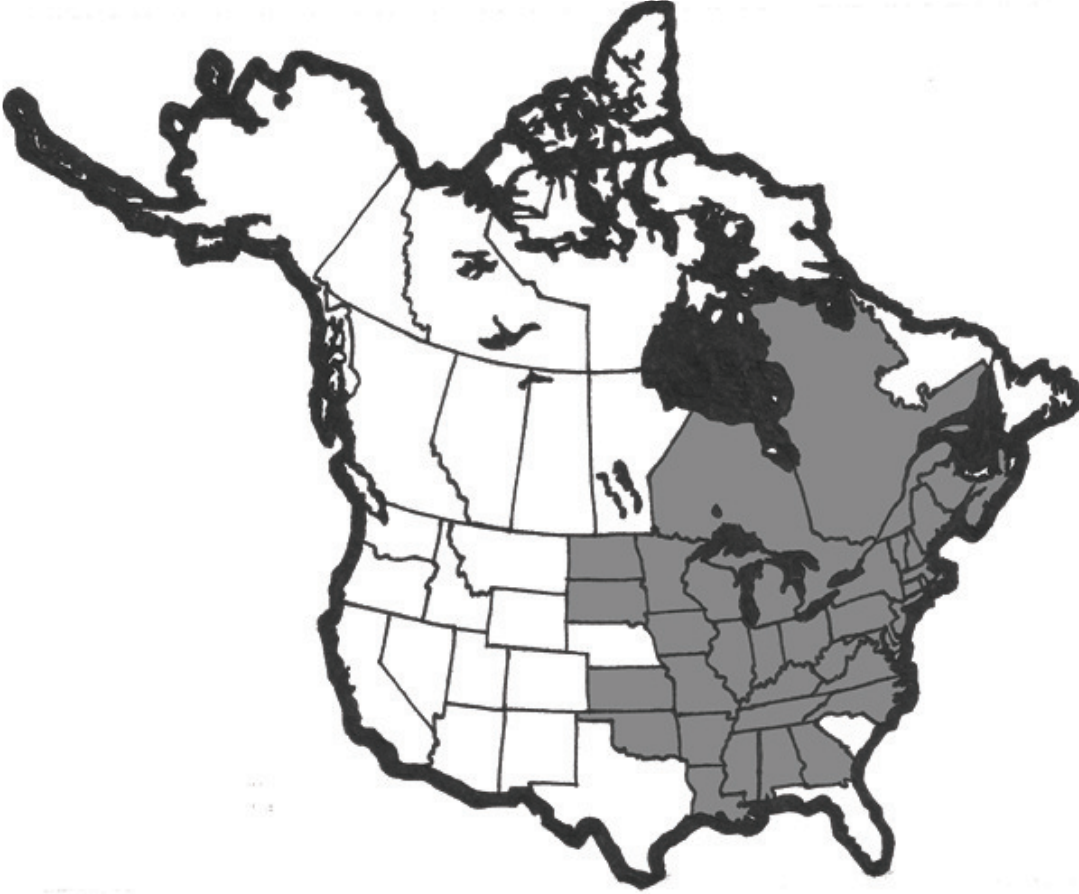


Wood stoves burned the wood more efficiently than an open fire.



The evaporator was designed to let more hot metal surfaces come in contact with the sap. This meant the same amount of wood energy could more quickly heat the sap.

Looking Back, Thinking Forward The Maple 'Belt' of North America



Maple Sugar Trees need the following elements in their habitat in order to thrive:

Temperature:

Early spring temperatures need a 'window' of time where temperatures fluctuate daily from just below freezing at night, to just above freezing during the day.

Summer temperatures can be hot, but not too hot to avoid stressing the tree and drying out the soil.

Soil:

Soil must be moist but not soggy. Excess water needs to drain away from the roots. Soil needs to be rich and a deep enough layer for the sugar maple tree's root system.

Note: areas in Canada north of the Maple Belt do not have soil that is deep enough to support the Maple Sugar tree's root system.

Tree Migration:

Climate change affects plants because they cannot change their needs for moisture, temperature, soil, as fast as the climate in their area might be changing. In a way, trees are picking up their 'roots', and beginning to grow in areas they have not grown in before because the temperature and habitat has become suitable for them to now grow their seedlings. At the same time, areas that once grew healthy groves of plants no longer have the right temperature or moisture levels for the trees to be healthy and so the trees no longer can survive in their traditional growing regions.

Equipment: _____

Name: _____



Looking Back, Thinking Forward - History

The History of the _____ In Pictures and Notes

<p>(Draw a picture)</p>	<p>How did the First Nations people make and use this type of equipment.</p>
<p>(Draw a picture)</p>	<p>How did the early settlers in the 1700s make and use this type of equipment?</p>
<p>(Draw a picture)</p>	<p>How did settler adapt the equipment in the 1800s and 1900s to make his type of equipment more efficient?</p>
<p>(Draw a picture)</p>	<p>How is this piece of equipment made today? What are the key design differences? Why were these changes made?</p>

