

Exploring the Mighty Oak

Overview: Oaks are important trees in nature and in landscaped environments. In this lesson, students will explore the mighty oak and discover how critical they are in ecosystems.

Grade Level/Range: 5th – 8th Grade

Objective:

Students will:

- Learn how to identify oaks and search for specimens in their community.
- Explore the importance of oak trees in the ecosystem and why they are considered a keystone species.
- Brainstorm a way to share the benefits of oak trees with friends and family.

Time: 60+ Minutes

Materials:

- Tree Identification Guide (Book/Website/App); suggestions in Laying the Groundwork section
- Garden journal or paper and clipboard
- Pencils
- Ecosystem of an Oak Tree Worksheet

Time of year: Spring, Summer, Fall

Background Information:

Oak trees are a keystone species. A keystone species is one that plays such a critical role in its environment (by supporting food webs, offering shelter, keeping ecological systems in balance, etc.) that, if removed, would significantly alter the ecosystem where it is found.

Hardwood trees that can be deciduous or evergreen, oaks are often identified by their distinctive fruit – the acorn. Acorns are an important food staple for many animals (including humans in some cultures) because they are a good source of protein, fat, and carbohydrates. Above ground, the trees offer food, shelter, shade, and help clean the air above ground. [Below ground](#), the roots stabilize the soil, help sequester carbon, and release exudates (carbon-based molecules) that feed beneficial microorganisms important for soil life. The benefits oaks provide are vast and diverse. For more details, read [The Oak Trees' Mighty Role in Habitats and Humanity: https://kidsgardening.org/resources/digging-deeper-oak-trees/](https://kidsgardening.org/resources/digging-deeper-oak-trees/).

Oak trees (species in the genus *Quercus*) are common in natural forests across much of the Northern Hemisphere, and they have been widely planted in backyards and as street trees. No matter where you live, you will most likely be able to find some kind of oak tree growing in your community!

They range in size from 30' to 100', and there are hundreds of species of oaks. There are species native to five continents (North America, South America, Asia, Africa, and Europe). Species found in the U.S. include white oaks, red oaks, black oaks, bur oaks, Chinkapin oaks, water oaks, pin oaks, Shumard oaks, willow oaks, post oaks, and live oaks.

For more information about the growth habits and life cycles of trees, check out:



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- Exploring Tree Rings: <https://kidsgardening.org/resources/lesson-plan-tree-rings/>
- Fall Foliage: Why Leaves Change Colors: <https://kidsgardening.org/resources/digging-deeper-why-leaves-change-colors/>

Laying the Groundwork:

Use the background information above to introduce oaks to your students. If possible, plan a visit to your schoolyard or nearby greenspace in search of an oak tree. The leaves of different species of oaks vary greatly, but most have simple leaves, many with decorative lobes and edges that are arranged in alternate patterns on their branches. To help with ID, in the spring, students can also look for their catkins (flowers), and in the fall, they can look for acorns (fruit).

For your hunt, check out an identification guide from a library and/or look for an online guide such as [USDA Field Guide to Native Oak Species of Eastern North American](#). You may find region-specific tree guides from regional organizations such as state parks, native plant societies, and natural history museums. [The Field Museum's Common Oaks of the Chicago Region Guide](#) is one example.

Alternatively, you could try using the iNaturalist's Seek App, a free app that helps identify species using photos you take: https://www.inaturalist.org/pages/seek_app

If a tree walk is not a possibility, use an online database like the [Arbor Day Foundation Tree Guide](#) to explore some common oaks digitally.

Exploration:

1. Share the definition of a keystone species. Ask: *Do you think an oak tree is a keystone species?* and record students' answers. Next, ask students to brainstorm ways to find an answer to this question. Ask: *What would we need to learn about an oak tree to support this classification? How can we uncover that information? What are our next steps?*
2. Observation and research are two ways students can dig deeper into exploring the importance of oak trees in their ecosystems. If you have access to an oak tree, plan a time for students to observe the tree and search for signs of life. Record observations in a garden journal (or use paper and a clipboard). Some suggestions for observations:
 - a. Look for the presence of animals, both big (e.g., squirrels and birds) and small (e.g., caterpillars and spiders). Look for any signs of nests in tree limbs or holes in the trunk (small or large). Check leaves for galls and explain that tiny wasps create them.
 - b. Take the air temperature under the shade of the canopy and in full sun and compare. What does this mean for the environment?
 - c. Look at the ground around the tree. Are there leaves present? If so, is there anything living in or under the leaves? What else is growing on the ground? Other plants? Grass? Weeds? Can you find any acorns?
 - d. Bring a trowel and make a few small holes in the soil to see if you find any animal life. Use a magnifying glass if possible.
 - e. Check out the soil quality around the tree and compare it to nearby areas. After a rain, observe water patterns to see if there are any signs of soil erosion around the tree.

If you do not have an oak tree easily accessible and observation is not possible, you may want to share a video about oaks. Here are a few to consider:

- o A Year in the Life of an Oak Tree from The Woodland Trust: <https://www.youtube.com/watch?v=zdKYWiVy9FY>
- o Habitats: Oak Trees from Descanso Gardens: <https://www.youtube.com/watch?v=iYP-RXqbvm0>

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- Adaptations: Oaks and Wildlife from Descanso Gardens:
<https://www.youtube.com/watch?v=HQeA0842z8k>

3. Follow up observations with research about oak trees. Ask students to search for organisms that rely on oak trees to meet their needs. For each, have them also consider whether these organisms have a mutually beneficial relationship with the oak trees and also help the oak tree survive or not. Additionally, ask them to make a list of the ways oak trees positively impact the environments they live in. They can use pages 1 and 2 of the Ecosystem of an Oak Tree Worksheet to help collect their data. If time is short, you can divide students into groups and have each group research one section of the worksheet and then share their findings with the rest of the class.

If you would like to help students get started with their research and/or need to save time, you may want to share The National Park Service's Species Spotlight on Oaks:
<https://www.nps.gov/articles/species-spotlight-oaks.htm>.

4. As a class, discuss findings and combine them into a class list of all the ways oak trees are important in their ecosystems. Return to your discussion about whether or not the oak is a keystone species. Ask again: is the oak tree a keystone species? Would removing an oak tree from an ecosystem significantly impact life in that ecosystem? Reflect on whether or not your observations and research have changed their initial response.
5. To reinforce the activity, use page 3 of the Ecosystem of an Oak Tree Worksheet to create a graphic representation depicting all the organisms living in and around an oak tree found during your research and how they interact. Ask them also to note how the trees impact the physical environment. Display drawings at school or in the community.

Making Connections:

Support a class project to raise awareness of the importance of oaks. Possible ideas include creating an oak tree ID guide, creating a spotlight or map of prominent oak trees in your community, participating in a community tree planting event, or raising oak trees from acorns to give to friends and family. Check out garden stories [Project Climate Club](#) and [From Apples to Acorns](#) for inspiration.

Branching Out:

- Explore how trees grow and how tree rings are a way to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem (NGSS MS-LS2-1). Check out KidsGardening's [Exploring Tree Rings](#) lesson plan to dig deeper.
- Learn about the pests and diseases that harm oak trees and how to help combat them in your area. Check out [Plant Heroes](#) by the American Public Gardens Association for resources on Sudden Oak Death, Light Brown Moth, Invasive Shot Hole Borer, Shoestring Root Rot, and Spongy Moth.

Standards:

5-LS2 Ecosystems: Interactions, Energy, and Dynamics

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

LS2.A: Interdependent Relationships in Ecosystems

■ The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy

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ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)

MS-LS2-2.

Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

LS2.A: Interdependent Relationships in Ecosystems

- Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2)

MS-LS2-4.

Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)

Related Articles:

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Fall Foliage: Why Leaves Change Colors: <https://kidsgardening.org/resources/digging-deeper-why-leaves-change-colors/>

Carbon Cycle and Carbon Sequestration: <https://kidsgardening.org/resources/digging-deeper-carbon-cycle-and-carbon-sequestration/>

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