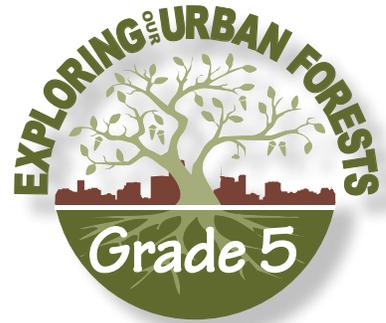


Grade: 5

Relationships

Oak tree communities include many organisms that are a part of food webs.



Teacher Background Reading

The relationships among plants and animals can be observed directly and documented by students as a food web. Students can explore the plants and animals in schoolyard, in a nearby park with trees and shrubs, a canyon, or other open space. By reading about local oak communities, students can learn how oaks have many relationships and provide rich habitats for wildlife. Healthy oak woodlands can support up to 350 species of animals. This includes many insects, birds, reptiles and amphibians, and mammals.

Food chains show how energy moves from one organism to another in the form of food. The arrows point from the primary source of food to the next thing that eats it, and so on. The arrows show the direction that the energy is flowing. Food webs describe the interconnection of the food chains in an ecosystem, and give a picture of how plants and animals in an ecosystem are related to each other. ■

Vocabulary

Carnivore: an animal that eats meat as the main part of its diet

Communities: all the different plant and animal populations interacting with each other in an ecosystem

Decay: to decompose through the action of bacteria and fungi

Decomposers: organisms such as fungi, bacteria or invertebrates that feed on and break down dead plant and animal matter

Decomposition: the mechanical or chemical breakdown of dead material

Ecosystem: a biological community of interacting organisms and their physical environment

Food chain: a series of organisms linked together by food energy, each organism eaten by the next one in the chain

Food web: the complex and interlocking series of food chains

Herbivore: an animal that eats plants as the main part of its diet

Omnivore: an animal that eats both animals and plants

Scat: animal droppings

Grade 5/Lesson 1:

Relationships

In this activity, students will become familiar with organisms that live in our local habitat by exploring food chains, observing decaying matter and developing a better appreciation for microhabitats.

Learning Outcomes

Students will identify food chains in different microhabitats that are defined by shrubs and trees. Students will identify some of the organisms that live in, on, and under decomposing study areas in the schoolyard. Students will become familiar with plants and animals in local ecosystems dominated by oaks.

MATERIALS:

- Copies of the “Relationships Journal” - 1 per student
- Clear containers with lids (plastic tubs, glass jars, or plastic baggies) – 1 per group
- Clipboards or folders – 1 per group
- Large spoons or trowels for digging, picking up items – 1 per group
- Magnifying glasses – 1 per group
- Optional: field guides on insects, spiders and plants; bug boxes

Getting Ready:

Locate three types of study areas in the schoolyard, several of each: shrubs (could be landscaping plants, school garden areas, or a schoolyard habitat), trees and the grass or other plants under them, and areas with decomposing wood or organic matter. For this, look under wood chips, in planters or leaf piles and under trees. Create an area by laying a non-rubber mat, carpet square, board, or cardboard over a dirt patch for 2-3 weeks before starting the project and keeping it moist.

If you find an area with decomposing material, let the maintenance or grounds keeper know not to clean the area until you are done with the lessons. You can also cover a dirt patch with mulch, dead leaves or a log.

Look through the schoolyard to find areas that have signs of living organisms. If you have trouble with this, contact your naturalist or local arborist. Look for insect holes, spider webs, woodpecker holes, patterns in the wood surface or bark (scratches from animals or birds), animal tracks, piles of sawdust (termites), and scat (animal poop).

Write the vocabulary words at the beginning of this packet on the board and go over the definitions of each word with the class. Revisit them as they come up in the lessons.

Copy the “Relationships Journal” for each student (see student handouts). Students can also use journals, notebooks or scratch paper.

ENGAGE:

Begin by asking the students why forests aren’t piled high with fallen trees, branches, and leaves. What happens to trees after they die? (They decompose or turn into soil and nutrients that the surrounding trees use for food.) Ask students where their schoolyard has components of an urban forest (trees, landscaping).

Ask students how animals get the food they need. As they describe the food chain, list each part of the chain on the board and connect with arrows. (Nutrients in the soil get absorbed by the roots of plants and trees along with energy from the sun for food for the plants. Small animals and insects eat the plants to get their energy, then bigger animals eat the smaller animals to get their energy. When animals and plants die, their decomposing tissue provides nutrients for the plants again.)

Take students on a tour of the schoolyard to show examples of the signs of organisms they will be looking for in their study areas. These are the signs that you found previous to the lesson. Show students the insect holes, spider webs, woodpecker holes, patterns in the wood surface or bark, animal tracks, piles of sawdust, and scat that may have found. You want to show them the kinds of things they will look for and explain how you found them.

EXPLORE:

Divide the group into teams of three or four, explaining that the teams will each study one of three microhabitats in the schoolyard: shrubs, trees, and a decomposing

environment. Assign the teams to a study area and let them know you will take them to the assigned area. Team members will need to record each different kind of plant and animal they see, and the evidence for animal activity. This will be recorded in the chart on the first page of their “Relationships Journal”.

Assist students in coming up with three of their own questions about the plants and animals in their study area. Have them write the questions in the space provided in their journals. What have they observed about nature in the schoolyard, during recess or other class projects? Have students discuss and answer questions by making educated guesses and write these on the board or journals that they can compare after their research.

Gather the materials needed for the study areas (containers, clipboards, digging tools and field guides, if using them). Take students to their study areas and distribute the materials. Explain that students should be careful, disturbing the area and the living things around it as little as possible. They can put animals into the containers, but only briefly so they can observe and draw them. Students must return animals quickly to the places where they were found. They should make sure the study area is in its original state when they finish their observations.

Students should write down any plants and animals they find in their chart. If they can't identify something, they should sketch it in their journal. Look for ants, aphids, beetles, bees, and spiders!

Encourage students to look for evidence of animal activity such as insect holes, nests, spider webs, woodpecker holes, patterns in the wood surface or bark, animal tracks, piles of sawdust, and scat. Record this evidence in the “Relationships Journal.”

EXPLAIN:

When groups have finished the observations of their areas, bring the entire class together. Walk around the schoolyard to see all the study areas, asking each group to tell you what surprised them most about their study area. This will give students a reference point when the other study areas are discussed in the classroom. Write down what they tell you about each area so you or the students in each group can write it on the board back in the classroom. Ask students to point out which organisms are herbivores, carnivores, omnivores, or decomposers. Omnivores are rare in nature, except for humans and some other mammals.

ELABORATE:

After you or the students have written about their study areas on the board, take a

few minutes for each group to add any information they observed about other study areas as they saw them.

To further learn from the observations made in the study areas, have students work in their teams to answer the “Study Exploration Questions” in their journal. Students should use the observations they made of their own study area and what you’ve written on the board from the groups sharing about each of the other study areas. Afterwards, discuss the answers as a group, for these six questions on the study sheet:

What similarities were there in the three study areas?

What differences were there?

What might explain the differences?

Which animals and plants were found in all the study areas?

Which plants and animals were found only in your study area?

How do the animals in your study area interact with their environment? (The study area provides habitat, including shelter, food, and a place to raise young.)

EVALUATE:

To evaluate your students’ understanding, tell them to imagine that the tree(s) or shrub(s) in their study area has just been cut down or that the log was removed. As a class, discuss what might happen to the other plants and animals in the study area?

Ask students to choose an animal or insect that they found living in their study area and write a story from the animal’s or insect’s perspective if the trees/shrubs or log were taken away. They can write the story as a “day in the life” or from a larger perspective with long term effects.

EXTENSION:

Put a date on the class calendar at the end of the school year, when students can revisit the study site and note changes. How does the soil look and feel now? How are the plants different? Do you see other insects, or insects in different places?

REFERENCES:

American Forest Foundation (2012). The Fallen Log. In *Project learning tree: Pre K-8 environmental education activity guide* (6th ed., pp. 105-107). Washington, DC: Author.

Grade 5/Lesson 2:

Food Webs

Students take a look at their schoolyard and an oak community ecosystem and discover ways that plants and animals are connected to each other.

Learning Outcomes

Students will understand that ecosystems are made up of interdependent organisms and the physical environment. Students will describe relationships in their schoolyard and in oak communities by developing food chains and webs.

MATERIALS:

- Schoolyard Relationships journal from Lesson 1 (with “Food Web” worksheet added) Students can also use journals, notebooks or scratch paper.
- Colored pencils or crayons
- Clipboards or folders - 1 per pair of students
- Copies of “Student Background Reading” - 1 per student
- Drawing paper - for schoolyard food webs
- Optional: yarn, scissors - for schoolyard food webs

Getting Ready

Review the Student Background Reading.

Copies of Student Background Reading “Life in an Oak Community” (or print one copy of student reading and use document camera to read as a class), and “Food Webs” worksheet added to the Schoolyard Relationships journal from Lesson 1. (Students can also use journals, notebooks or scratch paper.)

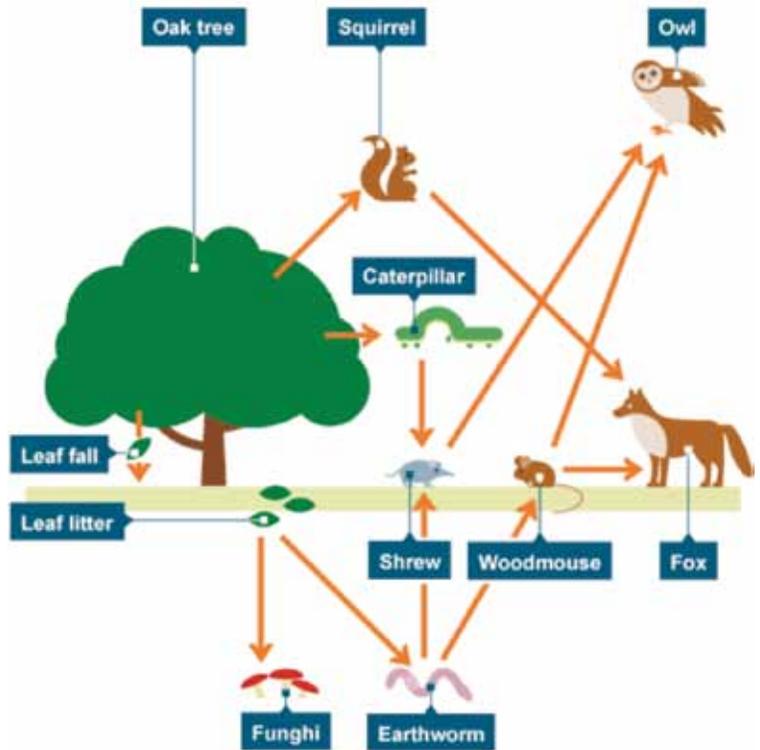
If you have an iPad in the classroom or a Smartphone, Audubon Society has some fantastic apps that could be used in the classroom (or in the field) if students want to identify or get more information about an animal or plant.

ENGAGE:

Write the words “food chain” on the board. Ask students to share an example of a food chain. Write the example on the board. If students are struggling, start writing down parts of this example: leaf → deer → mountain lion. Have them help you create another food chain.

Food chains show how energy moves from one organism to another in the form of food. The arrows point from the primary source of food to the next thing that eats it, and so on. The arrows show the direction that the energy is flowing.

Explain that, in reality, it is rare for an animal to eat only one type of food. After drawing two food webs on the board, draw arrows to connect the two food chains making a web. A food web describes the interconnection of the food chains in an ecosystem and gives a clearer picture of how plants and animals in an ecosystem are related to each other.



http://www.bbc.co.uk/bitesize/intermediate2/biology/images/200/124_bitesize_intermediate2_biology_test1_3_decomposer.png

EXPLORE:

Have students read the Student Reading “Life in an Oak Community”. Have students get into the same groups as Lesson 1 and ask them to identify 1 or 2 food chains from the reading. Once each group has identified two food chains, have them share out to the class and write them on the board.

As a class, link the student-generated food chains into an oak community food web. Allow students to share out more organisms from the reading to complete the food web with animals found in an oak community.

Pass out the “Food Webs” worksheets and have students add the page to their journals. Instruct the groups to go out into the schoolyard to their study areas.

Referring to the animals, insects and plants that they recorded in the Relationships Journal in Lesson 1, have the students write out two food chains or webs in their journals on the page labeled “Study Area Food Web”. Remind them to include arrows showing the flow of energy: tree sap → ant → small bird. They can sketch the plant or animal if they don’t know its name.

EXPLAIN:

In or out of the classroom, have each student pair up with a student from another group to create a schoolyard food webs. Students should use a combination of their schoolyard food chains and include at least 12 plants, animals and decomposers. Have students draw this schoolyard food web on the page in their journal listed “Schoolyard Food Web.” (*Optional: students can create a more elaborate food web model by using construction paper to draw the plants and animals, and string or yarn to connect them.*)

Circulate between the groups to check for understanding. Remind students that decomposers are good organisms to help interconnect their food webs. If time permits, have each group share their schoolyard food web.

ELABORATE:

As a class, read the Student Reading “Life in an Oak Community” and ask the students to listen for relationships that could be food chains. Ask students to name some differences between their schoolyard food web to the oak community food web (the oak community food web is much larger and has more organisms) and write them on the board.

Lead a discussion about the food webs:

What would happen if one of the links is removed from the oak community food web? (Organisms that depend on it are affected, either good or bad. The web itself changes shape, as animals could die and their predators would have to find other food sources.)

Would the community still survive? (It wouldn’t necessarily destroy the community, but it could, depending on which animal died. You never know the consequences of disrupting the web.)

What would happen if a link is removed from your schoolyard food web? (It would change the dynamic of the environment, a little or a lot depending on which link was removed.)

What would happen if a shrub is removed? A tree removed? (Shelter, food and

anything else the shrub or tree provides would be lost. Potentially the organisms would have to move and find new resources or die)

What if chemicals are sprayed on the shrubs and the insects die? (Insects are an important part of the chain and could be an important food source for another animal or provide an important role for another organism that needs it to survive.)

What could make a plant or animal fall out of the food web and disappear? (This could result from loss of food source, shelter, new predator or disease.)

Were the changes more dramatic when the ecosystem was composed of many parts or when it had fewer parts? (The changes are more dramatic when the system is smaller.)

How are humans part of the oak community web? (Humans have a variety of impacts that are both good and bad, such as cutting oak trees for lumber or for firewood, hunting animals, grazing cattle, releasing pesticides into the environment, planting oaks, and restoring habitat for animals.)

How are humans part of the schoolyard web? (Grazing cattle, releasing pesticides into the environment, planting oaks, and restoring habitat for animals.)

EVALUATE:

In their Relationship Journal, on the “My Food Web” page, have students design a food web that includes themselves and the plants and animals that they eat and get energy from. Students should use the knowledge they have learned in these lessons and classroom discussions about oak community and school yard food webs. Ask them to include at least 12 plants and animals, and some decomposers (such as worms in composting food scraps, or flies on rotting garbage).

EXTENSION:

Create a food web with natural materials. Have some clear collection containers on hand, such as repurposed food containers for insects. Ask students to collect leaves, insects, fungus and decaying matter, grass, worms in soil, etc and create a food web outdoors, using yarn to connect items. Do this activity at the base of a tree or bush and supplement with drawings or words on index cards. Remember to return any live insects near where you found them.

REFERENCES:

American Forest Foundation (2012). Web of Life. In *Project learning tree: Pre K-8 environmental education activity guide* (6th ed., pp. 194-196). Washington, DC: Author.

Antunez de Mayolo, K. (2008). Wild Residents in the Oak Community. In *Investigating the oak community: A curriculum guide for grades 4-8* (pp. 36-39). Oakland: California Oak Foundation.

Standards Grade 5:

Next Generation Science Standards

5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

California Science Standards

The California Science Standards for fifth grade focus on earth sciences, and have limited life science standards. Energy and matter are key concepts covered in many Outdoor Schools (sixth grade camp), and students can be more prepared when they have completed these lessons. Since students are tested in grade 5 on science knowledge over the previous years, these lessons can be a good review of the following fourth grade life science standard on energy and matter:

2. All organisms need energy and matter to live and grow. As a basis for understanding this concept:

2.a. Students know plants are the primary source of matter and energy entering most food chains.

2.b. Students know producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs and may compete with each other for resources in an ecosystem.

2.c. Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.

Common Core Standards

Literacy – Reading

3. Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

Literacy - Speaking and Listening

1. Engage effectively in a range of collaborative discussions with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

2. Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

Literacy - Language

3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.

Grade 5/Student Reading

Life in the Oak Community

Oaks are common in San Diego. Canyon live oaks are found at lower elevations and in urban canyons. Coast live oaks and Engelmann oaks grow in meadows in East County. Black oaks grow in the mountains. They provide shelter, food, water, and places where wildlife live and reproduce.

Who lives in the oak community?

Oak communities are one of the richest habitats for wildlife. Healthy oak woodlands can support up to 350 species of animals. This includes many insects, birds, reptiles and amphibians, and mammals.



Barn owls, wood ducks, and many other cavity-nesting birds use oaks as their homes. In winter, 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. In the summer, squirrels nest in oaks.

Nematodes, tiny round worms, and earthworms live within an oak's root system. The leaf mulch at a tree's base is home to many insects and spiders. Slugs, snails, beetles, millipedes, centipedes, caterpillars, earwigs, and ants live around the base of the tree. Many of these organisms help decompose dead leaves and branches, making the soil more fertile.

Many insects make themselves at home in oaks. Bark beetles eat through the living tissue just under the tree's bark. The tunnels create intricate patterns in the wood underneath the bark. Many oaks have galls, with insects living inside them. The oak tissue sometimes becomes irritated by insect eggs and grows a gall around them. This protects the insect and doesn't harm the oak tree.

Sometimes insects can kill the oaks. Locally, oak trees are threatened by an insect called the gold-spotted oak borer. The larvae live under the bark in the living cambium, where the nutrients and water move up and down the tree. The larvae eat this



living tissue, and this causes the tree to die after 5 to 6 years. The adult oak borer insects exit the tree in early summer. They can fly about a mile, and lay their eggs on the bark of other oak trees. The eggs hatch and the larvae start eating the cambium in the new oak trees. They follow the life cycle of insects!

Who lives in dead oaks?

Oaks continue to support the community even after they die. When a tree dies, its nutrients are recycled back into the environment through decomposition. Wood-eating insects invade a dead or dying tree. They break it down for other invaders to eat and live there. Plants and fungi absorb nutrients from the decaying wood. Here's a look at some common things you may find on, in, and around dead wood.

Many animals depend on decaying logs as places to hide from the elements. Beetles and other animals may spend the winter inside a rotting log. Some beetles, wasps, slugs, and other animals lay their eggs in decomposing wood. Salamanders may wait inside a log during the day, to stay cool and damp. Then they come out at night to hunt for food.

Some animals eat wood! Termites, sow bugs, carpenter ants, and wood roaches are scavengers that eat or tunnel through wood. They help break down the log into nutrients and soil. Many of those animals also eat other kinds of plant matter, such as dead leaves. Centipedes, beetles, and spiders are predators that feed on the wood-eating animals. Birds, skunks, and other animals tear into logs to eat these predators!

What foods do oak trees provide?

About two dozen different bird species eat acorns. Scrub jays, wood ducks, 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 the woodpecker pushes an acorn into the hole for storage. Acorn woodpeckers may store 200 acorns or more on a single tree trunk or branch!



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

Many insects depend on oaks for food, too. Insects eat acorns and also eat oak leaves, twigs, bark, and wood. Many of these six-legged animals become meals for insect-eating birds.

Mule deer also eat acorns. Other wildlife species depend on the grasses, fungi, seeds, berries, insects, and many other foods that are found in oak communities.

Acorns were a primary food resource or staple for the Kumeyaay and other native Californians. The Kumeyaay harvested acorns in the fall around late October and early November. The whole community would go into the mountains and foothills to camp. They gathered acorns that fell from the trees and carried them in baskets. The Kumeyaay knew how to choose ripe acorns and acorns that were not infested with worms. They were careful not to take too many acorns. They knew special ways to store and prepare the acorns for food.

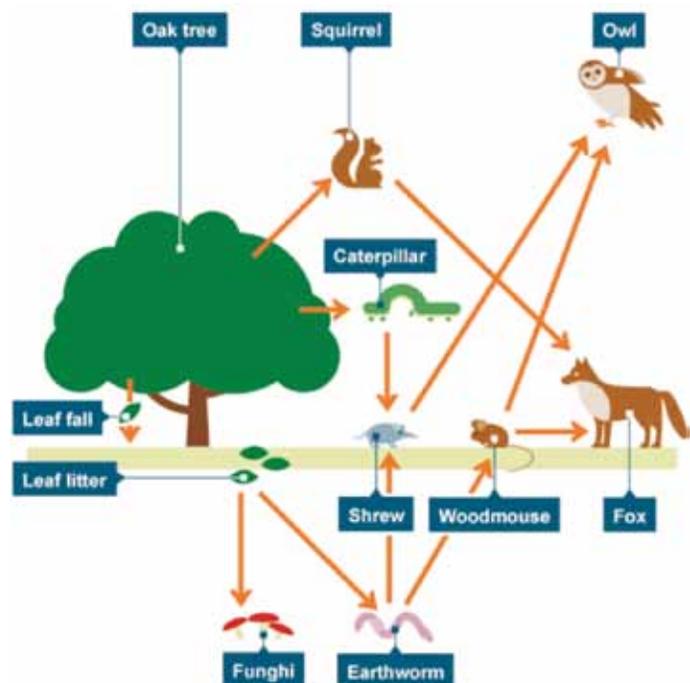
Oak Communities and the Food Chain

One way that plants and animals are connected is through energy. All life depends on the ability of green plants to use sunlight. Through this process, called photosynthesis, plants take energy from sunlight and make that energy available to animals as food.

A food chain is a simple way of showing energy relationships between plants and animals. An example of a food chain is: sun → plant → seed → mouse → owl. This shows that a seed is eaten by a mouse, which in turn is eaten by an owl. However, it is rare for an animal to eat only one type of food. Plant eaters (herbivores) eat the plants directly. Animal or flesh-eaters (carnivores) in turn eat herbivores or other carnivores, thus forming a food chain. Omnivores eat both plants and animals.

A food web describes the interconnection of food chains in an ecosystem. The food web gives a more complete picture of how plants and animals in an ecosystem are related to each other.

Plants and animals depend on each other in other ways besides food. For example, plants may depend on animals for pollinating flowers, dispersing seeds, and keeping insect populations in check. Animals may depend on plants for shelter from storms or cold weather. They may find shade under plants, to stay cool. ■



Grade 5/Lesson 1 & 2 /Schoolyard Relationships

Schoolyard Observations

List the organisms you found during your exploration of the schoolyard or local natural area:

PLANTS:	ANIMALS:	EVIDENCE OF ANIMAL ACTIVITY:
<i>Leaf of a shrub</i>	<i>Insect</i>	<i>Holes in leaves (example)</i>

Drawings of other animals observed:

Grade 5/Lesson 1/ Schoolyard Relationships

Study Area Questions:

1. _____

2. _____

3. _____

Grade 5/Lesson 1/ Schoolyard Relationships

Study Exploration Questions:

Work in your team to answer the following questions:

1. What similarities were there in the three study areas?
2. What differences were there?
3. What might explain the differences?
4. Which animals and plants were found in all the study areas?
5. Which plants and animals were found only in your study area?
6. How do the animals you found in the study area interact with their environment? (The study area provides habitat, including shelter, food, a place to raise young, and space to live.)

Grade 5/Lesson 2/Schoolyard Relationships

Study Area Food Web

Draw two food webs below with at least six plants and animals, using animals you find or have previously found in your study area.

Grade 5/Lesson 2/Schoolyard Relationships

Schoolyard Food Web

Draw a food web that includes at least 12 plants, animals and decomposers, and is a combination of organisms found in your study area and other locations in the schoolyard or natural area.

Grade 5/Lesson 2/Schoolyard Relationships

My Food Web

Draw a food web using at least 12 organisms, including plants, animals, decomposers, and you!

Collaboration of



Funding provided by Proposition 84
Through the California Department of
Forestry and Fire Protection
Urban and Community Forestry
Program



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Leadership Starts Here



Additional resources for educators available at
www.sdchildrenandnature.org