

Maple Syrup: A Sweet Springtime Lesson

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Lower Elementary - Maple Sap Collection

Activity: The students collect sap from the tapped trees in the sugar bush. They use buckets and teamwork to pour the sap from the bag/buckets on the tree into 55 gallon barrels in the woods.

Key Points:

- ✓ Sap flow requires fluctuating day/night temperatures (above freezing during the day, below freezing at night)
- ✓ Collect carefully because it requires 40 gals of sap to make one gal of syrup. ("Whatever you catch by the drop don't spill by the pail.")
- ✓ Both bags and buckets are used to collect sap. Bags are easier to store and are disposed at end of year while buckets can be reused but must be washed
- ✓ It is necessary to filter the sap multiple times to remove debris and other wildlife attracted to the sap
- ✓ Sap is sterile as it comes out of the tree. Any microbes that grow between collection and cooking are killed by the boiling process



Saint John's Maple Syrup Operation

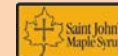
The production of syrup from the sap of the sugar maple tree (*Acer saccharum*) is a springtime ritual in many parts of the northeastern United States, including central Minnesota where syrup-makers at Saint John's have made syrup since 1942. Saint John's produced syrup ca. every other year until 2000 when the process became an annual affair. In central Minnesota, the trees typically produce sap from mid-March until mid-April. Approximately 1000 taps are installed that yield nearly 10,000 gallons of sap which is boiled down to make about 250 gallons of syrup. The Saint John's wood-fired evaporator is 4 x 16 feet and uses approximately 12.5 cords of wood per season or roughly 22 gal. of syrup per cord. The operation is run by a core group of monastic, university and volunteer syrup-makers and dozens of volunteers. In addition, each year we provide an educational experience about the syrup-making process for hundreds of students, from pre-K through college. We also host two maple syrup festivals, open to the public, and have had over 1600 people attend.

Saint John Maple Syrup Statistics: Averages

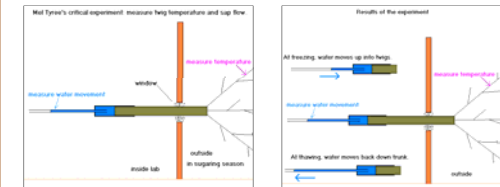
Years since the operation began	67
Number of syruping seasons	34
Tapping date	10 March
Number of taps	1375
Sap flow season	19 March – 11 April
Total sap production (gal.)	9834
Sap per tap (gal.)	7.4
Syrup production (gal.)	245 (45 – 560)
Sap sugar concentration (%)	2.2 (1.4 – 2.7)
Sap / syrup ratio	39.8
Wood used in typical season (cords)	12.5
Syrup production (gal) / cord	21.5
Number of volunteers	200
Number of student visitors	1100
Number of other visitors	1800



Syrup Scout Patch



Boy and girl scouts have the opportunity to earn a unique *Saint John's Maple Syrup* patch by attending one of the maple syrup festivals and completing a series of activities. Scouts learn to tap trees, collect sap, cook syrup, and attend educational talks while writing down things they learned. When they answer a few questions about maple syruping at the end, they earn their patch!



Images by Dr Virginia Berg, University of Northern Iowa

Upper Elementary - Maple Tree Tapping

Activity: The students identify trees that are appropriate to be tapped for maple sap. They then use tools to make the tap hole and attach the sap collection equipment.

Key Points:

- ✓ Sugar maple trees are identified by opposite branching, bark appearance; small sharp-pointed buds, whitewashed lichens, black mold on bark
- ✓ Any tree in the maple family may be tapped for sap, sugar maples are preferred for higher [sugar]
- ✓ Tree size for tapping: 12" dia. for one tap; additional tap at 18"
- ✓ Tools: hand drill, hammer, spile, sap collection bag/bucket
- ✓ Handheld electric drills or drill mounted to a chain saw can also be used, esp. for installing many taps
- ✓ Drilling technique – avoid previous tap hole, slight upward angle to allow sap to flow out; 2" into sapwood



Middle School - Rule of 86

Activity: The students determine the [sugar] of the sap using a hydrometer or refractometer. The students then use the Rule of 86 to determine the sap to syrup ratio.

Key Points:

- ✓ By law, maple syrup must contain 66% sugar (wt/wt) or 87.2% solids (wt/vol)
- ✓ Maple sap is typically 2.0% sucrose
- ✓ The sugar concentration of the solution can be measured with a hydrometer or a refractometer
- ✓ The Rule of 86 estimates the amount of sap needed to make a gallon of syrup
Gallons sap per gallon syrup = 86 / [sap sugar]
- ✓ Example: If sap has a [sugar] of 2.0%, it will take 43 gallons of sap to make one gallon of syrup (= 86 / 2)
- ✓ The rule is derived from the weight of sugar in 1 gal of syrup (7.2115 lbs) compared to weight of sugar in 1% sugar solution (0.0836 lbs)



High School - Sap to Syrup

Activity: The students learn the science and art of cooking maple sap to make maple syrup.

Key Points:

- ✓ Native Americans traditionally cooked syrup by heating rocks in a fire, then transferring the hot rocks to a basket of sap
- ✓ Sap can be cooked using a batch method, i.e., a pot on a stove or over a fire
- ✓ Large operations use a continuous flow evaporator - sap enters one area and syrup exits another area
- ✓ A continuous flow evaporator, such as the one at Saint John's requires: (a) feeding firebox with wood, (b) monitoring level of sap in evaporator; (c) monitoring amount of sap in storage reserve tanks; (d) monitoring progress of the cooking; (e) controlling the temperature of the fire; (f) filtering syrup to remove sugar-sand; (g) removing finished syrup

