

K–3 Module

Unit 1 Conserving Natural Resources

Lesson 1

What Are Natural Resources?

Lesson 2

People Use Natural Resources

Lesson 3

Landfill in a Jug

Lesson 4

There Is No “Away”

Lesson 5

Treasures of the Earth—A Play

My students enjoyed these lessons and participated enthusiastically.

— Anne Harris, second-grade teacher, Jefferson Elementary School, Cloverdale Unified School District

My class really enjoyed this unit. They were very interested in the topic.

— Sharon Janulaw, kindergarten teacher, Marguerite Hahn Elementary School, Cotati-Rohnert Park Unified School District

K-3 MODULE

Unit 1: Conserving Natural Resources

Overview

UNIT 1'S CONCEPT

People use natural resources to live and to make many items, and they are responsible for conserving and protecting those resources.

Note: The following lessons were developed by Olga Clymire, Anne Harris, Sharon Janulaw, and Ted Schut, with ideas submitted by Nona Reimer.

The five lessons in this unit are:

LESSON 1: WHAT ARE NATURAL RESOURCES?

Lesson's concept: Natural resources are things that come from nature, such as plants, animals, soil, minerals, energy sources (e.g., sunlight, fossil fuels), air, and water. These natural resources are used to meet the needs of all living things, including people.

In Lesson 1 students will:

- Make journals.
- Observe models of categories of natural resources.
- Identify natural resources on the school grounds, record them on a chart, and describe them in their journals.
- Determine the natural resources used to make various items on the school grounds and in the classroom.
- Compare items made from different natural resources.

LESSON 2: PEOPLE USE NATURAL RESOURCES

Lesson's concept: People use natural resources to live and to make things.

In Lesson 2 students will:

- Make "Earth Pockets" using paper plates in which the students place a string of illustrations and words that show the transformation of a natural resource into a product.
- Work in groups to make mobiles that represent the kinds of natural resources humans need in order to live.

- Classify an item based on the natural resource from which it was made.
- Make a collage of items made from a specific natural resource.

LESSON 3: LANDFILL IN A JUG

Lesson's concepts:

- Placing waste material in landfills is the most common method of disposing of solid waste in the United States.
- Landfills take up space and are located in areas that are, or once were, habitats for people and wildlife.

In Lesson 3 students will:

- Listen to stories, such as *Farewell to Shady Glade* by Bill Peet and/or *Where Once There Was a Wood* by Denise Fleming, and discuss how a landfill can affect habitats of wildlife and people.
- Construct model landfills in a gallon jug, add garbage to these models on a daily basis, and record what has been added.
- Discuss what they can do with the new garbage when most of their model landfills are full.
- Identify the garbage they placed in the model landfill that could have been reused or recycled.

LESSON 4: THERE IS NO "AWAY"

Lesson's concepts:

- Items that become solid waste are made from a variety of natural resources.
- Most of the solid waste is buried in a landfill.
- Some garbage can be reduced, reused, or recycled (including composting).

In Lesson 4 students will:

- Look at the pictures of a landfill in *Where Does the Garbage Go?* by Paul Showers and describe a landfill.
- Classify classroom garbage according to the kinds of natural resources used to make the garbage.
- Listen to the story *Katherine and the Garbage Dump* by Martha Morris and relate the actions of the character to actions they can take with the garbage in the classroom.
- Classify items that can be reduced, reused, or recycled.

LESSON 5: TREASURES OF THE EARTH—A PLAY

Lesson's concept: People use natural resources to make many items and are responsible for conserving and protecting these resources.

In Lesson 5 students will:

- Perform a play about the importance of natural resources to people.
- Write a pledge to do one thing to conserve natural resources.
- Share the actions they have done based on their pledge.

Required Books to Implement Unit 1

- **For Lesson 3:**
 - Fleming, Denise. *Where Once There Was a Wood*. New York: Henry Holt and Company, 1996.
 - Peet, Bill. *Farewell to Shady Glade*. Boston: Houghton Mifflin Company, 1966.
 - Showers, Paul. *Where Does the Garbage Go?* Illustrated by Rand Chewning. Let's-Read-and-Find-Out Science series. New York: HarperCollins Children's Books, 1994.
- **For Lesson 4:**
 - Morris, Martha. *Katherine and the Garbage Dump*. Illustrated by Yvonne Cathcart. Toronto, Canada: Second Story Press, 1992.
 - Showers, Paul. *Where Does the Garbage Go?* Let's-Read-and-Find-Out Science series. New York: HarperCollins Children's Books, 1994.

Recommended Books to Implement Unit 1

- **For Lesson 2:**
Brooks, Felicity. *How Things Are Made*. Designed by Chris Scollen. Finding Out About series. Tulsa, Okla.: EDC Publishing, 1989.
- **For Lesson 3:**
Wilcox, Charlotte. *Trash!* Minneapolis: Carolrhoda Books, Inc., 1988.
- **For Lesson 5:**
Ross, Anna. *Grover's 10 Terrific Ways to Help Our Wonderful World*. Illustrated by Tom Leigh. New York: Random House, 1992.

PROJECTS

Projects provide hands-on experiences for students. Some lessons in Unit 1 are project-based and encourage students to apply what they have learned in the classroom. Some project-based lessons are service-learning oriented in which students participate in improving the environment in their school and community.

The following describe four projects and an example of a class that has completed a similar project that addresses this unit on conserving natural resources. Teachers are encouraged to select one of these projects with their students or to have their students develop one of their own. If students implement an applicable project, they and their teachers are encouraged to send a description of the project to the California Integrated Waste Management Board's Office of Integrated Education, MS-14A, P.O. Box 4025, Sacramento, CA 95812-4025.

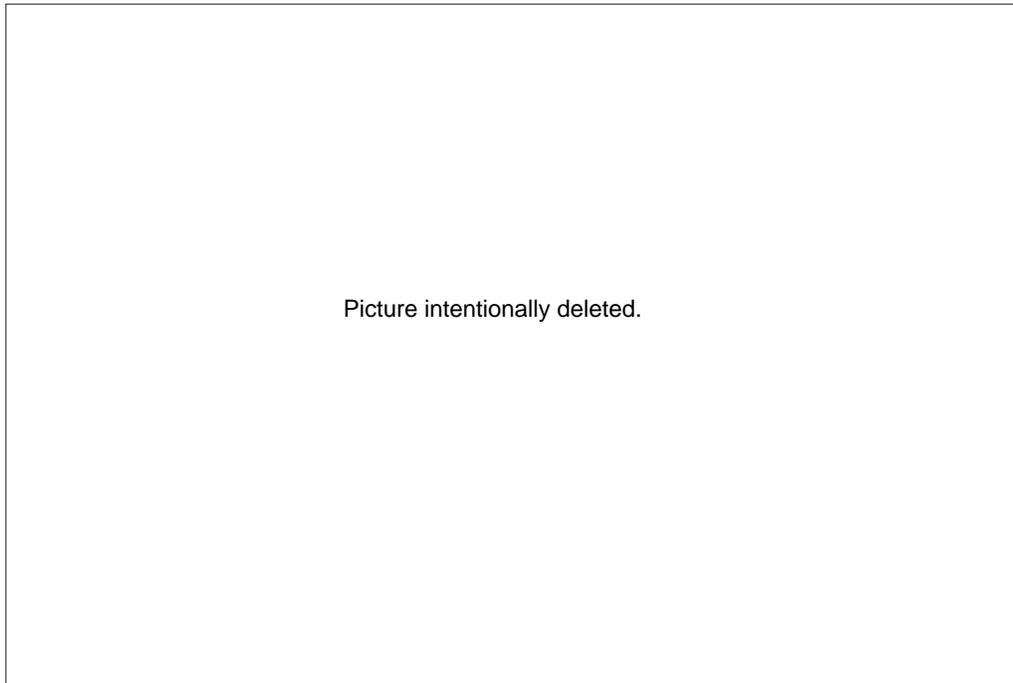
- **Project 1:** Through displays, posters, and other art forms, students show the ways natural resources can be used wisely. (Lesson 2)
- **Project 2:** Students look in the classroom at the types of materials that are thrown away. They reuse everything possible in the classroom. Students also recycle everything possible in the classroom and take it to a recycling center. (Lesson 3)
- **Project 3:** Students develop a plan on how to reduce waste in the classroom. For example, they can monitor the use of paper and paper towels and ensure that lids are on markers

and glue sticks so they won't dry out and then have to be thrown in the trash. (Lesson 4)

- **Project 4:** Students perform the play, "Treasures of the Earth and How People Use Them," for other classes to teach their fellow

students about the importance of natural resources to people. (Lesson 5)

Example of a School Participating in a Project



Students in Anne Harris's second-grade class present the play, "Treasures of the Earth and How People Use Them," to another class at Jefferson Elementary School in the Cloverdale Unified School District. The play teaches the importance of natural resources to people.

NOTES

LESSON 1: What Are Natural Resources?

LESSON'S CONCEPT

Natural resources are things that come from nature, such as plants, animals, soil, minerals, energy sources (e.g., sunlight, fossil fuels), air, and water. These natural resources are used to meet the needs of all living things, including people.

PURPOSE

Students will learn about natural resources and the products people make from these resources. Students also prepare for the unit by making journals.

OVERVIEW

In this lesson students will:

- Make journals.
- Observe models of categories of natural resources.
- Identify natural resources on the school grounds, record them on a chart, and describe them in their journals.
- Determine natural resources used to make various items on the school grounds and in the classroom.
- Compare items made from different natural resources.

CORRELATIONS TO CALIFORNIA'S CONTENT STANDARDS AND FRAMEWORKS

- Students work together to identify the natural resources used to make objects outside and inside the classroom.
 - "Properties of materials can be observed, measured, and predicted. As a basis for understanding this concept, students know objects can be described in terms of the materials they are made of and their physical properties." (*Science Content Standards, Grades K-12; Kindergarten; Physical Science, Standard 1a*)
 - "Humans use air, fresh water, soil, minerals, fossil fuels, and other sources

of energy that come from the Earth." (*Science Framework, page 97*)

- "Students collect information about objects and events in their environment." (*Mathematics Content Standards for California Public Schools, Kindergarten Through Grade Twelve, page 3*)
- "To participate effectively in society, students need to: Develop personal skills. . . group interaction skills (and) . . . social and political participation skills." (*History-Social Science Framework, page 24*)
- Students describe in their journals some natural resources outside and inside the classroom and determine the natural resources used to make certain products.
 - Students "write brief expository descriptions of a real object, person, place, or event, using sensory details." (*English-Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve, page 8*)

SCIENTIFIC THINKING PROCESSES

observing, communicating, comparing, classifying

TIME

45-60 minutes to prepare for the lesson; 60 minutes to implement the lesson

VOCABULARY

Crude oil, fossil fuels, icon, minerals, natural resources, organisms

PREPARATION

- ___ 1. Read the “Background Information for the Teacher” at the end of this lesson.
- ___ 2. Obtain used paper (blank on one side) for students to use for journals. (Sources of used paper include printers, real estate offices, school’s office or classrooms, and parents.)
- ___ 3. Start collecting “clean” classroom trash to use for Lesson 3 (nothing toxic or potentially dangerous; no food that can get spoiled). Keep it in a box or bag. Make sure to notify the custodian of your plan. Try to include paper towels, candy wrappers, short pencils, small pieces of chalk, bent paper clips, paper used on one side and used on both sides, aluminum can or tray, plastic container, milk carton, polystyrene meat tray, dried-up markers and glue sticks, nuts with hard shells, and fresh orange peels.
- ___ 4. Make a copy of the “Natural Resources Chart” for each pair of students (page 9).

MATERIALS

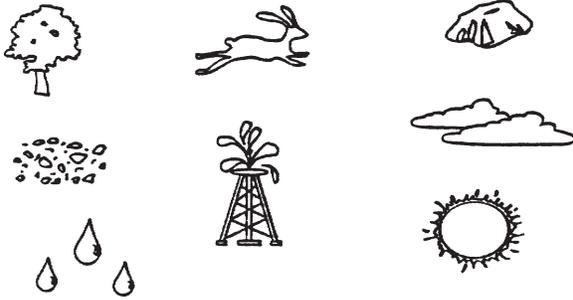
- ___ Items that can represent different categories of natural resources:
 - ___ Potted plant (to represent trees and other plants)
 - ___ Stuffed animal (to represent animals)
 - ___ Bag of soil (to represent soil)
 - ___ Rock (to represent minerals)
 - ___ Molasses or chocolate syrup (to represent crude oil, a fossil fuel which is an energy source)
 - ___ Empty jar and a jar full of water (to represent air and water)
- ___ A pocket folder for each student (If you plan to have students make their own journals, see “One Way to Make Your Own Journal” in this lesson.)
- ___ A copy of the “Natural Resources Chart” for each pair of students
- ___ Clipboard (Heavy cardboard cut to 9 by 12 inches can be used as a clipboard, and a large paper clip can keep the paper on the cardboard.)
- ___ A file folder for each student for the “Assessment Portfolio” (If possible, use reused ones or those made from recycled materials.)
- ___ Optional: a file box to keep the “Assessment Portfolios”

PRE-ACTIVITY QUESTIONS

- A. Tell students that they will each make a journal. In the journal they will write and draw information about what they are studying. Students should know that people write and draw in journals to record observations, thoughts, ideas, and information about certain topics.
- B. Provide a pocket folder and ten sheets of paper for each student. (If you do not have access to pocket folders, students can make their own folders by following the directions on “One Way to Make Your Own Journal.”) To model conserving paper, distribute paper that was used on one side.
- C. Ask students to draw or describe in their journals something that comes from nature.
- D. Ask students to share the entries from their journals as you write their responses on the chalkboard.
- E. Ask students what they know about the word *natural* and the word *resources*. Encourage them to create a class definition of *natural resources*.

PROCEDURE

- A. Show the following items, each representing a category of natural resources: potted plant, stuffed animal, soil, rock, and molasses (to represent crude oil, an energy source).
 - Tell students that things that come from nature are called *natural resources*. Natural resources are things that all living things need in order to live.
 - Help students identify each category of natural resources as you list them on the chalkboard: plants, animals, soil, minerals (rocks), energy sources (sunlight; fossil fuels, such as crude oil).
 - Ask students what else they cannot live without. Lead them to say “water” and “air.”
- B. Ask students to draw an icon for each of the seven categories of natural resources. (Note: Help them write a definition for icon and include it in their journals.) This can be done in groups of seven, with each student drawing one icon and writing the category that the icon represents. (See the example on the next page for ideas for icons.)



- C. Provide a copy of the “Natural Resources Chart” for each pair of students. Note that students will focus on five categories of natural resources, because these are the ones most often used by people to make things (in addition to air and water, which we usually use in the manufacturing process of products): plants, animals, soil, minerals, and crude oil (from fossil fuels in the category of energy sources).

- Describe how to complete the chart. Students should write or draw what they see that comes from the natural resources listed on their charts.
- In preparation for a trip outside the classroom, ask each pair of students to bring a “Natural Resources Chart,” pencil, and a clipboard. (A clipboard can be made out of stiff cardboard.)
- Lead students outside.

Note: The answers in *italics* are possible students’ answers and might not reflect a correct answer.

- Help students identify things that are part of nature. *Trees, rocks, soil.*
- Ask them what natural resources they see (or feel, in the case of air). *Plants, animals (people), minerals, crude oil (asphalt), air.*
- Ask students what they see that people have made from natural resources. For example, “What do you see that is made from a plant?” *A wooden bench is made from wood from a plant.* “What do you see that is made from minerals, such as rocks and steel?” *The building, the road, the poles supporting the swing.*
- Select one item on the school grounds and help students complete their charts.
- Lead students on a walk on the school grounds to look for natural resources and help them to complete their charts.

- D. Back in the classroom, ask students to write or draw the following in their journals:
1. I saw _____
 2. _____ is part of nature.
 3. One thing that I saw that was made by people is _____
 4. The natural resource or resources from which this thing was made is _____
- E. Ask students to share their journal entries. Then discuss some ways that natural resources are used by people.

DISCUSSION/QUESTIONS

- A. Have students locate in the classroom objects made from natural resources. Ask students from which category of natural resources this object was made.
- B. Ask students to review their original class definition of natural resources and ask whether they wish to change any of the words to make the meaning clearer and more accurate.
- C. Discuss with students:
- Which items that were seen indoors and outdoors were different but came from the same natural resource? *Buildings and the sidewalk; desks and bench.*
 - Which items that were seen indoors and outdoors were similar but came from different natural resources? *Wooden bench and plastic bench.*

Note: In Lesson 2, students will learn more about ways people use natural resources.

APPLICATION

- A. As a class, make a drawing (mural) linking an item in the classroom to the natural resource that was used to make this item; e.g., wooden chair—plant.
- B. Ask students to draw or write in their journals what they learned about natural resources.
- C. Ask students to share their journal entries.

Homework Assignment: Ask students to select an item at home and to be prepared to tell the class the following day what the item is and what natural resource or resources it came from.

- D. Ask students to share their homework assignments.
- E. In addition to journals, it is recommended that students make an "Assessment Portfolio" to keep samples of their work from each lesson or unit. This will provide an authentic assessment of performance-based student work.
1. Introduce the idea of a portfolio. Explain that a portfolio contains information that illustrates a student's work. Discuss the following reasons for a student to select items to be placed in a portfolio:
 - It is the student's best work during the lesson or unit.
 - It represents something that the student learned.
 - It represents something that was challenging to the student.
 - It is something that took a long time and effort to complete.
 - It was something the student greatly improved upon. (The student could submit "before" and "after" examples of work.)
 2. Provide a file folder for each student.
 - Ask each student to write his or her name on the tab of the file folder. (You might need to help the younger students with this task.)
 - Ask students to select products (drawings or writings) from their journals.



Submitted by Beth O'Neal, kindergarten and first-grade teacher, Marguerite Hahn Elementary School, Cotati-Rohnert Park Unified School District.

- Have students answer the following questions verbally about the work they selected (could be shared with the class if the students agree to do so):
 - Why did you choose this piece to include in your portfolio?
 - Why is this your best work (drawing, writing, project)?
 - What did you learn from this work?
 - If you ever did this project (or other work) again, what would you do differently?

Note: It is recommended that a file box be provided to keep the students' "Assessment Portfolios."

Note: Students can select examples of work from their journals and from any projects that they completed at the end of each lesson. Or, instead of selecting a product from each lesson, students can select one or two from the entire unit, once the unit has been completed.

EXTENSION

Make a class list of things in the room according to the natural resources from which they were made. Graph things in the room by categories of natural resources. Discuss:

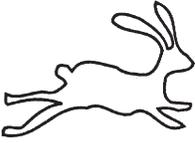
- What is the most common natural resource used in the classroom?
- Why is it the most common natural resource used?



Submitted by Debby Carter, kindergarten and first-grade teacher, Coyote Valley Elementary School, Middletown Unified School District.

NATURAL RESOURCES CHART

Names: _____ Date: _____

Natural resource	Object made by people
<p>Plants</p> 	
<p>Animals</p> 	
<p>Soil</p> 	
<p>Minerals</p> 	
<p>Energy sources (fossil fuels, like crude oil)</p> 	

ONE WAY TO MAKE YOUR OWN JOURNAL

Supplies Needed

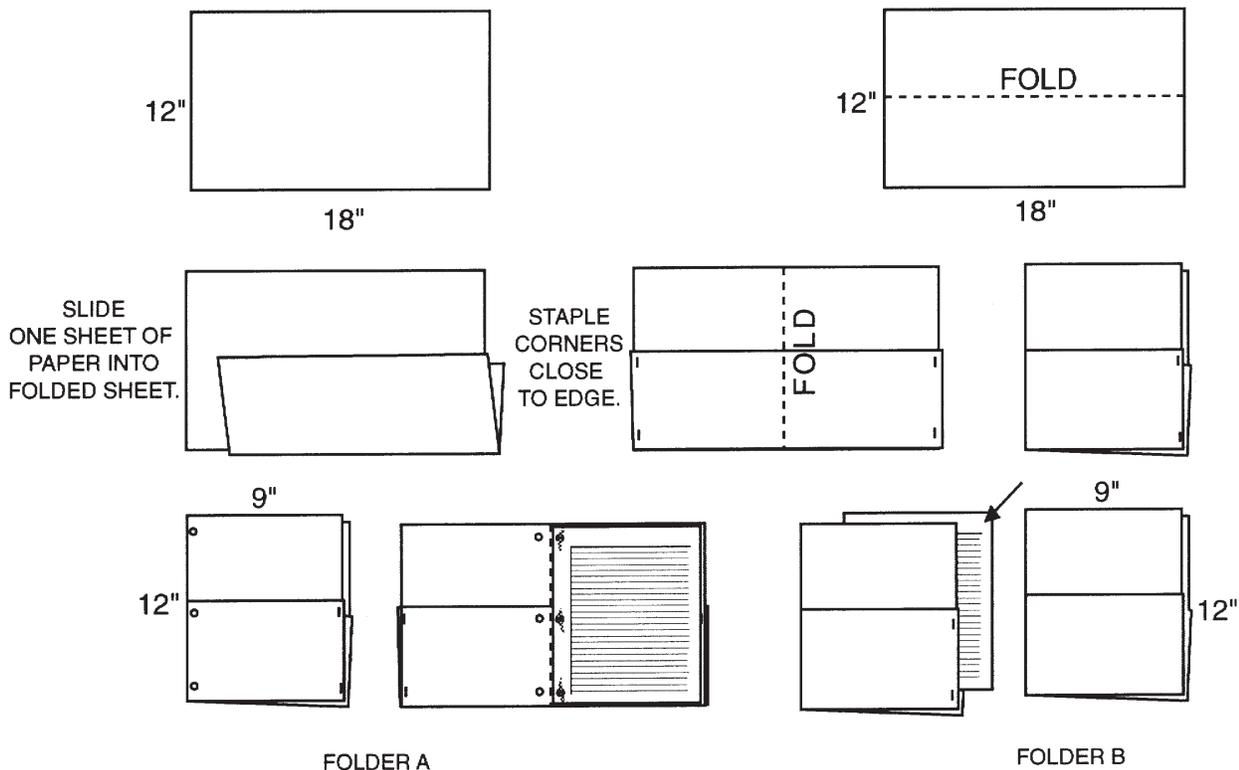
- 12- by 18-inch tagboard or construction paper (two sheets for each student)
- Stapler
- Three-hole paper punch and brass fasteners (three for each student) (If these are not available, the pages can be stapled.)
- Lined and unlined paper (15 sheets per student: 5 lined and 10 unlined) (To model reusing, use paper that has been used on one side.)

Directions

1. Distribute two sheets of 12- by 18-inch tagboard or construction paper to each student.
2. Have students make their journals by doing the following (see illustrations below):
 - Fold one sheet of tagboard or construction paper in half lengthwise.

- Slide one sheet of paper into the folded sheet.
 - With the folder open, staple the left side and the right side of the folded sheet onto the unfolded sheet, as close to the edge as possible. The folded sheet will make pockets on the inside and outside of the front cover.
 - Fold the entire journal cover in half so it closes like a book.
3. **A.** If you have brass brads, punch three holes in the left margin with a three-hole punch. (See Folder A.) Place the brass fasteners through the back of the folder and through the lined and unlined pages but not through the front cover. This will make the front cover easier to open.
 - B.** If you do not have brass brads, staple the journal pages to the journal cover. (See Folder B.)

TWO 12" X 18" SHEETS OF TAGBOARD OR CONSTRUCTION PAPER



BACKGROUND INFORMATION FOR THE TEACHER

Natural resources are things that come from nature (the natural environment) and are the living and nonliving components that support life on Earth. They can be classified into seven categories: plants, animals, soil, minerals, energy sources (e.g., sunlight, fossil fuels), air, and water.

All products that we use everyday come from Earth's natural resources, which provide the raw material for the products that people make. For example, iron ore is the raw material in the natural resources category mineral, and people use iron ore to make steel. Steel is used to make cars, appliances, and many other products. Trees are natural resources classified as plants, and people use trees for lumber to build houses and other structures; they also use a tree's pulp to make paper.

This unit introduces students to different categories of natural resources and ways some natural resources are used by people to make a variety of products (which often end up in a landfill). Since natural resources are required by all living things, humans are also totally dependent on natural resources, such as air, water, plants, and animals, for their survival.

In this unit, natural resources are classified into seven categories, which are briefly described below. The category of energy sources can be further subdivided into sunlight, fossil fuels, and other energy sources (e.g., wind, hydro-power). Ways that people depend on these categories of natural resources are further described in Lesson 2.

PLANTS—Plants are living things that can produce their own food. Trees, shrubs, grasses, seaweed, and some microscopic algae are examples of plants. Green plants produce oxygen. They also produce food for animals that eat plants.

ANIMALS—Most animals can be defined as living things that rely on other organisms for food. Animals have a nervous system and can usually move on their own. Examples of types of animals are: mammals (includes humans), birds, reptiles, amphibians, fish, and invertebrates, such as insects, spiders, and worms. Some microscopic living things are also classified as animals.

SOIL—Soil is a mixture of minerals from weathered rock and decaying plant and animal matter. It also consists of microscopic living things, such as bacteria and fungi. Most plants that live on land need soil in which to grow, and soil provides water and nutrients to plants. Many animals live on or in soil.

MINERALS—Minerals are naturally occurring substances that originally came from rock, such as phosphorous, bauxite, iron, salt, gold, silver, copper, and potassium. Many minerals are essential for the healthy growth of plants and animals, and plants absorb minerals that are dissolved in water. Animals must obtain needed minerals by eating plants or by eating other animals that have eaten plants.

AIR—Animals need oxygen in the air to breathe, and plants use carbon dioxide in the air in the process of photosynthesis. The gases are recycled through plants and animals.

WATER—Plants use water when manufacturing their food, and animals drink or absorb water to maintain bodily functions. Some animals live in water, and some use it as a place from which to get food, to seek protection, or to cool off. Fresh water on land is replenished by the water cycle and is essential to all living things.

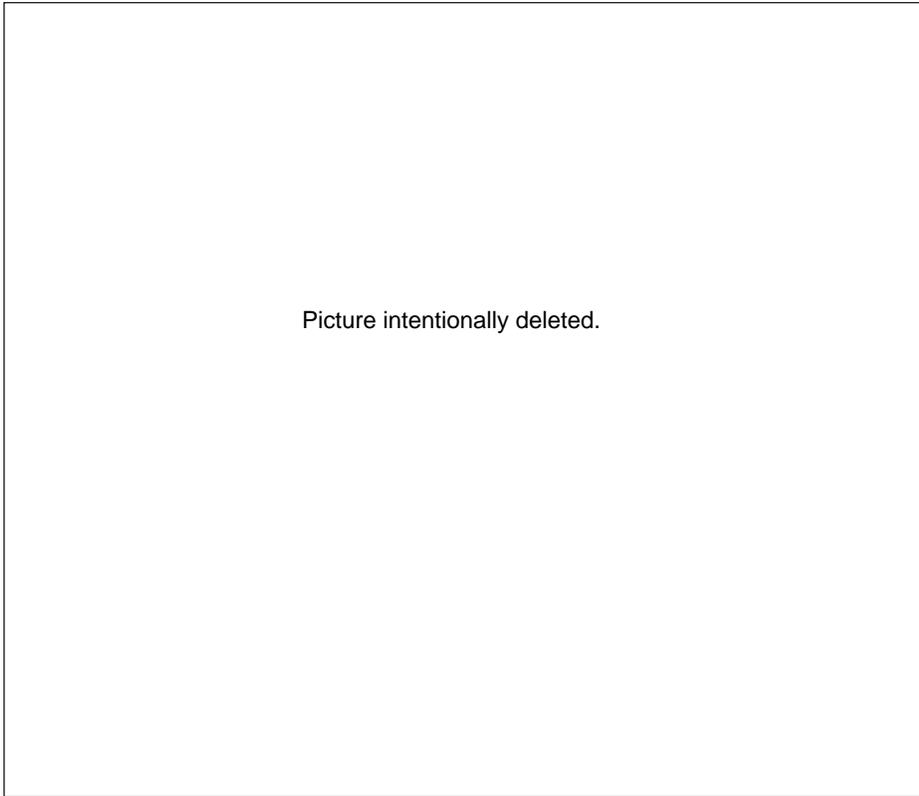
ENERGY SOURCES

- **Sunlight**—The energy derived from sunlight is used by green plants for photosynthesis. Sunlight also powers the water cycle by evaporating water from land and surface water. Note that “sunlight” is not addressed in this unit, because the lessons focus on the connections among natural resources, manufactured items, and solid waste.

- **Fossil Fuels**—Fossil fuels include crude oil, coal, and natural gas. The fossil fuels we are using now originated from partially decayed plants and animals that lived millions of years ago. In this unit students are introduced to crude oil. The crude oil that we are presently using came from marine plankton that lived millions of years ago. These marine plants died, and through time and tremendous pressure and heat created by layers of rock that trapped the plants, crude oil was formed.

- Other Energy Sources—Other energy sources include wind, hydropower, geothermal, and tidal energy. These are not addressed in *Closing the Loop*.

Note: For information and activities on renewable and nonrenewable natural resources, see the 4–6 Module, Unit 1, Lesson 4.



At the Solar Community Housing Association, Homestead CO-OP, children look for examples of natural resources and objects that people made from natural resources.

NOTES

LESSON 2: People Use Natural Resources

LESSON'S CONCEPT
 People use natural resources to live and to make things.

PURPOSE
 Students will be able to trace objects to the category of natural resources from which they were made. They will identify some of the natural resources that people need in order to live.

OVERVIEW
 In this lesson students will:

- Make “Earth Pockets” using paper plates in which the students place a string of illustrations and words that show the transformation of a natural resource into a product.
- Work in groups to make mobiles that represent the kinds of natural resources humans need in order to live.
- Classify an item based on the natural resource from which it was made.
- Make a collage of items made from a specific natural resource.

CORRELATIONS TO CALIFORNIA'S CONTENT STANDARDS AND FRAMEWORKS AND TO BENCHMARKS FOR SCIENCE LITERACY

- Students make “Earth Pockets” to show the natural resources used to make certain products and the transformation that occurred from the natural resources from which the products were made to the products themselves.
 - “Earth is made of different kinds of materials that have distinct properties and provide resources for human activities.” (*Science Content Standards, Grades K–12; Grade 2; Earth Sciences, Standard 3*)
 - “Humans use air, fresh water, soil, minerals, fossil fuels, and other sources of energy that come from the Earth.” (*Science Framework, page 97*)
- Students work in groups to complete a

mobile that shows the natural resources humans need in order to live.

- “Most living things need water, food, and air.” (*Benchmarks for Science Literacy, page 111*)
- “Students demonstrate an understanding that being a good citizen involves acting in certain ways.” (*California History–Social Science Standards; Kindergarten; Standard K.1*)
- “In order to participate effectively in society, students need to: Develop personal skills. . . group interaction skills (and). . . social and political participation skills.” (*History–Social Science Framework, page 24*)
- “Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept . . . students will . . . communicate observations orally and in drawings.” (*Science Content Standards, Grades K–12; Kindergarten; Investigation and Experimentation, Standard 4e*)
- “Students create original artworks based on personal experiences or responses.” (*Visual and Performing Arts Framework; Goal 4, page 101*)

SCIENTIFIC THINKING PROCESSES
 observing, communicating, comparing, ordering, classifying.

TIME
 30 minutes to prepare for the lesson; 60 minutes to implement the lesson

VOCABULARY
 crude oil, manufacture

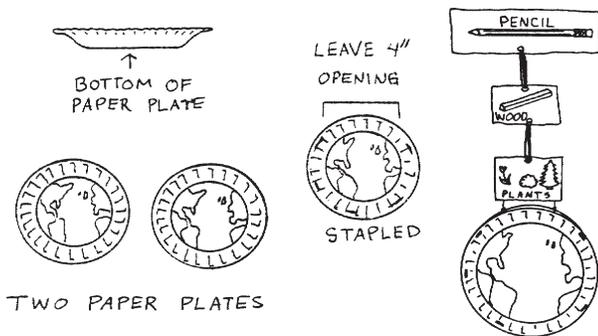
PREPARATION

Note: “Part I” could be completed with students in kindergarten and grade one; and “Part I” and “Part II,” with students in grades two and three.

- ___ 1. Read the “Background Information for the Teacher” at the end of this lesson.
- ___ 2. Make an “Earth Pocket.”
 - Draw a picture of the Earth on the bottom of each paper plate; or use the picture, “Outline for an Earth Pocket” (page 19), cut it out, and glue it to each paper plate.
 - Staple the two paper plates together, leaving a 4-inch opening to make a pocket. (See the accompanying illustration.)
 - Tape or staple a piece of string or yarn (approximately two feet long) to an illustration of a pencil on a card, as shown below (e.g., cardboard from a cereal box). This card should be large enough not to fall into the pocket.

Note: It is recommended that you make cards out of used products, such as cereal boxes, to model conserving natural resources.

- Further down the string, attach a card with an illustration of a piece of wood and the word “wood.” This and all other cards should be small enough to fall easily into the pocket.
- Attach the illustration and the word “plants.”
- Place the cards and attached string inside the pocket, leaving the pencil illustration sticking out of the pocket.



- ___ 3. Make a copy of the “Outline for an Earth Pocket” for each student or each group of students.

MATERIALS

For “Pre-Activity Questions”

- ___ Piece of butcher paper on which to record a list

For “Part I, Making ‘Earth Pockets’ ”

- ___ Two paper plates for each student
- ___ String or yarn (approximately two feet long) for each student
- ___ Cards (e.g., index cards or cards made from pieces of cardboard from cereal boxes)
- ___ Scissors
- ___ Crayons and other art supplies
- ___ Stapler and staples
- ___ Book, *How Things Are Made* by Felicity Brooks
- ___ A copy of the “Outline for an Earth Pocket” for each student or each group of students

Optional

- ___ Hole punch
- ___ Yarn for students to lace the paper plates together

For “Part II, Making a Mobile of the Natural Resources We Need in Order to Live”

- ___ Cardboard from boxes
- ___ String or yarn
- ___ Hole punch (A hand-held single-hole punch works best.)
- ___ Tape
- ___ Cards (e.g., index cards or cards made from pieces of cardboard from cereal boxes)
- ___ Scissors
- ___ Crayons and other art supplies
- ___ For students who do not have access to newspapers and magazines, provide such materials to help them complete the homework assignment.

PRE-ACTIVITY QUESTIONS

Ask students: “What things (products) do people make out of natural resources?”

- List the names of some products on a piece of butcher paper and post the list in the classroom.
- Tell students that they will be adding to this list during this lesson.

Natural Resources	Products
<i>trees</i>	<i>cardboard</i> <i>telephone pole</i>
<i>minerals</i>	<i>rock water fountains</i> <i>water pipes</i> <i>coat rack</i> <i>glass</i> <i>wire</i> <i>plaster walls</i>
<i>animals</i>	<i>shoes</i> <i>clothing</i> <i>honey</i>

Submitted by Kathy McCurry's third-grade class, Sutter's Mill Primary School, Gold Trail Union School District.

PROCEDURE

Note: "Part I" could be completed with students in kindergarten and grade one; and "Part I" and "Part II," with students in grades two and three.

Part I, Making "Earth Pockets"

Note: The directions for making an "Earth Pocket" may need to be simplified for younger students.

- A. Show students the "Earth Pocket" (that you made in "Preparation" #1), making certain that the card on which a pencil is drawn is sticking out of the pocket.
 - Ask students what the yellow part of the pencil is made from. As they say *wood* (and possibly lead), pull out the string to the piece of card with the "wood" sign and illustration.
 - Ask where wood comes from. When students say *trees*, ask what category of natural resources are trees. *They are plants.* Pull out the card on which plants are drawn.
- B. Brainstorming with students, make a list of things that they use every day. Write these on butcher paper below the list (started at the beginning of the lesson) of what people make from natural resources. Encourage students to look in the book, *How Things Are Made* by Felicity Brooks, for additional ideas and list them.

- C. Select one item from the list of things used every day.

- With the class, prepare an illustration of the item on a card. Then connect the card with string to an illustration of what the item is made from, down to the category of natural resources from which the item was made. This activity may have one or more steps.
- Place the cards and string inside the "Earth Pocket," with the item sticking out.
- Slowly pull out the string and the natural resource attached.

- D. Ask students to work individually and to select another item from the list of things used every day. They should then list the steps (or sources) from the natural resource to the item. They can use ideas from *How Things Are Made* by Felicity Brooks. Some examples are listed below:

- Book (paper—pulp—plant)
- Paper (pulp—plant)
- Crayon (wax—crude oil—fossil fuel)
- Paper clip (steel—rock—mineral)
- Milk (cow—animal)
- Sweater (wool—sheep—animal)
- Plastic bag (crude oil—fossil fuel)
- Glass (sand—mineral)

Lady bug puppet—cotton—plant
Collapsible dog—wood—tree—plant
Bracelet—plastic—fossil fuel
Rugrat toy—plastic—fossil fuel
Backpack—cloth—plant

Submitted by Debby Carter's kindergarten and first-grade class, Coyote Valley Elementary School, Middletown Unified School District.

Note: Several illustrations are included at the end of this lesson. Some of these could be copied for students to use if they do not wish to draw their own illustrations. They can color, cut out, and glue each illustration on a piece of stiff paper.

Note: For younger students, consider having groups of five students make one "Earth Pocket." Each student can make one part.

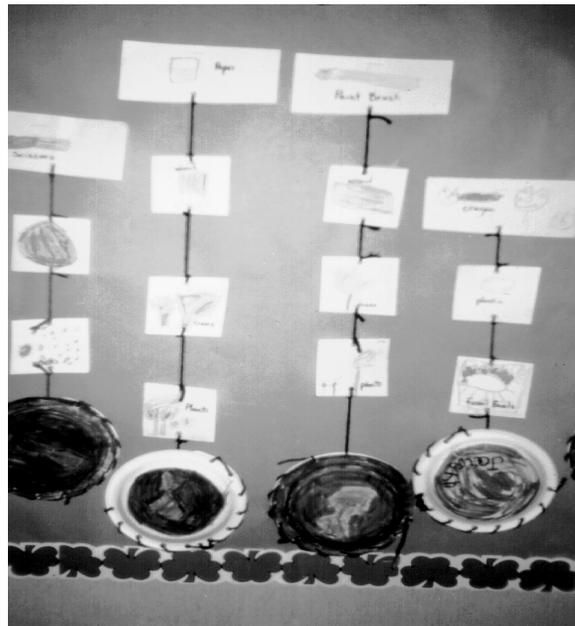
- E. Tell students that they will be making their own "Earth Pockets."
- Distribute two paper plates to each student.
 - Provide a copy of the "Outline for an Earth Pocket," cards, and art materials.
 - Have students color the picture of the Earth and then glue it to the bottom (which will become the outside of the pocket) of each paper plate. (See illustration in "Preparation.")
 - Help students place the two paper plates together (with the illustrated bottom of the plate on the outside) and staple the two paper plates together (approximately five staples), leaving an opening of about four inches on top.

Note: Another way to do this is put two plates together and punch holes through the edges of both paper plates, leaving four inches on the top with no holes. A hand-held single-hole punch is needed to do this. Have students use yarn to sew the edges. (Tape the end of the yarn to make it easier to thread through the holes.)



LACED YARN

- Have students prepare the illustrations and words of their objects on cards. They should illustrate each step back to the natural resource from which the object was made. Make certain that students use the larger card for the main object and smaller cards for all others. Students should then connect the parts (in order) to a piece of yarn or string.
 - Ask students to place the sources from which the item was made into the "Earth Pocket," making certain that the illustration of the object sticks out.
- F. Allow students to share their "Earth Pockets" with a partner or in a small group. Each student can pull out the parts slowly as other students guess what is connected to the object all the way to the natural resource from which it was made. Once students have made their presentations, they can



Submitted by Debby Carter, kindergarten and first-grade teacher, Coyote Valley Elementary School, Middletown Unified School District.

take their "Earth Pockets" home to share with their families.

Part II, Making a Mobile of the Natural Resources We Need in Order to Live

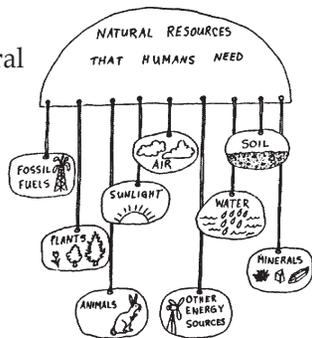
- A. Discuss with students which of the Earth's natural resources are needed by humans in order to live and how each of the natural resources will be used by humans. For example: water (to drink), air (to breathe), plants and animals (for food and clothing), minerals (from which to make things), soil (in which to grow food), energy sources (for electricity), and fossil fuels (for fuel and from which to make things).

Note: Lesson 4 addresses people's use of petroleum products.

- B. Help students to make a mobile that shows different natural resources that people need.
- Separate students into small groups.
 - Provide a piece of cardboard, yarn, cards, and art supplies.
 - Assist students in making a mobile showing different natural resources hanging from strings from a piece of cardboard.

Note: For younger students, make one mobile as a class. Have several groups draw, label, and color various natural resources. Have another group make the body of the mobile out of card-

board and punch holes in a row on the bottom from which pictures of natural resources can be hung. Then the group members should write "Natural Resources That Humans Need" on the body of the mobile. The last group can attach the strings to the body of the mobile.

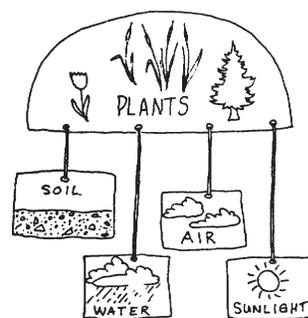


DISCUSSION/QUESTIONS

- A. Discuss with students:
- Why are natural resources important?
They provide us with things we need in order to live.
 - How do people use natural resources?
For making things; for producing energy; for providing the water, food, and shelter that they need in order to live.
 - Can there be shortages of natural resources for people to use? *Yes, if we use a lot of them.*
- B. Review the list, which was brainstormed at the beginning of this lesson, of the things people make from natural resources and the things students use every day. Ask students if they agree with the entire list. Do they want to add or delete any items? If so, ask them to explain why.
- C. List the following natural resources on the chalkboard or on a piece of butcher paper: plants, animals, minerals, fossil fuels. Ask students: "How can people make certain that the natural resources that they need, but that might be in short supply, will be available for many years to come?"
- Plants: *e.g., reuse and recycle items made from wood; plant more plants.*
 - Animals: *e.g., provide places for them to live.*
 - Minerals: *e.g., take care of things so they will last a long time; reuse and recycle items.*
 - Fossil fuels: *e.g., conserve them, don't waste them, and recycle items made from petroleum.*

APPLICATION

- A. Ask students to describe in their journals, two natural resources that they need and how they use them.
- B. Ask students to share their journal entries.
- C. As a class, select a toy and trace its creation to a natural resource category.
- D. Develop a guessing game with clues that will lead students to identify an object in the classroom. For example, tell students, "I am thinking of an item that is made from plants."
- E. Show students the "Earth Pocket" you made in "Preparation" step "2": Pencil—Wood—Plants.
- Ask what natural resources the plants need.
 - Have students help you make signs and illustrations for "Soil," "Water," "Air," and "Sunlight."
 - Cut the plants card from the "Earth Pocket." Add four pieces of string to the "Plants." Hang on the strings the signs and illustrations of the natural resources the plants need in order to live. (See illustration.) The string can be stapled or taped on.
 - Ask students to explain, based on what they just did and saw, additional ways people depend on natural resources.
We depend on natural resources that plants need, because we depend on plants.



- F. Ask students to circle (on the list developed in "Discussion/Questions" section "B") those ideas that they can do to conserve some natural resources. Keep this list to add to in Lesson 3 and Lesson 5.

Homework Assignment: Ask students to make a collage of items that are made from one specific natural resource. One way to do this is to have them use a piece of cardboard on which they

write the name of a natural resource. Then they can cut out pictures from newspapers and magazines of items made from that natural resource.

Note: For students that do not have access to a newspaper or magazine, provide one for each of them.

Project Idea: Have students show through displays, posters, and other art forms the ways natural resources can be used wisely.

EXTENSIONS

- A. Have students make a mobile on how wild-life depends on different natural resources. Encourage students to come up with their own ideas on how to do this.
- B. For older students, have groups of students use the book, *How Things Are Made* by Felicity Brooks, to help them illustrate how one product (such as paper, glass, shoes) is made. These illustrations could be displayed on a bulletin board or on poster board hung in the classroom.

RESOURCES

Videos

Where, Why, and How: House—A Child's Guide to the Origins of Everyday Stuff. Pyramid Film and Video, 1994 (9 minutes).

Explains what natural resources are used to build a house.

Wood: The Miracle Resource. Temperate Forest

Foundation, 1994 (15 minutes).

Discusses the various ways wood is used by people.

Videodisc

Windows on Science: Primary Science. Volume 2, Earth's Resources. Atlanta, Ga.: Optical Data School Media.

A multimedia science program that guides students to survey the Earth's resources and how they are used to produce useful products.

Books

Brooks, Felicity. *How Things Are Made. Finding Out About* series. Tulsa, Okla.: EDC Publishing, 1989.

Explains from what natural resources things are made. Contains illustrations and descriptions of how some items are made. These include leather shoes, clay pottery, clothing, paper, glass bottles, cans, plastic blocks, and soap.

Jones, George. *My First Book of How Things Are Made: Crayons, Jeans, Peanut Butter, Guitars, and More.* New York: Scholastic, Inc., 1995.

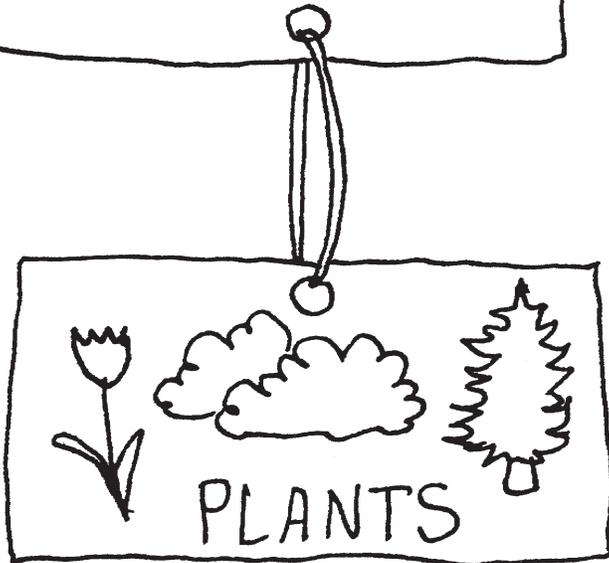
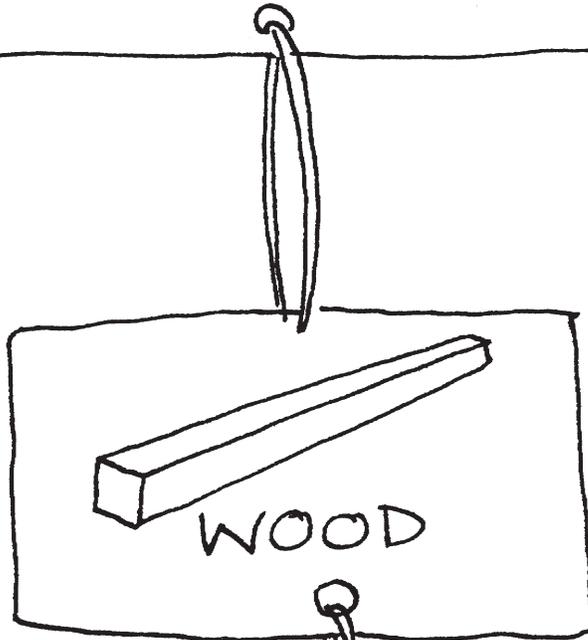
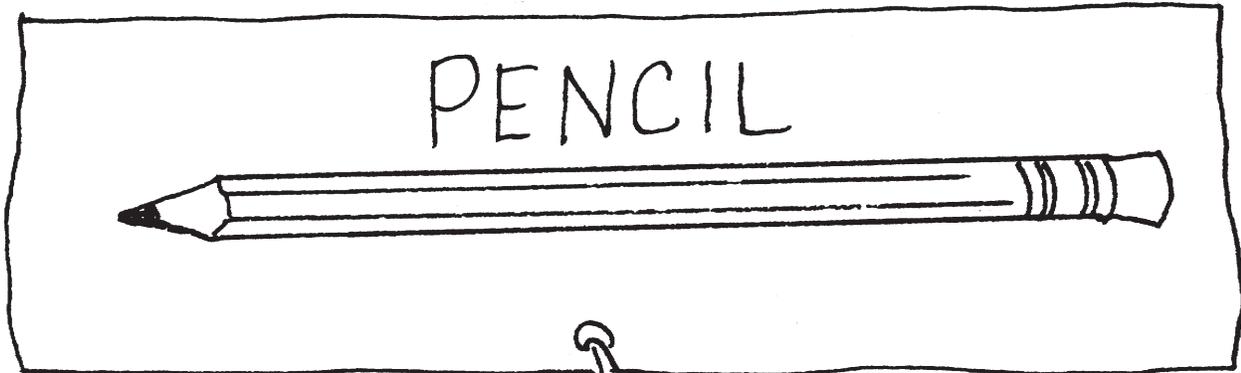
Explains how crayons are made, as well as peanut butter, grape jelly, footballs, orange juice, blue jeans, guitars, and books. This book can be used to show students ways people make products from plants.

Student's Page

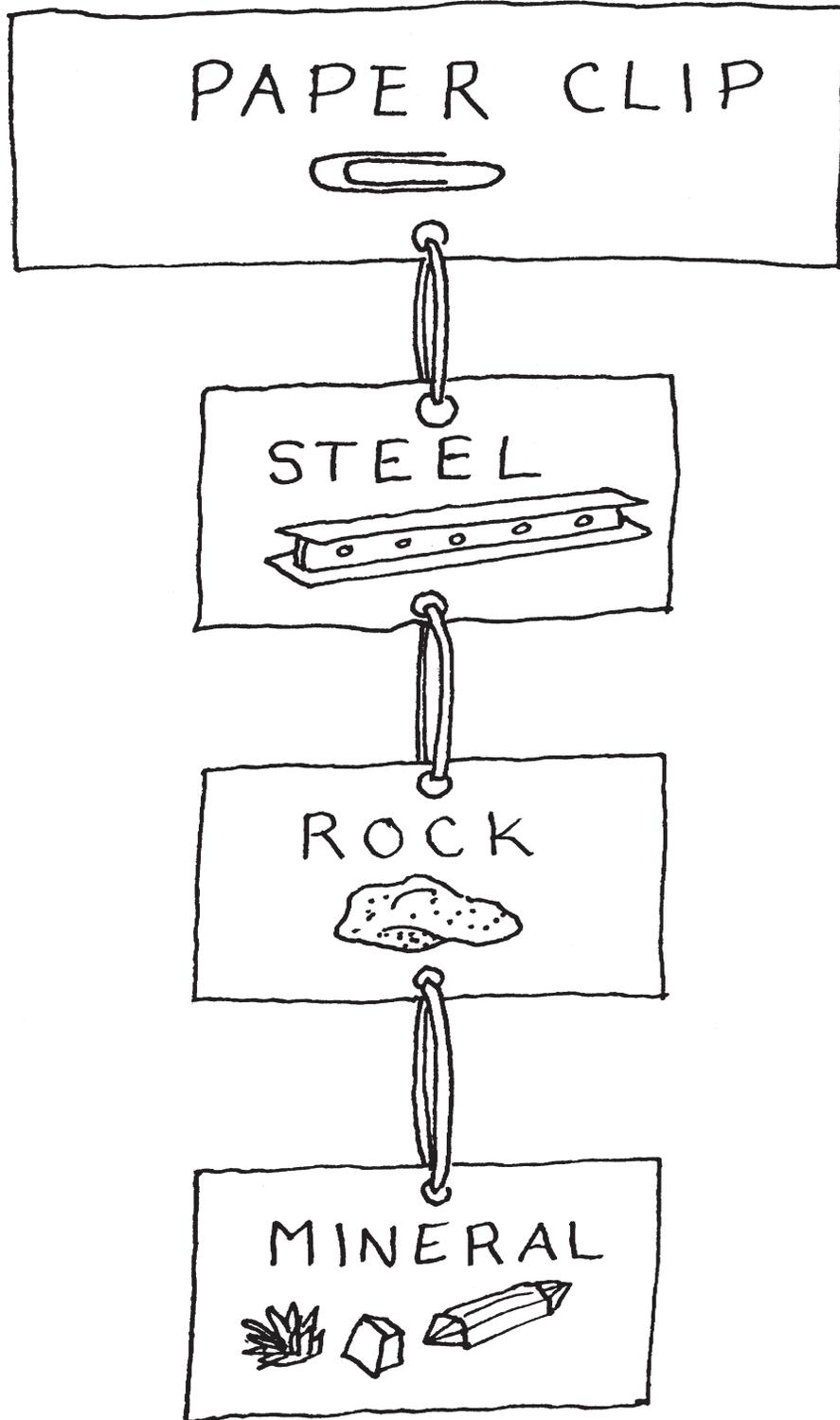
OUTLINE FOR AN EARTH POCKET



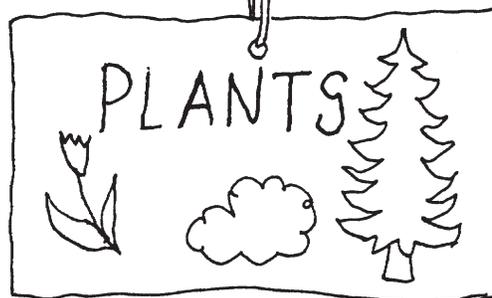
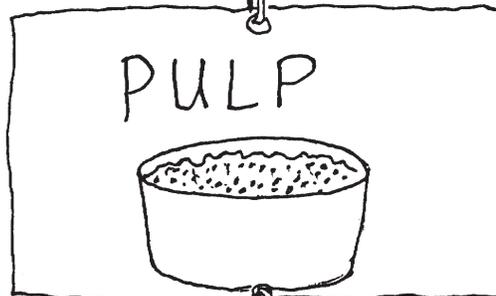
PENCIL



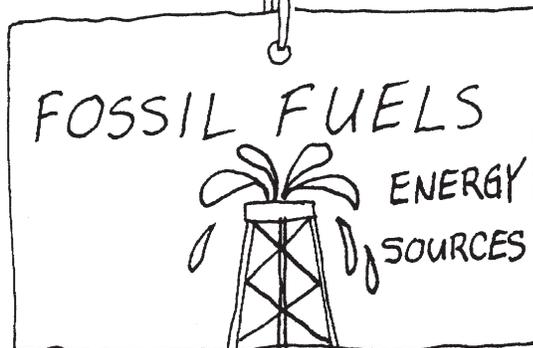
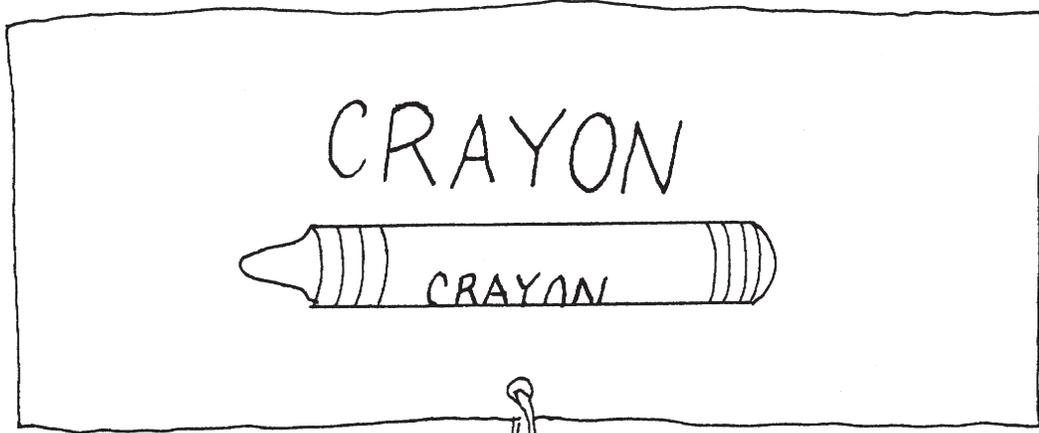
Student's Page
PAPER CLIP



Student's Page
BOOK



Student's Page
CRAYON



BACKGROUND INFORMATION FOR THE TEACHER

Humans depend on natural resources for their survival. The following describes ways people depend on natural resources.

PLANTS—Humans breathe the oxygen that plants make. Humans use plants for food, clothing, and in building materials. They also use wood to heat their homes. Humans use plants to beautify an area, to keep soil from eroding, and to serve as windbreaks. Many medicines are derived from plants.

ANIMALS—Humans use animals for food and clothing and to learn from and to appreciate (for aesthetic purposes). The droppings of some domesticated animals are used as fertilizer. Humans also use animal products in medicines.

SOIL—Humans use soil in which to grow plants for food and on which to build roads and buildings. They also use soil in products, such as adobe bricks.

MINERALS—Humans use minerals to manufacture thousands of different items. Silica is used to make glass; bauxite is used to make aluminum; many minerals are used to make items, such as cars, computer parts, and appliances.

AIR—Humans need clean air to breathe to stay alive.

WATER—Humans need clean water to drink to stay alive. Water is also used in the manufacturing process of most products. The water might become part of the product, be used to wash items, or used to cool down machinery.

ENERGY SOURCES

- **Sunlight**—Humans depend on sunlight, which provides energy for green plants to grow. Humans depend on green plants for food, clothing, fuel, and building materials. They also need sunlight to power the water cycle so they can have fresh water to drink and to use for other purposes. Humans use solar power to generate electricity and to heat water and homes and other buildings. Note that “sunlight” is not addressed in this unit, because the lessons focus on the connections among natural resources, manufactured items, and solid waste.

- **Fossil Fuels**—Fossil fuels include crude oil, coal, and natural gas. Humans use fossil fuels as a source of energy to generate electricity and to move machines. Petroleum is manufactured from crude oil. Humans use petroleum to make a variety of products, such as plastics.

- **Other Energy Sources**—Other energy sources include wind, hydropower, geothermal, and tidal energy. Humans usually use these energy sources to generate electricity; however, these are not addressed in this unit.

Note: In this lesson we will use only four categories of natural resources: plants, animals, minerals, fossil fuels (a subcategory of energy sources). These are the natural resources from which most products are manufactured. Note that air and water are almost always used in the manufacturing process.

LESSON 3: Landfill in a Jug

LESSON'S CONCEPTS

- Placing waste material in landfills is the most common method of disposing of solid waste in the United States today.
- Landfills take up space and are located in areas that are, or once were, habitats for people and wildlife.

PURPOSE

Students will demonstrate that solid waste takes up space in a landfill and that many materials can be diverted from the landfill and reused or recycled.

OVERVIEW

In this lesson students will:

- Listen to stories, such as *Farewell to Shady Glade* by Bill Peet and/or *Where Once There Was a Wood* by Denise Fleming, and discuss how a landfill can affect habitats of wildlife and people.
- Construct model landfills in a gallon jug, add garbage to these models on a daily basis, and record what has been added.
- Discuss what they can do with the new garbage when most of their model landfills are full.
- Identify the garbage they placed in the model landfill that could have been reused or recycled.

CORRELATIONS TO CALIFORNIA'S CONTENT STANDARDS AND FRAMEWORKS

- Students construct model landfills in a gallon jug, add garbage to these models on a daily basis, and record what they have added.
 - "Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept . . . students will: draw pictures that portray some features of the thing being described." (*Science Content Standards, Grades K-12; Grade 1; Investigation and Experimentation, Standard 4a*)

- "All matter has properties that can be observed, defined, and recorded. Matter occupies space, it has substance, and we can measure its weight." (*Science Framework, page 41*)
- Students develop a chart of items that often go into a garbage can, and they record each day the items which were placed in the model landfills. They categorize items in the model landfill as "reusable" or "recyclable."
 - Students "record observations and data with pictures, numbers, and/or written statements." (*Science Content Standards, Grades K-12; Grade 1; Investigation and Experimentation, Standard 4b*)
 - "Students sort and classify objects." (*Mathematics Content Standards for California Public Schools, Kindergarten Through Grade Twelve, page 2*)
- Students listen and interpret stories about wildlife and habitats.
 - "Students identify the basic facts and ideas in what they have read, heard, or viewed." (*English-Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve, page 2*)
 - "Different types of plants and animals inhabit the Earth. As a basis for understanding this concept, students know: stories sometimes give plants and animals attributes they do not really have." (*Science Content Standards, Grades K-12; Kindergarten; Life Sciences, Standard 2b*)
- Students generalize how a landfill can affect habitats of wildlife and people.

- "To develop geographic literacy, students must: Understand human and environmental interaction." (*History–Social Science Framework*, pages 15 and 16)
- Students show through drawings what happens to garbage after it is placed in a garbage can. They also draw and label items they placed in their model landfills on a daily basis.
 - "Students create original artworks based on personal experiences or responses." (*Visual and Performing Arts Framework*; Goal 4, page 101)
- Students sort objects in their landfills and develop a chart or bar graph, using pictures to show what materials should be reused, recycled, or placed in a landfill.
 - "Students organize, represent, and com-

pare data by category on simple graphs and charts." (*Mathematics Content Standards for California Public Schools, Kindergarten Through Grade Twelve*, page 6)

SCIENTIFIC THINKING PROCESSES

observing, communicating, comparing, categorizing

TIME

60 minutes to prepare for the lesson; 45–60 minutes per day for five days to implement the lesson

VOCABULARY

garbage, landfill, recycle, reduce, reuse, solid waste, trash

PREPARATION

- ___ 1. Read the "Background Information for the Teacher" at the end of this lesson.
- ___ 2. Obtain examples of pictures from magazines and old calendars that show pictures of natural areas, such as forests, deserts, and grasslands.
- ___ 3. Contact the local waste management coordinator and ask for information about the nearest landfill. (Check the telephone directory, or call California Integrated Waste Management Board's Office of Integrated Education at (916) 341-6769 to get the phone number for your city's or county's solid waste department, often part of the Department of Public Works.) If possible, have the coordinator send you photographs and other information on the landfill. Also, ask whether the coordinator is willing to come to speak about solid waste to the class or to set up a field trip. The coordinator will also have information about what could be recycled in your community.
- ___ 4. If possible, arrange to take students to see a local landfill or take slides or a video of the landfills to show the class. If that is not possible, show the video, *Kids Talking Trash* (available free of charge

- from the California Integrated Waste Management Board), or other video that shows a landfill (see "Resources").
- ___ 5. Ask students to bring plastic jugs from home. Cut the top off each jug. Pre-cut enough 1-gallon plastic water or milk jugs to provide one for each pair of students. (Clear, 1-gallon plastic juice containers would also work.) If any of the edges are jagged, trim them with scissors and tape with masking tape. Recycle the top portion of each jug. Cut blue construction paper to fit the bottom of each jug. See "Diagram of Landfill in a Jug" at the end of this lesson (page 34).

Note: Younger students may need a container larger than one gallon in which to work.

- ___ 6. If available, locate an area on or near the school grounds where students can collect grass, sticks, leaves, and small rocks to place in their model landfills. If such an area is not available, explain to students what they will be making and assign them to bring from home items to make the area inside their 1-gallon jugs more natural. (You might need to discuss with students what the term "more natural" means.)
- ___ 7. Make a transparency of "A Simple Diagram of a Landfill" (page 35).

MATERIALS

For “Part I, Designing a Natural Area in a Jug”

- ___ Enough 1-gallon milk or water jugs to provide one for each pair of students
- ___ A custom cut piece of blue construction paper for the bottom of each jug
- ___ Enough garden soil (not potting soil, because it is sterilized) to provide 6 cups for each student
- ___ Grass, sticks, leaves, rocks, plastic animals
- ___ Pictures (from outdated calendars) and books containing pictures of natural areas, such as forests, deserts, grasslands

For “Part II, Reading Farewell to Shady Glade or Where Once There Was a Wood”

- ___ The following books:
 - *Farewell to Shady Glade* by Bill Peet
 - *Where Once There Was a Wood* by Denise Fleming

For “Part III, Developing a Landfill”

- ___ The book, *Where Does the Garbage Go?* by Paul Showers
- ___ Transparency of “A Simple Diagram of a Landfill”
- ___ A small garbage can with nonhazardous solid waste, such as various types of paper, aluminum can, bottle, plastic cup, plastic bag, toys; at least one item for each student
- ___ One metal spoon for each pair of students
- ___ Scissors, tape, utility knife
- ___ Several plastic grocery bags, cut in fourths; or sandwich bags (to be used as landfill liners)
- ___ Clay or clay soil (enough for each pair of students to mold the clay or clay soil under their landfill; approximately 1 cup per jug)
- ___ Several cups of gravel
- ___ Plastic containers for soil dug up from the landfill in a jug

Optional

- ___ The video, *Kids Talking Trash* (shows a landfill)
- ___ The book, *Trash!* by Charlotte Wilcox (contains photographs of a landfill)

For “Part IV, Filling the Landfill with Garbage”

- ___ Assorted small pieces of garbage between $\frac{1}{2}$ and 1 inch in size

(e.g., pieces of fruit, bread, leaves, cloth, newspaper, copy paper, aluminum foil; bottle caps; rubber bands; paper clips; pennies; plastic scraps; grass)

- ___ A pair of plastic or garden gloves for each pair of students

Note: If you would like to build a model of a sanitary landfill with your students, see the 4–6 Module, Unit 1, Lesson 2.

PRE-ACTIVITY QUESTIONS

- A. Have students sit in a circle on the carpet, and place the garbage can containing non-hazardous solid waste in the middle of the circle. Ask the following questions.
- What is this? *A garbage can.*
 - What goes in it? *Trash; garbage; things we don’t want anymore.*
 - Why do we need to throw away garbage? *Gets smelly; takes up space.*
 - What are some garbage that we throw away? *Paper, cans, food scraps.*

Tell students that the difference between trash and garbage is that trash includes dry waste and does not include food waste; whereas, garbage is made up of dry waste and food waste. Solid waste includes garbage, yard waste, and other household waste (like appliances and furniture).

- B. Make a chart labeled “What Goes in a Garbage Can” and list students’ responses. Allow students to look inside the garbage can for additional ideas. If some students indicate that some of the items could be recycled, circle the names of those items, but at this time do not get into the topic of recycling. Keep the chart for reference, to add information to, and to use for assessment at the end of the unit.

What Goes in a Garbage Can?

- | | |
|-----------------|----------------------|
| 1. Bottles | 7. Plastic bags |
| 2. Wrappers | 8. Cardboard |
| 3. Newspapers | 9. Broken pencils |
| 4. Chip bags | 10. Plastic spoons |
| 5. School paper | 11. Empty food boxes |
| 6. Paper plates | 12. Leftover food |

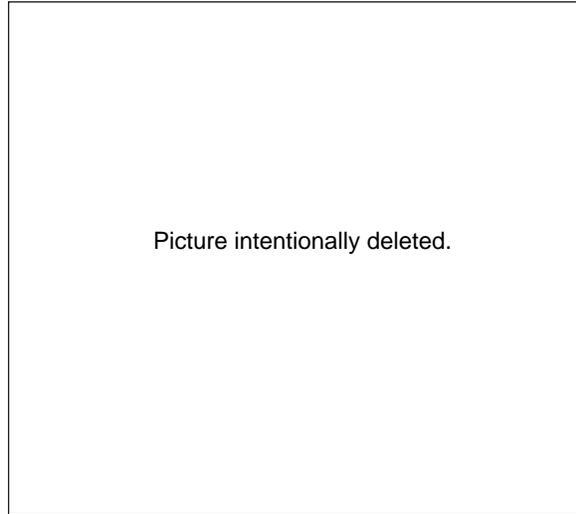
Submitted by Ted Schut’s first-grade class, Ripona Elementary School, Ripon Unified School District.

C. Ask students to use drawings or discuss and record responses to complete this sentence: "I put my garbage in a garbage can; then it goes . . ." Prompt students with the following questions:

- What happens to the garbage after it goes in the garbage can?
- Who moves the garbage can? *At school it is usually the janitor. At home it is a family member who places the garbage can by the curb.*
- How does the garbage get into the garbage truck? *Sometimes people lift the garbage can and throw the contents into the truck, and sometimes the truck has a special machine that lifts the can and places its contents into the truck.*
- Where does the garbage truck take it? (Some students will not know this or will say the landfill. Since this is the pre-activity section, allow students to answer in their own way.)
- If students completed drawings concerning where the garbage goes, then encourage several students to share and explain their drawings.

Note: To find out what happens to the garbage in your community after it leaves the curb, check with your local garbage company. In some communities the garbage truck takes the garbage directly to a landfill. In other communities, the garbage truck takes the garbage to a transfer station. From the transfer station, the garbage is placed on large transfer trailer trucks for hauling to the landfill. Some communities have a materials recovery facility (MRF) where the materials are first separated into recyclable materials and nonrecyclable materials. The nonrecyclables (solid waste) are then hauled to a transfer station or directly to a landfill. (See photograph on page 36.) (You may share this information with students in the next section of this lesson.)

D. If you were able to get the local waste management coordinator to speak to your class, have the class develop a list of questions for the speaker. Then send these questions to the speaker ahead of time so he or she can prepare the answers for the class.



Students in Carolyn Ann Weiss's fifth-grade class at Jefferson Elementary School begin designing a natural area in plastic jugs.

PROCEDURE

Part I, Designing a Natural Area in a Jug

- A. Tell students that they will be designing a natural area in a jug. Do the following:
1. Provide one jug to each pair of students.
 - Have students place the custom cut (the size of the bottom of the jug) piece of blue paper in the bottom of their jugs.
 - Tell students that the construction paper represents water found underground. This is called groundwater.
 - Place (or have students place) four cups of soil on top of the blue paper. Ask what this could represent. *Soil on Earth.*
 2. Tell students to design a natural area inside the gallon jug, such as a grassland, oak woodland, or desert. They can do this by adding items, such as grass, sticks, leaves, and rocks. You can ask students to bring materials from home or organize a collecting expedition on or near the school grounds. Provide pictures and books containing pictures of natural areas.
 3. Encourage students to draw or list some plants and animals that might live in the natural areas they have created. They can make cardboard cutouts of some living things.

Part II, Reading *Farewell to Shady Glade* or *Where Once There Was a Wood*

- A. Introduce students to the word *landfill*. Show photographs, read sections of a book (pages 4–16 in *Where Does the Garbage Go?* by Paul Showers) and/or show a video about landfills. (At the beginning of the video, *Kids Talking Trash*, a landfill is shown; show only that section at this time.)

Note: Other books, such as *Trash!* by Charlotte Wilcox, contain photographs of a landfill.

- B. Do one or both of the following:
- Read to students the book, *Farewell to Shady Glade*. Have students suppose that a landfill was planned in Shady Glade. Discuss:
 - How will Shady Glade be affected? *Shady Glade would be filled with garbage.*
 - How might the animals that live in Shady Glade be affected? *They wouldn't have a place to live. The animals' homes might be destroyed. Do animals always have another place to move to? No.*
 - Could real animals jump on a train to go to another area to live? *No.*
 - How could animals get to another area to live? *They can walk or run, slither, or fly there.*
 - If the animals move to another place, what happens to the animals that already live in that other place? *The animals might be crowded and fight for territory; there might not be enough food and shelter for all of the animals.*
 - Can animals really talk as people do? *No.*
 - Do animals, like people, need a place to live? *Yes.*
 - Read to students or have students read the book, *Where Once There Was a Wood*. Have students imagine that instead of a housing development, a landfill was placed in the area of the forest. Discuss:
 - How would the landfill affect the forest? *The trees would be cut down.*
 - What could the people who are developing a landfill do to help

the animals? *They could make sure the animals have another place to live. They can leave trees around the landfill for the animals.*

Note: It is important for students to realize that many landfills are also in cities and not just located far away in nature. Any time a landfill is built, the area will change because of the construction of the landfill.

Part III, Developing a Landfill

- A. Tell students that they will be developing a landfill in their plastic gallon jugs.
- Provide metal spoons.
 - Have students use metal spoons to dig a hole for a landfill in the soil in their gallon jugs. They can make the hole as small or as large as they want, but they should not touch the blue paper, which represents groundwater.
 - Have them note that the soil area was disturbed as a result of digging the hole.
 - Ask what could be done with the soil that was dug up. *The soil could be placed in a garden, in a pot with a plant, or in a container.* Tell students that because they will need this soil at a later time, they should place it in other containers.
- B. Ask students what the blue paper on the bottom part of the gallon jug represents. *Water under the ground.* Tell students that people pump this water through wells and use it to drink and to water their crops. Garbage should not touch or leak on the blue paper.
- C. Challenge students to make sure that their landfills won't leak on the blue paper, even if it rains on the landfill. Allow students to design their landfills and provide the materials they ask for. Some students might think to place a plastic liner, gravel, and/or clay (or clay soil) under the garbage; other students might not. Allow students to make their own decisions.
- D. Provide about six or seven pieces (about 1/2 to 1 inch in size) of garbage and/or allow students to find something in the classroom that they could put in their landfills. They can refer to the chart, "What Goes in a Garbage Can?" that they created.

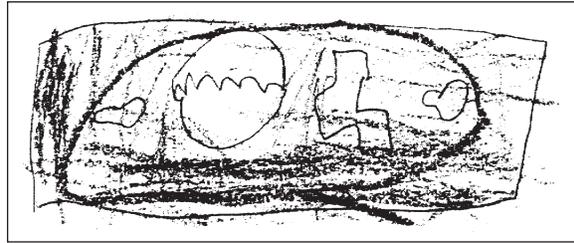
Offer some additional examples, such as a piece of crayon, part of snack/lunch, a leaf, a piece of paper, or a tissue.

- Ask students to record in their journals today's date and to describe what they plan to place in their landfills.
 - Have students pretend that they are unloading a garbage truck, and have them place pieces of garbage in their landfill. Ask the students what they might do before the garbage trucks arrive the next day to keep the garbage from smelling, blowing away and becoming litter, or attracting rats? *Cover the existing garbage with soil.* Explain to students that in real landfills, covering the garbage on a daily basis is required by law.
- E. Show students the transparency, "A Simple Diagram of a Landfill." Ask students to compare the drawings in the transparency to the landfills they completed.
- F. Allow students to redesign their landfills. They can remove the garbage and add clay, a liner, and gravel, and then they can place the garbage on top of the gravel.
- G. Ask students to draw pictures of their model landfills in their journals. They can also write how they developed their landfills and what they added to their landfills. They should describe their journal entries to a group of students.

Homework Assignment: Have each student name his or her landfill and to share the name with the class the following day.

Part IV, Filling the Landfill with Garbage

- A. Students will be adding garbage to their landfills every day for about five days or when at least half of all the landfills in jugs are full. Ask students to draw and label in their journals the items they "dumped" into their landfills every day. Each day, students should pack down the garbage, as the compactors do at a real landfill. (They should determine a way to do this without touching the garbage.) Then they should cover the new garbage layer with soil. This simulates how the garbage at a landfill is covered daily with soil to eliminate odor and to keep animals, such as rats, out of the landfill.



Submitted by Beverly Hayes, kindergarten and first-grade teacher, John A. Otis Elementary School, National School District.

First we dug the hole. Then we put clay to cover the soil. Then we put the banana peel and other garbage.

Before that there was a beautiful area for animals and plants but you see now it's filled up with garbage and stuff like that.

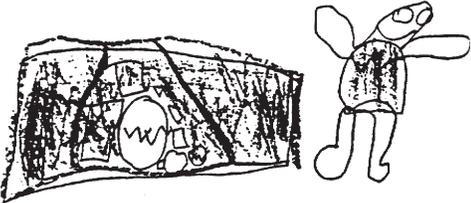
Submitted by Anne Harris, second-grade teacher, Jefferson Elementary School, Cloverdale Unified School District.

1. Note that some landfills in a jug will become full before others. The students with full landfills can work on a plan on what to do with their future garbage. Maybe some can negotiate using someone else's landfill on a temporary basis.
 2. When most students' model landfills are full, ask what students can do with the new garbage. Ask students to describe the results of their negotiations concerning the use of someone else's landfill. If some students recommend digging new landfills, discuss the impact the new landfill will have. Lead students to a discussion on recycling and reusing. Discuss how not to make garbage in the first place by not buying as much stuff that will become garbage when you are done with it. (This concept will be covered in Unit 2, Lesson 1.)
- B. If available, show the entire video *Kids Talking Trash*. Discuss those parts applicable to this lesson.

NAME Jonas
DATE 4-9-97

LANDFILLS

WE MADE A MODEL OF A LANDFILL TODAY. HERE IS A PICTURE OF OUR LANDFILL.



THIS IS WHAT WE PUT IN OUR LANDFILL:

Jelly beans, egg shells,
Paper towel, Chalk, Paper
Scraps

Submitted by Beverly Hayes, kindergarten and first-grade teacher, John A. Otis Elementary School, National School District.

- C. Have students create a master list of all the items that they placed in their landfills. Label the list, "What Went into Our Landfill Each Day." With two different colored markers, have students help you circle those items on the chart which could be reused or recycled. This can be referred to throughout the unit as students add to the list and circle new items that can be reused or recycled (or both).

Part V, Digging in the Landfill

- A. After five days or when the landfills are full, provide plastic or garden gloves to each pair of students and have them sort through their landfills. They should do this, if possible, without disturbing the non-landfill areas in their jugs.
- B. Discuss what in their landfills could have been reused or recycled. Could some of the items not have been used or bought in the first place?

DISCUSSION/QUESTIONS

Ask students:

- How long did it take for the landfill to fill up?

- Why did some landfills fill up faster than others? *Smaller hole; more garbage was placed in the hole.* Although the students' landfills are much smaller than real landfills, the concepts still apply. Some communities have to expand their landfills, as they are too small. Most communities in California have reduce, reuse, and recycle programs in place, so the garbage doesn't fill up landfills too quickly.
- What could students have done to keep the landfill from filling up too quickly? Explain that cities and counties throughout California are trying to keep a lot of the solid waste from going to landfills. This solid waste can be reused or recycled. (Note that since some "solid waste" can be reused or recycled, it is not really waste, but is actually materials which can be reused or recycled.) Some cities and counties are also expanding their landfills. All of these expansions require a layer of clay soil under a plastic liner and a layer of crushed rock followed by a layer of soil to be placed on the ground before any garbage is added. The clay soil, liner, and layers of other materials (e.g., gravel) are used to protect the groundwater from becoming contaminated by rainwater that can pick up hazardous substances from the garbage.
- Was it easy to take the garbage out of the students' landfills and to separate it?
- Would it be easy or difficult to try to separate the garbage from a real landfill? *Difficult.* What would some of the problems be? Explain to students that some communities have a "recovery" facility that takes all types of solid waste and materials and separates it. However, in a landfill, once the solid waste has been covered with soil, it is very difficult and would be very expensive to try to remove all the items that could be reused and recycled. Therefore, it is more efficient to separate the recyclable and usable materials before the solid waste is buried in the landfill.
- What was the condition of the items placed in the model landfills when they were removed? Was anything rotting? Explain to students that solid waste placed in landfills usually does not rot or decompose rapidly, because there is not enough air for many living things (e.g., certain bacteria and fungi) that make things decompose. However, there are bacteria that do not need oxygen to live, and they

can decompose materials. Therefore, some decomposition does occur in landfills. (This topic will be addressed further in the K–3 Module, Unit 3.)

FIELD TRIP OR SPEAKER

- A. Take students on a field trip to see their local landfill (or transfer station). Students should note that it would be quite difficult to separate garbage once it is placed in the landfill. Many urban areas also have transfer stations, where the garbage is taken and loaded on larger trailer trucks for transporting to the landfill. These might be closer to the school and easier to visit.
- B. If a field trip is not possible, ask the waste hauler or local solid waste coordinator to visit your class and explain where the garbage goes. Ask whether the speaker can bring a video, slides, or pictures of the local landfill.

APPLICATION

- A. Discuss, as a class, the pros and cons of placing garbage in a landfill. For example, some pros include: that garbage needs to go somewhere, and a landfill keeps garbage away from where people live; placing garbage in a landfill is easy; the garbage is better contained. Some cons to placing garbage in a landfill are: landfills take up space which can be used by people and wildlife; a landfill is unsightly; a landfill might pollute groundwater. Also, landfills themselves have limited space. When a community’s landfill closes, where will its garbage go?
- B. Ask students to review the chart, “What Goes in a Garbage Can,” and decide whether the items for recycling are accurate. Ask what other items should be recycled, and add these to the chart.
- C. Have students determine what items in their model landfills (including the containers themselves) should be reused, recycled (or composted), or placed in a landfill after the activity. For example, many communities recycle rinsed gallon HDPE bottles (high-density polyethylene); organic wastes, such as banana peels and leaves, can be composted or mulched; pennies can be reused; newspapers can be recycled, mulched, or composted; aluminum

can be recycled; cloth, if cotton, silk, wool, or other all-natural fiber, can be reused or even mulched.

- D. Help students develop a class chart or bar graph using pictures to show what should be reused, recycled, or placed in a landfill.

Note: In Unit 2 in the K–3 Module, students will explore further the concepts of reusing and recycling.

- E. Ask students to write or to draw and label in their journals what they can do to keep garbage out of a landfill.

What I Can do to Reduce
garbage that goes to
the Landfill:
give away my toys
compost food
reduce the amount of
paper I use
Reuse old chairs

Submitted by Debby Carter’s first-grade class at Coyote Valley Elementary School, Middletown Unified School District.

Project Idea: Look at the types of materials that are thrown away in the classroom. Determine what items do not need to be used (or bought in the first place). Use items that can be reused instead of those that become garbage after just one use. Reuse everything possible in the classroom. Recycle everything possible (that cannot be reused) in the classroom and take it to a recycling center.

VARIATION

Have students weigh the garbage before they place it in their model landfills. Then once they have removed the garbage and separated it, have students calculate the total weight for items that could be reused, those that could be recycled, and those that need to be placed back in the landfill. This will indicate how much garbage by weight can be diverted. Students should know that landfills do not close because they “get too heavy”; they close because space is used up by the garbage. However, because volume is too difficult to measure (also, some garbage brought to the landfill is compacted,

whereas other garbage is not), trucks with garbage are often weighed at the landfill, and their drivers pay to dump their garbage based on the weight of the garbage.

EXTENSIONS

- A. Have students make mini-compost containers to demonstrate what happens to garbage when it is exposed to air and water. Students should also make several model landfills and compare these to the mini-compost containers.
- B. Students could design their landfills to be kept from year to year and shared with the new classes.
- C. Students could develop a map showing where their garbage goes.

RESOURCES

Videos

Bill Nye the Science Guy: Garbage. Disney Educational Products, 1995 (50 minutes).

Bill Nye shows that garbage usually does not decompose in a landfill.

Garbage, Garbage, Garbage. The Green Earth Club series. Produced by TV Ontario, 1992.

Chatsworth, Calif.: AIMS Media (distributor) (15 minutes).

Shows a landfill site and explains what usually happens to garbage after it leaves our homes.

Kids Talkin' Trash. Alameda County Waste Management Authority, 1995. Distributed by the California Integrated Waste Management Board (14 minutes).

Students learn how to make less garbage and protect the environment by practicing the four R's: reduce, reuse, recycle, rot. Shows a landfill.

Books

Fleming, Denise. *Where Once There Was a Wood.* New York: Henry Holt and Company, 1996.

A book for primary students about different animals that lived in a forest before the area was developed for a housing project. A landfill can be substituted for the housing tract.

Hadingham, Evan, and Janet Hadingham. *Garbage! Where It Comes From, Where It Goes.* New York: Simon & Schuster, Inc., 1990.

Contains information about problems of solid waste disposal, landfills, and incineration. Explains the importance of recycling. Contains colored photographs and illustrations.

Peet, Bill. *Farewell to Shady Glade.* Boston: Houghton Mifflin Company, 1966.

A story about a group of animals that are forced to move to another area when bulldozers come to change their habitat.

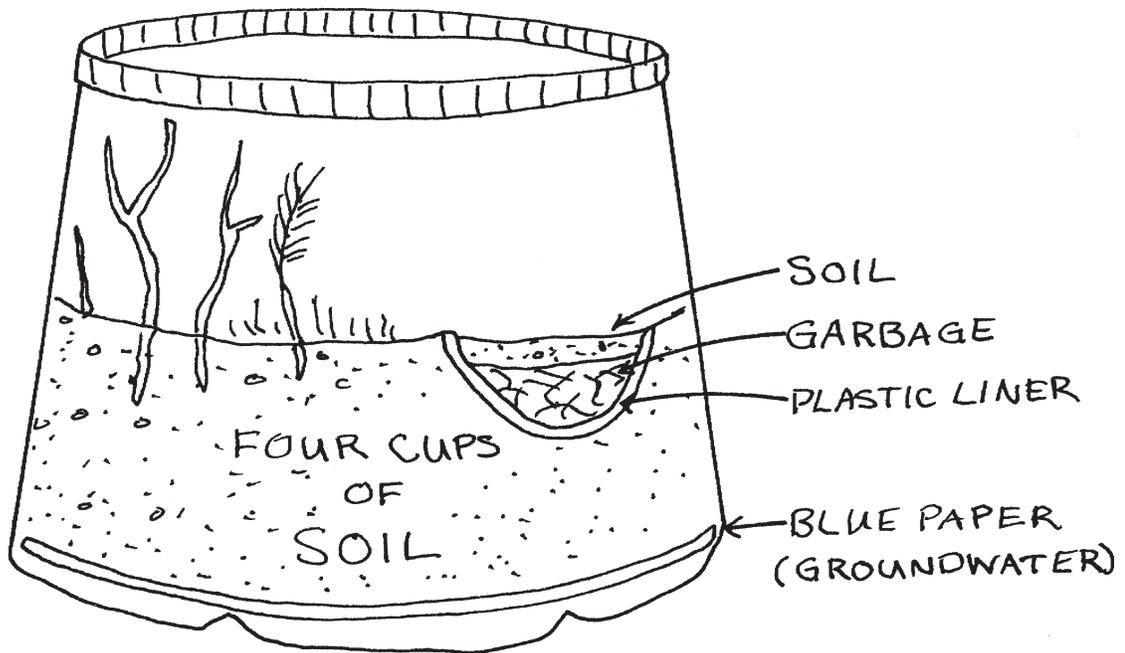
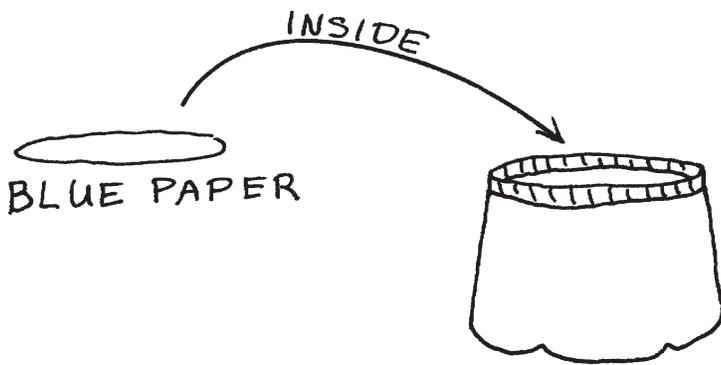
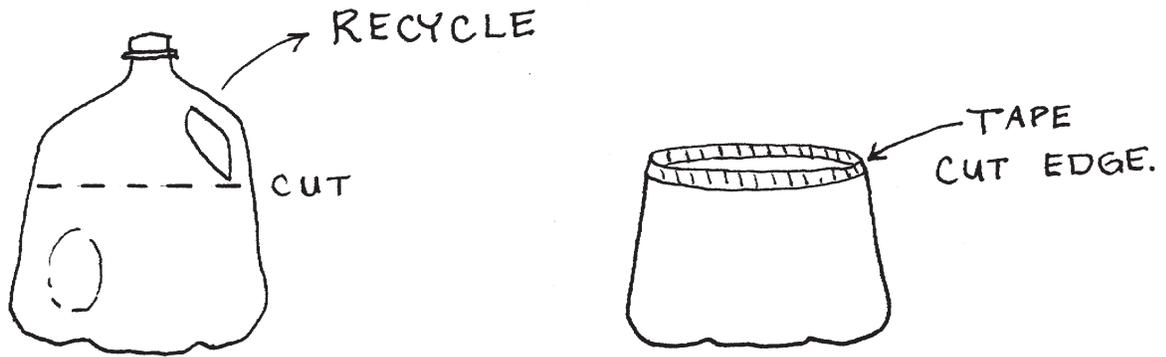
Showers, Paul. *Where Does the Garbage Go?* Let's-Read-and-Find-Out Science series. New York: HarperCollins Children's Books, 1994.

Describes landfills and how materials can be recycled into new products.

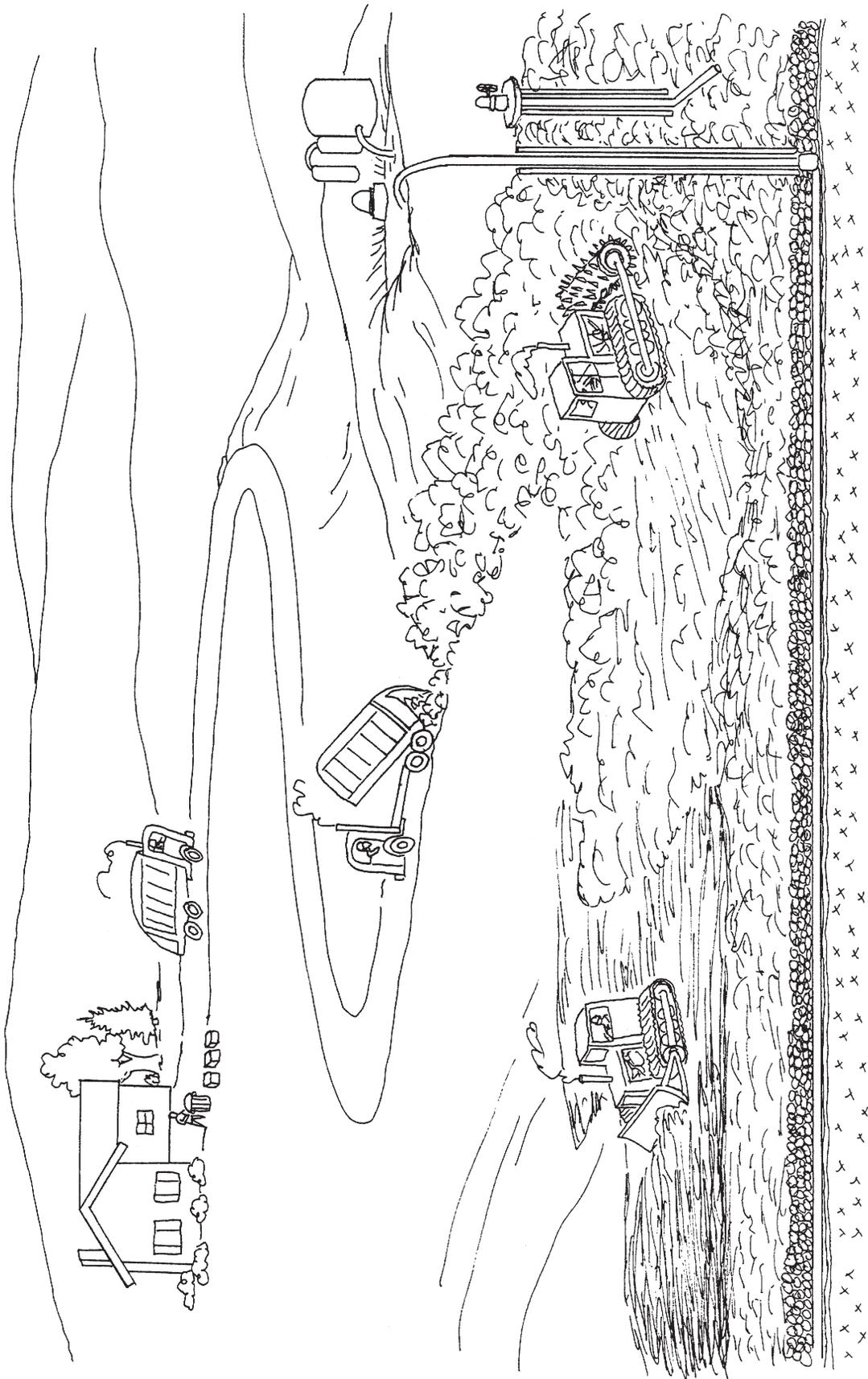
Wilcox, Charlotte. *Trash!* Minneapolis: Carolrhoda Books, Inc., 1988.

Shows a garbage truck, a landfill, and a plastic liner in a landfill.

DIAGRAM OF A LANDFILL IN A JUG



A SIMPLE DIAGRAM OF A LANDFILL



BACKGROUND INFORMATION FOR THE TEACHER

Waste management was once a simple task. You took all of your garbage, dumped it in a big pile or pit, and when the smell was too overwhelming, you just moved on. Then, as cities developed, waste was taken to remote dumps. These open dumps were often burned to make space for more garbage. When cities expanded, these dumps were no longer remote, and the problems associated with these dumps needed to be solved. Because of potential hazards to the health of humans and the environment, open dumps have been illegal in California for many years.

New landfills are required by law to incorporate special design features. One of these features includes using a synthetic membrane to keep the toxic liquid, which accumulates when rainwater leaches through the garbage, from contaminating groundwater. The liquid, also known as leachate, is collected and treated at a waste water treatment facility. Methane gas, generated by the decomposition of organic matter in the landfill, is also collected through pipes in the landfill and is either burned off or used for energy.

Once landfill sites have reached capacity, they must be capped (closed with layers of clay and soil) and monitored. Such sites are often landscaped and used for parks and housing develop-

ments. In older landfills there have been some problems that have resulted from the buildup of explosive methane gas and the settling of buried garbage. Engineers and scientists are working on ways to make these sites safe for people and wildlife.

Instead of being treated as raw materials to make new products, landfilled materials are buried, potentially lost to us forever. (It is possible that in the future some landfills may be “mined” to extract materials, such as aluminum and steel.) In addition, large areas of land are used for landfills. These areas were once natural ecosystems, providing habitats for wildlife and plant life. In this lesson, students determine that garbage takes up space in a landfill and that landfills are located in areas that are or once were habitats for people and wildlife.

For information about the environmental concerns posed by landfills, such as groundwater pollution, see the “Background Information for the Teacher” in the 4–6 Module, Unit 1, Lesson 2; in the 4–6 Module, Unit 4, Lesson 2; and in “Appendix B–IV, Landfill Issues,” in this guide.



A garbage truck deposits solid waste into the Eastlake Sanitary Landfill, owned and operated by Lake County in northern California.

LESSON 4: There Is No “Away”

LESSON’S CONCEPTS

- Items that become solid waste are made from a variety of natural resources.
- Most solid waste is buried in landfills.
- Some garbage can be reduced, reused, or recycled (including composting).

Note: Composting (including vermicomposting) is considered to be part of recycling. Unit 3 in the K–3 Module contains lessons on vermicomposting; Unit 3 in the 4–6 Module contains lessons on composting.

PURPOSE

Students will learn that most of the “garbage” in the classroom usually goes to a landfill, but many items considered garbage are actually materials that can be reduced, reused, and recycled (also composted) to conserve natural resources.

OVERVIEW

In this lesson students will:

- Look at the pictures of a landfill in *Where Does the Garbage Go?* by Paul Showers and describe a landfill.
- Classify classroom garbage according to the kinds of natural resources used to make the garbage.
- Listen to the story *Katherine and the Garbage Dump* by Martha Morris and relate the actions of the character to actions they can take with the garbage in the classroom.
- Classify items that can be reduced, reused, or recycled.

CORRELATIONS TO CALIFORNIA’S CONTENT STANDARDS AND FRAMEWORKS AND TO BENCHMARKS FOR SCIENCE LITERACY

- Students classify garbage according to the kinds of natural resources that were used to make the items being discarded.
 - “Students collect information about objects and events in their environ-

ment.” (*Mathematics Content Standards for California Public Schools, Kindergarten Through Grade Twelve*, page 3)

- Students listen to the story *Katherine and the Garbage Dump* by Martha Morris and relate the actions of the character to the actions they can take with the garbage in the classroom.
 - “Students identify the basic facts and ideas in what they have read, heard, or viewed.” (*English–Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve*, page 2)
- Students categorize classroom garbage items into those that can be reduced, reused, or recycled.
 - “(People) need to exercise judgment, care, and planning in their use of natural resources, including plants, animals, soil, and water, and in their practices of disposing of wastewater and materials.” (*Science Framework*, page 125)
 - “Discarded products contribute to the problem of waste disposal. Sometimes it is possible to use the materials in them to make new products, but materials differ widely in the ease with which they can be recycled.” (*Benchmarks for Science Literacy*, page 189)
 - “Properties of materials can be observed, measured, and predicted. As a basis for understanding this concept, students know: objects can be described in terms of the materials they are made of . . . and their physical properties . . .” (*Science Content Standards, Grades K–12; Kindergarten; Physical Sciences, Standard 1a*)

- “To participate effectively in society, students need to: Develop personal skills (and) . . . group interaction skills.” (*History–Social Science Framework*, page 24)

SCIENTIFIC THINKING PROCESSES

observing, communicating, comparing, classifying, relating

TIME

30 minutes to prepare for the lesson; 60 minutes to implement the lesson

VOCABULARY

landfill

PREPARATION

1. Read the “Background Information for the Teacher” at the end of this lesson.
2. Obtain clean classroom garbage that you began collecting during Lesson 1. Try to include paper towels, candy wrappers, short pencils, small pieces of chalk, bent paper clip, aluminum can or tray, plastic container, milk carton, polystyrene meat tray, paper used on one side and used on both sides, dried up markers and glue sticks, banana, or orange peels.
3. Obtain information about what can be recycled in your community.

MATERIALS

- ___ Clean classroom garbage
- ___ Plastic tarp on which to spread out the garbage
- ___ Four hula hoops, or yarn to make four large circles (*Note:* If your students are familiar with composting, obtain a fifth hula hoop.)
- ___ Names of the following natural resources on separate pieces of cardboard: plants, animals, minerals, petroleum
- ___ The book, *Where Does the Garbage Go?* by Paul Showers
- ___ The book, *Katherine and the Dump* by Martha Morris
- ___ If available, the video, *Kids Talking Trash* (available from the California Integrated Waste Management Board)

PRE-ACTIVITY QUESTIONS

Note: The answers in *italics* below are possible students’ answers and might not always be correct, especially with the “Pre-Activity Questions” when teachers are assessing their students’ understanding about a topic or concept.

- A. Spread the garbage that you have collected from the classroom on a tarp for students to

see. Ask students:

- What should we do with this garbage? *Throw it in a garbage can; throw it away; recycle it.*
 - What happens to our garbage when we throw it in a garbage can? *Someone picks it up and takes it to a dump; it gets buried.*
 - Where is this place where our garbage goes, the place that we call “away”? *A dump; a landfill; a transfer station.*
- B. Students should already be familiar with how a landfill looks if they completed Lesson 3 in Unit 1. If needed, show students the first part of the video, *Kids Talkin’ Trash*, to remind them of a landfill’s appearance. (They will also see a picture of a landfill in a book in the “Procedure” section of this lesson.)

PROCEDURE

- A. Show students the cover of the book, *Where Does the Garbage Go?* by Paul Showers.
 - Ask the students what they think this book is about.
 - What information might be in this book?
 - Show students pages 12 through 14 from *Where Does the Garbage Go?* which show pictures of a landfill.

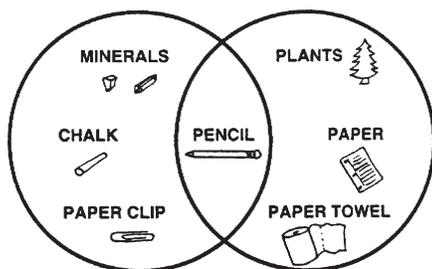
Note: You do not need to read the entire book.

- Ask students to describe a landfill.
 - Tell students that people in most cities and other communities depend on landfills to get rid of their garbage.
 - Discuss: Do people get rid of garbage when it goes to a landfill? The garbage does not just disappear or go away. Does the garbage remain in the landfill?
- B. Focus students’ attention on the garbage that you have collected from the classroom. What

natural resources were used to make the items that someone placed in the garbage? *Plants, minerals.*

- C. Tell students that they will separate items into groups, based on the natural resources that were used to make the items.
- Use hula hoops or make circles out of yarn.
 - Ask students to label each hula hoop with one of the following categories of natural resources: plants, animals, minerals, fossil fuels.
 - Have students place each piece of garbage in the appropriate circle representing the natural resource from which the garbage came from. Make sure that students realize that all of these items came from one or more natural resources.

Note: If an item is made from two natural resources, you could show your students how a Venn diagram works. Overlap a portion of two circles representing natural resources and place the item in the overlapped area. This is recommended for older students only.

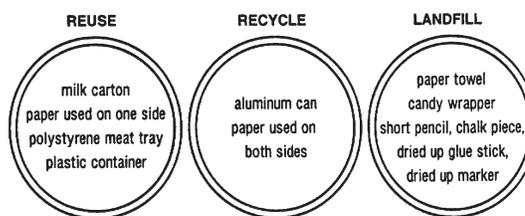


- Were any items made from more than one category of natural resources? If so, which ones? *Answers will vary.*
 - Which natural resource had the most number of items? *Answers will vary; for example, minerals.* Why do you think this is so? *There are many different types of minerals on Earth which are used to make many different items.*
- D. Tell students to suppose that the place where your classroom’s garbage used to be thrown “away” can no longer be used because it is full. They have to keep all of the classroom garbage in the classroom until they figure out what to do with it. Is there anything that they can do with it? *Recycle it; reuse it; give it away to someone.*
- E. Ask students to remove the garbage from each hula hoop and place it in one area.

- F. Read to students *Katherine and the Dump* by Martha Morris.
- Discuss the story with the class.
 - What did Katherine end up doing with the garbage that was thrown into her yard? *She reused and recycled many items. She made things with it.*
 - What can we do with our classroom’s garbage? *Some items can be reused; some items can be recycled; some items will need to be taken to another landfill that is open.*

Note: Lessons on recycling are included in the K-3 Module, Unit 2.

- G. Relabel three of the hula hoops based on students’ suggestions of what could be done with the items. *Recycle, reuse, place in landfill.* Note that “reduce” is not described in the book, *Katherine and the Dump*. Keep the fourth hula hoop for the “reduce” category to use later in the lesson.



HULA HOOPS FOR STRING CIRCLES

DISCUSSION/QUESTIONS

- A. Ask students:
- What items do we still have in the “landfill” hula hoop? *Paper towel, candy wrapper, short pencil, dried up marker and glue stick, banana peel.*
 - What could we have done to reduce the number of items we had there in the first place? *Close up the tops of the markers to keep them from drying out; use only the number of paper towels that you need to dry your hands; use a sponge or cloth towel instead of paper towels to clean up spills.*
 - What items in the classroom can we use less of in the first place? *We can use less new paper by using paper previously used on one side; we can use fewer paper towels by using cloth towels or use one paper towel instead of two or three each time we wash our hands.* What items in our homes can we use less of? *We can use fewer paper towels; we can use fewer paper cups by*

using plastic or glass cups; we can use fewer plastic bags if we reuse the ones we have and not buy many more.

- B. Have students place any item they could have “reduced” (used less of) from the landfill pile into a new hula hoop pile called “reduce.”
- C. Tell students that some people recycle yard waste and kitchen scraps (like banana peels) by composting. Ask if anyone knows what composting is. Tell students that they will learn more about composting in another lesson.

Note: If your students are familiar with composting, use a fifth hula hoop in which students can place items that can be composted, which includes banana peels and paper. Lessons on composting are included in the K-3 Module, Unit 3.

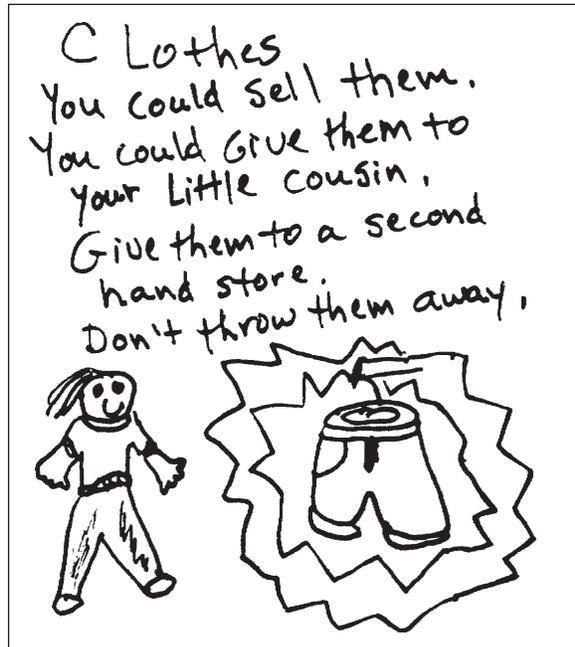
- D. Ask students to look at what’s left in the landfill hoop and ask what natural resources these came from. Make certain that students realize that when items end up in the landfill, it means that someone took the natural resources from their natural environment and placed them in an area where they can no longer be used by people or other living things. Discuss:

- What happens to the natural resources when they end up in the landfill? *They are buried and can no longer be used.*
- If we throw paper in a landfill, can that paper be used again? *No.* How are we wasting this paper? *We can't reuse it or recycle it.* What can we do to keep from wasting it? *Reuse it or recycle it. Keep it out of the landfill.*

APPLICATION

- A. Ask students to look at what has been separated from the garbage that was going to the landfill and to appreciate how much they have conserved. Discuss with students what they learned in this activity.
- B. Ask students to select an item they often use. Discuss:
 - What happens to that item when we no longer want it?
 - What can we do to keep that item from going to the landfill?
- C. Ask students to list things they can do to re-

duce the number of natural resources that are being wasted. Younger students can draw pictures showing what they can do, or they can ask an older person to write for them as they dictate their ideas. They can do this in their journals.



Submitted by Lana Best, kindergarten, first- and second-grade teacher, Pacific School, Lincoln Unified School District.

- D. Have students add to the list they began in Lesson 2 concerning what people can do to conserve natural resources. They can circle those actions that they think they could do. Students will add to this list in Lesson 5.



Submitted by Christine Lucas, second- and third-grade teacher, Baywood Elementary School, San Luis Coastal Unified School District.

Project Idea: Have students come up with a plan on how to reduce waste in the classroom. For example, monitor the use of paper and paper towels; check that lids are on markers and glue

sticks to keep them from drying out.

Note: The topic of reusing and recycling is addressed in the K-3 Module, Unit 2.

RESOURCES

Videos

Kids Talkin' Trash. Alameda County Waste Management Authority, 1995. Distributed by the California Integrated Waste Management Board (14 minutes).

Students learn how to make less garbage and protect the environment by practicing the four R's: reduce, reuse, recycle, rot. Shows a landfill.

Tinka's Planet. Distributed by The Video Project (12 minutes).

Tinka discovers that not all garbage needs to be thrown away. She visits a recycling center and learns how recycling can help to conserve natural resources.

Books

Brown, Laurie Krasny, and Marc Brown. *Dinosaurs to the Rescue! A Guide to Protecting Our Planet.* New York: Little, Brown, and Company, 1992.

Dinosaur characters describe what students can do to conserve natural resources and reduce, reuse, and recycle. Includes a section that recommends that children use only as much of the natural resources as they need in order to avoid wasting resources.

Davies, Kay, and Wendy Oldfield. *Waste.* Starting Science series. Austin, Tex.: Steck-Vaughn Company, 1992.

Describes some activities that primary students can do to learn more about waste.

Morris, Martha. *Katherine and the Garbage Dump.* Toronto, Canada: Second Story Press, 1992.

The story of how Katherine's backyard became a dump and how Katherine got people to clean it up by reusing and recycling the garbage.

Showers, Paul. *Where Does the Garbage Go?* Let's Read-and-Find-Out-Science series. New York: HarperCollins Publishers, 1994.

Describes a landfill, the importance of recycling, how things get recycled, and what students can do to reduce the amount of garbage they generate and the amount that goes to a landfill.

Other Resources

Environmental Education Compendium for Integrated Waste Management and Used Oil. Sacramento: California Department of Education and California Integrated Waste Management Board, June, 1999. Copies are available through the California Integrated Waste Management Board.

Contains information about and evaluations of many curricula on waste management and used oil.

The Web site for the California Integrated Waste Management Board contains updated information about solid waste: www.ciwmb.ca.gov.

BACKGROUND INFORMATION FOR THE TEACHER

People have a habit of throwing things away. But where is this “away”? For most people in California, “away” is the landfill. A landfill is a place where people’s garbage is dumped. It is required by law for all modern landfills to be lined with plastic and clay. This keeps the garbage leachate from contaminating ground-water. Leachate is a solution, often rainwater, that has leached through garbage in a landfill.

Every day large trucks deliver garbage to the landfill. Throughout the day the garbage is compacted with heavy machines. Then a layer of soil is placed over it to keep the garbage from creating foul odors and to keep rodents and insects from getting into the garbage and spreading disease.

The garbage, however, does not go away. It occupies space in a landfill. Items buried in a landfill decompose slowly, because the conditions are not ideal for rapid decomposition by decomposers, many of which need oxygen and moisture. (For more information about decomposers, see the K-3 Module, Unit 3 on vermicomposting.) Note that some decomposers, such as anaerobic (those that do not need oxygen) bacteria also decompose garbage in a landfill. Some drier parts of a landfill are “mummified” for awhile, but as time goes by moisture in the site moves around to different locations and decomposition takes place. What takes five or ten years in a wet landfill to decompose might take 30 to 50 years in a dry landfill site.¹ Furthermore, all of the natural resources used to make the items that are now in the landfill are no longer available to people and other living things. To unbury and separate items for reuse or recycling would be cost-prohibitive at this time.

According to Mark Murray, Executive Director of the Californians Against Waste Foundation, “As long as people continue to generate garbage, we will need landfills to contain that garbage and keep it from contaminating the environment. But landfilling is not the best place for materials that can be reduced, reused, recycled, or composted. In 1997 Californians disposed of approximately 35.7 million tons of garbage.

¹ Written communication from Joe Haworth, Information Officer, County Sanitation Districts of Los Angeles County, October 22, 1998.

Ten years ago, 90 percent of that material was landfilled. Today, 68 percent of that material is landfilled. The rest is recycled and composted.”²

The California Integrated Waste Management Board (CIWMB) is responsible for implementing the Integrated Waste Management Act, which is a comprehensive set of laws, passed in 1989, designed to address California’s solid waste problems and lessen the demand on natural resources. Students can help to reduce solid waste through reducing, reusing, recycling, and composting. For more information on waste management-related legislation, see “Appendix B-I, History of Waste Management.”

The integrated waste management hierarchy promoted by the California Integrated Waste Management Board emphasizes the following priorities concerning products and packaging:

1. Reducing and reusing
2. Recycling and composting
3. Environmentally safe transformation (waste-to-energy) and environmentally safe land disposal (landfilling)

For more information on waste-to-energy facilities, see “Appendix B-V, Incineration: Waste-to-Energy Facilities.”

Understanding the role landfills play in managing our waste and impacting our environment will enable us to use our natural resources in a more efficient manner.

² Written communication from Mark Murray, Executive Director, Californians Against Waste Foundation, October 12, 1998.

LESSON 5: Treasures of the Earth—A Play

LESSON'S CONCEPT

People use natural resources to make many items and are responsible for conserving and protecting these resources.

PURPOSE

Students will share with others the importance of caring for natural resources by presenting a play.

OVERVIEW

In this lesson students will:

- Perform a play about the importance of natural resources to people.
- Write a pledge to do one thing to conserve natural resources.
- Share the actions they have done based on their pledge.

CORRELATIONS TO CALIFORNIA'S CONTENT STANDARDS AND FRAMEWORKS

- Students develop a list of what they can do to show that they care about natural resources.
 - "(People) need to exercise judgment, care, and planning in their use of natural resources, including plants, animals, soil, and water, and in their practices of disposing of wastewater and materials." (*Science Framework*, page 125)
 - "The Earth is composed of land, air, and water. As a basis for understanding this concept, students know . . . how to identify resources from the Earth that are used in everyday life and that many resources can be conserved." (*Science Content Standards, Grades K–12; Kindergarten; Earth Sciences, Standard 3c*)
- Students perform a play that shows the importance of natural resources to people and the need to care for those resources.
 - "(People) farm the soil, mine resources from the earth, and get energy by burn-

ing fuels, including wood, which is also used to make paper and to build." (*Science Framework*, page 125)

- "Because we depend on other species for food, clothing, shelter, and other needs and will continue to do so, it is important for humans to respect nature and conserve natural habitats, resources, and species." (*Science Framework*, page 141)
- "To participate effectively in society, students need to: Develop personal skills (and) . . . group interaction skills." (*History–Social Science Framework*, page 24)
- "Students listen and respond to oral communications. They speak in clear and coherent sentences." (*English–Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve*, page 5)
- "Students convey the emotional qualities of given characters through simple dramatizations." (*Visual and Performing Arts Framework; Theater: Creative Expression Component, Example for Goal 3 for Kindergarten Through Grade Four*, page 83)

SCIENTIFIC THINKING PROCESSES

observing, communicating, relating, applying

TIME

15–30 minutes to prepare for the lesson; 60 minutes or more (depending on whether the play will be performed in front of other classes) to implement the lesson

VOCABULARY

Select a word or two from the play or from students' pledges.

PREPARATION

1. In this lesson students will perform a play about the importance of natural resources to people. Consider videotaping the play so students can see how the play can be improved before their performance in front of another class. Please note, there is no “Background Information for the Teacher” in this lesson.
2. Make a copy of “Treasures of the Earth and How People Use Them” (pages 46–48).
3. If students will be performing the play, see the “Preparation” section in “Treasures of the Earth and How People Use Them.”

MATERIALS

Materials for the Play

- Three pictures of minerals and/or objects made from different minerals; for example, jewelry, car, aluminum can, pots and pans, appliances (These can be found in magazines and newspapers.)
- Two large black garbage bags with the word “fossil fuels” on a piece of paper taped to each bag
- Two items made out of plastic
- A sign for each character (See the play at the end of this lesson for the list of characters.)

PRE-ACTIVITY QUESTIONS

Ask students: If we wanted to tell others about natural resources, what would we want to tell them? List students’ responses on the chalkboard.

PROCEDURE

Help students perform the play, “Treasures of the Earth and How People Use Them,” in class. For younger students, you will need to be the narrator. For older students, have one student be the narrator for the entire play, or select a different student to be the narrator for each scene.

Note to teacher: Because the focus of the play, “Treasures of the Earth and How People Use Them,” is on solid waste, the very important link that all other living things depend on natural resources was not included. For example, animals depend on plants for food and shelter, as well as for oxygen. Also, sunlight is an energy

source that is essential to almost all living things. Consider selecting other curricula to teach these very important concepts. Students can add to this play to show what they have learned about the importance of natural resources to all living things.

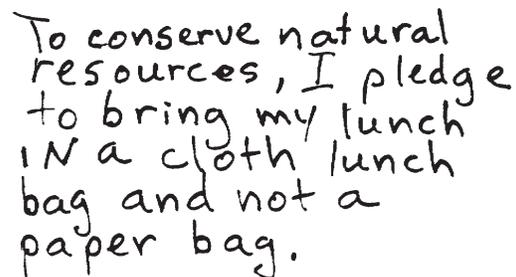
DISCUSSION/QUESTIONS

What can we do to conserve natural resources or to show that we care about natural resources? Add to the list brainstormed in Lesson 2 and Lesson 3 concerning what people could do to conserve natural resources.

APPLICATION

Project Idea: Have students present the play to other classes.

- A. Ask students to write a pledge to do one thing to conserve natural resources or to show that they care about natural resources. They can get ideas from the list they just completed concerning what people could do to conserve natural resources. Students can begin with:
 - “To conserve natural resources, I pledge . . .”; or
 - “One thing I will do to conserve natural resources is . . .”; or
 - “I can show that I care about natural resources by doing the following . . .”



To conserve natural resources, I pledge to bring my lunch in a cloth lunch bag and not a paper bag.

Submitted by Beth O’Neal, kindergarten and first-grade teacher, Marguerite Hahn Elementary School, Cotati-Rohnert Park Unified School District.

Homework Assignment: Ask students to share their pledges with family members.

- B. Check back with students in one month to see whether the students are honoring their pledges. Congratulate those students who have put effort into implementing their pledges. Allow students to rewrite (change) their pledges if they are having difficulty in implementing them.

- C. Once a month, allow students to share and celebrate their efforts for implementing their pledges.

RESOURCES

Video

Get Busy: How Kids Can Save the Planet. 3-2-1 Contact Extras video. Pleasantville, N.Y.: Sunburst Communications, 1992 (30 minutes).

Gives practical suggestions for improving the environment. Shows students taking part in reducing pollution and cleaning up the environment.

Books

50 Simple Things Kids Can Do to Recycle. Prepared by The EarthWorks Group. Berkeley: EarthWorks Press, 1994.

Contains many ideas on projects that students could do concerning recycling.

Kid Heroes of the Environment: Simple Things Real Kids Are Doing to Save the Earth. Prepared by The EarthWorks Group. Berkeley: EarthWorks Press, 1991.

Describes environmentally responsible actions that students have implemented.

Ross, Anna. *Grover's 10 Terrific Ways to Help Our Wonderful World.* New York: Random House, 1992.

Grover from Sesame Street describes what students can do to conserve natural resources (e.g., fix broken things, choose things that can be used again). Written for students in primary grades.

Williams, Rozanne Lanczak. *Let's Take Care of the Earth.* Cypress, Calif.: Creative Teaching Press, Inc., 1994.

Recommends to students in primary grades to take care of the areas (e.g., desert, forest, ocean) where animals live.

TREASURES OF THE EARTH AND HOW PEOPLE USE THEM

A PLAY

Written by Olga Clymire, Anne Harris, Sharon Janulaw, and Ted Schut

Preparation

- Obtain three pictures of minerals and/or objects made from different minerals; for example, jewelry, car, aluminum can, pots and pans, appliances.
- Obtain two black garbage bags and tape a piece of paper with the word “fossil fuels” on each bag.
- Obtain two items made out of plastic.
- Make a sign for each character.

(If you plan to present this play to other classes, make costumes or badges for the cast of characters. Students can design these.)

Cast of Characters:

Note: This play is based on a class of 20 students. If you have fewer students, reduce the number of plants and/or assign some students more than one role. If you have more students, increase the number of plants, minerals, and fossil fuels.

Humans (3)

Plants (trees) (4)

Animals (2) (sheep and wild bird)

Minerals (3)

Soil (2)

Car (1)

Fossil Fuels (2)

Air and Water (2)

Narrator (1)

Narrator: What are natural resources and how do people use them?

Scene 1

Characters: four plants, one human

Plants: We are the treasures of the Earth. We are natural resources.

We are plants.

Action: Four plants (trees) are growing. One human goes up to one plant and pretends to pick a fruit and eats it. Then the human goes up to another plant and moves its arms from a tree position (e.g., arms extended on sides) to a house (e.g., a V over its head). Then the human plants four seeds. Then the human sits down and pretends to read a book.

(Narrator narrates as students act out the scene.)

Narrator: Plants are very important natural resources. Humans eat plants. Humans use plants like trees to make houses, furniture, clothing, paper, and medicine. They also plant plants to beautify an area, to make shade, and to protect soil from being washed away by rain or blown away by the wind.

Scene 2

Characters: two animals (one sheep and one wild bird), three humans

Sheep and Bird: We are the treasures of the Earth. We are natural resources. We are animals.

Action: One human pretends to shear a sheep and then knits a sweater. Another human pretends to shovel the droppings and places them on crops. The third human pretends to look at a wild bird through imaginary binoculars.

(Narrator narrates as students act out the scene.)

Narrator: Animals are important natural resources. Domesticated animals are used by humans for food and clothing. For example, people get wool from sheep. The droppings of some animals are used as fertilizer for crops. Some people enjoy observing wild animals, such as birds.

Scene 3

Characters: three minerals, one human

Minerals: We are the treasures of the Earth. We are natural resources. We are minerals.

Action: Each of the three minerals hold up a picture that is either a mineral or an object that is made from a mineral. The human admires imaginary jewelry. The human acts out holding a fork and eating with it.

Narrator: Minerals are important resources. Minerals are found in rocks. Humans use minerals like iron to make steel. They use a mineral called bauxite to make aluminum. They make jewelry, tools, and machinery out of iron, silver, gold, copper, and other minerals.

Scene 4

Characters: two soils, one plant, one human

Soils: We are the treasures of the Earth. We are natural resources. We are soil.

Action: Soil is on the ground. A plant grows out of it and the human eats the plant. Then the human plants another plant. Then the human pretends to read a book at home in a chair.

Narrator: Soil is a very important natural resource. Humans use soil in which to grow crops for food and clothing. We build roads and houses on soil.

Scene 5

Characters: two fossil fuels, one car, two humans

Fossil Fuels: We are the treasures of the Earth. We are natural resources.
We are fossil fuels.

Action: Each fossil fuel wears around its waist a black garbage bag with the words “fossil fuels.” A car drives by and then stops. One human pretends to “pour” one of the fossil fuels into a car. Another person shows two plastic items.

Narrator: Fossil fuels are very important natural resources. People use fossil fuels to make cars, trucks, and planes go. People also use fossil fuels to make petroleum products from which clothing, like nylon and polyester, can be made. Plastics are made from petroleum. (Turn to the audience.) What items are made out of plastic? (Allow audience to mention several items.)

Scene 6

Characters: one air, one water, three humans

Air and Water: We are the treasures of the Earth. We are natural resources.
We are air and water.

Action: Air and water stand about five feet from each other. A person comes up to the air and takes in a deep breath. Another person comes up to water and takes a drink. A third person starts swimming next to the water.

Narrator: Air and water are natural resources. We need them to stay alive. There’s no new air and there’s no new water. It is all recycled by nature. We need clean water to drink and clean air to breathe. Let’s take care of our air and water and keep them clean.

Scene 7

Everyone: We are the treasures of the Earth. We are natural resources. We also enjoy natural resources in their natural state. We love trees. We love animals. We love rocks. We love soil. We love petroleum and other energy sources. We love air and water. Use wisely, conserve, and protect natural resources.

Then everybody sings to the tune of “Mary Had a Little Lamb”:

Reduce, reuse, recycle, recycle, recycle

Reduce, reuse, recycle

Don’t throw Earth’s treasures away.