

## NAME THAT SOURCE: Types of Water Pollution and Their Sources

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### OBJECTIVES

The students will do the following:

1. Identify the source of various water pollutants using flash cards to depict sources.
2. Identify the source category (urban, forestry, agriculture, or mining).
3. Distinguish whether the source is nonpoint or point.
4. Identify the different types of water pollution (sediment, nutrients, bacteria, or toxics).

SUBJECTS: Science, Social Studies

TIME: 1-2 class periods

MATERIALS:

Magazines, on-line images

Scissors

Colored felt markers or colored pencils

3" x 5" (7.5 cm x 12.5 cm) index cards

Spray adhesive or glue stick

2 buzzers or bells

Posterboard

Fact Sheets (included)

Camera (optional)

### BACKGROUND INFORMATION

Water can become polluted in many ways. Water pollution results when people add things to water that makes the water unsuitable for use by humans and other organisms in nature. There are two main ways water can become polluted. The first way is when pollutants are put directly into water and you can go to one place and see it happening. This is called "point source." Point sources are fairly easy to find and control. For example, factories and wastewater treatment plants have pipes that pour wastewater directly into rivers, streams and lakes. Today, laws exist to make sure the wastewater is cleaned or "treated" before it enters a river, stream, or lake. Point sources can be easily inspected.

The second way water can become polluted is by nonpoint source pollutants. Nonpoint pollutants get washed off of land (runoff) or out of the air when it rains or snows. It is very difficult to determine exactly where these pollutants come from because you cannot go to one single spot and see it happening. That is why it is called "non" or "no" point pollution. In most cases, nonpoint source pollution results from the improper use of land. Any time we drop something on the ground or pour something into a storm drain, it can end up in our water. (NOTE: When runoff ends up at a wastewater treatment plant, it becomes a point source even though it originated as a nonpoint source.) These pollutants can change water and make it unfit for us to use. Preventing nonpoint source pollution is difficult because it is hard to determine where the pollutants are coming from.

Part of the difficulty in addressing nonpoint source pollution is the “everydayness” of the issue. We are so used to seeing the many land use activities that cause nonpoint source pollution, we never stop to consider them as causes of environmental pollution. For example, the runoff following a storm from a large urban area may contribute more pollutants to nearby waterways in a 24-hour period than any factory. Suburban shopping malls are convenient, but acres of pavement provide no place for rain to slowly filter through the soil. Cattle wading in a creek at first glance look like part of any rural scene, but a closer look may reveal trampled streambanks and muddy water. The list could go on and on. These land use activities contribute sediment, excess nutrients, bacteria, and toxic chemicals to water bodies and reduce water quality. Unlike point source water pollution, pollutants from these activities come from a widespread area and cannot be traced to a single point or source such as a discharge pipe. Nonpoint source pollution can sometimes be traced to a single farm, mining operation, or town. However, it is generally difficult to control these pollutants at a single point. This is what makes water pollutants nonpoint.

It is often the cumulative effects of many land use activities in an area that seriously degrade water quality. A variety of land uses are necessary to survive as a society. However, pollution can be minimized by changing the way these land uses are carried out. For example, soil erosion can be minimized by using mulch and other groundcovers to protect disturbed soil. In some cases though, a land use change may be necessary to prevent pollution. For example, it is better to plant row crops following natural land contours.

## **PROCEDURE**

### **I. Setting the Stage**

Explain that:

- (1) Water pollution comes from point and nonpoint sources;
- (2) Water pollution that can be traced to a single source such as a discharge pipe from an industrial facility is called point source,
- (3) Nonpoint source pollution enters water from many diffuse sources and is often difficult to control;
- (4) Most nonpoint source pollution originates from four major land-use source categories: urban, forestry, agriculture, or mining;
- (5) Nonpoint source pollutants can be categorized into four types: sediment, bacteria, nutrients, and toxics; and
- (6) Nonpoint source pollutants such as bacteria, nutrients, and toxics may bind or attach to sediment particles and be transported with sediment.

### **II. Advance Preparation**

Have students make flash cards by cutting out pictures from old magazines and on-line images of potential sources of point and nonpoint source pollution. Include construction, automobiles, farms, factories, gardens, landfills, etc. (See examples of possible nonpoint pictures or student sketches in the Teacher Sheet below.) If pictures are not available, have students make sketches or take photographs around the community. Use a spray adhesive or glue sticks to attach pictures and sketches to the 3" x 5" (7.5 cm x 12.5 cm) index cards. On the back of each card, write point or nonpoint, the source category, and the type. For example, a power plant discharge pipe would be point, industry, and toxics. You may want to laminate the cards for future use.

### III. Activity

- A. Divide the class into two equal teams and have the teams form two lines. The first person in each line will get one bell or buzzer. The teacher will flash the cards up one at a time. The first team to buzz or ring gets to answer. Each team gets two points for every correct answer and loses one point for each wrong answer. If the answer is wrong the other team is given a chance to answer for one point. Then, these two people move to the end of the line and the next two get the buzzer or bell.
- B. After each card, discuss the answer, especially if one or both teams get it wrong. Use a piece of poster paper taped to the wall or the chalkboard to keep score. Continue until all the cards are used up.

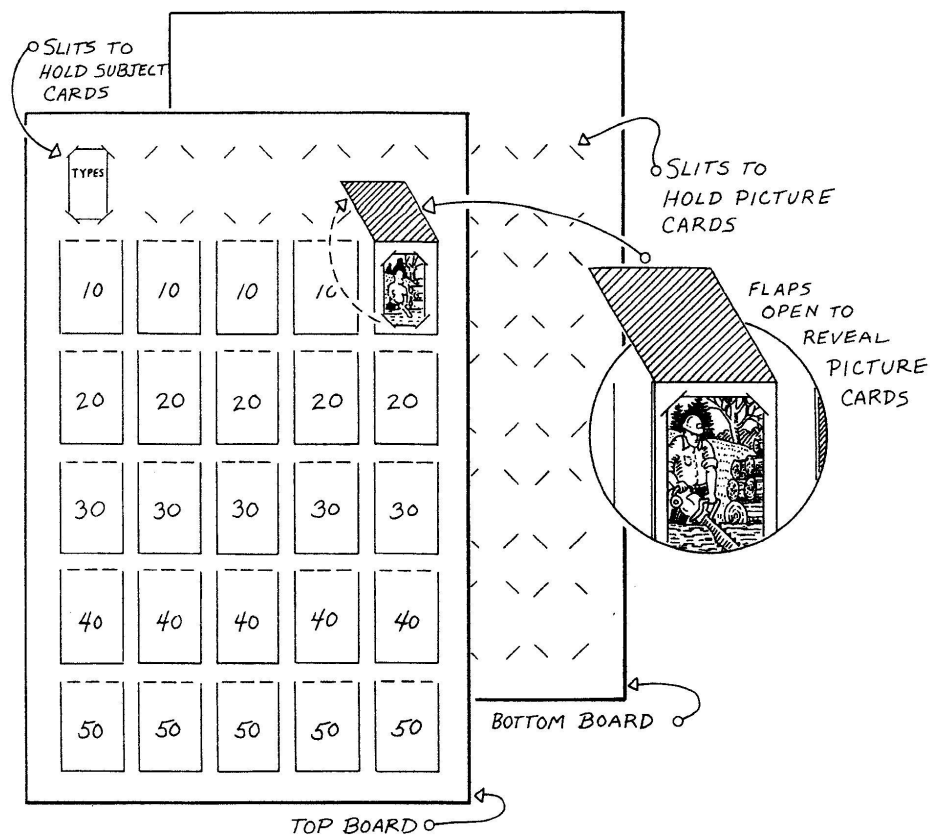
### IV. Follow-up

- A. Let students draw and label their own sketches of nonpoint pollution sources or take pictures of local problems and use these as flash cards for another game.
- B. Create a new game called "Name the Solution" which focuses on solutions to nonpoint source pollution problems. Possible solutions can be found in Name That Source Fact Sheets in the Appendix.

### V. Extension.

- A. Divide students into teams and give each team a Fact Sheet from the Appendix to review. Then have the Teams present what they have learned from the Fact Sheet to the Class. This additional knowledge can be applied in the advanced game below.
- B. Use the same cards to create a "Jeopardy-type" game board. Create the game board by taking two equal size posterboards and preparing them as follows:
  1. Make slits and cut out flaps on the top board and attach the top to the bottom with glue.

2. Then make the slits as shown on the bottom board. (You may want to laminate both sheets first and then cut them out to make a more durable game board.)
3. Make subject cards on 3" x 5" (7.5 cm x 12.5 cm) cards and attach to the top of the columns.
4. Then make or adapt your picture cards to relate to the subject cards. You may want to use some pictures for several categories in future games. To do this, label the answers Game A, B, C, etc. You may want to laminate the cards and use peel-off labels or overhead marking pens to put new answers on the back.



- C. The game is played following a “Jeopardy-like” format. Have the students form 2 or 3 lines. Then roll a dice or flip a coin to see who chooses the first category. Open the flap to expose the card. The first person to ring the buzzer gets to respond. Like “Jeopardy,” the person must respond with a question. For example, if the category is “Types” and the picture showed muddy water running off a soybean field, the answer would be “What is sediment?” If the same picture is under the “Source” category, the answer would be “What is row-cropping?” You may have some with more than one acceptable answer. For example, using this same picture under “Effects,” you might have “What is kill or harm aquatic life?” or “What is make the water unsuitable for drinking or swimming?”
- D. To score the game, give the first person/team with the correct answer the point value on the flap. Deduct the value from their score for wrong answers. Play the game until all flaps are opened up. You may want to add new cards and categories and repeat the game if you have time or play it later as a review.

## RESOURCES

NOAA (National Oceanic and Atmospheric Administration). Nonpoint Source Pollution Tutorial  
[http://oceanservice.noaa.gov/education/tutorial\\_pollution/welcome.html](http://oceanservice.noaa.gov/education/tutorial_pollution/welcome.html)

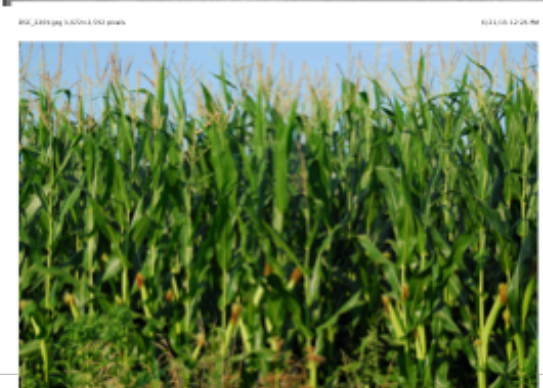
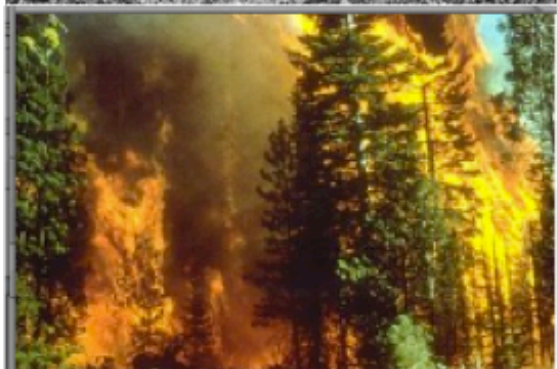
USEPA (United States Environmental Protection Agency). Stop Pointless Personal Pollution!  
[http://water.epa.gov/polwaste/nps/kids/middleschool/upload/stoppointless\\_article.pdf](http://water.epa.gov/polwaste/nps/kids/middleschool/upload/stoppointless_article.pdf)

USGS (United States Geological Survey). The USGS Water Science School.  
<http://water.usgs.gov/edu/>

**EXAMPLES OF POSSIBLE NONPOINT PICTURES OR STUDENT SKETCHES****Image – (source categories – pollutant type)**

1. Heavy rain—(urban, forestry, mining, or agriculture – sediment or toxics)
2. Forest fire—(forestry – sediment or toxics)
3. Abandoned mine—(mining – sediment or toxics)
4. Wind carrying dust—(agriculture, forestry, or urban – sediment or toxics)
5. Detergent foaming up water—(urban – nutrients)
6. Boats in lake—(urban – toxics)
7. Erosion on hillside—(agricultural, forestry, mining, or urban – sediment)
8. Corn field—(agricultural – sediment, nutrients, or toxics)
9. Exhaust from farm tractor in field—(agricultural – sediment or toxics)
10. Pig in pen—(agricultural – bacteria, sediment, or nutrients)
11. Batteries in area dump—(urban – toxics)
12. Flood—(urban or agricultural – sediment, nutrients, bacteria, or toxics)
13. Oil spill on coastline—(urban – toxics)
14. Barge carrying coal—(urban – toxics)
15. Oil on highway—(urban – toxics)
16. Smoke from factories or industrial wastes—(urban – toxics)
17. Horses in field—(agricultural – sediment, bacteria, or nutrients)
18. Open dump of garbage—(urban, agricultural, mining, or forestry – sediment, bacteria, toxics, or nutrients)
19. Chemical symbol of cobalt—(mining or urban – toxics)
20. Train—(urban – toxics)
21. Old 50-gallon drums of wastes—(urban, agricultural, forestry, or mining – sediment, bacteria, toxics, or nutrients)
22. Cows—(agricultural – sediment, bacteria, or nutrients)
23. Field with little or no grass—(agricultural – sediment)
24. Cropdusting—(agricultural – toxics)
25. Construction—(urban – toxics or sediment)
26. Person spraying garden—(urban – toxics)
27. Landfills—(urban – sediment, bacteria, toxics, or nutrients)
28. Clearcut forest—(forestry – sediment)
29. Pesticide container—(agricultural, urban, or forestry – nutrients)
30. Algal bloom—(agricultural, urban, or forestry – nutrients)
31. Chemical symbol of mercury—(urban or mining – toxics)
32. Chemical symbol of zinc—(urban or mining – toxics)
33. Cars—(urban – toxics)
34. Houses—(urban – bacteria, sediment, nutrients, or toxics)
35. Street cleaning machine—(urban – sediment, toxics, or bacteria)
36. Person with pet on a leash—(urban – bacteria, nutrients, or sediment)
37. Fast-food restaurant containers on ground—(urban – bacteria, sediment, nutrients, or toxics)
38. Heavy equipment harvesting a tree—(forestry – sediment or toxics)
39. Streambed covered with orange ooze—(mining – toxics)
40. Truck putting salt or sand on road—(urban – toxics or sediment)
41. Person washing driveway or sidewalk with hose—(urban – sediment or toxics)
42. Gas station with underground storage tanks—(urban – toxics)
43. Cleaning products under sink—(urban – toxic)





**APPENDIX: NAME THAT SOURCE FACT SHEETS**

**Land Use & Water Quality**  
**Sediment**  
**Nutrients**  
**Bacteria**  
**Toxics**  
**Other**  
**Best Management Practices**  
**Individual Actions**