NASTY WATERS: What Happens To Pollutants In Water

OBJECTIVES

The students will do the following:

1. Identify potential water pollutants
2. Observe, discuss, and record findings of a simulated polluted pond
3. Identify sources of water pollution as point or nonpoint
4. Observe that some pollutants are degradable and some are nondegradable (do not "break down")

SUBJECTS: Science, Language Arts

TIME: 2-5 class periods

MATERIALS:

several quarts or liters of lake or stream water

clear plastic quart or liter containers

pollutants such as laundry soap, motor oil, styrofoam pieces, houseplant fertilizer, rubber bands, vinegar, nail polish, soil, cookie or cracker crumbs, bits of paper, food coloring

small containers for pollutants

student sheet (optional; included)

plastic spoons

plastic jars

teacher sheet (included)

measuring spoons

permanent ink marker

masking tape

grow light or sun lamp (optional)

pencils or pens

notebooks (optional for journals)

BACKGROUND INFORMATION

There are two major categories of water pollution—point and nonpoint source—depending on where and how the pollution originates. For example, point source pollution is any kind of pollution that you can go to one spot and see where it is coming from, like a pipe discharging factory wastes into a stream. With nonpoint source water pollution, it is hard to see exactly where the pollution originates in most situations. For example, when land erodes, soil particles can travel many miles across the land before entering a body of water.

Water begins to collect impurities from the moment it begins to fall as rain. Dust, minerals, and soil all get washed into water bodies. In fact, erosion is a natural wearing away of the earth's surface. Water pollution results primarily from human land use activities. Water becomes polluted when substances ordinarily not found in water are added to it. For example, water is usually clear, but when it rains, dirt can wash into the water and make it muddy. People sometimes put things in water, like soaps and fertilizers. This can cause the water to become polluted. There are four basic types of water pollutants—sediment, nutrients, bacteria, and toxics.

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, stormwater from an urban area may contribute more pollutants to nearby waterways in a 24-hour period than any factory. Suburban shopping malls are convenient, but acres (hectares) 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 all over and are difficult to trace to a single point. It is often the cumulative effects of many land use activities in an area that seriously degrade water quality.

ADVANCED PREPARATION

A. Collect several quarts or liters of lake or stream water in clear plastic containers.

B. Gather "pollutants" or have the students bring in "pollutants" from home. Have them use their imaginations. (See materials list for some safe suggestions.)

C. Copy student sheet (included), one per student (optional).

PROCEDURE

I. Setting the Stage

A. Introduce the terms "water pollution," "point source," and "nonpoint source" and ask the students to distinguish point from nonpoint.

B. Explain to the students that this lesson will show them how we all contribute to water pollution in ways that can last a long time.

II. Activity: Create Mini-ponds

NOTE: This may be conducted as a teacher demonstration or each student (or team of students) can make a mini-pond.

A. Place a variety of pollutants in separate containers on a table. Place plastic spoons near the containers for handling. (NOTE: Use only pollutants that will not be harmful or dangerous to students.)

B. Discuss what each pollutant on the table represents and how this pollutant could pollute a water source in a real-life situation. For example: the rubber bands might be rubber tires (NP); the motor oil might be oil that is dumped down storm sewers in

town (NP); the styrofoam pieces might be food containers that make up litter and get washed into bodies of water (NP); plant fertilizers might be fertilizers that farmers use on their fields or homeowners use on their yards (NP); laundry soap might pass through a failing septic tank into bodies of water (NP); nail polish or food coloring might be chemicals that factories dump into the water (P); vinegar, which is acidic, might be the rain that falls through polluted air (NP) or acid mine drainage (NP) from a strip mine; and the cookie crumbs and paper can be compared to food and garbage that gets washed from the land to the water (NP).

C. Then discuss whether each type of pollutant would be point (P) or nonpoint(NP) source.

D. If conducting the lesson as a student activity, give each student or team a plastic jar which will be his/their "mini-pond."

1. Add lake or stream water to the jars (see illustration). (NOTE: You may want to explain that tap water may contain chlorine to kill organisms, so we need to use natural water instead.)

2. Let several students at a time come forward and add pollutants to their "mini-ponds" with close teacher supervision. Students or teams should only have one pollutant in their pond. One-eighth teaspoon (0.6 ml) to one teaspoon (5 ml) is a reasonable amount of pollutant to add to the jar.

3. Have them label their jars using a permanent ink marker on masking tape. The label should include student's name, pollutant, and date.

4. Put uncovered jars in a sunny window and allow the "mini-ponds" to rest in the classroom for a week. (NOTE: You may want to explain that the jars are left uncovered because living organisms like algae need oxygen to breathe.) As water evaporates, more water may be added. (NOTE: If sunlight is unavailable, use a grow light or sun lamp.)

5. Have students or teams record on a daily or every-other-day basis, the changes they observe, including water color and odor.

6. Students may give oral reports on what they observe at the end of the project.

III. Follow-up

A. Have students or teams observe how some pollutants seem to disappear (decompose) and some do not and record this in the data table (included). Explain that some pollutants "break down" or "decompose" with time, while others are non-degradable.

1. Have students or teams name or list those pollutants that appear to be breaking down and those that appear not to be. (NOTE: Explain that some pollutants seem to disappear or decompose when indeed they are still present and harmful, such as chemicals.)

2. Discuss how pollution that occurs today can affect living things for many years to come. For example, if a toxic substance is accidentally spilled into a pond, it may kill most of the fish and other aquatic life. It may take years for the pond to return to the original numbers of fish and other life that once lived there. In some cases, the pond may never be the same again.

B. Ask them which of the pollutants in the mini-ponds they think are the most dangerous to living organisms. Relate the mini-ponds to real-life pollution situations and discuss how people contribute to pollution.

IV. Extension.

A. Ask the students to look around the community and see if they observe any potential nonpoint source (NPS) pollution problems.

1. Have them make an NPS journal and record this information in the journal.

2. Ask them to note if any corrective actions are being taken.

3. If not, what would they do?

4. Have them report their findings to the class.

B. Invite a local water resource professional or agricultural extension agent to visit your class and discuss local nonpoint source water quality problems. Have the students share the information from their NPS journals and discuss ways they can help prevent nonpoint source water pollution.

RESOURCES

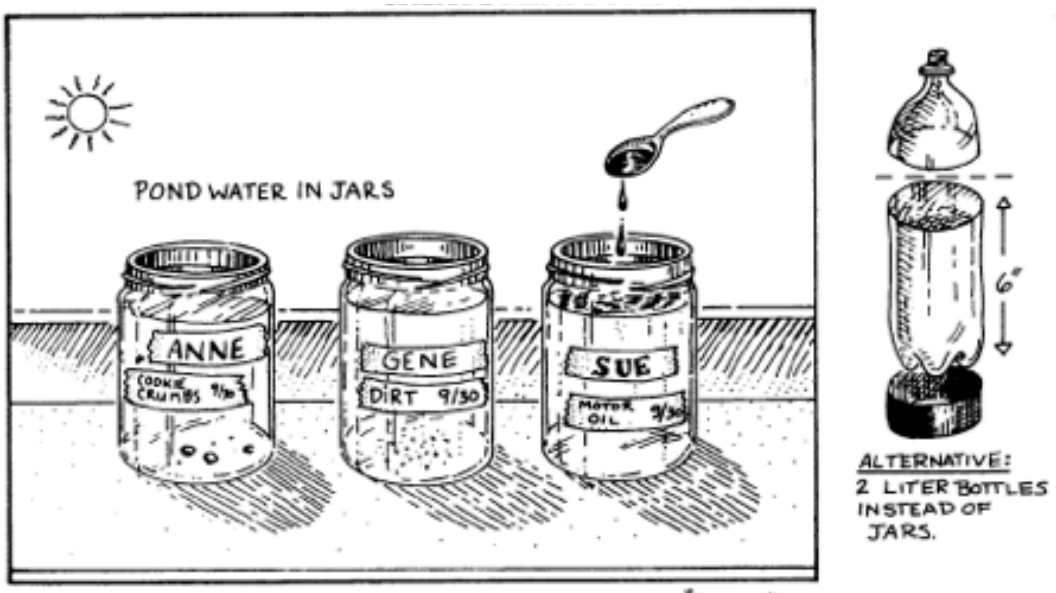
NOAA (National Oceanic and Atmospheric Administration). Nonpoint Source Pollution Tutorial http://oceanservice.noaa.gov/education/tutorial_pollution/welcome.html

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

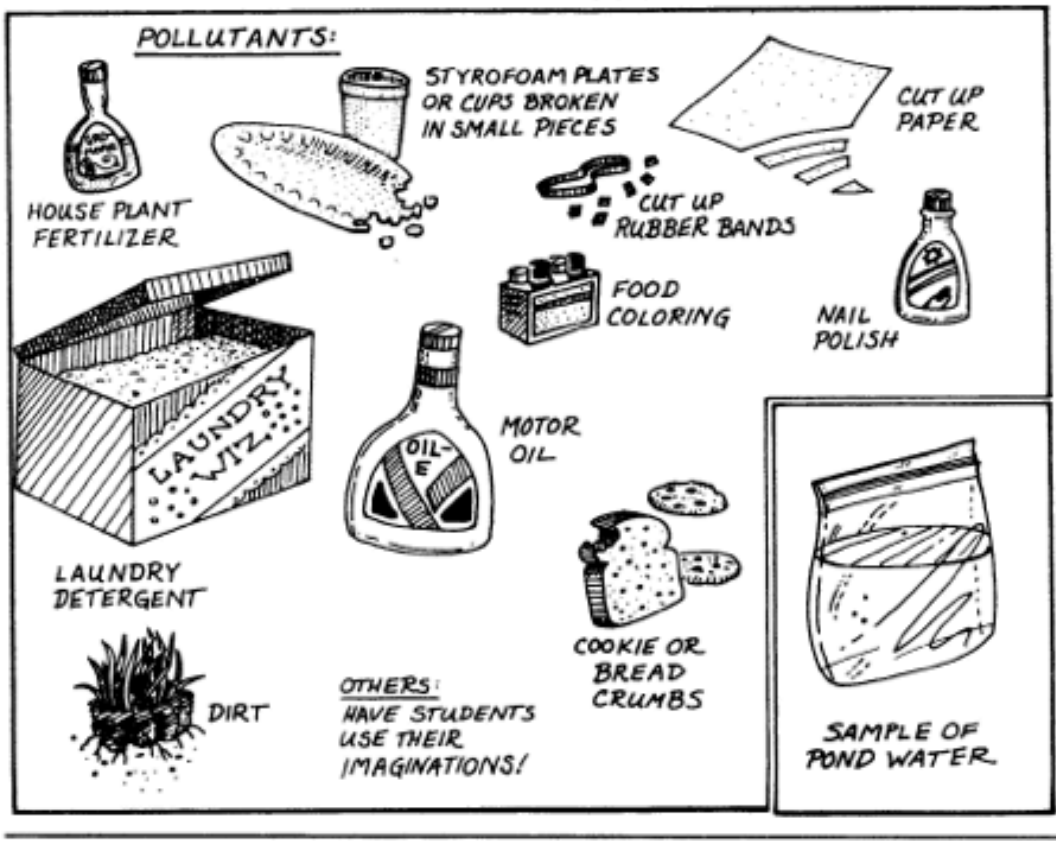
USGS (United States Geological Survey). The USGS Water Science School. http://water.usgs.gov/edu/

Teacher Sheet

CREATE MINI-PONDS



ADD 1/8 TO 1 TEASPOON POLLUTANT TO EACH "POND."
PLACE THE JAR IN A SUNNY WINDOW FOR ONE WEEK.



Student Sheet

_____ _____

Name Date

NASTY WATERS

1. Record your observations below. Observe your jar and four others.

Pollutant Type	Observations				
	Day 1	Day 2	Day 3	Day 4	Day 5
Jar 1 (your jar)					
Jar 2					
Jar 3					
Jar 4					
Jar 5					