

Ag Explorer Lesson 14: Sweet Science – Maple Syrup and Forest Stewardship

Target Grades: 6th–8th

Length: 35–45 minutes

STEELS Focus Areas

- 3.1 Biological Sciences
 - 4.4 Agriculture & Environment
 - 4.5 Humans & the Environment
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Learning Objectives

By the end of this lesson, students will be able to:

1. Describe how maple trees produce sap and how it is transformed into syrup. (3.1.7.A)
 2. Explain the biological and environmental factors that affect sap flow. (4.4.7.A)
 3. Evaluate sustainable forest management practices that support syrup production and ecosystem health. (4.5.7.C)
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Essential Question

How does understanding tree biology help farmers and foresters turn sap into one of Pennsylvania’s sweetest natural products?

Materials Needed

- Diagram: Maple tree sap flow (roots → trunk → tap → collection → boiling)

- Handout: “Maple Syrup Facts for Farmers”
 - Clear container with water to simulate sap
 - Photos or short video of maple syrup tapping in PA
 - Worksheet: “From Sap to Syrup”
 - Poster paper and markers
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Lesson Breakdown (35–45 minutes)

1. Hook: Tapping into Nature (5–7 min)

- Show a short clip or image of a maple tree with a tap and collection bucket.
 - Ask:
 - “Where do you think syrup comes from?”
 - “How do farmers know when it’s time to collect sap?”
 - Explain that syrup starts as sap—a watery liquid that trees produce every spring.
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2. Mini-Lecture: The Science of Sap (10 min)

Use visuals to explain:

- **Tree Biology:**
 - Sap carries water and sugars from the roots to the branches.

- In late winter and early spring, temperature changes cause sap to flow.
- Only certain species (like sugar maple) have high enough sugar content for syrup.

- **Sap-to-Syrup Process:**

- Trees are tapped with small spouts.
- Sap is collected and boiled to remove water—40 gallons of sap make 1 gallon of syrup.

- **Sustainability & Stewardship:**

- Tapping doesn't harm healthy trees when done correctly.
- Foresters protect maple stands through selective thinning and invasive species management.
- Using renewable energy (like wood-fired evaporators) supports eco-friendly syrup production.

3. Hands-On Activity: “Flow of the Forest” (15–18 min)

Instructions:

- In small groups, students create a diagram or mini-model of the syrup-making process.
- Must include and label:

- Tree biology (roots, trunk, leaves)
 - Sap flow
 - Collection and evaporation
 - Finished syrup
- Add notes on how each step depends on temperature, water, and forest health.

Optional Demonstration:

- Show water “flowing” through a clear tube or straw model to represent sap movement inside trees.
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4. Share-Out & Discussion (5–7 min)

- Groups present their models or diagrams.
 - Ask:
 - “What surprised you about how syrup is made?”
 - “Why are forests important beyond producing syrup?”
 - “What practices help keep maple trees healthy year after year?”
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5. Exit Ticket (3–5 min)

Prompt Options:

- “One thing maple trees need to make sap is...”
 - “One way maple syrup production can be sustainable is...”
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Assessment

- Group diagram completion
 - Discussion participation
 - Exit ticket response
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STEELS Standards Alignment

- **3.1.7.A:** Explain how plants transport nutrients and energy.
 - **4.4.7.A:** Describe the use of forest products in agriculture.
 - **4.5.7.C:** Evaluate sustainable forestry and renewable resource practices.
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Extension Opportunities

- Visit a maple sugar shack or forest conservation area.
- Experiment: Measure temperature changes and discuss sap flow conditions.
- Research how different tree species produce varying sugar concentrations.
- Create a poster on Pennsylvania’s maple syrup regions and production statistics.

Useful Links:

[New PA Maple Map Connects Consumers with Maple Products and Businesses | Commonwealth of Pennsylvania](#)

[Find Farmers/Products - PA Preferred](#)

[Maple Syrup Production | Penn State Extension](#)