

The Impacts of Climate Change on Maple Trees



#SilaandtheLand
Activity
Grade Level: 7-8

About This Activity

Learners investigate the functions of the many structures present within a maple tree, as well as the relationship between sweet water harvesting and climate conditions, using scatter plots.

Learning Outcomes

After completing this activity, learners will:

- Identify and explain the purpose of the biological structures within a maple tree
- Interpret scatter plots to support arguments about sweet water production
- Draw conclusions regarding the impact of climate change on maple trees and the production of sweet water

Curriculum Connections

Ontario

Grade 7 History: New France and British North America, 1713–1800 (A2.7, A3.5)

Grade 7 Geography: Physical Patterns in a Changing World (A1.1, A1.2, A1.4, A2.1, A2.2, A2.6, A3.10)

- Natural Resources Around The World: Use and Sustainability (B3.2, B3.4)

Grade 8 History: Canada, 1890–1914: A Changing Society (B2.6, B2.7)

Grade 8 Geography: Global Settlement: Patterns and Sustainability (A3.6)

Length of Activity

180 minutes

Materials List

Internet-enabled device

Cross-section of a maple tree or [digital image](#)

Sugar Maple Trees Have Nowhere To Go Under Climate Change Article

Maple sugar videos

Drawing/crafting materials (pencil crayons, pens, paper, modelling clay, etc.)

Finding the sweet spot: Shifting optimal climate for maple syrup production in North America Journal Article

Maple tree tapping materials

Step 1: All About Maple Trees

Remind learners or start a class discussion on what the Maple Tree taught Sila in the book titled, *Sila and the Land*. Ask them:

- What is underground and helps trees, just like the Maple Tree to grow big and tall? (Ans: roots)
- Just like the Maple Tree, we too have our own individual roots. What do our roots help us connect to? (Ans: various; family, ancestors, culture, and the land we walk on)
- Why would we want to protect our own individual roots? Why are they important?

Lead the class into thinking about how climate change can affect Maple Trees themselves.

- Introduce the class to the article titled, [Sugar Maple Trees Have Nowhere To Go Under Climate Change](#). Learners can read it individually, in groups, or as a class.

- b. Educators are encouraged to explain that as the climate warms (changes) in areas rich with sugar maple trees, the ability to collect high volumes of maple sap will decrease. The reason (explained in the above article) for this decrease is due to the fact that sugar maple trees along with many other animal and plant species are predicted to move northward where suitable conditions like climate and resources will be ideally situated in North America as the climate continues to change. However, for sugar maple trees their suitable habitat depends on the type of soil and the microbes inside the soil that can promote tree growth. Currently, sugar maples grow in temperate forests but as they get pushed northward due to climate they will be forced into boreal forests where soil has very different properties. Therefore, researchers discovered there are both biological and soil characteristics that prevent the sugar maples from moving north. So as the climate continues to change in these temperate forests the sugar maple trees will not be able to go anywhere, and their growth and sugar water production will decrease significantly. For example, maple trees in Quebec are not sustainable in the northern region, which stresses the importance that climate change will have long-term impacts on maple syrup production in Canada.
- c. Try to stimulate learner thinking and discussion by asking prompting questions such as, “What do you notice?”, “What do you wonder?”, or more specifically, “If a Maple Tree’s roots can’t help the tree grow big and tall because of climate change, is that fair to the Maple Tree?”. Climate change is hurting the Maple Tree’s connection to the land we walk on because its roots are weak, which in turn affects our own individual roots as we are all connected through the land.

Step 2: Maple Sugar Videos

These videos provide a general overview of the process of making maple syrup from start (tree

identification) to common practices for storing maple sugar. We highly recommend watching this series as a class as it shares how the Anishinaabeg learned about the sap of the maple tree and how to create sweet water, maple syrup.

- a. [The Stories](#) (11:41 minutes)
- b. [Collecting Maple Sap](#) (12:48 minutes)
- c. [Language](#) (7:43 minutes)
- d. [Ininiaatig - Maple Trees](#) (11:20 minutes)
- e. [Ziinzibaakwad - Maple Sugar](#) (14:25 minutes)

Please allow learners to think of what might happen if Indigenous Peoples are unable to practice collecting and processing maple sap each spring, based on what they learned in the video series.

Step 3: Exploring the Structures of a Maple Tree

Introduce learners to a cross-sectional slice of a maple tree trunk. If possible, use a real maple tree slice, however, a digital image can be utilized and found [here](#). Project the digital image at the front of the class or have the physical maple tree slice at the front of the class so learners can all see it.

- a. Allow learners to identify the following structures below. Educators can give descriptions of these structures to the class and allow learners to decide where they think each structure could be.
 - i. Xylem: This transports sweet water (sap) up from the roots to the leaves. It is also known as sapwood.
 - ii. Heartwood: This is the dark non-living wood at the core of the tree’s trunk. Heartwood forms when the xylem cells plug up with resins and minerals. Heartwood supports the tree.
 - iii. Phloem: This is the tissue in the tree that transports sweet water (sap) down from the leaves to the roots. When phloem dies it becomes bark.
 - iv. Cambium: This is the growing layer of cells. The cells divide, producing phloem to the outside and xylem to the inside of the tree.

- v. Bark: This is the dead, outside covering on trees. The bark protects the trees from excessive water loss, injury, insects, disease, weather, herbivores, etc.
- b. Invite learners to create their own cross-sectional representation of a maple tree trunk. Be sure to remind students to label each of the structures and note their function(s). Learners can work individually or in groups. These cross-section representations can be simple drawings or more creative 2-D or 3-D representations. The materials required to create these representations can range from paper, pencil crayons, cardboard, markers, modelling clay, toothpicks, popsicle sticks, etc. Get creative!
- c. As learners are creating their own representations, or as they are finishing up, discuss with them where maple sugar trees grow naturally (consider by region for example). Some questions to guide their thinking include:
 - i. Why might sugar maple trees grow more easily in the Deciduous Forest region as opposed to other regions more north or south?
 - ii. Perhaps animals, soil, and temperature are potential factors? Any reason as to why?
 - iii. What are other possible considerations?
- c. To establish comparison data, learners can collect and represent their own maximum/minimum temperature data over a short period of time. If possible, educators can tap maple trees with the class during the maple syrup harvesting season. It would be ideal for learners to identify what days and weeks might yield the highest volumes of sweet water.
- d. Plotting their own data with the temperature and volume of sweet water collected can greatly help show this comparison.

Step 5: Conclusion

Allow learners to write answers down to these questions below in their own journals or discuss as a class.

- a. What captured your attention and what new information did you learn?
- b. Taking everything we learned today from the video series, the articles, and from the *Sila and the Land* book, what might be the consequences or impacts of climate change on maple trees?
- c. If Anishinaabe and other Indigenous Peoples cannot practice the harvesting of maple sap as much as they used to due to climate change, will it be problematic? How might this impact their livelihoods and lifestyles since they have such strong relationships with the land? How does this make you feel?

Step 4: Scatter Plotting and Comparing

Introduce learners to the maximum/minimum temperature graphs on the second page of this journal article titled, [Finding the sweet spot: Shifting optimal climate for maple syrup production in North America](#).

- a. Educators can relate these graphs (Fig 1.) to the flow of sweet water (this journal article gives excellent background information when considering the impacts of climate change on maple syrup production).
- b. As learners explore these scatter plots, ask learners to make predictions about when the flow rate of the sweet water will be at its peak.