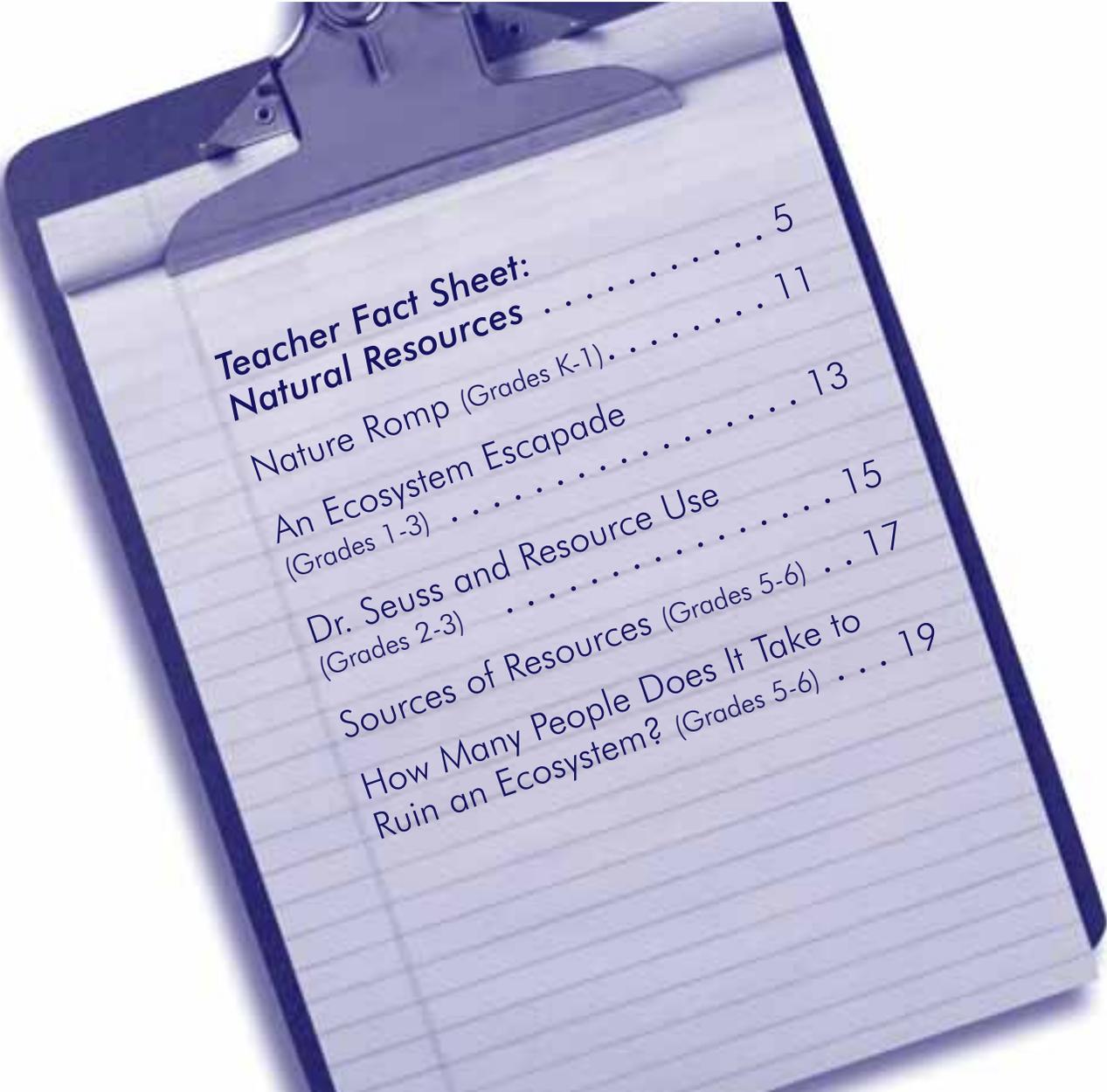


CHAPTER

1.1

Natural Resources



Teacher Fact Sheet:	
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Grade • Subject • Skills Index

Activity Name	Nature Romp	An Ecosystem Escapade	Dr. Seuss and Resource Use	Sources of Resources	How Many People Does It Take to Ruin an Ecosystem?
Grade Range					
K	✓				
1	✓	✓			
2		✓	✓		
3		✓	✓		
4					
5				✓	✓
6				✓	✓
Subjects Covered					
Math					
Science	✓	✓	✓	✓	✓
Language Arts			✓		
Social Studies				✓	✓
Art	✓	✓			
Health					
Skills Used*					
Communication	✓	✓		✓	✓
Reading			✓		
Research				✓	
Computation					
Observation/Classification	✓			✓	
Problem Solving			✓	✓	
Motor Skills	✓	✓			✓

*See Glossary of Skills for more details.

Natural Resources

What Are Natural Resources?

Natural resources are useful materials from the Earth, such as coal, oil, natural gas, and trees. People use natural resources as **raw materials** to manufacture or create a range of modern conveniences. Water and food provide humans with sustenance and energy, for example, and fossil fuels generate heat as well as energy for transportation and industrial production. Many of the same natural resources used by people are important to plants and wildlife for survival as well.

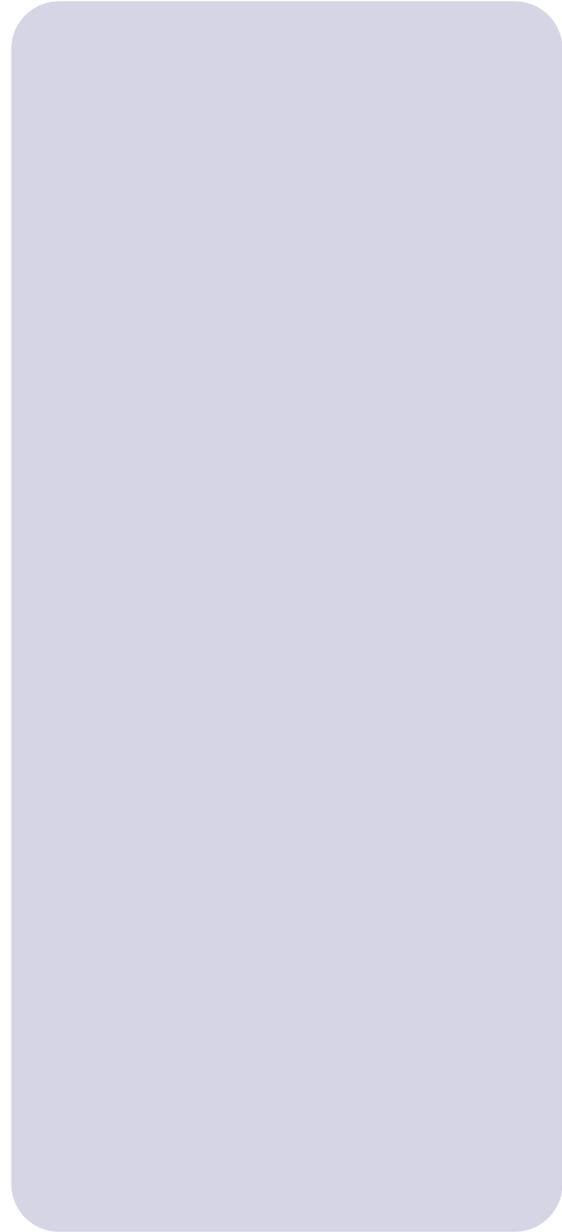


Virgin Versus Recovered Resources

Resources used for the first time are considered **virgin resources**, and their extraction, processing, and use requires a great deal of energy and can create pollution. **Resource**

recovery is a practice that conserves natural resources by extracting used materials (e.g., paper, glass, and metals) and energy from the waste stream and reprocessing them for reuse. For example, a company can create plastic from oil, a virgin natural resource, or it can use recovered plastic from recycling programs. If a company uses recovered plastic, it is actually saving materials that would otherwise become waste, helping to prevent the depletion of natural resources, conserving energy, and preventing pollution that would have been created in the extraction and processing of oil from the ground.

In addition to the benefits already discussed, using recovered resources reduces threats to **biodiversity**. Natural resource extraction, along with other human activities, increases the rate at which species of plants and animals are now



vanishing. Diminishing the Earth's biodiversity has a substantial human cost because wild species and natural ecosystems are important resources. For example, some economists estimate that the lost pharmaceutical value from plant species extinctions in the United States alone is almost \$12 billion. Reducing the land

Biodiversity

Biodiversity refers to the variety of organisms that live on Earth. Supporting so many different organisms requires the conservation of the natural resources they need to survive. Using natural resources can not only deplete the Earth of the resources themselves, but by destroying critical **habitats**, it can also drive some species to extinction, ultimately reducing biodiversity.



disturbance and pollution associated with virgin materials extraction by using recovered materials, therefore, helps stop the degradation of the Earth's ecosystems.

Renewable Versus Nonrenewable Resources

Some natural resources are nonrenewable and some are renewable. **Nonrenewable resources** are those that become depleted more quickly than they naturally regenerate. One example of a nonrenewable resource is mineral ore. Once mined and used completely, it is gone forever for all practical purposes, because it will take millions of years to regenerate.

Renewable resources can be replenished at approximately the same rate at which they are used (for example, sun and wind, which can be used to provide energy).

Products Made From Natural Resources

People use an abundance of resources to survive in a continually developing world. Globally, however, some people live simpler lifestyles than others and therefore use fewer resources. The following table lists some natural resources and the products and services people produce from them.

Natural Resource	Product/Service
Trees	Paper, furniture, fuel
Cotton plant	Clothing
Oil/Petroleum	Plastic, fuel
Gas	Fuel
Coal	Fuel
Iron ore	Steel products (cans, bridges)
Bauxite ore	Aluminum products (cans, car parts)
Gold	Jewelry, dental material
Copper	Wire, coins, electrical equipment
Manganese	Steel, cast iron
Cobalt	Steel, jet engine parts, cutting tools
Platinum	Air pollution control and telecommunications equipment, jewelry
Chromium	Stainless steel, green glass, gems (rubies and emeralds), leather treatment
Diamonds	Jewelry, mechanical equipment

Renewable or Nonrenewable—or Both?

Some resources can be considered both renewable and nonrenewable. Trees are considered a renewable resource because their supply can be replenished (e.g., more trees can be planted). If, however, an entire forest of 400-year-old trees is cleared and a new-growth forest is planted, the supply of old-growth trees has not been replenished. It takes many generations for an old-growth forest to mature, and so, old-growth trees are considered nonrenewable. Trees are a complex resource because as a forest, their environmental and economic contributions often depend on their age. For example, clearing a forest of 200-year-old Redwoods, unlike clearing a forest of new-growth pines, reduces the corollary biodiversity that is usually found in old-growth forests.

What Are the Benefits of Natural Resources?

Renewable resources offer a number of environmental and economic benefits over nonrenewable resources. One obvious benefit is the infinite supply of renewable resources—they cannot be depleted. Another benefit of using renewable resources is self-reliance. A country that can provide its own renewable resource, such as solar-powered electricity, need not rely on other countries for an energy source. Additionally, renewable resources offer communities relief during periods of recovery from natural disasters. When communities lose standard services that require the use of natural resources (e.g., electric power or natural gas), renewable resources, such as wind and solar energy systems, are used to provide these services until the usual methods of achieving service can be restored. Following Hurricane Andrew in 1992, for example, a south-Miami subdivision continued to have working streetlights because they were all **photovoltaic** (PV)-powered. The areas became neighborhood gathering spots for a community left without electricity following the storm. In several cases, homes equipped with PV systems were able to keep minimal services running and became emergency shelters for surrounding residents who had lost power.

Greenhouse Gas: A gas that absorbs and retains heat from the sun. Greenhouse gases include methane, ammonia, sulfur dioxide, and certain chlorinated hydrocarbons. A buildup of these gases traps warmth in the Earth's atmosphere, changing the global climate.

Global Climate Change: Natural- or human-induced change in the average global temperature of the atmosphere near the Earth's surface.

What Are the Challenges of Using Natural Resources?

Extracting, processing, and using natural resources creates air, water, and land pollution, which can cause global environmental problems. For example, carbon dioxide, which is produced from **deforestation**, and from burning coal, oil, and natural gas (fossil fuels), is a critical **greenhouse gas**. Many scientists believe that the buildup of greenhouse gases in the atmosphere can cause global climate change. Over time, this condition could pose serious dangers around the world, prompting such disasters as flooding, drought, and disease.

In addition, extracting and using resources can disturb relationships within **ecosystems**. For example, the effects of clearing an old-growth forest for wood can destroy habitats used by



What Are Ecosystems?

Ecosystems are self-regulating communities of plants and animals that interact with one another and with their nonliving environment. Examples of ecosystems include ponds, woodlots, and fields.

Organisms within an ecosystem are connected by energy. Individuals in a community feed on each other, thus transferring energy along a **food chain** or **food web**. In a food chain, energy is transferred from one organism to another in a linear form. For example, the sun provides fuel for a fig tree, which provides sustenance for wasps. The wasps are a food source for spiders, which are eaten by birds. More complex food webs can be thought of as a network, involving energy transfers among several organisms.

many animals, forcing them to find homes elsewhere. If these animals leave an ecosystem, further disturbances can occur within plant and animal populations that depend on these species.

Additionally, with the absence of tall trees in the forest, lower vegetation would lose shade provided by the upper canopy, resulting in increased exposure to sunlight and decreased moisture. Changes in an ecosystem's climatic conditions will eventually change vegetation type, which will alter the kinds of animals that can exist in that community. Over time, if enough ecosystems are affected, an entire community type can change (e.g., over-harvested fields can turn into deserts).



Population growth, increasing affluence, technological change, and urbanization are all responsible for rapidly rising resource consumption all over the world. The relationship between population growth and increased resource use varies among developed and

undeveloped nations. For example, according to the Department of Energy, residents of the industrialized world comprise only 20 percent of the world's population, yet consume 86 percent of its iron and steel, and 76 percent of its timber. Despite the inconsistent relationship between resource use and developed and undeveloped nations, it is apparent that worldwide, more people use more resources. With population, technology, and lifestyle demands growing exponentially, people are using increasing amounts of many natural resources.

Natural Resource Consumption Facts

- The United States uses one million gallons of oil every 2 minutes.
- Every American uses about 47,000 pounds of newly mined materials each year.
- A television requires 35 different minerals, and more than 30 minerals are needed to make a computer.
- Over the past 40 years, global consumption of wood as industrial fuel rose by nearly 80 percent. North America alone accounts for about 40 percent of both production and consumption of wood as industrial wood products.
- In 2001, each person in the United States threw away an average of 4.4 pounds of waste each day.

(Sources: Natural Resources Defense Council, 1996; National Mining Association, 2000; World Resources Institute, 2000; EPA, 2003.)

Innovative Technology Using Recovered Materials

Plastic lumber was developed to utilize low-cost materials such as plastic grocery bags and wood chips or sawdust. Used as a wood alternative, plastic lumber offers several advantages over using lumber; it is long lasting, requires limited upkeep, and resists warping and decay. One example of how using plastic lumber can conserve and recover resources is a bridge at Ft. Leonard Wood, Missouri. The construction of the plastic lumber bridge utilized 13,000 pounds of mixed plastics that otherwise would have gone to waste. This exercise in reuse translates into significant natural resource conservation.

Emerging Trends

Increasing demands for natural resources have spurred new methods for conserving existing resources. More and more companies are developing new and innovative technologies that use recycled materials as raw materials in the manufacture of products. Some steel producers, for example, use minimills and a manufacturing process that uses virtually 100 percent recovered scrap steel as the raw material.

Recovery—In Action

- More than 65 percent of the steel produced in the United States is made from recovered steel.
- The average aluminum can contains an average of 50 percent post-consumer recycled content.
- By 2003, the paper industry relied on recovered paper for 50 percent of its feedstock.
- Using recovered aluminum cans saves 95 percent of the energy required to make the same amount of aluminum from bauxite, its virgin source.
- Recycling and reuse of 2,000 pounds of paper saves 7,000 gallons of water and 380 gallons of oil.

(Sources: Steel Recycling Institute, 2000; Aluminum Association, 2000; American Forest and Paper Association, 2000; The Can Manufacturers Institute, 1997; Weyerhaeuser Company, 1999.)

How Can You Help?

An increasing number of individuals are also practicing **conservation** methods by using less—such as buying products with less packaging. (See the Teacher Fact Sheets titled *Recycling* on page 101 and *Buying Recycled* on page 107). Certain lifestyle changes, such as composting food scraps rather than buying fertilizer (see the Teacher Fact Sheets titled *Source Reduction* on page 79 and *Composting* on page 141), also preserve natural resources. Other suggestions

for ways to practice conservation of natural resources include:

- Reducing waste by reusing paper grocery and lunch bags or eliminate waste by using cloth bags.
- Donating old toys, clothes, furniture, cars, and other items to organizations such as the Salvation Army rather than throwing them in the garbage.
- Closing the recycling loop by purchasing recycled-content products and packaging.

Additional Information Resources:

Visit the following Web sites for more information on natural resources and solid waste:

- U.S. Environmental Protection Agency (EPA): <www.epa.gov>
- U.S. EPA Office of Solid Waste composting site: <www.epa.gov/epaoswer/non-hw/composting/index.htm>
- World Resources Institute: <www.wri.org>
- Natural Resources Defense Council: <www.nrdc.org>
- United States Department of Energy's National Renewable Energy Laboratory: <www.nrel.gov>
- United States Department of Energy's Center of Excellence for Sustainable Development: <www.sustainable.doe.gov>

To order the following item on municipal solid waste, call EPA toll-free at (800) 490-9198 or look on the EPA Web site <www.epa.gov/epaoswer/osw/publicat.htm>.

- *A Collection of Solid Waste Resources* on CD-ROM



Science



Art

Nature Romp



Objective

To gain an appreciation of nature and the environment.



Activity Description

Students will take a nature walk, make observations, and collect natural objects for an art activity.



Materials Needed

- Bags (e.g., old lunch or grocery bags)
- Paint
- Smocks
- Crayons
- Glue
- Scissors
- Pens or pencils
- Construction paper
- Large sheet of paper



Key Vocabulary Words

Nature
Environment
Habitat



Duration

2 hours



Skills Used

Communication
Observation/classification
Motor skills



Activity

Step 1: Draw a chart on a large piece of cardboard or poster board with headings that describe several types of natural objects that students could find outdoors. Headings might include rocks, leaves, flowers, bugs, animals, nuts (see below). Attach a sample of each of these objects (e.g., for flower, it can be a flower petal or seed). Discuss each of the

objects and tell students their mission will be to find evidence of these items in the outdoors. Examples of the types of evidence students might bring back that would fit into the category headings could include pebbles, leaves or needles, seeds, acorns, feathers, and twigs.

Step 2: Bring students outdoors into the school yard, a field, a patch of woods, a garden, or other natural area, no matter how

Rocks	Leaves	Flowers	Bugs	Animals	Nuts

small. Distribute a bag to students, and tell them they are on a scavenger hunt to find evidence of the items discussed in class. Please ensure that students only collect items that have fallen to the ground or are dead; no live plants, flowers, insects, or other organisms should be collected, nor should bark be peeled off trees. Teachers might have to work closely with students to help them locate and identify appropriate items.

Step 3: While students are collecting objects, ask them for their observations. You might want to talk about their discoveries, focusing on colors, senses, seasons, or animal lives (e.g., hibernation, food).

Step 4: Regroup in the classroom and help students spread everything they've collected on a table. Ask the students to categorize their items into the headings on the chart you prepared earlier. Compare the different colors, sizes, and shapes of each of the items. Group everyone's objects together and attach them to the posterboard, or let students keep their own pile and proceed to Step 5.

Step 5: Prepare for painting and gluing by putting on smocks and gathering the art supplies (e.g., paper or cardboard, glue, crayons, paint, construction paper, and scissors). Ask students to create artwork, using objects they collected, that depicts the natural environment they just explored. Students can glue natural objects directly onto the paper, or they can create a sculpture. Students could also create cut-outs of animals or plants that they observed.

Step 6: Allow the artwork to dry and hang posters around the classroom to bring a little of the environment indoors!

Teachers: Please note that many federal and state land management agencies prohibit or discourage collecting living or non-living items in a natural environment. Depending on your situation, you might want to consider directing students to draw or paint the live organisms they find as a substitute for the real thing.



Assessment

1. Ask students if they found anything outside that they had never seen before. If so, can they explain what it is?
2. Review some of the specific items found and what their purpose is.
3. Ask students to share what they like best in nature.



Enrichment

1. Schedule a day trip to a local nature center where students can participate in further outdoor education.
2. Adopt a specific tree in your schoolyard and observe how it changes through the seasons. Have students draw the tree during different seasons.
3. Participate in an environmental education workshop and obtain copies of the conservation/environmental education activity guides entitled *Project WILD K-12*, *Project WILD Aquatic Education*, or *Project Learning Tree*. Project WILD's state coordinators and their facilitators conduct workshops (usually 6 hours long) for educators within their state. The activity guides are provided to those who participate in the workshops. They include numerous indoor and outdoor hands-on activities related to the environment, with a focus on wildlife. Other classroom materials are available without participating in the workshops. For more information, and to find out how to get information in your state, visit the Web site <www.projectwild.org>. You can also contact the Project WILD National Office at (713) 520-1936 or <info@projectwild.org>.

An Ecosystem Escapade

Objective

To learn how animals and plants depend on each other in ecosystems.

Activity Description

Students will role-play elements of a food web to illustrate the connections in ecosystems.

Materials Needed

- Paper or cardboard
- Crayons or markers
- Scissors and string
- Hole-punch

Subjects Covered

Food chain
Food web
Ecosystem

Duration

1 hour

Skills Used

Communications
Motor skills



science



art

Activity

Step 1: If possible, take the students outside into a natural environment, such as woods (otherwise, ask them to use their imaginations and conduct the lesson indoors). Explain what an ecosystem is and what types of ecosystems are in your area. Ask them to identify different animals and plants that they see when they go outside. Discuss in a group what all animals and plants have in common (i.e., that they need to eat). Explain how some animals eat plants, some plants eat animals (e.g., a Venus Fly Trap), and some animals eat other animals. Ask the students what they eat.

Step 2: Explain that animals and plants rely on each other for food and for survival. All of the plants and animals working together, eating each other and being eaten, is part of nature and can be

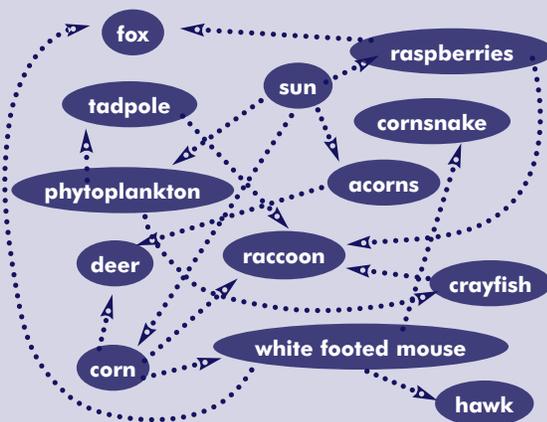
Sample Food Chain:

(in an Eastern U.S. deciduous wooded ecosystem)



Sample Food Web:

(in an Eastern deciduous wooded ecosystem)

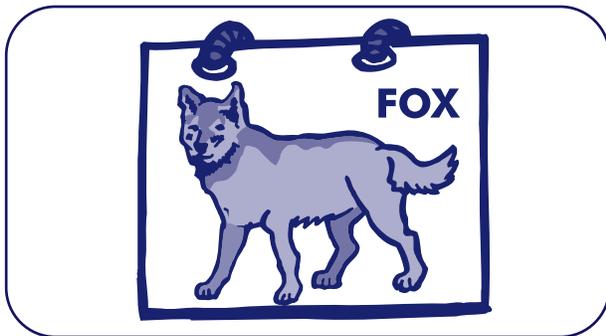


Arrows indicate the direction that energy is transferred.

described as “food chains” or “food webs.” Show the students an example on the board (see sidebar for examples of food chains and food webs).

Step 3: Based on the animals and plants that are named by the students, create a food web on the board and have students help you decide which animals and plants eat each other.

Step 4: Have each student pick one animal or plant in the ecosystem described on the board. Instruct each student to draw a picture on a piece of paper or cardboard of their animal or plant and write its name near the picture.



Step 5: Using a hole-punch and string, help students create a placard to identify them as a particular animal or plant.



Step 6: Facilitate an exercise with the students in which they find the animal or plant that they eat and link hands with that person. If the food web is created properly, many people should be holding hands.



Assessment

1. As Step 6 is being conducted, ask students to remember what eats what. If there is more than one option, acknowledge students when they say a correct answer, even if no one in the class is role-playing that particular plant or animal.
2. Ask students why animals eat other animals or plants.
3. Ask students what would happen to the plants and animals in the food web if one plant or animal disappeared. Explore with students reasons why an animal or plant would disappear.



Enrichment

1. Create illustrations and placards exemplifying a chain of foods that the students eat. Then link hands to create one or more chains (for example, people eat hamburger, which is made from cows, which eat grass).
2. Teach the students the words to “This Land Is Your Land” and sing it as a class. Discuss some of the lyrics that describe particular ecosystems (e.g., redwood forests).
3. Tell students the different types of ecosystems that exist in your geographic location, such as streams, ponds, forests, deserts, and meadows. Have each student pick one and draw a picture of it, including animals and plants that live in it. If possible, have students collect items in nature, such as leaves, acorns, bones, bark, to include in their artwork.

Dr. Seuss and Resource Use



Objective

To learn about resources and the potential negative impacts humans can have on the environment through overconsumption.



Activity Description

Students will listen to the teacher read *The Lorax* by Dr. Seuss. The teacher will then show the class products that exemplify reduced resource consumption.



Materials Needed

- *The Lorax* by Dr. Seuss



Key Vocabulary Words

Natural resources
Pollution
Ecosystem
Consumption



Duration

2 hours



Skills Used

Reading
Problem solving



Activity

Day 1: Listening Exercise

Step 1: Introduce and discuss the concept of natural resources and product consumption with students (refer to the Teacher Fact Sheet titled *Natural Resources* on page 5). Review vocabulary words above. Note how humans continue to consume more and more products, which takes a toll on the environment.

Explain that ecosystems are comprised of many different interrelated components, such as different plant and animal species. Add that when one part of an ecosystem is disturbed, it impacts the entire ecosystem.

Step 2: Take students to a quiet area outside where they can sit comfortably and listen without distractions. Have students sit in a circle. Once settled, ask students to close their

eyes and take three long deep breaths to help them relax.

Step 3: Once students are calm and attentive, read *The Lorax* out loud. In this story, a character called the “Once-ler” cuts down “Truffula” trees for their valuable silk tufts and uses them to make “thneeds.” Due to increasing thneeds sales, the Once-ler builds a factory and invents an axe that can cut down four trees at once. The Lorax, a wise creature of the forest, recognizes the potential harm this could have on the Truffula tree forest ecosystem. He speaks up to defend the trees, animals, air, and water that the Once-ler is destroying in pursuit of more money and to satisfy those who want thneeds. Eventually all the Truffula trees are depleted, and the Once-ler can no longer produce thneeds. The once beautiful site is left contaminated with polluted air and water.



science



language
arts



Journal Activity

Remind students that the Lorax spoke for the trees, "for the trees have no tongues." Ask students to choose one thing in the environment that is in jeopardy and cannot speak for itself and defend it. Why is it in jeopardy?

Step 4: Discuss the story with the students. Begin by asking them why the Once-ler is called the "Once-ler." Evaluate why the Once-ler had to use all the Truffula trees and ask the students to speculate why he would not listen to the Lorax. Ask the students if they can suggest a way for the Once-ler to make thneeds without destroying the ecosystem in which the Lorax lived.

Step 5: Have students suggest "thneeds" that they often use (e.g., clothes, food, books). Instruct students to go home that night and think about how they can consume less resources while still using their thneeds. One example is buying used clothing instead of new clothing. Instruct students to bring in their thneed for a "show and tell" activity the following day.

Day 2: "Show and Tell"

Step 1: Have students present their thneed and explain their solution for consuming less resources while using their thneed. If the student cannot think of a solution, ask the class to contribute its ideas.



Assessment

1. Ask the students why the Once-ler cut down the Truffula trees.
2. Ask the students why the Brown Bar-ba-loots have to leave the forest after the Once-ler starts his thneed production. Could something like this happen in real life? How?
3. Have students list three ways the Thneed factory caused problems for the Truffula Tree forest and its residents.
4. Have students explain what the Lorax's message "Unless" means (answers should include the need for future generations to protect and care for the Earth).



Enrichment

1. Break students into groups of approximately five students. Have students rewrite *The Lorax* so that the Truffula tree forest and its inhabitants are saved. Students can use this to develop a script and act out their own story in front of the class.
2. Instruct students to create a collage of their needs and wants, labeling them "thneeds" and "thwants," by cutting pictures out of magazines. Once the collages are complete, ask the students to tell the class about opportunities to use less resources with the thneeds and thwants.



science



social studies

Sources of Resources



Objective

To identify natural resources as renewable or nonrenewable; to learn where resources come from; and to understand how overconsumption of limited supplies can be problematic.



Activity Description

Students will research resources, investigating their sources and uses. They will present conclusions to the class and identify on a map where the resource is most often found.



Materials Needed

- Wool sweater
- Plastic milk jug
- Metal can
- Glass bottle
- Plastic boot or raincoat
- Fruit and/or vegetables
- Wood object (chair, ruler, etc.)
- Cotton T-shirt
- Paper
- Dairy product (egg, cheese, milk, etc.)
- Leather (belt, shoe, purse, etc.)
- Pushpins
- Paper (used to make small labels/tags)
- Scissors
- Pens
- World map



Subjects Covered

Natural resources
Renewable
Nonrenewable
Raw materials
Consumption



Duration

1 hour



Skills Used

Communication
Research
Observation/classification
Problem solving



Activity

Step 1: Display all of the materials from the “Materials Needed” list above except for the last five items. Discuss the concept of natural resources with the students and ask them to identify what each of the objects on display are made from (refer to Teacher Fact Sheet titled *Natural Resources* on page 5). List their answers on the board. Use the list to define and explain the key vocabulary words.

Valuable Natural Resources

Aluminum	Nickel
Chromium	Oil
Coal	Petroleum
Cobalt	Platinum
Corn	Silver
Diamonds	Tin
Fish	Wheat
Fresh Water	Wool
Gold	Zinc



Journal Activity

Ask students to list the kinds of natural resources they use frequently. Are they renewable or nonrenewable? Ask students to write about what they would do if the world supply of the resource ran out.

Step 2: Have a brainstorming session with students to identify well-known resources such as those listed in the “Valuable Natural Resources” sidebar. Try to come up with at least as many resources as there are students in the class. Write the list on the chalkboard.

Step 3: Have each student choose a natural resource from the list.

Step 4: Instruct students to research their chosen resource. They should use library and Internet resources to investigate the dominant sources and uses for their resource. Students should also research consumption of their resource and analyze whether their resource might become depleted in the near future.

Step 5: Display a large map of the world in the front of the classroom.

Step 6: Have students write the name of their resource on several small pieces of paper.

Step 7: Have students present information about their resource to the class, discussing their research conclusions. Students should begin their presentation by telling the class what their resource is and where it is most typically found. Students should pin the paper that labels their resource on the map at the appropriate regions. Additionally, students should discuss whether the resource is renewable or nonrenewable and tell the class some of the resource uses and any associated consumption issues.



Assessment

1. Ask students to identify the natural resources used to make items, other than those previously studied. Have students think about their house, family car, room, school, or other familiar objects in their lives.
2. Test students’ memory of where some of the assigned resources come from. Take the pins out of the map and have students place the pins at the proper geographic locations as you call out the resources.
3. Ask students to explain and discuss the importance of monitoring resource consumption. Also, discuss why it is important to develop and discover alternatives to certain resources.



Enrichment

1. Have students research, via the Internet or the school library, information on our global population and specific resource quantities. Have them calculate and record figures to determine the approximate future supply of particular resources.
2. Have students pick their favorite resource and identify ways to conserve it. With this information, have students write and act out a skit that exemplifies resource conservation practices.
3. Conduct a geology lesson that incorporates a discussion of the formation of some common natural resources (e.g., coal, petroleum, diamonds). Ask students why all resources are not located right in their backyards. Discuss what this means in terms of resource availability (e.g., how we get resources from other countries).



science



social studies

How Many People Does it Take to Ruin an Ecosystem?



Objective

To learn how animals and plants depend on each other in ecosystems and how human activities can impact ecosystems.



Subjects Covered

Food chain
Food web
Ecosystem



Activity Description

Students will role-play elements of a food web to illustrate the connections in ecosystems and will respond to real-life scenarios that impact ecosystems.



Duration

1 to 2 hours



Materials Needed

- Red stickers
- Green stickers
- Black stickers
- Cardboard
- String



Skills Used

Communications
Motor skills



Activity

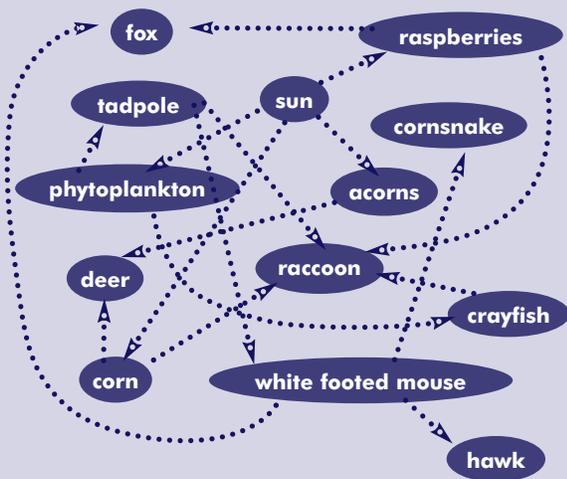
Step 1: Discuss ecosystems with students and identify the types of ecosystems that exist in your geographical area. Select an ecosystem to study (e.g., forest, meadow, stream, pond).

Step 2: As an in-class exercise with students, brainstorm some of the animals and plants that make up that ecosystem. Have a student write everything on the board and have the class create links between the items that plants and animals eat and those that eat them. The result should be a complex food web (see example in the side bar). Leave the food web on the board until the next day.

Step 3: Assign each student to a particular plant or animal that exists in a

Sample Food Web:

(in an Eastern U.S. deciduous wooded ecosystem)



Arrows indicate the direction that energy is transferred.

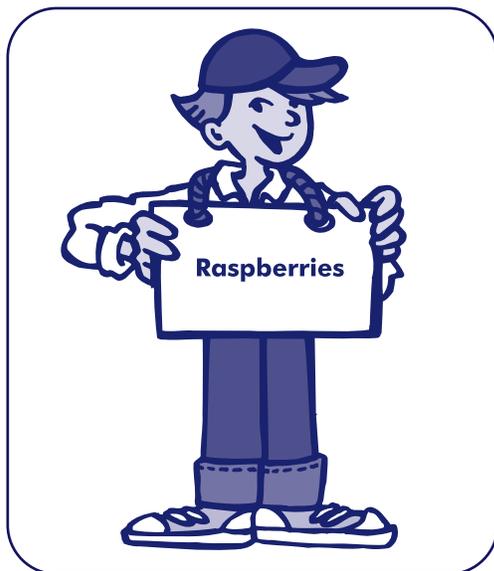


Journal Activity

Ask students to describe a natural place that is special to them. Have them write about what lives there and why it is so magical. Or ask them to write a poem that is in the shape of something in nature.

specified ecosystem. Have them research (either at the school library or on the Internet) what the plant eats, what eats it, and any factors that are necessary in its habitat for survival. Have students tell the class what they found, in 5 minutes or less, modifying the existing food web as you go.

Step 4: Have students create a placard to identify themselves as a certain plant or animal. All students should start off with a green sticker on their placard, indicating that the population of their plant or animal species is healthy.



Step 5: Facilitate an exercise in which each person holds hands with the person wearing a

sign of the animal or plant that they eat. The result should be a tangled web of students, holding several people's hands.

Step 6: Now, introduce some human-created scenarios that would affect this ecosystem (see examples below). When an animal or plant is affected, a red or black sticker must be placed on the person's placard. For example, in a meadow ecosystem, a scenario might be that a farmer applies pesticides to the meadow, which kills off the Monarch Butterflies. Whomever is playing the role of the Monarch Butterfly would put a black sticker over top of the green sticker (and should be removed from the web). Students should be asked to identify what other species are affected by the disappearance of the Monarchs in this ecosystem. Those that are affected (that depend on the Monarch for food or that serve as prey for the Monarch) should place a red sticker over top of the green sticker, indicating the species is in trouble.

Sample Scenarios of Human Activities That Could Affect Ecosystems:

- Pesticide-containing runoff makes its way into a stream from which animals drink.
- A household dumps used oil in the storm drain, which empties out into a bay.
- An old-growth forest is clear-cut.
- Hazardous waste from a factory is dumped into the river.
- Acid rain from factories kills off trees in a forest 200 miles away.

Step 7: Introduce several detrimental scenarios until the students decide that the ecosystem is no longer viable and should be considered destroyed.



Assessment

1. Have students define and describe a food web.
2. Ask students to describe the characteristics of an ecosystem.
3. Ask students to explain how several elements of an ecosystem can be harmed even if only one element is initially affected.



Enrichment

1. Repeat the exercise described in Step 6, but this time use examples of recent human actions and efforts to make a positive impact on an ecosystem. For example, through the work of biologists and naturalists, the fox is reintroduced into an ecosystem and environmental groups help Congress to pass and enforce laws to protect its habitat.
2. Present the class with a scenario that pits human activities against an ecosystem. Break the class into groups and assign different roles to the different groups. For example, one group could represent a developer that wants to fill in a wetland to build a shopping mall. Another group could represent a group of citizens of that community that want to save the wetland. Another group could represent the new workers who could benefit from jobs at the new mall. Students should be instructed to think of all the reasons why they would support or oppose the mall from their perspective and have a mini-debate about the issue.
3. Take the students on a field trip to a local park, stream, pond, or wooded area, and take an inventory of all the common birds and plants that are observed in that ecosystem. Students could learn how to use field guides and identify the species observed.
4. Give the students a list of species that have become extinct in the last 100 years and ask them to research how they became extinct (e.g., overharvesting, habitat destruction) and present the information to the class, along with a description of the species and/or a photograph. This will help the class appreciate the beauty of many of the extinct species and gain an understanding of the human activities that caused their demise.