

INTRODUCTION TO POLLUTION PREVENTION

Many satellites put in orbit by the United States and other countries have included geographic image surveys as part of their missions. Not only have those images clearly illustrated the beauty and diversity of the planet's surface, but also those images have shown that it is isolated and self-contained. Although enormous in scale, the Earth is not infinite nor are its resources. While the planet can support an abundance of life and even can absorb some level of pollution, its carrying capacity (the amount of life supportable through resource allocation and use) is fixed. Because of this, the combination of natural and human-made detrimental effects, including pollution, must be considered to ensure that the carrying capacity is not exceeded.

The effect of natural or human-made change on Earth is often difficult to determine and is speculative on a worldwide scale, although studies of individual ecosystems and smaller geographic areas prove less difficult to measure. Instances of pollution can be investigated to determine effects and risks posed. Environmental studies and analyses have received increasing attention in past decades. Only through education can we as citizens become informed enough to make accurate and responsible decisions about our environment. The focus of this chapter is environmental pollution, either occurring naturally or human-made. There are two fundamental reasons for our concern with environmental pollution: (1) human health, welfare, and resource needs and (2) concern about the rest of nature.

Human Health, Welfare, and Resource Needs

Our personal concern with environmental pollution mainly revolves around health problems from natural, as well as human-made, pollutants. Human health and well-being can be impacted by environmental pollution in two distinctly different ways: (1) on a personal level by detrimental health due to contamination or depletion of water, air, and other needed resources or (2) by reduced social and economic benefits or degradation in a geographic, ecosystem, or global context through slow deterioration of our habitat or decreasing availability of resources.

The cost of control and remediation measures for pollutants sometimes is reflected in health-care costs to treat afflictions caused by pollution. Reduced or eliminated mental well-being or recreational benefits often are overlooked and are underestimated because of the difficulty in quantifying costs. The cost of the inability to fish a stream segment because of aquatic pollution, to stay outdoors for extended periods because of elevated ozone levels, or to play in areas contaminated by pollution is difficult to determine economically. Maintaining a healthy and sustainable environment for these activities often runs contrary to human and economic needs for population, urban, agricultural, and manufacturing growth and development.

Concern for Nature

Concern for nature other than that readily identified as healthful or economically beneficial has been a part of human existence for centuries. For example, there are many things about the balance of nature that we don't know. The loss of some species may throw off that delicate balance in ways that we cannot foresee at the time. This is a major theme of the modern environmental movement. Although many concerns mainly address human enjoyment, nature has value simply in its existence. Consider, for example, the number of people who place value in the protection of endangered species and the national park system, even though they have never seen an Indiana Bat or visited Little River Canyon. This protection of nature does not come without a price to all of us. Some resources have to be left unclaimed, some land has to be left undeveloped, and funds must be spent on protection and preservation of the delicate balance of nature.

Cultural Change

One of the major factors in the creation of environmental pollution stems from the consumption of resources, production and manufacture of goods, and disposal of wastes. Demand from citizens for a ready supply of goods increases as the population increases. Technology offers more products to make our lives better and easier, and our purchasing power increases.

The controversy over the creation of pollution traditionally has focused on finger pointing and on placing economic matters above environmental concerns. Industry, government, and public groups have not always realized that environmental protection and economic growth do not have to be mutually exclusive. Government regulation, industry initiative, and public demand have caused great improvements to be made in the area of environmental protection. Better process design, control measures, and pollution prevention activities to reduce or eliminate pollutants at the source have reduced much pollution. Although great successes have been achieved, much more must be done in order to protect human health and the environment from pollutants.

A cultural change continues in the way many Alabamians work and play. Businesses, industry, agriculture, and other activities continue to make improvements in their operations. Collectively, they are trying to make a difference, as are public environmental groups and government agencies who keep watch over the environment and who encourage progress. These collective actions are important to success, but what can we do individually? We must all consider our activities, taking into consideration the environmental impact they may have. The idea of “throwing it away” is a myth. Wastes do not “disappear” when we “throw it away.” All waste must be disposed of somewhere, and consumption of most materials creates at least one form of pollution from solid waste or from discharges in water or emissions into the air.

When purchasing materials and services, we must consider questions such as “What will happen to it after I use it? Can it be recycled? Can I purchase goods with less packaging? Is there a better alternative?” and finally, and most importantly, “Do I really need it?” Unfortunately, we often must act and make decisions without complete information. Educating ourselves, taking the time to get accurate information, and considering the consequences of our actions collectively and as individuals are important first steps in solving the problems created by environmental pollution.

From *World Book Encyclopedia*

OBJECTIVES:

The student will be able to:

1. Name sources of pollution.
2. Design a story map.
3. Identify ways to help clean up the Earth.

BACKGROUND:

In the story, *The Whump World*, Pollutians leave their devastated planet and arrive on a small lush planet inhabited by the Whumps. The Pollutians quickly chop down all the trees and build huge cities and highways, while the Whumps take refuge in caverns deep underground. Soon the Whumps' world is polluted and the Pollutians move on. The Whumps, hearing their world quiet again, return to the surface and find that new plant life is already breaking through the pavement.

VOCABULARY:

environment - the world around us including water, land, air, and food

pollution - contamination of the environment with man-made waste

ADVANCE PREPARATION:

1. Locate and read *The Whump World* by Bill Peet.
2. Prepare enough paper and art supplies for students in groups of four.

PROCEDURE:

Setting the Stage

1. Discuss the term "pollution" with students.
2. Ask students to give examples of pollution and write them on the board. (Brainstorming)

Activities

1. Read aloud and discuss *The Whump World* by Bill Peet.
2. Divide the class into groups of four.
 - Have each member design a different segment of a story map.
 - Divide *The Whump World* into the following sections:
 - The peaceful world of the Whumps is disrupted by the arrival of the Pollutians.
 - The Whumps live underground while the Pollutians pollute their world.
 - The environment becomes so polluted that the Pollutians search for a better place to live.
 - After the Pollutians leave, the Whumps come out of hiding and reclaim their land.
3. Students will illustrate and connect the parts of the story to form a mural. Headings may also be added to the story map.

Follow-Up

1. Have students write or dictate sentences about the story on strips to add to the display.
2. Allow students in each group to read their sentences from the map.
3. Discuss who the "Whumps" are on planet Earth.
4. Discuss how students can help in cleaning up Alabama, their own city, and neighborhood.

Grades:

K-2

Subjects:

Science, Language Arts, Creative Arts

Time Needed:

50 minutes

Materials:

The Whump World by Bill Peet
large sheets of paper (for groups of four)
art supplies

EXTENSIONS:

1. Students can sponge paint Pollutian and Whump shapes onto the display.
2. Use this activity as an introduction to the pollution unit. Create a bulletin board that focuses on pollution. Have students draw or paint appropriate illustrations to go with each pollution problem discussed throughout the unit. As each problem is covered, students can add more information by writing and/or illustrating their ideas and solutions on sentence strips and attaching them to the bulletin board. Display related experiments or projects near the bulletin board.

ORIGINAL DEVELOPMENT RESOURCES:

Markel, S. (1991, April). What rots? *Instructor*, p. 66.

Peet, B. (1970). *The Whump world*. Boston, MA: Houghton Mifflin.

(1990) Video: *The rotten truth*. The Children's Television Workshop.

OBJECTIVES:

The student will be able to:

1. Identify sources of litter.
2. Collect litter in the environment.
3. Count and sort items gathered from school grounds.
4. Become more aware of litter.
5. Create “Critter Litterbugs” from trash.
6. Discard items in proper places.

BACKGROUND:

Litter takes away from the beauty of the environment and can cause health-related problems as well. Some litter, such as fruit and vegetable peels, decay quickly and actually nourish the soil when composted. But plastics, glass, and metals do not decay very fast. Litter needs to be disposed of properly. Work gloves should always be worn to protect hands when cleaning up litter.

Students need to begin to understand the influence of people organizing together for a cause. Students can use their combined influence to bring about better awareness of trash problems in a school or community. They may even work together to change policies in their school, school district, and state to improve the environment.

VOCABULARY:

litter - trash, wastepaper, or garbage lying scattered about

ADVANCE PREPARATION:

1. Label five sturdy boxes: glass, metal, paper, plastic, and organic plant material.
2. Gather work gloves for each student.
3. Gather all art materials for “Critter Litterbugs.”

PROCEDURE:

Setting the Stage

1. Ask students to define the term “litterbug.”
 - Ask students if they know someone who is a litterbug.
 - Ask students if they have ever been a litterbug.
2. Explain to students that they will be creating “Critter Litterbugs.”
3. Prompt students by saying, “One day you meet a strange little creature that begins following you around. He is a dreadful litterbug, scattering trash wherever he goes. Since he is now yours, you must solve his littering problem.”
4. Divide the class in to teams of three or more.
 - Give each team a trash bag and gloves.
 - Explain that they will be gathering trash from around the school grounds.
5. Go to the area which has been littered with trash and explain to students that they will be having a Trash Pick-Up Race.

Grades:

K-2

Subjects:

Science, Related Arts, Language Arts

Time Needed:

two 45 minute sessions

Materials:

six medium sized cardboard boxes
trash bags
work gloves for each student
brown paper lunch sack
strips of crepe or tissue paper
paint, crayons, or markers
glue
rubber bands
shredded newspaper

Activities

Activity 1

- Go to the area which has been littered with trash.
- Explain that items should be picked up carefully with gloves on and placed in a trash bag. Caution the children not to pick pieces of broken glass.
- Give the students five minutes to collect trash.
- When a signal is given have teams run to pick up the trash.
- At the end of five minutes have the students return to the teacher.
- The team with the most trash wins.

Activity 2

- Transport trash back to the classroom.
- Sort trash into labeled boxes.
- Graph sorted trash by types, using tallies or pictographs.
- Those items that can be reused may then be sorted from the others and placed in a separate container.
- Return or recycle what you can, discard the rest.

Activity 3

1. Students will create “Critter Litterbugs” as follows:
 - Decorate the bag with paint or crayon. Include both the front and back view of the critter.
 - Stuff the bag with shredded newspaper.
 - Gather at the top and secure with rubber bands.
 - Glue tissue or crepe paper strips out the top.
 - Take trash items that are reusable and use to decorate “Critter Litterbugs.”
 - Cut feet from 5” squares. Glue to bottom of bag.
2. Use these story simulators with students. Stories may be written, dictated, illustrated, or told orally.
 - Where did you meet this crazy litterbug?
 - What kind of litter does this critter leave behind?
 - What problems does the litter create?
 - How do you try to solve the critter’s problem? What finally works?

Follow-Up

1. Set the Critter Litterbugs around the classroom such as on top of cabinets, next to waste baskets, or near sink areas. Put a sign next to each one that reads, “Don’t Be A Critter Litterbug!”

EXTENSIONS:

1. Have students keep an eye out for litter. Tell them to clean up when paper, broken pencils, and other litter collect in the area.
(Note: Whenever possible, students should recycle or reuse the things they pick up.)
2. Students can create colorful “litter patrol” buttons to wear or signs to put on their desks. (Note: Using recycled materials for these should be encouraged.)
3. Read *Trash!* by Charlotte Wilcox.

ORIGINAL DEVELOPMENT RESOURCES:

Commins, E. (1982). *Early childhood activities*. Atlanta, GA: Humanities Limited.

List, L. (1982) *Music, art and drama experiences for the elementary curriculum*. New York, NY: Teachers College Press.

Poppel, G. (1987). *The planet of trash: An environmental fable*. Bethesda, MD: National Press, Inc.

Schwartz, L. (1990). *Earth book for kids: Activities to help heal the environment*. Santa Barbara, CA: The Learning Works, Inc.

Wilcox, C. (1988). *Trash!* Minneapolis, MN: Carolrhoda Books, Inc.

Notes

OBJECTIVES:

The student will be able to:

1. Locate his/her hometown on a map of Alabama.
2. Describe sources of water pollution in Alabama rivers, lakes, and streams.
3. Recognize the importance of keeping water clean.

BACKGROUND:

Fish and other water organisms need oxygen to live. Pollutants take away the oxygen in water that these organisms need. Thus the more pollutants there are, the less likely fish will survive. A few pollutants that can be found in Alabama's rivers, lakes, and streams are detergent, motor oils, and fertilizer. This activity will let students see the effects pollutants and a lack of oxygen can have on fish.

VOCABULARY:

decompose - to decay or rot from a process of microbial action

eroding - land that is worn away or washed away

fertilizer - chemical applied to crops and lawns that can be washed out of the air and soil and into the water supply

pollutant - a substance that can harm water, air, land, or living organisms

ADVANCE PREPARATION:

1. Locate a map of Alabama. Have a sticker to place on map for locating hometown.
2. Make fish and fishbowl (as stated in procedure).
3. Gather all ingredients and place in film canisters.
4. Locate overhead projector or flashlight. (Note: There is a danger of the water weight breaking the glass on an overhead.)

PROCEDURE:

Setting the Stage

1. Show map of Alabama.
 - Instruct students to locate their hometown.
 - Allow a student to place sticker on correct spot.
2. Locate the closest body of water.
 - Ask students to name things that live in the water.
 - Have students come up with a name for the fish in the activity. (Use the name of closest body of water for story.)
 - Explain to students they will be shown a demonstration of what can happen to fish when people pollute the water.

Activities

1. The fishbowl can be made from a glass or plastic fishbowl, a pickle jar, a three-liter clear soft drink bottle

Grades:

K-2

Subjects:

Science, Language Arts, Geography, Social Studies

Time Needed:

50 minutes

Materials:

map of Alabama
stickers
glass fishbowl or similar container
fish made from construction paper with contact paper and one paperclip for a weight
overhead projector or flashlight
nine empty film canisters with tops
liquid dish detergent (1 tbs)
red food coloring with water (1 tsp)
1/4 cup of each ingredient:
soil
cooking oil
salt
paper confetti
powdered detergent
hot water

(remove plastic container from bottom and cut off the tapered top), or any similar container. The fish can be cut from construction paper, covered with contact paper or any other waterproof item.

- Place fish on a stick or tape to front of bowl.
- Put the bowl on an illuminated overhead projector or use a flashlight behind the “river.”

2. Read and adapt narrative. Ask individual students to add the ingredients in the film canisters as indicated to represent pollution.

Teacher’s Note: Teachers should review the narrative in advance and adapt the language to the students’ level.

Narrative: Imagine a river as it meanders through the countryside, past the farmers’ fields, widening into a lake, but narrowing again as it passes through the city. In this river named _____ lives a fish. Its name is _____. (Point to the fish in the clear water in the fishbowl). **Ask: How does it feel to be this fish?**

(This question should be asked repeatedly throughout the story and should generate an enthusiastic response from the students. Let students respond aloud.)

The fish swims down the river past an eroding bank. An eroding bank is where soil sometimes gets washed into the river. When it rains, what will happen to the bank? What if it rains a great deal? (Have student pour soil from the container into the water.) **Ask: How does it feel to be this fish?**

Suppose part of the soil eroding into the water came from farmland. The farmer has just put fertilizer on the field. Instead of staying on the field to help the crops grow, some of the fertilizer may ride “piggy-back” on the eroding soil and go into the river. (Add sand to simulate fertilizer.) What effect will the fertilizer have on the plants in the river? (It will make plants grow.) If the plants grow too abundantly and too fast, the river can’t continue to support them. They die, fall to the bottom, and start to decompose. Decomposing things use oxygen. What else in the river needs oxygen? (the fish) **Ask: How does it feel to be this fish?**

Farm fields aren’t the only source of fertilizer that can flow into a river. Homes may also be a source. Where the river has widened into a lake, several families have built their homes. Perhaps their septic tanks drain into the water, or some of the fertilizers they’ve put on their lawns have washed into the water. (Add liquid dish detergent to represent pollution from homes. Detergents have some of the same chemicals in them as fertilizers.) As the lake narrows into a river, our fish continues downstream past the city. Even though the city people don’t pollute the water directly, what they do at their own homes or subdivisions can affect the quality of the river’s water. Have you ever seen a car leaking oil? Where does the rain wash this oil? Oil covers the top of the water so oxygen cannot get in. (Put the oil into the fish bowl.) **Ask: How does it feel to be this fish?**

In the winter when it gets icy and snows, what do we put on our roads to make it easier to drive? (Salt or sand. Put salt into the water.) When you eat or drink something salty, what do you do? (You get something else to drink.) Can this fish get fresh water to drink? (No.) **Ask: How does it feel to be this fish?**

Suppose the city has a park next to the river. People litter the park, and some of it blows into the water. (Put pieces of paper into the fishbowl.) **Ask: How does it feel to be this fish?**

As the river leaves the city, there are several factories that are located along it. Although regulations are strict, if the factory’s control equipment is not working properly, some chemicals or heated water may flow into the river. (Put powdered detergent into the fishbowl and stir for effect.) **Ask: How does it feel to be this fish?**

The waste water treatment plant for the city is also located along this section of the river. The plant does its best to clean out impurities, but some polluted water gets into the river. The river has a large volume of water though, and the plant only puts a small amount of pollution into it. It shouldn't cause too much of a problem. Right? It would be like putting two drops of this food coloring into this jar of water. (Put in food coloring and stir it.) **Ask: How does it feel to be this fish?**

Follow-Up

1. Ask students if they have ever seen a river, lake, or beach closed for swimming.
2. Ask students if they would like to swim in a river like the one in the story.
3. Review story and discuss ways the students could help solve some of the problems mentioned.

EXTENSIONS:

1. Have students draw pictures of how fish and other water organisms would look if they lived in polluted waters. Allow them to draw new pictures in which the fish live in clean water and discuss the differences in the pictures. Display on bulletin board to show contrast.
2. Read or improvise as a blues tune.
3. Ask a local fish expert to come and speak with the class. Have students create questions ahead of time and send these to the guest speaker.

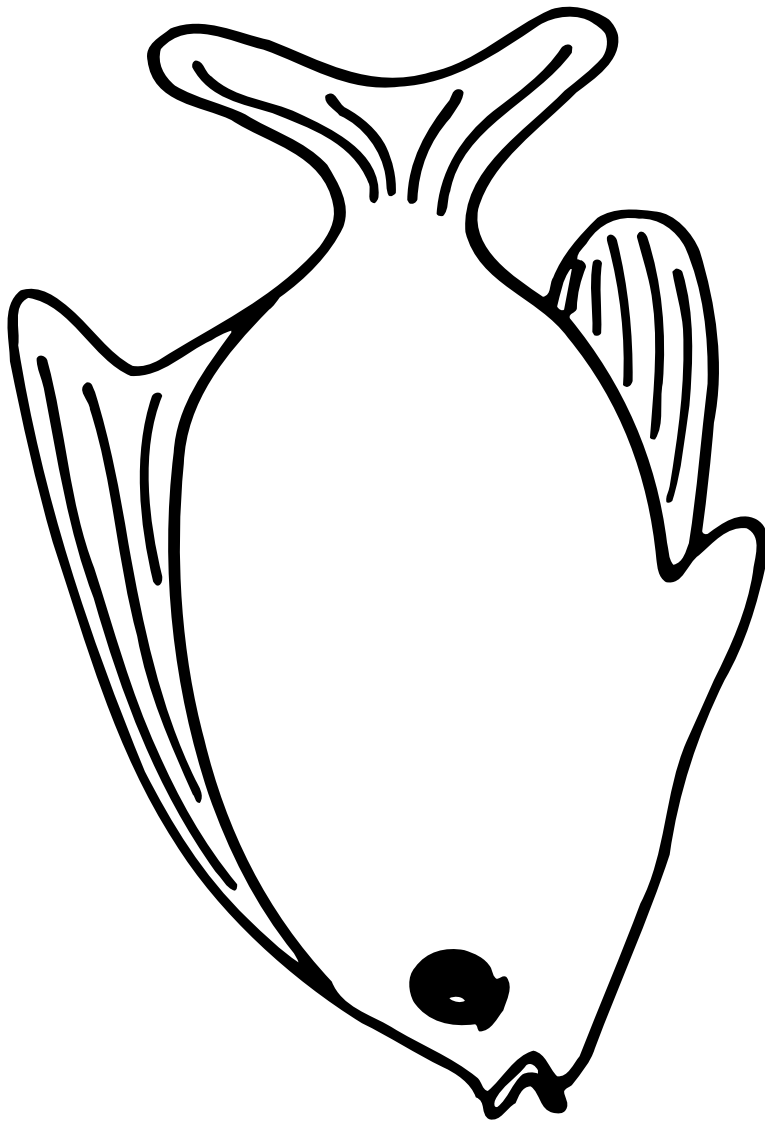
THE DIRTY WATER BLUES

Pure water gurgles
and splashes along
until pollution
flows into the song:
oil, tar, paint, dye,
mud and muck
come splashing by.
Cans, jars, bottles,
Old shoes, old news--
that's the dirty water blues.
Sweet fresh water
rolls away from this song,
while dirt and pollution
keep flowing along,
and along, and along.

ORIGINAL DEVELOPMENT RESOURCES:

Miles, B. (1988). *Save the Earth! An ecology handbook for kids*. New York, NY: MacMillan Publishing Co.

South Carolina Department of Health and Environmental Control, *Action for a cleaner tomorrow*. (used by permission). Call 1-800-768-7348 for trainings and workshops.



Captain Bob And His Friends

POLLUTION PREVENTION

OBJECTIVES:

The student will be able to:

1. Recognize and discuss the problems associated with marine litter and the way it affects living things.
2. Illustrate ways to help solve pollution problems by making a group mural.

BACKGROUND:

Litter and other water pollution have become a very serious problem. There are many things that are harmful when thrown into the water. When sea gulls and pelicans get their beaks caught in plastic soft drink rings, they can starve, strangle, or drown. Oil spills are another serious problem to marine life. One solution to the problem is public education.

VOCABULARY:

bay - a place in which a small body of water is set off from the main body of water and has land on three sides.

ADVANCE PREPARATION:

1. Gather picture books and magazine pictures of sea life mentioned in play (sea turtle, sea gull, pelican). See "Exploring the Gulf" and "Life in the Gulf" in Learning Through Legacy (K-2).
2. Gather baby oil and water source for student experiment.
3. Collect materials for group mural.

PROCEDURE:

Setting the Stage

1. Show students pictures of sea life from books and magazines. Place these around the room.
2. Discuss with students what happens when fish and birds become covered with oil.
 - Allow students to dip their fingers in baby oil and rinse them off with water.
 - Discuss results.
 - Ask students to imagine what happens to fish and birds when they swim through an oil slick.
3. Ask students to name other things that would be harmful when carelessly distributed in the water.

Activities

Introduce the characters of the play.

- Have students draw pictures of a sea turtle, sea gull, pelican, and Captain Bob. Cut out and glue on popsicle sticks to make puppets.
- Explain to students they will be holding up their characters throughout the play. Read the play, "Captain Bob and His Friends."

Grades:

K-2

Subjects:

Science, Language Arts, Creative Arts

Time Needed:

60 minutes

Materials:

baby oil
water
4 popsicle sticks for each student
six-pack rings
written play (included)
children's illustrations
butcher paper
art supplies
glue
photographs of sea life

Follow-Up

1. Discuss how the problems in the story could have been avoided to begin with.
2. Allow students to illustrate ways to solve pollution problems by making a group mural.
(Note: Student illustrations of the characters may be incorporated into the mural as well.)

EXTENSIONS:

1. Take a walk around the block or a nearby stream. Ask students to take a trash bag and pick up the items that do not belong.
2. Make clean water bottles and dirty water bottles.
 - Materials: two small clean water bottles, water, baby oil, trash.
 - Fill both bottles almost full of water. Finish filling dirty water bottle to top with baby oil. Put trash in dirty water bottle as well (foil, paper). Put caps on bottles.
 - Ask students which bottle they would prefer to drink.
3. Read *Down by the Bay*. A record also accompanies this book. This is a nonsense book and record.

ORIGINAL DEVELOPMENT RESOURCES:

Becklake, J. (1990). *Green issues, thinking for the future: Pollution*. New York, NY: Aladdin Books Ltd.

Raffi Songs to Read (1987). *Down by the bay*. New York, NY: Crown Publishing Company.

Tice, M. *Captain Bob and his friends*.

Captain Bob and His Friends

It was a beautiful sunny day as Captain Bob left the pier for a day of sailing. He hadn't gone far when his friend Tom E. Sea Turtle stopped to say hello.

Tom E. Sea Turtle: "Good morning, Captain Bob."

Captain Bob: "Good morning, Tom. How are you today?"

Tom E. Sea Turtle: "Not too good. My stomach hurts. I ate a plastic garbage bag by mistake. It looked just like a delicious jellyfish."

Captain Bob: "I'm so sorry, Tom. I hope you feel better soon." (*Captain Bob sees Sammy Seagull flying by. He sees that Sammy's face looks very sad.*)

Captain Bob: "Sammy, you look so sad. What's wrong?"

Sammy Seagull: "Oh Captain Bob, I have a fishhook caught in my foot."

Captain Bob: "Let me see if I can help. Maybe I can get it out."

Captain Bob was able to get the fishhook out and put some medicine and a bandage on Sammy's foot. The wind blew, and Captain Bob steered his sailboat out into the bay. He hadn't gone far when he heard Fred and Franny Fish calling out to him. Captain Bob stopped to see what was the problem.

Franny Fish: "We need your help, Captain Bob. Fred has gotten motor oil all over him! What should we do?"

Captain Bob: "Come here, Fred, and let me wash you off."

Captain Bob gently washed the motor oil off Fred, and he felt so much better. Captain Bob was so glad he was able to help. As Captain Bob sailed near Rock Island, he saw Pelican Pete sitting near the water.

Captain Bob: "Hello Pete. It's a fine day, isn't it?"

Captain Bob noticed that Pete didn't answer him. Then he saw the problem. Poor Pete had his bill caught on a plastic six-pack ring. He couldn't open his mouth to talk. Captain Bob used his pocket knife to cut the ring off Pete's mouth.

Pelican Pete: "I was so glad to see you, Captain Bob. I knew you could help me; from now on I'll be much more careful where I stick my bill."

Captain Bob turned his sailboat around to start for home. He thought about all the animal friends and the problems they had. He remembered it was just last week that he had helped Danny Dolphin. Danny had gotten tangled up in fishing line. Captain Bob knew it was up to him to help his animal friends. He called a town meeting that night and told the people about the problems the animals were having. Humans were the ones who were dropping the litter in the water. The people asked Captain Bob to apologize to the animals for them. They promised to put litter in trash cans where it belongs.

Notes

OBJECTIVES:

The student will be able to:

1. Identify sources of water in the community
2. Observe how water is cleaned in a water treatment plant.

BACKGROUND:

In nature, water is not always clean and safe enough for people to drink. Water picks up all kinds of contaminants, due to pollution from homes and industries. Water treatment is the process of cleaning water and making it safe for people to drink.

Our drinking water comes from both surface and groundwater. Water in lakes, rivers, and swamps may contain impurities that may sometimes make it look and smell bad. Water that looks clean may contain harmful chemicals or bacteria and other organisms that can cause disease.

Water treatment plants clean and maintain the quality of drinking water by taking it through several processes. One of these is filtration, the process of separating matter from liquid.

VOCABULARY:

contaminant - an impurity that causes air, soil, or water to be harmful to living organisms or the environment

filtration - the process of separating matter from a liquid

ADVANCE PREPARATION:

Gather all materials for experiment and place them on a table in preparation for student observation.

PROCEDURE:

Setting the Stage

1. Ask students if they know where the water that is piped into their homes comes from. Investigate the water source for their community. Show the nearest lakes, streams and creeks on a map while pointing out correlating map symbols. Measure distances from their community to closest water source.
2. Discuss how water is cleaned before it is safe to drink and use in our homes
3. Allow students to move in front of experiment table.

Activities

1. Place a 1 inch layer of cotton on the bottom of the screened container.
2. Add about 1 inch of coarse sand and then a 1 inch layer of gravel.
3. Set the container over the jar and slowly pour the muddy water into the container.
4. Discuss the results. (Note: Don't drink the water ! It may look clean, but it may contain bacteria.) Students should observe that appearances can be deceptive, a lake with clear water may be full of contaminants.

Grades:

K-2

Subject:

Science

Time Needed:

30 minutes

Materials:

a container with a screen bottom
(make one or use a flour sifter)
coarse clean sand
clean gravel
absorbent cotton
a large glass jar
muddy water

Follow-Up

1. Discuss the government's role in regulating our water.
2. Allow students to repeat the experiment themselves.
3. Ask why community needs may differ. Discuss: Cities with more contaminants in the water may charge a higher rate for purifying the drinking water.

EXTENSIONS:

1. Read aloud *The Magic School Bus at the Waterworks* by Joanna Cole and compare the activity with the water treatment plant described in the book. Discuss the water facts on 1-11. Children can copy facts and illustrate, displaying the importance of providing water to the community.
2. As an excellent enrichment activity, visit a water treatment plant nearby.

ORIGINAL DEVELOPMENT RESOURCES:

Cole, J. (1986). *The magic school bus at the waterworks*. New York, NY: Scholastic.

Williams, R. (1991). *Ecology for kids*. Cypress, CA: Creative Teaching Press, Inc.

OBJECTIVES:

The student will be able to:

1. Discuss several sources of air pollution.
2. Observe that burning rubbish, trash and unregulated materials (chemicals) can release visible and invisible air pollutants.
3. Explain causes of air pollution.

BACKGROUND:

Students will learn how burning rubbish, trash and unregulated materials (chemicals) contribute to air pollution. Most air pollution is caused by people burning inappropriate materials, using low grade gasoline, and using unregulated freon in home and automobile air conditioners. Other examples of air pollutants are coal, oil, and other fossil fuels that industries use as sources of power.

VOCABULARY:

pollutant - a substance that can harm water, air, land, or living organisms

ADVANCE PREPARATION:

1. Run off a copy of Pollution Puzzler for each student.
2. Gather candle, match, and glass cover for the experiment.

PROCEDURE:

Setting the Stage

1. Ask students to give examples of air pollution they have observed.
2. Ask students to give examples of invisible air pollution.

Activities

1. Place a candle where students can see it.
 - Light the candle.
 - Ask students if they see any pollution.
2. Lower the glass cover over the candle until it touches the flame.
 - Hold cover over flame for a few seconds.
 - Take glass away but leave candle burning.
3. Ask students to look at the glass and describe what they see.
 - Explain that as the candle burned, it released gases and small particles of the burned wax into the air.
 - The particles were not visible until they collected on the glass.

Follow-Up

1. Show pictures of horse drawn carriages, gas guzzling cars of the 70's and electric cars that are just being introduced to the public.
2. Discuss why some industries use a less efficient and less costly means of burning pollutants. Better filtration could and should be used with these factories, instead of cutting costs.

Grades:

K-2

Subjects:

Science, Related Arts

Time Needed:

45 minutes

Materials:

candle
match
white or clear heat-resistant glass cover
copy of Pollution Puzzler (included)

3. Discuss the “Clean Air Act.” How do students feel about the government regulating the free enterprise economy to save our ozone?
4. Discuss what will happen to our air if air pollution increases?

EXTENSIONS:

1. Allow students to make puzzles from their Pollution Puzzlers.
2. Sing this song with students to the tune of “**This Land is Your Land.**”

This land is your land.
This land is my land.
From the Tennessee Valley.
To Dauphin Island.
From the Bankhead woodlands.
To the Gulf Shores dry sands.
This land was made for you and me.

This air is your air.
This air is my air.
To keep it cleaner.
Is a job we all share.
We need a solution.
To stamp out pollution.
This is a job for you and me.

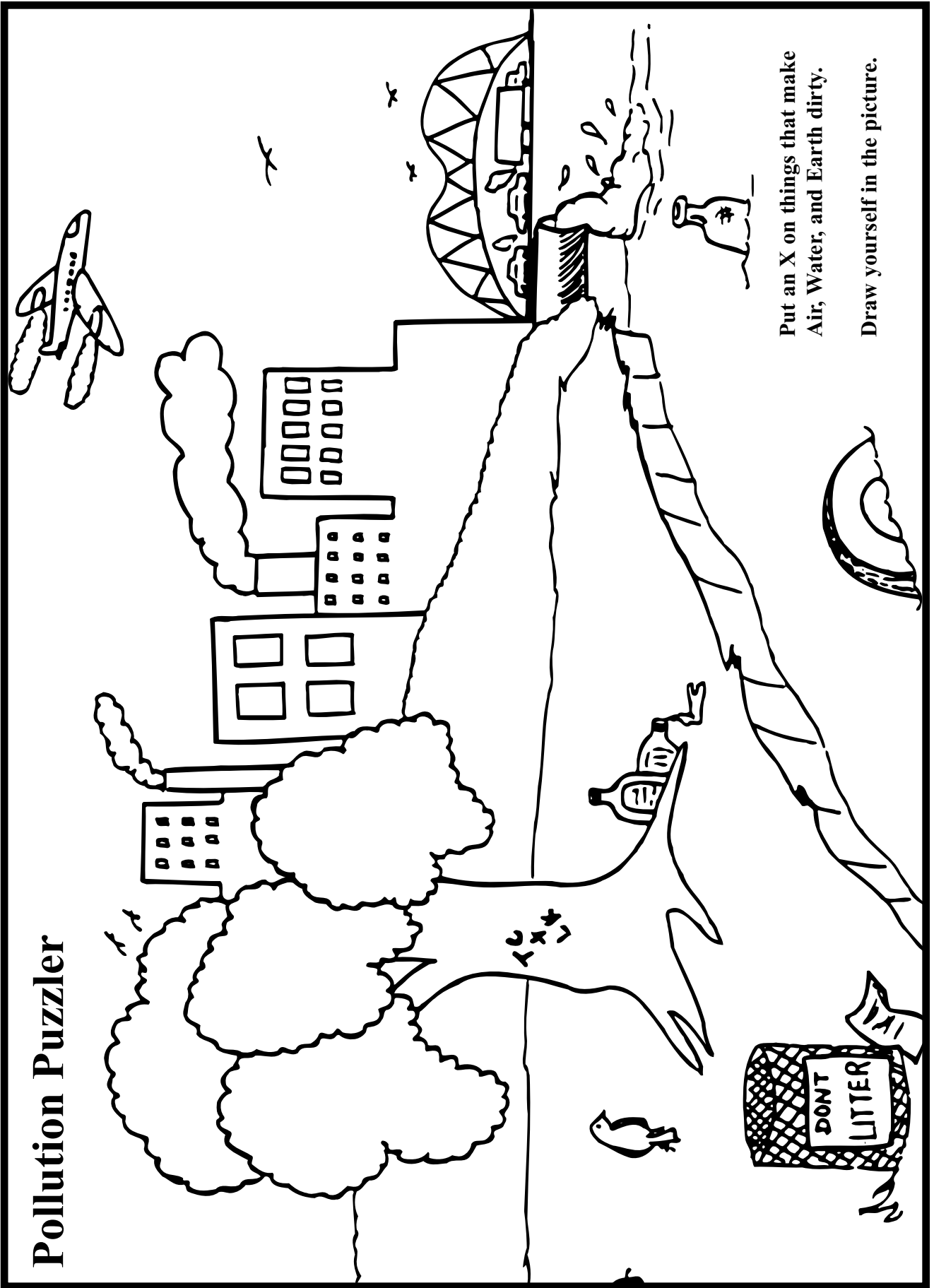
(Note: Verses can be adapted to include familiar landmarks for students)

3. Discuss where pollution comes from. Make a puff book. On each page show one thing that causes air pollution, share with class.
4. Place vaseline on an index card, hang several around the school. Check them for visible pollution in 3 days.
5. Make a graph showing ways to clean air and things that dirty our air. Correlate, read, and interpret graphs.

ORIGINAL DEVELOPMENT RESOURCE:

Pollution: Problems and solutions. (1990). Ranger Rick’s Nature Scope. National Wildlife Federation, Washington D.C.

Pollution Puzzler



Put an X on things that make
Air, Water, and Earth dirty.

Draw yourself in the picture.

Notes

OBJECTIVES:

The student will be able to:

1. Explain that some products are harmful to people as well as the environment.
2. Discuss the problems associated with hazardous waste.

BACKGROUND:

Hazardous waste is waste that is flammable, corrosive, unstable, or radioactive. It can also contain dangerous substances such as pesticides or lead and can be produced by industry as well as small businesses or households. This waste creates serious pollution problems. According to the Environmental Protection Agency (EPA), hazardous waste is a waste that exhibits one or more of the following characteristics:

1. Corrosivity - It is an acid or base that eats away at other things.
2. Ignitability - It can burn.
3. Toxicity - It is harmful to living organisms.
4. Reactivity - It can explode when it mixes with air, water or other chemicals.

VOCABULARY:

hazardous waste - waste from chemicals that are poisonous to the environment

radioactive - material that can damage or destroy living cells

toxic - poisonous substance harmful to living organisms

ADVANCE PREPARATION:

1. Make Mr Garbaggio
 - Open the top of the garbage can and cut a strip of cardboard as wide as the teeth will need to be. Make them long enough to fit around the front of the garbage can rim. Cut the cardboard into jagged teeth, and tape them to the inside of the rim.
 - Cover the lower part of the garbage can with a large rectangular piece of fake fur fabric. Use double stick tape or sew in place. A small hole will need to be cut where the pedal is so Mr. Garbaggio can “eat,” (Note: fake fur is optional).
 - Cut monster feet out of heavy cardboard and fur fabric. Glue the fabric to the cardboard and attach the covered cardboard feet to the bottom of the garbage can, so toes will stick out.
 - Cut out another rectangle of fur, and tape or glue it to the lid.
 - Tape or glue Styrofoam eyes to the fabric. Make sure they are secured to the fabric backing. Glue paper eyes to the

Grades:

K-2

Subjects:

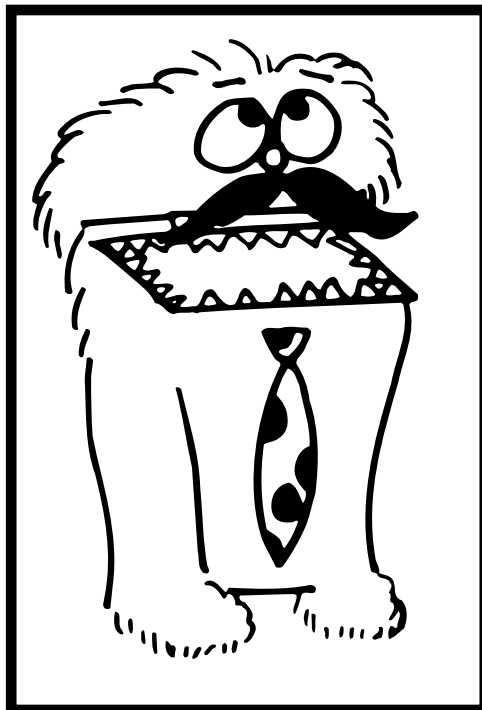
Science, Language Arts, Related Arts

Time Needed:

30 minutes

Materials:

one garbage can with foot pedal
lightweight cardboard or oak tag
masking tape, double stick tape, or a
needle and thread
heavy cardboard
pieces of fur fabric
straight pins
two Styrofoam balls (for eyes)
two black felt circles (for pupils)
round object for nose
pictures of hazardous products
empty cleaning cans



eyeballs.

- Glue or sew on nose.

(Note: Other accessories may be added such as a moustache, feathers for hair and funny tie.)

2. Make cabinet from cardboard box.
3. Prepare pictures of various household hazardous substances and place in cabinet.
(Refer to the definition in background of hazardous substance when selecting pictures. Examples: drain cleaners, toilet bowl cleaners, oven cleaners, batteries, motor oil, antifreeze, mothballs, bleach, paint, bugspray)

PROCEDURE:

Setting the stage

1. Discuss the term hazardous.
 - Define
 - Discuss products that may be hazardous to the environment.
2. Introduce Mr. Garbaggio. Explain to students that Mr. Garbaggio has a story to share with them.

Activities

1. Teacher and Mr. Garbaggio will perform play, “Hazards at Home”

Follow-Up

1. Discuss reasons hazardous materials are harmful to the environment.
2. Discuss ways to avoid using hazardous products.
3. Use Mr. Garbaggio in the classroom as the class mascot. Write Mr. Garbaggio letters. Tell him about your concerns for the environment.
4. Work in cooperative groups to formulate questions about the environment. Groups can change questions and research the answers.

EXTENSIONS:

1. Teacher and students could make nontoxic cleaning substances to be used at school. Use baking soda and water, Bon Ami, or products available from a local grocery store.
2. Allow students to dictate or write letters to a local company that produces hazardous waste. Concerns may include how the company treats, stores, and disposes of its toxic waste. Send letters in one large envelope to save paper and postage fees.
3. Warm up math exercise. Students learn to distinguish environmentally safe cleaning products from products that can be harmful to our planet. Place 8 to 10 products on table. Use both environmentally unsafe as well as safe biodegradable products (i.e. Safe: Baking soda, vinegar, lemons. Unsafe: chlorine bleach, flammable cans under pressure) Have students feed Mr. Garbaggio the safe products and discard the harmful products to the side. Let students count the difference.

ORIGINAL DEVELOPMENT RESOURCES:

Environmental Protection Agency (EPA, 401 M St., SW, Washington, D.C. 20460). www.epa.gov

Henson, C. (1994). *The muppets make puppets!* New York, NY: Workman Publishing.

“Household Hazardous Waste Wheel.” Legacy, Inc. P.O. Box 3813, Montgomery, AL 36109, www.legacyenvd.org, 1-800-240-5115.

ADDITIONAL RESOURCES:

http://dnr.wi.gov/org/caer/ce/eek/teacher/groundwaterguide/This_Product_May_be_hazardous_activity.pdf

Hazards At Home

Teacher: Hi, Mr. Garbaggio ! How are you?

Mr. Garbaggio: Funny you should ask. I had to go to the hospital last week. My stomach still doesn't feel very good.

Teacher:: Too much candy again, Mr. Garbaggio?

Mr. Garbaggio: Not exactly. I was looking for something to eat like I usually do, and I found something that looked pretty good. So I put it in my mouth, and all of a sudden what I ate made me sick ! I still have to eat special foods. At the hospital, they told me there are a lot of things in my house that are dangerous to eat, smell, and touch.

Teacher: Really? (Look in the cupboard, a cardboard box with a door, and pull out pictures representing various household hazardous substances. For each item, ask the students what it is used for and whether or not it is hazardous. Rephrase the question by interchanging the words: hazardous, poisonous, toxic, harmful, could make you sick. Emphasize that children should never taste, touch, or smell these hazardous substances.)

Teacher: There are a lot of things toxic at my house, too. If these things can make me sick, then I don't want them in my house. (Start to throw the hazardous materials into Mr. Garbaggio.)

Mr. Garbaggio: Don't throw them in here ! These things are dangerous to me and if they are thrown into the trash they may get buried at the landfill. Rainwater can run through them and carry the poisons into our drinking water, or an animal could eat them.

Teacher:: Okay, I'll pour them down the sink instead.

Mr. Garbaggio: Don't do that ! If you pour them down the sink, they will go to the treatment plant where they try to clean the water. These poisons can't be cleaned very well so they'll end up in the rivers or lakes.

Teacher: The river? That could hurt a number of my friends who live there if they were to drink the water. Let's see, there are the Scales, a fish family, and the Quacks - you know that nice family of ducks and their cousins from Canada, the Honkers. (To students) Do you know anyone who drinks water from the river? Okay Mr. Garbaggio, I won't pour them down the drain. But what can I do?

Mr. Garbaggio: Have your parents save these items in a safe place until your town has a hazardous waste collection day. Or call your local officials and find out the proper way to get rid of waste in your area. Then your parents can take it where other people will carefully collect the poisonous materials in special containers and take them away to places where they can be thrown away safely. Some can be burned in special ovens. Others, like used motor oil, can be made into new oil.

Teacher: You mean recycled?

Mr. Garbaggio: You bet !

Teacher: That sure sounds better than putting these harmful things in the water.

Mr. Garbaggio: It sure is, but do you know the best thing you can do?

Teacher: What's that?

Mr. Garbaggio: Find other things to use in place of these toxic materials. There are lots of things you can use to clean with that are not hazardous. I make up a mixture of soapy water to kill the bugs on plants and use baking soda and water to clean the oven. Then no one has to worry, not the Scales, the Quacks, not you and not me !

Teacher: Thanks for telling what to do about toxins, Mr. Garbaggio. But next time you want to learn something, please ask somebody about it. Don't just eat anything you find around your house. Promise?

Mr. Garbaggio: I promise.

The End.

Notes

OBJECTIVES:

The student will be able to:

1. Identify different types of noise pollution.
2. Offer solutions to noise pollution.

BACKGROUND:

How serious is urban pollution? Urban dwellers are subjected to excessive noise. According to the US EPA, nearly half of all Americans, mostly urban residents, are regularly exposed to noise pollution- any unwanted, disturbing, or harmful sound that impairs or interferes with hearing, causes stress, hampers concentration and work efficiency, or causes accidents. Noise is the country's most widespread occupational hazard. About 9 million workers in the US are exposed to potentially hazardous levels of noise. Millions of people damage their hearing by listening to loud music using home and car stereos (boom cars), and portable stereos (boom boxes) held close to the ear. Using earphones can also damaging hearing.

Harmful effects from prolonged exposure to excessive noise include permanent hearing loss, high blood pressure (hypertension), muscle tension, migraine headaches, higher cholesterol levels, gastric ulcers, irritability, insomnia, and psychological disorders, including increased aggression.

VOCABULARY:

noise pollution - sound that is annoying and may cause hearing loss

PROCEDURE:

Setting the Stage

1. Discuss the term "noise pollution" with students.
2. Explain that some noise pollution, such as noise from airplanes, TVs, and stereo equipment can be damaging to our hearing.

Activities

1. Have students make a list of ten noises they hear on their way home from school and at night. Have them bring their list to school the next day. (Note: Students may use a tape recorder to record sounds.) List the sounds on the quiet and loud sheet.
2. Identify the noise and loudness level of each item on the sheet.
3. Discuss ways to reduce the amount of noise pollution we are exposed to.
 - turning down volume of car stereos
 - recognizing cars without mufflers
 - using loud motorized devices only during daylight (leaf blower, lawn mowers)
 - muting the sound of loud musical instrument (rubber pads on drums, using headphones with electric guitars and synthesizer).
4. Work in groups: Fill out your plan for decreasing noise pollution in your area.

Grades:

K-2

Subjects:

Science, Language Arts, Social Studies

Time Needed:

15 minutes initially
25 minutes follow up

Materials:

pencil
paper
tape recorder (optional)

Follow-Up

1. Students should distinguish between noise that people can control and those that cannot be controlled.
2. Allow students to design a plan for decreasing noise pollution in the area.

EXTENSIONS:

1. Recordings can be made of different sounds. Students can listen to recordings and try to guess what the sounds are. This could be done as a group activity or set up at a listening center.
2. Cameras or pictures from magazines can be used along with the recordings of sounds. Students can match the pictures to the sounds on the recordings. A map of the area where the sounds were recorded can also be constructed with the photographs.

ORIGINAL DEVELOPMENT RESOURCES:

Commins, E. (1982). *Early childhood activities*. Atlanta, GA: Humanities Limited.

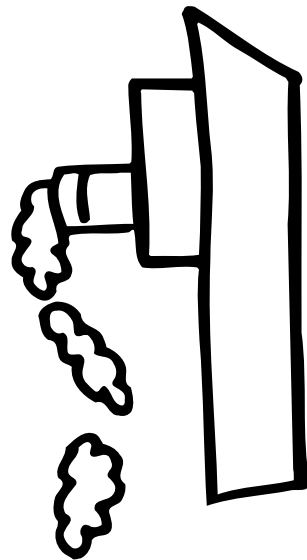
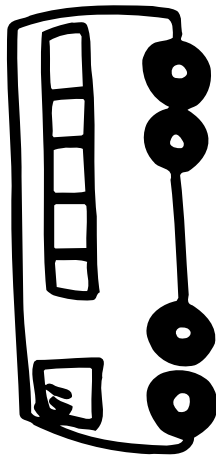
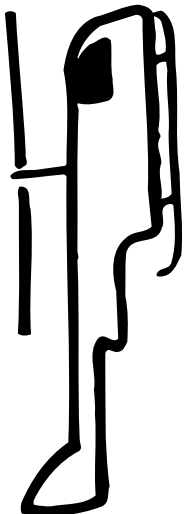
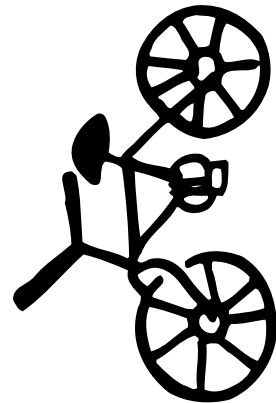
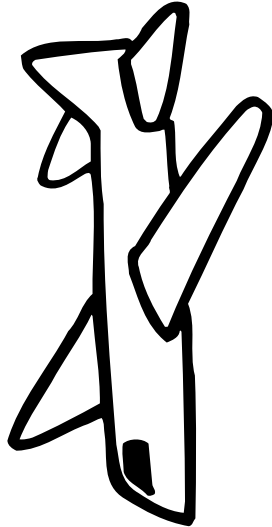
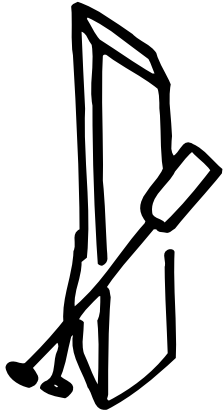
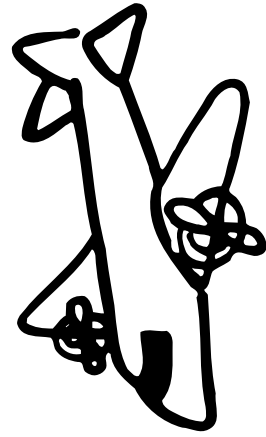
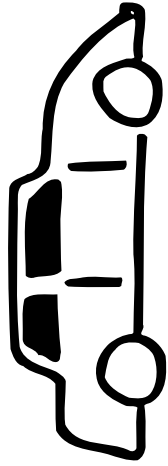
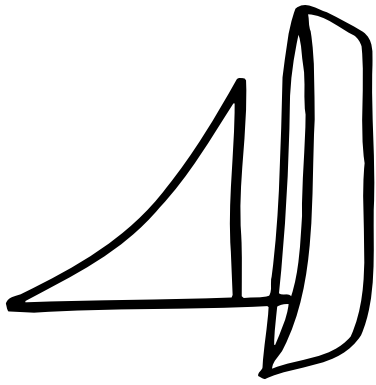
Miller, E.T. (1998). *Living in the environment*. Belmont, CA: Wadsworth Publishing Company.



Quiet



Loud



OBJECTIVES:

The student will be able to:

1. Explain their personal responsibility to the Earth.
2. Become a spokesperson for chosen topics.
3. Give persuasive speeches in front of class.

BACKGROUND:

In *The Lorax*, a small boy listens as the old Once-ler recalls how the rare Truffula Trees become extinct. He tells how the Lorax spoke for the trees and the animals until the last Truffula Tree was chopped down. The only creature that remains is the Once-ler. After the story of the Lorax is told, the Once-ler gives the last Truffula Tree seed to the boy. He asks the boy to plant it, protect it, and grow a forest so that the Lorax and all of this friends will come back.

VOCABULARY:

greenhouse effect - accumulation of heat in the lower atmosphere through the absorption of longwave radiation from the earth's surface.

ADVANCE PREPARATION:

Locate and read *The Lorax* by Dr. Seuss.

PROCEDURE:

Setting the Stage

Begin a discussion with students by asking this question, "What would happen if all the trees in the world were cut down?" (Discuss the decrease in oxygen, the increase in the "green house" effect due to increased carbon dioxide, the lack of paper and wood products, no homes for many animals, less fruits and nuts.)

Activities

1. Read *The Lorax* by Dr. Seuss.
2. Have students follow the example of the Lorax who was the only one to speak for the trees.
 - Students can develop or write short persuasive talks to speak for the trees, the oceans, and the whales.
 - Students may select their own topics, or the teacher can assign topics. (Note: Students may work individually or in small groups.)
 - Visual aids can also be made by the students to be included in speeches.

Follow-Up

Students will give their persuasive speeches in class. (If students are working in groups, each member of the group should have a turn speaking, if desired.)

EXTENSIONS:

1. Student speeches may be recorded using audio or video tapes and played back in a listening center.
2. Students can use old T-shirts and fabric paint to create wearable art that sends an environmental message.
3. Get permission from Creative Publications to write a (school) script from *The Lorax* and perform a play or skit for others in the school.

Grades:

K-2

Subjects:

Science, Language Arts

Time Needed:

60 minutes

Materials:

The Lorax by Dr. Seuss
materials for student to create visual aids

4. Refer to “Who Needs a Tree” in Learning Through Legacy (K-2).
5. Refer to “The Gift of the Tree” in Learning Through Legacy (K-2).

ORIGINAL DEVELOPMENT RESOURCES:

Dr. Seuss. (1971). *The lorax*. New York, NY: Random House.