



Maple Sugaring Pre- and Post-Trip Activities

Designed for grades K-5

To help your students get the most out of their time at the Green Mountain Audubon Center, we strongly recommend that they be introduced to some key questions and concepts before the program and have opportunities to reflect on and synthesize what they learned after their visit. There are many, many possible lessons on topics related to the science, math, history, and economics of maple sugaring in Vermont. We've listed some of our favorites that tie in well with our program, but also recommend the lessons in the following curriculum guides:

Lockhart, MaryAnn. *The Maple Sugaring Story: A Guide for Teaching and Learning about the Maple Industry*. Charlotte, VT: Vermont Maple Promotion Board, 1990.

Peck, Jill L. *Maple Sugaring in Vermont: A K-8 Standards-based Unit of Instruction*. Vermont Agriculture in the Classroom. ***Download for free from www.vt-aitc.org/pdfs/full-Maple-Unit.pdf

For activities that focus on **scientific inquiry and/or investigation**, look for the .

Recommended Pre-Trip Activities

Inquiry: Sugaring Questions

All Grades

What is maple syrup? Where does it come from? How is it made? Record and discuss what your students already know and what they want to know about maple sugaring. Bring some of your questions to the Audubon Center to find answers to during your visit.

Calendar for the Seasons

All Grades

Keep a calendar as a class to make notes in on changes that are happening outdoors through the seasons. During sugaring season, note when trees are being tapped (late February and early March), when collecting and boiling is happening (March through the beginning of April), and when buds start breaking (mid-April). Pick a tree (a sugar maple, if possible) in your schoolyard to visit as often as you can and record observations on how it changes through the seasons (i.e. when it leafs out, flowers, makes seeds, what wildlife visit it, when it drops its leaves etc.). Mark your trip to the Audubon Center on the calendar and anticipate what will be happening in the sugarbush during your visit.



Build a Sugar Maple

All Grades

Objective: Students learn about the different structures that make up a sugar maple and how sugar is produced, stored, and used in the tree through the seasons.

Materials: Pictures of different structures of a sugar maple tree (roots, trunk, branches, leaves, buds, flowers, seeds).

Procedure: Give each student a picture of a tree structure and ask the class to use their pictures to “build” a sugar maple. For older students, have them draw their structure. Tell the story of sugar in the tree: production by the leaves through photosynthesis during the summer, storage in the roots as starch over the winter, traveling up the trunk to the buds in the spring as sap to be used to build new leaves, flowers, and seeds in the branches. Talk about where

the sugar will be in the maples during your trip to the Audubon Center (traveling from the roots up the trunk to the buds).

Tree Leaf and Bud Sort

Grades 2-5

Objective: Students learn to identify different tree species by sorting leaves and buds into different groups based on their characteristics.

Materials: Samples of leaves and buds from a variety of local tree species – or pictures if samples are not available – including a sugar maple (enough for small groups of students to have samples from each species); tree identification keys; paper; pencils.

Procedure: Ask small groups of students to sort the paired leaf and bud samples into two different groups. For younger students, you may want to sort leaves and buds separately, or just sort leaves. Students may choose to make groups in any number of ways based on size, shape, color, texture, or other features, but should try to create clear categories that another person would have no trouble deciding which group to put a sample in.

Discuss the groupings that the students came up with. Then show them how scientists have sorted tree species by leaves (deciduous vs. evergreen needles; simple vs. compound) and by buds (opposite vs. alternate position on the branch; short vs. long; sharp vs. rounded; smooth vs. hairy; color). Help students to sort their samples into these categories and to positively identify the sugar maple sample so they will know which trees to tap at the Audubon Center.



Sugaring Stories

All Grades

As a class, read *Sugarbush Spring* by Marsha Wilson Chall or another children's storybook about maple sugaring. Discuss the process that was used to make syrup in the story. What was it like in the sugarbush during the springtime? What do they think it will be like to visit the sugarbush at the Audubon Center? For older students, show them the key words they will learn on your trip. Ask them to pay attention during the story to see if they can learn the meaning of the sugaring words. Have them look up the words that are not in the story.

Recommended Post-Trip Activities

Trip Review

All Grades

Look over the list of questions students generated before coming to the Audubon Center. Can students answer any of these questions now? Do they have new questions to add to the list? If they had time, what could they do to answer the questions that they still have? Have students summarize the highlights of their trip to the Audubon Center or draw a picture of something that captured their interest.

Investigation: Syrup and Density

Grades 2-5

Objective: Students learn about the concept of density by comparing the densities of water and maple syrup.

Materials: Beakers of room temperature water; room temperature Grade B maple syrup; droppers; paper and pencils; hydrometer or refractometer (optional).

Procedure: Show students a cup of water and a cup of maple syrup. Ask them if they think these volumes of liquid weigh the same or if one weighs more than the other. Why? Explain the concept of density. How could they test whether one liquid is denser than another without weighing the cups? Hint: Less dense materials float in denser liquids (i.e. humans floating a

swimming pool), and denser materials sink in less dense liquids (i.e. a brick sinking to the bottom of a swimming pool). Ask students to predict what will happen if they add a dropper of maple syrup to a cup of water. Will the syrup dissolve, float, or sink in the water? Have students record their predictions in writing or as a drawing, then let them add a dropper of syrup to their own beaker of water and record their results (tip: holding a piece of white paper behind the beaker will make it easier to see the syrup in the water). How do their results compare with their predictions? Why is syrup denser than water? Would sap be more or less dense than syrup? Than water? How does sap change to syrup? Discuss how the process of evaporation slowly removes water from sap and concentrates the heavier sugars until the sap is dense enough to call syrup. If possible, demonstrate the use of a hydrometer or refractometer that sugarmakers use to test the density of the boiling sap to know when it has changed to syrup.

Stovetop Sugarmaking

All Grades

Objective: Students experiment with the process of converting sap to syrup through evaporation.

Materials: At least one gallon of sugar maple sap (tap a tree in the schoolyard if possible); large pot; hot plate; hydrometer; paper; pencils.

Procedure: Review the process of sugarmaking that you saw on your trip to the Audubon Center.

Do students remember how sap is converted to syrup? How much sap it takes to get a gallon of syrup? Now that they have learned about sugarmaking at the Audubon Center, you are going to try making syrup for yourselves on the stovetop. Measure and record the starting volume and density of the sap. Ask students to predict how much syrup they will have at the end and how long it will take to make. Keep the pot boiling on the burner during the day. Check and stir the boiling sap periodically. Monitor the density closely when it gets close to syrup. When you have syrup, measure and record the ending volume and density. Then enjoy! Evaluate students' predictions and discuss the process.

Sugarbush Forest Murals

All Grades

Objective: Students create murals of a sugarbush during different seasons showing the sugarbush as a forest ecosystem with many interconnected living and non-living components.

Materials: Large roll of newsprint; markers or crayons.

Procedure: Ask students to brainstorm what they saw in the sugarbush on their trip to the Audubon Center (sugar maples, other trees and plants, stumps, sap buckets, trails, people, sugarhouse etc.). Ask them to describe what the sugarbush was like and what other parts of the forest they think are a part of a well-managed sugarbush (wildlife species, snags, dead and downed trees, saplings, rotting logs, insects, leaf litter etc.). Discuss how the sugarbush would look different during the summer, fall, and winter. Divide the class into four groups and give each group a roll of newsprint. Have each group create a mural of a sugarbush during one of the seasons. Display the murals when they are complete. Compare the differences in the forests between the seasons and discuss how the parts of the sugarbush are interconnected.



Investigation: Can You Taste the Difference?

All Grades

Objective: Students put their taste buds to the test to see if they can tell the difference between Vermont maple syrup, artificial maple syrup, and sugar in oatmeal cookies.

Materials: Ingredients and equipment for baking maple oatmeal cookies (see recipe in *Sweet Maple* or use your own); artificial maple syrup; sugar; paper for graphing; markers.

Procedure: Ask the students what it is that makes maple syrup so special? Could they taste the difference between the grades of syrup at the Audubon Center? Do they think that they could taste the difference in baked goods? Break the class into three baking teams and have each team bake cookies with a different sweetener: Vermont maple syrup, artificial maple syrup, or sugar. Conduct a blind taste test by giving the students one of each type of cookie and asking them to record (1) which one they like the best and (2) which cookie contains the Vermont maple syrup. Record the classes' preferences and guesses in a bar graph or pie chart. Discuss the results. Were there any other factors that affected people's preferences (i.e. did one team burn or under-bake their cookies)?

Sugarmaker Interviews

Grades 3-5

Invite a local sugarmaker(s) to your classroom to talk with your students. Before his/her visit, ask your students to brainstorm questions that they have for the sugarmaker. Ask them to think about their trip to the Audubon Center, and what else they would like to know about sugaring from other sugarmakers. Give pairs or small groups of students time to ask the sugarmaker(s) their questions on the day of the visit, to record their conversations, and to take photos.



Resource: For a detailed lesson plan, see **Sugarmaker Oral Histories** in *Maple Sugaring in Vermont: A K-8 Standards-Based Unit of Instruction*, p. 134.

Be a Sugarmaker

Grades K-3

Objective: Students review the tools used to boil sap into syrup by acting out the process of sugaring through play.

Materials: Materials to build a mini-evaporator; assortment of common household items to represent sugaring tools (see *Project Seasons*, page 197).

Procedure: Review what students remember about the steps and tools that they saw at the Audubon Center used to boil sap into syrup. Involve the students in building a mini-evaporator for the classroom. Gather the sugaring “tools” together and go through what each one represents. Guide students through acting out being sugarmakers, and give them free time to play “makin’ syrup.”

Resource: For a detailed lesson plan, see **Be a Sugarmaker** in *Project Seasons*, Shelburne Farms, 1995, p. 197.

Fit to be Thinned

Grades 3-5

Objective: Students consider factors important to tree growth when acting out making management choices in a sugarbush.

Materials: Tree identification cards describing the species, size, age, and health of various trees in a sugarbush from seedlings to snags.

Procedure: Review what trees need to grow (sunlight, water, soil, air, space). Talk about what happens when a tree does not get enough of any one of these resources. Review what the sugarbush at the Audubon Center was like. What types of trees were in the forest? How big were they? Were they growing close together or far apart? Were the trees competing for any of the resources that they need to survive? Discuss how thinning in a young or crowded sugarbush can give the trees that are left behind more resources to grow and increase the amount of sap a maple produces. Give students tree identification cards and act out being a crowded sugarbush. Have students make choices about which trees to leave and which ones to cut down. Discuss.

Resource: For a detailed lesson plan, see **Fit to be Thinned** in *Project Seasons*, Shelburne Farms, 1995, p. 195.