

Science

SCI.III.5.4

Grade: 2

Strand:

**Using Scientific Knowledge in Life Science
- Ecosystems**

It is recommended this Strand be taught in the spring (III.51, 53, 54)

Standard:

All students will analyze how humans and the environment interact

Benchmark:

Describe positive and negative effects of humans on the environment.

Constructing and Reflecting

SCI.I.1.1 - Generate reasonable questions about the world based on observation.

SCI.I.1.2 - Develop solutions to problems through reasoning, observation, and investigation.

SCI.II.1.1 - Develop an awareness of the need for evidence in making decisions scientifically.

SCI.II.1.2 - Show how science concepts can be illustrated through creative expression such as language arts and fine arts.

SCI.II.1.4 - Develop an awareness of and sensitivity to the natural world.

Vocabulary / Key Concepts

Natural resources, recycle, reduce, reuse, rainforest, waste, endangered animals, pollution, conservation, habitat, environment,

Context

- household wastes
- school wastes
- waste water treatment
- habitat destruction due to community growth
- reforestation projects
- establishing parks or other green spaces
- recycling

Knowledge and Skills

Benchmark Clarification:

Humans have the ability to change the environment. Human actions such as development, construction, pollution, maintenance, and preservation affect the environment.

Students will:

- Discuss the effects of development (community growth/creating parks) on the environment
- Discuss the effects of construction (roads, malls, parking lots) on the environment
- Discuss the effects of pollution (garbage, waste water treatment) on the environment

Resources

Coloma Resources:

“Can Kids Save the Earth?” Teaching manual and Big Book

“Where Does All the Garbage Go?” Teaching Manual and Big book

Habitats

Pond Habitat-model

Gets Eaten-video

Rain Forest-video

Hops Home-video

Ant Anatomy-chart

Holiday Special-video

Frog Cycle

Butterfly

Butterfly Pavilion

Butterflies-ordered by each bldg. in the spring

A Butterfly is Born-Big Book

Planet Frog-habitat

Butterflies-book

Other Resources:

Michigan Teacher Network Resources

<http://mtn.merit.edu/mcf/SCI.III.5.E.4.html>

Sustainability Education Handbook – web resources for environmental topics – extensive!

<http://www.urbanoptions.org/SustainEdHandbook/ScienceHeredityHumanImpact.htm>

Berrien County Resource Recovery Education Specialist – Jill Cooley – EXCELLENT classroom resource person – 983-7111 ex 8234

Species Charades – lesson plan to introduce endangered species and the idea of “endangered”. Education World.

http://www.education-world.com/a_lesson/03/lp310-01.shtml

Resources

Other Resources (con't.):

Five Lessons Teach Students to Reduce, Reuse, Recycle – Education World -

http://www.education-world.com/a_lesson/lesson308.shtml

Community Resources: DNR personnel and other individuals, books, internet, local maps. Harlow, Rosie. *Nature in Danger*. Kingfisher, 1995.

“Waste Not.” *Sing the Science Standards* (Songbook/CD).

<http://scienceexplosion.indiegroupp.com/>

EPA – Recycle City - A game, an interactive book, and other puzzles will teach you hundreds of ways a whole town can reduce, reuse, and recycle. – Very Cool!

<http://www.epa.gov/recyclecity/first.htm>

EEK – Environmental Education for Kids – Univ. of Wisconsin – online mag – Excellent! Lots of Resources on one site.

Animals in Danger Series. Heineman Library.

<http://www.dnr.state.wi.us/org/caer/ce/eeek/earth/recycle/index.htm>

Michigan Teacher Network Resources

<http://mtn.merit.edu/mcf/SCI.III.5.E.4.html>

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Instruction

Students will participate in a neighborhood clean up day or around school grounds. Collect the trash and bring it back to the classroom to discuss environmental hazards.

During discussion, teacher should highlight alternate plan of action for properly disposing of trash.

Assessment

Students identify and describe two interactions between humans and the environment.

P.S. of the teachers manual "Where Does All the Garbage Go?" describes 2 interactions between humans and the environment.

The whole teachers manual "Can Kids Save the Earth?" Also addresses the 2 interactions.

Teacher Notes:

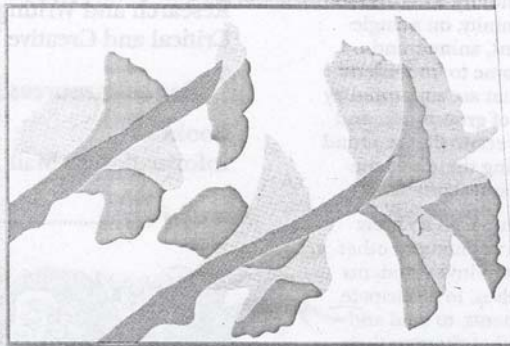
<http://www.misd.net/mibig/>

Analyze how humans and the environment interact.

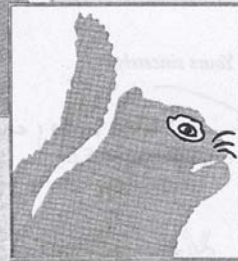
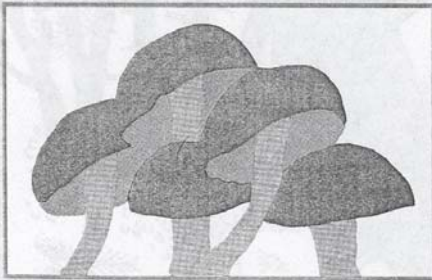
Students need to learn the role that animals play in design of systems managed by humans. Students should describe the positive and negative effects that humans have on the environment. They should understand the systems that best encourage the growth of plants and animals and then can be managed by humans. Finally, they should describe more positive and negative effects that humans have on the environment. Students in middle school should be able to explain how humans benefit from the use of plant and animal materials. In middle school, students should be able to describe ways in which humans change the environment. In high school, they should be able to explain the effects that agriculture and urban development have on ecosystems.

Teaching Guide

THE WEB OF LIFE



#1



RANGER RICK® SCIENCE SPECTACULAR

Meets the National Science Education Standards:

- Science as Inquiry
- Life Science
- Earth and Space Science
- Science in Personal and Social Perspectives
- Unifying Concepts and Processes

Dear Teacher,

The first step in working to preserve nature is to appreciate it. The Big Book, *The Web of Life*, focuses on one natural community, a deciduous forest, and within that community, on a singletree-home to dozens of plant, animal, and insect species. As children come to understand the numerous forms of life that are supported by just one tree during its cycle of growth, life, and death, they will come to appreciate the profound interdependence of every living thing and the delicate balance of nature that sustains us all.

This Teaching Guide follows up with a variety of ideas for active learning in science and other curriculum areas. The activities invite students to explore nature for themselves, to participate in classroom science experiments, to read and discuss, to write and draw, and to sharpen their research and critical thinking skills.

We hope the Big Book and Teaching Guide will help them appreciate how they, too, are important strands in the web of life.

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Illustrated by Valeri Gorbachev

Ranger Rick Science Spectacular

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Getting Started

Background

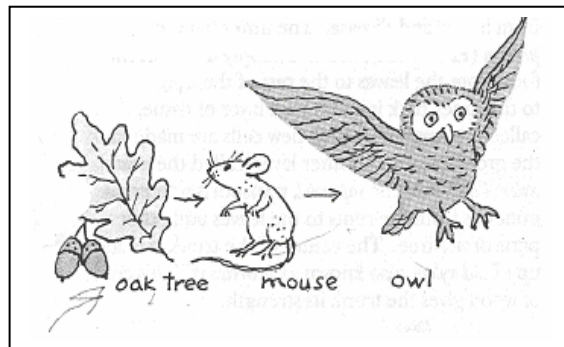
The following background information supplements the information and ideas found in *The Web of Life*. You might wish to share some of it when reading the book with students, while doing activities, or when answering students' questions.

What is the web of life?

The web of life consists of the many diverse and overlapping connections of all life on earth. Ecology -- the study of interrelationships among living things and their environments is the branch of science that studies the web of life. What's the difference between the web of life and a food chain?

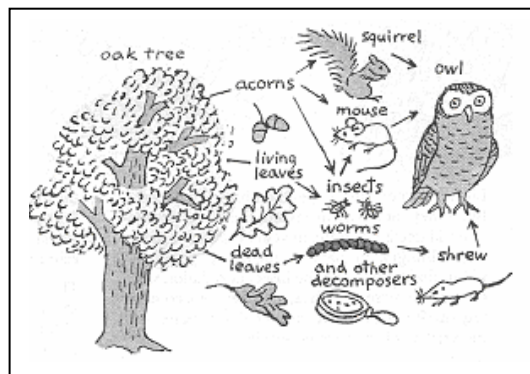
A FOOD CHAIN

Food chains are part of the web of life. A food chain starts with plants, producers, which use the sun's energy to produce food. The chain of energy next passes on to plant-eating animals, such as mice, known as primary consumers. Then it proceeds to the animals that eat the primary consumers -- for example, weasels -- known as secondary consumers. If a third animal, such as an owl, were to eat the secondary consumer, it would be known as a tertiary consumer. (However, when the owl eats mice, it goes back to being a secondary consumer!) Finally, various organisms break down dead plants and animals into nutrients and energy. These organisms -- such as earthworms, bacteria, fungi, and some types of insects -- are known as decomposers.



A FOOD WEB

As you can see, a food chain describes each step of the process as though it were happening separately. But in fact, while one plant grows, another is being eaten by an animal, and yet another is decomposing to make food for another plant. What's more, mice eat insects as well as the nuts, fruits and seeds of plants. Talking about the web of life is a means of picturing the many interconnected food chains and the many simultaneous life cycles that are continuously taking place.

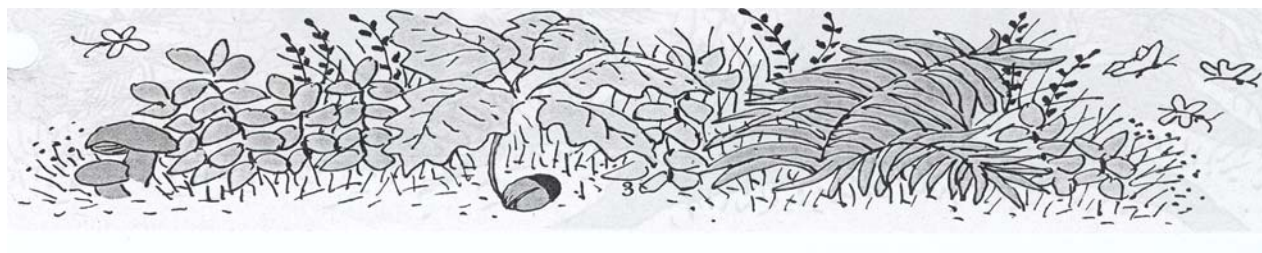


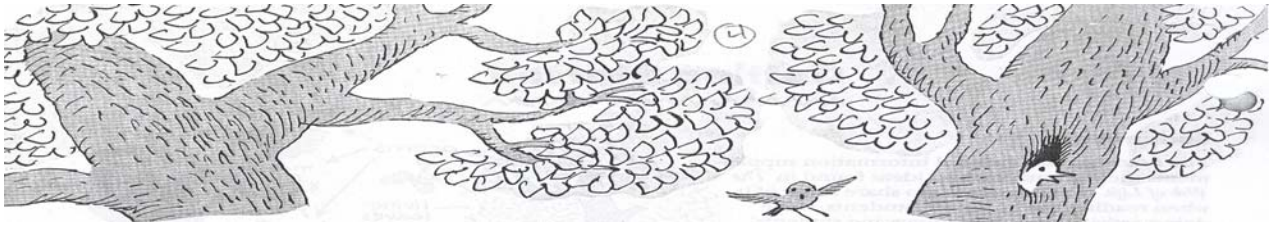
What is a community?

A community is one unit of life studied by ecologists. A community is any group of animal and plant species living in the same specific environment--for example, a tide pool, a meadow, a forest, or even a single tree.

How do communities survive?

Within a single community, animals and plants both depend on and compete with one another. For example, a tree might be home to a variety of insect species that weaken it by feeding on its bark or its sap. Eventually, the weakened tree will die, but its rotting wood will provide nutrients for other plant, animal, and insect species.





Likewise, some birds depend on insects for food. But if they eat too many insects, the insect population will decline and the next generation of birds will go hungry. In that case, the bird population will probably fall and the insect population will once again increase. Thus, members of a community survive in a delicate balance that depends on the survival of every single species.

How are trees and other plants "producers" of food?

All food chains begin with green plants. That's because animals (and non green plants, such as fungi) have to feed off other organisms. Green plants, however, produce their own food through photosynthesis – the process in which their leaves combine carbon dioxide from the air, water from the plant's roots, and energy from the sun to make glucose and other simple sugars. By carrying on photosynthesis, plants transform the sun's energy into food that enters the food chain and goes on to sustain all life on earth.

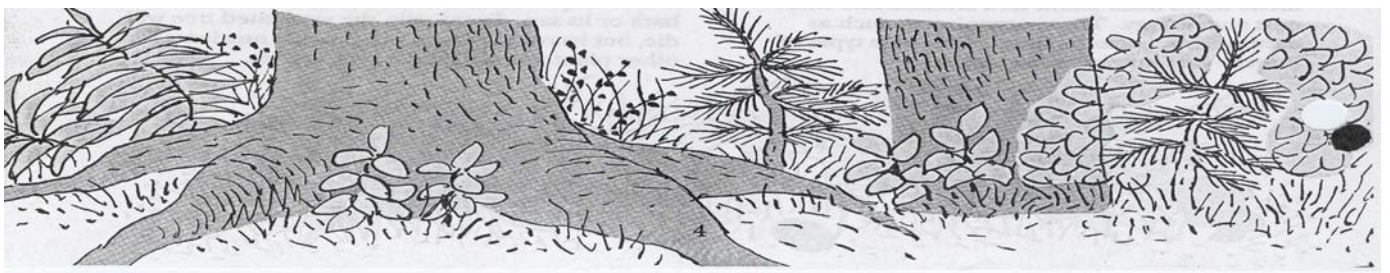
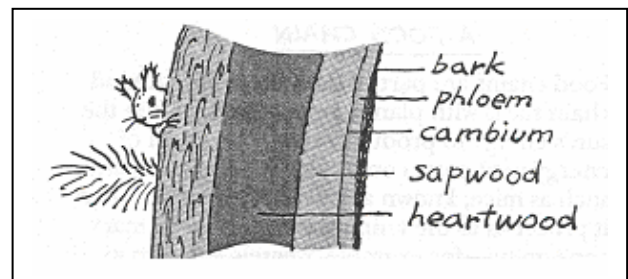
During photosynthesis plants also take in carbon dioxide and release oxygen. Animals, on the other hand, release carbon dioxide and take in oxygen. In this way, animals and plants help one another survive, each releasing the substance that the other needs to breathe.

How do the parts of a tree work together?

The parts of a tree all work together to produce and distribute food. The leaves are the "food factories" of the tree. They contain chlorophyll -- the green pigment that absorbs sunlight needed for photosynthesis. Through tiny openings called stomata, the leaves also absorb carbon dioxide and release oxygen into the atmosphere.

The branches of a tree support the leaves, and the trunk supports the branches. The outside of the trunk is the bark, which protects the tree from injury and disease. The inner bark, or phloem (FLOW-em), acts as a supply line--carrying food from the leaves to the rest of the tree. Next to the inner bark is a very thin layer of tissue, called the cambium, where new cells are made for the growing tree. Another layer, called the new xylem (ZYE-lump) or sapwood, transports water and minerals from the roots to the leaves and other parts of the tree. The center of the trunk is made up of old xylem, also known as heartwood. This core of wood gives the trunk its strength.

The roots, which are covered with very fine root hairs, look like underground branches. Roots have two functions: They anchor the tree in the soil, and they absorb from the earth the water and nutrients needed for the tree's growth.

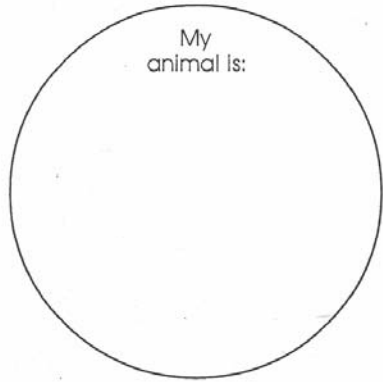




Animal Recording Sheet

Use library and computer lab time to find the answers to at least six of the ten questions. You also must include the name of the book or website where you found your information.

My animal is:



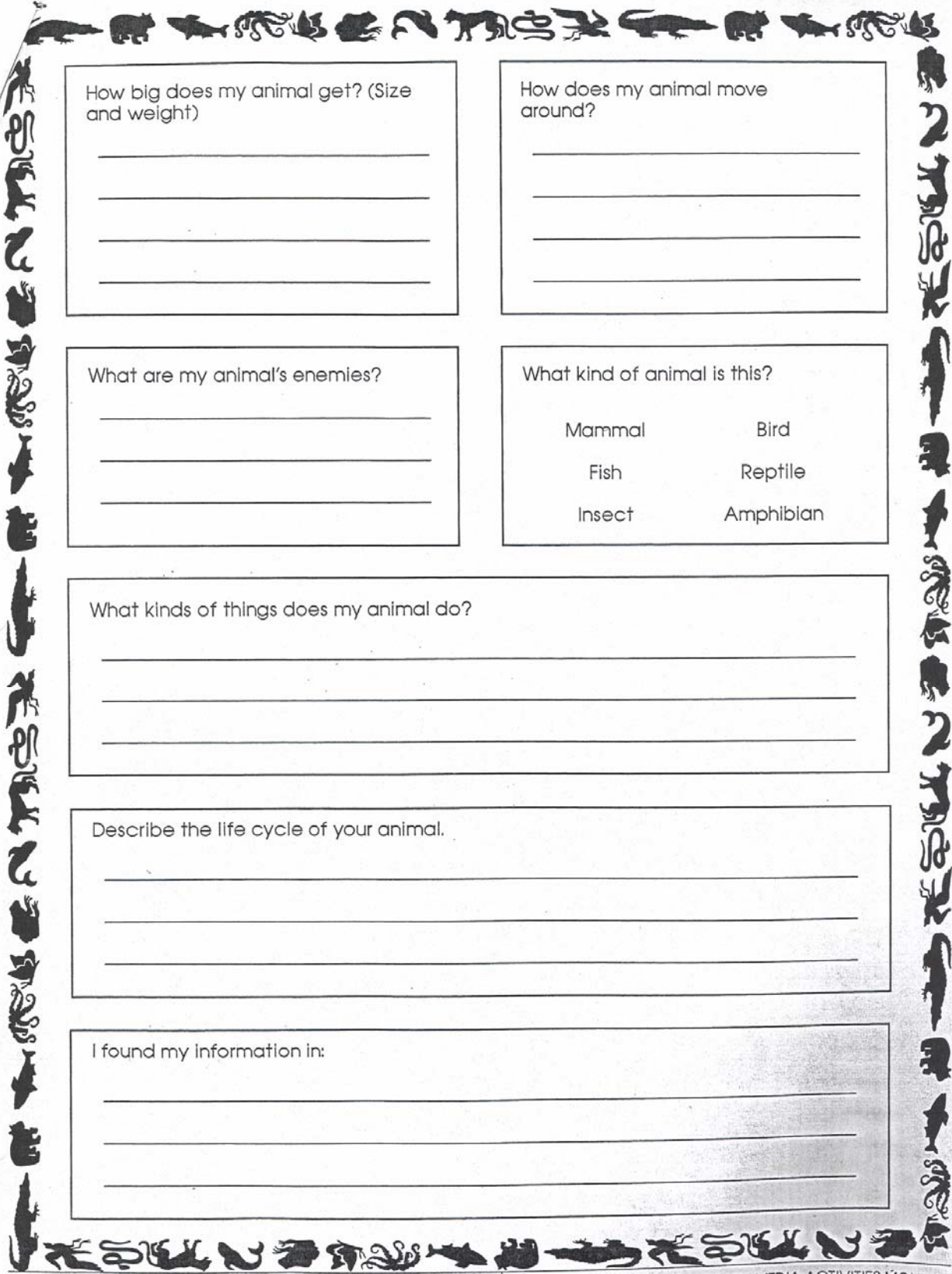
Where does my animal live?

What does my animal eat?

What does my animal look like?

How many babies does my animal have?





How big does my animal get? (Size and weight)

How does my animal move around?

What are my animal's enemies?

What kind of animal is this?

Mammal	Bird
Fish	Reptile
Insect	Amphibian

What kinds of things does my animal do?

Describe the life cycle of your animal.

I found my information in:

How are consumers-that is, animals-part of the web of life?

Since animals cannot make their own food, they have to eat to get energy. Animals that eat plants are known as herbivores. Animals that eat other animals are known as carnivores. And animals that eat both plants and other animals are called omnivores.

Why are trees important in the web of life ?

Trees, like other plants, are the direct source of food for countless species of mammals, birds, insects, and other living beings that feed on their fruits, nuts, seeds, and leaves. In addition, various fungi, insects, mites, millipedes, centipedes, and other creatures live off the tree's bark, trunk, roots, and sap. And, of course, many carnivores and omnivores feed on the herbivorous animals that feed on the trees.

Trees also shelter living creatures. Birds and squirrels build their nests in the forks of the branches. A good number of animals build their homes, hives, or nests in tree cavities. Insects and fungi grow beneath the bark or on the bark's surface. Below the ground, earthworms, moles, shrews, and many other creatures live in tunnels beneath a tree. They, too, are part of the web of life. As they churn up the soil, they make it easier for a tree's roots to grow and to absorb oxygen from the earth.

Finally, after a tree dies, its rotting wood supports a variety of insects, fungi, and other organisms, as well as fertilizing the soil to nourish other trees and plants.

What are decomposers?

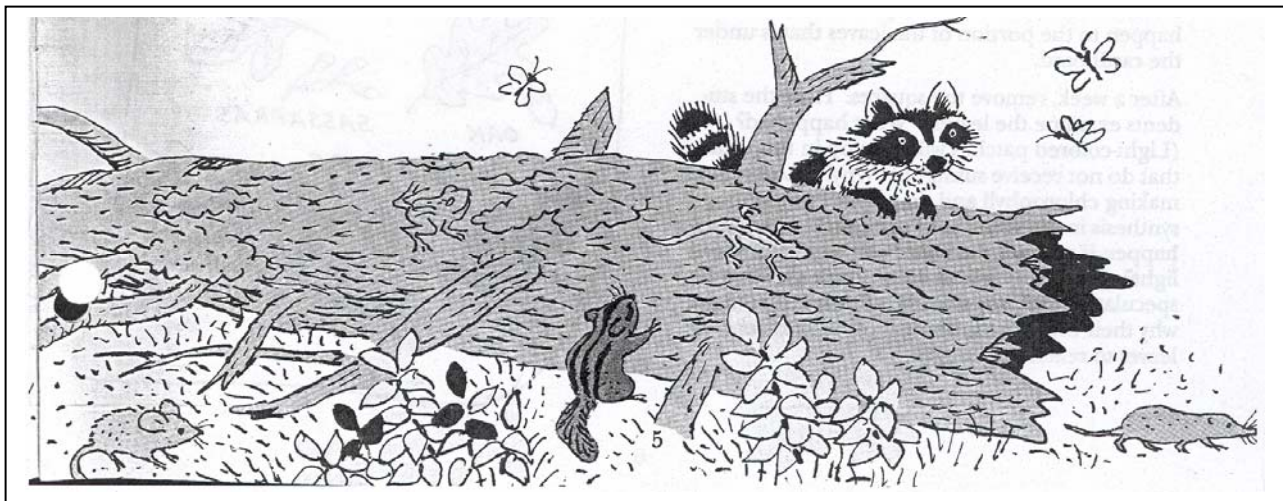
A decomposer helps dead animals or plants to decompose-to break down into minerals and other substances that form the basic nutrients for plants. Decomposers include fungi (mushrooms, molds, mildews, and similar nongreen plants), bacteria, and certain insects.

How do decomposers participate in the web of life?

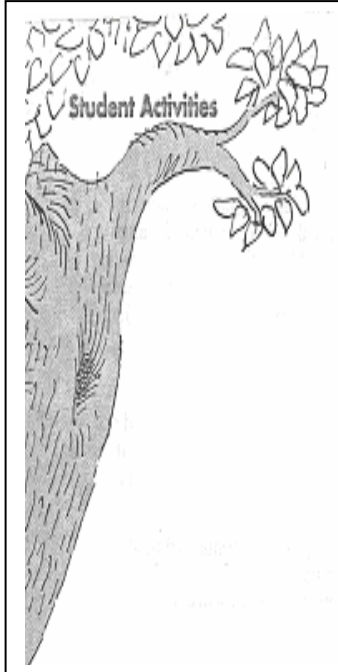
After plants or animals die, decomposers feed on the dead matter. As they digest it, they break it down to form a dark brown substance known as humus. Humus is soft and spongy. It contains simple nutrients that plants need, such as carbon, nitrogen, and phosphorus. The presence of humus in the soil enables new plants to take root and grow. These plants then become food for certain animals, and the cycle of life continues.

Before Reading

Start by brainstorming with students about what "the web of life" might mean. Invite them to share their prior knowledge about different ways that people, animals, and plants depend on each other and on their environment. Encourage them to relate their ideas to your own "backyard" environment as well: What are some of the familiar trees, plants, animals, and insects? Does anyone know what the wild animals eat? Where do they make their homes? Point out that each plant or animal they can name is connected in some way to other plants or animals. All together, these connections make up the web of life around you. Then show the cover of the Big Book. Invite students to describe the setting and the creatures they see there and to predict what they might find inside.



HANDS-ON SCIENCE



A tree is an important producer in the web of life. Some of the following activities will help students understand how a tree receives nourishment from the sun and soil. Other activities will help them observe and classify trees. Still teach children about moseying things that depend on trees for food and shelter and about how all living things are bound together in the web of life.

Leaves, Leaves, Leaves

Green plants, such as trees, are known as producers because they produce their own food. They do so through photosynthesis, which means "putting together with light." Green plants put the sun's light together with carbon dioxide and water to make glucose, a simple sugar that nourishes the plant. They use chlorophyll, the substance that makes leaves green, to absorb the sunlight.

Here's a simple way to show the sun's importance in photo-synthesis: Cut out four one-inch squares of cardboard. Attach the squares to the leaves of a houseplant with paper clips. Place the plant in the sun. Ask the students to predict what will happen to the portion of the leaves that is under the cardboard.

After a week, remove the squares. Have the students examine the leaves. What happened? (Light-colored patches will develop in the areas that do not receive sunlight.) Why? (Leaves stop making chlorophyll and do not carry on photosynthesis in the absence of sunlight.) What would happen if none of the leaves could get any sunlight? (The plant would die.) Invite children to speculate about why trees in a forest grow tall and why their branches spread out wide. (to enable leaves to reach the sunlight)

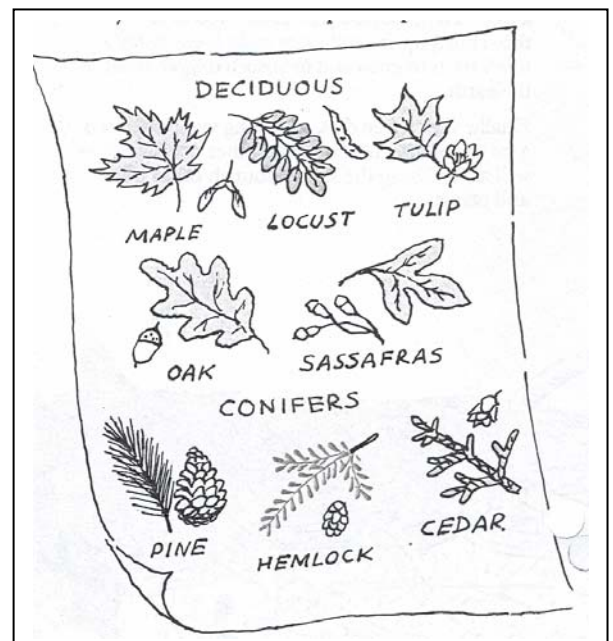


Leaves and Needles

Trees can be divided into two main groups. Those that lose all their leaves every fall are called deciduous trees. These include oaks, birches, sycamores, maples, locusts, beeches, ashes, elms, and many more. In general, deciduous trees have flat, broad leaves, and they grow their seeds in flowers.

Trees with scaly leaves or needles are called conifers. These include pines, firs, spruces, cedars, hemlocks, and redwoods. Conifers bear their seeds in cones, which give them their name. They lose and replace their needles gradually all year-round, which gives them their other name -- evergreens.

Tell students that they can be tree detectives. A tree's needles, flowers, cones, or leaves are their clues they can use to help them identify trees. Go on a nature walk together to collect fallen leaves, flower parts, cones, and needles, or have groups of students collect these items on their own. Place each group's collection on a separate paper plate. Then use a field guide to identify as many leaves and other tree parts as possible.



"Tree Logs"

Encourage each student to make a "tree log," a notebook for recording facts and observations about trees. Suggest that students start by pasting leaves or needles into their logs and labeling them. They might also illustrate their logs by drawing pictures of the various trees they saw, and by drawing animals, birds, flowers, insects, and other wildlife they observed around their trees. Some students might enjoy writing a few words telling what they noticed about each tree or recounting their experiences finding leaves and needles.

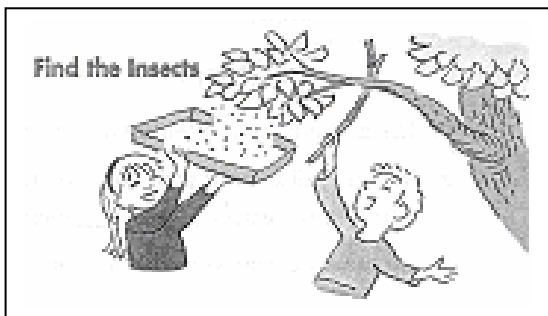
Mystery Tree

Tree logs might also be used to record students' observations from the following activity. Divide the class into partners. Have one partner put on a blindfold. Then have the other partner lead the blindfolded student to a tree she or he has selected. Let the blindfolded students make observations about the tree, using touch, smell, and hearing:



- What does the bark feel like?
- Can you wrap your arms around the trunk?
- What do the leaves feel
- How does the tree smell.
- Feel on the ground around the tree: Are there any plants or fallen branches there? Do you hear any sound that might come from an animal in the tree, such as a songbird or a woodpecker?
- Have the seeing student lead the blindfolded partner back to the starting point, take off the blindfold, and let the student try to find the "mystery tree," using the sense observations as clues. Then have the students switch roles. Afterwards, students can write or draw what they observed in the tree logs.

Note: Make sure you have scouted out the area for poison ivy or similar plants, and steer students away from any dangerous areas.



Adopt-a- Tree Student Page

Trees can be your laboratory for all kinds of hands-on explorations, provided the weather is fair. Distribute copies of the reproducible on page 8. Students might wish to paste or staple these into their tree logs. Then divide the class into groups of two, three, or four students. Take the class outdoors and have each group choose a tree to "adopt" and study. Help them understand what they need to do to complete each activity on the sheet. Suggest that they write and draw their observations in their tree logs.

Every tree is at the center of a web of life.

Insects and other consumers are an important part of this web. Students can discover some of the insects that live in a tree by using a "beater tray." You can make one out of a large cardboard carton as follows:

1. Cut the sides of the carton so they are only about 3 inches high.
2. Line the inside of the carton with either white paper or cloth.

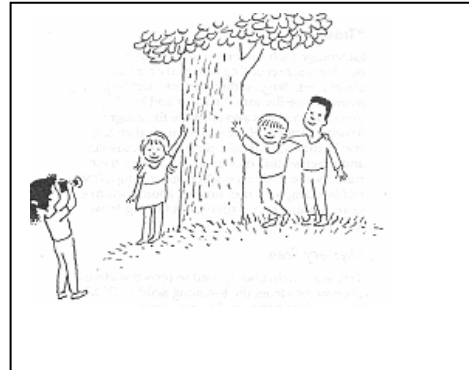
Go outdoors and hold the tray under a branch. Gently shake the branch or tap it a few times with a stick. Look for insects that may have fallen into the tray. (The sides of the tray should stop any from crawling away.) Have students draw the creatures in their tree logs, recording the date and noting which tree they came from, and encourage them to make notes of any observations they may have. Together, use an insect guidebook to identify the insects and learn more about where they live and what they eat. Discuss how the tree where they were found helped provide for those needs. Afterward, be sure to return the insects to their homes.

Adopt a Tree

Name _____

Try these activities with a friend or group of friends. They will help you really get to know a tree.

You need: a pencil or pen
 a tree book (field guide)
 a measuring tape
 a magnifying glass
 a small garden shovel
 white paper
 crayons
 tape
 a camera (optional)



1. Use a tree book to identify your tree. Our tree is a _____ .
2. Measure all around your tree's trunk at shoulder height.
Our tree measures _____ inches around.
3. Estimate how tall your tree is. Our tree is about _____ feet tall.
4. Look up at the trunk and the branches. Are there any signs of birds or other animals nesting, feeding, or resting in the tree?
5. Stand quietly under your tree for a minute or more. What sounds do you hear?
6. Look around the base of your tree. Do you see any signs of animal life?
7. Use a magnifying glass to examine the ground under your tree. What do you see?
8. Dig up some soil from under your tree and spread it out on a piece of clean white paper. Use your magnifying glass to examine the paper for living creatures.
9. Make a leaf rubbing: Place a fresh leaf on a hard, flat surface. Cover it with a piece of clean paper. Rub lightly with the side of a crayon. Label the rubbing with your tree's name.
10. Make a bark rubbing: Tape a clean piece of paper to the tree. Rub lightly with the side of a crayon. Label the rubbing.
11. Draw or photograph your tree. Then share what you learned about it with others!



Another way to use the tray is to place it under a sieve filled with leaf litter. (This activity works best in the fall.) Shake the sieve while poking the leaves with a twig. You may find different insects or other creatures in your tray. You might also spot long threads of fungi – fungi before they have put out mushrooms or other spore-producing parts.



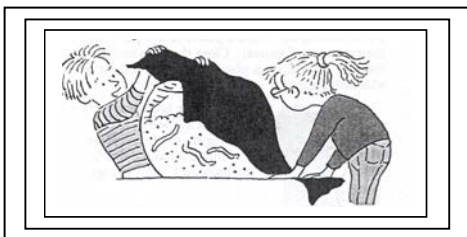
What Lives on a Fallen Tree

Find a rotting log outdoors. Suggest that students look for fungi, mosses, and other plants growing on the log. Are there any signs of insects or other animals around the log—any eggs, holes, tracks, spider webs? Let students explore the log further by carefully peeling away some bark and using a small stick to dig into the rotting wood. (Note: First check the log to make sure there are no wasp nests or other hazards.) Do they see any further signs of animal or insect activity? Finally, have students look underneath the log for the parts that are already changing into soil. Have students use their tree logs to record all forms of life that they find on, in, or under the log.

Students might also enjoy studying one type of decomposer commonly found on rotting wood— (of the sow bug. These bugs are dark in color, with flat, oval bodies divided into segments. Collect about six sow bugs and put them into a clear plastic box with holes in the cover. Add some soil, bark, and leaves, along with a small container of water to keep the air damp.

Put the sow bug box somewhere cool and shady and observe the bugs for a few days. Like reptiles, these insects shed their skin, so you might look for empty skins, as well as for signs of eggs or young. Try this experiment to see where sow bugs prefer to live. Place about an inch of soil over the bottom of a large plastic tray. Sprinkle water on half the soil to make it damp; leave the other half dry. Put some sow bugs into the middle of the tray. Which side do they prefer? (the damp side) Have students record all observations in their tree logs. When students are finished observing the sow bugs, return the bugs to their homes.

Worms at Work



Earthworms are among the most important decomposers. They feed on decaying organic material and "recycle" it into rich soil. Students might enjoy observing these creatures in a class worm farm.

Find earthworms by digging in damp soil or under a rotting log. Fill a large clear container with layers of damp soil and dead leaves, adding water as necessary. Next, add the worms.

Cover the container with dark paper or cloth, allowing air to enter, and leave it undisturbed for a few days. Then let students look through the sides. Can they see the earthworms? Have they made tunnels from one level to another? (If there are no tunnels, make sure the soil is damp enough for the worms and that they are not too warm or too cold.) Have students list ways that earthworms are important to the web of life. (They turn rotting plants into soil; they help air get into the soil; they are a source of food for birds and other animals.) What would happen if there were no earthworms? (The soil would become hard and airless; decomposition would take longer.)