



# Investigating the Oak Community

A Curriculum Guide for Grades 4-8

Kay Antúñez de Mayolo  
for the  
CALIFORNIA OAK FOUNDATION

# INVESTIGATING THE OAK COMMUNITY

Investigating the Oak Community is dedicated to all the children of California, with the hope that they may be good neighbors to oaks and oak communities.

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Founded in 1988, the California Oak Foundation (COF) is a 501(c)(3) nonprofit organization with a statewide membership committed to preserving the state's oak forest ecosystem and its rural landscapes. COF provides oak conservation information to children and adults, encourages stewardship of California's oak woodlands, and supports community members in carrying out local oak conservation practices.

COF advocates curbing urban sprawl, creating livable cities and planning responsibly at the state, regional and local levels. In partnership with rural landowners, conservation organizations, businesses, public agencies and others, COF works to mitigate losses of biological diversity and protect California's critical watersheds and wildlife habitat.

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# Introduction

Take a moment to think of your favorite view in the California landscape. For most Californians, oak trees are somewhere in that view. It's not surprising when you consider that oak woodlands and oak savanna cover over 10 million acres in forty-six of our state's fifty-eight counties.



Californians love native oaks! In 1990, we celebrated the first “Year of the Oak” and each year we honor oaks on November 1, “Oak Day.” California’s native oaks offer serenity and beauty to our landscape – and so much more. Oak woodlands profoundly affect the variety and abundance of wildlife, providing food, water and cover for approximately 350 vertebrate species. Oak woodlands are also the basis of watersheds that protect drinking water for millions of Californians.

Unfortunately, habitats where we find these native trees are rapidly diminishing. Historical accounts tell us that dense oak stands, covering an estimated 4 million hectares (10 million acres), once formed an impressive canopy over the state. During the past two hundred years, due in part to population growth, urban and rural sprawl, and agricultural conversions, we have dramatically changed the ways we use the land and its resources. These practices have vastly altered the oak woodland ecosystems, threatening the health of California’s watersheds and wildlife.

*Investigating the Oak Community* is designed to involve 4<sup>th</sup> through 8<sup>th</sup> grade students in a variety of activities that will develop their awareness, understanding, and knowledge of the important role of oaks in the California landscape. It will encourage students to take action to foster the sustainability of this vital natural resource. Its goal is to help today’s youth join the ranks of Californians who value and protect the state’s rich biodiversity.

## **A Focus on Community**

This curriculum guide is designed to help students understand that individual native oak trees are part of a complex and interconnected forest community. Most ecologists refer to this oak community as the “oak woodland,” “hardwood rangeland,” or “hardwood forest,” depending on its specific form. For example, in oak woodlands or hardwood rangeland, the tree canopies contribute more than 30 percent cover but seldom overlap; while hardwood forests are a mixed vegetation type with the canopies of trees such as oaks, maples, and bay often overlapping.

Because the oak woodlands of California need our attention, we have chosen to refer to them as the “oak community.” We encourage you to help children find the individual native oak trees in their urban and suburban neighborhoods, which may be the only remaining elements of earlier woodlands; or to explore nearby rural oak woodlands to learn of the complex interconnections among their plant and animal residents. In this way, students can begin a lifelong understanding about the interrelationships of plant species, wildlife, and people that together form the “oak community.”

# Using this Curriculum Guide

*Investigating the Oak Community* has been designed as a thematic and a project-based learning curriculum guide. The activities are clustered so that they may be used as small units or as the basis of a project. Each of the units and suggested action projects is organized around one of these questions:

- **Are there native oaks in our neighborhood?**
- **What can we learn about California's native oak communities?**
- **How do oaks grow?**
- **How is the oak community important to Californians?**
- **What can we do to protect the oak community?**

Consider starting with the first unit as an introduction to native oaks in your area, and then choose one or more of the next three units to help your students gain a comprehensive understanding of oak community ecology and conservation issues. Follow up these learning activities with an action project which students can apply toward helping the native oak community.

The lessons work well with a single student working alone, a group or class of students, or in non-formal settings such as 4-H or scout meetings. They are designed to be flexible. Use them in the way that best meets your curriculum goals, that suits your location, and that capitalizes on the interests of your students.

## Project Based Learning

This curriculum uses a project based learning approach. According to the *Project Based Learning Handbook*,\* this approach encourages students' active involvement in deciding what they want to study, and in completing a project.

It "involves students in problem-solving and other meaningful tasks, allows students to work autonomously to construct their own learning, and culminates in realistic, student-generated projects."

Project based learning allows students to construct their own knowledge, making it easier for them to transfer and retain information. This is because content is presented in a realistic, holistic way, rather than in fragments. Projects allow students to deal with content in a way that is personally relevant. Project based learning also accommodates diverse approaches to learning because it offers multiple ways for students to participate and to demonstrate their knowledge.

Driving questions are a key element of project based learning. They bring a sense of purpose and coherence to the projects and learning activities. The driving question gets at the heart of a topic, and helps students integrate, synthesize, and critically evaluate the information they encounter. This curriculum guide offers possible driving questions. Use them as is, or develop driving questions that interest you and your students and meet your program needs.

\*Project Based Learning Handbook.  
Novato, CA Buck Institute for Education, 1999.

# Correlation to Subject Standards

The key concepts addressed in this curriculum are from the following California State standards:

*Science Content Standards for California Public Schools, Grades K-12*, Sacramento, CA: California State Board of Education, October 1998.

*History and Social Science Standards for California Public Schools, Grades K-12*, Sacramento, CA: California State Board of Education, October 1998.

*Mathematics Content Standards for California Public Schools, Kindergarten Through Grade Twelve*, Sacramento, CA: California State Board of Education, December 1997.

*English and Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve*, Sacramento, CA: California State Board of Education, December 1997.

## **Science**

### **Life Science**

Students understand that living organisms depend on one another and on their environment for survival; that ecosystems can be characterized in terms of their living and nonliving components; and that many plants depend on animals for pollination and seed dispersal, while animals depend on plants for food and shelter. (Grade 4)

Students understand that organisms in eco-systems exchange energy and nutrients among themselves and with the environment; and that, over time, matter is transferred from one organism to others in the food web, and between organisms and the physical environment. (Grade 6)

### **Investigation and Experimentation**

Students understand that scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, students should develop their own questions and perform investigations. Students will:

- Differentiate observation from inference

(interpretation) and know that scientists' explanations come partly from what they observe and partly from what they interpret from their observations. (Grade 4)

- Measure and estimate weight, length, or volume of objects. (Grade 4)
- Formulate predictions and justify predictions based on cause and effect relationships. (Grade 4)
- Construct and interpret graphs from measurements. (Grade 4)
- Classify objects based on appropriate criteria. (Grade 5)
- Develop a testable question. (Grade 5)
- Plan and conduct a simple investigation based on a student-developed question, and write instructions others can follow to carry out the procedure. (Grade 5)
- Identify a single independent variable in a scientific investigation and explain what will be learned by collecting data on this variable. (Grade 5)
- Select appropriate tools and make quantitative observations. (Grade 5)
- Record data using appropriate graphic representation and make inferences based on those data. (Grade 5)
- Draw conclusions based on scientific evidence and indicate whether further information is needed to support a specific conclusion. (Grade 5)
- Develop a hypothesis. (Grade 6)
- Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data. (Grade 6)
- Construct appropriate graphs from data and develop qualitative statements about the relationships between variables. (Grade 6)
- Communicate the steps and results from an investigation in written reports and verbal presentations. (Grade 6)
- Identify changes in natural phenomena over time without manipulating the phenomena. (Grade 6)
- Select appropriate tools and technology to perform tests, collect data, and display data. (Grd. 7)

# Correlation to Subject Standards (Cont'd)

- Utilize a variety of print and electronic resources to collect information as evidence of a research project. (Grade 7)
- Communicate the logical connections among a hypothesis, scientific concepts, tests conducted and conclusions drawn from the scientific evidence. (Grade 7)
- Communicate the steps and results from an investigation in written reports and verbal presentations. (Grade 7)
- Plan and conduct a scientific investigation to test a hypothesis. (Grade 8)
- Evaluate the accuracy and reproducibility of data. (Grade 8)
- Distinguish between variable and controlled parameters of a test. (Grade 8)
- Construct appropriate graphs from data and develop quantitative statements about the relationships between variables. (Grade 8)

## History and Social Science

Students demonstrate an understanding of the physical and human geographic features that define places and regions of California by using maps, charts and pictures to describe how communities in California vary in land use, vegetation, wildlife, climate and population density. (Grade 4)

Students describe the social, political, cultural and economic life and interactions among people of California from the pre-Columbian societies to the Spanish mission and Mexican rancho periods. (Grade 4)

Students analyze the divergent paths of the American people from 1800 to mid-1800s and the challenges they faced. They understand about the influence of industrialization and technological development including modification of the landscape and how physical geography shaped human actions (e.g. growth of cities, deforestation, farming, mineral extraction). (Grade 8)

## Mathematics

### Measurement and Geometry

Students understand perimeter and area. (Grades 4-5)

Students understand and compute volume and areas of simple objects. (Grades 4-5)

Students deepen their understanding of the measurement of plane and solid shapes and use their understanding to solve problems. They understand the concept of pi and use these values to estimate and calculate the circumference and the area of a circle. (Grade 6-8)

Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, scale, area and volume are affected by changes of scale. (Grade 7-8)

### Algebra and Functions

Students use information taken from a graph or equation to answer questions about a problem situation. (Grades 4-5)

Students represent quantitative relationships graphically and interpret the meaning of a specific part of a graph in the situation represented by the graph. (Grade 7-8)

### Statistics, Data Analysis, and Probability

Students organize, represent and interpret numerical and categorical data, and clearly communicate their findings. (Grade 4-5)

Students collect, organize, and represent data sets that have one or more variables and identify relationships among variables within the data. (Grade 7-8)

### Mathematical Reasoning

Students make decisions about how to approach problems. (Grades 4-5)



## English and Language Arts

### Reading

Students identify main ideas and structural patterns found in informational text (e.g. compare and contrast, cause and effect, sequential or chronological order, proposition and support) to strengthen comprehension. (Grades 4-8)

### Writing Strategies

Students write informational and research reports, identify topics, ask and evaluate questions, and develop ideas that lead to inquiry, investigation and research. (Grades 4-8)

### Listening and Speaking

Students summarize major ideas and supporting evidence presented in spoken messages and formal presentations. (Grades 4-8)

Students identify how language use (e.g. sayings and expressions) reflects regions and cultures. (Grades 4-8)

Students deliver focused, coherent and informative presentations that convey ideas about an important idea, issue, or event. (Grades 4-8)

### Suggested Grade Levels

Suggested grade levels accompany the description of each activity, although with adjustments you can use all the activities with students in grades 4-8.

### Oak Community Portfolios

To evaluate students' progress in learning the key concepts and in completing the tasks outlined in a project, consider an alternative assessment practice such as the Oak Community

portfolio suggested in each activity. Set forth learning objectives at the beginning of the study, and try using a rubric to evaluate the knowledge and skills gained. For a more complete discussion on using portfolios, journals and rubrics as assessment tools, refer to Appendix 2.

### Presenting Multiple Points of View

The North American Association for Environmental Education points out in *Environmental Education Materials: Guidelines for Excellence* that good environmental education presents multiple points of view on key issues. As the facilitator of student learning, teachers should present current information and expose a variety of viewpoints about an issue. *Investigating the Oak Community* supports this philosophy and encourages teachers to use this curriculum in a manner that helps students gain a solid knowledge and understanding of the complexity of oak community conservation in California.

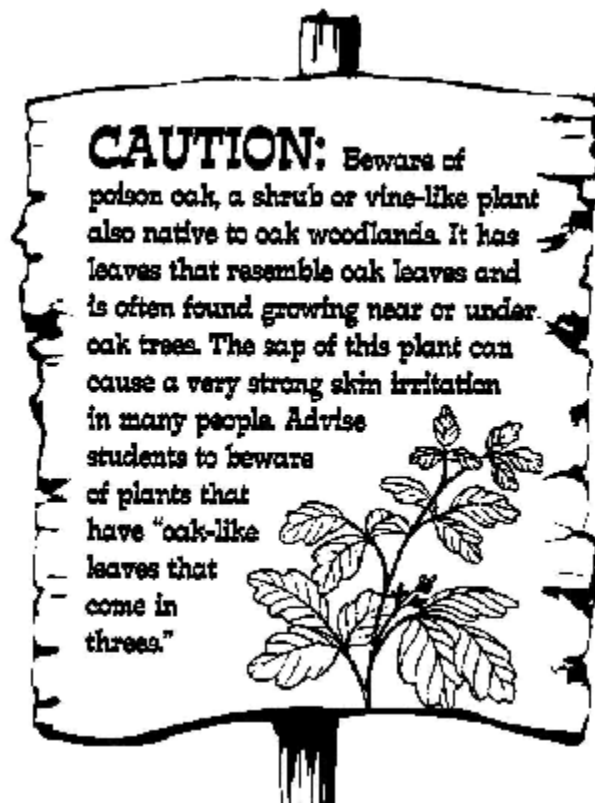
### Collecting Acorns

Access to viewing oaks or collecting samples of leaves and acorns is an important component of several of the activities. The best season to collect

acorns is between August and October. Consider making arrangements to visit a park, nature area or other location to collect acorns and view oaks. Be sure to ask permission to collect these plant materials on both public and private lands.

### Awards and Grants

Consider using this curriculum as a basis for applying for a special award or grant program. There are many programs that promote service learning and other learning activities that focus on community or environmental problem solving. A list of award and grant programs is offered in Appendix 5.





# Are There Native Oaks in Our Neighborhood?

The activities that make up this unit help focus students' attention on finding native oaks in their own neighborhood. Since people are a part of the oak community, these activities can help students build a life-long interest in both oaks as individual trees and components of a woodland or forest.

Consider starting your study of the oak community with this unit, and using all or some of the following activities. Then choose one or more of the other units to deepen students' understanding of the oak community.



## Activities

**1-Oak Watch**

**2-Identifying Native Oaks**

**3-Oak Homes for Wildlife**

# Oak Watch

### Grade Level

4-8

### Subjects

*Language arts,  
math, science, art*

### Skills

*Observing, analyzing,  
inferring, communicating*

### Materials

For each student: *Journal or sheets of paper, pens, pencils, colored markers, crayons, watercolors, etc., clipboard*

For the class: *Large sheet of butcher paper, copies of the “Oak K-W-L” and “Oak Watch Activities” student pages, small plastic bag or boxes, camera, binoculars, magnifying glasses or hand lens, measuring tape, compass*

### Summary



Students study an individual oak, and then answer questions and make drawings of what they observe.

### Objective



Students gain an awareness of oaks in their community, develop observational skills by keeping a journal that monitors a particular oak and its surroundings, and record any changes over several months.

### Background

In order for students to develop an interest and concern for the stewardship of oaks, getting to know oaks is an important first step. Finding a location for this activity will depend on where you live. If you need help locating a site, contact a local agency or organization for ideas. Once you have made the necessary arrangements, take students as often as possible to view the oak tree or trees they have selected to observe. As an alternative to a long-term study, consider planning to do this type of activity when your students participate in an outdoor school visit, as the focus of a field trip, or as an individual assignment if there are oaks near their homes.

This activity introduces students to keeping a journal or log of their observations. They can make their notes, sketches and other types of observations in a notebook or on sheets of paper that can be turned into a scrapbook or portfolio. The idea is to have students make a series of observations over time. Encourage students to keep their journals as part of the Oak Community portfolio.

### Preparation and Planning Tips

- Locate a site (school grounds, neighborhood park or nature area, nearby rural area, or along a street) to take students over an extended period of time to view native oak trees. Be sure to obtain necessary permission to leave school or to enter private property. If students are doing this activity on their own, make sure they have the same clearances.
- See “Exploring California’s Oak Landscapes” in *Oaks of California* for a list of the 110 best places for viewing oaks and native oak communities in California.
- Read over the “Oak Watch Activities” teacher pages. Plan whether you will direct students in one or more of the activities, or will encourage students to choose a certain number of activities to do each time you visit the site. Depending on your class, some of the activities may require advance instruction on your part; plan accordingly.
- Refer to Appendix 3: Tools for Measuring Oaks, and Appendix 4: Soil Studies and Investigations for additional ideas for the activity.

## Opener

Ask the students to help you make a class “K-W-L” chart on the butcher paper. As a group, brainstorm and list on the chart:

- What students know (K) about oak trees and where they grow.
- What students want (W) to know about oaks and oak habitats and ecosystems.
- Make a column for adding what they learn (L) about oaks and their habitat throughout the activities.

Post the chart so that the class can refer and add to it as their understanding about oaks develops.

Give students a copy of the “Oak K-W-L” student page, and have them begin to fill it in. Ask them to keep the chart in their Oak Community portfolio.

## Procedure

1. Go to the site you have chosen for the activity. At the site, ask each student (or grouping) to choose an individual oak or group of oaks to observe.
2. Provide the students with a copy of the “Oak Watch Activities” student page. Guide them in observing chosen subjects, or have them choose a certain number of oaks to observe.
3. Give students time to conduct their observations, circulating among them to answer questions or to focus their observations. See the “Oak Watch Activities” teacher pages for specific ideas on ways to enhance each suggestion.
4. After the time is up, assemble the class to share some of the students’ observations.
5. Return to the site as often as possible over the next several months. Students may conduct the same observations to look for changes, or conduct new ones to deepen their knowledge of the oak tree.

## Wrap-Up

Have students assemble a presentation of their notes and drawings for the class. Students may want to present art or graphic displays, oral presentations, poetry or theatrical renditions of life in the community of oaks.

## Extension Idea

Pace off or use a measuring device to calculate the distance from one edge to the other of the tree’s canopy. Do the same to measure the circumference and area under the canopy. Convert these measurements from feet to meters.

## Assessment

Use a rubric to evaluate the extent of each student’s effort. See Appendix 2, which contains suggestions for developing an assessment rubric.

### References and Resources

*Compass and Map — Pocket Guide.* Available free by ordering from Suunto at 800/543-9124, ext. 225 or Email: [info@suuntousa.com](mailto:info@suuntousa.com).

*Exploring Maps and What Do Maps Show.* Available free from Branch of Publications, National Mapping Division, U.S. Geological Survey, 508 National Center, Reston, VA 22092, or online at [www.usgs](http://www.usgs).

Field study equipment and other teaching supplies. Available from *Acorn Naturalists* or from *Forestry Suppliers, Inc.*, listed in Appendix 5.

Herman, Marina L. et al., *Teaching Kids to Love the Earth.* Duluth, MN: Pheifer-Hamilton Publishers, 1991.

Leslie, Clare Walker, and Charles E. Roth. *Nature Journaling.* Pownal, VT: Storey Books, 1998.

Pavlik, Bruce M., Pamela C. Muick, Sharon G. Johnson, and Marjorie Popper. *Oaks of California.* Los Olivos, CA: Cachuma Press and the California Oak Foundation, 2000.

Russo, Monica. *Watching Nature: A Beginner’s Field Guide.* New York: Sterling Publishing Co., 1998.

# Oak Watch K-W-L

- List what you **KNOW (K)** about oaks and the oak community.
- List what you **WANT (W)** to learn about oaks and the oak community.
- List what you have **LEARNED (L)** about oaks and the oak community.

**K****W****L**

# Oak Watch Activities

**During each Oak Watch session, choose several activities to complete. Keep notes, measurements and drawings in your Oak Community portfolio. Be sure to include the date each time you observe your oak.**

1. Find out what kind of oak you are observing.
2. Make a map so that you can find your oak on another visit. Find some landmarks to pace off and, if you have one, use a compass to find out which direction they stand from your selected tree. Show this information on your map.
3. Make a sketch of your tree's shape. Draw the shape of its trunk, branches, and canopy (the top of the tree).
4. Use a crayon or pencil with soft lead to make a rubbing of your tree's leaves and bark.
5. Use at least six words to describe the bark and leaves. Can you use these words to write a poem?
6. Measure the oak's circumference and estimate its height.
7. What wildlife do you notice living in or visiting the tree? Where do they perch or attach themselves? Use binoculars or magnifiers to look more closely.
8. Do you notice any galls? Draw a picture of these interesting "homes." If you don't know the name for a certain kind of gall, make up one.
9. Are there any dead areas on the tree or holes in the tree? Describe them.
10. Are there any flowers or seeds (acorns)? Sketch what you find.
11. Are there any other oak trees near your tree? Are they older or younger? Are they the same or different types of oaks? How can you tell? Describe what you find.
12. What is the soil like under your tree? Using a small shovel, find out how deep the layer of old leaves is under your tree. What else do you notice about the soil under the tree? Are there any insects or worms? If you pour a glass of water on the soil, how long does it take it to soak in? Make at least two observations and design a chart to organize your observations.
13. During your visit, tie a plastic bag around a few leaves of your tree and go back later to measure how much water transpires from the leaves.
14. Keep a seasonal record of "oak tree events." What day did you notice the buds form on the branches? When did the leaves start to fall? When did the galls start to form? When did the acorns ripen and begin to drop?
15. List several ways people have impacted your oak tree.
16. Take photographs of your tree throughout the Oak Watch.

# Oak Watch Activities—teacher page

1. Find out what kind of oak you are observing.
  - *See the activity “Identifying Native Oaks.”*
2. Make a map so that you can find your oak on another visit. Find some landmarks to pace off and, if you have one, use a compass to find out which direction they stand from your selected tree. Show this information on your map.
  - *Good resources for learning about maps can be obtained from the U.S. Geological Survey. See the Resources section for information on how to request free copies.*
  - *For teaching about using a compass, request a free brochure from Suunto. See the Resources section for contact information.*
3. Make a sketch of your tree’s shape. Draw the shape of its trunk, branches, and canopy (the top of the tree).
4. Use a crayon or pencil with soft lead to make a rubbing of your tree’s leaves and bark.
5. Use at least six words to describe the bark and leaves. Can you use these words to write a poem? *Introduce your students to these poetry forms:*
  - *A **cinquain** is a five-line poem that describes or expresses feelings for the characteristics of a subject. You may want to provide students with an open line diagram and these simple directions:*

**Line 1** - Pick a subject; name with one word

**Line 2** - Describe the subject with two words

**Line 3** - Use three words to describe what the subject does

**Line 4** - Write four words describing how you feel about the subject

**Line 5** - Write another word (one word) for the subject
  - ***Haiku** is a stylized form of poetry that is three lines with a total of seventeen syllables. Introduce your students to this model:*

**Line 1** - five syllables, **Line 2** — seven syllables, **Line 3** — five syllables
6. Measure the oak’s circumference and estimate its height.
  - *See Appendix 3 for information about how to measure oaks.*
7. What wildlife do you notice living in or visiting the tree? Where do they perch or attach themselves? Use binoculars or magnifiers to look more closely.
  - *Refer to the Background Information and student pages for the “Oak Homes for Wildlife” activity and the “Wild Residents in the Oak Community” activity.*
  - *Introduce your students to using hand lenses and binoculars. Provide them with the local names of animals and plants in your region that may be associated with the oaks. Check with local nature centers and organizations such as the Audubon Society and the California Native Plant Society for names of volunteers to help you with this activity.*
8. Do you notice any galls? Draw a picture of these interesting “homes.” If you don’t know the name for a certain kind of gall, make up one.
  - *Refer to “What Gall Is That?” activity.*
9. Are there any dead areas on the tree or holes in the tree? Describe them.
10. Are there any flowers or seeds (acorns)? Sketch what you find.
11. Are there any other oak trees near your tree? Are they older or younger? Are they the same or different types of oaks? How can you tell? Describe what you find.
12. What is the soil like under your tree? Using a small shovel, find out how deep the layer of old leaves is under your tree. What else do you notice about the soil under the tree? Are there any insects or worms? If you pour a glass of water on the soil, how long does it take it to

soak in? Make at least two observations and design a chart to organize your observations.

- *Refer to Appendix 4 for soil investigation ideas and background information.*

**13.** During your visit, tie a plastic bag around a few leaves of your tree and go back later to measure how much water transpires from the leaves.

- *Students can measure the amount of water they capture and compare what they find to similar experiments done by other students. Ask them to pour the water into a measuring cup and record the information.*
- *Review the process of evapotranspiration with your students (see the Glossary for more information).*
- *Also review the process of photosynthesis with your students (see the Glossary for more information).*

**14.** Keep a seasonal record of “oak tree events.” What day did you notice the buds form on the branches? When did the leaves start to fall? When did the galls start to form? When did the acorns ripen and begin to drop?

**15.** List several ways people have impacted your oak tree.

- Review the many ways people have used California oaks—for firewood, making furniture, and in landscapes around homes, buildings, and parks.
- Point out that oaks found in home and school landscapes often suffer from too much water and soil compaction.
- Refer to the activity “Planting and Caring for Young Oak Trees.”

**16.** Take photographs of your tree throughout the Oak Watch.



# Identifying Native Oaks

### Grade Level

4-8

### Subjects

*Science, language arts,  
math, geography*

### Skills

*Observing, comparing,  
analyzing, inferring,  
organizing, communicating,  
computing*

### Materials

For each student:  
*Copies of the “Learning to  
Recognize Oaks,”  
“California Native Oak  
Match-ups,” and “Mini  
Field Guide to California  
Native  
Oaks” student pages;  
samples of native oak leaves  
and acorns*

For the class: *Magnifiers,  
rulers, identification keys to  
California native trees  
(optional), map of  
California*

### Summary



Students make and use an oak guide that helps them identify California native oaks using leaves and acorns.

### Objective



Students learn ways to recognize and identify California native oak trees found in their communities.

### Background

The student pages for this activity provide short descriptions of the species of California native oaks that are scattered around the state. Also see “The Diversity of California Oaks” in *Oaks of California* for excellent descriptions and pictures of California’s 20 oak species, as well as a key to identifying California’s tree oaks.

### Preparation and Planning Tips

To help students learn to recognize native oaks, gather leaves of several kinds of oaks found in your area. You may want to include leaves of non-oaks as well to help students distinguish an oak from other trees. If oak trees are nearby, first-hand observations will also give students the chance to see how the tree is shaped, and they can feel the texture of the bark.

The best time to collect acorns is during the months of August to October when oaks drop them. Collect enough acorns with their caps so students can make observations about their special characteristics. Some caps are warty, while others are scaly like roof shingles; these characteristics can help identify the oak species.

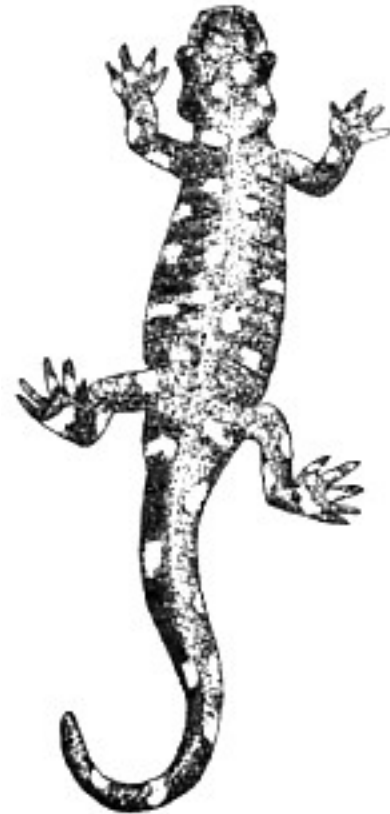
## Opener

Ask your students to draw the shape of an oak, oak leaf or an acorn. Once they have completed a sketch, pass out samples of oak leaves and acorns and ask students to compare their drawings with the real thing. Discuss how the drawings and specimens are the same and how they are different.

## Procedure

1. Explain that during their study of oaks and oak communities, students will begin to recognize the native oaks growing in their neighborhood and region. Give students copies of the “Learning to Recognize Oaks” student page, and ask them to do numbers 1-3 for an oak and an acorn you have given them. Provide them with rulers to measure the length of the leaves and acorns, and magnifiers to make the work of observing much easier and more fun. Suggest that they look at leaf edges and surfaces.
2. Give students the “California Native Oak Match-Ups” student page and ask them to use it to identify their leaves and acorns.
3. Pose these questions:
  - How are oak leaves different from or the same as other leaves? (*Many oak leaves are lobed or have a sharp point at the end of major leaf veins.*)
  - Why is it an advantage for an oak tree to have spiny edges on its leaves? (*To protect it from herbivores that like to eat leaves.*)
  - What were the species of oaks we identified? What makes a blue oak blue? (*Try rubbing off the bluish wax on the leaf surface to prove they really are blue.*)
  - Can you find the hairs on a coast live oak leaf? (*Look on the leaf’s undersurface and along edges.*)
  - Looking at the “California Native Oak Match-Ups” information, which oak species grow in our area?
4. Provide copies of the “Mini Field Guide to California Native Oaks” student page. Assist students as they work together or individually to fill in the blanks to make an identification guide.

5. Students can fold the student page as indicated to make a small book.



California tiger salamander

## Wrap-Up

Ask students to share their identification guides. Have them trade guides with each other, and try to use someone else's guide to identify leaves and acorns. Help students summarize their findings. Have students place their identification guides in their Oak Community portfolio.

## Extension Ideas

- Preserve oak leaves between two sheets of clear contact paper. These leaves last for many years and can be used to make leaf rubbings.
- Use blueprint or other light sensitive paper to make “sunprints” of the oak leaves and acorns.
- Collect and preserve oak leaves in spring, summer and fall (and winter if it is an evergreen oak).
- Use the *Cal Alive! Exploring Biodiversity* software to study oak woodlands throughout California.

## Assessment

Using the “Mini Field Guide to California Native Oaks,” ask students to identify leaves and acorns from another region (using pictures from books if you do not have access to actual materials).

### References and Resources

*Cal Alive! Exploring Biodiversity*, interactive CD-ROM about California biodiversity — including an excellent section on oak woodlands. Available from the California Institute for Biodiversity, listed in Appendix 5.

Field guides, light sensitive paper, and other teaching supplies. Available from Acorn Naturalists, listed in Appendix 5.

Churches, Ken R. and Jennifer Mitchell. *Oak Tree Project*. University of California Cooperative Extension. 891 Mountain Ranch Road, San Andreas, CA 95249, 1990.

Hickman, J. (editor). *The Jepson Manual: Higher Plants of California*. Berkeley, CA: University of California Press, 1993.

Keator, Glenn. *The Life of an Oak*. Berkeley, CA: Heyday Books and California Oak Foundation, 1998.

Miller, Howard, and Samuel Lamb. *Oaks of North America*. Happy Camp, CA: Naturegraph Publishers, 1985.

*Native Oaks of California poster*. Order from Good Nature Publishers Company at 1904 Third Street, Suite 215, Seattle, WA 98101 or at [www.goodnaturepublishing.com](http://www.goodnaturepublishing.com) or the California Oak Foundation.

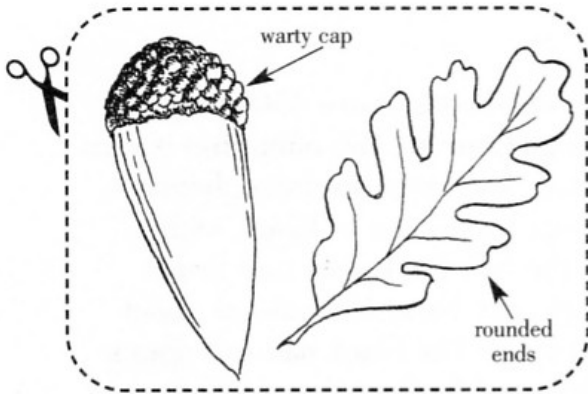
Pavlik, Bruce M., Pamela C. Muick, Sharon G. Johnson, and Marjorie Popper. *Oaks of California*. Los Olivos, CA; Cachuma Press and the California Oak Foundation,

### Source

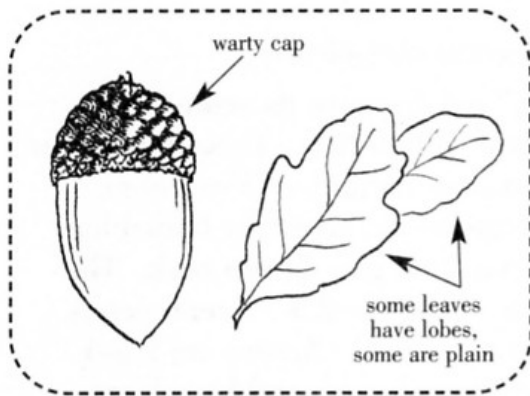
Thanks to Ralph Schardt for the *mini field guide* idea.

# Learning to Recognize Oaks

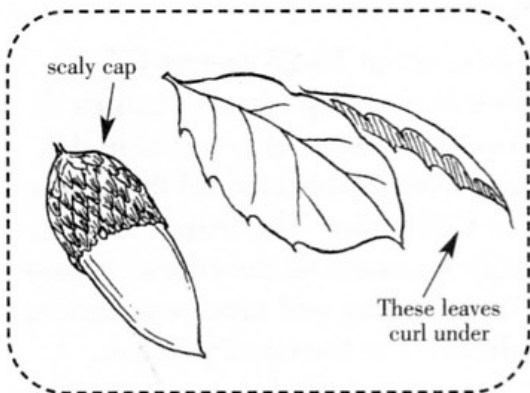
1. Trace or make a rubbing of your oak leaf. Use a ruler to measure the length and width of your leaf. Add this information to your tracing or rubbing.
2. Make a list of words that describe how your leaf feels and smells.
3. Sketch your acorn. Be sure to include a drawing of its cap, if it has one. Measure the length of your acorn and include this information with your drawing.
4. What kind of oak are you observing? List its scientific name and other information.

**Valley Oak or Roble** (*Quercus lobata*)

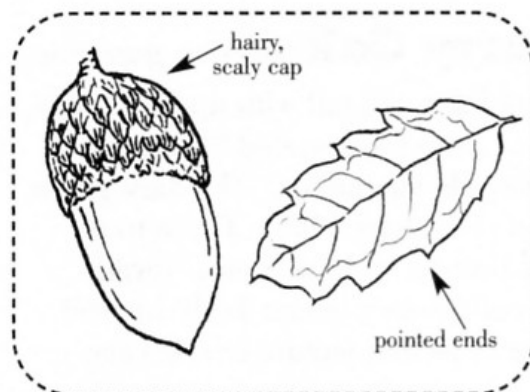
This is the tallest California oak tree, growing up to 36 meters (118 feet) in height with a spreading crown. It is a deciduous tree, which means it loses its leaves in the fall. You can find it from Shasta to Los Angeles Counties growing in deep, fertile soil near streams and rivers. It is often found near farms or in areas where agricultural activities were once located. Its leaves are 5-10 centimeters (2-4 inches) long with deep lobes. The acorn is very large, often 2.5-5 centimeters (1-2 inches) long.

**Blue Oak** (*Quercus douglasii*)

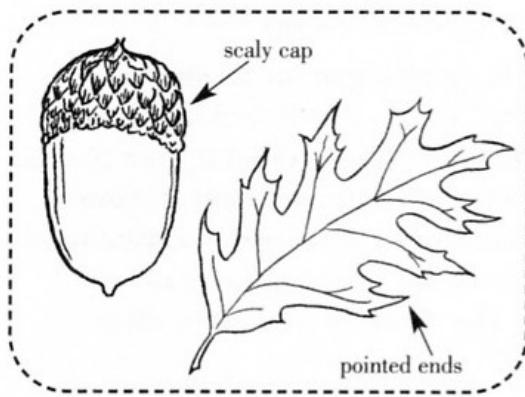
This is a deciduous oak, which means it loses its leaves in the fall. Growing up to 15 meters (50 feet) tall, this oak is found in the foothills and nearby areas of the Central Valley from Shasta to Kern Counties. Blue oaks often grow with valley oaks and are only found in California. In the foothills, blue oaks grow in shallow soils on steep slopes and mingle with interior live oaks and gray pines. The bark of the blue oak is light gray or almost white. Leaves are a distinctive blue-gray color and measure from 2.5-5 centimeters (1-2 inches) long. Acorns take one year to mature and are small, about 1.5-2.5 centimeters (3/4-1 inch) in length.

**Coast Live Oak or Encina** (*Quercus agrifolia*)

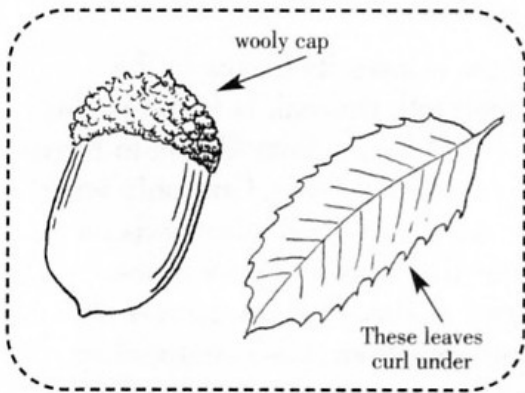
This is a large, evergreen oak that grows up to 30 meters (100 feet) tall. It is found from Mendocino County to northern Baja California (Mexico) in the coastal mountain ranges. The leaves look like holly and are leathery, about 2.5-7.5 centimeters (1-3 inches) long and curl under at the edges. Look for tufts of brown fuzz along the leaf veins. The acorns are small and slender with a cap that has thin and flattened shingle-like scales.



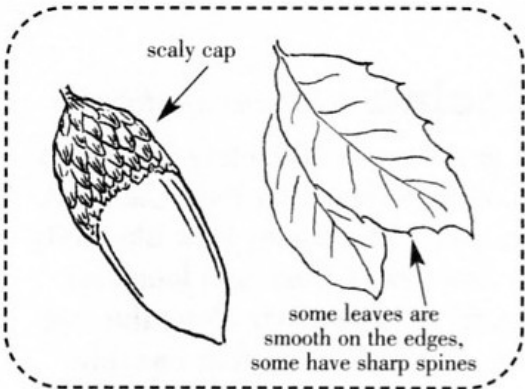
**Engelmann or Mesa Oak** (*Quercus engelmannii*) This is a very rare oak that is primarily found in San Diego County, but grows from northern Baja California (Mexico) to Pasadena in Los Angeles County. It is "late" deciduous which means that it loses its leaves each year, but usually not all at the same time. It grows up to 15 meters (50 feet) tall and has a rounded crown. The leaves are smooth, leathery, bluish and wavy on the edges. The acorns are oblong and between 1.5-5 centimeters (3/4-2 inches) long.

**Black Oak** (*Quercus kelloggii*)

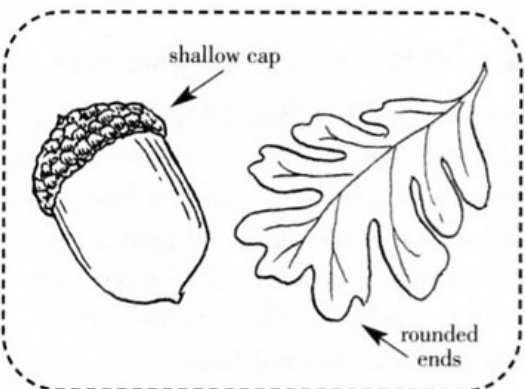
This oak generally grows in higher elevations above 450 meters (1500 feet) from Oregon to San Diego County. You often find it with ponderosa pines and incense cedars. Its leaves are large, between 7.5-10 centimeters (3-4 inches) long, deeply cut or lobed, with a bristle on the tip of each lobe. In the fall, the leaves turn bright yellow. The trunk is stout with dark gray bark. Acorns are about 2.5-3.5 centimeters (1-½ inches) long. The black oak will sprout from its base if the top is cut or damaged by fire.

**Canyon Live Oak** (*Quercus chrysolepis*)

This oak is called the “golden cup” oak because its acorns have distinctive caps that are covered with yellow fuzz. These trees grow in sheltered canyons from northern Baja California (Mexico) to Oregon. The tree rarely forms a single trunk, generally branching several times near the ground. It has thin, gray-brown bark. The leaves are evergreen and holly-like. They are 2.5-10 centimeters (1-4 inches) long, and curl at the lower edges. Acorns are 2.5-4 centimeters (1-1½ inches) long, are egg-shaped, and have large golden cups.

**Interior Live Oak** (*Quercus wislizenii*)

This is a medium-sized evergreen tree, about 18-25 meters (55-85 feet) tall, with a short trunk that often is made up of many trunks. It grows in hilly areas and near creeks and streams. It is found in the North Coast Ranges, the dry valley and foothill woodlands of the Central Valley, and the dry parts of southern California. The leaves are flat, stiff, and shiny, and can be either spiny or smooth on the edges. Acorns are about 2-4 centimeters (¾-1½ inches) long and take two years to mature. This oak is sometimes confused with the coast live oak.

**Oregon White or Garry Oak** (*Quercus garryana*)

This is a large tree (up to 20 meters [60 feet]) tall with upward limbs and a compact crown. It also has a shrub form, called “Brewer’s Oak,” that is found in the Sierra Nevada mountains. The dark green, lobed leaves are 10-15 centimeters (4-6 inches) long. These trees are scattered throughout the Coast Ranges and the Sierra Nevada Mountains. Its acorns are 2.5 - 3 centimeters (about 1-1¼ inches) long and plump with shallow, warty cups that mature in one year.

Cut along this solid line

Canyon Live Oak

Notes:

Paste acorn & leaf illustration here.

Engelmann or Mesa Oak

Notes:

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Blue Oak

Notes:

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California Black Oak

Notes:

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Mini Field Guide to California Native Oaks

Name: \_\_\_\_\_

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Notes:

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Valley Oak

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Interior Live Oak

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Oregon White or Garry Oak

Notes:

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Coast Live Oak

Notes:

Paste acorn & leaf illustration here.

22



# Oak Homes for Wildlife

### Grade Level

4-6

(can be adapted for 7-8)

### Subjects

Science, language arts

### Skills

Observing, comparing,  
analyzing, inferring,  
relating, communicating

### Materials

For each student: *Copies of “Who Lives in the Oak Community?” and “Seek and Peek” student pages*

For the class: *Chart paper, colored markers, several pictures of oak residents or pieces of “physical evidence” (see Preparation and Planning Tips), field guides*



### Summary

Students read and answer questions about the oak woodland community.



### Objective

Students become aware of the importance of oaks as part of a community.

### Background Information

Refer to the student pages to become familiar with residents of the oak woodland ecosystem. Also see “Wildlife and Oaks” and Appendices D and E in *Oaks of California* for further information and pictures about wildlife found in California oak communities.

### Preparation and Planning Tips

- Find several pieces of physical evidence that give clues to the interactions within the oak ecosystem. These might include galls, wormy acorns, chewed leaves, or dead branches with holes in them. Alternatively, find several pictures of animals and plants that live in oak woodlands (from books, calendars, or magazines).
- Make necessary arrangements to visit a park, nature area, or other place to observe oaks. If possible, try to find a site where oaks can be observed as part of a natural community. If this is not possible, an individual oak will suffice.

## Opener

Ask students what animals and plants they have observed living among oaks. Show students the “physical evidence” or the pictures, and ask them what these things tell us about an oak woodland community. Begin a list of organisms that students might find in an oak community. You might set up a touch table for students to examine the “physical evidence.”

## Procedure

Use the Field Activity, the Classroom Activity, or both to introduce students to the wildlife residents of oak communities.

## Field Activity

1. Prior to taking students to the site you have chosen, ask them to read the “Who Lives in the Oak Community?” student page. This reading provides them with information about interactions within the oak woodland community.
2. Ask students, as individuals or in small groups, to make a large picture or mural of what they expect to see in an oak community. They can refer to the brainstorm list from the Opener and the information found in the reading to construct their picture.
3. Take students to the chosen site to observe an oak community (or individual oak). Students can take notes and make sketches of the organisms and other things they observe about oak communities first-hand. When possible, use field guides to help students identify the organisms.

## Classroom Activity

1. Ask students to read the “Who Lives in the Oak Community?” student page.
2. Use the “Seek and Peek” student page to help students learn about the complex interrelationships of oaks and wildlife. This illustration features many species that depend on oaks and are part of the oak woodland ecosystem. Ask students to identify each of the species featured in the picture.

3. Have students choose one (or more) oak community resident to research and report on. See Appendix 5 for suggestions of where they may get help in their search.

## Wrap-Up

Ask students to share their observations or reports. Refer back to the list created prior to doing the activity to compare what new information they discovered or observed first-hand. Allow students to modify their pictures or murals. Ask students to include their notes and drawings in their Oak Community portfolio.



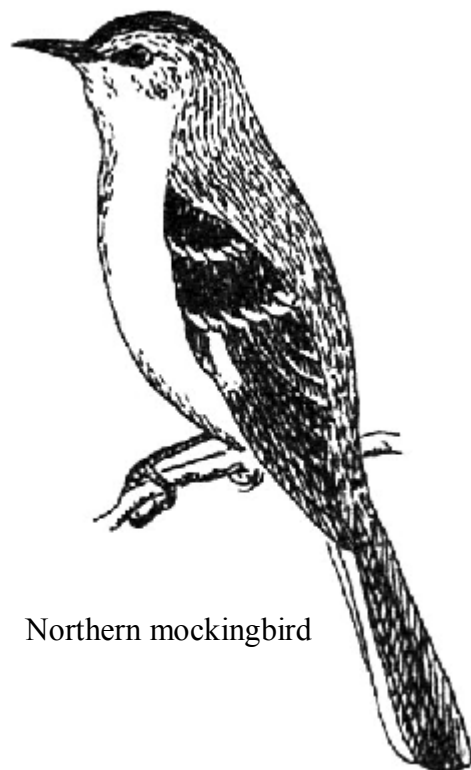
great horned owl

## Extension Ideas

- Read aloud Mark Twain's tall tale featuring oaks and jays, "What Stumped the Blue Jay" found in *A Tramp Abroad or The Complete Short Stories of Mark Twain*.
- Read aloud from *An Island Called California*. Portions of this book explore the natural history of the oak woodland community.
- Offer students access to the software *Cal Alive! Exploring Biodiversity* to learn more about oak woodland wildlife relationships.

## Assessment

To check for understanding, ask students to choose at least six organisms that live in the oak woodland community and draw a "web of life" to illustrate their interrelationships.



Northern mockingbird

### References and Resources

Bakker, Elna. *An Island Called California*. Berkeley, CA: University of California Press, 1984.

*Cal Alive! Exploring Biodiversity*, interactive CD-ROM about California biodiversity — including an excellent section on oak woodlands. Available from the California Institute for Biodiversity, listed in Appendix 5.

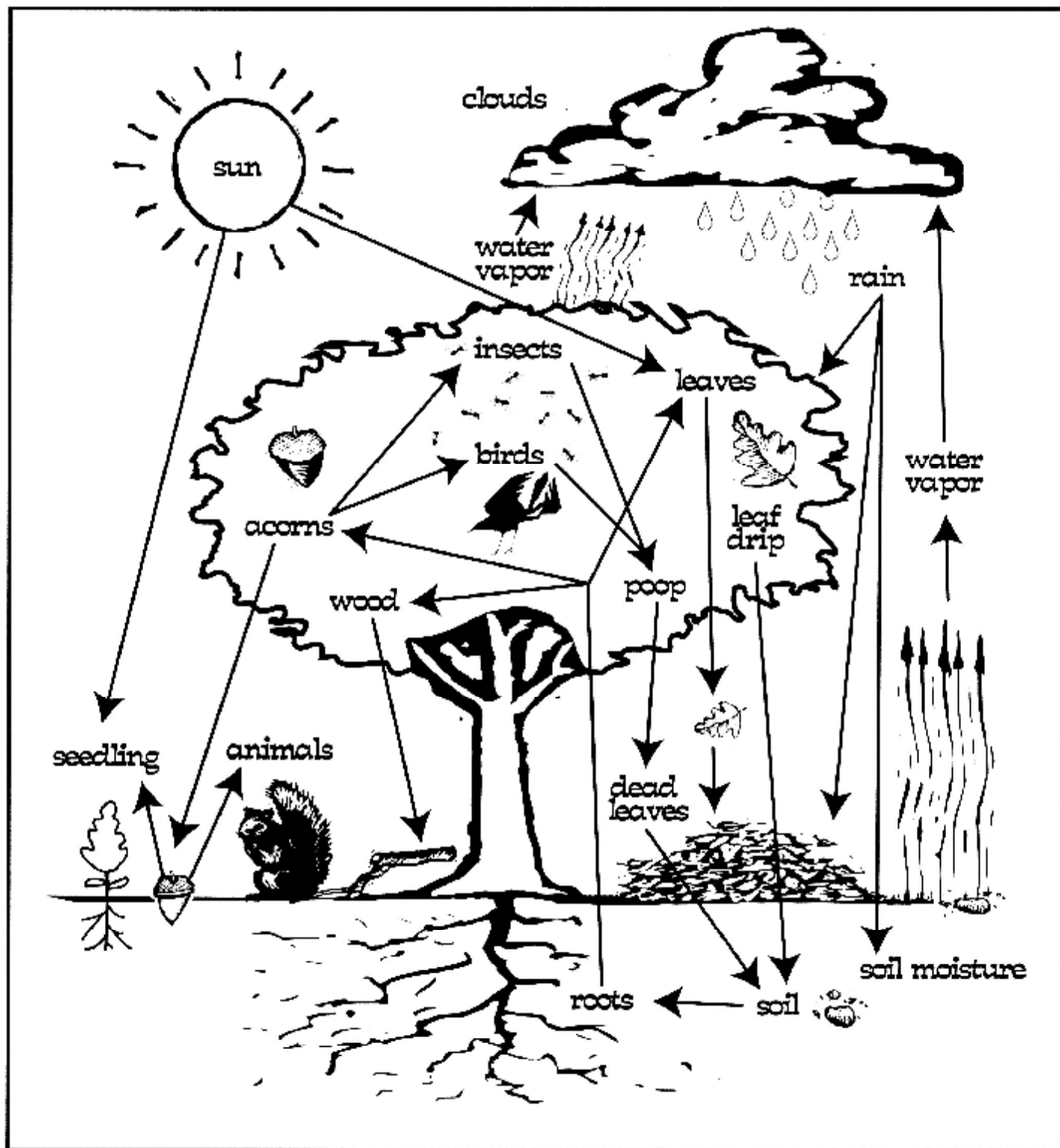
Keator, Glenn. *The Life of an Oak*. Berkeley, CA: Heyday Books and California Oak Foundation, 1998.

Pavlik, Bruce M., Pamela C. Muick, Sharon G. Johnson, and Marjorie Popper. *Oaks of California*. Los Olivos, CA: Cachuma Press and the California Oak Foundation.

Twain, Mark. What Stumped the Blue Jay, in *The Tramp Abroad or The Complete Short Stories of Mark Twain*.

# Who Lives in the Oak Community?

Many different animals and plants live together in an oak community.  
They depend on the oak trees – and on each other – to survive.



Adapted from *Autumn Oaks*. Shasta Natural Science Association

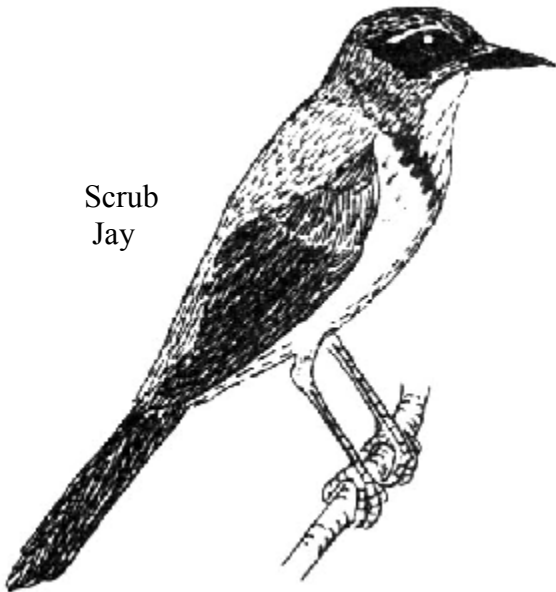
# Who Lives in the Oak Community (cont'd)

## Oaks Offer Food Aplenty

Oaks are a rich food source for a lot of different creatures. About two dozen different bird species eat acorns. Scrub jays, magpies, wood ducks, wild turkeys, mountain quail, and flickers are just a few of these acorn eaters. Some woodpeckers also feed on the oak sap.

One of the most colorful birds found in the oak community is the acorn woodpecker. This bird drills a hole in a tree's bark or in utility poles with its bill, then pushes an acorn into the hole for storage. Acorn woodpeckers may store 200 acorns or more on a single tree trunk or branch!

Scrub  
Jay



Squirrels and scrub jays collect and hide acorns so that they can eat them later in the winter. Animals like these play an important role in helping new oak trees grow. Since well-hidden acorns are protected from freezing and drying, many of the stored acorns grow into new trees.

Many insects depend on oaks for food, too. Insects eat acorns, but also oak leaves, twigs, bark and wood. Many of these six-legged creatures become meals themselves for insect-eating birds such as bushtits, warblers, vireos and orioles.

Mule deer and wild pigs eat acorns. Other wildlife species depend on the grasses, fungi, seeds, berries,

insects and a whole list of other foods that are found in oak communities.

## Home, Sweet Home

Many insects make themselves at home in oaks. Galls are formed when certain insects, usually wasps, place their eggs on oak leaves or branches. The oak tissue becomes irritated by the eggs and grows around them, forming an "insect nursery." This covering protects the insect during its life cycle. Galls apparently do not harm the oak since most form during summer and fall when the tree is growing slowly.

Barn owls, wood ducks, and many other cavity-nesting birds use oaks as their homes. In winter, ring tail cats and squirrels sleep in hollowed-out portions of trees. Bees also use these cavities to build their hives. In spring, many bird species nest in oaks; and in summer, so do squirrels.

Nematodes, tiny round worms, and earthworms live within an oak's root system. The leaf mulch at a tree's base harbors slugs, snails, wood lice, beetles, millipedes, centipedes, caterpillars, earwigs, ants, daddy longlegs and other spiders. Many of these organisms help decompose dead leaves and branches beneath the tree, making the soil more fertile.

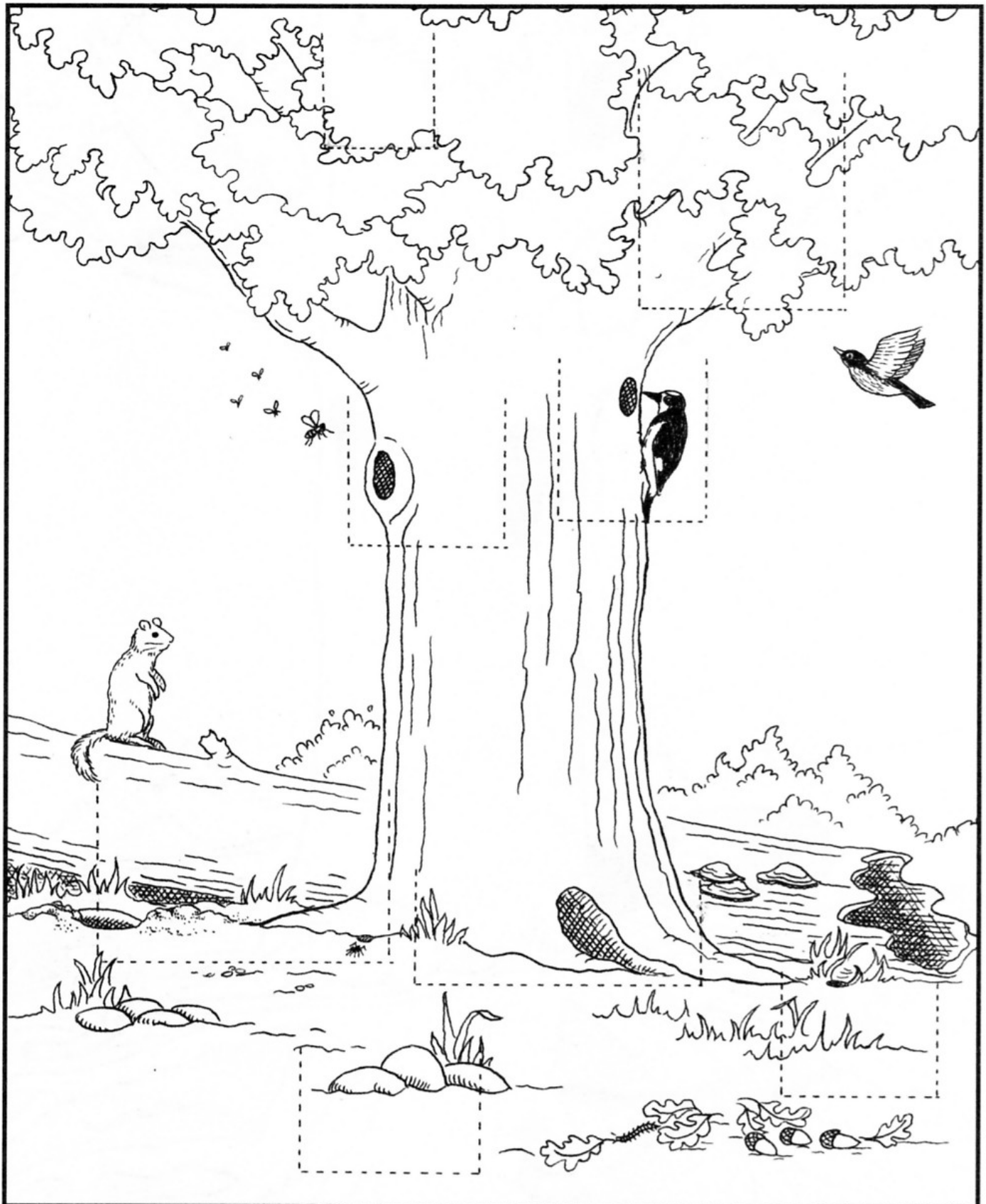


## Oak Trees: The Heart of the Oak Community

Oaks continue to support the community even after they die. Salamanders, worms, snails, termites, and ants help decompose logs and help turn wood into humus. This humus enriches the soil.

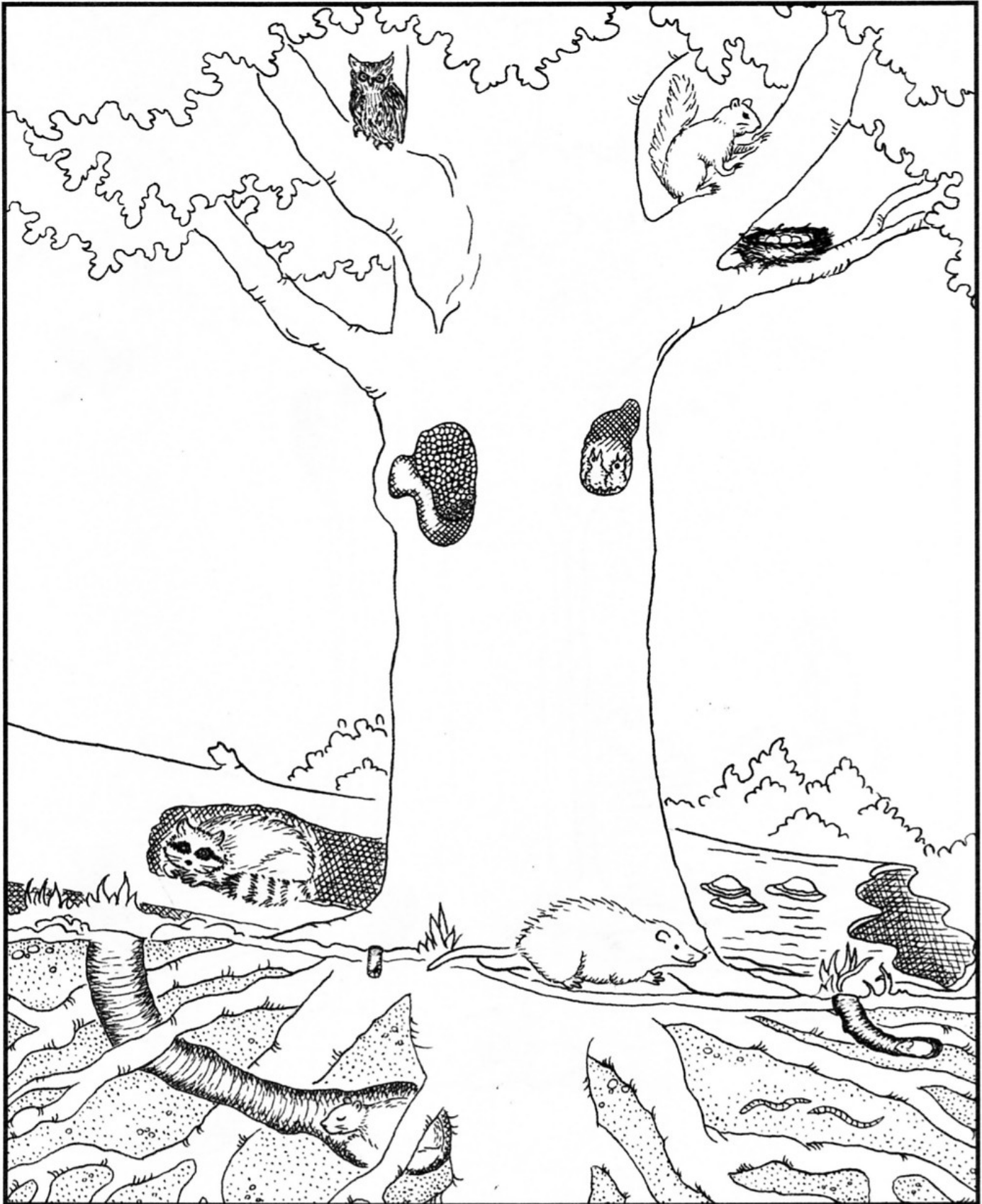
As you can see, many species and thousands of individual organisms may depend on a single oak to survive. An oak tree is truly the heart of this community.

# Seek & Peek (sheet A)



Cut on dashed lines & put on top of sheet B

# Seek & Peek (sheet B)





# **Learn About California's Native Oak Communities**

The five activities in this unit will deepen students' understanding of oak community ecology. Students learn about the complex interrelationships of the plants and animals that live in and among oaks, and about the competition for resources and interactions with the living and non-living components of the community. Students will also take a look at how wildfire has helped shape the oak community.



## **Activities**

- 4 – Oak Community Field Study**
- 5 – Wild Residents in the Oak Community**
- 6 – Who Gets the Acorn?**
- 7 – What Gall is That?**
- 8 – Wildfire in the Oak Community**

# Oak Community Field Study

## Grade Level

4-8

(can be adapted for 7-8)

## Subjects

Science, math

## Skills

Observing, organizing, comparing and contrasting, measuring, evaluating, analyzing information

## Materials

For the class:

Thermometers, hand trowels, plant and animal identification guides, light meter or photosensitive paper, index cards, tape measure, small scales, measuring cups, binoculars, plastic bags, copies of Appendix 3: Tools for Measuring Oaks, copies of "Field Study Guidelines" student page and any additional equipment needed for students' investigation questions.

## Summary



Student teams investigate living and non-living components of two different sites in an oak community.

## Objective



Students measure, analyze, and describe differences between two sites to learn about the living and non-living components of an oak community.

## Background Information

California's native oak landscapes are very diverse and widespread, covering nearly 11 million acres statewide. From the Pacific shore to high desert slopes, and mingling with redwood trees to the north and cactus to the south, oaks are included in many kinds of forests, woodlands and chaparral communities. Oaks provide forage for grazing animals, habitat for hundreds of wildlife species and protection for water quality. Oaks give our state its character—golden hills dotted with deep green trees.



western toad

Despite growing attention by Californians toward protecting individual oaks, California's oak woodlands remain a community at risk. Of major concern is the fact that in many areas of the state, oak populations are experiencing little or no tree replacement. Without regeneration, the sustainability of oak woodlands are in jeopardy. Scientists are working to understand the complex reasons that regeneration has declined. This decline, as well as concerns about loss of habitat and open spaces, are prominent reasons for studying oak communities. This activity involves students in conducting a field study that can help them build a deeper understanding and knowledge of the oak community and, therefore, their role within it.

For additional information, refer to the Background Information in the "Wild Residents in the Oak Community" activity and the "California Oak Community Facts" student page in the "Oaks for All Reasons" activity.

### **Preparation and Planning Tips**

- Locate an oak woodland community within which students can conduct a field study. This may be within walking distance or a short ride from your school at a public park or nature area or on private land. Within the oak community find two separate sites for students to compare, such as under an oak tree and in a grassy area between oak trees.
- Obtain necessary permission from the land manager or owner to use the field study area, and from school authorities to take students off campus.
- Plan what students will investigate in the field study. You may have students brainstorm a list of questions as suggested in the Opener, or use the student pages as the framework for the study. Also refer to Appendix 3: Tools for Measuring Oaks and Appendix 4: Soil Studies and Investigations for information and ideas.
- Gather the necessary equipment to conduct the identified field study questions. Place in a plastic bag all the equipment needed for each team's particular study.
- If you will be using the "Field Study Guidelines" student pages, make copies and cut them apart. Place the guidelines in the plastic bag that contains the corresponding equipment.

### **Opener**

Ask your students what aspects of an oak community they would like to investigate. Prompt them to consider both living and non-living elements of this ecosystem. Allow all ideas to surface and then help them narrow down several investigations that may include tree size and species, soil type and moisture, amount of sunlight, temperature range, animal and plant life (both macro and micro) and water sources. Determine how many investigation teams will be formed and who will be assigned to each team. If students will be investigating any aspects not included on the student page, provide each team with a list of questions to help design the investigation.

## Procedure

1. Assign each team the task of organizing field study questions for the topic it will investigate. Review the equipment and directions for each team.
2. Explain that each team will investigate two different sites within the oak community. Describe the two sites (such as one under an oak tree's canopy and the other in a grassy area between two oak trees); ask teams to predict differences they might find between the two sites.
3. At the site, point out the boundaries of the study and any poison oak in the area. Help teams to carry out their investigations.

## Wrap-Up

Have teams evaluate the differences they found between the two sites. Give teams time to summarize their data and findings on a large piece of paper and then present their findings to the entire class.

## Extension Ideas

- Visit the study site at different times of the year and repeat the investigations.
- Map the study site, including in the map all the oak trees. Assign students different sections of the study site to monitor over time.
- Collect acorns from the site to grow, and return to plant the young oak seedlings. See the activities “Growing Big Oaks from Little Acorns” and “Planting and Caring for Young Oak Trees.”
- Note all the ways that humans have impacted the oak woodland community field study site.

## Assessment

Ask pairs of students to describe at least four of the field study investigations, and compare and contrast what was found in the two sites.



Wood duck

### Source

This activity was adapted with permission from Project Learning Tree's *Forest, Field and Stream, Environmental Education PreK-8 Activity Guide*. Washington, D.C.: American Forest Foundation, 1993/1994/1995/1996/1997/1998. The complete Activity Guide and High School Modules can be obtained by attending a PLT workshop. For more information visit the Project Learning Tree web site at [www.plt.org](http://www.plt.org).

# Oak Community Field Study Guidelines

## Temperature

**Guidelines:** What investigations will your team make?  
Write out your field study investigation questions.

**Suggestions:** At each site, measure the air temperature at ground level, at 2.5 centimeters (one inch) beneath the soil, and at about 1/3 meter (one foot) above the soil. Before starting to make measurements, organize a chart or table to keep track of the temperature data.

**Materials:** Thermometer, ruler, hand trowel, and paper for making data table

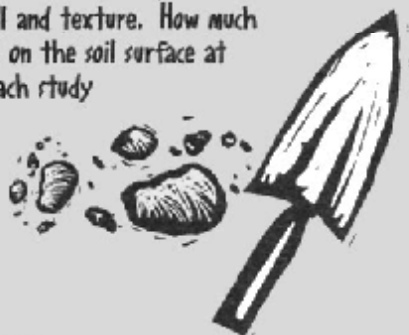


## Soil

**Guidelines:** What investigations will your team make?  
Write out your field study investigation questions.

**Suggestions:** Study the soil moisture in the two sites. To do this, scrape a cupful of soil from the top of the ground and collect a similar sample of soil from under the surface. Feel the soil. Is it dry or wet? If it is wet, it will stick together. Look for other characteristics such as color, smell and texture. How much plant material is found in the soil at each site? Gather a handful of plant material on the soil surface at each site and put it in a plastic bag. You can weigh bags of materials collected at each study site and compare the weights.

**Materials:** Hand trowel or small shovel, small scale, plastic bag, and measuring cup



## Plants

**Guidelines:** What investigations will your team make?  
Write out your field study investigation questions.

**Suggestions:** Make a leaf collection of the plants you find at the two study sites. Try to find out the names of these plants. **BE CAREFUL! POISON OAK GROWS NEAR OAK TREES.**

**Materials:** Plant identification guides and index cards to mount leaves or for making sketch



# Oak Community Field Study

## Guidelines (cont'd)

### Sunlight

**Guidelines:** What investigations will your team make?  
Write out your field study investigation questions.

**Suggestions:** Study the amount of sunlight that reaches the ground at each site. Use a light meter or photosensitive paper, or describe the differences with terms such as "shady," "dark," "very light," or "bright."

**Materials:** Light meter, photosensitive paper



### Animals

**Guidelines:** What investigations will your team make?  
Write out your field study investigation questions.

**Suggestions:** Look for evidence of animal life such as feathers, tracks, nests, or scat. Observe birds and mammals at each study site. Don't forget to listen for birdcalls and to look for insects on the bark of the oak tree or under the leaves on the ground.

**Materials:** hand lenses, collecting boxes, binoculars, and animal identification guides



### Trees

**Guidelines:** What investigations will your team make?  
Write out your field study investigation questions.

**Suggestions:** What types of oaks do you find in each study site? Count the number of oaks in each study site. Measure the height of an oak and its circumference at each site. Are the oaks at each site about the same size?

**Materials:** Oak identification guide, tape measure, and "Tools for Measuring Oaks" information (optional: diameter tape)



# Wild Residents in the Oak Community

## Grade Level

4-8

(can be adapted for 7-8)

## Subjects

Science, language arts,  
technology

## Skills

Organizing, analyzing,  
inferring, applying,  
communicating

## Materials

For each student (or pair of students): *Reference materials from the library or the Internet, copy of “Wildlife in California Oak Communities” student page*

## Summary



Each student chooses a California oak community animal to research, then writes and presents a report about the animal.

## Objective



Students develop research skills while learning more about the wild residents of an oak community.

## Background Information

It is easy to understand how important California’s oak communities are in supporting a variety of wildlife in the state:

- There are approximately 100 million acres of land in California; oaks occur on nearly 11 million acres of these lands.
- Oak communities are one of the richest habitats for wildlife, providing shelter, food, water and spaces in which wildlife may live and reproduce. Various components of oak communities — including living trees, shrubs, grasses and other plants, dead trees (called snags), logs, and rock outcrops — provide shelter and homes for wildlife.
- Within the oak woodlands, the canopy of oak trees shade about 10 percent of the ground surface. Shaded and unshaded areas offer different types of habitat for wildlife.
- Around 350 species of vertebrates are found in oak woodlands including 160 species of birds, 60 species of reptiles and amphibians, and 90 species of mammals.

Refer to the student pages to become familiar with some of the species found among oaks. Also see “Wildlife and Oaks” and Appendices D and E in *Oaks of California* for further information and pictures about wildlife found in California oak communities.



## Preparation and Planning Tips

- To help your students access information via the Internet, become familiar with the websites listed in Appendix 5. You might also help them write business letters to the appropriate organizations to request information (refer to “Guidelines for Requesting Information and Help” in Appendix 5).
- Decide how you will assign animals for students to study. You may have students choose from the list on the student page, or cut apart a copy of the list and have students draw an animal from a hat. The research reports may be done by individuals or in pairs.

## Opener

Ask students for the names of wildlife they know are found in California’s oak communities. Next ask them how they would find more information about oak community residents. Explain that they will research one or several animals found in the oak community. Assign or have each student choose an animal to research.

## Procedure

- Have students read the directions listed on the student page. Make sure that students understand what their research reports must include and things they will need to consider when conducting their research. Explain that students (or pairs of students) should also be prepared to give a one-minute presentation about the animal they researched.
- Allow enough time for the students to complete the assignment.
- Have students give their one-minute presentations.

## Wrap-Up

Organize the reports into a class-made reference book titled *Wildlife in the California Oak Community*.

## Extension Ideas

- Make copies of the reports to provide to all students.
- Offer students the opportunity to use the *Cal Alive! Exploring Biodiversity* software to research information about oak woodland organisms.

## Assessment

Have students use the information they obtained to write out two questions, as in a “Jeopardy game” format. Use the questions in a quiz show style review of the activity.

### References and Resources

*Cal Alive! Exploring Biodiversity*, interactive CD-ROM about California biodiversity - including an excellent section on oak woodlands. Available from the California Institute for Biodiversity, listed in Appendix 5.

*Guide for Managing California’s Hardwood Rangelands*. University of California, Division of Agriculture and Natural Resources Publication #3368, 1996. For order information, contact the University of California Communication Services at 6701 San Pablo Avenue, 2nd Floor, Oakland, CA 94608-1239, or at 510-642-2431.

### Source

Johnson, Sharon G. *Wildlife Among the Oaks: A Management Guide for Landowners*. Berkeley, CA: Integrated Hardwood Range Management Program. Available from the Integrated Hardwood Range Management Program, listed in Appendix 5.

Pavlik, Bruce M., Pamela C. Muick, Sharon G. Johnson, and Marjorie Popper. *Oaks of California*. Los Olivos, CA; Cachuma Press and the California Oak Foundation.

# Wildlife in California

## Oak Communities

Pick one animal from this list and find information that answers the questions listed on the next page.

<b>MAMMALS</b>	<b>BIRDS</b>	<b>AMPHIBIANS AND REPTILES</b>
bobcat	acorn woodpecker	salamander
black bear	American crow	Pacific tree frog
woodrat	Anna's hummingbird	California newt
coyote	burrowing owl	western toad
deer mouse	California quail	red-legged frog
gray fox	downy woodpecker	horned lizard
fox squirrel	great horned owl	garter snake
mountain lion	flicker	California kingsnake
mule deer	mockingbird	gopher snake
pocket mouse	mourning dove	alligator lizard
shrew	Steller's jay	western pond turtle
bat	western scrub jay	western rattlesnake
gray squirrel	red-tailed hawk	rubber boa
chipmunk	wood duck	western skink
raccoon	yellow-billed magpie	fence lizard

# Wildlife in California Oak Communities (Cont'd)

1. Name of animal you have chosen to research:
2. What is its scientific name? What group of animals does it belong to: mammal, bird, fish, reptile, or amphibian?
3. What is its role in the oak community? (That is, what "jobs" does it do, what does it eat, or who eats it?) To answer this question, you can draw an oak community "web of life" that includes your animal and the other living things in the community that are connected to it in some way.
4. What are other interesting facts or information about your animal?
5. Where did you get your information? What books or websites did you use?
6. Include a drawing or picture of your animal.

# Who Gets the Acorn?

### Grade Level

4-6

*(can be adapted for 7-8)*

### Subjects

*Science, math, physical education*

### Skills

*Observing, comparing, inferring, calculating, estimating, communicating*

### Materials

For the class: *100 acorns (or clay acorn models), 2 one-dozen capacity egg cartons to make the acorn granaries, 2 bricks or logs, picture or sample of tree limb, blackboard or chart paper, pieces of stiff paper, scissors, stapler, timer, paper and pencil for recording*  
For each team of 4 students: *2 plastic sandwich bags*

### Summary



Students play a game that simulates how wildlife species compete for the same food source.

### Objective



Students learn that when more than one wildlife species live in the same habitat or community, such as woodpeckers and squirrels in oak woodlands, they often compete for the same food source.

### Background Information

Usually more than one species of wildlife share a habitat. In order to survive, reproduce, and care for their young, these species may need to compete for the same resources within the habitat. They may compete for the same food source, water, and places to find shelter.



California ground squirrel

Woodpeckers and squirrels both live in the oak woodland community and depend on oak trees for food and shelter. If there is not enough food or space, the adult generation may survive, but the young die. Many animal populations undergo changes in their numbers as a result of the fluctuation in their food supply and spaces available to raise their offspring.

## Preparation and Planning Tips

- Make sure you have enough acorns before beginning this activity. Students can collect acorns or make clay models if real acorns are not available.
- Set up the game as follows:
  - ▶ In an open field or playground mark off two parallel lines, 18 m (20 yds) apart.
  - ▶ Make an acorn granary from an egg carton by cutting a piece of stiff paper in half to fit into an egg carton. This will block off one-half of the carton. Close the carton and poke holes in the bottom section (the part that holds the egg). Test the size of the hole with an acorn before beginning the. Make two granaries; each should hold at least one dozen acorns.
  - ▶ Prop up the two acorn granaries with bricks or logs on one end of the playing field. The players will begin the game at the other end.
  - ▶ Spread out the 100 acorns in the area between the two lines.

## Opener

Ask students where they think squirrels and woodpeckers store their acorns, noting their responses on a blackboard or chart paper. If available, show them a picture or sample of a tree limb or trunk where woodpeckers have drilled holes and stored the acorns.

## Procedure

1. Form teams of four and assign each participant the role of a woodpecker or a squirrel (two each per team).

2. Explain that the woodpeckers will pick up individual acorns with their index finger and thumb and then place them in the holes in the granary. Each woodpecker must deposit at least six acorns, one in each hole, to survive and reproduce.
3. Provide the squirrels with plastic bags to serve as their cheek pouches. Explain that real squirrels gather acorns in their pouches and store them in a crevice or hole in the ground. For the game, the squirrels pick up the acorns with their hands and put them in the bag as they are playing. They need to gather at least three acorns; since they feed on other sources of food, they don't need as many as the woodpeckers.
4. Before starting the game, ask students to form a hypothesis about which animal will gather more acorns. Ask them to phrase it such as, "Because the woodpecker has \_\_\_\_\_, it will \_\_\_\_\_."



acorn woodpecker

5. Each team plays one round that lasts for only two minutes. Before the round begins, explain that the game begins with all the players of the first group standing on the line opposite from the granary. Start the timer for two minutes and say, "Start." Students play until you say, "Stop."
6. After each round, have the four players count and record the number of acorns placed in the holes. Repeat the same for the bags. Determine who survived and who died.
7. Let each new team repeat steps 5 and 6.
8. After everyone has a turn, repeat the game with only those that survived during the first game. This time the woodpeckers must gather at least twelve acorns and the squirrels six since they are gathering food for their babies. Set the time for two minutes.

### References and Resources

*Cal Alive! Exploring Biodiversity*, interactive CD-ROM about California biodiversity - including an excellent section on oak woodlands. Available from the California Institute for Biodiversity, listed in Appendix 5.

Twain, Mark. What Stumped the Blue Jay, in *The Tramp Abroad or The Complete Short Stories of Mark Twain*.

### Source

This activity was adapted with permission from "Woodpeckers and Oaks," Oak Woodlands Wildlife. University of California Cooperative Extension National 4-H Science Experiences and Resources for Informal Education Settings (4-H SERIES) Program.

## Wrap-Up

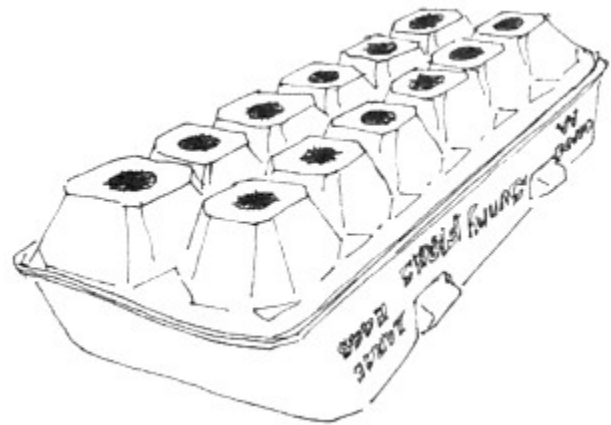
After the final round, gather all the students and discuss the activity. Ask them to describe how easy or difficult it was to collect acorns. Which organism seemed to be better adapted to gathering acorns? What happens to those who cannot compete for food?

## Extension Ideas

- Use *the Cal Alive! Exploring Biodiversity* software to find out more about the acorn woodpecker and its relationship to oak trees.
- Read aloud Mark Twain's tall tale featuring oaks and jays, "What Stumped the Blue Jay" found in *A Tramp Abroad or The Complete Short Stories of Mark Twain*.

## Assessment

Ask students to write about what would happen to the acorn woodpeckers if all dead trees were cut down.



example of an acorn granary  
made from an egg carton

# What Gall is That?

## Grade Level

4-8

## Subjects

Science

## Skills

Observing, classifying,  
analyzing, inferring

## Materials

For the class: *Samples of galls, plastic boxes or jars, a sharp knife, magnifiers, colored pencils and paper*

For each student:  
*Copies of the "Oak Apple Gall Life Cycle" student page and "Gall Identification Key" student page*



## Summary

Students examine oak leaf and stem galls.



## Objective

Students learn that insect galls on oak trees represent a complex interrelationship between an insect and its host.

## Background Information

Galls are the result of a very interesting biological relationship between oak trees and other species. They are actually peculiar looking homes for a diverse and poorly studied group of insects, some of which are still unidentified and their life cycles uncharted.

A gall begins when an insect lays its egg on or within a particular part of a certain plant. The plant reacts to the egg and forms a cancer-like growth around the egg. This structure provides both shelter and food for the egg as it changes into a larva. If you cut open a fresh gall, often you will find the maggot-like larva inside.

Most of the adults of these gall insects are very small and live for a short period of time. Gall insects spend most of their lives within the gall as larvae or pupae. They chew their way out only when they are ready to emerge as adults. If no holes are in the gall, an insect is still inside, either alive or dead.

Galls commonly occur on leaves and stems of plants. A great variety of insects create galls, but the most common are wasps, aphids, and mites. Each species of gall insect lays its eggs upon a specific (or closely related) plant species. Gall insects lay their eggs on a very specific part of the plant such as the stem or the leaf. Most types of leaf galls will be found only on the upper or lower side of the leaf, while others are found only along a leaf vein. The eggs of some gall insects will produce only one gall per egg while others produce the oak apple that contains many eggs and developing larvae.

Galls are a good example of the ways in which many species are completely dependent on other species for their existence. If the host species is eliminated, the gall insects are also eliminated.

## Preparation and Planning Tips

- During the late summer and fall, locate and collect specimens of oak apple galls and oak leaf and stem galls. These samples can be protected for future use by placing them in plastic boxes or jars. If oak apple gall samples are gathered prior to the adult insect exiting the gall, the adult will be trapped in the jar for students to observe. Be sure that the samples you collect are identified on the “Gall Identification Key.”
- Read over the Background Information to prepare to tell students about gall insects.

## Opener

Distribute the gall samples and ask students to make observations and come up with answers to the question: “This came from an oak—what do you think it is?”

As a group, make a list of observations and note key descriptive words on the blackboard. Tell students about the relationship between insect galls and oaks, and about the insect gall life cycle. Give them copies of the “Oak Apple Gall Life Cycle” student page. Explain that they will use a picture key to identify the galls you have collected.

## Procedure

1. Using copies of the “Gall Identification Key” student page, students can identify the gall samples.
2. After successfully identifying the specimens, have students make drawings of the galls to include in their Oak Community portfolios.

## Wrap-Up

Ask students to report on what they found and to share their drawings. Keep samples of the galls on hand for students to continue to observe.

## Extension Ideas

Pose these investigation questions for students to research:

- Do galls harm oaks?
- Do gall insects have enemies?
- Are galls more commonly found on leaves or stems? Are there more galls on the upper or lower surface of leaves?
- Is there only one insect inside each gall?
- Where do gall wasps usually exit the gall?
- What other parasitic relationships do oaks have?

## Assessment

Ask students to explain the relationship between the oak tree and a gall insect, in their own words with an accompanying illustration of a gall.

### References and Resources

Pavlik, Bruce M., Pamela C. Muick, Sharon G. Johnson, and Marjorie Popper. *Oaks of California*. Los Olivos, CA: Cachuma Press and the California Oak Foundation.

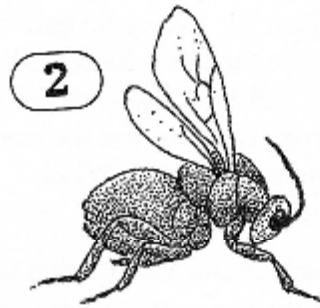
Russo, Ronald A. *Plant Galls of the California Region*. Pacific Grove, CA: The Boxwood Press, 1979.

### Source

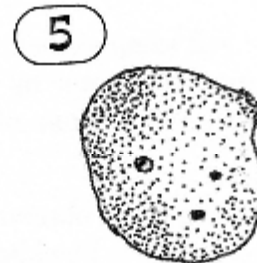
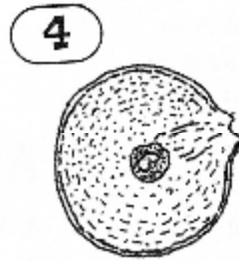
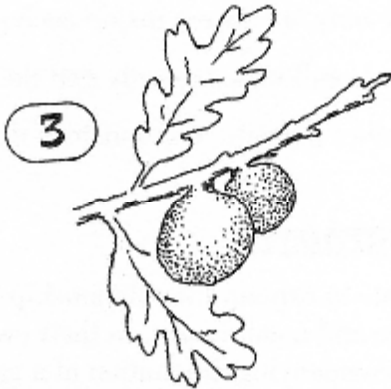
This activity was adapted with permission from *Autumn Oaks*. Redding, CA: Shasta Natural Science Association, 1995.



# Oak Apple Gall Life Cycle



(illustration enlarged 30 times)



- 1) On the oak's branch.....
- 2) A very tiny (about one millimeter) mature gall wasp lays an egg that grows into a tiny larva.
- 3) While feeding on the stem, the larva releases chemicals from its saliva causing the stem to swell into a ball or whitish "apple."
- 4) In its protective gall "house," the larva changes into a pupa and then an adult. When the tiny new adult is ready, it burrows out of the gall and flies away.
- 5) Finally, the gall turns black and drops off the tree.  
Can you see where the wasp left the gall?

# Gall Identification Key



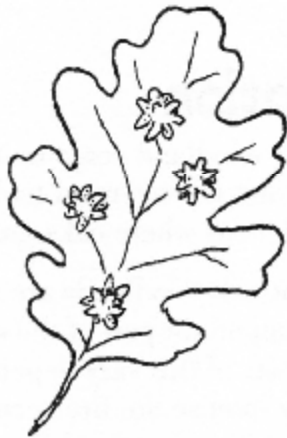
**caterpillar**



**jumping ball**



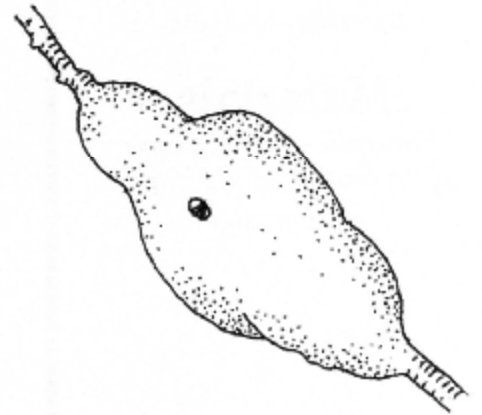
**candy kiss**



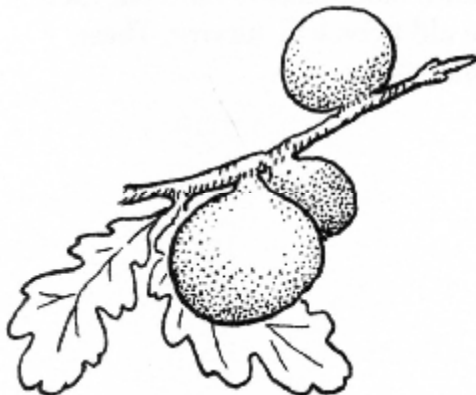
**urchin**



**spined turban**



**stem**



**oak apple**



**club**



**saucer**

# Wildfire in the Oak Community

## Grade Level

7-8

## Subjects

*Math, history, science*

## Skills

*Analyzing information and data, graphing, inferring, applying*

## Materials

For each student: *Copy of "A History of Wildfires" student page*

## Summary



Students analyze data gathered by resource managers and draw conclusions about how wildfire has influenced a particular California oak community.

## Objective



Students learn about the role of wildfire in oak woodlands and how human activities have both increased and decreased the number of wildfires.

## Background Information

Fire is a natural part of California's oak woodland community. It has also been used as an important land management tool since Native Americans first inhabited areas where oaks grow.

Scientists and land managers know that oak woodlands are well adapted to wildfire and that fire is an important part of the oak woodland's ecology. The ecological effects of fire vary depending on how frequent, what season, and how intensely the fire occurs. Low intensity fires do not kill most oak species and oak woodlands are extremely well adapted to surviving hot summer fires. Mature oaks can survive regular, low groundfires, and young seedlings and saplings can re-sprout after being burned on the top. Lightning- caused fires, from storms coming up from Mexico and spreading into Southern California, can cause older oaks to burn out their crowns, but often limbs of these old trees will survive. These dead cavities make ideal wildlife habitat.

Native Americans made use of fire in their stewardship of oak woodlands. They burned woodlands to increase habitat for game species, to improve access for hunting and gathering of acorns, and to encourage plant materials for their crafts. (For more information, see the Background Information for the “Oak Communities in Early California” activity.)

European settlers burned oak woodlands and neighboring chaparral lands to keep stands open for their livestock production and to encourage forage. Studies of wildfire history indicate that these early ranchers regularly burned their land in 8- to 10-year intervals. Researchers have noted that during the decades where wildfire occurred in 8- to 10-year intervals, a greater number of trees in different stages of their life cycles made up the oak woodlands.

When more and more suburban areas began encroaching on ranches, this burning practice was reduced. In the 1950s, the “Smokey Bear” fire suppression campaign changed dramatically the number of fires in oak communities. All efforts were directed to suppress wildfire and eliminate it from forests, including oak woodlands. As a result, the amount of underbrush dramatically increased, adding to the “fuel” available to burn in a wildfire. In the past 40 years, wildfires have been less frequent, but much larger and more destructive.

## **Preparation and Planning Tip**

Introducing the topic of fire’s role in the oak woodland community helps students understand that not all wildfire is detrimental to California ecosystems. Review the Background Information to prepare for a discussion with your students about fire in the oak community. Consult Appendix 5 for information on where to get additional help or to locate a guest speaker.

## **Opener**

Ask your students to think about fire’s role in nature. Ask them to brainstorm ways that fire affects plants, animals and the landscape, and note their responses. Find out if any have had first-hand experience with viewing wildfire in a natural area. If so, what did they notice after a year had passed? Did all the plants and animals die? Help students draw conclusions about the role of wildfire. Also encourage a discussion about the impact of people moving into wild or rural areas where wildfire is part of the natural cycle.

## Procedure

1. Explain to students that they will study data gathered by fire researchers interested in learning about how fire influences oak communities. Provide them with copies of “A History of Wildfires” student page. Point out the time span of the information on the graph.
2. Hold a discussion about the historical events that took place during this span of time such as the pre-Spanish or Native California period, the Spanish-Mexican ranching era, the American expansion into California (including the Gold Rush era), and the modern era that includes the “anti-fire” philosophy and expansion of communities into the oak woodlands.
3. Ask students to analyze the number of fires per decade as shown by the bar graph.
4. Have students answer the questions on the student page to help them summarize the information and draw several conclusions.

## Warm-Up

Have students share their results. Conduct a class discussion on what the data mean in terms of how frequently fires have had a role in shaping this stand of oak trees.

## Extension Ideas

- Contact the California Department of Forestry and Fire Protection to obtain a copy of the free teacher bulletin with student activities, *Learning to Live with Fire*.
- Have students use the Internet to request fire data from the California Department of Forestry and Fire Protection website at [www.fire.ca.gov](http://www.fire.ca.gov).
- Invite a forest ranger or fire management specialist from USDA-Forest Service, National Park Service, Bureau of Land Management, California Department of Forestry and Fire Protection, California State Parks and Recreation, or a local fire agency to discuss the management issues of fire in oak communities.

- Visit an oak woodland (or other plant community) that was recently burned by a wildfire, and carry out a field study. (See the “Oak Community Field Study” activity.)
- Have students investigate other fire-dependent plant communities such as chaparral, lodgepole pine and redwood forests.

## Assessment

Locate additional wildfire data and have students create a bar graph to interpret the data. Have them draw conclusions about how the frequency of wildfire may influence the animals and plants in the area.

### References and Resources

Blackburn, Thomas C., and Kat Anderson. *Before the Wilderness: Environmental Management by Native Californians*. Ballena Press Publication, 1993.

Comnes, Leslie, and Kay Antúnez. *Learning to Live with Fire*. California Department of Forestry and Fire Protection, 1997.

Pavlik, Bruce M., Pamela C. Muick, Sharon G. Johnson, and Marjorie Popper. *Oaks of California*. Los Olivos, CA; Cachuma Press and the California Oak Foundation, 2000.

Standiford, Richard B. “The Role of Fires in California’s Oak Woodlands,” *Oaks ‘n’ Folks*. Vol. 9:2, September 1994. University of California Integrated Hardwood Range Management Program.

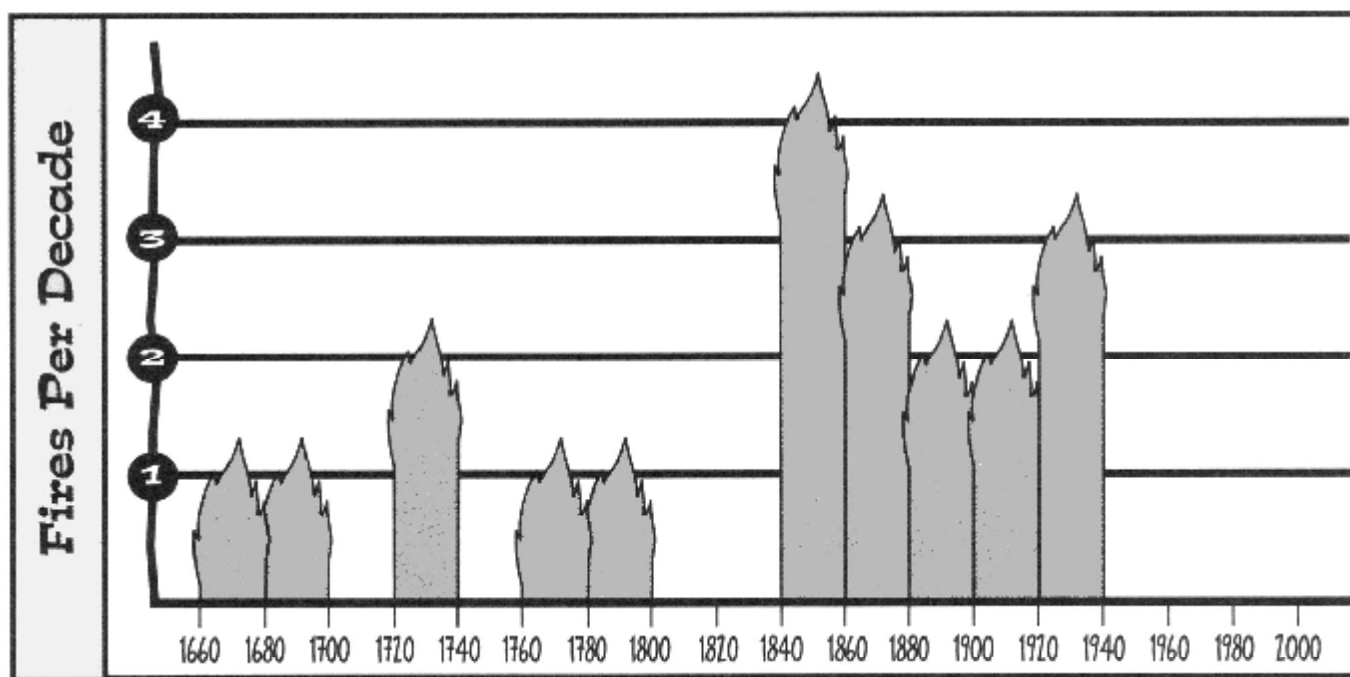
Standiford, Richard B., and Theodore Adams. “Fire in California’s Hardwood Rangelands,” *Guidelines for Managing California’s Hardwood Rangelands*. University of California Division of Agriculture and Natural Resources Publication #3368, 1996.

# A History of Wildfires

Wildfire has an important role in shaping the California oak community. At a research station in the Sierra Nevada foothills near Sacramento, scientists studied how often fires have burned in the area. This information is shown on the graph below. Take time to study the graph to understand how it is organized, and then answer the questions based on the information shown.

**Study the graph and answer these questions:**

1. What does the horizontal axis represent? Explain in a complete sentence.
2. What does the vertical axis on the left side represent?
3. During which decades were there the greatest number of fires in this oak forest?
4. What may have caused these fires?
5. Why do ranchers choose to burn their land?
6. What happens to oak communities when fire is not allowed to burn?
7. What conclusions can you draw about the role of fire in an oak community?



**1660-1830** Native California

**1770** Spanish colonize California

**1840** Mexico governs California

**1830-1940** Rancher burning/Gold Rush

**1940-1990** "Smokey Bear" Era

**1970** CA becomes the most populated state

# How Do Oaks Grow?

The three activities in this unit help students understand the oak's life cycle. Students plant acorns and nurture them into young oaks. They also learn about the role of old oaks in the oak community.



## Activities

**9 – Grow Big Oaks from Little Acorns**

**10 – Planting and Caring for Young Oak Trees**

**11 – Investigating Old Oaks in the Oak Community**

# Growing Big Oaks from Little Acorns

## Grade Level

4-8

## Subjects

*Science, math, language arts*

## Skills

*Observing, analyzing, inferring, relating*

## Materials

For the class: *2-cubic-foot bag of soil; ½-gallon milk cartons, propagation tubes, or other containers; labels for containers; acorns, thin strips of paper, glue stick or tape, measuring tapes or rulers*

For each student: *Copy of Acorn “Sink or Float” Observations, “Acorn Planting Data,” “Oak Seedling Care Pledge” and “Graphing Seedling Growth” student pages*

## Summary



Students gather and select acorns, and then grow them into oak seedlings.

## Objective



Students learn how to plant an acorn and nurture it into a seedling. They learn the special requirements that oaks have for soil, light, temperature and water.

## Background Information

In preparation for guiding students to grow acorns into oak tree seedlings, review the following information. Older students may find it useful to read the information on their own.

## Gathering and Preparing Acorns for Propagation

Acorns mature and drop from the tree during the late summer and early fall—August to November. Watch for wildlife gathering acorns as a clue to seed maturity.

Try to collect acorns from trees growing close to where you plan to plant them. This will ensure that the new oaks in the community will be genetically related to each other and are adapted to the environmental conditions of the area. Try to identify what type of oak you are collecting from, and note its species name and location.



Collect acorns from strong, healthy-looking trees. If you plan to propagate acorns, pick them directly from the trees or gather them from beneath the tree's canopy. Not all acorns will be healthy. Choose acorns that are greenish brown, firm and plump. Some acorns may be damaged by insects or not completely formed. Acorns with pinholes may indicate insect activity inside. If the seed rattles, it is likely to be dried out and probably won't germinate.

You can find oaks in many public areas such as in parks, along roadsides, and in national or state forests. You will need to obtain permission to gather acorns. Check with park managers about regulations or restrictions that may prohibit acorn collection. If you collect on private property, be sure to obtain the owner's permission before entering. California has explicit laws about gathering plant materials, and it is important to remember that these regulations are designed to protect the plants and wildlife species. Take only a portion of what you find and leave enough for the woodpeckers, jays and squirrels. Some of these acorns will become new oaks, too.

Acorns can be stored for several weeks as long as there is adequate moisture and cool temperatures. Keep them damp, preferably in a closed container or self-sealing plastic bag. Place them in a refrigerator (but not the freezer!) or other cool place. Before storing the acorns, rinse them to add fresh moisture and to remove mildew on the surfaces. Store only the healthy acorns. Use the "sink and float" test described in the activity to check for good acorns.

After processing, the acorns can be stored for several months—at least until March. Periodically rinse the acorns and keep them in a cool place. Plant them in growing containers or directly in their natural habitat.

## **Nurturing New Oaks**

Planting acorns is the best part of this activity! If you decide to plant acorns directly in their natural habitats, plant them in the fall just as the jays and squirrels do — directly into the ground.

Remember to plant the tip of the acorn pointing downward or sideways. The tip may be broken and the taproot already forcing its way out of the seed coat. Acorns will grow as soon as all the conditions are right, so also consider the following factors.

## **Soil**

You will need fertile soil to successfully grow acorns into oak seedlings. Healthy acorns will germinate in native soil, that is, soil from where the trees grow naturally; but if you plan to grow acorns in containers, follow these guidelines:

- Purchase potting soil from a garden center.
- Use garden soil that has been sterilized in an oven for two hours at 160°-180° F. Soil contaminated with microbes, weed seeds and snail eggs will interfere with acorn germination.
- You can make your own soil. Refer to Appendix 4 for a recipe for making your own soil and for additional soil activities that complement this activity.

## **Light**

Caring for oak seedlings will require an understanding of how trees grow. All plants need light to carry out photosynthesis, the complex process that enables plants to convert light energy, carbon dioxide and water into oxygen and sugars. All life on Earth depends on this biochemical process.

If oak seedlings are grown in containers indoors, place them near a window or skylight. Short periods of direct sunlight can be beneficial, but avoid extreme temperatures caused by direct exposure to sunlight.



Artificial light can be used if natural light is not available. One 100-watt incandescent or two fluorescent bulbs placed over (about 0.3 - 0.6 m [1-2 ft] above) the seedlings will be adequate. Incandescent light is rich in “red” light waves that help seeds to germinate, but also causes them to grow spindly stems. Heat from lights also tends to dry out the soil. Limit use of artificial light to twelve hours at a time.

## Temperature

Seedlings will grow in room temperatures ranging between 18°-24° C (65°-75° F). Night temperatures should not drop below 15° C (60° F). If the seedlings are growing out-of-doors, they will respond to the change of seasons, initiating growth above and below ground as soon as the weather is warm.

## Water

Acorns planted directly into the soil will probably not require watering, but a cup or two to supplement Mother Nature won't hurt. Use caution when watering seedlings in containers. Allow excess water to drain out of the container to prevent the spread of soil fungi and bacteria, which damage or kill seedlings. Avoid soggy soil or washing soil away from young roots. Air-conditioned rooms may lack enough moisture unless a humidifier is used. Keep seedlings away from areas that receive a constant flow of air to keep their leaves from dehydrating. Seedlings will benefit from occasional misting.

## Things to Remember:

- Keep seedlings in a cool, shady place and avoid excessive and varying soil temperatures.
- For seedlings in containers, saturate the soil with water. Don't water again until the seedlings partially dry out. Never allow seedlings to sit in excess water.



## Preparation and Planning Tips

- Be sure to review the Background Information carefully to prepare for conducting the activities described here. Growing acorns into young oak trees is easier than it may seem. This lesson provides several activities that can be used alone or together to teach students about how plants grow.
- Gather about 60 acorns either before the activity, or as part of the Opener with students. Be sure to obtain the necessary permission for doing so.
- An important question to consider before you start is, “Where will we plant these new oaks?” See the “Planting and Caring for Young Oak Trees” activity for ideas and information about finding a suitable location.
- Be sure to think through a plan for planting the seedlings once they have reached a few months old. If trees are in containers, they should be planted either in the late spring or fall of the same year. The first year of an oak's life is devoted to the development of a sizable root system. If a young tree is left in a container for more than a year, its taproot will begin to coil, constraining its growth when it is finally planted in the ground. Some valley oak taproots can grow 30 centimeters (12 inches) in just three months!
- Find a suitable place to keep the containerized seedlings while they are germinating and growing. They can take up quite a lot of space, so select a location that will not be disturbed or in your way. A variety of growing containers can be used, but the easiest are half-gallon milk cartons. Be sure to poke holes in the bottom or sides to allow for drainage. A tray or pan under the cartons is helpful in collecting excess water. Use a spray bottle to mist and water seedlings. This technique will apply adequate water and help control the spills. Propagation tubes are also useful for growing seedlings in the classroom, as they are compact and save space (see the References and Resources for ordering information).

## Opener

Ask students what they know and what they want to know about how oak trees grow (you might create a class K-W-L as in the “Oak Watch” activity). If students will be gathering the acorns, familiarize them with the information about collecting acorns described in the Background Information. Either take students to gather the acorns, or show them the acorns you have gathered.

## Procedure

### Part 1: Acorn “Sink or Float”

1. Take the caps off the acorns, place the acorns in a container and cover them with water. Immediately remove any acorns that float and save them. Allow the rest of the seeds to soak for at least 12 hours. Remove any new acorns that float and keep them with the other “floaters.” Drain off the water and place all the “sinkers” in storage containers as described in the Background Information.
2. Ask the students to propose ideas or hypotheses about why the “floater” acorns don’t sink with the rest. Record their ideas on chart paper or a blackboard and then allow them to open the “floaters” to investigate the contents. Provide students with a variety of tools to break open the acorns. Prepare them for finding larval worms and other surprises.
3. Have students record and describe their findings on the “Acorn ‘Sink or Float’ Observations” student page to be included in their Oak Community portfolios.

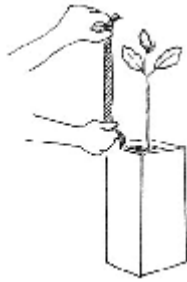
### Part 2: Planting Acorns

1. Give students a “sinker” acorn, and have them make observations and measurements (color, length, and overall size and appearance). Ask them to summarize their observations and measurements on the “Acorn Planting Data” student page.
2. Demonstrate how to plant an acorn. Allow each student or group to prepare and fill a container with soil, and plant an acorn.
3. Lead a discussion on the physical requirements needed for oak seedlings to grow:
  - What does an acorn need to grow?
  - How can you tell if it needs water?
  - How much water should you give to your seedling?
  - How will you know if you have given it too much water?
  - What will happen if the soil becomes too hot?
  - How much light should it get?
  - How do its roots grow?
4. Give each student an “Oak Seedling Care Pledge” certificate. Read the pledge together as a class, and have each student sign and date their certificate.
5. Have students complete the questions on the “Acorn Planting Data” student page, and begin a series of observations.



**Part 3: Recording the Seedlings' Growth**

1. Once oak seedlings begin to grow, have students graph the rate of stem growth.
  - For younger students, make a bar graph using thin strips of paper to measure the stem length. Place a strip of paper next to the stem and snip off at the point where the stem ends. (Some seedlings grow so quickly that strips longer than 27.5 cm [11 in.] may be needed). Attach the measuring strip to the horizontal axis (the time line) of the graph on the "Graphing Seedling Growth" student page. The seedling's height can be read using the vertical axis. Try to make at least three measurements over time.
  - Have older students use measuring tapes or rulers to measure the stem lengths, then plot this information on the "Graphing Seedling Growth" student page. Students should take measurements at least once a week.



2. Have students place their completed student pages in their Oak Community portfolios.

**Wrap-Up**

At each step of the way, review what has been accomplished by filling in the "Learned" portion of the K-W-L chart you started in the Opener.

**Extension Ideas**

Keep a visual record of the day you plant acorns by taking photographs or making a video.

- Plant some acorns in containers and some in the ground. Make comparisons of their growth rates.
- Measure and keep a record of how much water you give the oak seedlings. This can be done as a group record, or each student can keep track individually.
- Keep track of rainfall throughout the duration of this project. Discuss with students how the amount of rainwater compares to the amount of hand watering needed.

- Collect rainwater for watering oak seedlings. Have students investigate differences between rainwater and tap water.
- Discuss how a tree grows and how water travels through a seedling.
- Make sketches or take photographs to keep a visual record of seedling growth and changes.
- Refer to Appendix 4, for several other soil activities.
- Try other demonstrations that reinforce students' understanding of photosynthesis.

**Assessment**

Interview students individually. Ask them how they would explain the process of growing an oak seedling from an acorn to a friend or family member. Develop a simple rubric that evaluates the accuracy of their description and their understanding of the process (see Appendix 2 for information about rubrics).

**References and Resources**

Churches, Ken, and Jennifer Mitchell.  
*Oak Tree Project* (booklet and video). University of California Cooperative Extension, 891 Mountain Ranch Rd., San Andreas, CA 95249, 1990.

*How to Collect, Store and Plant Acorns*. Oakland, CA: California Oak Foundation.

*How to Grow California Oaks*. Berkeley, CA: Integrated Hardwood Range Management Program, University of California, Berkeley. Single copies are available on request from the Integrated Hardwood Range Management Program, listed in Appendix 5.

Propagation tubes. Available from Stuewe and Sons, Inc., 2290 S.F. Kiger Island Drive, Corvallis, OR 97333-9461; 800.553-5331 or [www.stuewe.com](http://www.stuewe.com).

For students:

Burnie, David. *Tree*. Eyewitness Books, New York: Alfred Knopf, 1988.

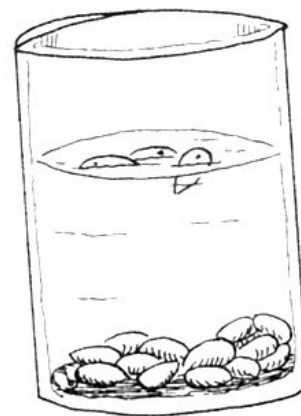
Giono, Jean, *The Man Who Planted Trees*, Chelsea, VT: Chelsea Green Press, 1985. (Also available as a video.)

# Acorn “Sink or Float” Observations

1. Draw or describe what happened when you dropped your acorn into a container of water. Did it sink or float?

2. Draw or describe what you found inside your floating acorn.

3. What new ideas or information did you learn from this investigation?



# Acorn Planting Data

1. Identify the species of oak tree that dropped your acorn.
2. Draw a picture of your acorn and label its measurements in either centimeters or inches.
3. On the back of this page, describe or draw the steps you took to plant your acorn.
4. How do you plan to care for your acorn while it is beginning to grow?

Light:

Temperature:

Water:

5. Use the back of this page to list other observations you make.

# Oak Seedling Care Pledge

## Oak Seedling Care Pledge

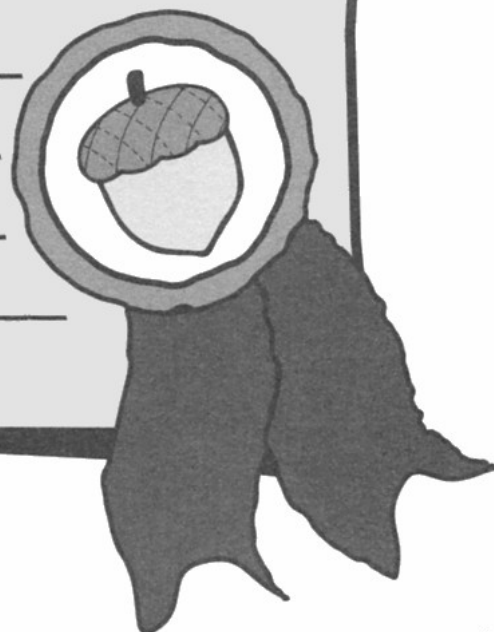
"I, \_\_\_\_\_, promise to care for my California native oak. I pledge to give it water and sunlight, and to watch over it during hot and cold weather. When it is ready to plant, I will find a place for it that has plenty of space and sunshine. I will always remember how special my California oak seedling is to the oak community."

Signature \_\_\_\_\_

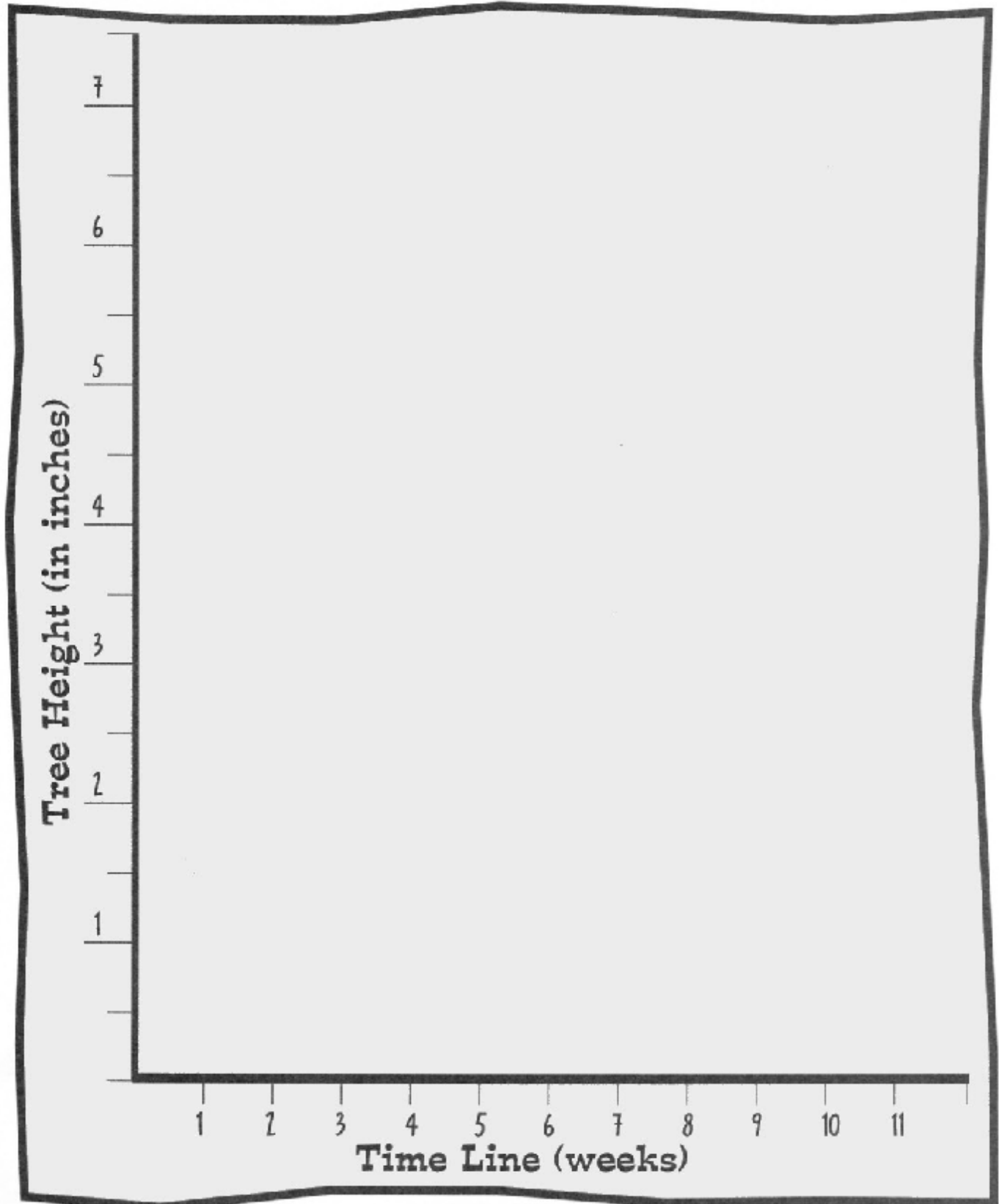
Signature of Witness \_\_\_\_\_

Date \_\_\_\_\_

Location \_\_\_\_\_



# Graphing Seedling Growth





# Planting and Caring for Young Oak Trees

## Grade Level

4-8

## Subjects

Science, language arts

## Skills

Communicating,  
observing, analyzing,  
inferring, organizing

## Materials

For the class: *Shovels, stakes, markers, water, seedling, crayons, paper*  
For each student: *Copy of "Acorn to Oak Growing Game" student page; dice; a marker (acorn cap)*

## Summary



Students plant their oak seedlings, and plan and participate in a ceremony that celebrates the event.

## Objective



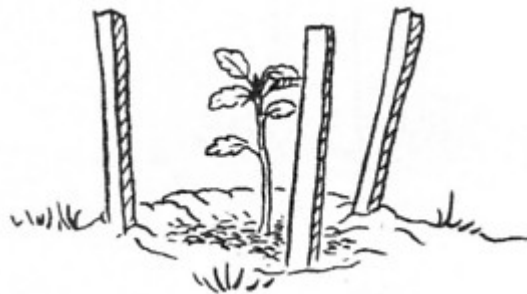
Students learn how to plant and care for young oak trees.

## Background Information

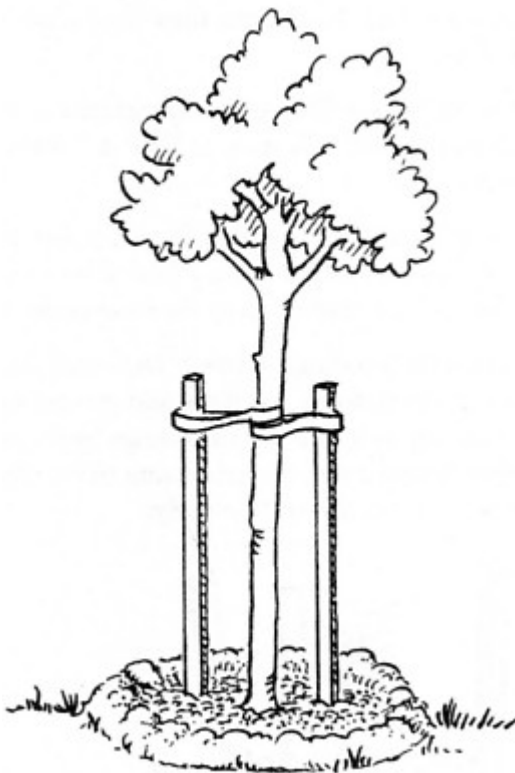
With careful planting and good care, most oak seedlings will grow into young trees at the rate of about half a meter (1-2 ft) per year. Planting and maintaining oak seedlings and young trees will take little effort if you consider the following conditions. Help your students become oak caretakers by sharing these tree planting and caring tips with them.

Is there enough space for the seedling to reach maturity in the location selected? A mature oak will need at least a 7.5-m (25-ft) diameter canopy space.

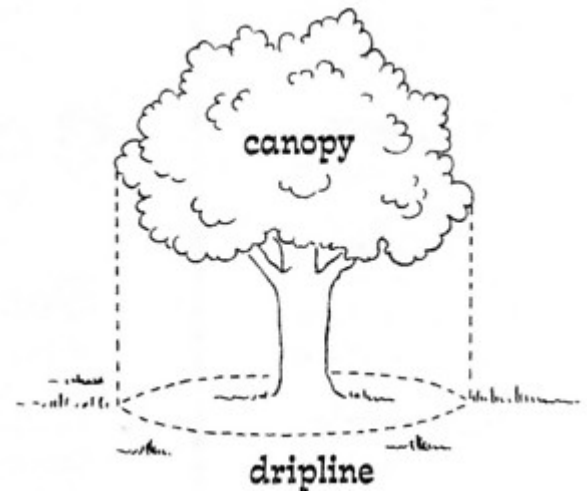
- Will it have to compete with other plants for soil nutrients, water, light and air? Keep weeds and lawn away from the young tree by clearing a 0.5-m (18-in.) radius from the base of the tree.
- Will wildlife damage the seedling or tree? Deer and cattle browse the leaves of young trees. Gophers and ground squirrels may chew on the young roots. In urban settings, pets, people and machines often trample and disturb young trees. Build a protective barrier or mark the trees clearly.



- If the seedling is to be planted in a lawn or garden area, will it get too much water and need to compete with the grass for soil nutrients? Oaks planted in lawns usually develop many shallow roots. These trees are less stable and have less chance for survival than those that form deep roots and locate a water supply deep within the soil. Do not allow water to collect around the base of young oaks planted in lawns.
- Will it get the water it needs? If an oak is planted in a natural area, it will benefit from occasional deep watering (once or twice a month) during the first three years.
- Will it be planted at some distance from other trees? Oak seedlings are susceptible to the same diseases that older trees may have. If trees are planted too close together, insect pests may pass easily from one to the next. In young trees, powdery mildew and aphids are problems, especially when the trees grow in low light conditions or are crowded together.



- When the tree matures, will its dripline be clear of pathways and other conditions that might disturb its roots? A tree's dripline is the area included beneath the tree's canopy or crown. It is circumscribed by the edge of the canopy and is the area where most of the tree's roots grow. Avoid paving, excavating and compacting the soil within the dripline. Older oaks commonly have root systems that extend well beyond the dripline.



- Will the tree be allowed to grow without pruning? Branches help shade the bark, avoiding sunburned trunks. Cuts on young branches, as in pruning, may introduce diseases. Pruning is neither necessary nor recommended, except for branches that are dead or crossing closely over each other.
- Will the tree be staked? Staking trees promotes vertical growth and protects them from damage. Stakes with flexible ties support the trees by allowing the stem to move freely. Trees that are allowed to bend will form stronger trunks. Remove the stakes and ties as soon as the trees have gained some height.
- Is the soil appropriate? Fertilization of the seedlings and young trees is not recommended unless there are indications that the tree has a deficient supply of nutrients. Seek advice at a garden center if you suspect that the soil needs amendment.

## • **Planning and Preparation Tips**

To get off to a good start, help your students become “oak stewards” by reading Background Information and preparing yourself for their questions. You do not need to be an expert to share this knowledge.

- Help your students plan where the trees will be planted. You will need to get permission to plant oak seedlings or trees at the site you have chosen. Carefully consider who will take care of the trees once they are planted, especially if the students will not be involved. If students will take care of the new trees, establish a tree care schedule that includes everyone.
- Refer to Appendix 1 for tree planting ceremony ideas.

## **Opener**

Take your students on a walking tour to view trees in the schoolyard, neighborhood, along streets or in a park. Point out different types of trees, noting oaks. Ask them if they can find any “trees in trouble,” noting trees that are struggling or showing signs of insect pests or other damage. Use the terms dripline, canopy and crown. Take time to enjoy the shelter of a tree’s canopy while gathering information on what they know about tree care needs: planting, watering, staking, pruning, and disease prevention.

Back in the classroom, hold a group discussion using the points covered in the Background Information to help students consider the necessary steps in planning a successful tree planting. List their comments on a piece of chart paper or the blackboard. Discuss appropriate places to plant the trees and the need to seek permission to plant them at these sites. Discuss who will care for the trees after they are planted.

## **Procedure**

Dig a hole twice the diameter of the container and with a depth that will measure 2.5-5 cm (1-2 in.) higher than the ground level when the soil and tree are positioned in the hole. Do not plant trees in holes where the tree will be lower than the soil level. Trees planted lower will collect too much moisture around the trunk or stem, which encourages the crown to rot.

- Roughen the sides of the hole to allow for root growth, and moisten the hole with water.
- Carefully remove the seedling tree from the container, taking care not to harm the delicate root system.
- Position the tree in the hole and refill the hole with the original soil. Carefully tamp the soil down to push out large air pockets that will dry out the roots. Adding soil amendment, such as compost, bark or peat moss, is unnecessary unless the soil is unusually poor.
- Cover the soil around the tree’s base with a 5-cm (2-in.) layer of mulch. Water the tree thoroughly, allowing the soil to settle around the roots. Do not plant trees in very dry or soggy soil. Roots grow well in moist soil where adequate oxygen is present.
- If trees have been kept in containers for more than one year, the roots need to be carefully loosened before being placed in the hole. Carefully straighten or cut a circling taproot. If the taproot has been damaged, the tree may take months to recover from the shock of planting. The side roots will then take on the function of supplying moisture to the young tree.

2. Take students to the planting site. You may need to help them prepare the holes and plant their trees, especially if the soil is dry. Be sure to water the young trees and provide protection with a stake or marker.
3. Conclude the planting with a ceremony.

## Wrap-Up

Lead a review discussion of the planting activities. Continue the discussion of how tree care during the next few years will determine if the trees will survive. Ask students to draw a poster to illustrate proper tree care such as watering, staking, removing the stakes, and watching for diseases. Showcase the posters on a class bulletin board. Have students (in pairs) play the “Acorn to Oak Growing Game” to review planting and caring for new oaks.

## Extension Ideas

- Take a photograph of each child kneeling next to his or her oak seedling or tree.
- Plan a field trip to plant trees in a nature area or location away from school.
- Call the local newspaper (or school newspaper) to announce the arrival of new oaks in your neighborhood or school grounds.
- Invite a tree expert to help with planning your tree-planting event.
- Use a cross-section of a tree trunk or large limb to show students the tree’s growth rings and discuss the needs of trees.
- Invite a tree expert or Master Gardener to lead a walk around the school grounds to talk about proper tree care. Contact your county’s agricultural extension office for names of Master Gardeners who may be willing to help you.
- Read the story or view the video, *The Man Who Planted Trees*.

## Assessment

Have students create an oak care booklet or a board game to demonstrate their understanding of planting and proper care for young trees.

## References and Resources

Churches, Ken, and Jennifer Mitchell.  
*Oak Tree Project* (booklet and video). University of California Cooperative Extension, 891 Mountain Ranch Rd., San Andreas, CA 95249, 1990.

Contact the Integrated Hardwood Range Management Program, listed in Appendix 5 for single copies of these references: *How to Grow California Oaks*, *Living Among the Oaks: A Management Guide for Homeowners*, *Wildlife Among the Oaks*; and *Oaks n’ Folks* (a newsletter).

*Keeping Native California Oaks Healthy* (Tree Notes #7). California Department of Forestry and Fire Protection, P.O. Box 670, Santa Rosa, CA 95402-0670, June 1990.

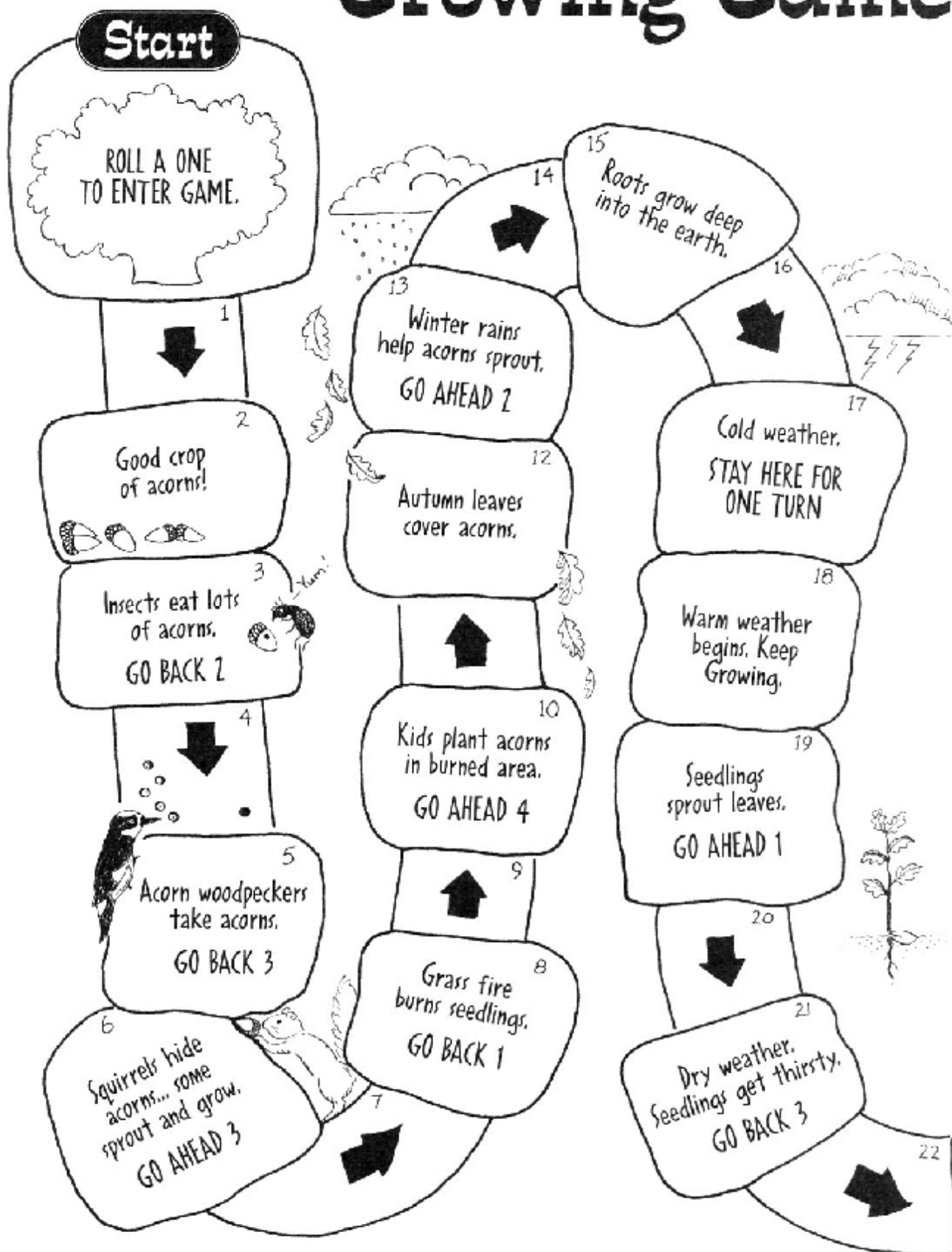
*Oak Trees: Care and Maintenance*. Los Angeles County Department of Forester and Fire Warden, 1320 North Eastern Ave., Los Angeles, CA 90063.

*Oaks on Home Grounds* (Leaflet #2783). Division of Agriculture and Natural Resources, University of California Cooperative Extension, May 1984.

*Plant Your Own Oak Tree* (Leaflet #21334). Division of Agriculture and Natural Resources, University of California Cooperative Extension, March 1983.



# Acorn to Oak...Growing Game

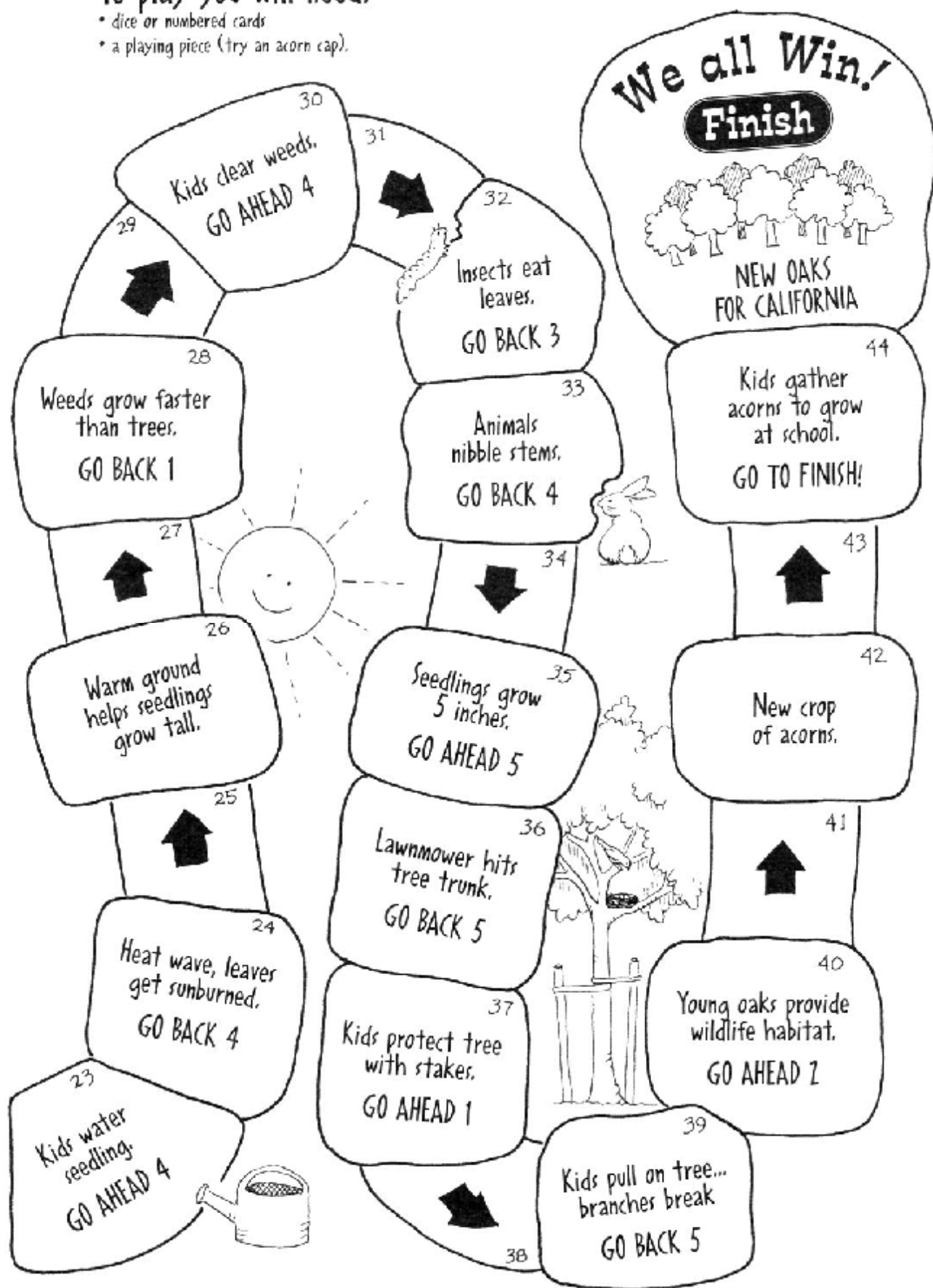




Cut here, then tape to "watch line" on other game board page.

To play you will need:

- dice or numbered cards
- a playing piece (try an acorn cap).



# Investigating Old Oaks in the Oak Community

## Grade Level

6-8

## Subjects

*Science, language arts*

## Skills

*Formulating questions, hypothesizing, gathering and analyzing information, drawing conclusions, communicating*

## Materials

For the class:

*Magnifying glasses, hand trowels or small shovels, binoculars, measuring tapes, or other equipment needed for investigating student questions*

For each pair of students: *Copy of "Old Oak Investigation" student page*

## Summary



After students investigate an old oak tree, they evaluate and draw conclusions about the future of the tree.

## Objective

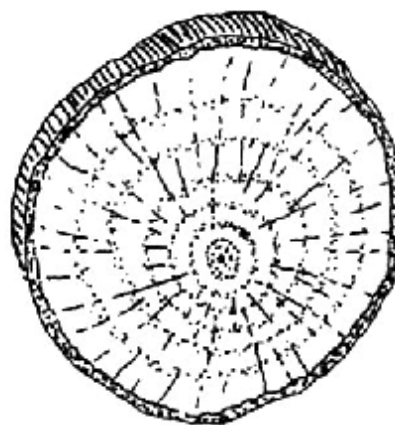


Students learn how to pose a question about the health of an old oak tree, gather, organize and analyze information, then draw a conclusion about what solutions could extend the tree's life.

## Background Information

While measuring a tree's height and trunk circumference can give an indication of its age, this procedure is not always an accurate method for determining age. Some oaks grow more quickly than others. In fact, oak researchers in Northern California have found many short 100-year-old blue oak trees that are only 15 centimeters (6 inches) in diameter.

Sampling the tree's rings with an increment borer can give a more accurate account of the tree's age. Each ring represents one year or season of growth. The core sample can also reveal a historical record of local climate and fire occurrence. The width of each band or ring can reveal the amount of rainfall and overall growing conditions.



oak tree  
rings

None the less, it is useful to measure the circumference and diameter of an old tree because they give the best indication of age without using specialized tools. See Appendix 3 for information about how to make these measurements.

Other information that can be gathered in an old oak investigation include observations about the following:

- **Dead parts of the tree's trunk and limbs.** Are there signs of decay, rot, fungus, or mistletoe? Mushrooms at the base of a tree in the fall or early winter may mean that a fungus is growing in the tree's trunk under the bark.
- **Soil compaction under the tree's canopy.** When the soil is hardened, water has difficulty percolating through, and there are fewer passages for air to reach the roots.
- **Wet soil.** If the old tree is growing near a lawn or garden that gets irrigated frequently, it may get too much water during the summer months. Fungus may spread into the tree.
- **Nearby construction.** If paths, trenches, paved roads or buildings have been placed too close to old trees, their roots may have been disturbed when soil was moved.
- **Few leaves.** When an old tree has few leaves, it cannot do a good job of making its own food. Photosynthesis is the process where green plants capture and use sunlight to combine carbon dioxide and water. The products are carbohydrates and oxygen.
- **Scars and scrapes.** Is there evidence that the old oak has been used as a fence post or bumped by people or machinery? Sometimes old oaks growing along fences have been used as posts or even for mounting signs. Nails and wire may be imbedded in their trunks causing unusual growth.
- **Insects.** A few pests on an oak are normal and not serious. But a big infestation or severe insect attack can cause leaf loss, twig die-back, and sticky or sooty foliage. Pit scale can be a serious problem for oak trees.

## Preparation and Planning Tips

Locate an old oak tree that is easy for students to observe and investigate. This activity may be used as part of the "Oak Watch" activity (p. 12) or carried out in conjunction with a field trip. Check out the neighborhood, a park, or even the school grounds to try this activity.

## Opener

Ask students to think about the conditions that make old oaks unhealthy. Allow them to make suggestions of all types. Afterwards, ask each student to write down at least one question they want to investigate regarding what makes old oaks unhealthy.

## Procedure

Ask students to share their questions from the Opener, then write them on a piece of chart paper. Make sure there are enough questions for each pair of students to have one. Cut the chart paper into strips with one question per strip, or write the questions on separate pieces of paper.

1. Give each pair of students a question, or have them "draw from a hat." Give them a copy of the "Old Oak Investigation" student page.
2. Ask each pair of students to turn their question into a hypothesis and write it on the student page. Explain that a hypothesis is an educated guess or a statement to be investigated. Provide an example such as:

**Question:** Does a child's swing in an old oak harm the tree in some way?

**Hypothesis:** The soil under a child's swing in an old oak is very compacted and this makes it difficult for the tree to get enough water and oxygen.

3. Have each student pair plan how they will test their hypothesis, using the student page to record their plan.
4. Allow students to gather, organize and analyze information to test their hypothesis. This process may include developing a test for soil compaction, testing for excess water or moisture, investigating insect infestations, or estimating the effects of damage due to loss of leaves, bark or branches.



5. Finally, have students draw conclusions based on their investigation, and formulate possible solutions that will benefit the old oak.

## Wrap-Up

Each pair of students summarizes their investigation using the student page, and makes a presentation to the class.

## Extension Ideas

Have the students turn their investigations into a report to send to the landowner or manager of the area where they investigated the old oak.

- Invite a forester or other tree expert to talk to the students about old oaks. Help students develop a list of questions to ask such as “What kind of special care does the old oak growing in my backyard need?” or “Are there any laws that protect old oaks in our area?”
- Have students make a map of the area (school grounds, neighborhood or park) and indicate where the old oaks are located.
- Have students read sections from *Oaks of California* that describe historic oaks such as the “Hooker Oak” in Chico and the “Jack London Oak” in Oakland.
- Have students find out what happens to old oaks when they are burned by wildfires.
- Find out which plants grow best under old oaks in gardens.

## Assessment

Students choose another old tree and assess its health. They make a map of where it is located and provide several observations that indicate their understanding of what may be the future of this tree.

### References and Resources

*Care of California Native Oaks*. Oakland, CA: California Oak Foundation.

*Oaks on Home Grounds* (Leaflet 2783). Division of Agriculture and Natural Resources, University of California Cooperative Extension, 1984.

Johnson, Sharon G. *Wildlife Among the Oaks: A Management Guide for Landowners*. Berkeley, CA: Integrated Hardwood Range Management Program. Available from the Integrated Hardwood Range Management Program, listed in Appendix 5.

Pavlik, Bruce M., Pamela C. Muick, Sharon G. Johnson, and Marjorie Popper. *Oaks of California*. Los Olivos, CA; Cachuma Press and the California Oak Foundation.



California quail

# Old Oak Investigation

1. What is your question about old oaks?
2. Make a hypothesis. (Turn your question into a statement, which may be right or wrong at this point.)
3. How will you investigate your hypothesis? List all the things you will do to check your hypothesis.
4. Carry out your investigation. Organize your data (the information you gather) into a chart, graph or other way to show what you have discovered about old oaks.
5. Draw conclusions about the results of your investigation.
6. Provide two or three suggestions for possible solutions to help this old oak.

# How Are Oak Communities Important to Californians?

The four activities in this unit will deepen students' understanding of the importance people place on oaks and oak communities. Through the use of children's literature, maps, and issue analysis, students examine both historical and personal perspectives and learn about the importance of oak communities to past and present Californians.



## Activities

**12-Oak Communities in Early California**

**13-Oak Place Names**

**14-Investigating Issues: Oak Community Dilemmas**

**15-Oaks for All Reasons**

**16-Oak Tales**

# Oak Communities in Early California

## Grade Level

4-8

## Subjects

*Cultural and natural history, language arts, art*

## Skills

*Inferring, relating, applying, analyzing information, drawing conclusions*

## Materials

For the class: *Reference books with pictures and information about Native Californians (optional)*

For each student: *Copy of "How Native Californians Used and Cared for the Oak Community" student page*

## Summary



After students read about how Native Californians influenced and used the oak community, they make a mural to represent what they have learned.

## Objective



Students learn that the oak community was influenced by Native Californians.

## Background Information

The journals and diaries of early explorers and missionaries provide valuable information that is useful in modern times to better understand how Native Californians managed the landscape. Father Juan Crespi, who accompanied the Portola expedition in 1769-70, wrote one of the earliest descriptions of the landscape. Traveling through the inland area of the Santa Barbara coast during the spring, he wrote:

“We went overland that was all of it level, dark and friable, well covered with fine grasses, and very large clumps of very tall broad grass, burnt in some spots and not in others; the unburned grass was so tall that it topped us on horseback by a yard.” (Source: Barbour, et al)

Thirty years later, Father Junipero Serra, founder of the California missions, reported on entering a valley that was “more than a league in width, and in parts so green that, if I did not know in what country I was, I would have taken it, without any hesitation, for land under cultivation.” (Source: Blackburn and Anderson)

Recently, many scientists, ethno-botanists, and resource managers, who share an interest in how the landscape has evolved due to the influence of humans, have taken a new look at documents of early California travelers. They have focused on how the authors of these references discuss ways that Native Californians used and managed land and natural resources. It is now thought that the many California tribes intentionally nurtured and managed certain plants and animals for their own benefit.

One example of such a practice was the use of fire to clear out brush to make it easier to collect acorns and hunt animals; these fires may have favored the oak woodlands and grasslands by slowing down the natural succession of grasslands to shrublands and heavily wooded areas. Low burning fires did not harm oaks; in fact, the disease and pests that infect acorns were probably kept in control with frequent episodes of fire. Intentionally set fires also helped open areas and promoted a lush springtime growth of grasses and herbs. This attracted deer and other wildlife helping to expand the herd while also filling the hunter's larder. Another example is digging for bulbs to eat; this helped spread the new smaller bulbs just as harvesting seeds helped to spread seeds.

Managing nature's resources has always been influenced by the knowledge, understanding and goals of those who are in control of the land. This is demonstrated by the observation made by the Spanish governor Jose Joaquin de Arrillaga, whose proclamation in May 1793 may have started a 200-year practice of fire suppression in California's coastal areas. His address stated:

"The widespread damage which results to the public from burning of the fields, customary up to now among both Christian and Gentile Indians in this country, whose childishness has been unduly tolerated...I see myself required to have the foresight to prohibit for the future...all kinds of burning...." (Source: Barbour, et al)

Whereas Father Crespi noted that "not a bush can be seen" when he traveled through the coastal valleys, today the same area is dominated by chaparral and coastal sage scrub vegetation, not

grasslands. This clue may help us to understand that the modern California landscape was shaped not only by nature's slow process of plant succession by natural selection but also by the influence of human interventions.

See "California Oaks and the Human Past" in *Oaks of California* for additional historical references to oaks and how humans used them.

## Preparation and Planning Tips

This activity will acquaint students with some of the early uses of California plants found in the oak community. Read the Background Information and student pages to become familiar with the information prior to using it with your students. For a more in-depth study, locate copies of the books listed in the References and Resources.

## Opener

Ask students what they think the California oak community looked like in the days of the Native Californians. They can write down their thoughts in their journal or on a piece of paper to include in their portfolio, or participate in a class discussion.

## Procedure

1. Provide each student with a "How Native Californians Used and Cared for the Oak Community" student page. Read it aloud to the class, ask several students to read portions aloud, or assign each student to read it on their own.
2. After reading the material, pose these questions to help students interpret the information:
  - What were some of the most important plants used by the first people who lived in the oak community?
  - How did they use these plants?
  - How did they take care of these plants?
  - What are some of the ways native people managed these plants (use of fire, control of pests, propagation)?
3. Ask students to work in small groups to draw a large picture showing at least one way Native Californians used or managed the plants and animals found in the oak community.

## Wrap-Up

Ask each group of students to display their picture and make a short presentation to the class about what they have chosen to depict.

## Assessment

Pose a question for students to reflect on this lesson, such as “How do you think that Native Californians (or the Spanish) may have shaped today’s oak community?”

## Extension Ideas

Use the *Cal Alive! Exploring Biodiversity* software to listen to Malcolm Margolin talk about Native Californians and oaks.

- Explore in more depth the customs associated with making acorn meal.
- Organize a field trip to a park that can be used to focus on Native Californians and how they used and managed oak woodlands. See Appendix 5 for where to get information about finding a site.
- Ask students to find out how Native Californians used acorns in many of their games. *News from Native California* is an excellent resource.
- Obtain a “Spring Wildflower” poster from the California Native Plant Society. Many of the plants that Native Californians used are illustrated on this poster. Ask students to choose one flower to look at carefully and then make their own drawing, including the common and scientific names.

## References and Resources

Balls, Edward K. *Early Uses of California Plants*. Berkeley, CA: University of California Press, 1962.

Barbour, Michael, Bruce Pavlik, Frank Drysdale, and Susan Lindstrom. *California’s Changing Landscapes: Diversity and Conservation of California Vegetation*. Sacramento, CA: California Native Plant Society, 1992.

Blackburn, Thomas C., and Kat Anderson. *Before the Wilderness: Environmental Management by Native Californians*. Menlo Park, CA: Ballena Press, 1993.

*News from Native California* (newsletter). Heyday Books, P.O. Box 9145, Berkeley, CA, 94709. (Vol. 8:1 is an issue devoted to *Games and Toys of Native California*.)

Ortiz, Bev. *It Will Live Forever: Traditional Yosemite Indian Acorn Preparation*. Berkeley, CA: Heyday Books, 1991.

Pavlik, Bruce M., Pamela C. Muick, Sharon G. Johnson, and Marjorie Popper. *Oaks of California*. Los Olivos, CA; Cachuma Press and the California Oak Foundation, 2000.

### For Students

Dagit, Rosi. *Grandmother Oak*. Boulder, CO: Roberts Rinehart Publishers, 1996.

*Cal Alive! Exploring Biodiversity*. Interactive CD-ROM about California biodiversity — including an excellent section on oak woodlands. Available from the California Institute for Biodiversity, listed in Appendix 5.

*Spring Wildflowers* poster. Available from the California Native Plant Society, listed in Appendix 5. Many chapters offer this poster free or at a discount to teachers.

# How Native Californians Used & Cared for the Oak Community

Many Native California tribes lived within the oak community. The Miwok, Maidu, Wintu and Pomo lived in the foothills and depended on oak woodlands for food and other materials. They ground acorns into a meal that was an important part of their diet. They used oak wood for making tools, fish traps and arrows, and their shelters. They also used other plants growing in the oak community. They gathered seeds for food, herbs for medicines, and shrub materials for making baskets.

To learn about Native Californian life, historians have studied interviews with Native Californians themselves and diaries of Spanish explorers and missionaries. From these accounts, it is thought that the native people cared for the land in ways that favored some plants and animals. One thing they did each year was to burn grassy areas between the trees in oak woodlands to make hunting and gathering acorns easier. These fires also helped to kill diseases and pests in dried leaves and old acorns lying under the trees, making the oak community healthier.



## Harvesting and Preparing Acorns

Acorns were as important to Native Californians as corn was to tribes in Central and South America or rice to Asian people. One family needed 500 pounds of acorns — or more — each year! The people did many things to protect the oak trees and to increase the acorn harvest.

Native Californians used acorns from nine of the California oaks: valley oak, Oregon oak, blue oak, scrub oak, canyon oak, interior live oak, coast live oak, California black oak and the tanoak. Since acorns were not always abundant from each species each year, the tribes had to know how to carefully harvest and store these edible nuts. They were careful not to take too many acorns. Most tribes also had strict rules about blessing the acorns before preparing or eating them. They held special ceremonies — dances, songs and prayer — to express thanks to the creator and to the spirit world for providing acorns.

Each fall the tribes dedicated themselves to gathering enough acorns to eat throughout the year. They would watch for changes in the seasons: Leaves falling and turning brown, wildlife gathering fruits and seeds, and changing weather. To compete with the birds, deer, bears, squirrels and gophers that also eat acorns, the native people learned to knock acorns off the trees with long poles before they were ready to drop. This way, they could gather the acorns before the other animals had a chance at them. They could also harvest acorns from their favorite trees all at one time. Another benefit of this method is that it caused old and dead branches to fall off of the trees, which helped rid the trees of diseases and pests, keeping them healthier.

The people gathered the acorns into large cone-shaped burden baskets. They carried these on their backs held with a strap across the forehead, so that their hands were kept free to gather acorns. After collecting the acorns, the people dried them and stored them.

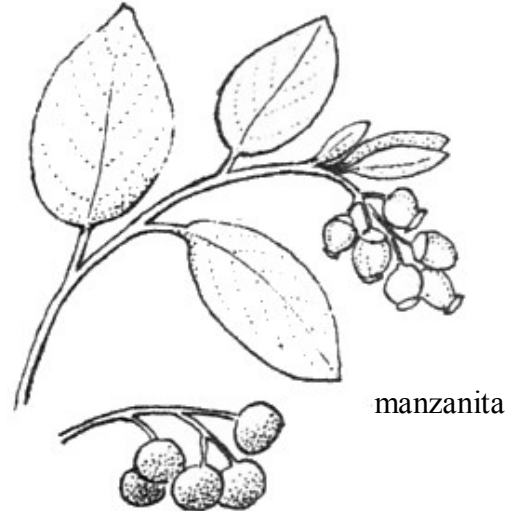
Women were in charge of preparing acorn meal — a long and tiring process of pounding, grinding, and sifting. The most difficult task was removing the bitter and poisonous tannic acid from the ground meal. This required washing the meal several times using special baskets. The people made bread and soups from the acorn meal. To make soup, they placed the meal and water in a watertight cooking basket. They then placed hot stones in the basket to heat up the soup. Berries, nuts, meat, insects, ashes, and clay found in the oak woodlands helped flavor the acorn meal soup.



## Gathering Other Food and Materials from Oak Woodlands

In addition to acorns, Native Californians ate many other foods found in oak woodlands. In the springtime they collected fiddleheads from bracken ferns and the stems and leaves of clover, miner's lettuce, monkey flower, paintbrush, and the California poppy. They boiled, steamed, or ate raw these wild greens. In the summertime they gathered blackberries, thimbleberries, salmon berries, gooseberries, currants and elderberries. The people made these fruits into flour, cooked them into a sauce, or soaked them in water to make a sweet drink.

Shrubs found growing in the oak woodland also provided plenty of food. Manzanita and toyon have berries that Native Californians dried, ground into flour, then used to make bread or mush. They also made cider out of the berries from the manzanita (which means “little apple” in Spanish).



manzanita

Many of the colorful spring wildflowers of the oak woodland produce bulbs and tubers, which the Native Californians put to good use. They harvested the bulbs from wild onions, brodiaeas, mariposa lilies, and soap plants using digging sticks they made from long straight sticks. At harvest time, they celebrated with special songs and dances. Then they would harden the sticks by charring them in a fire, and then sharpen the end to a point. They used these sticks to dig and lift larger bulbs out of the soil. When smaller bulbs would fall off the bulb clump, the people would leave them for the next year's harvest.



California blackberry



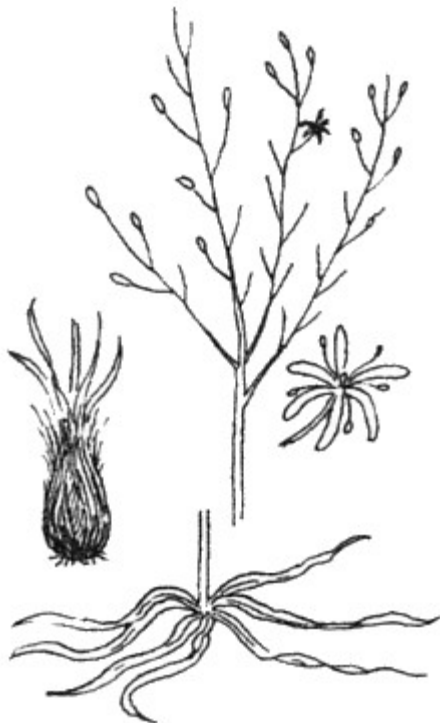
Native Californians used soap plants in lots of different ways. This plant is common in oak woodlands, and has a large bulb covered with dark brown, hairy fibers. It is called soap plant, because the people used to crush the bulb and rub it with water, making a soapy shampoo for bathing. This bulb can also be eaten, and is very tasty if it is roasted for more than a day.

Native Californians used soap plant bulbs in catching fish. They would dam up a stream to trap the fish, and throw in uncooked soap plant bulbs. A toxic substance in the bulb would stun the fish, causing them to float to the surface. Then the people would collect them to eat. Native Californians also used soap plant fibers to make small brushes for sweeping up acorn meal. They used a gummy substance from the soap plant to glue together the fibers to make the brush. They also rubbed this glue on the body to cure stomach aches and cramps, and to heal wounds.

Poison oak is a very common plant in the oak community. This plant grows under and near oak trees, and sometimes sends long stems up the trunk like a vine. Unlike the Spanish and Americans who came to California during the past 200 years, Native Californians did not get a rash after touching this plant. They used the stems for twine and to make baskets. They also used the juice from the stems, leaves and roots of poison oak to cure ringworm and warts.

## **We're Still Learning**

Although there is lots of information about which plants Native Californians used for foods, medicines, fiber, and building materials, there is much less information about how they cared for and managed plant communities like the oak woodlands. This fascinating topic has recently caught the interest of ethno-botanists, scientists who study the use of plants by native people. Ethno-botanists are studying to learn more about how California's native people may have affected the plant communities we find here today.



soap plant

# Oak Name Places

## Grade Level

4-8

## Subjects

*Geography, history,  
language arts*

## Skills

*Observing, analyzing,  
inferring*

## Materials

For each pair or small group of students:  
*Neighborhood, county, regional, or California map (may be a variety of maps for the class), plotting pins or markers*

For each student:  
*Copies of "Can You Find 'Oaks' All Over This Map?" student page, and "California Native Oak Match-Ups" student page from "Identifying Native Oaks" activity #2*



## Summary

Students use maps to locate place names that refer to oaks.



## Objective

Students gain an understanding about the importance of oak trees and woodlands in California geography and history.

## Background Information

Throughout California's cultural history, oaks have provided the landscape and backdrop scenery for dramatic events and day-to-day activities. Many cities, towns, streets, schools, parks and buildings have names including the word "oak," or the Spanish equivalent, *roble* (a deciduous oak) or *encino* (a live oak). The abundance of oak-derived names in our state clearly suggests the significant role oaks have played in shaping California's character.

This activity can help students consider how changes in land use affect the environment. For example, in Sacramento a small shopping center bears the name "Four Oaks Corners." There are no trees associated with this 50-year old complex, but oaks do grow in natural and urban settings nearby. Were there ever "four oaks"? Did they die or were they removed? Questions such as these can help students learn to infer and speculate about changes in land use over time.



According to Erwin G. Gudde, author of *California Place Names*, the naming of people, places and things is one of the oldest elements of human culture. He explains that place names arise from “incidents, superstitious beliefs, the forming of landed estates, the desire to honor persons, and other causes.” He notes that there are over 150 place names on California maps that include the word oak, the most popular name derived from a tree next to willow or pine.

The study of place names has proven to be of great importance for the investigation of historical land use, especially in situations where nothing has been written down. Historians and cultural anthropologists make use of place names to speculate about what took place or what was found in a place based on its name. Many Native American and Spanish place names described earlier features of the land. The name Yucaipa, in San Bernardino County, is derived from the Serrano Shoshonean dialect and means “wet or marshy land”; Coloma means “beautiful valley” in Maidu; and Yosemite from “uzumati” means “grizzly bear” in Miwok. Montano de Oro State Park, formerly a Spanish land grant rancho, translates as “mountain of gold” and refers to the blaze of spring flowers still seen there every year. Oakland (Alameda County), Live Oak (Sutter County), Paso Robles (San Luis Obispo County) are places where oaks still thrive, and the oak community must have presented a strong visual image to early settlers who chose these words in English and Spanish to name their new towns.

## Preparation and Planning Tips

- Locate maps for the activity. Groups may use different maps, but choose ones with as many references to oaks as you can find.
- It is helpful if students have completed the activity “Identifying Native Oaks” before doing this one.

## Opener

Pose questions about a local place name that has the word oak in it, such as “Does anyone live on Fair Oaks Way? Where do you think that name came from?” Lead a discussion about how place names came about and why they are important in determining something about the history of a place.

## Procedure

1. Pass out maps and the “Can You Find ‘Oaks’ All Over This Map?” student pages. Ask pairs or small groups to highlight with pins or pens the oak-related words they find like oak, roble, encino, encina, woodland, oakmont or oakdale.
2. Ask students to review their “California Native Oak Match-Ups” student page to find out what species of oaks are found in the region of their maps.
3. Finish the activity by having students complete the student page to summarize their findings and inferences.

## Wrap-Up

Display the maps with the place names highlighted.

## Extension Ideas

Have students use the telephone directory to count how many businesses use words or phrases that include “oak.” Make a list of examples.

- Read aloud sections of William Brewer’s journal, *Up and Down California in 1860 - 1864*, written during his historic travels in California. Brewer provides descriptions of vast oak woodlands throughout much of the state.
- Ask students to find out if your community has a “heritage oak preservation” ordinance and how it is working to protect oaks and oak woodlands in your community.

## Assessment

Ask students to reflect on the name of your school. Can they give you an idea of ways the school’s name may have meaning as a place name in the neighborhood or region?

### References and Resources

Farquhar, Francis P. (editor), *Up and Down California in 1860-1864: The Journal of William H. Brewer*. Berkeley, CA: University of California Press, 1966.

Gudde, Edwin G. *California Place Names*. Berkeley, CA: University of California Press, 1969.

# Can You Find “Oaks” All Over This Map?

1. Describe the scale of the map you are using. Is it a map that shows the whole state, part of the state, a region of the state, a county, a portion of the county, a city or part of the city? Can you tell how many centimeters (or inches) are equal to a kilometer (or mile)?
2. List all the names that include the word “oak.” Look for names like Oakmont, Fair Oaks, Paso Robles, Live Oak, or Encino. How many can you find?
3. Choose several California cities that have “oak” in their name. What species of oaks grow near these places today? Check your “California Native Oaks” student page or an appropriate book.
4. Are oaks still in the areas where you found the oak names?
5. Did you find more oak names in some areas of the map than in others? What might that tell you?
6. How many of the oak names were in English? How many in Spanish? Why do you think that might be?
7. What did you learn from this activity?

# Investigating Issues: Oak Community Dilemmas

## Grade Level

7-8 (can also be adapted for 4-6 graders by choosing one dilemma and working it through as a class)

## Subjects

Social studies, language arts

## Skills

Defining problems, analyzing information, identifying bias, relating, reflecting, communicating, formulating possible solutions

## Materials

For the class: Large pieces of paper and marking pens

For each group of one-third of class: Copies of "Oak Glen Street

Dilemma (An Urban Issue)," "Oak Knoll Dilemma (A Suburban Issue)" or "Fair Oaks Dilemma (A Rural Issue)" student page

For each student: Copies of "How Do We Decide?" and "Planning for the Council Meeting" student pages

## Summary



Students prepare possible solutions to one of three land use issues affecting oak communities and role-play a decision-making model.

## Objective



Students use problem-solving skills to analyze and develop a solution to a land use conflict involving oaks in an urban, a suburban, or a rural area. They will simulate a decision-making process to decide on a solution to the issue.

## Background Information

In California, urban expansion into the surrounding wildlands has degraded or destroyed much of the state's oak woodlands, creating wildfire hazards and increasing serious flood potential. Since the mid-1940s, 1.2 million acres of oak woodland habitat have been converted to urban and agricultural uses and another 10 million acres are at risk. An additional 14,000 acres are estimated to be lost each year to residential development and woodcutting.

Oak woodlands provide soil stabilization, ground water recharge, air and water quality, wildlife habitat, nutrient recycling, recreational opportunities, and aesthetic qualities. Unfortunately, urban development has had a major influence on the oak woodland community. Oaks are not protected by California state law in 2000. Elected city councils and county boards of supervisors in California's 58 counties decide land use issues. Oaks are present in 46 of the counties.

**2008 Note:** Since the publishing of this book, two laws pertaining to oaks have been passed:

[Assembly Bill 242](#) was signed by Governor Davis in 2001 enacting the Oak Woodlands Conservation Act to provide funding for conservation and protection of California's oak woodlands.

[Senate Bill 1334](#) was signed by Governor Schwarzenegger in 2004 giving oaks status under the California Environmental Quality Act (CEQA).

Building policies seldom require careful assessment of oak woodlands before development to minimize the removal of trees or stands of trees. In some counties, it is permissible to clear wooded areas to facilitate development. Most cities and counties lack effective tree preservation ordinances; or if they have them, they usually lack the staff for enforcement. Thus, more trees are removed than necessary for development, and many of those retained are inadvertently killed or damaged.

How communities decide to develop and use land is a complicated process. Zoning laws and ordinances can help local leaders and planners agree on land uses that meet the community's objectives. When these laws and ordinances do not include considerations of local natural resources such as soil, water, wildlife, trees and shrubs, development can put these resources severely at risk. See the "How Do We Decide?" student page for additional information about community planning processes. Also see "Preserving Oaks for Future Generations" in *Oaks of California* for additional perspectives on land use patterns that affect California's oak communities.

## Preparation and Planning Tips

- Read over the Background Information and student pages to become familiar with problem-solving scenarios. Develop a plan to organize the students into groups that will allow each student to be involved.
- It would be helpful if students have done the "Investigating Old Oaks in the Oak Community" activity prior to this activity.

## Opener

Ask the students how they would react if they found out that the school district has decided to build more classrooms on the school's playground. What would they think if a tree or trees had to be removed? Who would they talk to about this? How might they be able to influence the decision? Are there other options? Make a list of their ideas, and then group or draw lines between ideas that have a connection to each other.

## Procedure

1. Explain that students will be doing an activity that simulates what takes place when community leaders and planners must make a choice of what to do with land that includes part of California's oak forest.
2. Distribute copies of the "How Do We Decide?" student page, and read it aloud as a class. Explain that small groups will represent community members or interested parties, and will present their concerns and solutions to a community council. The council will listen to presentations and then vote on a solution. Ask, "Which decision-making process will we be using in this activity: consensus, legislative, or authoritative?"
3. Divide the class into three groups of at least 10 students per group. Explain that each group will examine one of three dilemmas and carry out a simulation to resolve it. Give all the members of each group a copy of their dilemma. Explain that each group will choose three people to be council members, and the others are to represent the different parties involved in the dilemma. Give everyone copies of the "Planning for the Council Meeting" student page to help them plan.
4. Allow each group at least one class period to read over its dilemma, to choose who will take on each role listed, and to plan their presentations for the council meeting. Distribute paper and pens for making any visual aides students need to explain their position or solution.
5. When presentations are ready, have each group convene a council meeting with the rest of the class observing. Each group will have three council members who will listen to the presentation of the others in their group, and then decide how to resolve the conflict. Council members must understand that their role is to make a decision that will satisfy all groups involved — that their decision may or may not be the best land use choice. After each presentation within the group is heard, the council members meet for a few minutes to vote on the best plan.

6. After each council meeting, the class can discuss these points:
- Do you agree with the council? Why or why not?
  - How will the parties in the dilemma feel about the decision?
  - What changes would you suggest?
  - Which seemed to be more important — people's needs or protecting the oaks? Do you agree with this view?
  - How did the community's laws, ordinances, or general plan help or hinder the decision-making process? Are changes needed in order to make better decisions?

## Wrap-Up

After each group has held its council meeting, lead a group discussion comparing the three different dilemmas:

- What was at issue in each of the dilemmas?
- How realistic was each dilemma?
- How were the dilemmas the same?
- In what ways were they different?
- Which dilemma was the easiest to resolve? Why?



red-tailed  
hawk

- Which was hardest to resolve? Why?
- Why do you think cities and counties have zoning laws, ordinances, and land-use plans? What would happen if they didn't?
- What dilemmas involving oaks does our community face?

## Extension Ideas

- Invite a city or county planner to watch the class presentations, and afterward to provide insight into the dilemmas.
- Have students find out what local ordinances and zoning laws may protect oaks and oak woodland communities in your area.
- Take students to a city council, chamber of commerce, or planning council meeting to make a presentation about their oak studies.
- Have students transmit their findings to the California Board of Forestry (P.O. Box 944246, Sacramento, CA 94244-2460) and California Fish and Game Commission (1416 9th Street, Room 1320, Sacramento, CA 95814).

## Assessment

Ask each student to explain, in one or two paragraphs, how the oak woodland community can be helped if each community (urban, suburban, and rural) developed a land use plan or adopted special zoning laws or ordinances.

### References and Resources

Pavlik, Bruce M., Pamela C. Muick, Sharon G. Johnson, and Marjorie Popper. *Oaks of California*. Los Olivos, CA; Cachuma Press and the California Oak Foundation, 2000.

### Source

This activity was adapted with permission from Project Learning Tree's "We Can Work It Out," *Environmental Education PreK-8 Activity Guide*. Washington, D.C.: American Forest Foundation, 1993/1994/1995/1996/1997/1998. The complete Activity Guide and High School Modules can be obtained by attending a PLT workshop. For more information visit the Project Learning Tree web site at [www.plt.org](http://www.plt.org).

## How Do We Decide?

Making decisions about how land is used, especially when oak communities are involved, is very controversial in California. Some cities and towns have guidelines for making decisions when a change in land use may affect oaks. When there are no set guidelines, community leaders must resolve conflicts on a case-by-case basis. Decision-makers use several land use planning tools to make decisions about their communities. These tools are the community's general plan or area wide plan, zoning regulations, and ordinances:

- A *general plan* describes the community's strategy or policy regarding growth and development.
- *Zoning regulations* lay out the community's rules for how much and where public and private development (building) can take place. For example, zoning may regulate where businesses and homes can be built.
- *Ordinances* are rules about specific activities in the community. Ordinances may include whether you can do an activity in the community and may limit where you can do it. For example, an ordinance may state that skating or riding bikes in a park is only allowed on the paved roads and walkways.

All these land use planning tools help citizens and public decision-makers decide how development and growth issues will take place. These planning tools can also be helpful in protecting oaks.

When a decision must be made, community leaders can use three different models for deciding what to do. They usually set up guidelines for making a decision, following the consensus model, the legislative model, or the authoritative model. Each of these models differs in who makes the decision, how it is made, and how much the citizens can be involved.

The **consensus model** is used when a group of people is aware of a problem and come together to offer a variety of solutions. They compare different ideas to resolve the problem, weigh the pros and cons, and then decide if they all agree on what action to take. When they unanimously agree on what to do, they have reached consensus.

When lawmakers become aware of a problem, they invite the public and government agencies to provide ideas for solutions using the **legislative model**. They listen to testimony that provides a variety of alternatives. When they are ready to vote on the way to solve the problem, the majority vote determines what will happen. This decision then becomes a law or a policy.

The **authoritative model** is when someone or a group who has been given authority makes a decision. There is little public involvement in this process. Only people who have been given the authority gather information on solutions to the problem. Then they make a decision on what will happen.



# Planning for the Council Meeting

## For the Community Members

Plan a three- to five-minute presentation for the council meeting based on the following:

1. What group or person do you represent?
2. What is the problem (or issue) you are trying to resolve?
3. What is your position on this issue (what do you think should happen)?
4. What are the reasons for your position?
5. What decision would you like to see the council make?
6. What are the other positions in this issue (what do the other people think should happen)?
7. What are the reasons you do not support the other positions?
8. What do you think the other parties would say about your position? What would you say to counter these statements?

## For the Council Members

Plan for the council meeting by studying the issue. Do not decide yet how you will vote. Use the following questions:

1. What is the issue?
2. Who are the parties involved and what are their positions (what do they think should happen)?
3. What rules (general plan, zoning regulations, ordinances, etc.) does your community have in place to help resolve this issue?
4. What else might be helpful in deciding this issue? (For example, an ordinance that the council could pass in the future.)
5. What might be possible solutions to this issue that would satisfy each of the parties involved?

# Oak Glen Street Dilemma (An Urban Issue)

Residents of the “Oak Park” neighborhood in the city of Oakville are very excited about the new shopping district proposed for their neighborhood. After several years, the City Council has agreed to allow the rebuilding of a rundown portion of Oak Glen Street. Several business owners have proposed to build new shops along the street. The shops will make shopping more convenient for residents, and will also provide new jobs.

The city’s general plan states that new trees must be planted in front of any new shops and that the owners must take care of them. New trees planted in public areas are to be maintained by the city’s Department of Public Works. There are several very large oak trees already growing along Oak Glen Street and a small grove of young oaks is growing in a vacant lot in between two buildings that will be torn down.

When the redevelopment plan was announced, a group of several neighbors in the area expressed concern that the older oaks along Oak Glen Street and the small grove of young oak trees would be removed. They pointed out that the oaks were there long before the city spread into the Oak Park neighborhood.

Mrs. Roble owns a small café facing Oak Glen Street and next door to the vacant lot with the grove of young oaks. She is interested in buying the lot to expand her business, but she plans to remove the trees. The owner of the vacant property lives in another city and has not been contacted about the issue.

The neighborhood also has an active group of senior citizens who love their oak-lined streets but fear that someday the trees will fall over the sidewalks and harm someone. Before the redevelopment project gets started, they would like the old oak trees to be surveyed, and those that are dangerous taken out.

The City Council has agreed to listen to concerns about the oak trees in order to proceed with the redevelopment plans. It has asked the three parties to discuss their concerns and to present solutions to the problem. The City Council members will then decide what to do.

## What to Do

1. Chose three members of your group to serve as the City Council members.
2. Divide the rest of your group into three groups representing the three different parties:
  - Mrs. Roble and her attorneys.
  - The citizen’s group interested in saving the old oaks along the street and in protecting the oaks in the vacant lot.
  - The senior citizens’ group interested in surveying the old oaks.
3. Use the “Planning for the Council Meeting” student page to get ready for the City Council meeting.

# Oak Knoll Dilemma (A Suburban Issue)

Oak Knoll is a subdivision that was started during the late 1960s when new housing projects began spreading into the suburban area at the edge of the city of Oakville. Oak Knoll got its name from its rolling hills covered with oak trees. The neighborhood has a park-like feel, with winding streets, green lawns, and majestic old oaks. When the project planners built the subdivision, they removed many of the young trees, leaving mostly older oaks. The homeowners all love the large, beautiful trees that help make their neighborhood so attractive.

Recently, the community began to notice that many of the large oaks were beginning to die. The Oakville Community Council hired an arborist (a tree specialist) to examine the trees. She carefully checked the trees and informed the homeowners that their green lawns had caused the old oaks to suffer. She pointed out that summers in California are dry; and frequent lawn watering had helped promote the growth of a fungus into the older oaks. She said that the trees are in jeopardy of dying if the homeowners continue to keep their lawns green with frequent watering.

In one section of the Oak Knoll Subdivision there are several vacant lots next to a creek that floods each winter. Because of the flooding, the lots never were sold or built on. A grove of small oaks has sprung up on the lots, and children love to play here. Many families from the city come out to this neighborhood to walk along the creek and to view the birds and other wildlife. However, nearby homeowners are worried about vandalism in this area. In fact, last summer vandals apparently started a small fire, and it burned up the fence of a house next to a vacant lot.

The Oakville Community Council has a limited amount of money for community projects. Three different groups have an idea about how the money should be spent.

One group is worried about what would happen to their homes and neighborhood if the large oak trees die. They want to use the Council's money to replace the lawns under the oaks with water-conserving ground cover plants. Another group wants to purchase the vacant lots to build a park with a soccer field. They say that they will need to remove some oaks to build the field, but that many oaks will line the edge of the field and will provide shade for those watching the games. Another group wants to purchase the vacant lots, but convert it into a nature area. They think that a nature area will protect most of the young oaks, and will give the neighborhood even more beauty and interest. The children will also be able to use the nature area to explore and observe wildlife.

The Oakville Community Council would like to decide what to do about the oaks. It has asked the three parties to discuss their concerns and to present solutions to the problem. The Community Council members will then decide what to do.

## What to Do

1. Choose three members of your group to serve as the Oakville Community Council members.
2. Divide the rest of your group into three groups representing the three different parties:
  - Neighborhood group that wants to replace lawns with water-conserving ground cover.
  - Neighborhood group that wants to buy the vacant lots for a soccer field.
  - Neighborhood group that wants to buy the vacant lots for a nature area.
3. Use the "Planning for the Council Meeting" student page to get ready for the Oakville Community Council meeting.

## Fair Oaks Ranch Dilemma (A Rural Issue)

The scenery changes only fifteen minutes out of the city of Oakville. The freeway narrows into a two-lane highway bordered with fences separating the farmland and ranches. This is the rural area known as Fair Oaks.

One of the ranches in Fair Oaks is for sale and local citizens have asked the Oakville Community Council to purchase the 40 hectares (100 acres) of oak woodlands and orchards. The owner has recently died, and the rancher's grandchildren have inherited the ranch. The grandchildren live far away and have no interest in maintaining the ranch; they also need money to pay the inheritance taxes. If the community does not purchase the property, the ranch will be sold to a land developer who would like to convert the ranch into new housing. The city is growing rapidly and it needs more housing.

For the past two generations, the rancher raised a small crop of apples and walnuts in an orchard along the creek. The rest of the ranch is an oak woodland. There are many large, old oak trees on the hill slopes where ranch cattle grazed on the grasses. The cattle used the old oaks for shade on hot summer days. Young oak trees are found in only a few areas: along the fences and near the ranch house, barn, and other buildings. There are several large dead trees or "snags" on the ranch property. Acorn woodpeckers and squirrels store their acorns in the trees' limbs and hollowed-out cavities.

Several citizen groups have proposed a variety of uses for the property. One group sees the need for more housing and is encouraging the council to work with land developers in order to build more houses, but also to set aside part of the property as "open space." Other groups oppose building houses, and want the council to call for a vote in order to raise money to purchase the ranch to be set aside as a regional park. But even those who want a park disagree on how it should be developed. One group wants a sports park with a new golf course and soccer fields, while another group wants the area to be left as a nature area for hiking and fishing.

Before the Oakville Community Council can move forward, it has decided to consult with each group of citizens and the developer to hear a variety of proposals. When all the ideas have been presented, the Council will vote on what to do.

### What to Do

1. Choose three members of your group to serve as City Council members.
2. Divide the rest of your group into three groups representing three different parties:
  - Group that wants to have developers buy the ranch and build houses on it, setting aside part of it for "open space."
  - Group that wants to have the Council buy the ranch, and turn it into a sports park.
  - Group that wants to have the Council buy the ranch, and keep it a nature area.
3. Use the "Planning for the Council Meeting" student page to get ready for the Oakville Community Council meeting.

# Oaks for All Reasons

## Grade Level

6-8

## Subjects

*Social studies, science,  
language arts, art*

## Skills

*Communicating,  
defining a problem,  
gathering and  
organizing information,  
analyzing information,  
using the media,  
developing an action  
plan*

## Materials

*For the class: Poster  
paper; art supplies;  
sample fliers, posters,  
door hangers, and  
advertisements; video  
camera or tape recorder*

*For each student:  
“California Oak  
Community Facts”  
student page*

## Summary



Students read about ways that the oak community is important for California. Then they consider an audience they want to reach, and develop a poster, flier, or door hanger, or create an “infomercial” to inform others about oaks and oak communities.

## Objective



Students demonstrate what they have learned about the importance of oaks in California by designing a communication strategy to inform others.

## Background Information

Read the “California Oak Community Facts” student page for information about specific ways that oaks are so important in California.

Designing a communication strategy involves choosing an effective way to present ideas or information. If the message is to be conveyed as a poster or artwork, the topic to be illustrated needs to be carefully and creatively designed to express all the elements of information to be shared. Posters, fliers and door hangers combine both artwork and written information, balancing only a few words and simple images to express ideas. Infomercials follow these same rules through use of catchy slogans and phrases to convey important messages.



raccoon

## Preparation and Planning Tips

- You may choose to have students create a print-based message (a poster, flyer or door hanger) or develop an infomercial that tells others about oaks and oak communities. These two different activities are described in the Procedure.
- Collect sample fliers, posters, door hangers, and advertisements for students to critique or to use as a source of ideas.

## Opener

Give each student a copy of the “California Oak Community Facts” student page. Read the facts aloud as a class. Lead a discussion with students about the facts, including such things as, “Why are oaks and oak communities so important in California? Which facts surprised you? Which facts might surprise other people? Which facts point out most clearly the reasons for caring for oaks in our community?”

## Procedure

### Designing a Communication Strategy Using Art and Words

1. Display poster, flyer, doorhanger or advertisement samples and ask students to jot down their ideas of what the messages communicate. Have them focus on one item and explain whether it is effective or ineffective in motivating them to do something.
2. Explain to students that they will use what they have learned about the importance of oaks in California to create a flyer, poster or door hanger to tell others about this information. Ask students what would make the project most effective in telling others and in motivating them to action. Possible ideas include:
  - Is easy to read and understand;
  - Uses simple language;
  - Describes what people can do;
  - Is illustrated with eye-catching artwork or has a catchy slogan or jingle.
3. Divide the class into pairs or groups of three students. Have each group choose an audience

they want to reach, then develop a flyer, poster or door hanger, or other presentation to communicate about the importance of oaks in California.

4. After groups have finished, have them exchange their presentations with another group for review. Reviewers can offer written suggestions for clarifying the message or for improving the presentation.
5. Allow time for groups to revise their presentations based on the review.

### Oak Community Infomercials

Divide the class into teams of three or four students.

1. Each team is to identify an oak community problem in their neighborhood, city or region. If the problem has become an issue, the students should be able to describe who the “players” are and what point of view they hold regarding the problem.
2. After identifying a problem on which to focus, each team prepares a presentation organized as an infomercial. Each message should be one to two minutes long and should:
  - Describe the problem: its cause(s) and effect(s) and why it is a problem.
  - Describe what, if anything, is being done about the problem by the neighborhood or community.
  - If the problem has turned into an issue, clarify students’ position or point of view on the problem.
  - Use the “California Oak Community Facts” student page to back up any claims about the importance of the issue.
  - Finally, the team should suggest a practical solution that they think would help correct the problem or issue. This could be a solution the students invent or one they have found out about and believe will work.
3. Point out that team members may use notes and cards, and that each team member must have a role in the presentation. Allow the use of visual aides, props, or music.

## Wrap-Up

Have each group share its presentation with the class. For the infomercials, tape or video record each presentation. After all the groups have shared, discuss:

- Which presentation would be the most effective at increasing public awareness of the importance of oaks in California?
- Which would be most effective at motivating the community to take action?
- Did creating your presentation help you and your group clarify your understanding of oak issues?

## Extension Ideas

After the presentations, do one of the following:

- Display flyers, posters and doorhangers in a public area such as the school cafeteria, school entrance or public facility.
- Send flyers, posters, doorhangers or tapes of the infomercials to the local news media.
- Choose one of the posters, fliers or doorhangers to copy and deliver to the students' families or within the community. Use a different type of presentation format to help students learn about creative ways to express their ideas.



ornate shrew

Have students organize their information in one or more of the following ways:

- Feature article to be printed in the school or local newspaper.
- Letter to the editor.
- Cartoon or cartoon strip that discusses the problem, issue or solution.
- Flier, poster or door hanger that can be distributed or displayed.

## Assessment

Use a rubric to assess each student's performance (see Appendix 2 for a sample rubric). Ask students to find an example of a public awareness campaign and write a one-paragraph critique of the item.

### References and Resources

Pavlik, Bruce M., Pamela C. Muick, Sharon G. Johnson, and Marjorie Popper. *Oaks of California*. Los Olivos, CA; Cachuma Press and the California Oak Foundation, 2000.

### Source

Thanks to Bruce Forman of the California Department of Fish and Game for providing tips on involving students in making presentations that deal with environmental problems and solutions.

"Are Oak Communities Important for CA's Biodiversity?" was adapted from California Oak, Newsletter of the California Oak Foundation, Spring/Summer, 1995.

# California Oak Community Facts

## ...Are oaks valuable to the economy of the community?

- People pay more money for homes that have trees in their yards or that are located near a park.
- Businesses like areas that have trees along the street and in the parking lots.
- Planting and caring for trees provides lots of jobs for the community.
- Trees planted near buildings can reduce the amount of energy needed for heating in winter and air conditioning in summer.
- Trees absorb noise pollution creating a less stressful place to live and work.
- Trees remove impurities from the air by gathering dust particles on their leaves; this dust later washes off and returns to the ground.



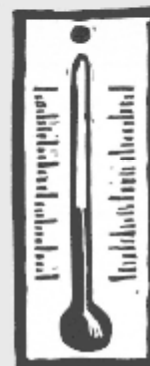
## ...Are oak communities important for CA's biodiversity?

- Oak woodland communities are found in 46 of California's 58 counties.
- Oak communities are part of the "hardwood rangeland," which provides the greatest variety of habitats for wildlife species in the state.
- There are 7.5 million acres of hardwood rangelands in California.
- Private citizens own about 80 percent of California's hardwood rangelands.
- Oak trees' dead trunks and branches, along with the shrubs, grasses, and other plants, rocks, and dead logs found in oak communities provide many places for animals to hide and make homes.
- Oak communities are one of the most important habitats for birds migrating to and from the tropics.



## ...Do oaks preserve water quality?

- Oaks increase the amount of water that seeps into the ground. When it rains, oak trees help direct water back into the earth rather than letting it flow out into storm drains.
- Oak tree canopies soften the impact of raindrops before they hit the ground. This helps prevent soil erosion.
- In the summer, oak tree canopies create shade that protects streams and soil from high temperatures. Cool stream water is a better habitat for fish and aquatic wildlife than warm water; and cool soil stays moist longer than heated soils.
- In oak woodlands, the rich leaf litter beneath the oaks helps hold moisture in the soil and nourishes grasses that also hold soil in place.
- Oak tree roots help stabilize soil, preventing erosion and sedimentation.





# Oak Tales

### Grade Level

4-8

### Subjects

Language arts, reading

### Skills

Oral communication,  
reading comprehension,  
analyzing, organizing

### Materials

For the class:

*Grandmother Oak* or  
other children's book  
(see References and  
Resources)

For each pair of  
students: Blank paper,  
colored pens or markers



### Summary



Students write and illustrate books about the oak community that they read to younger students.

### Objective



Children strengthen their reading and comprehension skills while continuing to learn about native oaks.

### Background Information

Students will gain an understanding of storytelling by analyzing a short story written about a California oak tree in Southern California. Provide them with an analysis of the characters, the plot, the influence of key words, and the use of illustrations.

### Preparation and Planning

- Locate copies of *Grandmother Oak* or another book about oaks.
- Make arrangements for your students to read to younger students in another class or school.

### Opener

Ask students if they remember reading a story about an oak tree. After they share, introduce the story *Grandmother Oak* by showing the cover illustration and asking what they think the story may be about.

### Procedure

#### Part I

1. Read aloud the story, showing the illustrations as you read. After reading, hold a class discussion to summarize the story. Ask, “Who were the main characters?” “What key words were used to tell the story?” and other questions to help students analyze the story and plot. Read aloud the book’s inside back jacket, which explains that the book is about a real tree.
2. Explain that the book is organized around a storyline and that each part of the tale, including the illustrations, helps advance the story. Ask the students how the storyline is organized in *Grandmother Oak*? (It is a sequence of historical events.)
3. Next, have students read this book aloud to someone in a younger grade. Help them prepare by discussing good techniques for reading aloud to young children.

4. Have students write down a few observations of the younger student's reaction to the book. What did the younger students learn about oaks by reading them this book? Did they understand the key words?

### Part 2

1. Have students work in pairs to choose a topic related to the oak community about which they would like to write a short story for a young child. Make suggestions such as "animals and oaks," "acorns and big oaks," etc.
2. Ask students to develop a storyline of at least six or more ideas. What are the key ideas and words they want to develop? Who are the characters and what will they say?

Next allow pairs time to write out the story based on their ideas and to develop illustration ideas to accompany the story. Provide paper and other materials to create the books.

### Part 3

Arrange for students to read their book to a young child.

1. Ask them to record their impressions about what the child learned from his/her story and the child's overall reaction.

## Wrap-Up

Ask students to share their experiences of reading to younger children. Review what the older students thought the younger children learned about oaks.

## Extension Ideas

- Introduce a selection of poetic forms such as haiku and free verse, and use oaks as an inspiration to write poetry.
- Individually or in small groups, have students write and illustrate a book about oaks for younger children that includes several "pop-up" pages or little doors to open.
- Ask students to read aloud and make an audio-tape of *Grandmother Oak* for younger children to listen to while they read the book.

## Assessment

Have students fold a piece of paper in half and then again twice in the other direction to create eight boxes. Ask them to plan a story about an oak by filling in the eight spaces with key words or drawings.

### References and Resources

Dagit, Rosi, *Grandmother Oak*, Boulder, CO: Roberts Rinehart Publishers, 1996.

Anthony, Joseph. *In a Nutshell*, Nevada City, CA: Dawn Publications, 1999.

Levert, Calude and Carme Sole Vendrell. *Pedro y Su Roble*, Madrid, Spain: Susaeta, 1989.

# What Can We Do to Help the Oak Community?

Following is an activity designed to help students move from knowledge to action. It provides a concrete way for students to build on their understanding of oak communities, and develop and carry out a project that benefits the oak community in their area.

Other activities in this guide that have an action orientation include: “Growing Big Oaks from Little Acorns,” “Planting and Caring for Young Oak Trees,” “Investigating Old Oaks in the Community,” “Oaks for All Reasons,” and “Oak Tales.”



## Activities

### 17-Taking Action for Oaks

# Taking Action for Oaks

## Grade Level

4-8

## Subjects

*Language arts, social science*

## Skills

*Discussing, analyzing, planning, evaluating*

## Materials

*For the class: Large sheets of paper, markers, and any other materials needed for the specific project students select*

*For each team: Copies of “Project Plan” student page*

## Summary



After their involvement in a variety of oak community learning activities, students will choose a project that applies what they have learned toward helping the oak community, and then students will plan and carry out the project.

## Objective



After identifying ways they can help conserve oak communities, students will choose a project to implement.

## Preparation and Planning Tips

- Careful preparation and planning are the best assurances of a successful project. Be sure to help students develop a solid understanding and rationale for their efforts. Offer them opportunities to explore the issues from all sides before they choose to implement a project. Be sure that the activities are within the scope of your students’ age and abilities.
- Community service and service learning activities provide students with opportunities to expand and apply their knowledge and skills in meaningful ways. You can explore, in advance, several ideas for community service projects, and have students choose which to implement. Check Appendix 5 for a list of organizations to contact for assistance, for possible grants or for recognition of student projects. Also consider asking for donations or grants from your community to help pay for materials and supplies needed for a project.

## Opener

When your students have concluded a variety of studies involving oak communities, spend time brainstorming what they might do to help conserve oak communities. Refer to the sidebar “Possible Action Projects” on the next page. Be sure to follow the general rules for brainstorming by allowing all ideas to be valued and noted.

## Possible Action Projects

- Survey the school grounds or neighborhood for oaks. Create a map or brochure that identifies the oak species and where to find them. Students can use these tools to lead oak appreciation tours for other children or community members.
- Grow acorns into young oak trees to donate to a local park or open space area, or to plant at school or in the neighborhood. (Be sure to check beforehand with park and open space departments to make sure they will accept seedlings.)
- Research what other plant species are part of the oak community. Students can propagate plants such as bunchgrasses, native annuals and woody shrubs in their school gardens or donate to a park in order to benefit oak community wildlife.
- Join a community group that organizes oak tree plantings.
- Create “Caring for the Oak Community” posters or booklets to pass out during a special event such as California Arbor Day (March 7), Earth Day (April 22), or California Oak Day (November 1).
- Hold a symposium or “oak fair” at school to display and discuss activities that students have completed while investigating the oak community.
- Raise funds to contribute to a local oak community conservation effort.
- Develop a long-term oak community monitoring project. (Students at Jepson Middle School in Vacaville, for example, are keeping growth rate records of oaks that are “taking back” an abandoned walnut orchard on their school grounds.)
- Have students share their ideas of what they have learned about oak conservation. Students can hold a discussion with local citizen groups, community councils, park district boards or local government officials.

## Procedure

1. Organize the class into groups of about four students. Each group needs to choose a scribe to keep track of all ideas for organizing and carrying out a project. Assign one of the ideas listed during the brainstorming session to each group. After the students discuss possible ways to carry out a project, each group needs to complete the “Project Plan” student page for its project.
2. Have each group present its ideas to the class.
3. After each group presents its list to the entire class and a general discussion is held, the class votes on which of the project ideas to do either as a whole class or in smaller groups.
4. Once a project is chosen, organize the class into groups to develop a plan for each component of the project.
5. [Optional] Work with students to determine an assessment tool to evaluate both individual and group efforts.

## Wrap-Up

Involve the students in evaluating their projects. Hold a group discussion and use a student-developed rubric to evaluate the outcome and impact of the project.

## Assessment

Refer to the students’ criteria outlined in the project evaluation rubric to assess each project.

### References and Resources

Pavlik, Bruce M., Pamela C. Muick, Sharon G. Johnson, and Marjorie Popper. *Oaks of California*. Los Olivos, CA; Cachuma Press and the California Oak Foundation, 2000.

Thomas, John W., John R. Mergendoller, and Andrew Michaelson, *Project Based Learning Handbook*, Novato, CA: Buck Institute for Education, 1990.

# Taking Action for Oaks Project Plan

1. Team members:
2. Project Title:
3. Describe your team's project in one or two complete sentences.
4. Make a list of the steps you would follow to begin your project.
5. Where would you get information for your project?
6. What help would you need to get started?
7. Make a list of the criteria you would use to evaluate your project.

# Appendices



- **Appendix 1: Tips on Planning a Tree Planting Ceremony**
- **Appendix 2: Student Journals and Portfolios**
- **Appendix 3: Tools for Measuring Oaks**
- **Appendix 4: Soil Studies and Investigations**
- **Appendix 5: Additional Information and Materials**
- **Appendix 6: Glossary**

# Tips on Planning a Tree Planting Ceremony

Organizing a ceremony to accompany a tree-planting event can provide many extra opportunities to learn about trees. Consider how to make the event a lesson on why new trees in your community will become valuable assets within the local environment. When students have participated in selecting and planting trees and planning the planting ceremony, they will want to take a greater role in the future care and stewardship of the young trees.

## Ideas to Consider

- Create a sense of purpose for the tree-planting event by asking students to share their experiences and feelings about the trees. Ask them to share a favorite memory or draw a picture of a tree that has special meaning to them.
- Discuss the environmental benefits that young trees provide, especially to urban environments. Students can brainstorm ideas made from their own observations.
- Take students to visit the proposed tree-planting site before the event. Try to imagine together how the new trees will change the site.
- When planning the event, have small groups of students be responsible for planning these parts of the ceremony: Who will be invited? How long will the ceremony last?
- Will there be speeches or music? Should invitations be sent? What type of decorations would be nice? What tools will be needed?
- For younger children, make special tree hats. Measure each child's head and cut a wide strip of construction paper to make a band. Staple the two ends together. Have students make trees out of green and brown construction paper (or draw and color a free shape). Attach the tree to the headband.
- Use construction paper or white contact paper to make badges or stickers in the shape of a tree, leaf or acorn. Ask students to create an original slogan stating why trees are important. Wear these or give them away on tree-planting day.
- Ask students to compose poems, songs, or speeches about their new trees. Let them judge which ones will be included in the tree-planting event.
- Select favorite books about trees or well-known poems to read to the students prior to the event. Some of these tales can be used during the ceremony. Check the book list on the next page for ideas.
- Have students make stakes or protective devices for the new trees. Add ribbons or streamers to call attention to the trees.
- Write tree care pledges on paper cut in the shape of a tree, leaf or acorn. These can be tied to the new tree, buried when the tree is planted, or worn by the tree-planters. Help students make pledges that include their help to care for the new trees.
- Choose names for the tree (or grove of trees) that tell something about the students' hope for its success. Some examples are "Our Victorious Valley Oak" or "Our Mighty Mesa Oak."





- Make a display of books about trees and related topics to have on hand during the ceremony.
- Be sure to take lots of pictures to show off at a later date — and to help students remember the importance of the ceremony.

## **Books**

Giono, Jean. *The Man Who Planted Trees*. Chelsea, VT: Chelsea Green Publishing Co., 1985. (Also available in video.)

Levert, Claude and Carmen Sole Vendrell. *Pedro y Su Roble*. Madrid: Susaeta, 1989. (A very cute story told in Spanish.)

Russell, Naomi. *The Tree*. New York: E. P. Dutton, 1989. (For grades PreK-2.)

Silverstein, Shel. *The Giving Tree*. New York: Harper and Row, 1964. (For grades PreK-8, also in Spanish.)

Urdu, Janice and Mark Simont. *A Tree is Nice*. New York: Harper and Row, 1956. (For grades PreK-2.)

# Student Journals and Portfolios as Learning and Performance Assessment Tools

Both journals and portfolios are valuable tools for helping students learn new concepts and gauge their progress. Several activities such as “Oak Watch” and “Oak Community Field Study” provide opportunities for students to use journals to document observations, make sketches, and take notes and measurements. All the lessons offer suggestions for what to include in student portfolios.

Keeping a journal is an excellent way for students to develop observation skills and express themselves in a multi-disciplinary way. A journal can be open-ended and very creative. In fact, it can be an important tool to help students link topics that wind through a thematic and multi-disciplinary curriculum such as *Investigating the Oak Community*.

It may be fun to remind your students that journals have helped us learn about people and places, especially in early California. Point out that the diaries and logs kept by travelers, explorers, and scientists now help us understand what we can no longer see (refer to the quotes in the activity “Oak Communities in Early California,”). These

“voices from the past” may help students appreciate that observations made by the first European visitors now help scientists understand changes in the state’s oak woodland landscapes.

Your students’ journals can become a part of a portfolio of their work, or the journal itself can serve as the portfolio—especially if it is filled with drawings and other materials that they accumulate. They can purchase a notebook, or make a booklet out of plain and lined paper to use as a journal.

A journal or a portfolio can help connect all the lessons and activities together, especially if the entire unit of study is spread out over a long block of time. It can also become a “database” from which students take information they have gathered and use it in a different activity. An idea for a science project, lists of words to inspire a poem, a sketch to accompany a story or essay all may originate from their journal or portfolio. Have the students create a table of contents for their journal or portfolio — a helpful way to keep track of what has been accomplished.

Both the journal and the portfolio can provide an ongoing record of students’ progress in developing knowledge and skills, while helping them take a look at their own learning.

Students can benefit from using their journals and portfolios as a source of reflection on what they have learned while they are investigating the oak community. Once in a while, ask them to review what they have in their journal or portfolio and to summarize what they think are the most important things they have observed or learned. Ask them to put their thoughts into a detailed drawing, poem, or “mind-map.” A mind-map can start with the phrase “The Oak Community” with several lines extending outward, on which students can list information. Students can add more lines and branches from the lines to show what they have learned.

Ask students:

- What are the big ideas or generalizations about what you have learned?
- What were the most interesting things you have learned?
- What additional thing would you like to learn or comment about?

## Journal keeping can help develop skills in these content areas:

### Science

- Observing
- Measuring
- Listing
- Identifying
- Comparing

### Language Arts

- Writing poetry or prose
- Communicating, describing, problem-solving

### Social Studies

- Mapmaking
- Documenting

### Mathematics

- Measuring
- Charting
- Graphing
- Computing

### Art

- Sketching (hand-eye coordination)
- Composing

## Evaluating Student Portfolios

Student portfolios are valuable tools for conducting alternative assessments of student learning. Schedule a conference to talk with students about their work. Ask them to select samples of their best work — observations, data, and notes — to review together. Encourage them to include samples of their work that demonstrate their ability to communicate, investigate, solve problems, and apply new information. A table of contents should accompany the portfolio. You can use a rubric (as follows) to evaluate the individual and group work represented in the portfolio.

## Evaluating Student Work Using a Rubric

A rubric is an assessment tool that evaluates the quality of student work on the basis of careful descriptions of what high, medium, and low level products should contain. You can use a rubric to evaluate student work in portfolios and journals.

In the box is an example of a rubric for group work. It includes three areas — content, presentation, and representation — and assigns values to each area. It is intended to be fair to each student, yet motivate the group to complete the task as a whole.

### Sample Rubric for Group Work

#### Content

- 4 students completed all components of the assignment clearly
- 3 students completed all components with some unclear conclusions
- 2 students did not cover all components
- 1 components not addressed

#### Presentation

- 4 content expressed clearly with a variety of modalities
- 3 content expressed clearly with missing connections between components
- 2 content missing
- 1 some content expressed, yet unclear and unresolved

#### Representation

- 4 all students participated in speaking and presenting the materials or delivering the presentation
- 3 most students participated; speaking and organization was good
- 2 some students did not participate and it was difficult to follow the presentation
- 1 some disruptions or inappropriate solutions; off task behaviors

#### Grading scale:

12=A+, 11=A, 10=A-, 9=B+, 8=B, 7=B-, 6=C+

# Tools for Measuring Oaks

## Measuring Tree Height

Here is a simple way to measure the approximate height of a tree. You will need a new pencil, a tape measure and a partner.

1. Starting at the base of the tree, step backward (be careful!) until you are further away from the tree than the tree's base is from its top.
2. Ask your partner to stand next to the tree's base.
3. Hold a pencil straight up by its point. Close one eye and hold the pencil so it lines up with the tree.
4. Move yourself forward and backward until the pencil looks as tall as the tree. Without moving your arm, turn the pencil sideways (keep your thumb lined up with the tree trunk) so it looks as if it is lying on the ground (see the illustration).
5. Ask your partner to walk away from the tree in the direction of the pencil. To you it will seem as if your partner is walking along the pencil. Tell your partner to stop when it looks like he or she is lined up with the end of the pencil.
6. Measure the distance between your partner and the tree's base. This will be the approximate height of the tree.

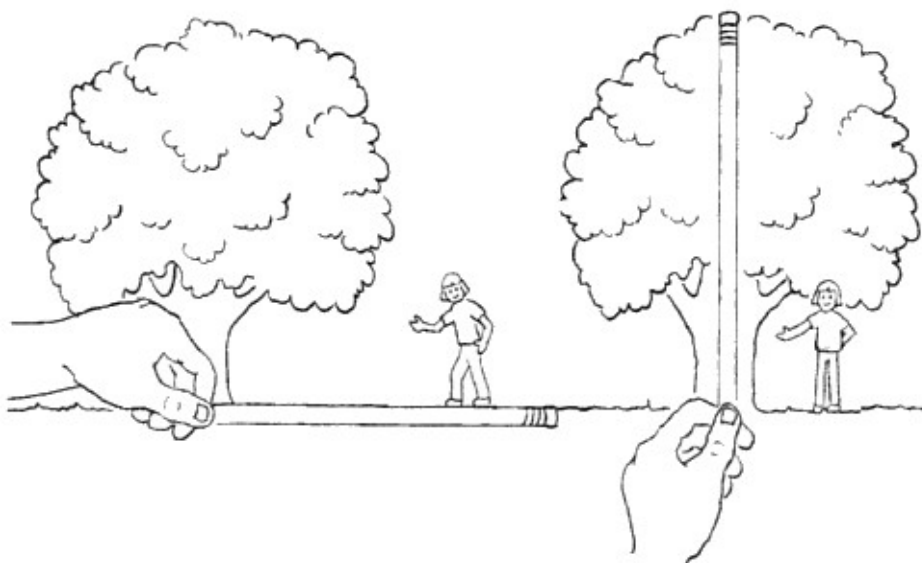
$$\text{Diameter} = \text{Circumference} / \pi$$

## Measuring Tree Circumference and Diameter

To find the circumference of a tree, stand on the uphill side of the tree's trunk and measure from the base up to 1.4 meters (4.5 feet). Then, using the tape measure (or a piece of string) circle the trunk at that height and note the measurement.

This is the circumference. You can calculate the diameter of the tree by dividing the circumference by it (or 3.14):

If you have a special DBH tape measure (DBH = diameter at breast height), you can use it to measure the tree's diameter directly. The tape is based on the formula for calculating diameter from the circumference. To construct a short section of a DBH tape, copy and cut apart the tool on the next page and use it to make a measuring tape by gluing several copies together to form a continuous tape. For a more durable measuring tape, copy the tool onto a strip of plastic or vinyl cloth. To measure the diameter with a DBH tape, stand on the uphill side of the tree's trunk and measure from the base up to 1.4 meters (4.5 feet) with a regular measuring tape. Then, using the DBH tape, circle the trunk at that height and note the measurement. This is the diameter.



Thanks to the Sacramento Tree Foundation for the DBH tape.

**6****Small Trunk:**

To measure a tree with a small trunk, use the "inches" scale below to measure up the trunk to 12" above the ground, then circle the tree's circumference with the tape to measure tree diameter.

**7****Large Trunk:**

To measure a tree with a large trunk, use the inches scale to measure up the trunk 54 inches (4-1/2 feet) above ground, then circle the tree's circumference with the tape to measure tree diameter.

**8**

17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

**3****Formula:**

This scale is derived from the formula where the diameter equals circumference divided by pi.

**4****Numbers:**

These numbers are 3.1416 inches apart.

**5**

9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

**1****2****Diameter Scale:**

This upper scale will measure the tree's diameter in inches as you measure around the tree trunk.

**Tree Diameter Measuring Tape**

Inches 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |



Cut along dashed lines, then tape strips together to complete the "Tree Diameter Measuring Tape".

# Soil Studies and Investigation

Soil is a collection of mineral particles mixed with living and non-living organic matter, water and air. The different soil types are determined by their parent material and the size and shape of mineral particles. For example:

*Clay soil* (sometimes called adobe or heavy soil) is made up of microscopic mineral particles. These tiny flattened particles (about 0.000002 mm or 1/12,500th inch) limit space for air and water. Clay soils drain slowly because water has difficulty moving through the particles.

*Sandy soil* is made up of large, round particles (about 0.03 mm or inch) that create large spaces between particles. Sandy soils drain very quickly, warm quickly, and contain much soil Air. They do not hold water well and tend to lose valuable soil nutrients with frequent watering.

*Loamy soil* is a combination of sand, clay, and silt (particle size is about 0.0005 mm or 1/500<sup>th</sup> inch). This is the ideal soil type for growing plants. Loamy soils drain well, do not dry out quickly, and have a lot of soil air that promotes good root growth.

*Humus*, also known as mulch or compost is organic matter such as old leaves, bark, and insect parts. This material provides a nourishing layer of topsoil.

By studying soil samples, students can learn to understand how different soil types affect plant growth.

## Investigating Soil Samples

1. Have students collect soil samples from different locations, such as near their classroom door, next to “home-base,” in an open field, and under an oak tree.
2. Transfer the sample to a sheet of white paper, a plain paper plate, or graph paper. Have students use a toothpick to group the sample into different “parts” or materials. Offer them hand lenses or other magnifiers to observe carefully.
3. Have students draw a circle around each group and decide which parts have the greater amounts. If students used graph paper, challenge them to quantify the varying amounts of material, and to give a ratio for the sample components.

## Soil Shakes

1. Place a soil sample into a jar and fill with water, using one part soil to four parts of water.
2. Close the lid and shake hard for a few seconds. Allow the jar to stand overnight.

3. The following day, students will be able to observe the soil separated into layers. Larger particles (coarse sand and rocks) settle on the bottom and the finer particles of silt and organic materials (leaves, twigs, and stems) will float or be suspended in the water.

## Potting Soil Recipe

1. To make your own potting soil, mix two parts loamy soil with one part sand.
2. Add vermiculite, perlite, crushed rock or broken bricks to make the soil spongy and light.

## More Soil Investigations

- Have students explore how long it takes water to seep into different soil types. Dig a hole into the ground and fit a juice can or paper cup with holes punched into the bottom. Fill the can with water and find out how long it takes the water to soak into the soil. Try this experiment in different locations and soil types.
- Test for soil compaction. How easy is it to stick a pencil into the soil? Test different locations and help students draw conclusions about how oaks will grow in each type of soil condition.

# Additional Information and Materials

## Guidelines for Info and Help

When assigning your students the task of seeking information about a specific topic, keep in mind the following:

- Most information can be obtained easily from a library or through the Internet. The staff at government agencies or private organizations should not be asked to do the research for your students' class work.
- Try local agencies and organizations first.
- Be specific when requesting information. Suggest that students do not ask the organization or agency to "send everything."
- When requesting that information be sent, include a self-addressed, stamped envelope (with double or triple postage) and allow at least one month for a reply.
- If more than one student is requesting information from a source, send the requests together and ask that all information be returned in one envelope or package. This courtesy will help insure a reply from organizations that may not have enough staff or budget to handle large numbers of information requests.
- Use proper letter writing format. Students should create a header in the letter that includes their name, school name and address, the name of the organization and address, and date the request is made. It might also include the teacher's phone number or e-mail address. Letters should clearly state the project and how the information will be used. Have your students submit a rough draft of their letter to you for editing and approval.

Name of your school or club  
Address

Date:

Name of person  
Name of organization or agency  
Address

Dear \_\_\_\_\_:

The students at (name of school or club) are about to begin a project, and we hope you can help us. Students have discovered that the oak community in (name of location) is rapidly decreasing due to \_\_\_\_\_. They are learning about this issue as part of a year-long class project that integrates social studies, language arts and science. They have decided to take on the project of propagating acorns and growing them into new oaks that they will plant in their neighborhoods, local parks and on school grounds.

We hope that you can help us with a donation. We will need to purchase potting soil, growing containers, and \_\_\_\_\_ in order to grow the oak seedlings. Please let us know as soon as possible if you can help us. You can reach me at \_\_\_\_\_. Thank you for your help and interest.

Sincerely,

## Find Additional Information and Materials

The following list provides sources for additional information and materials to help you with investigating the Oak Community. Inquire about guest speakers, docent programs, supplies of acorns, or places to visit or to plant young oak trees with your students. Additional references and resources accompany each activity.

### **Agencies**

#### **The Resources Agency**

<http://resources.ca.gov/>

#### **California Biodiversity Council**

<http://ceres.ca.gov/biodiversity>

#### **California Department of Forestry and Fire Protection**

<http://fire.ca.gov>

#### **California Department of Fish and Game**

<http://dfg.ca.gov>

#### **California Department of Parks and Recreation**

<http://cal-parks.ca.gov>

#### **California Department of Education, Office of Environmental Education**

<http://cde.ca.gov>

#### **California State University Campuses**

<http://calstate.edu>

#### **University of California**

<http://universityofcalifornia.edu>

#### **Natural Reserve System**

#### **University of California**

<http://nrs.ucop.edu>

#### **UC Cooperative Extension**

<http://ucanr.org/index.cfm>

#### **UC Integrated Hardwood Range Mgmt. Program**

<http://danr.ucop.edu/ihrmp>

#### **California 4-H**

<http://ca4H.org>

#### **U.S. Department of Agriculture, Forest Service Pacific Southwest Region Office**

<http://www.fs.fed.us>

#### **U.S. Department of the Interior, Bureau of Land Management**

<http://ca.blm.gov>

#### **U.S. Department of the Interior, National Parks Service**

<http://nps.gov/parks.html>

#### **United States Environmental Protection Agency**

<http://epa.gov/students>

### **Organizations**

#### **California Native Plant Society**

<http://cnps.org>

#### **California Oak Foundation**

<http://californiaoaks.org>

#### **California ReLEAF Trust for Public Land**

<http://tpl.org/>

#### **The Nature Conservancy**

<http://thenaturecompany.org/default.html>

### **Sources of Educational Materials**

#### **Acorn Naturalists**

<http://acornnaturalists.com>

#### **California Institute for Biodiversity**

<http://calalive.org>

#### **Forestry Suppliers, Inc.**

<http://forestry-suppliers.com/>

#### **Project Learning Tree (PLT)**

<http://plt.org>

#### **Project WILD California**

<http://projectwild.org>

#### **USDA Forest Service, Urban Forestry Lab Exercises**

[http://na.fs.fed.us/spfo/pubs/uf/lab\\_exercises/cover.htm](http://na.fs.fed.us/spfo/pubs/uf/lab_exercises/cover.htm)

### **Award and Grant Programs**

#### **Environmentality Challenge**

<http://www.energyquest.ca.gov/index.html>

#### **Keep California Beautiful Program**

<http://kab.org/affiliates>

#### **SeaWorld/Busch Gardens Environmental Excellence Awards**

<http://www.seaworld.org/conservation-matters/eea/index.htm>

#### **The President's Youth Service Award**

<http://www.presidentialserviceawards.gov/yes/>

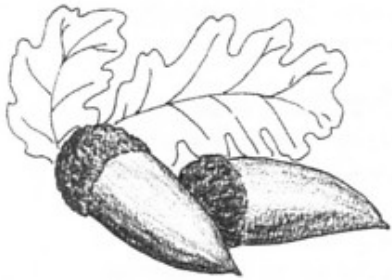
#### **Toyota TAPESTRY Grants Program for Teachers, National Science Teachers Assn.**

<http://nsta.org/pd/tapestry/>



# Glossary

**acorn:** a nut-like fruit from the oak tree that contains a single seed.



**acorn cap:** a scaly or knobby cap that attaches an acorn to a branch.

**biodiversity:** the variety and amount of life forms present and interacting in an ecosystem.

**canopy:** the upper portion of a tree made up of the twigs, branches, and leaves.

**chaparral:** a type of plant community made up of low evergreen trees or shrubs with small, tough leaves, often forming thickets.

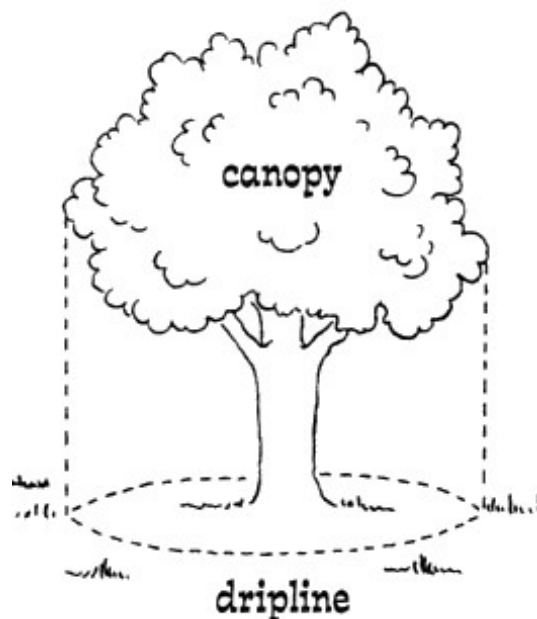
**crown:** the topmost branches of a tree.

**community:** a group of different species that live and interact together in the same area.

**dripline:** the outer edge of the area formed by a tree's canopy.

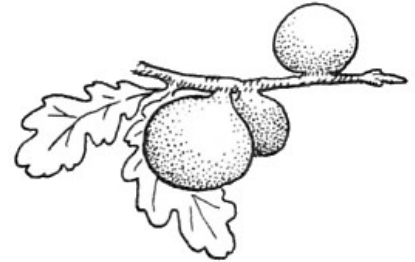
**ecosystem:** a community of animals and plants interacting with each other and with their environment.

**evapotranspiration:** the process whereby water evaporates or changes from a liquid to a gas or vapor as it moves through the plant tissue.



**forage:** foods such as grasses, herbs, and nuts taken by browsing or grazing.

**gall:** a swelling on a leaf or stem caused by a parasitic organism such as a wasp.

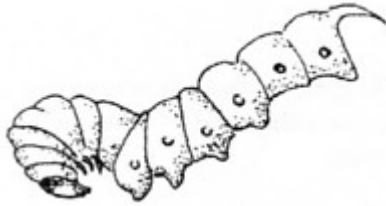


**habitat:** the space where an animal or plant lives, and that provides its food, water and shelter.

**hardwood rangeland:** an area of vegetation with a mixture of grasses and hardwood trees such as oaks.

**hypothesis:** a scientific “guess” or possible explanation of a condition that can be tested by a carefully designed investigation.

**larva:** the stage in the life cycle of an insect usually characterized as a worm (plural is larvae).



**oak community:** all the species of organisms that live in a complex interrelationship with oak trees.

**oak woodland:** an open, oak-tree dominated type of habitat with over 10 percent of the area covered by trees.

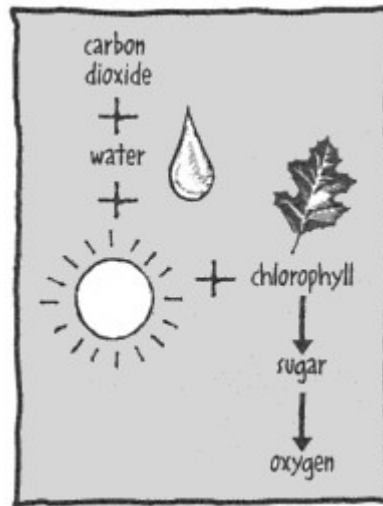
**open space:** an area within a community that has not been developed or that has been designated as a park or natural reserve.

**parasite:** an organism that lives on or within another “host” organism and depends on it for its source of nourishment.



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**photosynthesis:** the chemical process in green plants of making simple sugars from water and carbon dioxide in the presence of sunlight.



The process of photosynthesis

**pupa:** the stage in the life cycle of some insects that is between the larva and the adult (plural is pupae). In many insects the pupa is inactive and in some it is enclosed in a tough case or cocoon.



**sapling:** the intermediate stage of tree development between seedling and mature tree.

**savanna:** a grassland habitat with scattered trees covering less than 10 percent of the area.

**seedling:** young tree made up of a small stem and single set of leaves that has recently emerged from its seed.

**shrub:** a woody plant, usually made up of several stems, less than 4 m (12 feet) tall.

**shrubland:** vegetation, such as chaparral, made up of mostly shrubs.

**snag:** a group of related organisms capable of interbreeding and producing the same kind of organisms that are fertile.

**tap root:** the main, thick primary root with smaller side roots that grows downward into soil.

**tannin (tannic acid):** bitter tasting chemicals that protect a plant from decay or injury from animals or insects.

**woodland:** an open, tree-covered area with more trees than a savanna but less than a forest. Tree canopies cover more than 300 percent of the area but do not overlap.