

Pollution Search



Activity 36

Here's a way for your students to take a closer look at pollution: what it is, what its sources are, and what people can do to reduce it.

Levels

Part A: Grades 2-6
Part B: Grades PreK-2

Subjects

Science, Social Studies, Math

Concepts

- Altering the environment affects all life forms—including humans—and the interrelationships that link them. (2.2)
- Pollutants from human and natural systems can enter ecosystems in various ways. (3.3)
- Ecosystems possess measurable indicators of environmental health. (3.4)
- The application of scientific knowledge and technological systems can have positive or negative effects on the environment. (3.5)

Skills

Observing, Comparing and Contrasting, Organizing Information, Solving Problems



Differentiated Instruction

Key Vocabulary, Nonlinguistic Representations, Prior Knowledge Links, Realia/Hands-on Learning, Higher Order Thinking



Technology Connections

Internet Resources, Digital/Video Cameras, Presentation Software

Materials

Magazines, scissors, tape, poster board, copies of student page, *The Cat in the Hat Comes Back* by Dr. Seuss

Time Considerations

Preparation: 30 minutes
Activity: Two 50 minute periods

Related Activities

Air We Breathe; Every Drop Counts; Reduce, Reuse, Recycle; Energy Sleuths; Waste Watchers; Improve Your Place

OBJECTIVES

- Students will identify forms of pollution and describe the effects that various pollutants can have on people, wildlife, and plants.
- Students will describe relationships between various forms of pollution and human actions.

ASSESSMENT OPPORTUNITY

- Pass out copies of the student page. Have each student circle items in the picture that are potential sources of pollution. On the back of the page they should explain how each item they circled might cause pollution and what can be done to prevent this form of pollution. See answers on the last page of this activity.

BACKGROUND

Brown haze wraps around a city. Unwanted tires, appliances, and other refuse float in a stream. Oil washes up on a beach. All of these are examples of **pollution**. Human-generated chemicals, trash, noise, and heat can all be pollutants, but so can ash spewing from an erupting volcano or smoke spreading from a forest fire. Pollution is any contamination of air, water, or land that affects the balance of the environment. Here's an overview of three types of pollution—air, land, and water—and a look at pollution controls.

Air Pollution—Automobiles, incinerators, coal-fired power plants, and factories release carbon dioxide, sulfur oxides, particulates, and other pollutants into the air. Fireplaces and wood-burning stoves add carbon monoxide, ash, and other pollutants to the atmosphere. Other major forms of air pollution include smog and toxins such as benzene, asbestos, and lead.

Air pollutants can cause health problems for people and other living things. Smog can make people's eyes burn and damage their lungs. **Acid rain**, caused primarily from the combination of water, oxygen, and atmospheric sulfur dioxide or nitrogen oxides, has poisoned lakes in certain regions, either killing fish or causing chronic stress that makes fish less able to compete for food and habitat. **Chlorofluorocarbons (CFCs)** in the stratosphere destroy the ozone layer, allowing more of the sun's harmful ultraviolet rays to reach Earth, possibly leading to increased rates of skin cancer. Increased amounts of carbon dioxide and other **greenhouse gases** in the atmosphere may affect world climate.

Since the Clean Air Act of 1970, great strides have been made to reduce air emissions. In 1975, Los Angeles recorded 118 days in which it had a stage 1 Smog Alert. In 1996, the number had dropped to 7 days (California Air Resources Board). EPA reports that the installation of stack scrubbers at electric utilities has reduced sulfur dioxide emissions by over 40%. Cleaner fuels, emission controls and engineering features have reduced the emissions from





today's cars by more than 90% compared to a car of the 1970's. These efforts will need to continue because over 100 million Americans still live in areas that do not meet the Clean Air Act requirements.

Water Pollution—Years ago, it was common for sewage treatment plants and industrial plants to discharge polluted waste water directly into rivers, bays, and oceans. Known as “point-source pollution,” this practice continues unabated in many parts of the world. In the United States, government regulations, voluntary pollution prevention by industry, and citizen awareness have helped improve waste disposal methods. As a result, in parts of the U.S., many rivers and streams that were once severely polluted have been revived.

Non-point source pollution is pollution that is wide-ranging; for example, fertilizers, pesticides, and oil from cars wash into waterways from streets and agricultural land. People should be aware that any pollutant released in a **watershed** or into the atmosphere will eventually find its way into the water cycle.

Lead in drinking water is another type of water pollution. It can have serious health affects for babies and small children, as well as adults. Lead is rarely found in source water, but enters tap water through corrosion of plumbing materials. Very old and poorly maintained homes may be more likely to have lead pipes, joints, and solder, but even legally “lead-free” pipes in new homes may contain up to 8 percent lead.

Land Pollution—Everything we throw away needs a place to go. Solid wastes that do not contain hazardous materials can be moved to sanitary landfills (about 69% of our solid waste ends up here) or burned to ash in an incinerator and then landfilled. Many other items (glass, aluminum, paper, etc.) can be recycled (the U.S. currently recycles about 31% of its solid waste). Items



like food scraps and yard waste can be composted, turned into organic material that can then be used as fertilizer for a yard or garden. (See Activity 37, “Reduce, Reuse, Recycle” for more information about landfills and incinerators, including problems associated with them.)

Hazardous wastes—flammable liquids, volatile or corrosive chemicals, and radioactive by-products—pose special disposal problems. Certain hazardous materials can be incinerated; others must be sealed in long-lasting, leak-proof drums; and others, like radioactive waste which may remain hazardous for generations, must be secured underground in complex, concrete reinforced structures.

Pollution Controls—By definition, pollution is bad. However, some pollution is also unavoidable. Natural events that we can't control, such as volcanic eruptions and decomposition in wetlands, can generate pollution. And much of our basic lifestyle generates pollution: producing goods, washing clothes, driving to work, watching television, growing food, rinsing things down the sink, fertilizing lawns, and so on. However, we can reduce the amount of pollution we produce by changing aspects of our lifestyles and

by adopting new pollution-reducing technologies. For example, scrubbers in the smokestacks of coal-burning power plants greatly reduce the amount of sulfur and nitrogen oxides such plants release. Wastes stored in properly designed and maintained facilities can also be kept out of water supplies. Technological advances in the auto and petroleum industries, such as improving fuel efficiency, development of hybrid vehicles and cleaner fuels, are leading to less polluting and energy consuming vehicles. By riding bikes or walking instead of driving, people can further reduce the pollution they generate.

We also control and reduce pollution through laws. The United States has some of the strictest pollution control laws in the world. The Clean Air Act and the Clean Water Act (the Federal Water Pollution Control Act) are probably the two best-known examples.

Under those laws, the Environmental Protection Agency (EPA) sets

- standards for which pollutants and, how much of each, can be released into waterways by sources such as industries and sewage plants;
- maximum levels of particular pollutants in the air; and
- the amount of pollution that motor vehicles can produce.

Other pollution control laws

- protect public drinking water supplies (Safe Drinking Water Act);
- regulate pesticide use (Federal Insecticide, Fungicide, and Rodenticide Control Act-FIFRA);
- control solid waste and hazardous waste disposal (Resource Conservation and Recovery Act-RCRA); and
- regulate ocean dumping (Ocean Dumping Act).

GETTING READY

For Part A, make plans to take your students on a walk through the school neighborhood to look for signs and sources of pollution. For Part B, get a copy of *The Cat in the Hat Comes Back* by Dr. Seuss. For the Assessment section, make copies of the student page.

Safety! For Part A, check for any hazards along the walk route, such as heavy traffic, deep holes, sharp objects, or poisonous or irritating plants.

DOING THE ACTIVITY

Part A—Neighborhood Patrol

1. Ask students to describe what life would be like without clean air. What about life without clean water?

 2. Ask students to list as many things as they can that might contaminate, or make unsafe, the air we breathe or the water we drink. List their ideas where everyone can see. Ask students what words people use to describe the types of things they've listed ("pollutants" or "pollution"). Discuss what the term "pollution" means.

 3. Take students on a walk (outdoors or indoors) to look for and record pollution, pollutants or potential sources of pollution. During your walk, have students identify pollution they can see (litter, smoke); hear (honking horns,

airplanes); or smell (diesel fumes, fresh paint). Alternatively, have students find examples of pollution on land (litter, animal wastes), in the air (car exhaust), and in water (pollutants that could wash into storm drains). Have them create a data collection chart using the identified categories. As students spot different examples, have them explain how each one could pollute. What kinds of plants or animals (including people) could be affected by each one?

Also ask students what might have caused each form of pollution. For example, how did a piece of litter get on the ground? How did oil get on the pavement? Have students research pollution prevention strategies that are being implemented by local industries, community groups, government agencies, etc. (Students can create bar graphs depicting the number of pollutants they have recorded in each category.)

4. Back inside have students go over their data and check to see that they have at least one example for each category identified earlier (sight, smell, sound; or air, land, water). They can continue their search by looking through magazines for other examples of pollution. As an option, have students to draw pictures of the pollution they identified on your walk.

5. Create a large chart on poster board or chart paper with columns for each different category of pollution identified in Step 3. Have students take turns placing the pictures they drew or the items they recorded into the pollution categories.

6. As a group, review and discuss the finished chart. Depending on the level of your group, ask students some of these questions:

- Do any of the same items appear in different categories? If so, do you agree with where those items were placed? Can something pollute two different things, such as air and water, or land and water? How?
- Can people always see, hear, or smell pollution?

- Which examples on the chart might affect people's health? Which ones might affect plants or animals? In what ways?

One at a time, point out several examples on the chart and ask students how each form of pollution might be prevented. (To prevent litter, people could dispose of their trash properly; to prevent oil leaks, they could keep cars in good running order; and so on.) Depending on the level of your students, you might also have them discuss the fact that we can't prevent all pollution. Explain that we have developed technologies to reduce the amount of pollution we generate, and people are constantly working to develop newer technologies.

Variation

 Instead of taking students on a walk, bookmark pictures on the Internet that show various types of pollution. Have students categorize the pictures according to the type of pollution.

Part B—Cat with an Attitude

1. Tell students they are going to hear a fable about pollution. A fable is a story that teaches an important lesson.

2. Read aloud *The Cat in the Hat Comes Back*, making sure to show the pictures. (The story is also available on video.)

3. Tell them that, besides being funny, the story can teach us something about people's attitude toward pollution.

- Ask students what represented pollution in the story. (the pink stuff)
- Where did the pollution come from? (the cat)
- How did the cat deal with the pollution first? (moved it from one place to another)
- Did this solve the problem? (no)
- Who did the "big cat" call on to help him solve the problem? (little cats)
- What did the little cats do? (broke the pink stuff into little pieces and spread it around)



- Did this help? (no)
- Who finally cleaned up the mess? (little cat “Z”)
- Could we see him? (no)
- What did he use to clean it up? (a “vroom”)
- Could we see it? (no)
- Do we know how it works? (no, just that it “cleans up anything”)
- Ask the students if they can compare this story to any real life situation.

4. Ask students what they can do today to make their world a cleaner, safer, and healthier place. Encourage them to learn more about what causes different types of pollution and what they can do to reduce it, clean it, or prevent it.

Variation for Younger Students

1. Read aloud *The Cat in the Hat Comes Back* (or watch it on video).
2. Ask students what pollution is, and what the cat did that caused pollution. Ask what the cat did to clean up pollution.
3. Give each student a pair of rubber gloves, and explain that they will use them to help clean up pollution at the school. Student can use pens or crayons to decorate the gloves with nature images, colors, and so forth.
4. Take students on a walk to look for one kind of pollution—litter. Wearing their rubber gloves, have students pick up the litter and put it in a large trash bag.

Safety! Visit the site beforehand to check for any hazards at the site, such as deep holes, sharp objects, or poisonous or irritating plants. Do not allow students to touch or go near anything sharp (broken glass, syringes) or hazardous (car batteries, pesticide containers). Do not allow students to pick up litter in the street or parking lot, in a tunnel, or on a bridge.

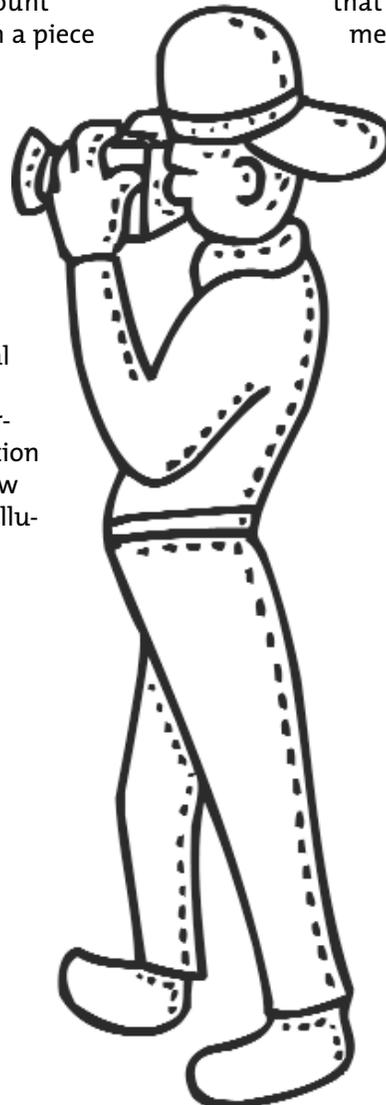
 5. After collecting the litter, you may want to help students sort it into piles, deciding what can be reused, recycled or thrown away.

Enrichment

- For homework, have students look through newspapers or magazines, and bring in pictures of pollution or potential pollution problems. They should each write a sentence or two about the pollution represented in their pictures. Have them mount their pictures and writing on a piece of construction or poster paper. The students should each tell how the pollution represented on their posters fits into categories they identified during their schoolyard walk in Part A.
-  Have students take digital pictures of the pollution they see around the neighborhood, and then use presentation software to create a slide show about the various types of pollution and what can be done.

- Now that your students are more aware of pollution, have them complete a service-learning project in their community. Here are some projects your group may want to do:
 - Join forces with local cleanup operations.
 - Adopt an area—a nearby roadway, local park, or school—and keep it litter free.
 - Sponsor a pollution awareness week in your school. Have people take steps to reduce pollution all week long. Then encourage them to follow those steps all year long.
 - Organize a stream, beach, or neighborhood cleanup.
 - See the PLT *GreenWorks!* Guide at www.plt.org for more information about planning and carrying out a service-learning or community action project.

■ Have students research pollution prevention strategies that are being implemented by local industries, community groups, government agencies, etc.



Answers to Assessment

A person fertilizing the lawn—When used improperly, lawn chemicals may contribute to nonpoint source pollution. Students may want to consult with their garden center or local environmental agencies to learn about some of the potential hazards of certain lawn fertilizers and pesticides. Students can encourage adults to read chemical labelling carefully to insure that these products are used and disposed of properly.

Six-pack rings—If improperly discarded, plastic six-pack rings may entangle and harm wildlife, both on the land and in the water. To protect these organisms, six-pack rings should be cut into smaller pieces and disposed of properly.

Person pouring motor oil down a drain—Some individuals who change their own motor oil contribute to nonpoint source pollution by not following proper oil disposal guidelines. Students can encourage adults to dispose of this potential pollutant properly and inform them to drop off their used motor oil at nearby service stations equipped with collection facilities.

Car driving on a road—Automobiles and other combustion engines release various air-borne pollutants. In order to reduce this type of pollution, students can limit their use of automobiles by carpooling, taking mass transportation (buses and subways), and exploiting alternative means of transportation (such as walking or riding a bicycle). Students can also encourage adults to buy fuel-efficient cars and to keep all automobiles properly serviced.

Person walking a dog—Improperly discarded dog wastes are not only an unsightly form of litter, but may be a potentially harmful environmental pollutant, as well. Students can encourage dog owners to always clean up after their pets, and to discard the waste in a proper receptacle.

A person opening a refrigerator, and a computer left on—A major source of air pollution is electricity generation, which often occurs in coal-fired or natural gas power plants. Using electricity—especially large appliances like refrigerators, furnaces, water heaters, washers, dryers, and so on—contributes to air pollution. Students can encourage adults to buy energy-efficient appliances and to monitor their use.

READING CONNECTIONS

Geisel, Theodor Seuss (Dr. Seuss). *The Cat in the Hat Comes Back*. Random House, Inc. 1976. Using simple words and a rhyming text, the Cat in the Hat returns in a magical and messy adventure that shows just how difficult it is to totally clean up a problem. Grades K-4. ISBN: 0394800028.

Geisel, Theodor Seuss (Dr. Seuss). *The Lorax*. Random House. 1971. In this classic story, the Once-ler describes how his greedy actions destroyed a beautiful and thriving environment. Children will enjoy the colorful characters and rhyming verse. Also available in Spanish. Grades PreK-6. ISBN: 0394823370.

Harper, Joel. *All the Way to the Ocean*. Freedom Three Publishing. 2006. This book delivers a message to adults as well as kids about protecting oceans and keeping our sewers free from trash. Important lessons about friendship and teamwork are also found, as organized efforts through schools and neighborhoods to clean up water resources are described. Grades 5-8. ISBN: 0971425418.

Hiaasen, Carl. *Flush*. Yearling. 2005. On Father's Day, Noah visits his dad at the local jail. Dad is a feisty environmentalist with a short fuse. Convinced that the Coral Queen was dumping raw sewage into the harbor, he sank the floating casino. Noah knows that his dad was right about the sewage, even if his corrective method was a little over the top. To clean the slate and the harbor, he drafts a motley crew of friends to

get the goods on the illegal dumpers. Grades 4-6. ISBN: 0375821821.

Miller, Christina. *Wastes*. Franklin Watts. 1986. Surveys the treatment of household waste and some possible future solutions to the growing problem of its disposal. Grades 6+. ISBN: 0531101304.

Peet, Bill. *Wump World*. Houghton-Mifflin. 1970. The Wump World is an unspoiled place until huge monsters bring hordes of tiny creatures from the planet Pollutus. All Grades. ISBN: 0395311292.

Stenstrup, Allen. *Hazardous Waste*. Children's Press Inc. 1991. Explains what hazardous wastes are, how they are produced, and why it is difficult to dispose of them. Grades 4-8. ISBN 0516055062.



Pollution Scene

