SCIENCE

Fire as Tool to Support Plants and People

ESSENTIAL UNDERSTANDINGS

- **Lifeways and History**

LEARNING OUTCOMES

Students will understand

- the function of different plant parts,
- Oregon Tribes observe what plants need to survive and grow, and
- Oregon Tribes use fire as a tool to support plants.

ESSENTIAL QUESTIONS

- Why do Oregon Tribes use fire to help plants grow?

REQUIRED TIME

- 35 minutes

Overview

In this lesson, students will explore how Oregon Tribes observe what plants need to survive and use fire as a solution to help diverse plants like camas, tarweed, hazelnut trees, and huckleberries grow stronger. Students will make connections between how plants use their parts to meet their needs and how Native people in Oregon developed careful fire practices as an engineering solution to help plants thrive. Students will be introduced to the concept of Traditional Ecological Knowledge (TEK) as the overarching term for Native American ways of engaging with the environment. This lesson connects tribal lifeways with plant science and engineering problem-solving. Students will also have the opportunity to learn how both controlled burns (for understory) and cultural burns (to support plants) are engaged with today.

Background for Teachers

Oregon Tribes have used controlled fire for thousands of years to manage the land. Understanding how fire can support plants is an integral part of Tribes' traditional ecological knowledge. Their use of fire demonstrates sophisticated understanding of plant biology and ecosystem relationships. For example, the article, Indian Burning in the Willamette Valley, explains that,

> *"When early European settlers arrived in Western Oregon, they encountered a landscape quite different from what we see today. Much of the Willamette Valley was an open oak savannah, and the forests were a patchwork of new and old growth, reflecting centuries of intermittent fire. For many early visitors, this was the "natural" landscape - but in fact the native peoples of the area had been "managing" their environment for about 4,000 years, primarily through the use of fire. By using low-intensity spot firing in the Fall, the Kalapuya and other local peoples had learned how to maximize the landscape for the products they needed most - seed, textiles, wapato, and forage for game. In fact, they had maintained the Willamette, Umpqua and Rogue Valleys in a truly prehistoric state - since the last great climate change about 4000 years ago, when a wetter climate succeeded a long dry period."*[1]

STANDARDS

Oregon Science Standards

- **1.LS1.1** – Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
- **1.ETS1.1 –** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

[1] *Henry J. Warre & Thomas Miles Richardson, Jr. (n.d.). Indian Burning in the Willamette Valley. Indian burning in the Willamette Valley.* https://www.oregonhistoryproject.org/articles/historical-records/indian

Considerations for Teachers

Practices

While teaching this lesson, the following principles can help guide your decision-making and engagement with students.

- Focus on teaching the Essential Understandings through scientific analysis of how plants use their parts and how Native people developed solutions.
- When sharing content with students, address the "why" not just the "what" - emphasize the careful observation and problem-solving that guides Native fire practices.
- Highlight the strengths and continuing knowledge of Oregon's Native peoples today while acknowledging their long history and tradition.
- Connect science concepts (plant parts and needs) with social studies concepts (tribal knowledge and lifeways).
- Ensure your teaching practices are accessible and appropriate for Native and non-Native students.

KEY WORDS and IDEAS

- **Lifeways:** how a group of people live, work and play together.
- **Cultural Burn/Planned Burn:** A small, safe fire that Native American people start on purpose to help plants, using knowledge passed down for thousands of years
- **Plant Parts:** The different pieces of a plant (roots, stem, leaves, flowers) that help it live and grow
- **Problem and Solution:** When something needs to be fixed (problem) and finding a way to fix it (solution)

Assessment

During this lesson, observe and listen to students during discussions and as they work independently and collaboratively to determine how their learning is progressing. Write down what you notice about what students say and do in relation to the success criteria. Use this formative information to provide feedback to students and plan next steps.

At the end of the lesson, provide students with an opportunity to reflect on their learning through a self-assessment. Students can indicate their level of learning in relation to specific success criteria.

Success Criteria

- Students can identify ways plant parts help plants survive and grow.
- Students can explain how Oregon Tribes observe plant problems and use fire as a solution.
- Students can give an example of how Oregon Tribes help plants with fire today.

For the following activities, use the slide deck to support your implementation.

Opening

Time: 10 minutes

Step 1:

Let students know that they're going to learn a little about how plants use their external parts to help them grow and how Oregon Tribes help them using fire.

Step 2:

Review the learning outcomes, success criteria, key words and ideas and essential question with students.

Step 3:

Explain the parts of plants to students.

- Roots: "Roots need space in the soil to spread out and find water and nutrients (food for plants)"
- Stems: "Stems need to reach toward sunlight and not be crowded by other plants"
- Leaves: "Leaves need sunlight to make food for the plant - they can't work well in shade"

Step 4

Show students pictures of an overgrown field of Camas and a drawing of people from Oregon Tribes playing in a clearing

- What do you notice about these pictures?
- Which plants look like they have room to grow?

Say to students, "Today we're going to learn about how Oregon's Tribes observed plants like these and discovered a problem - some plants weren't getting what they needed. They developed a solution using small, controlled fires that helped plants stay strong and grow!

Step 5:

Explain the solution, "Oregon Tribes developed a careful solution - they used small, planned fires to help plants! This wasn't just any fire - it was very carefully planned."

- Reinforce safe fire practices for students.

Explain the Problem, "Oregon Tribes observed that some important plants had problems:

- Camas roots couldn't spread because too many other plants were crowded around them
- Hazelnut tree branches couldn't reach sunlight because there were too close together
- Huckleberry leaves were shaded by too many trees and did not produce berries

Make a connection to science, "Plants need their parts to work well to survive and grow!".

Main Activity

Time: 20 minutes

Step 1:

Display pictures of camas, tarweed, hazelnuts, and huckleberries.

Explain how each plant benefits from controlled burning:

- "Camas grows better after a fire because the fire clears away other plants."
- "Fire helps tarweed seeds open and grow." The Kalapuya would burn the plant to remove the sticky resin, making it easier to harvest the seeds.
- "Fire helps hazelnut trees produce more nuts."
- "Huckleberry bushes grow more berries after a fire."

Step 2:

Have students work with a partner to match pictures of the plants with the benefits of fire. Print out the handout and cut out the matching cards for students to use in this activity.

Ask students to share their matches with the class, reinforcing the correct connections.

Step 3:

Make the connection to engineering. Say to students, "Just like engineers today, Native people:

- Asked questions: 'Why aren't these plants growing well?'
- Made observations: 'The plants are too crowded and shaded'
- Developed a solution: 'Careful fire can clear space and help plants'"

Make a connection to tribal knowledge. Say to students, "These practices are part of Oregon Tribes' lifeways - the special ways they live and care for the land. They learned this through thousands of years of watching and caring for plants."

Step 4:

Make a modern connection. Say to students, "Today, tribal fire experts still use this knowledge! People from the Confederated Tribes of Grand Ronde, Siletz, and Warm Springs work with scientists and firefighters to do cultural burns."

Show a section of the video, Cultural Burn at Smithfield Oaks, from 2:35-4:22 minutes.

Invite students to share their impressions and questions.

Make a science connection. Say to students, "People from Oregon Tribes still help plants use their parts better - just like we learned plants need to do to survive and grow!"

Closing

Time: 5 minutes

Step 1:

Make a connection to the standards. Say to students, "We learned how plants use their external parts to survive (like scientists study), and how Native people developed solutions to help plants (like engineers do). This is part of tribal lifeways that continues today."

Step 2:

Support students to conduct a self-assessment in relation to the success criteria using the handout at the end of this lesson plan. This process supports students to develop ownership over their own learning.

Step 3:

Have students do the self-assessment based on the Success Criteria. Go over the Success Criteria as needed.

Additional Information for Teachers:

In the past, anthropogenic fire was most common in the Willamette, upper Umpqua, and Rogue Valleys; in high-elevation huckleberry areas; and in eastside Ponderosa forests, the traditional homelands of Kalapuya, upper Umpqua, Takelma, and Sahaptin peoples. Fire maintained open oak savannah prairies and supported many plant and animal species.

The Camas Prairie restoration project demonstrates ongoing collaboration between Tribes and federal agencies. Since beginning prescribed burns, the amount of camas in the prairie has more than doubled, showing how fire helps camas plants use their root systems more effectively.

According to Colby Drake, Fire Program Manager for the Confederated Tribes of Grand Ronde: "A lot of the Indigenous ways and a lot of the knowledge that is retained can be beneficial... It's really helping our land."

Additional Resources

2nd grade lesson by the Confederated Tribe of Siletz Indians, Cultural Burning

Video of Oregon tribal fire training near Eugene that features the Confederated Tribes of Grand Ronde, Ancient Native American Forest Practices by Oregon Public Broadcasting

Educational content about cultural burning nationwide that includes a video discussing Indigenous use of fire, Indigenous Fire Practices Shape Our Land by the National Park Service

Article explaining cultural burning vs. prescribed burns, How Indigenous Practice of 'Good Fire' Can Help Forests by the UC System

Historical documentation of tribal fire practices, Indian Use of Fire in Early Oregon by Oregon Encyclopedia

Article on traditional Indigenous knowledge, Indigenous Burning Practices in Wildfire Management by Mountain Rose Herbs

Handout: Matching Cards

Directions: Cut out the cards along the dotted lines. Work with a friend to match the pictures with the words.

Camas

Image Courtesy of Walter Siegmund, CC BY-SA 3.0 <https://creativecommons.org/licenses/by-sa/3.0>, via Wikimedia Commons

This plant grows better after a fire because the fire clears away other plants.

Tarweed

Image Courtesy of Wikimedia Commons

Fire removes the sticky resin, making it easier to harvest the seeds.
Fire opens seeds to go into the earth to grow.

Hazelnut trees

Hazelnut Harvest, 2014 Jacki-Dee
https://www.flickr.com/photos/werms/15436457696/in/photostream/

Fire makes the soil healthier so there are more nutrients to help the trees grow.

Fire helps the trees grow more new shoots which is good for basket weaving.

Huckleberries

Evergreen Huckleberry Photo Courtsey of Willamette Biology
https://www.flickr.com/photos/willamettebiology/5048944242/in/photostream/

This plant needs open sun to grow.

It is fire adapted and grows back quickly and healthy after a fire.

Handout: Student Self-Assessment

Directions: Read aloud the lesson Success Criteria in the first column to students. Have them indicate if they were able to meet the criteria by marking it in the handout, with hand gestures, or by sharing aloud. Ask students to explain why they chose "not yet" or "yes" to a peer.

Success Criteria	Not Yet 	Yes 
I can tell you what plant parts help plants survive and grow		
I can explain how Oregon Tribes observed plant problems and used fire as a solution		
I can give an example of how Oregon Tribes continue to use this knowledge today		