

Lesson 23

Water Mystery

What is the difference between point source and non-point source pollution?
What are possible sources of non-point source pollution?
What can be done to prevent pollution?

GOAL To understand that non-point source pollution is not easily identifiable

OBJECTIVES Students will:

- ✓ identify causes of non-point source “pollution”
- ✓ solve pollution problems

MATERIALS case studies, pollution sources listed on board, pencil, papers

CORE CURRICULUM CONTENT STANDARDS

- Language Arts 2(4)
- Science 3(4,5), 7(8), 8(2), 14(1,2)
- Social Studies 6(5), 9(1), 10(5,7,8)

VOCABULARY non-point source pollution, source point pollution, acid rain, nutrient, pesticide

PROCEDURES

1. Begin by asking students if they know the difference between point source pollution and non point source pollution. (*point source - identifiable source of pollution; non-point source pollution - non-identifiable source of pollution*)
2. Ask for examples of each. (*point source – factory, oil spill; non-point – see list below*)
3. Explain that rain or precipitation that falls to the ground, runs-off over the soil to the waterways. Pollution mixes with the run-off and seeps into the soil, surface and ground waters.
4. Examples of non-point source pollution to be discussed with students are (may be listed on board):
 - a. **motor oil** – improper disposal or leakage of motor oil can seriously pollute ground water and surface waters. It can kill plants, smother animals and contaminate fish and drinking water.
 - b. **acid rain or deposition** – when rain, snow or dry particles from the atmosphere is more acidic than normal (normal is usually a pH of 5.6). Carbon dioxide combines with the water droplets to form carbonic acid. Sources can stem from the burning of fossil fuels, such as oil, and emissions from industry and cars. Acid rain can contribute to the depletion of nutrients in the soil and the addition of metals into the water.
 - c. **animal wastes** – livestock, pets and concentrated populations of wildlife can cause diseases in the water.

- d. **excessive nutrients** – oversupply of nitrogen and phosphorous can come from leaking septic tanks, fertilizers or manure from farms and lawns, sewage, laundry detergents and some grass clippings and leaves.
 - e. **household hazardous waste** – toxic or poisonous substances in the home, such as gasoline, nail polish remover, paints, and oven cleaners should not be dumped down sinks or drains.
 - f. **litter** – roadside trash, unswept parking lots, and wind blown trash can cause hazards to wildlife and contamination of waterways.
 - g. **pesticides** – these substances contain chemicals that are used agriculturally (farms) and on lawns. The chemicals harm both the environment (soil) and can also impact human health.
 - h. **road salts** – used to de-ice highway surfaces, parking lot pavements and other road surfaces and paved areas. Too much going into waterways can change the salinity of water that support certain animals and plants.
 - i. **sediment** – tiny soil and rock particles are carried away by rain into the waterways, increasing turbidity and reducing light penetration; sedimentation can occur as a result of erosion.
 - j. **toxic metals** – metals such as mercury, nickel, zinc and lead are toxic to human organisms because they can accumulate and become concentrated in the body. The metals can originate from cars, industry and pesticide misuse.
5. Explain to students they are experts in the field of water quality. Inform the students that the town manager has approached them because the town has experienced problems with the surface water. The town officials are not able to identify the sources of pollution. They have called in a team of experts (students) to help them identify the pollution sources.
 6. Break up students into groups. They represent the experts and are provided with a challenge. Have them come up with possible solutions to the town's dilemma to solve the pollution mystery. Explain to students the town can not clean up the hazards until the "experts" are able to identify the sources.
 7. Explain to students that there are three sites of concern. Provide three possible scenerios (student sheets) to the student groups to read and discuss. Have students review case studies and decide what the cause of pollution is for the three sites and their recommendations.

EXTENSIONS

1. Have students research ways to prevent non-point source pollution.

RESOURCES

Haskin, Kathleen M., *The Ways of the Watersheds: An Educators Guide to the Environmental and Cultural Dynamics of New York City's Water Supplies*, 1995, Claryville, NY: The Frost Valley YMCA

GLOSSARY

acid rain - rain containing acids that form in the atmosphere when industrial gas emissions combine with water

non-point source pollution - pollution caused by rainfall or snowmelt moving over and through the ground; as the run-off moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water

nutrient - a source of nourishment, especially a nourishing ingredient in a food

pesticide - a chemical used to kill pests, especially insects

source point pollution - pollution from industrial and sewage treatment plants with an identifiable source

Case Studies

Case 1 – Dirty Dilemma

A section of the river has a higher level of sediment and turbidity. A noticeable decrease in the amount of macroinvertebrates was prevalent. Rocks seem to be covered with silt causing the aquatic life to be smothered. The water temperature during the summer months has increased. The team was requested to go to several sites along the river bank that the town had pinpointed to try to determine a cause. They visited two of the sites and were on their way to the third. Along the riparian banks, they noticed trees down from storms and floods, causing the banks on the river to be free of vegetation.

- What did they see?
- What can be the cause of the sediment increase?
- What can be done to improve this situation?
- Was this a manmade situation or natural?

Case 2 – Nitrate Rising

The results of chemical tests indicated there was a rise in the pH level, nitrates and phosphorous in water. Algal blooms were on the rise causing a lower level of oxygen rich water. They were concerned about the aquatic life because there was a noticeable decrease in organisms. The area was close to an organic farm that utilized manure as fertilizer. Additionally, there was a partially finished development going in close by. The new houses were situated on top of a hill and some of the home owners were experiencing problems with faulty septic tanks. To make matters worse a sewage treatment plant was situated upstream. The team went to the site to conduct a survey. They noticed a pipe with a possible “contaminant” flowing into the river.

- What could be the cause of the problem?
- What can be done to improve the situation?
- What could be the cause of the increase in pH, nitrates and phosphorous levels?
- Was this a manmade situation or natural?

Case 3 – Fowl Litter

Aquatic wildlife seemed to abound in this area, but lately, the water fowl and other wildlife were getting caught in pieces of litter and plastic strewn around the lake beach areas. An influx of tourists visited during the summer months in an attempt to cool off. Many families would come and bring picnic lunches to enjoy on those hot days. Due to the sudden increase in tourism, the town was not able to keep up and had not placed more receptacles in this area. The wind would sometimes blow items away. Not too far in the distant was a closed landfill and paper recycling facility. On their way to the lake area, the team noticed a paper recycling truck with the tarp not securely tied.

- What is the cause of the problem?
- What can be done to improve the situation?
- Was this manmade or natural?

Read the three case studies.
Try to determine the cause of pollution.
Is it point or non-point source pollution?
Provide your input to the town manager (present to class).