

# Urban Watershed Pollution Lesson Plan

## 1. Materials Needed

- a. Urban watershed model
- b. Empty squirt bottle “sludge bottle”
- c. Spray bottle with water
- d. Cocoa powder
- e. Sprinkles
  - i. Red
  - ii. Green
  - iii. Brown

## 2. What is Pollution?

- a. Allow students to brainstorm different types of pollution
- b. Then tell them what pollution is: harmful substances deposited in the air, in the water, or on the land.
- c. Today’s lesson will focus on water pollution; what causes it and how we can help prevent pollution.

## 3. Watershed

- a. Explain that this model is a “watershed”. A watershed is simply an area of land that drains into a particular body of water. The rainwater that falls on the land flows down hills and slopes and drains into a creek or river. Many watersheds make up a much larger “river basin” or “lake basin”.
- b. Point out the various areas in the watershed model: the construction area, subdivision, industrial plant, riverbanks, and streets.
- c. Explain that everyone lives in a watershed and has a watershed address. Some students might know which body of water is nearest to their home or school.

## 4. The Two Types of Water Pollution

- a. Point Source Pollution
  - i. Point source pollution can be traced back to specific source.

- ii. Industrial Plant (point to building with the smokestacks) we often refer to this as the “Pokémon Plant” which makes Pokémon cards, plastic toys, etc. You can refer to the plant as anything you would like-for older kids refer to the plant as an electronics plant.
  - iii. *Action: For the Industrial Plant, squirt the cocoa/sludge mixture into the top of the plant and watch it flow through the pipe and into the ocean.*
  - iv. Have students watch the results. The “pollutants” are discharged directly into the water.
  - v. Explain that industrial plants sometimes have accidental discharges into the water.
- b. Non-Point Source Pollution
- i. Non-point source pollution originates from many sources. Each time it rains, run-off from the streets picks up litter, car lubricants, pet waste, excess fertilizers and pesticides, leaves, etc. These pollutants reach our waterways via wind, storm drains, and general run-off.
  - ii. The EPA (Environmental Protection Agency) has determined that non-point sources are the main cause of our nation’s water quality problems. Most people think that industry is responsible for the majority of our nation’s water quality problems, but that is not true.
  - iii. Examples of non-point source pollution include:
    - 1. Fertilizer and Pesticides: Ask the students what fertilizers and pesticides are. You may need to prompt their answers. Fertilizers are nutrients that help plants grow nicely and help yards become greener. Pesticides are used to get rid of bugs and other pests.
      - a. *Action: Put sprinkles on selected areas. Use red for pesticides and green for fertilizer.*
    - 2. Car Lubricants and washing materials: Mention that cars, trucks, construction vehicles, etc. leak liquids (oil, antifreeze, grease, etc.) when not properly maintained. You often see dark spots on paved areas where this has happened. Ask students if they have ever seen a shiny multicolored layer on top of a rain puddle. Explain that this is oil. Some people also wash their cars at home in their driveways.
      - a. *Action: Use cocoa and water mixture in “sludge bottle” and squirt on these areas as they are discussed.*
      - b. Driveways: Sometimes people wash their cars in their driveways. When they do this, all the dirt and grime on

their car and the soap they use to wash their car runs off into the stormwater drains

- c. Roads and Bridges: When cars aren't properly maintained, they can leak oil, transmission fluid, and antifreeze as they drive around.
- d. Parking Lots: If cars are leaking, they will leak their liquids onto the blacktop where it will wash away into our rivers and lakes.
- e. *Action: using one of the water bottles, make it "rain" over the areas where you have sprinkled fertilizer and pesticide gelatin mix and the areas you squirted "slurry" representing lubricants.*
- f. Again, point out that the rainwater carries these pollutants directly into bodies of water. Look how dirty the water is becoming. Prompt the students to think of how this might affect our water quality and aquatic life.
- g. Storm Drains: Explain that storm drains are found on the curbing in neighborhoods and along all streets and are designed to allow rainwater to flow off of the pavement. Oftentimes people pour things directly down a storm drain (such as paint, motor oil, household chemicals, etc.). All storm drains lead straight to a body of water without first being treated. We should never pour anything down a storm drain. They are designed only for storm water.
- h. Animal Waste/Fecal Matter: We often walk our pets in our neighborhoods and even along stream banks. Usually we do not pick up after our pets, but we must learn to do so. This would help prevent the buildup of fecal coliform in the waters.
- i. Litter and Trash
  - i. *Action: Sprinkle the colored sprinkles at various places around the map to illustrate litter. Litter can be carried into the water by wind or rain.*

5. Why are these pollutants harmful to our rivers and streams?
  - a. These pollutants affect Water Quality and Aquatic Life

- i. Fertilizer is a nutrient, it is food for plants – Fertilizers contain chemicals like nitrogen, phosphorous, and potassium that plants use to grow big. When these chemicals go into our lakes, they can also cause algae to grow. Remember, algae are plants that can use fertilizer to get bigger. Too much algae is a problem, though. When lots of algae die, they use up the oxygen in the water to decompose. This is a problem for fish because they need oxygen to breath. Too much algae at the surface of the water can also block sunlight from reaching other plant life at the bottom of lakes.
- ii. Pesticide is toxic. When pesticides enter our water bodies they can be transferred to organisms living in the water. For example, fish can absorb pesticides through their skin by swimming in the water. They also breathe in pesticides through their gills. Fish might also drink the pesticide-contaminated water or feed on other organisms that have eaten pesticides. Other animals eat fish, and thus the pesticide toxins travel up the food chain. When fish eat, drink or breathe pesticides, it can cause them to have trouble reproducing, to be more susceptible to diseases, and to have trouble escaping from predators.
- iii. Loose soil adds sediment to our water. Loose soil increases the cloudiness of the water, which increases the temperature, and decreases the amounts of oxygen in the water.
- iv. Animal waste and septic sewage adds harmful bacteria to the water. This can cause people and animals to become ill. Excess sewage in a body of water can even cause officials to close portions of a lake for swimming and recreation.
- v. Litter can injure people and animals and can even block storm drain pipes, which could lead to flooding.

6. What can we do?

- a. Ask students to brainstorm some things we can do to help prevent these pollutants from entering the rivers and streams. In the environmental field, we call them BMP's (Best Management Practices).
- b. Listed below are some things we can all do, you may want to mention a few that the students can relate to.
  - i. Household Activities
    - Do not litter (if you see litter, pick it up), dispose of waste in the trash
    - Do not pour anything down a storm drain (including grass clippings)

- Be a smart shopper; read labels and try to buy items that are least toxic
  - Dispose of chemicals properly
  - Pick up after pets
  - Maintain septic tanks
- ii. Lawns and Golf Courses
- Use fertilizers and pesticides properly and do not overuse
  - Try not to fertilize right before a heavy rain
  - Plant trees, shrubs, and vegetation. This helps slow the rain runoff and absorb some of the pollutants
  - Consider using organic fertilizers (manure or compost)
  - Do not allow soil, leaves, grass clippings, etc. to accumulate on the driveway or on the street (compost them)
- iii. Driveways/Parking Lots and Roads
- Keep cars tuned up to help prevent leaking lubricants( and reduce air pollution)
  - Anti-freeze is very toxic and has serious oxygen depleting characteristics. Motor oil can damage or kill underwater vegetation and aquatic life. Just one quart can contaminate 2 million gallons of drinking water.