

4HCCS BU-07704

Name _____

County _____



Level 1

Exploring *Your* Environment

Eco-Wonders



Youth Activity Guide



Note to Project Helper

Welcome to Eco-Wonders!

As an adult project helper you have the opportunity to help a young person learn more about the environment through the activities in this project book. You will have the chance to help a youth explore the "wonders" of the natural world. From building birds' nests to learning how to be a responsible earth steward, this curriculum contains dozens of hands-on, useful and fun projects for you and your youth to do and explore.

You will be the key individual with whom the young person shares each of the experiences outlined in this activity guide. You will provide encouragement and recognition, as the young person develops technical and scientific environmental knowledge and stewardship. In addition, the youth will learn important life skills such as creative thinking, decision making, problem solving and participating as a member of a team.

Your Role

- Review this guide and the Helper's Guide
- Support the youth in his or her efforts to set goals and complete the Planning Guide and Eco-Wonders Achievement Program
- Help select environmental projects to construct, give assistance in doing the activities and answer questions
- Help the young person to think about why something happened the way it did
- Serve as a resource person to help connect the young person with the community, resource materials and others knowledgeable about the environment

The Exploring Your Environment Series

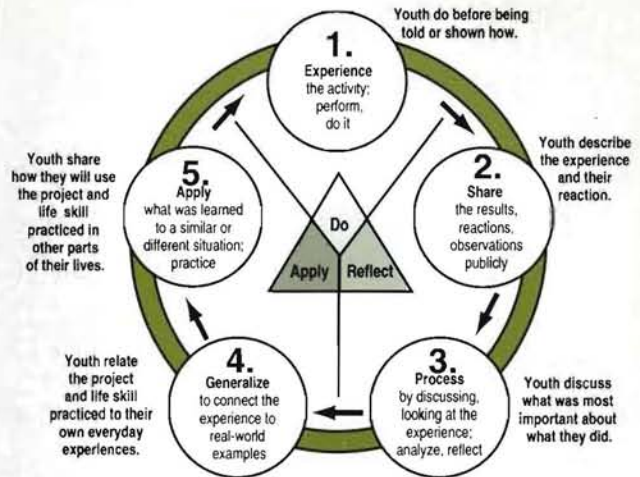
This is the first activity guide in the *Exploring Your Environment* Series.

Activity Guide	Level 1	Age	Grade
<i>Eco-Wonders</i>	1	9-12	5-7
<i>Eco-Adventures</i>	2	13-15	8-10
<i>Eco-Actions</i>	3	16-19	11-12
<i>Helper's Guide</i>			

These activity guides may be used by youth at any grade-level based on their environmental skills, knowledge and expertise. The *Helper's Guide* provides additional group activities that can be adapted to the family, classroom or youth group. These activities strengthen understanding of environmental concepts and reinforce environmental skills.

The Experiential Learning Model

The experiential learning model is used in each activity as a means to help the young person gain the most from the experience.



The five steps in this learning model encourage the young person to try to do all, part or some of the activity before being told or shown how. The activity is the experience part of the cycle. Use the questions listed in the *Making Connections* section of each activity to encourage the young person to think about what he or she has learned from the experience. The reflect and application questions ask the youth to:

- **share** what they did
- **process** what was most important about the experience
- **generalize** the life skill and earth stewardship skill practiced to their own lives
- **apply** the life skill or science process skill to a new situation.

To fulfill the experiential learning process you must complete all the steps, including the review questions in *Making Connections*. The experiential model enhances learning and adjusts to a wide variety of learning styles.

Evaluating the Experience

By asking the questions under *Making Connections* you can evaluate your youth's understanding of the key concepts and life skills practiced in each activity. Listen to and encourage consideration of each question, resulting in conclusions and opportunities for further application. In addition, the *Success Indicator* shown in the introduction of each activity will help you evaluate the experience.

In the *Helper's Guide* you will find an assessment sheet, *Evaluating the Impact*. Use this sheet to help you evaluate your youth's understanding of environmental concepts as he or she completes these activities.

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Eco-Wonders

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[http://www.epa.gov/epaoswer/osw/
basifact.htm](http://www.epa.gov/epaoswer/osw/basifact.htm)

Web Connections

[www.fourh.umn.edu/
exploreyourenvironment](http://www.fourh.umn.edu/exploreyourenvironment)

WARNING: Some web sites to which
these materials provide links for the
convenience of users are not managed
by the 4HCCS, which does not review,
control or take responsibility for the
contents of those sites.

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Welcome to Eco-Wonders!

Have you ever wondered...

- How clean is the air you breathe?
- What does a wildlife manager do?
- How can you turn waste into something valuable?
- How do the food you eat and the clothes you wear affect the environment?


Your adventures in *Eco-Wonders* will help you answer some of these questions and many more! Each section of your project book focuses on an ecological concept and provides activities that will help explain how the environment works. You'll jump right into real-world issues through investigations and explorations of the natural world!

The following information is provided in each activity:

Skills - Each activity lists Earth Stewardship Skills, Science Process Skills, Life Skills and a National Science Standard that you will learn and use. You will practice these types of skills when you answer the questions and discuss each activity with your helper.

Success Indicators - You have mastered this skill if you can do what these say. If you have trouble with this skill, keep practicing until you can.

Materials - These are the materials you will need to complete the activity.

 **Dig In** - This is the "do" part of the activity which you will usually get to share with others.

Making Connections - This is where you and your helper get together to see what you have learned about the environment. You will use these questions to help you discuss what you learned and what you did. You will talk about what was important about what you did, what it meant to you and how you could use what you learned in the future.

- **Talk It Over** - Share with others and talk about what happened in the activity.
- **Let's Reflect** - Questions get you thinking about the most important things you learned.
- **So What?** - Asks you about the activity and how what you learned relates or generalizes to your everyday life.
- **Issues to Discuss** - Helps you use or apply what you learned in a new way.



Content - Here you will find information and tips to help you complete the activity.

Dig In Deeper

These are more activity ideas to help you explore and learn about the environment. Each time you successfully complete one of these, record it on your achievement program page and have your helper initial and date it.



These are vocabulary words found in the activity. The definitions of these words are in the glossary at the back of your project book.



These are helpful hints to keep yourself safe when exploring the environment.



Here are ideas for science fair or 4-H fair projects.



Web Connections

Here you will find web site links at www.n4hccs.org where you can learn more about the environment.



Journal - You will be using an environmental journal throughout your exploration of the environment. This journal could be a spiral notebook, a three-ring notebook, a notepad or a journal you create yourself. A journal is a good place to draw or write ideas, thoughts, feelings, experiments and observations as you do each of the activities.

Your Project Helper - Your *Eco-Wonders* project helper is an important part of your overall environmental learning experience. This person may be your project leader or advisor, troop leader, teacher, family member, neighbor, friend or anyone who has the interest to work with you on these activities. Work with your helper to set your goals, work on the activities and discuss the questions. For online help visit: www.fourh.umn.edu/exploreyourenvironment

Achievement Program

Exploring Your Environment - Eco-Wonders

Guidelines

- Do at least three Required Activities and four Optional Activities (Dig in Deeper) this year and check them off.
- Have your project helper date and initial this log as you complete the activities.

Dig In Required Activities Optional Activities (Dig in Deeper)

Activity Name	Date Completed	Helper's Initials	Page/No.	Date Completed	Helper's Initials
Let's Grow					
Construct an Ecosystem					
Test the Air Quality					
Spin a Food Web					
Use Your Senses					
Weather Watch					
Round and Round					
Create a Compost Pile					
Searching for Signs of Pollution					
Food and Fiber					
Break It Down					
They Just Don't Mix					
Make a Mammal					
Camouflaged Critters					
Predator Devices					
Taking Note of Nature					
Life in the Sidewalk Cracks					
Build a Bird's Nest					



Exploring *your* Environment

Eco-Wonders Achievement Program Certificate

I certify that _____
has successfully completed the requirements of the *Exploring Your Environment - Eco-Wonders* Achievement Program, Level 1

Project Helper's Signature _____

Date _____



Ecological Themes

The activities in this guidebook will help you discover six important concepts or ideas related to ecology while you explore your environment. Each section focuses on one of these ecological concepts. The activities will help show how environmental processes and connections work.



Section 1

Four Elements Of Life – Sun, Air, Water, & Soil

The four elements or things needed for life are sunlight, air, water and soil. The combination of these elements affects all plants, animals and other living things on earth. For example, the amount of sunlight can help determine the kinds of organisms found in an area because almost all energy comes from the sun. Energy from the sun is captured in the leaves of green plants through the process of photosynthesis to produce food. All animals depend on this process (and the food it produces) for life. The availability of water also determines what creatures, including humans, can live in an area because life cannot survive more than a few days without water. Air and soil are equally important to sustaining any life on earth.



Section 2

Everything Is Connected To Everything Else

Nature is made up of a network of interconnections. Think of the links in a chain. Things in the environment, like deer or grass, make up each link. For example, in ecology a “food chain” is a series of organisms with each feeding on the one before it. For example the grass might be the first link, followed by the deer, which might be followed by a wolf. Then these chains are all connected together to make a food web. Just like a spider’s web is interconnected, an ecological food web gives a more complete picture of the relationships in an ecosystem. It shows how plants, microorganisms and animals depend on each other and on the sun, air, water and soil.



Section 3

Everything Must Go Somewhere

In nature there is no such thing as “waste.” Everything is in a constant change and becoming something else. So where does it go because there is no “away”? Materials are only moved from one place to another. They are changed from one form to another as they are used in the life processes of any organism in which they’re held for a time. Often, what is released by one organism is taken up by another as food. For example, manure (a “waste” product) is a great fertilizer that plants use. In addition, as in the case of harmful pollutants, they may build up in places where they don’t belong.



Section 4

There Is No Such Thing As a Free Lunch

For every action we take there is an effect on the natural

community. Despite what humans often think, we are animals and our lives depend on the rest of the living world, just like other animals. The materials we use to build our homes, the food that we eat and even the fuel that we use to get from here to there are tied to the natural world. And every action has a cost. There are no “freebies” in nature because everything is interconnected. Anything taken from nature by human effort must be replaced. The payment of this price can only be delayed—it cannot be avoided.



Section 6

All Plants & Animals Have a Home

The “home” is made up of two parts: habitat and niche.

The place where an individual organism (or population) usually lives is known as its habitat. A niche is the role or specific job that the organism does. For example, a rabbit’s habitat may be a field, while its job, or niche, is to eat clover. A plant or animal’s habitat is similar to what your home is to you. Here the organism can get the resources it needs. Some organisms, like fish, whales and crayfish, call the water their home. Others, like earthworms and moles, live in the soil. Still others may live on land in forests, grasslands or deserts.



Section 5

All Plants & Animals Are Affected by the M.A.D. Law (Move, Adapt or Die)

If the environment changes, plants and animals must either move or adapt to the new conditions or they will die. For example, in winter some ducks and songbirds migrate (move), rabbits, frogs and turtles adapt, and insects and weak animals may not survive. If an organism can survive, grow and reproduce under certain environmental conditions, we say that it is adapted to that environment. Adaptations are the special characteristics or features that increase an organism’s chance for survival and reproduction in that particular environment. So when the environment changes, organisms must change with it. If they don’t, they have to move or they will die.



Section 1

Four elements
of life - sun, air,
water and soil

Activity 1

Using the scientific method to discover what plants need to live and grow

Life Skill:

Reasoning – Applying rules and principles to a process

Earth Stewardship Skill:

Knowing what plants need to live and grow

Science Process Skill:

Experimenting and controlling variables

Success Indicator:

You will be able to:

1. Say what plants need to live and grow
2. Use the scientific method to observe how sunlight, soil, water and air affect plants

National Science Standard:

Understands scientific inquiry

Materials:

- bean seeds
- paper cups
- markers
- potting soil
- water
- measuring cups
- small plastic bags
- paper towels
- rubber bands
- different kinds of water
- liquids other than water
- peat moss
- clay
- sand
- gravel

Let's Grow

Some of the greatest adventures and explorations are waiting for you in your backyard, neighborhood, local pond or forest. The **environment** includes living things like plants, microbes, fungi and animals, and non-living things like water, nutrients, light, temperature and wind. Environments also include buildings, roads and homes. In general, the environment is all the living and non-living things that affect an **organism's** life. Organisms both influence and are influenced by their environment.

Ecology is the study of organisms and their relationship to one another and the environment. If you have a question about the environment, how do you find the answer? Maybe you ask someone or look in a book. Scientists have a special way of learning about things. They use the **scientific method**. The scientific method has 6 steps:

1. Ask a question or state a problem.
2. Make observations and gather information about the problem.
3. Form a **hypothesis**.
4. Test the hypothesis by designing and conducting an experiment.
5. Interpret your experimental results and make conclusions.
6. Share your information with others.

A hypothesis is a guess about the answer to a question that is based on information you've collected. It's like a prediction of what is going to happen. To test your hypothesis, you will need to design an experiment. As you work you may prove that your hypothesis is not correct. What is important is that you test your prediction using the scientific method.



Testing the hypothesis



How will you set up an experiment? First ask your question, form your hypothesis and determine how you will test your hypothesis. Collect the equipment and materials you will need for your experiment. As you do the experiment, write down what you find out. Compare your findings with your original hypothesis and make conclusions. What were the results of the experiment? Was your hypothesis correct? Lastly, tell others about what you did. The work of scientists just keeps building off the work that others have done.

Now that you know how the scientific method works, give it a try by finding out the answer to the question:

How do the things that plants need to live and grow affect plant growth?

Plants are fun and easy to study. They need four things to live and grow:

1. Sunlight
2. Air
3. Soil
4. Water



Find out how important these four things are by changing the amount or kind of these four elements and observing and measuring their affect on plant growth.

- Plant a bean seed about 1 inch deep in a cup full of potting soil. Water the seed and put it in a warm, sunny location. This is the normal condition, which is used for comparison.



- To design your experiment, first decide what growth requirement you want to study and change. Choose one thing at a time. It may be sunlight, soil, water or air. This one thing will be the only thing you change when you plant a new set of seeds.



Ecology
Environment
Hypothesis
Organism
Scientific method



Before you start each experiment, record your hypothesis in your journal. Then as you watch your bean seeds grow, record what happens to them in your journal. What do they look like? How big are they? Do they look healthy?

You can also:

- Measure your bean plant growth and graph these measurements.
- Compare growth between the test plants and the plant grown under normal conditions.
- Record special information about your plants and draw pictures of your bean plants as they grow.
- Record any thoughts or feelings you have during the experiment. Record your observations.

Using the notebook page below as an example, write down the growth requirement you tested and its affect on plant growth in your journal. Remember that if you are testing sunlight, you should still give the plants the same amount and kind of soil, air and water.

Bean Seed Experiment Notebook

Date Started _____

What I changed _____

What I left the same _____

Hypothesis:

I think the beans will grow best in _____

Because _____

Results:

The plants grew best in _____



Web Connections

For more information on exploring plants visit www.n4hccs.org and link to:

- Kids Do Ecology
- Biology4Kids



Four Elements of Life — Sun, Air, Water & Soil

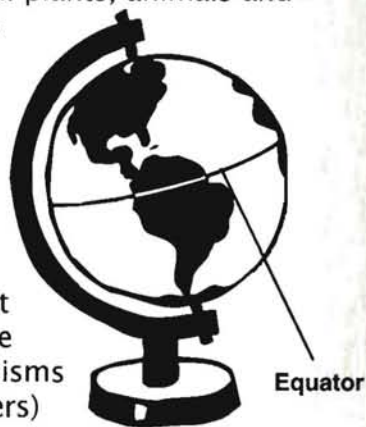
The environment consists of living and non-living things. The four elements or things needed for life are sunlight, air, water and soil. The combination of these elements affects all plants, animals and other living things on earth. For example, more direct sunlight is received at the equator than in cooler, temperate locations.

Therefore, sunlight can help determine the kinds of organisms (trees, birds, flowers) that are found in an

area. Many animals, including humans, cannot survive more than a few days without water. Most plants require soil for growth and all living things require air for life. Sun, soil, water and air are the support system for life on earth.

How will you demonstrate the affect of these four elements on plant growth?

- To test sunlight, place growing bean plants in areas without sunlight or in areas with different amounts of light.
- To test air, water the bean seeds and cover their cups with small plastic bags. Close the bags tightly with rubber bands to prevent air from getting inside.
- To test water, do not provide water to the bean seeds **you** planted. In additional experiments, you might also try providing different amounts of water or different kinds of liquids other than water.
- To test soil, try to grow bean seeds without soil at all by placing the seeds on a wet paper towel in a plastic sandwich bag. You might also try planting seeds in different types of soil like peat, moss, clay, sand or gravel and compare how these plants grow.



Making Connections

Talk It Over

- What happened to the bean plant when you changed one of the four elements of life (sun, soil, water or air)?
- Which of the four elements had the greatest effect on plant growth?

Let's Reflect

- What variations in plant growth did you observe under your experimental conditions?
- How do these four elements affect the lives of other living things such as animals and insects? How important are these elements to other living things?

So What?

- Why might we want to experiment with plants?
- Why is the knowledge of how plants grow important to people?

Issues to Discuss

- How is the bean plant growth similar to human growth? How is it different?
- Horticulture is the science and art of growing fruits, vegetables, flowers or ornamental plants. Someone who does this is called a horticulturist. Why would the study of horticulture be important to people?

Dig In Deeper

1. Suspend an old potato with lots of little buds in a jar filled almost to the top with water. Do this with four toothpicks poked part way into the potato. Keep the bottom of the potato in the water. Place the jar and potato in a shaded area for about a week. In that time roots should start to grow from the bottom and sprouts should come from the top. Then transfer the potato and jar into sunlight. What elements were important for potato growth? Share what you learned with your helper.
2. Participate in community beautification efforts. Grow the plants and flowers that will be planted around your neighborhood.
3. Cut the top off of a carrot and place it into a shallow saucer filled with some water. Surround it with rocks to hold it in place. Keep a little bit of water in the dish. Watch to see what happens.



Four elements
of life - sun, air,
water and soil

Construct an Ecosystem

Activity 2

Identifying the features
of an ecosystem

Life Skill:

Reasoning – Applying principles
to a procedure

Earth Stewardship Skill:

Understanding the components
of a healthy ecosystem

Science Process Skill:

Experimenting and observing

Success Indicator:

You will be able to:

1. Define an ecosystem
2. Build your own ecosystem
3. Explain how the four elements of life interact within an ecosystem

National Science Standard:

All populations living together
and the physical factors with
which they interact compose
an ecosystem

Materials:

- razor in safety holder
- scissors
- poke/awl/drill
- tapered reamer
- clear waterproof postal
or bookbinding tape
- silicone sealant
- two 2-liter plastic bottles
- one bottle cap
- wicking material
- water from a pond/lake
- soil collected from outside
- plant seeds such as grasses,
radishes, beans (these need
to be soaked overnight
before planting)



Using the items listed, build an ecosystem to watch how the four elements of life—sun, air, water and soil—interact. Ask an adult to help you cut the bottles, poke holes in the bottles and use the silicone sealant!

Once your ecosystem is made and all ingredients are added, it should run smoothly.

You can then watch and observe how it changes over time. Observe the changes that occur in your ecosystem and record those changes. What happens to the water in the bottles? Do the plants display healthy growth? What happens to plant leaves as they get older? Record what you observe in a journal. How does keeping a journal help you learn about the environment?



Just 4 things
and I am set
for life!



Draw a picture of what your ecosystem looks like in your journal. Draw arrows to show how the four elements of life move within the ecosystem.



Web Connections

For more information on ecosystems visit www.n4hccs.org and link to:

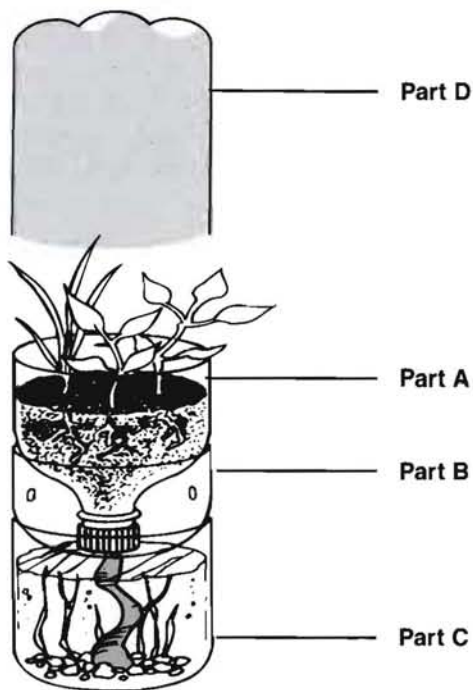
- Ecology for Kids
- Eddy the Eco-Dog





Building an Ecosystem

Use the following diagram to build an ecosystem:



Be sure to add water to the bottom of the column (Part C) before you connect A/B. Once your column is made, add soil and plant seeds to A. Then punch holes in the leftover portion of the bottle you have, section D. Attach this to the top of the column to complete your ecosystem.

Making Connections

Talk It Over

- How can the plants live and grow in your ecosystem?
- Why is water important to your ecosystem?

Let's Reflect

- Why are there holes in the bottle?
- How many relationships can you find in your ecosystem? How are the living and non-living things in your ecosystem dependent on each other?

So What?

- How do the four elements of life interact in your ecosystem?
- How does your ecosystem compare to the ecosystem in your backyard?

Issues to Discuss

- What are the similarities and differences between your ecosystem and life on earth?
- Ecologists are scientists who study ecosystems. They look at relationships between living and non-living things and the environment. There are forest ecologists, fire ecologists, plant ecologists, insect ecologists, freshwater ecologists, wetland ecologists and so on. Why are ecologists and the work they do important to us?

Science Exploration

As you are exploring, you will be working on developing some skills that will be important to you throughout your life. A skill is a learned ability to do something well. These include science skills:

- Observing** – seeing, hearing, tasting, smelling, feeling
- Communicating** – writing, questioning, drawing, speaking
- Comparing/Measuring** – using measurement tools, comparing one thing to another
- Ordering** – putting things in order or sequence
- Categorizing** – putting things in groups, sorting, classifying
- Relating** – asking questions, designing and doing experiments
- Inferring** – making predictions and conclusions, using models
- Applying** – using information to help solve problems

You will be using these science skills as you explore the environment.



Display your ecosystem at a fair. Include information about the four elements necessary for life.

Dig In Deeper

Instead of using water from a pond or stream in your ecosystem, use salt water. Just take tap water and mix in table salt. How does this affect the growth of the plants?



Four elements of life - sun, air, water and soil

Test the Air Quality

Activity 3

Identifying air polluting factors by building an air pollution collector

Life Skill:

Acquiring/Evaluating Information - Creating data gathering processes

Earth Stewardship Skill:

Understanding the importance of clean air

Science Process Skill:

Gathering and analyzing data

Success Indicator:

You will be able to:

1. Be more aware of the quality of the air you breathe
2. Make air pollution collectors to look at materials in the air

National Science Standard:

Human beings live within the world's ecosystems and modify ecosystems by destruction of habitats through pollution

Materials:

- index cards
- string
- petroleum jelly (e.g., Vaseline)
- magnifying glass or microscope

Air is one of the four elements of life. We all need **air** to breathe, but have you ever stopped to think about the quality of this air? How clean is it?

The air naturally has things in it like wind-blown dust, ash from fires and volcanoes and gases (you can't see these). Humans have also put things into the air causing **air pollution**. What's in the air where you live? Find out by making air pollution catchers.



Using the materials listed, build several air pollution catchers. After construction, tie them in different areas such as in a tree by your house, on your mailbox or outside your window at school. Leave them out for a couple of days. (**Note:** *If it rains, you will need to bring your air pollution catchers inside, or they will be ruined*). Put some of your air pollution collectors inside. Put one near a fireplace (not too close though), an air conditioner or a window.

Up or down, quality everywhere is important!



In your journal, draw a picture of what your collectors first looked like when you placed them outside. Then draw a picture of what they looked like after you collected them. Describe how they changed.



When you bring your collectors inside, use a magnifying glass or a microscope to look at the petroleum jelly area. What do you see? What materials did you collect? How do the cards placed inside compare to the cards placed outside?

Mark off an area on each index card to calculate the pollution found on the entire card. Count how many particles are in this area. Use this to estimate the number of particles on the whole card. You can then easily compare your air pollution collectors from different areas. Record your observations.



Air pollution catcher location	Amount of pollutants	Observations



Making an Air Pollution Catcher

Air pollution is caused from gases (remember, you can't see these) and pieces of matter (you can see these) that are put into the air. Gases from cars and trucks, smoke from factories and chemical sprays have all been added to our air. All of these extra things going into the air can be harmful. In large amounts they can hurt your eyes and lungs. Sometimes it can even be hard to breathe. Air pollution can look and smell bad, and it's not healthy. Some places around the world have bad air quality, but it may be getting better. Other places have good air quality.

You can build an air pollution catcher to find out what types of particles are in the air around you.



Punch a hole in an index card, and tie a string through it. Then smear petroleum jelly over the surface of the index card and hang it outdoors.

The sticky and gooey surface will catch some of the things in the air.

Hey, stick with it!



Making Connections

Talk It Over

- How did your collectors change after spending a few days in different areas?
- What kinds of things did you find on your collectors?

Let's Reflect

- Which locations showed the most air pollution?
- How would wind affect the amount of air pollution found on your collectors?

So What?

- What differences did you find in the materials collected on your cards from the different locations?
- How do you think the pollution in the air affects the organisms that use the air?

Issues to Discuss

- If you found things on your air pollution collectors, from where do you think they came?
- People who work for a pollution control agency may enforce clean air laws. They might work with car and power companies to improve air quality. Why are clean air laws and pollution control agencies important to people and the environment?



Air
Air pollution

Dig In Deeper

1. Visit a factory that helps keep the air clean as it leaves the plant. Find out about smoke stack scrubbers. How effective are these devices in cleaning the air from factories?

2. Many cities provide a daily "air quality index" for the community. Find out about this index, the scale that is used to make these predictions and how people change their daily lives with respect to this index.



Web Connections

For more information on air quality visit www.n4hccs.org and link to:

- Headbone Derby: Ecology Strikes Back!
- Eco-Pros: Environment of Planet Earth

Section 2

Spin a Food Web



Everything is connected to everything else

Activity 4

Understanding the components and interactions in a food chain and food webs

Life Skill:

Reasoning – Examining information for relevance

Earth Stewardship Skill:

Recognizing interdependence in the environment

Science Process Skill:

Organizing and classifying data

Success Indicator:

You will be able to:

1. Describe a food chain and a food web
2. Define the words producer, consumer and decomposer
3. Explain how life is made up of complex interactions
4. Construct a food web

National Science Standard:

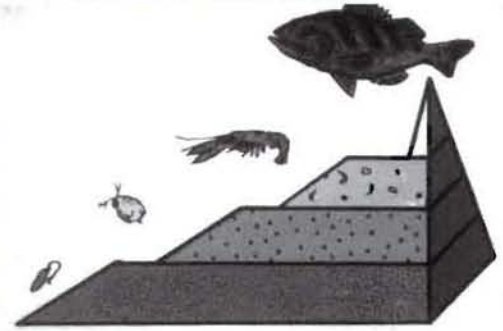
Energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores to carnivores and decomposers

Materials:

- scissors
- clothes hanger or straws
- construction paper and crayons
- string or yarn
- glue

Remember this song? "The ankle bone's connected to the leg bone. The leg bone's connected to the hip bone. The hip bone's connected to the..." and so on. So what's the point? These bones are all connected to make the human body.

We need all of these connections to do things like run or jump or dance. There are lots of connections in our environment too. A **food chain** describes how different organisms are connected to each other.



This is a simple food chain in a wetland. This chain shows what eats what in the environment and how those things depend on each other.



Nature is made up of a network of interconnections. Think of the links in a chain. Things in the environment, like deer or grass, make up each link. In **ecology**, a food chain is a series of organisms with each feeding on the one before it. For example, the grass would be the first link, followed by the deer, which might be followed by a wolf. Different food chains are connected together to make a food web.

Starting with connections in your own backyard, fill in the blanks below to help you start constructing the food chains that are part of the bigger **food web**.

The _____
 eats the _____
 and the _____
 eats the _____
 and so on.



Describe more food chains in your journal. Once you make some food chains, you can start connecting them into a web and make your own backyard food web mobile. To do this, you can either draw the things that make up the web, or you can use plentiful materials from the environment. For example, if your yard has trees you could use a twig to form the top framework of the mobile. From this you could hang leaves, nuts, seeds, etc. A leaf can represent a plant. Use construction paper to make examples of animals or rare items.

In addition you can:

- Try doing this activity in different environments. You could spin a web from a forest, a field, a wetland or wherever else your imagination and curiosity takes you. Put the name of this ecosystem at the top of the mobile (backyard, vacant lot, playground, prairie, Mississippi River, etc.). What are the producers, consumers and decomposers in each ecosystem?
- Using your food webs, draw lines from one organism to another that it depends on. For example, if a duck eats a fish, draw a line from the fish to the duck. Then you can draw a line from the duck to whatever eats it. As you connect different chains into webs on paper, you will see how many lines and connections there really are. Your food web may end up looking like a total mess because there are so many. You'll see that everything really is connected to everything else.



Making a Food Web

Many food chains together make up a food web. Although a food web is still a simple view of an ecosystem, it is an easy and good way to show the multiple connections in nature. If one living thing is destroyed, other members of the food web are affected. Each time a link is removed in the food chains that make it up, the whole web becomes weaker.

The **biotic** or living parts of the environment (the animals and plants) depend on each other, but they also depend on the **abiotic**, or non-living parts of the ecosystem. These include soil, water, air, nutrients, temperature, wind and sunlight.

All organisms that make up food chains and webs are grouped based on how they get food:

- **Producers** or **autotrophs** are organisms that make their own food. These are the green plants that use the green pigment chlorophyll to trap the energy from the sun to make food, called glucose, through a process called photosynthesis. This process is very important because all other organisms depend directly or indirectly on this reaction and producers for their food.



Consumers or **heterotrophs** are organisms that feed on the producers (plants) and other organisms as well. They do not make their own food.

There are several kinds of consumers:

- **Herbivores** are consumers that feed directly on plants (producers). Horses, cows and deer are examples of herbivores.
- **Carnivores** feed on other consumers. They are often called meat-eaters. Lions, cougars and wolves are examples of carnivores.
- **Omnivores** are consumers that eat both plants and animals. Humans, bears, pigs and raccoons are examples of omnivores.
- **Scavengers** are consumers that feed on dead animals. Beetles, vultures, flies and crows are examples of scavengers.
- **Decomposers** are consumers that break down and recycle organic matter (things that were once living) including the waste from living organisms and parts of dead plants and animals. They change dead unusable materials into nutrients that producers can use. Bacteria and fungi are examples of decomposers.

Making Connections

Talk It Over

- Hang your food web mobile where others will see it. Explain to them what it means.
- Where do humans fit into your food web?

Let's Reflect

- What kind of interconnections did you find within your food web?
- Describe the consumers and producers in your food web. Which consumers were omnivores, carnivores or herbivores?

So What?

- How do you think the things in your food web could influence other ecosystems?
- Teachers, students, librarians, principals, school counselors and parents all depend on each other to ensure a student's education. What other "webs" do you have in your life?

Issues to Discuss

- What do you think would happen if chemicals or a disease killed all the consumers in your food web?
- A wildlife manager cares for and makes decisions about certain areas of land to benefit wildlife. Why would a wildlife manager need to know about food chains and food webs?



**Safety
First**

Practice the basic rules of conservation. When you explore outside, protect the plants and animals that you are studying. Leave all animal homes unchanged.

Don't pick or kill plants unless there are many in that area and you have a reason for taking them. Pick up any litter. Take only photos. Leave only footprints. Have a positive impact on the environments you visit.



Abiotic
Autotrophs
Biotic
Carnivores
Conservation
Consumers
Decomposers
Ecology
Food chain
Food web
Herbivores
Heterotrophs
Omnivores
Producers
Scavengers



For more information on food webs visit www.n4hccs.org and link to:

- U.S. Geological Society's (USGS) TerraWeb for Kids
- U.S. Environmental Protection Agency's (EPA) Explorer's Club

Dig In Deeper

1. Try making a food web that represents what happens within your house. There are lots of little critters around (maybe some that you would rather not think about). There may be flies, centipedes, fleas, mites, cockroaches, ants, mice, etc. See if you can find any of these creatures and make a food web based on what you find. You may have to do some research to find out what these things eat or what eats them.

2. You just learned that animals eat different types of food. Some only eat plants, some only eat meat and some eat both plants and meat. Make a list of 10 animals that fit under each category. What would eat what if all of the animals were placed in a field full of a variety of plants and enclosed by a high fence?



Everything is connected to everything else

Use Your Senses

Activity 5

Using your senses to observe the natural world

Life Skill:

Acquiring/Evaluating Information—Obtaining and interpreting information

Earth Stewardship Skill:

Recognizing that our senses help us understand the environment

Science Process Skill:

Gathering and analyzing data

Success Indicator:

You will be able to:

1. Use four of your senses to observe the natural world
2. Make connections between and among the things you see, hear, smell and touch

National Science Standard:

Tools help scientists make better observations, measurements and equipment for investigations

Materials:

- pencil

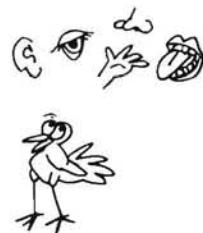


What is your favorite smell? What kind of sounds do you hear every day? What kind of things are fun to touch? What are some of your favorite things to watch? There are five main **senses**, or ways that we can learn about the world. These include hearing, smelling, tasting, touching and seeing. All of the thoughts and feelings we take in when we smell, hear, touch or see have to do with our senses.

We don't always pay attention to all our senses or use them to the fullest. If you use your senses, you can learn a lot about the environment.



That makes sense!



Choose a location in nature and pay attention to all of your senses. You may want to concentrate on just one sense at a time. For example, you may want to close your eyes as you try to smell, feel and touch what is around you.

Record at least three things from each of your four senses—sight, sound, touch and smell—as you explore your world. You will not taste in this activity because you should never taste something if you don't know what it is. Always ask an adult before you taste something in nature, because it might be poisonous.

What did you:

See?

1. _____
2. _____
3. _____

Touch?

1. _____
2. _____
3. _____

Hear?

1. _____
2. _____
3. _____

Smell?

1. _____
2. _____
3. _____

How do you think all of the things you saw, heard, touched and smelled were connected? Maybe you saw the sun shining and you touched a flower petal. These two would be connected because the flower uses the sunlight to make food. Draw lines to connect your observations. See how many connections you can find.



Sensing With Your Senses

Have you ever touched a spider's web, a pine cone, a bird's nest, tree bark, moss, feathers or rotten wood? Have you ever smelled pine pitch, moss, damp soil, worms or flower blossoms? Have you ever heard birds singing, night owls hooting, insects buzzing, trees creaking in the wind, dry leaves crunching, snow crunching under your feet or water running? Have you ever seen a patch of sunlight on the ground, a deer run through a field, a mother bird feed her baby or an acorn drop to the ground? You can experience all of these things and learn more about the environment around you when you use more than one of your senses.



Making Connections

Talk It Over

- When you used your senses did you notice some things you've never noticed before? Were they smells, sounds, touches or noises?
- Which sense was the easiest to use? Which was the hardest? Why do you think we rely on just a few senses to learn about the environment?

Let's Reflect

- Was it harder to learn things about your environment using certain senses? Why?
- Why do you prefer to pet (touch) a kitten but not a worm? How do our senses affect how we react to certain things?

So What?

- As humans we often learn a lot using our sense of sight, but we don't use our other senses as much. What things can we learn using our other senses that we can't learn by only using our sight?
- Describe situations where you rely on your senses when making decisions.

Issues to Discuss

- How did you feel as you explored the environment using your four senses?
- Some people can't use all of their senses. For example, they may be blind or deaf. How would you encourage them to learn about the environment?
- An environmental educator teaches people about the environment. They might encourage students to use their senses to explore the natural world. Why are environmental educators important to ensuring a thriving environment?



Web Connections

For more information on exploring the environment visit www.n4hccs.org and link to:

- The Wilderness Society's Kids Corner



Senses



Safety First

Be smart and aware when you explore the environment. Most accidents can be prevented if you practice safety and act responsibly. Avoid

dangerous situations such as horseplay. Discuss safety with adults, talk about emergency procedures and learn how to use a first aid kit.

Dig In Deeper

Try using your senses in different environments. How are the things you see, hear, touch and smell different in each environment? How are they the same?

Weather Watch

Activity 6

Making weather
measurement instruments

Life Skill:

Acquiring/Evaluating
Information – Creating data
gathering processes

Earth Stewardship Skill:

Understanding the relationship
between weather and living
organisms

Science Process Skill:

Collecting data

Success Indicator:

You will be able to:

1. Make some instruments to measure the weather
2. Keep a weather log and note changes in the weather
3. Describe connections between the weather and people, plants and animals

National Science Standard:

Tools help scientists make better observations, measurements and equipment for investigations

Materials:

- pencil
- thermometer
- coffee can
- ruler
- rain gauge: narrow olive jar or some other kind of clear jar with straight sides and a flat bottom, two-liter plastic soda bottle, scissors, wide clear tape, rain scale
- pinwheel: straight pin (with a flat head or push pin), construction paper, pencil with eraser, scissors

How do people, plants and animals act in different kinds of weather? Just watch the **weather** and then see what these things do in different kinds of weather. For example, do you notice that ducks are out and about during the rain? Or maybe you see that people run and hide when it rains. What happens if it is windy? How do plants react? The best way to learn about weather is to watch it!



You can become weather-wise by creating and using your own weather instruments. In this activity you will measure and observe **precipitation**, wind and **temperature**.

Precipitation

Make a **rain gauge** to measure precipitation. Precipitation is rain, snow, sleet and hail—all forms of water that fall to the earth. Place your rain gauge outside where it won't be disturbed. Find a way to keep it upright. After it has rained, read the rain scale on your rain gauge to record the amount of rain that fell. If it rained overnight, be sure to check your rain gauge early in the morning so that the water doesn't have time to evaporate.

If it snows you can set out an old coffee can to collect the snowfall. Measure the depth of the snow. Then bring the can indoors and let the snow melt. Pour the resulting water into your rain gauge and see how much water the snow made.



Wind

Make a pinwheel to help you observe the **wind**. The pinwheel won't tell you how fast the wind is blowing, but you can look at it to guess the wind's speed. Is your pinwheel moving fast? Slow? Kind of fast? Not moving at all?

Wind is air moving across the earth's surface. Sometimes the wind is gentle, but sometimes it is very strong and destructive. Winds are named by the direction from which they blow. If a wind blows from the west to the east, it is called a west wind. A north wind blows from the north. It's hard to describe wind, but you can see its effects. If you have ever had your hair blow in your face, had a paper you were holding blow away or watched a leaf float by, you've seen what the wind can do.



Use the rain gauge and the pinwheel to measure the weather. Also, use a thermometer to

measure the **temperature**. Record your measurements in the Weather Log or in your journal. Then watch how people, plants and animals act in this weather and record your observations.

Graph the results from your weather measurements so you can see changes over time.

Also, make some predictions about tomorrow's weather. Look at local newspapers or listen to the television news for **forecasts** of tomorrow's weather. Compare these to your own predictions. Were you correct?



Measuring the Wind and the Rain

Materials needed: , To make a pinwheel:

- Straight pin (with a flat head) or push pin.
 - A square of construction paper (8 1/2 x 8 1/2 is a good size to work with)
 - A pencil with attached eraser
 - Scissors
- Draw diagonal (from corner to corner) lines on your paper square. (See figure 1)
 - Use your scissors to cut along diagonal lines about two-thirds of the way to the center. Fold one of the corners to the center point. (See figure 2)
 - Then repeat for the other three corners. Overlap all four points at the center. Stick the pin through all layers of the paper and into the pencil eraser. Now your pinwheel is ready for the wind.

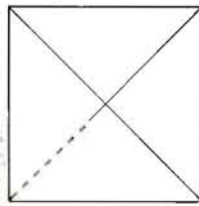


Figure 1

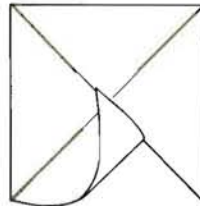


Figure 2

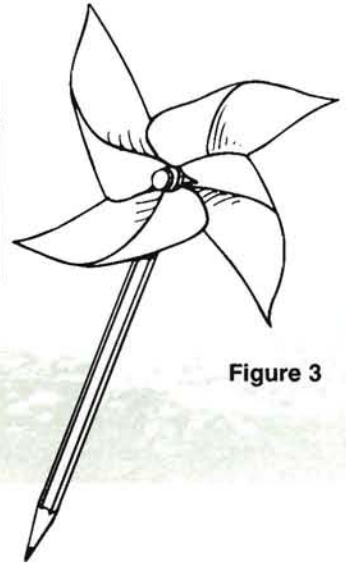
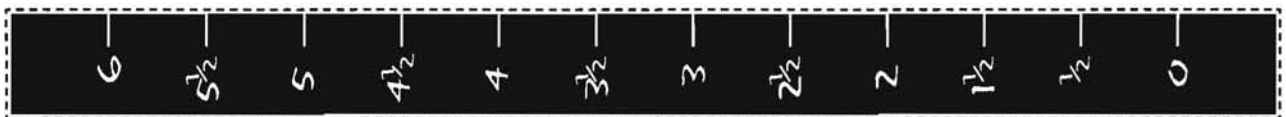


Figure 3

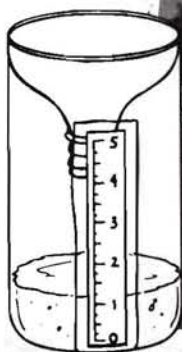
Weather Log

Date and time	Temperature	Precipitation (rain or snow?)	Wind speed	How are people, plants and animals acting?	Weather forecast for tomorrow



To make a rain gauge:

- Cut the top off of a two-liter, plastic soda bottle.
- Cut out the scale at the bottom of page 20.
- Attach the scale to a clear jar with wide clear tape. Make sure that the 0 mark is lined up with the bottom of the jar or the bottle.
- Put the bottle top upside down in the jar to serve as a funnel.
- Your rain gauge is ready to measure rainfall!



Making Connections

Talk It Over

- What kinds of weather did you observe?
- How did the weather change throughout the course of a day? Was it cooler in the evening or in the afternoon? What part of the day was the warmest?

Let's Reflect

- How did people, plants and animals act during this weather?
- What kind of pattern in the weather did you notice? For example, does it usually rain during certain temperatures?

So What?

- How does weather help show that everything is connected to everything else?
- What is the average temperature for a particular week (add up all of the temperatures then divide by the number of measurements you took)? How does the average temperature change over the course of a year?

Issues to Discuss

- What is your favorite kind of weather? In what kind of weather do you not like to be outside? Do you act differently in different types of weather?
- A meteorologist studies the weather and then tries to forecast it. Forecasting means predicting what the weather will be. Describe a time when you relied on a weather forecast to make a decision.



Web Connections

For more information on the weather visit www.n4hccs.org and link to:

- Weather Channel

Fair Ideas

Prepare a display of your weather log. Include drawings or photos of the weather.



Forecast
Precipitation
Rain gauge
Temperature
Weather
Wind

Dig In Deeper

1. Clouds come in different shapes and sizes. They can help you predict what the weather will be like. Cumulus, cirrus and stratus are just three cloud types. See if you can find out what these clouds look like and what kind of weather they indicate.

2. Research weather lore, stories and superstitions that people have used now and in the past in weather forecasting. For example, one saying goes like this: "Red sky at night, sailors delight. Red sky in morning, sailors take warning."

3. Find out about the difference between weather and climate. Share what you learn with your project helper.

Section 3



Everything must go somewhere

Activity 7

Identifying cycles in nature

Life Skill:

Reasoning – Identifying facts and principles

Earth Stewardship Skill:

Understanding the importance of cycles in nature

Science Process Skill:

Organizing and classifying data

Success Indicator:

You will be able to:

1. Explain the word "cycle"
2. Identify cycles in nature
3. Construct cycles found in nature

National Science Standard:

Organisms both cooperate and compete in ecosystems

Materials:

- 3 x 5 cards
- pencil

Round and Round

What comes after winter?
After spring?
After summer?
After autumn?
After winter?

Does there seem to be some repeating going on here? The changing of the seasons from winter to spring to summer to autumn and back to winter is called a **cycle**. A cycle is a series of events that happens over and over. It keeps repeating. It's like going around in a circle. There's no real beginning or ending.



It may seem hard to find beginnings and endings in nature. It may look as if a dead plant would represent an end, but it is just the beginning to new life as well. When the plant dies, it is broken down and its nutrients are added to the soil. Then other plants can use these nutrients to grow strong.

It may seem like a seed represents the beginning. But this seed came from a tree, which came from a seed, which came from a tree...and on and on. There are a lot of cycles in nature.

Hmm... which came first?



In nature, things that may seem useless, like dead animals, go somewhere and fit into a cycle. There is no waste in nature. Food chains, food webs, animal **migrations** and animal **hibernation** are all cycles. The lives of plants and animals are also in cycles. Their life cycles are often timed to take advantage of resources like lots of food or good weather.

The water or **hydrological cycle** is another cycle. This is the movement of water from land to the oceans to the atmosphere and back to the land. What other cycles in nature do you know about?

Make a set of cards that have the following names printed on them. Group the cards that fit together in a cycle. See if you can arrange them in the right order. How many cycles did you make?

Cloud	Seed	Insect egg	Baby
Oxygen	Winter	Day	Egg
Night	Rain	Lungs	River
Bush	Insect Adult	Teenager	Plants
Summer	Hen	Ocean	Bear
Juvenile	Insect pupa	Soil	Carbon dioxide
Autumn	Chick	Land	Berries
Adult	Toddler	Spring	Insect larva



Cycles in Nature

In nature, there is no such thing as "waste." Everything is in a constant change and becoming something else. So where does it go if there is no "away"? Materials are only moved from one place to another. They are changed from one form to another as they are used in the life processes of any organism in which they're held for a time. In the case of harmful pollutants, they may build up in places where they don't belong.

Often, what is released by one organism is taken up by another as food. For example, **manure** (a "waste" product) is a great fertilizer that plants use. Another example would be carbon dioxide that animals release when they breathe. This may be "waste" to animals, however plants need and use this gas. To complete this cycle, throughout plant life processes, oxygen (their "waste" product) is released and is used by animals.

A good way to help understand this concept is to think of a decaying tree. Once the tree dies, insects, mushrooms and other plants and animals feed on it until it is broken down into soil. Then the soil supplies nutrients to other plants. Even things that never seem to change, like rocks, are slowly broken down into soil.



Making Connections

Talk It Over

- Describe one of your cycles to a friend.
- Describe a cycle in which you or your friend would be a part.

Let's Reflect

- What are other ways to combine the cards to make different cycles?
- What would happen to a cycle in nature if one of the organisms in that cycle were removed?

So What?

- Describe the kind of cycles you see outdoors. What kind of cycles do you find indoors? How are they the same? How are they different?
- How are humans involved in the cycles in nature?

Issues to Discuss

- How can humans influence natural cycles in a positive way? In a negative way?
- Hydrologists study the characteristics, distribution and movement of water on and below the earth's surface and in the atmosphere. Why would a hydrologist need to know about cycles?



- Cycle
- Hibernation
- Hydrological cycle
- Manure
- Migration

Dig In Deeper

1. Find some other uses for the word "cycle". For example, "bicycle" has the word cycle in it. Also, there are cycles on washing machines and cycles on dishwashers.

2. Not only are there cycles in nature, but there are man-made cycles too. Recycling is one. Why do you think that this symbol is used to show if a product is recyclable?



Web Connections

For more information on cycles visit www.n4hccs.org and link to:

- Wisconsin Department of Natural Resources Environmental Education for Kids

Answers: cloud-rain-land-river-ocean; seed-bush-berries-bear-soil; insect egg-insect larva-insect pupa-insect adult; baby-toddler-juvenile-teenager-adult; oxygen-lungs-carbon dioxide-plants; winter-spring-summer-autumn; day-night; egg-chick-hen

Create a Compost Pile

Activity 8

Learning the process and principles of composting

Life Skill:

Reasoning – Applying principles to a process

Earth Stewardship Skill:

Understanding the importance of decomposition in nature

Science Process Skill:

Experimenting and collecting data

Success Indicator:

You will be able to:

1. Sort materials that can be put into a compost pile
2. Explain how to compost
3. Reduce your waste through composting

National Science Standard:

The distribution and abundance of organisms in ecosystems are limited by the ability of the ecosystem to recycle materials

Materials:

- fencing
- old plastic laundry basket or composter (optional)
- "wastes" for composting (vegetable peels, weeds, apple cores, manure, etc.)
- soil
- worms (optional)
- water
- thermometer
- shovel or pitchfork
- old plastic picnic chest (optional)
- scale
- paper
- pencil

What is **waste**? Do you throw vegetable peels and egg shells away? These things may be waste to you but they aren't waste to everything. They are food for earthworms, snails, soil animals, bacteria and fungi. Instead of throwing this kind of stuff in your garbage, you can send it somewhere else—into the **compost**.

Decomposition happens everywhere in nature. Leaves and fruit that drop from trees and are left alone will decompose. Plants and grasses that die are also broken down and become food for something else. **Microorganisms** like bacteria and fungi, as well as earthworms and snails, act as **decomposers**. They break down **organic** matter, which they use as food. The result is a dark, nutrient-rich, soil-like material called compost.



Through composting you will see that there is no such thing as waste in nature. Materials are just changing and becoming something else. Old orange peels and weeds become valuable compost, full of nutrients that serve as food for other plants. Much of what is put into the compost pile would otherwise be thrown away.



Make a compost pile.
Do the following and record your results in your journal:

- List the waste items you put into your compost pile.
- Record the weight of the materials that you put into your compost pile. By recording these original weights you can see how much waste is reduced.
- Keep a running total of the weight of the supposed "waste" products that you put in. Then weigh the finished compost.
- Take photos of your pile during the composting process.
- Draw pictures of some of the materials you put into the compost. Then draw what they look like after they are composted. Can you identify any of the materials you originally put into the pile?

Instead of throwing these "wastes" away, you have changed them to compost. These minerals and nutrients can now be turned back into the soil and recycled back to other plants.



Making a Compost Pile

To make a compost pile:

1. Choose a site for the compost pile outdoors. It should be placed on a site that drains well, is out of the way and has good aeration. You will need a total area of about 3 feet x 3 feet x 3 feet. You can use fencing or an old plastic laundry basket with the bottom cut out to keep all of the materials in a pile. There are also ready-made composters that you can buy.
2. When you create your pile, make layers with various materials. Fill your pile with various kitchen and yard wastes. If it is shredded or chopped, it will decompose faster. Use an equal mixture of "Browns" and "Greens" to speed the entire composting process.

Greens

(Materials containing nitrogen)

- Green leaves or plants
 - Weeds
- Grass clippings
- Dead flowers
- Fruit and vegetable scraps
 - Eggshells
- Peanut and nut shells
 - Coffee grounds
 - Used tea bags
- Farm animal manure (horse, cow, rabbit, chicken)

Browns

(Materials containing carbon)

- Autumn leaves
 - Twigs
- Corn stalks
 - Straw
 - Hay
- Sawdust
- Wood chips or newspaper (torn into tiny pieces)

3. Add some soil to your pile to add microorganisms to the mix that are needed for decomposition. You could also throw in a few earthworms to act as decomposers.
4. Sprinkle water on the pile to keep it moist during the composting process. The pile should feel damp, like a wrung out sponge.
5. The compost pile should reach temperatures between 90–140°F or 32–60°C within four to five days. If not, add more "Greens" to the mixture.
6. You will need to turn the pile over about once a week with a shovel or pitchfork to let air get to the bottom of the pile. Stirring helps get the needed oxygen to microorganisms for decomposition. You may notice that in 4–7 days the temperature peaks and then begins to fall. This is because the organisms eating the "waste" need more oxygen.
7. If you follow all of these suggestions, the "waste" material will rot more quickly. Your pile will begin to shrink and settle. This is a good sign! It means that the material is decomposing. If you turn your pile over every week, it should be ready in about 1–2 months. If you don't do this, it should be ready in 6–12 months.
8. The finished compost should be dark, loose and crumbly. It will look like soil and have a sweet, earthy smell. The compost is full of minerals that you can feed to plants (inside or outside) by mixing it with soil. The compost can be added to your garden or flowerpots, or used as mulch around shrubs to keep the weeds down and help keep moisture in.



Warning: Do not compost dog and cat droppings, meat scraps, bones, dairy products, raw eggs, any part of black walnut trees (they release harmful toxins), weeds that are full with seeds, diseased plants or leaves or anything else that stinks as it rots.

Making Connections

Talk It Over

- How well did the composting work?
- How long did it take for the waste to decompose into compost?

Let's Reflect

- One eco-concept explains that "Everything Must Go Somewhere." What are other ways of getting rid of wastes other than composting?
- Describe how much "waste" is thrown out after one of your meals. How much of this waste could be composted? How could you reduce the amount of waste from a meal?

So What?

- After weighing all of the materials you put into your compost pile, how much waste did you keep out of your garbage?
- Discuss with your helper the following reasons for composting:
 1. Composting continues the natural recycling of nutrients.
 2. Composting reduces the amount of wastes put into the garbage.
 3. Composting can save you money on trash removal.

Issues to Discuss

- In 1995, each person in the United States generated an average of 4.3 lbs. of solid waste per day (US EPA, 1995). Would and/or could composting influence this amount?
- A waste manager might work for the Office of Waste Management for a city. He or she would be in charge of dealing with all of the garbage that the city makes. This waste might be incinerated (burned) or put in a landfill. Why do cities and towns need someone to take care of waste?



Web Connections

For more information on recycling and composting visit www.n4hccs.org and link to:

- U.S. Environmental Protection Agency's (EPA) Recycle City



Make a display that shows and describes how you made your compost pile. Create a brochure that explains how others can compost.

Dig In Deeper



Compost
Organic
Microorganisms
Decomposers
Decomposition
Waste

1. If the weather is bad or you don't have a yard, you can compost indoors, too. An old plastic picnic chest will work, and a basement or garage is a good storage place. To compost indoors just follow the directions for making an out-of-doors compost pile.

2. Visit a compost facility where you can take your "waste" if you do not want to have your own compost pile. These facilities may take the finished compost to greenhouses, golf courses, agricultural areas or highway improvement projects.

3. Use your finished compost to grow plants. Compare these plants (their overall growth and health) with plants grown without the compost added to it.

4. Take a trip to a wooded area. Dig through the leaf litter to look at the soil. Can you see the natural composting happening? Find an old rotting log. Look for decomposers at work, breaking down this former tree into usable nutrients and minerals for new trees. How can you tell that natural decomposing is happening?



Everything must go somewhere

Searching for Signs of Pollution

Activity 9

Identifying pollution and pollution sources

Life Skill:

Solving Problems – Analyzing possible reasons or causes

Earth Stewardship Skill:

Understanding the danger of pollution to the environment

Science Process Skill:

Questioning and looking for evidence

Success Indicator:

You will be able to:

1. Define pollution
2. Give some examples of pollution
3. Look for possible signs of pollution in your community

National Science Standard:

Human beings modify the world's ecosystems through destruction of habitats through pollution, atmospheric changes and other factors

Materials:

- pencil
- paper



When you hear the word **pollution**, what do you think of? Smoke going into the sky, oil spilled in an ocean or maybe garbage thrown on the street?

Pollution could be gasoline spilled next to a gas pump, the loud noise near an airport, or too much **fertilizer** applied to a lawn. It could be soil running off bare land during a hard rain. It could include all of the road salt from plow trucks that runs off into waters when snow melts. All these things are pollution.



Search for signs of pollution both indoors and outdoors. Remember that pollution comes in many forms.

As you look for signs of pollution, you could also include places where you think that pollution could occur. A lawn, garden or farm field could possibly contribute to pollution. **Pesticides**, fertilizers and **manure** on fields and crops could all run off into waterways and cause pollution damage.

If you find a type of pollution, ask yourself these questions:

1. What is this pollution? (litter, oil, animal waste, etc.)
2. Where did or could it have come from? What is its source?
3. Might it affect the air, water, land or a combination of these?
4. How could it affect plants and animals?
5. How could it affect humans?



Record the answers to these questions and your findings in your journal.

Type of pollution	Sources of pollution	Where did you find it?	How would it hurt the environment?



Preventing Pollution

Pollution is any man-made change in the environment that creates an undesirable effect on living things. Sometimes people think that they get rid of garbage by throwing it away, that they get rid of **sewage** (human waste) by flushing it down the toilet or that they get rid of **exhaust** by releasing it into the air.

We are realizing that the pollution we supposedly "got rid of" doesn't really go away. In fact, all pollution must go somewhere. Some pollution can hang around for a long time, and it can be found in the air, on land, underground and in the water. For example, just because oil is washed off the street by rain does not mean that it really goes away. This oil could end up in our waters or in our soil.



Pollution doesn't have to be as big as an oil spill. Many of the ways we pollute are not obvious. They can happen on a day-to-day basis and be the result of the combined effects of everyone. For example, all of the litter, leaves, oil and pet wastes that people leave on the streets can go into storm drains and eventually into waterways where they are water pollutants.



Exhaust
Fertilizer
Manure
Pesticides
Pollution
Sewage

Making Connections

Talk It Over

- What are some of the effects of pollution that you observed?
- What types of pollution were the easiest to identify? Which were the hardest?

Let's Reflect

- What signs of pollution did you find?
- What kinds of pollution problems are in your community? What is being done about them?

So What?

- What effects could pollution have on a community?
- What effects could pollution have on human health?

Issues to Discuss

- Why do you think people pollute?
- Anyone can look for pollution and help clean it up—it doesn't have to be your paid job or career. If you are taking a walk, you can stop and pick up the trash you see. What are some other ways that you can help prevent pollution?



Web Connections

For more information on pollution visit www.n4hccs.org and link to:

- Agency for Toxic Substances and Disease Registry—Office of Children's Health
- National Institute of Environmental Health Sciences (NIEHS) Kids' Pages

Dig In Deeper

1. Make a TV commercial about pollution.
2. Draw and describe a made-up community that is very polluted. Then draw and describe a made-up community that is free of pollution. Show your drawings and descriptions to friends and family. Where would they rather live?
3. Help to clean up any pollution you found. You could join efforts already in place such as a highway or stream clean-up project.

Section 4



There is no such thing as a free lunch

Food and Fiber

Activity 10

Exploring how humans depend on nature for food and fiber

Life Skill:

Acquiring/Evaluating Information – Obtaining and interpreting information

Earth Stewardship Skill:

Recognizing human dependence on nature for food and clothing

Science Process Skill:

Gathering and analyzing information

Success Indicator:

You will be able to:

1. Think more about the foods you eat and the clothes you wear
2. Find out the origins of foods and fibers
3. Explain some of the impacts of food or fiber production on the environment

National Science Standard:

Organisms both cooperate and compete in ecosystems

Materials:

- foods and clothes (optional)

What are some of your favorite foods? What did you eat today? What are some of your favorite clothes? What are you wearing right now? Do you know where these foods and **fibers** (fibers are what make your clothing) come from and how they are made? Let's find out more about these products that are essential to human life.



Pick one of your favorite foods or pieces of clothing. Think through all of the steps to get that food to your stomach or those clothes on your body. What kinds of impacts does each step have on the environment? Using a variety of resources, find out the answers to these questions:

Your Favorite Food or Fiber:	How is it transported ? (trucks, ships, trains)
_____	_____
How is it produced? (planted, grown, harvested)	How is it marketed ? (advertised, displayed)
_____	_____
_____	_____
How is it processed ? (cleaned, changed into something people want, packaged, labeled)	How is it used? (eaten, worn)
_____	_____
_____	_____



Food and Fiber

Foods and clothes aren't free. Not only do they cost money in a store, but they also have other impacts on the environment. They can affect the environment, just like everything else we do.

A lot goes into (this means "made into") the things that we eat and wear. **Raw materials** are those products that are made into something else. For example, the raw materials in pizza are flour, yeast, sugar, salt, oil and water to make the crust and tomatoes, spices, cheese and lots more that you put on top. Where do these raw materials come from?



Many of the raw materials used in the food we eat and the clothes we wear come from the land. Farmers grow fruit, vegetables and grains that we eat. And they raise animals, like cows and sheep, which we also eat. Farmers bring us other natural materials like wool (from sheep), silk and cotton that we use to make clothes. Plants and animals help feed and clothe people around the world.

A lot of the ingredients in our food and clothing now come from other sources too. Humans have made new **synthetic** (not natural) materials. Synthetic materials in your clothing include things like lycra, spandex, polyester and rayon. Look at your clothes tag to see if synthetic, natural or combinations of materials were used to make your clothing.

Making Connections

Talk It Over

- What food or fiber did you choose to research? How important is it to you? How often do you eat or wear this product?
- Describe the process by which your chosen item came to you from the farm or manufacturing plant.

Let's Reflect

- What kinds of impacts might the food or fiber you selected have on the environment?
- Since people need food daily and clothes often, why is it important to preserve and take care of farm land for food and fiber production?

So What?

- Next time you take a bite of your breakfast in the morning or put on a sweater, think about from where that food or fiber comes. What kinds of impacts did it or could it have?
- Approximately a million acres of farmland is lost every year to housing developments. How might this affect the availability of food and fiber in the future?

Issues to Discuss

- Organic farmers grow food with the use of feed or fertilizer (manure or compost) that comes from plants or animals not exposed to chemical fertilizers or pesticides. Why might some people prefer organically grown foods?
- Some people choose their food or clothing based on what has the least environmental impact. What are other reasons people use when selecting food or clothing?



Fiber
Marketed
Processed
Produced
Raw materials
Synthetic
Transported

A Moo-ving Example!

Let's look at how a food product might affect the environment. Let's use milk as our example. From where does milk come?

- Milk often comes from cows. The cows probably graze in a field on grass. What could the cows do to the land?
- The farmer has to feed the cows. From where does the food the cows eat come? Does the farmer grow the cows' food? What could the farmer do to the land?
- Then the cow has to be milked. This can be done by hand or by machine. If a machine is used, how is it cleaned? What kind of effects could it have?
- Then the milk has to be processed. This includes changing it into a form that people like. It also includes putting it into containers and labeling it.
- Then the milk has to be taken to different stores. The milk is often transported by truck. What environmental effects could the truck have?
- The milk also needs to be kept cool in a refrigerator. What effects does a refrigerator have?
- Eventually, you can buy the milk. What effects does drinking milk have on you?



There sure are a lot of steps involved to get that milk into your glass! But there are even more than those described. The people that take care of the cows and that drive the trucks that carry milk have to be paid. So do the people that work at the grocery store. A lot of time and energy is needed to get that milk into your refrigerator too.



Collect at least three different types of foods or clothing (fiber). Research their ingredients or raw materials. Describe some of their impacts on the environment.



Web Connections

For more information on earth stewardship visit www.n4hccs.org and link to:

- EcoKids Online, part of the EcoKids Club
- E Patrol

Dig In Deeper

1. Draw pictures and describe some of the foods and clothes you and other people around the world eat and wear. How are they the same? How are they different?
2. What are the main foods and fibers produced in your state? What are the products into which they are made? Where are they sold?
3. We all need food and clothing. Find out how people in different countries get the food they eat and the clothes they wear.



There is no such thing as a free lunch

Break It Down

Activity 11

Finding out about biodegradable products

Life Skill:

Reasoning – Using logic to draw conclusions

Earth Stewardship Skill:

Understanding the value of biodegradable items in waste management

Science Process Skill:

Experimenting and collecting information

Success Indicator:

You will be able to:

1. Define biodegradable
2. Test how well three different kinds of waste products biodegrade

National Science Standard:

The distribution and abundance of organisms in ecosystems are limited by the ability of the ecosystem to recycle materials

Materials:

- three different kinds of waste products
- shovel
- wooden stakes
- permanent markers

W

hat were some of the products that you used today? What kinds of foods did you eat? What kind of clothes did you wear? Do you know if any of these things are

biodegradable?

Biodegradable means that a product will break down and become part of the earth again. Different things take different amounts of time to break down or biodegrade. Some things like banana peels and bread crusts will break down fast to become part of the soil. Others things like plastic bottles and Styrofoam take a long time to break down.



Select three different items that are considered wastes. This could be the wrapper from a fast food sandwich you ate, your yogurt container, some of the food you didn't eat, a sock with a hole in it that you threw away today or something else. Which of these items are biodegradable?



To find out if these items are biodegradable:

1. Take a photo or draw a picture of each waste. Include these in your journal.
2. Dig three holes in the ground that are about the same size.
3. Bury a different waste in each hole. Sprinkle some water on them to help them biodegrade.
4. Use a wooden stake to mark which hole has which waste.
5. Wait at least a month before you go back to your holes. Dig up your wastes and look to see what is biodegrading and what isn't.
6. Again, take a photo or draw a picture of the wastes.
7. Describe your experiment in your journal, record your observations and answer these questions:
 - Which items were biodegradable?
 - Which item decomposed the fastest?
 - Which was the slowest?
 - Which item decomposed the most?
 - Which decomposed the least?





Leaving Less Behind

For every action we take, there is an effect on the natural community. Despite what humans often think, we are animals and our lives depend on the rest of the living world, just like other animals. The materials we use to build our homes, the food that we eat and even the fuel that we use to get from here to there are tied to the natural world, and every action has a cost.

Lots of waste is made each day and we have to find ways to get rid of it. The problem, though, is that there are lots of people, lots of waste and not really any good ways to get rid of it. So, what can we do? You can buy products that are **durable** (this means that they last a long time); or you can buy and use products that don't have much packaging; or, you can just buy and use less.



Everything we do affects the environment, and all of this waste is not a good thing. As a result, lots of companies are now making new products that are biodegradable, such as some kinds of silverware, golf tees, packaging, leaf bags and garbage bags.



Biodegradable
Durable



Web Connections

For more information on recycling visit www.n4hccs.org and link to:

- The Earth Dog Site!

Making Connections

Talk It Over

- What waste products did you bury?
- What other types of waste do you make every day? How could you decrease the amount of waste you make every day?

Let's Reflect

- Compare the photos or pictures of the wastes before and after you dug them up. Did they start to break down?
- Was one month enough time to break down the items? How much longer do you predict it would take to break them down?

So What?

- How often do you use the products that you buried? How did the activity help you see what happens to the wastes? How did the activity encourage you to try to reduce the amount of waste you produce every day?
- What are other ways that we can recycle biodegradable materials?

Issues to Discuss

- An environmental engineer develops new products or practical methods to get a job done without damaging the environment. How might biodegradable products be important to the work of an environmental engineer?
- If you could make any kind of product that is not now biodegradable into something that could break down, what would it be? Why did you choose this product?

Dig In Deeper

1. Draw pictures of and describe some of the most common products or foods you use and eat. Are they durable or biodegradable? In what kind of packaging do they come? How does this activity make you think more about the kinds of products you use?

2. Find three different companies that make biodegradable products. What do they make?

3. How easily can you find biodegradable products in stores? Next time you are at the grocery store, a department store or mall, look for biodegradable products



There is no such thing as a free lunch

They Just Don't Mix

Activity 12

Demonstrating the effects of an oil spill

Life Skill:

Reasoning – Examining information for relevancy

Earth Stewardship Skill:

Understanding that some things hurt the environment

Science Process Skill:

Looking for evidence and analyzing results

Success Indicator:

You will be able to:

1. Discover how oil and water don't mix
2. Explore how an oil spill affects the environment
3. Determine methods for cleaning up an oil spill

National Science Standard:

Human beings modify the world's ecosystems through destruction of habitats through pollution, atmospheric changes and other factors

Materials:

- dish pan
- cold water
- vegetable oil (1–2 cups) dyed with food coloring
- liquid detergent
- hand lens
- Any of these that you have:** eye droppers or small spoons, straw/dry grass/leaves, cotton balls, styrofoam pieces, twigs/sticks/straws, string, sand, paper towels, newspaper, gravy separator, baster, strainer, kitty litter, gauze pads, coffee filters, old nylons, pieces of wood, rock, shells, fake fur, feathers, hard-boiled egg, cloth, etc. to add to your oil spill

Some things just don't mix well together. For you maybe it's peanut butter and pickles or anchovies on pizza. Maybe it's being sick riding in a car on a family vacation. Another thing that just doesn't go together is oil and water. By looking at an oil spill in the ocean, it's easy to see that oil, water and the environment don't mix.



I don't look good in black!



Pretend that you are on an oil clean-up crew after a big oil spill in the ocean. How can you clean up the oil spill? What are methods and materials for cleaning up the spill?

To find out, use the items listed in the Materials section to demonstrate how oil spills are cleaned up.

Your job is to think of ways to keep the oil from spreading and to remove it from the water. Try different clean-up methods. Always add the same amount of water and oil before you try each new method.



Record your methods and what worked and didn't work about each in the table or in your journal.

Method	Things That Worked	Things That Didn't Work

Now add rocks, shells, feathers (to represent bird feathers) or a hard-boiled eggs (to represent a bird egg) to the water. How does this affect the clean-up of the oil? Try cleaning up the items you put into the oil spill. Is this difficult to do? You can use detergent to clean the oil off. Look at the surface of the different things with a hand lens before and after you clean them.



Creating an Oil Spill

Oil is a **fossil fuel**. Natural gas and coal are also fossil fuels. They are called fossil fuels because they are made from the remains of things that lived a long time ago. When plants and animals died, their energy was captured and stored in the earth underground. Now we use this energy to drive our cars, light and heat our homes and so much more. Fossil fuels are very useful to people but spilled oil in the environment is harmful. People must take extreme care not to pollute the environment with fossil fuels.



To make an oil spill:

- Fill a dishpan halfway full with water. This will be a model of the ocean.
- Pour 1–2 cups of dyed oil into the pan. This is just like what happens when a big oil tanker spills oil into the ocean. Try to clean up the oil using the different items you collected such as cotton balls, paper towels, newspaper or coffee filters. You can filter, separate or absorb the oil. Try these clean-up and removal ideas:
 - Use twigs/sticks/straws and string to make a containment boom
 - Use straws to blow bubbles under the oil to help it move toward your collection material
 - Use sand to sprinkle on the surface to collect oil
 - Use liquid detergent to disperse the oil



Web Connections

For more information on water pollution visit www.n4hccs.org and link to:

- U.S. Environmental Protection Agency's Office of Water

Making Connections

Talk It Over

- What did you notice about the oil and the water?
- What materials and methods worked best to clean up the oil?

Let's Reflect

- What other things in nature do not mix?
- Why was it more difficult to clean up the oil spill when there were other items in the water (feathers, eggs, stones, etc)?

So What?

- What are some possible effects on plants and animals, including humans, from an oil spill?
- People depend on fossil fuels for many things in their lives. How can people balance their need for fuel with the needs of the environment?

Issues to Discuss

- How many dishpans would it take to cover the floor of your kitchen? How might you tackle a clean-up job of that size? How is this similar to an oil spill in the ocean?
- A marine biologist works with and studies plants, fish and animals that live in the seas and oceans. Why is it important that marine biologists know how to clean up oil spills before they happen?



Dig In Deeper

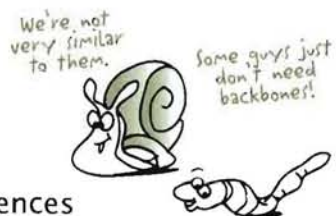
1. Make some drawings of what your clean-up methods look like. Describe how they could be improved.
2. Many people who work on their own cars get rid of their motor oil improperly by pouring waste oil into storm drains, sewers or on the ground. Educate others on how to properly dispose of their oil. Identify places in your community that recycle oil.
3. Oil spills are just one kind of pollution. What are some other kinds of pollution?

Section 5

All plants and animals are affected by the M.A.D. law

Make a Mammal

What makes a **mammal** a mammal? Mammals are a type of **vertebrate**. A vertebrate is any animal that has a backbone, called the **vertebrae**. Humans are mammals. Run your hand up the middle of your back. The bumpy bone you feel is your backbone.



Think about the similarities and differences between these groups of mammals:

Aquatic Mammals	Hoofed Mammals	Meat-eating Mammals

Within each group, what do the mammals have in common?

How is each group different from the other two groups?

When you are looking at a mammal, pay attention to its form and structure, or its appearance. Look at its various parts and structures and ask yourself, "What are they used for?" What traits does it have that adapt it for a particular type of diet? A particular way of life? The place where it lives?



Using your imagination, draw a picture of your own "mammal" in your journal. Include all the parts needed for mammal survival. Name your mammal, and fill in the blanks:

Mammal name: _____

Where it lives: _____

What it eats: _____

Write something about your mammal that makes it special.

Activity 13

Exploring the characteristics of mammals

Life Skill:

Reasoning – Identifying facts and principles

Earth Stewardship Skill:

Recognizing mammal adaptations to differing environments

Science Process Skill:

Identifying characteristics

Success Indicator:

You will be able to:

1. Describe some characteristics of mammals
2. Explain what different mammal "parts" are used for
3. Describe how mammals are adapted to their environment and their way of life
4. Make guesses about the lives of mammals based on their appearance

National Science Standard:

Species acquire many of their unique characteristics through biological adaptation, which enhance survival and reproductive success in a particular environment

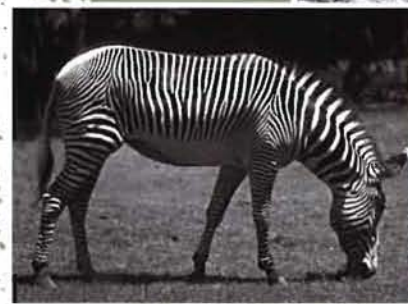
Materials:

- pencil
- wildlife magazines and books

Now choose two of the following activities and record your thoughts, answers and observations in your journal:

- Look through wildlife magazines and books for pictures of mammals. Look at each picture and pay attention to the mammal's different parts. How is the part used? How is the mammal adapted to where it lives and how it makes a living? How can you tell if the mammal hunts, or is it hunted by some other animal? What and how does it eat? How does it protect itself? How does it keep itself warm?
- Observe some real mammals. You could watch your dog or cat, or go to the park to watch squirrels. A local zoo would also be a great place to visit. Watch how these mammals use their different parts and how they are adapted to their environment and lifestyle.

- Take a look at these pictures of mammals. These are some mammals that you may have never seen before. Make some guesses about the lives of these mammals. Provide reasons for your choices.



- Do you think these mammals live in the trees or on the ground?
- Do you think they live in the water or on land?
- Do you think these mammals eat meat or plants or both?
- Do you think they run or hop?
- Do you think they live in a cold or warm area?



Marvelous Mammals

Amphibians (frogs and turtles), reptiles (snakes and lizards), birds (cardinals and penguins), fish (trout and bass) and mammals all are vertebrates. But what then makes a mammal different from these other vertebrates?

Mammals have the following characteristics:

- Mammals have lungs.
- Mammals have fur or hair (not scales like reptiles or fish, or feathers like birds).
- Mammals are usually born alive. Only two mammals lay eggs (duck-billed platypus and echidna).
- Mammal babies drink milk supplied by the mother.
- Mammals have limbs (arms and legs) with claws, hooves, or fingernails.
- Mammals are **warm-blooded**, that is, they maintain a relatively constant body temperature regardless of the temperature around them.
- Mammals have a backbone (vertebrae).

Amphibians, reptiles, birds and fish don't have all of these mammal features. If you look at all of the different mammals around the world, you will see that their characteristics vary. Different features and parts help them adapt and improve their survival in the environment where they live. Mammal **adaptations** fit their particular way of life. What adaptations do mammals have that help them survive?



Mammal "parts" and uses:

▪ Claws, hooves and nails

Claws are used for climbing, digging, fighting and/or protection and help mammals grip and move objects around. Hooves help ungulates walk on uneven ground.

▪ Horns and antlers

Horns and antlers are also found in **ungulates**. True horns grow continuously, are unbranched and are never shed. Antlers are made entirely of bone, are branched and are shed each year. Both are used by males to fight for female mates and to keep predators away.

▪ Limbs

The shape, size and look of mammals' arms and legs give you information about how they move.

- Walk and run – These mammals have long legs to help them run.
- Hop, jump, leap – These mammals have large hind feet to help them jump.
- Swim – Seals and whales have flippers and beavers have flaps of skin between their toes and fingers to help them swim.
- Fly and glide – Bats are the only mammals that fly and have wings. Flying squirrels have flaps of skin between their front and back legs that catch air and allow them to glide from tree to tree.
- Climb – These mammals have limbs that can grip branches. They may have claws or pads of their feet to help them grip.
- Digging and burrowing – These mammals have strong, wide, front feet, usually with claws, that help them dig into the ground.

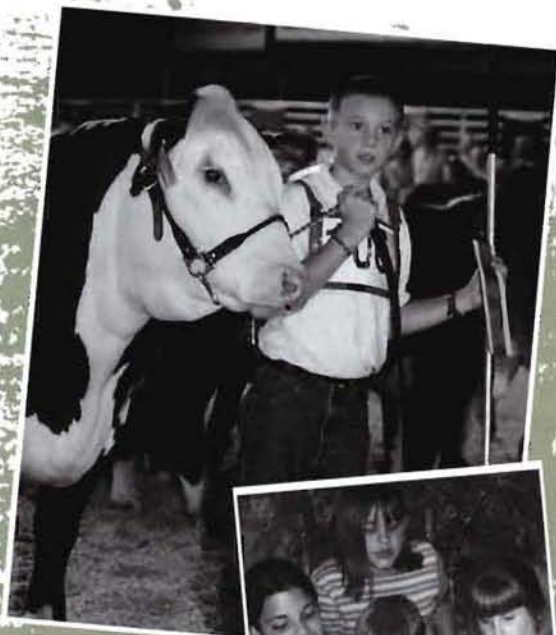
▪ Ears and eyes

The shape and size of the eyes and ears can vary. Moles have small eyes and ears for living underground. Rabbits have big ears to help them hear when a predator is near and to help cool them off. Elephants also have big ears, which they fan to keep cool.

▪ Tails

Tails help mammals balance, protect themselves, communicate with other animals, swim and even grip tree branches.

Making Connections



Talk It Over

- Did you think it was easy or hard to figure out how a mammal makes its living?
- What characteristics do all mammals share?

Let's Reflect

- What "parts" seemed to tell you the most about how the mammal makes its living?
- How do different parts aid in mammal survival?

So What?

- What do you think would happen if mammals could not adapt to the environment?
- What human adaptations have helped people live in different environments?

Issues to Discuss

- How can paying close attention to animal features help you explore the environment?
- A mammalogist studies mammals. They might focus on one mammal **species** or a group of mammals. Why would a mammalogist need to understand adaptations to study what mammals eat, how they move and how they live?

Web Connections

For more information on mammals visit www.n4hccs.org and link to:

- Ranger Rick's Kid's Zone from the National Wildlife Foundation (NWF)



Adaptation
Mammal
Species
Ungulate
Vertebrate
Vertebrae
Warm-blooded

Dig In Deeper

1. Picture a certain place or area in your mind. Then sketch and/or describe a mammal that you think would live there. Why would it look the way you drew it?

2. Teeth tell you a lot about what animals eat. Try looking at mammal skulls and pay attention to their teeth. Can you tell what they eat? You can find skulls (and help identify them) at local environmental or nature centers, natural history museums and the Department of Natural Resources.

All plants and animals are affected by the M.A.D. law

Camouflaged Critters

Activity 14

Exploring how animals use camouflage for protection

Life Skill:

Reasoning – Using logic to draw conclusions

Earth Stewardship Skill:

Understanding the importance of camouflage to animal survival

Science Process Skill:

Identifying characteristics

Success Indicator:

You will be able to:

1. Describe how camouflage is adaptive
2. State some creatures that are camouflaged and what makes them blend into their surroundings
3. Create creatures that are camouflaged in a given habitat

National Science Standard:

Species acquire many of their unique characteristics through biological adaptation, which enhance survival and reproductive success in a particular environment.

Materials:

- pictures or photos of chosen habitat types (optional)
- pencil
- materials like construction paper, glue, old shoe boxes, cans, old oatmeal containers, scissors, crayons, markers, etc.

What do you see in these pictures?

The colors, patterns, shapes and sizes of many creatures make them almost impossible to see if they don't move. A good example of this is the Australian Stick insect (*extatosomatiaratum*) pictured here. You really have to look hard to tell which part is the leaf and which part is the insect.

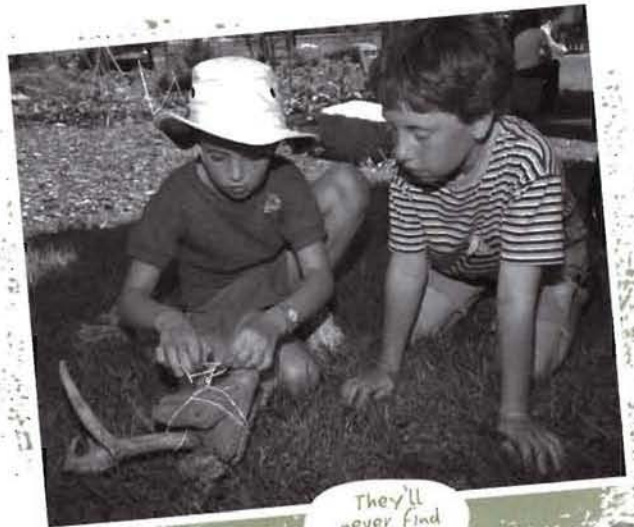
Body color, shape, pattern and even size can be a form of **adaptation**, which improves a creature's chances of surviving and reproducing. **Camouflage** is an adaptation because it helps animals blend in with their surroundings and makes them hard to see.



Think of three different habitats (places where animals live), like a forest, field, pond, underground, in a log, etc. Write these down in the table.

Think about the different colors, textures, shapes and patterns in these habitats. If you can get pictures or photos of them, do this, or even better, go examine the habitat in person.

Collect an assortment of materials to construct a creature that is adapted to live in each one of these habitats. The creature should be camouflaged within its environment.



Use your journal to record your habitat description.



Habitat #1

Draw a picture of your critter.

Describe its camouflage. _____

Is the camouflage for hunting or to keep from being hunted?

What does it eat? _____

Where does it get water? _____

When is it active? _____

If any of your three habitat types are nearby, place your creature in its environment (no hiding under objects allowed!) and then bring a friend out to see if they can find it. How camouflaged was your critter?



Hiding Out in Nature

Camouflage helps animals hide. Both **predators** (the hunters) and **prey** (the hunted animals) want to be able to hide. Predators want to be able to sneak up on their prey and prey need to be able to hide from their predators. Lots of creatures are camouflaged in their environments to help them stay alive.

Many creatures have colors or patterns that match their surroundings. Green tree frogs can seem to disappear in the green leaves of trees. Brown insects on the ground are hard to see. White polar bears are hard to spot in the snow of the Arctic. Leopards, tigers and zebras have spots and stripes that help them hide in the bushes, trees and grasses that surround them.



Some animals can even change their color to match their surroundings. Some color changes can happen for an entire season. For example, the fur of snowshoe hares and weasels changes from brown to white for the entire winter. On the other hand, flounder, octopus and chameleons can change their color rather quickly for a short time.

Other animals are not only colored to blend into their environment, but their shape matches it as well. The walking stick resembles tree twigs and the katydid resembles green leaves.



What did Katy do?



Making Connections

Talk It Over

- How did you make your camouflaged critter?
- How effective was the camouflage you put together?

Let's Reflect

- What did you see in the habitats that you thought would be helpful in making your camouflaged critter?
- What other animals use the same type of camouflage that you used for your critter?
- In what other kinds of habitats would your critter be camouflaged?

So What?

- Compare your critter to real animals. How are they alike and how are they different?
- When do humans use camouflage? Describe why camouflage can be useful to humans as well as animals.

Issues to Discuss

- In many bird species the female is very drab and dull colored while the male is more brightly colored. Make some guesses based on what you know about camouflage as to why this is so.
- A park ranger might work at a County, State or National Park. They enforce the rules, provide environmental education experiences, and help visitors enjoy their time in the park. Why would teaching visitors about animal camouflage help visitors and the animals enjoy the visits?

Share Your Ideas

Make a display of the camouflaged critters you made in this activity. Use pictures or photos. Describe how this camouflage is helpful. Make a picture with camouflaged animals hidden in it. Have people hunt for the hidden creatures.



Adaptation
Camouflage
Predator
Prey



Web Connections

For more information on animal defenses visit www.n4hccs.org and link to:

- Sea World/Busch Gardens Animal Bytes World
- Wildlife Fund's Kid's Stuff

Dig In Deeper

1. Go on a search both outdoors and in books and magazines to find ten examples of real creatures and their camouflages. Record your findings, thoughts and feelings as you learn more about camouflage.

2. To see how camouflage works, collect little strips of colored paper, pieces of colored yarn or a variety of paint chip colors. If you are inside, scatter these across a patterned carpet. If you are outside, scatter them across a lawn. Then pretend that you are a hungry bird looking for food and that those colored pieces are your food. Time yourself for 10 seconds and pick up as much food as you can. Then look through the food you've collected. Is there a particular color that was collected the most? Repeat the activity. Why is one kind of color collected the most often?

Answer Key: Brightly colored males attract females and warn other males to stay away. Females are dull and camouflaged to blend in with surroundings to incubate eggs and keep young warm once they hatch. Female plumage blends into browns and greens of nature so predators can't see her on the nest.



All plants and animals are affected by the M.A.D. law

Activity 15

Exploring predator and prey relationships

Life Skill:

Reasoning – Identifying facts and principles

Earth Stewardship Skill:

Recognizing the role of predator and prey in nature

Science Process Skill:

Classifying information

Success Indicator:

You will be able to:

1. Explain some predator strategies that animals use to catch their prey
2. Create predator devices from a variety of materials

National Science Standard:

Species acquire many of their unique characteristics through biological adaptation which enhance survival and reproductive success in a particular environment.

Materials:

- "junk" box containing things like rubber bands, paper towel rolls, pins, paper clips, clothespins, scissors, glue, tape, cardboard, string, wire, foil, staples, construction paper, pipe cleaners, etc.

Predator Devices

Have you ever heard of the words "**predator**" and "**prey**"? A predator is the hunter and the prey is the hunted. What are some characteristics that both predators and prey might share?



We are two of a kind!

Can an animal be a predator in some instances, and a prey in another instance?



To explore the predator and prey relationship, take a container and put together a "junk" box. Include things in your box like rubber bands, paper towel rolls, pins, paper clips, clothespins, scissors, glue, tape, cardboard, string, wire, foil, staples, construction paper and pipe cleaners. Do not read ahead until your box is ready.

Your task is to take the "junk" and make it into a predator part used for catching its prey. As you think about how to make your predator device, remember that predators have a lot of different strategies to catch their prey. Some set traps (antlions, spiders), some chase (cheetahs, wolves), some sit and wait (frogs, chameleons, some fish), some use special devices like echolocation to locate prey (bats, whales, porpoises), and some use a variety of these strategies. You may find the tips on page 44 helpful.

Many predators rely on their five senses to help them capture their prey. Great gray owls listen for mice under the snow. Peregrine falcons use their excellent eyesight to dive down and kill birds in flight. Many snakes smell the air with receptors in their tongue to locate prey. Some predators (lions, wolves) don't go after prey alone, but hunt in groups.



Share your "predator" with your group. Take a photo or draw a picture of your predator and include it in your journal.

Tips for Creating a Predator

Use one of these examples to create a predator device that is an extension of your body.

Create a predator device that:

- could catch a slow-moving land animal.
- could be used for hunting animals at night.
- could find, pick up and break open an egg.
- can break open hard-shelled animals.
- is to be used for getting at animals that live in rotten logs and stumps.
- can catch a flying insect.
- could dig up roots and search for grubs in them.
- can be used for getting at animals that live underground.
- can pick up leaves and search for insects beneath them.
- can get at insects that live in holes in trees.

These are just suggestions for predator devices. You can invent other strategies too.



All Plants & Animals Are Affected By The M.A.D. (Move, Adapt, or Die) Law

If the environment changes, plants and animals must either move or adapt to the new conditions, or they will die. For example, in winter some ducks and songbirds migrate (move), rabbits, frogs and turtles adapt and insects and weak animals may not survive.

If an organism can survive, grow and reproduce under certain environmental conditions, we say that it is adapted to that environment. Adaptations are then the special characteristics or features that increase an organism's chance for survival and reproduction in that particular environment.



Making Connections

Talk It Over

- Show someone how your predator device is used. What animals use this same idea in catching their prey?
- What type of prey could be captured by your predator?

Let's Reflect

- Describe how some of the animals pictured at the beginning of the activity can be both a predator and prey.
- How could prey animals adapt to avoid your predator?

So What?

- How can predators and their various devices fit into the M.A.D. Law?
- What happens to populations of prey animals when predators are removed from an ecosystem? How would this change the food webs found in an ecosystem?

Issues to Discuss

- Find out about some of the parts used in tools, machines or other equipment. How are the parts used? How are these parts similar to the "tools" used by predators? (claws, talons, teeth, etc)
- A wildlife biologist may observe and research different animals in their natural surroundings. Why is understanding the role of predators and prey important to wildlife management?



Web Connections

For more information on predators and prey visit www.n4hccs.org and link to:

- National Geographic Society



Predator
Prey

Dig In Deeper

1. Make a list of predators in your journal and then answer these questions: How do they catch their prey? What characteristics do they have to help them catch their prey? What characteristics do their prey have to get away? Share what you discovered with your helper.

2. Animals aren't the only things that can be predators. Some plants can be predators as well. Check out the Venus fly trap, sun dew and pitcher plant. Find out what kinds of prey they go after and how they catch their prey.

Section 6

All plants and animals have a home

Taking Note of Nature

Activity 16

Exploring the components of a habitat

Life Skill:

Acquiring/Evaluating Information – Obtaining and interpreting data

Earth Stewardship Skill:

Recognizing the link between an animal's habitat and its niche

Science Process Skill:

Observing and classifying data

Success Indicator:

You will be able to:

1. Look at various plants and animals in nature
2. Describe their habitat and niche

National Science Standard:

All populations living together and the physical factors with which they interact compose an ecosystem

Materials:

- pencil
- magnifying glass (optional)
- binoculars (optional)

What is your home like? Do you have any jobs to do at home? Maybe your chores are to take out the garbage and feed the dog. Animals and plants have homes and jobs too.

Plant and animal homes are called their **habitat**, and their job is their **niche**. An animal's habitat is the place where it finds food, water, shelter and space. There are also many niches, or jobs, that the organism could serve in the habitat. Its job may be to eat plants, or its job might also be to provide food for bigger animals. Now that you know what habitats and niches are, see if you can find them in nature.

What is your job for the day?



To understand the jobs of plants and animals in their different homes, choose any outdoor area to make the following observations. Record what you find in your journal, and take photographs or draw pictures of the organisms you observe.

- Look at the plants around you. Plants could include trees, shrubs, flowers, ferns and mosses. Focus on one plant at a time. What grabs your attention? Describe how it looks. Do you see any fruits, nuts, seeds, cones, or flowers on this plant? How could animals use this plant? Describe where it's found. What other plants and animals share the habitat with this plant?
- Look around at the insects. This could be an ant, spider, beetle, or butterfly. Pick out one. What do you first notice about it? Describe how it looks? Describe the area around the insect. Did you find it in a log, on a tree, on the ground, etc.? What other organisms share this space? What is it doing?



- Look at the birds. Usually they are a type of wildlife that is pretty common and easy to locate. Focus on one bird at a time. What do you first notice about the bird? Where did you see the bird? What is it doing? Is it flying, swimming, hopping on the ground, climbing on a tree, looking for food, or eating?



- Look for some other animals like frogs, fox, squirrels, turtles, bats and deer. What do you notice first? Describe how it looks. What is it doing—walking, running, hopping, digging, swimming, climbing a tree, hunting for food or eating? What signs of it do you see (tracks, droppings, chewed branches, etc.)? What do you think it eats? Describe the area surrounding the animal.



Home is where the heart is.



For each organism you observe, try to figure out its habitat. Then look to see who or what shares its habitat. Look low on the ground and high into the air. Was it alone or in a group? What was it doing? This may give you clues as to the organism's niche or its job in the habitat.

Prepare a presentation of your observations and share it with your group.



Home in a Habitat

An organism's "home" is made up of two parts: habitat and niche. The place where an individual organism (or population) usually lives is known as its habitat. A niche is the role or specific job of that organism. For example, a rabbit's habitat may be a field, while its job, or niche, is to eat clover.

A plant or animal's habitat is similar to what your home is to you. Here the organism can get the resources it needs. The habitat must have four important things:

Food – to live and grow

Water – for drinking and sometimes for bathing

Shelter – a safe place to hide, sleep, be warm or cool and be protected from the weather

Space – room to move, grow and raise their young

Some organisms, like fish, whales and crayfish, call the water their home. Others, like earthworms and moles, live in the soil. Still others may live on land in forests, grasslands or deserts.



Making Connections

Talk It Over

- What kind of plants and animals did you observe?
- Were the organisms producers or consumers?

Let's Reflect

- What is easy or hard to figure out about a plant or animal's habitat or niche?
- How is each organism important to the functioning of a habitat?

So What?

- How are some of the plants and animals you saw like you? How are they different from you? Do you have any of the same kind of jobs in your home?
- Suppose you went to an arctic region or a tundra. Describe this habitat and the animals you would find living in this area. What are these animals' niches? How does the habitat affect the type of animals (and their niches) that live in an area?

Issues to Discuss

- How have people adapted to live in different habitats? What niches do people fill in a habitat?
- A naturalist usually teaches in an outdoor setting. Naturalists often create and develop environmental activities and teaching materials for a wide range of people. What type of subjects would a naturalist teach to improve earth stewardship in a community?



Learn about any poisonous or dangerous plants and animals in your area. If you don't know what something is, let it be!



Web Connections

For more information on habitats visit www.n4hccs.org and link to:

- Department of Energy Biological and Environmental Research Program's Educational Sites for All Ages—Top Sites on the Web



Habitat
Niche

Dig In Deeper

1. Draw some of the plants and animals you observed in this activity (Dig In). What is unique about them? What made them different from the other plants and animals around them?
2. Look up some of the plants and animals you saw in an encyclopedia. Find out more about their habitats and roles in the environment.
3. How are the plants and animals you saw connected? See if you can make a food chain or food web with the organisms you observed.
4. Visit a zoo or nature center to watch the behavior of animals. Describe their habitat and niche.

All plants and animals have a home

Life in the Sidewalk Cracks

Activity 17

Discovering the many plants and animals that live around us

Life Skill:

Acquiring/Evaluating Information – Obtaining and interpreting data

Earth Stewardship Skill:

Recognizing that animals and plants are found everywhere

Science Process Skill:

Observing and classifying data

Success Indicator:

You will be able to:

1. Look at the small things found in the sidewalk cracks
2. See what things go unnoticed

National Science Standard:

All populations living together and the physical factors with which they interact compose an ecosystem

Materials:

- butter knife or Popsicle stick
- sheet of white paper
- pencil
- magnifying glass

We often forget or don't pay attention to the small stuff. On our way down the street, we may be too busy to notice the little, but living, things that are all around us. Have you ever really taken a close look at what lives around you? In this activity you will discover the many kinds of plants and animals that live in spaces as small as the sidewalk cracks.



Find an old and cracked sidewalk, driveway or parking lot. Count how many plants are growing in the cracks. How many of them are the same? Look closely for animals on the plants. You might find ants, mites, aphids and so on. Make some sketches of the small stuff you find in the cracks in the sidewalk in your journal. Record the details of each object, like its color, feel, size and special features.



To explore the sidewalk crack **habitat**:

- Pull out one or two of the plants. Can you find plants like these in your lawn or a field away from the concrete?
- Using a butter knife or Popsicle stick, scoop out some of the stuff from the crack and put it on a piece of paper. Look at it carefully and divide it into two groups—human-made objects and natural things.
- Separate the natural pile into seeds, soil parts and animals. Separate the human-made pile into metals, glass, paper and plastic. Which pile has more in it? Sketch the objects you find.
- Do you think that you have the same responsibility for the smallest plants and animals as you have for the largest tree, animal or bird? Why are we responsible for all living things? (**HINT:** Remember what you learned about the food web)



Environmental Ethics

Ethics are a system of morals or rules that guide our behavior, decisions and choices. You have a personal ethic that tells you what is right or what is wrong. Ethics deal with questions like: What is good and what is bad? What is right? What is fair? What is a good life? How should we, as human beings, behave? What are our duties, obligations and responsibilities? Our ethics can change over time and often answers to these questions will change depending on the person or group. It is important to work to understand your beliefs and values, so you can better understand why you act the way you do.



An environmental ethic then describes the relationship between humans and nature. Your personal environmental ethic describes how you think people should act in and toward the environment. How would you describe a good relationship between people and the environment? Do we have any responsibilities toward the environment? How should people act in nature? There are no right or wrong answers to these questions. It is your personal environmental ethic. It is good to develop an environmental ethic because with this you have the power to influence environmental issues.



Safety First

Learn about the area you are going to explore before you go out. Always let someone know when you go out exploring and when you think you'll be back. Also, it is best not to go into strange areas unless you are with a person who knows the area. Ask an adult to teach you how to use a compass.



DO NOT
TREAD, MOSEY, HOP, TRAMPL
STEP, PLOP, TIPTOE, TROT,
TRAIPE, MEANDER, CREEP,
PRANCE, AMBLE, JOG, TRUDGE
MARCH, STOMP, TODDLE, JUMP
STUMBLE, TROD, SPRINT, OR
WALK ON PLANTS.



Making Connections

Talk It Over

- What was the most interesting thing you found in the sidewalk cracks?
- Were there more animals or plants living in the sidewalk cracks?

Let's Reflect

- What makes up the habitat that you found in the sidewalk cracks? What is each plant's and animal's niche in the sidewalk habitat?
- How is the sidewalk crack habitat similar to your backyard habitat? How are they different?

So What?

- How did learning about small, unique and often unnoticed habitats help you understand plants and animals even more?
- How did studying this tiny habitat change your understanding of habitats?

Issues to Discuss

- What did you learn about your community by paying attention to the "small stuff"?
- Use simple words or phrases to describe your environmental ethic.
- Geographers study features of the earth's surface. They may focus on particular regions or may help to plan a new city. Why would a geographer need to understand the local habitat when planning the construction of a new building?



Web Connections

For more information on habitats visit www.n4hccs.org and link to:

- KSE Worldwide (Kids for Saving the Earth)

Dig In Deeper

1. Collect soil samples from different areas near a factory, a shopping center, a park, an alley and so on. Separate each pile as you did in this activity (Dig In). Are they different or basically the same? Can you tell the difference between areas? Have someone give you an unmarked sample. By examining it can you guess the kind of area from which it came?

2. Go on an animal safari in your own home. Take along a flashlight, a magnifying glass and some paper and a pencil. Look closely through each room for animals and evidence of animals. Be sure to look carefully in closets and dark corners. Then look outside in the bushes, trees and flowers surrounding the house. Are any of the animals the same as those you found in your house?



All plants and animals have a home

Build a Bird's Nest

Activity 18

Building a bird's nest

Life Skill:

Problem Solving – Generating an action plan

Earth Stewardship Skill:

Recognizing the variety found in different animal populations

Science Process Skill:

Solving problems through experimentation

Success Indicator:

You will be able to:

1. Name some of the materials used in bird nest construction
2. Describe some of the reasons birds build nests
3. Discover the detail of birds' nests

National Science Standard:

Biological evolution accounts for the diversity of species

Materials:

- any collected materials from nature such as sticks, twigs, grasses, mud, moss, lichens, leaves, rocks, spider webs, dog hair, horse hair (these are a variety of materials that birds actually use to build their nests), books about birds' nests, field guide to birds, tweezers

Check these out. What do you think they are?

These are actually pictures of birds' nests (mud nests of cliff swallows and suspended nest of crested oropendolas). Did you have any idea that birds' nests could be so odd looking? How could the shape or location of nests help protect the young? Why do you think nests are made certain ways?



Me, I prefer a house of wood.



Oropendula nest used with permission Honolulu Zoo www.honolulu zoo.org



Use any of the materials you collected to build a bird's nest. You can look at real pictures of birds' nests to make a copy of one, or you can design your own kind of nest. Be creative but remember you can only use materials that would be available to a bird.

To make the activity more fun, try using only your mouth and four fingers to carry materials. Birds usually carry nest-building materials in their bills or with their feet (most birds have four toes). By using only your mouth and four fingers or a tweezer to represent the bird's bill, you will get a better feel of bird nest building.

What kind of bird do you think would use the nest you built?

Why would that bird use your nest? _____

How strong do you think your nest is? _____

Would it stay together in the rain or in a windstorm? _____



Draw a picture of your nest in your journal. Write a paragraph on how you constructed your bird nest. How did you feel as you were building the nest? Was it a challenge, or was it pretty easy? What things would you have done differently?

After you have built your bird's nest and talked about it with someone, place it in a tree.



Living in a Bird's Nest

Birds don't give birth to live young, but instead lay eggs. Birds build a nest to hold these eggs and their babies once the eggs hatch. Nests are baby birds' homes. Caring for the eggs and the young is a big job. Parent birds must be careful to protect their babies from **predators** and other things that could cause harm. Temperatures in the nest also have to be just right for the babies to grow and develop. Predators and weather vary from place to place, so bird nests come in a variety of shapes and sizes to protect the baby birds from both of these hazards.



Making Connections

Talk It Over

- How easy or hard was it to build your bird's nest?
- What special adaptations do birds have that help them in nest building?

Let's Reflect

- Compare the nest you made to other kinds of real birds' nests. How are the nests similar and how are they different? Think about the structure, materials, size and shape.
- What is the role of natural camouflage in protecting birds and bird nests?

So What?

- How are bird nests like human houses?
- How does human activity affect the availability of nesting materials and nesting places? How would this affect the bird populations in an area?

Issues to Discuss

- One bird researcher suggested that 4 million songbirds are killed every day in North America by domestic cats (Stallcup, 1991). What could people do to help prevent this problem?
- A wildlife rehabilitator cares for injured birds and wildlife and works to release them back into the wild as soon as possible. When rehabilitating an injured bird, why would it be important to know about its nesting habits?



Web Connections

For more information on birds visit www.n4hccs.org and link to:

- Rainforest Action Network's Kids Corner



Predators



Design a game or quiz on birds' nests. Make flip-up panels or a rotating wheel with correct answers.

Dig In Deeper

1. Place different colors of yarn outside in the spring and watch the colors the birds take to help build their nests.

2. Did you know that birds don't just build nests in trees but they also build nests on the ground, on cliff ledges, in holes in trees and even in the ground? See if you can find out how these different kinds of nests look. Also find out about the kinds of birds that build these nests. Do any of these unique nest builders live near you?

3. Bowerbirds are large songbirds found only in New Guinea and Australia. They build some unique structures called bowers. See if you can find out what these are and how they are used.

4. Locate a nest in the wild and carefully record observations of bird activity. Try not to disturb the nest. Also, you should be careful not to hang out closely around the nest for too long. The mother bird may be scared to return to the nest and her eggs may get cold.

5. Start a birdwatching club in your area. Try going in the early morning for the best bird show. Bring along a pair of binoculars and a bird identification book, then open your eyes and ears and enjoy.

6. Find out what species of birds in your area are declining in numbers and find out why this is happening. The U.S. Fish and Wildlife Service would be a great place to start for help.

A

Abiotic – not alive

Adaptation – a change in structure, function, or form that produces better adjustment of an animal or plant to its environment

Air – the invisible mixture of gases that surround the earth; atmosphere

Air pollution – contamination of the atmosphere

Autotroph – an organism capable of sustaining itself through conversion of inorganic substances to organic material; a producer

B

Biodegradable – capable of being readily decomposed by biological means, especially by bacterial action

Biotic – of life, or caused by living organisms

C

Camouflage – a disguise or concealment of any kind

Carnivore – any animal that only eats meat

Compost – a mixture of decomposing vegetable refuse, manure, etc. for fertilizing and conditioning the soil

Conservation – the practice or act of protecting from loss, waste, etc.; preservation

Consumer – organism that feeds on producer (plants); they do not make their own food

Cycle – a complete set of events recurring in the same sequence over a period of time

D

Decomposer – an organism that breaks down organic material to forms capable of being recycled

Decomposition – to break up or separate into basic components or parts; to rot

Durable – lasting in spite of hard wear or frequent use

E

Ecology – the study of the relationships of organisms to each other and to their environment

Ecosystem – a system involving interactions of living organisms with one another and with their non-living environment

Environment – all the living and non-living things that affect an organism's life

Ethics – a system of morals (what is right and wrong) or rules that guide our behavior, decisions and choices

Exhaust – the chemicals and particles that come out of cars, trucks, buses and motorcycles

F

Fertilizer – plant nutrients that can be applied to the soil that help plants grow better

Fiber – any substances that can be separated into threads or threadlike structures for spinning, weaving, etc.

Food chain – a natural chain of organisms of a community wherein each member of the chain feeds on members below it and is consumed by the members above it, with autotrophic organisms (producers) being at the bottom

Food web – interconnected food chains

Forecast – to estimate or calculate in advance; predict or seek to predict (weather, business conditions, etc.)

Fossil fuel – dug from the earth; coal, petroleum and natural gas are fossil fuels

H

Habitat – the region where a plant or animal naturally grows or lives; native environment

Herbivore – an animal that only eats plants

Heterotroph – an organism that is incapable of synthesizing food and therefore is dependent on other organisms for it; a consumer

Hibernation – to spend the winter in a dormant state; long periods of sleep or something like sleep by which animals escape stresses like winter

Hydrological cycle – the cycle of water movement involving evaporation, precipitation and the flow to the seas

Hypothesis – a guess about some observed facts that must be tested experimentally before it can be accepted as valid or discarded if it proves to be incorrect



M

Mammal – any of a large group of warm-blooded, usually hairy vertebrates whose offspring are fed with milk secreted by the female mammary glands

Manure – animal excrement or other substance put on or into the soil to fertilize it

Marketed – buying and selling; trading of goods or services

Microorganism – any microscopic animal or vegetable organism; especially any of the bacteria, protozoan, viruses, etc.

Migration – movement from one place to another with the changes in seasons, as many birds and some fishes

N

Niche – the particular role of an individual organism in its community and its environment, including its position in the food cycle, its behavior, etc.; the specific space occupied by an organism within its habitat

O

Oil – any of various kinds of greasy, combustible substances obtained from animal, vegetable and mineral sources

Omnivore – animals that eat any sort of food, especially both animal and vegetable food

Organic – pertaining to or derived from living organisms

Organism – any living creature

P

Pesticide – any chemical used for killing insects, weeds, etc.

Pollution – decay or corruption through contamination

Precipitation – condensation that causes the fall of rain, snow, sleet or hail

Predator – an animal that lives by capturing and feeding upon other animals

Prey – an animal hunted or killed for food by another animal

Processed – prepared by a special treatment

Produce – to make or manufacture

Producer – an organism that manufactures food through the process of photosynthesis

R

Rain gauge – an instrument for measuring rainfall

Raw material – a material still in its natural or original state, before processing or manufacture

S

Scavenger – any animal that eats refuse and decaying organic matter

Scientific method – designating the method of research in which a hypothesis, formulated after systematic, objective collection of data, is tested

Senses – any of the five faculties of receiving impressions through specific bodily organs and the nerves associated with them (sight, touch, taste, smell and hearing)

Sewage – waste matter carried off by sewers or drains

Species – the fundamental biological classification consisting of a number of plants or animals all of which have a high degree of similarity

Synthetic – produced by chemical synthesis rather than by natural processes

T

Temperature – the degree of hotness or coldness of anything, usually as measured on a thermometer

Transport – to carry from one place to another, especially over long distances

U

Ungulate – belonging to a group of all mammals having hoofs

V

Vertebrae – any of the single bones or segments of the spinal column

Vertebrate – an organism that has a backbone, or spinal column

W

Warm-blooded – having a body temperature that remains relatively constant, independent of, and usually higher than, that of the surroundings

Waste – useless or discarded material, as ashes, garbage, sewage, etc.

Weather – the general condition of the atmosphere at a particular time and place, with regard to the temperature, moisture, cloudiness, etc.

Wind – a natural current of air



Environmental Books:

Eyewitness Science: Ecology by Steve Pollock; Dorling Kindersley; New York; 1993.

The Young Oxford Book of Ecology by Michael Scott; Oxford University Press; New York; 1995.

Crinkleroot's Guide to Knowing Animal Habitats by Jim Arnosky; Simon & Schuster Books for Young Readers; New York; 1997.

Who Eats What?: Food Chains and Food Webs - Let's-Read-And-Find-Out Science Stage 2 by Patricia Lauber; Harper Collins Publishers; New York; 1995.

Lives Intertwined:

Relationships Between Plants and Animals by Allen M. Young; Franklin Watts, A Division of Grolier Publishing; New York; 1996.

Nature Detective: How to Solve Outdoor Mysteries by Eileen M. Docekal; Sterling Publishing Co., Inc.; New York; 1989.

I Can Be a Biologist by Paul P. Sipiera; Children's Press; Chicago; 1992.

Nature Projects for Young Scientists by Kenneth G. Rainis; Franklin Watts; New York; 1989.

Environmental Experiments About Life - Science Experiments for Young People by Thomas R. Rybolt and Robert C. Mebane; Enslow Publishers, Inc.; Hillside, NJ; 1993.

Field Guides:

The Audubon Society Field Guide Series. New York: Alfred A. Knopf.

Golden Field Guides. Racine, WI: Western Publishing Co.

Golden Nature Guides. New York: Golden Press. (paperback series)

Peterson Field Guides. Roger Tory Peterson (Ed.). Boston, MA: Houghton Mifflin Co.

Ranger Rick's Nature Scope. Washington, DC: National Wildlife Federation.

Environmental Organizations:

The following organizations can provide you with resources. Many of them are even free. Look for activities, videos, filmstrips, CD-ROMs, audiocassettes, maps, posters, informative articles, technical information, pamphlets, brochures, and fact sheets.

Alliance for Environmental Organization

American Forest Foundation

American Nature Study Society

Ducks Unlimited

Izaak Walton League of American, Inc.

National Audubon Society

National Geographic Society

The National Wildlife Federation

The Nature Conservancy

North American Association for Environmental Education

Soil and Water Conservation Society of America

US Army Corps of Engineers

US Bureau of Land Management

US Department of Agriculture

USDA Natural Resources Conservation Service (NRCS)

US Environmental Protection Agency

US Fish and Wildlife Service





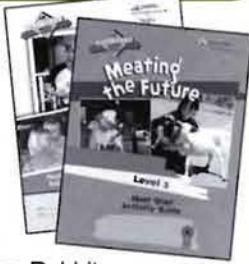
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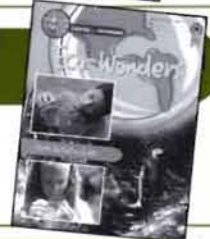
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- Health – It's Your Choice



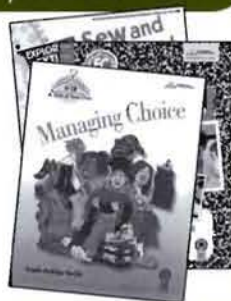
Environmental Sciences

- Exploring Your Environment



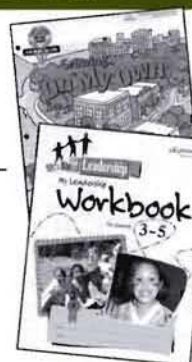
Consumer and Family Science

- Clothing Decisions – A style of Your Own
- Financial Champions
- Sewing and Textiles



Personal Development and Leadership

- Child Development – Kids on the Grow
- Moving Ahead – Adolescent Growth and Development
- Step Up to Leadership



Science and Technology

- Aerospace Adventures
- Computer Mysteries
- Electric Excitement
- Embryology in the Classroom
- Entomology
- Science Discovery Series
- Small Engines
- Woodworking Wonders



Staff and Classroom Resources

- Down-To-Earth
- Embryology in the Classroom
- Lessons and More
- Moving Ahead – Adolescent Growth And Development
- The Power of Experiential Learning
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Level 1

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