SUBJECTto® CLIMATE

Drought and Trees: Plant Adaptation Lesson

Created By	Grades	Subjects	Duration
Alice Severson	3rd, 4th, 5th	Environmental Literacy and Sustainability, Science	95 minutes

Lesson Overview

Essential Questions	• How can plants, as a system, adapt to climate change to avoid extinction? • What can we learn from First Nations about honoring Wisconsin's native plants? • How can I make connections to the plants in my community?
Learning Outcomes	Students will be able to: • Use evidence to explain how an oak tree's traits are influenced by drought • Create a model to show how a plant may adapt to climate change • Conduct an interview to connect my learning to local plant life and members of my community
Summary	Students make connections to local culture and consider how native plants are adapting to drought by reading graphs and making a model. **Inquire:** Students find personal meaning in an oak tree and learn about the significance of oak trees to certain First Nations people. **Investigate:** Students create a model to explore drought adaptation solutions of native plants and connect this to how trees adapt globally. **Inspire:** Students find oak trees in their community and use their learning to inform others about their adaptations and cultural significance.

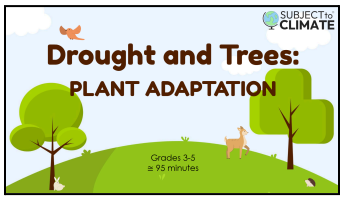
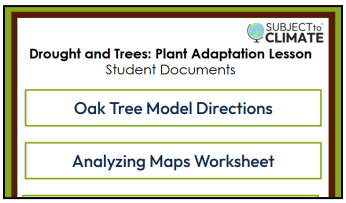
Instructions

Inquire
≈ 40 minutes
	• Students use a leaf to locate an oak tree near their school, if possible.
	  ○ Use images of leaves in the Teacher Slideshow, if circumstances do not allow for realia.
	  ○ Students search the school grounds or nearby area for a tree with matching characteristics.
	  ○ Students sit around the oak tree and discuss what it symbolizes for them and their classmates. Alternatively, stay in the classroom and imagine a wooded area.
	• Students work in small groups to draw a picture of the oak tree and write about what it symbolizes. Students share their work.
	• Students view a map of Eau Claire, Wisconsin, and a picture of the oak tree that stands for the Council Oak in the Teacher Slideshow.
	• Teacher explains the significance of the oak tree for the First Nations from Wisconsin.
	  ○ For the Lakota (also referred to as the Sioux or Dakota) and Ojibwe (also referred to as Ojibwa) tribes, the oak tree was a meeting place where the two tribes could come together for peace talks and some spiritual ceremonies.

	○ Students watch American Indian Studies: An Overview (0-1:04) to demonstrate how important the oak tree was to the First Nations in this area. ○ Additional teacher information is provided in the Teaching Tips. • Students learn the meaning of the word, *confluence* using context from the video and the definition in Teacher Slideshow. • Students consider the question, "How may climate change be affecting this incredible tree?" ○ Teacher explains that we will be investigating this question through model-making. ○ Students view this video if they need more background knowledge about climate change.
Investigate **≈ 45 minutes**	• Students turn and talk to answer the question: "What is a model? How is it useful in explaining phenomena?" and share ideas. • Students build a model of a tree in small groups. Directions are provided in the Student Document. • Students discuss how their model represents an oak tree *system*. Discussion questions are provided in the Student Document. • Students display their tree systems. • Class returns to the question: "How may climate change be affecting this incredible tree?" ○ Students view images of Wisconsin drought conditions and make inferences about how this may affect oak trees and other plants. ○ Students review a map of their state and the current drought conditions. • Teacher explains that oak trees, like other plants, have been found to adapt to drought. ○ Students discuss the question: "What changes to this system could help an oak tree survive a drought due to climate change?" ○ Possible responses include having longer roots, losing leaves, growing smaller leaves, and having thicker or thinner bark. • Groups choose an adaptation and discuss how they can change their model to illustrate how an oak tree may survive a drought due to climate change. • Groups make changes to their model. • Groups present their model to the class. This presentation may be used as a formative assessment. • Teacher congratulates students for their creative systems thinking. ○ Teacher highlights models that used thicker bark as the solution. ○ Oaks throughout the world have used this adaptation to survive droughts. ○ Thicker bark also helps trees survive forest fires, which can occur as a result of drought. • Students view maps showing the relationship between drought and bark thickness. See Teacher Slideshow. Students can complete the Student Document worksheet, Analyzing Data, to share noticings or discuss as a class.
Inspire **≈ 10 minutes**	• Teacher invites students to identify oak trees in their neighborhoods and parks. • Students review oak leaf images to help with identification. • For homework, students show an oak tree to an adult (preferably outside, but this can be done virtually, if needed).

	○ Students will interview the adult using the questions in the Family or Community Member Interview sheet in the Student Document. They will discuss how the Lakota and Ojibwe tribes used oak trees as places to have peace talks. To continue in this tradition, the student and the adult share something peaceful with each other. ○ Students record notes about their interview. ○ If possible, students can take a picture of the oak tree. • Students share in class. Tree photos can be combined in a classroom Peace Collage. Students can add peaceful words to the collage throughout the year.

Accompanying Materials

Teacher Slideshow	Student Document
	

Teaching Tips

Suggestions	• This lesson encourages students to look at a native Wisconsin plant in a new light; with a view towards the historic importance and the symbolism granted to it by the Lakota (also referred to as the Sioux or Dakota) and Ojibwe tribes, and as a resilient and complex organism. • The Peace Collage invites students to continue reflecting on the messages of the lesson as they make connections to their communities. • This lesson can be further connected to social and climate justice by following up with lessons on equity of tree coverage in urban and suburban areas and heat islands, as well as lessons on the First Nations that reside in Wisconsin. • For more information on the significance of the Council Oak from Rick St. Germaine, an Ojibwa (also referred to as Ojibwe) tribal member's perspective, see this interview transcript.
Prerequisites	• Students should have a basic understanding of climate change. To provide students with some background, teachers can use "Saving Planet Earthly" or Introduction to Climate Change. • Students should have an understanding of systems thinking. From Center for Ecoliteracy: "A systems approach helps young people understand the complexity of the world around them and encourages them to think in terms of relationships, connectedness, and context." • Gather materials needed for oak tree system modeling: ○ Initial build*:* small paper cups, yarn or string, green paper, paper straws, tape, scissors ○ Possible suggestions for additional materials for engineering revision*:* pipe cleaners, more paper, plastic wrap or tagboard, hole puncher, or other assorted craft materials

	• Print or project the three maps for students to refer to.
	  ○ Global Drought Map
	  ○ Figure S4: Global distribution of bark thickness across all species
	  ○ Tree-bark thickness indicates fire-resistance in a hotter future

Differentiation	• For a lesson on the equity of tree coverage, use the Tree Equity Interactive Game. • Classes that do not have access to oak trees can watch this video of a walk through the UW Wisconsin arboretum. • Groups of students with mixed abilities can collaborate on tree models. • When possible, group same-language peers together to allow for translanguaging during collaboration and sensemaking. • As an extension, watch the video, How plants 'remember' and survive drought (0:49-1:46) and discuss how oak tree and crop adaptations are similar or different.

Learning Standards

Primary Standards
Environmental Literacy and Sustainability Standards
ELS.EX2.A.i: Analyze a system to break it down into its component parts to understand their interconnectedness in forming the whole system.
Science Standards
3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment.
4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
4-ETS3-1. Construct an explanation for how energy is transferred in a system, and then revise that explanation based on new evidence.
Secondary Standards
Social Studies Standards
SS.Geog 4.a.4 Describe how certain places may have meanings that distinguish them from other places (e.g., cemeteries, places of worship, state or national parks, historical parks, or battlefields). Compare and contrast the human characteristics of rural, suburban, urban, and tribal locations in Wisconsin and the United States. Identify and describe how people may view places in the community differently (e.g., students and senior citizens responding to a new playground).
SS.Geog5.a.3-4 Compare the positive and negative effects of human actions on our physical environment (e.g., availability of water, fertility of soils) over time.