

# Oak Woodland Ecosystem Investigation

Science and Engineering Practices (SEP) – Asking Questions & Defining Problems

Disciplinary Core Ideas (DCI) – Ecosystems: Interactions, Energy and Dynamics

Use the boxes as guidelines to arrive at the NGSS standards which are written in **bold**

**Objective:** Students will foster an appreciation for the dynamic oak woodland ecosystem. By making keen observations and thinking critically about what they see, students will come to appreciate the relationships among all living things.

**Background:** The oak woodland is a common ecosystem in the western United States, and is also found in many other areas of the world. There are between 300 and 500 species of oak worldwide. In California alone, there are 20 different species of oak – more than 5,000 species of insects, nearly 60 species of amphibians and reptiles, 100 species of mammals, and more than 150 species of birds rely on oaks for their survival. The primary reasons that oak woodlands support such a variety of species are that they produce an abundant supply of food in the form of acorns and they provide ample shelter, nesting sites, and shade.

The oak woodland is an ideal ecosystem for illustrating the complex interactions that go largely unnoticed by humans but that drive the survival of hundreds of species. By looking at the oak woodland as a whole system, many of its attributes are revealed, giving us a richer sense of how nature sustains life over time.

## Activity:

Ask students to recall if they've ever seen an oak tree before. How about an acorn? Ask students if they have any questions about oak trees that they've always wondered about.

Explain that they will be exploring the oak woodland ecosystem like scientists today. When scientists study an ecosystem, they often divide it into sections or quadrats. They observe and record what they find in each section, and then they consolidate the information to look at the ecosystem as a whole.

1) Divide students into pairs. Give each pair one laminated panel. Explain that they will be the expert scientists for their particular panel, or part of the ecosystem.

Have students study their panel and make a list of all of the living organisms (plants and animals) they see.

*What types of animals do you see?*

*Are they predators or prey?*

*What types of vegetation do you notice?*

*Does it provide food or shelter?*



**The energy source for all living things is the sun. Plants create their own energy from sunlight, and the food of almost any kind of animal can be traced back to plants.**

Make a list of all of the plants and animals on your panel.

*What is the relationship between the plants and animals?*

*What are the interactions between the living organisms on your panel?*

*How about the non-living organisms?*

*What is the ultimate source of energy for this ecosystem?*

Explain to students that they are going to make a food web for their panel. Every organism is part of a chain and every chain begins with the sun, which is needed by the plants to make their own food. The first two links in a food chain will always be the sun and a plant. Have students draw the **sun**, and each **plant** and **animal** on their list in a circle around their paper. They need only draw one of each animal and plant. Remember to label your organisms. Next, add the arrows. The arrow goes from the **food** to the **organism** that eats it. (Don't forget about decomposers!)

See example of panel 1 food web on the following page:

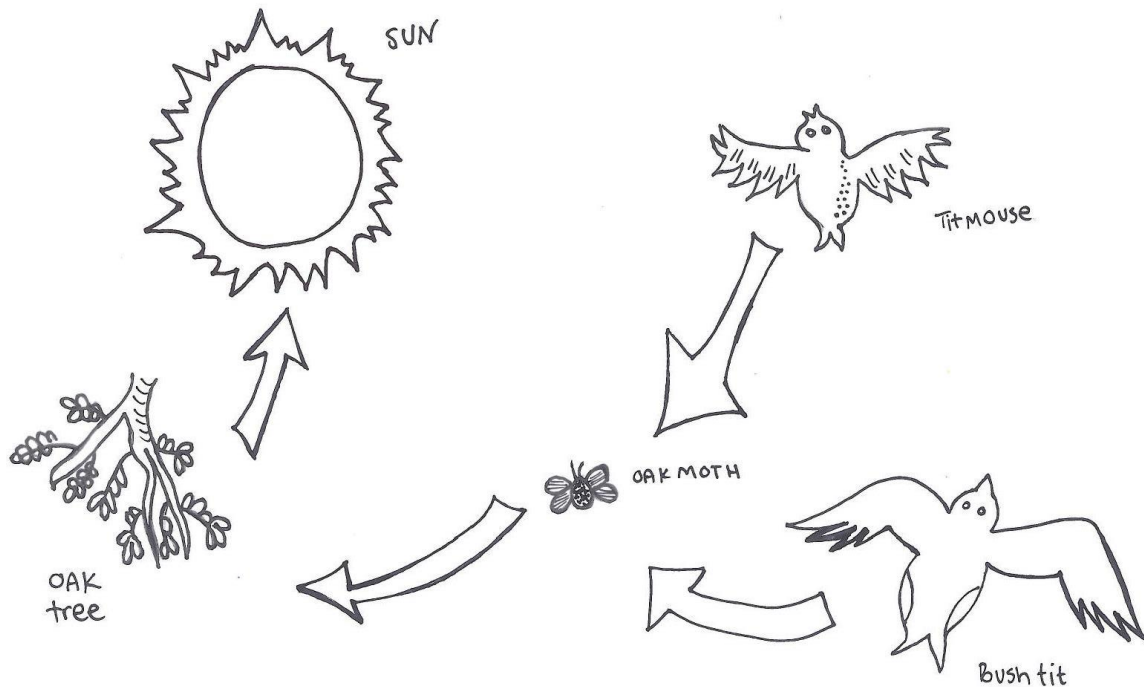


Figure 1. Example food web for Panel #1

2) Walk around the room and check in with groups as they construct their food webs – if groups finish early have them compare their food webs with their neighbors.

3) After the pairs have exhaustively observed their panel and noted all of the **connections** and **interactions** within their section of the oak woodland, provide each pair with the two information cards that pertain to their panel.

### Construct an explanation of observed relationships

Ask students to read the cards and discuss them with their partner. Ask them to write down and define at least one word they are unfamiliar with, and summarize their card in their own words.



4) Have students separate into four corners based on similar panel features and discuss the corresponding standard shown on the card in their corner: Students will read their corner card and take turns answering the questions on it in their panel group. Some panels may have evidence of more than one standard – allow students to choose which corner they think best represents their panel.

If your panel has evidence of decomposers, like fungus, mushrooms, bacteria, lichen or scavengers, then move to corner #1.

**Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plant parts and animals) and therefore operate as “decomposers”. Decomposition eventually restores (recycles) some materials back to the soil**

**Matter cycles between the air and soil and among plants, animals and microbes as these organisms live and die. Organisms obtain gases, and water from the environment, and release waste matter (gas, liquid or solid) back into the environment.**

*Suggested panels #10, #15*

If your panel has evidence of newly introduced species, or a changing environment then move to corner #2

**Newly introduced species can damage the balance of an ecosystem**

**When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.**

*Suggested panels #1, #6, #7, #8*

If your panel demonstrates animals in a group of the same species, then move to corner #3

**Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size.**

*Suggested panels #2, #4, #5, #12, #14*

If your panel demonstrates animals that interact in a group with different species, then move to corner #4

**Mutually beneficial interactions may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.**

**Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.**

*Suggested panels #1, #3, #9, #11, #13,*

5) Now it's time to piece the ecosystem together. Ask each pair to bring their panels to a central location for the whole group to observe. As they place their panel in the appropriate spot, invite them to present their findings to the rest of the group. Encourage them to explain any interesting observations or interactions they noticed. See if they can use one word they defined in their explanation!

Once everyone has had a chance to present, ask the students:

*Now that you see the oak woodland in its entirety, what thoughts or questions do you have about what is going on in this ecosystem?*

*What differences do you notice between the small view of your single panel and the big picture of the larger mural?*

*What is the most surprising discovery you made?*

### **Construct an explanation of observed relationships**

Ask them to elaborate on any relationships they discovered – thinking about predator/prey relationships, shelter, food, and shade. Think about things in the ecosystem that they might not be able to observe.

*How might water, light, temperature, and soil help support or influence the ecosystem?*

### **Identify the evidence that supports particular points in an explanation**

*What evidence can you find in your cards that supports your idea?*

### **Language Arts connection:**

Write a short story about a day in the oak woodland from the perspective of an oak tree, an alligator lizard, a screech owl, an acorn woodpecker, or a turkey vulture. Refer to the cards for additional information.



Print out the panels of the mural to display in your classroom (available for free download at <http://www.ecoliteracy.org/downloads/oak-woodland-learning-activities>). Have each group color their panel. Use post it notes or other small bits of paper to add their expert information to the mural display.

## **Oak Woodland Ecosystem Investigation kit materials:**

**15 woodland panels**

(See backs of panels for their numbers)

**30 woodland info cards**

(Two cards per panel)

**4 corners info cards**

*Additional resources:*

**14 oak galls**

**Assortment of oak leaves and acorns**

**Oak woodland animal cards**

**Set up:**

**Hang each 4 corners info card in a corner of the classroom. Students will gather around these cards during the activity to answer questions and discuss their piece of the oak woodland.**

## #1 DECOMPOSERS

**Some organisms, such as fungus, mushrooms, lichen or scavengers, break down dead organisms (both plants and animals) and are called decomposers.**

**Matter cycles between the air and soil and among plants, animals and microbes as these organisms live and die.**

**Decomposing** is the act of breaking organic materials like dead plants and animals down into smaller parts so that the nutrients from these organic materials can eventually become part of the soil again.

*What is an example of a decomposer on your panel?*

*How is this decomposer helping the Oak Woodland ecosystem?*

*What would happen if this decomposer was not present in the Oak Woodland ecosystem?*

**What evidence can you find in your cards that supports your idea?**

## #2 NEWLY INTRODUCED SPECIES OR CHANGES TO ENVIRONMENT

**Newly introduced species can damage the balance of an ecosystem**

*What is an example of an animal or plant that was newly introduced to the ecosystem on your panel?*

*How did introducing this animal or plant into the ecosystem affect the other animals and plants living there?*

**When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.**

*What is an environmental change in your panel?*

*Imagine that you are an animal in the Oak Woodland Ecosystem, how are you affected by this environmental change?*

**What evidence can you find in your cards that supports your idea?**

### #3 ANIMALS IN GROUPS OF SAME SPECIES

**Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size.**

*How does your panel show animals of the same species being part of a group?*

*What are some advantages of living in a group versus living by yourself?*

*What are some challenges of living in a group?*

*How does being part of a group help animals obtain food?*

*How does being part of a group help animals defend themselves from predators?*

*How does being part of a group help animals cope with changes?*

**What evidence can you find in your cards that supports your idea?**

### #4 ANIMALS INTERACTING WITH DIFFERENT SPECIES TO HELP ONE ANOTHER

**Different organisms in an ecosystem interact with one another. *Mutualism* is a relationship between two organisms in which both organisms benefit.**

**Organisms depend on their interactions with both living and non-living things to survive in their environment.**

*What is an example of animals from different species in your panel working together to help one another?*

*How do you interact with both living and non-living things in your environment?*

**What evidence can you find in your cards that supports your idea?**