

# **Water Pollution**

## Teacher Instructions

### **Synopsis:**

In this lesson students will explore the problem of water pollution by first polluting a water body. They will then construct filters to try and remove the pollution. They will also compare the success of their filters at removing one contaminant versus multiple contaminants.

### **Learning Goals:**

- Students will be able to describe how pollution enters a waterway and how this might affect aquatic life.
- Students will investigate the effectiveness of their filters at cleaning water with one contaminant versus many contaminants.

**Recommended Grades:** Adaptable to K - 8

### **Estimated Time:**

- Prep Time: 20 minutes
- Class Time: 40 minutes (50 minutes with 7th and 8th grade extension activity)

### **Key Concepts and Terms:**

Pollution: materials that enter the environment which can be damaging to natural ecosystems

Water filtration: The process of removing solid materials from water through filtration.

Water purification: The process ensuring that water is safe for human consumption by treating it with chemicals

Nonpoint source pollution: Pollution that enters water from a number of sources, such as farm fertilizers and roadway pollution

Point source pollution: Pollution that can be traced back to a specific source such as a particular farm or paper mill

### **Materials Needed per 20 students**

- 1 medium sized basins
- 1 brick
- Soap
- Vegetable oil
- Road salt
- 2 liters of water
- Sand
- 20 small funnels
- 40 coffee filters
- 20 rubber bands
- 40 small cotton balls
- 40 small plastic cups

- 6 small soda bottles
- Conductivity probe

**Estimated Cost:** Under \$30 without extension activity

## Lesson

### Stage 1: Hook

Ask students what they know about water pollution and what pollution might come from roads in the winter.

### Stage 2: Introduce Concepts

Introduce the vocabulary and concepts of the activity. Explain that in this activity the pollutants will be very concentrated. Ask students to think about the effect of pollutants on ecosystem interactions.

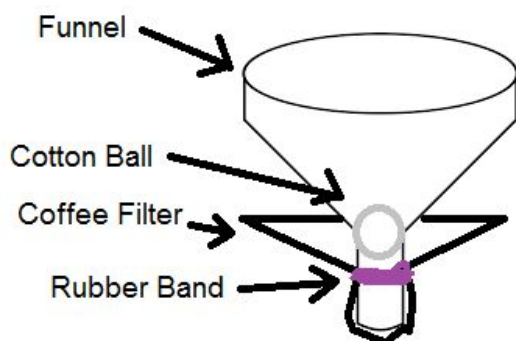
### Stage 3: Pollute the water

Invite a few student up to the front of the room to help pollute the water. Have them spread salt, sand, oil, and soap on the brick in a bucket or basin. The brick represents a road in this simulation. Have a few more student volunteers pour water over the brick to rinse the pollutants into the water. Invite the whole class to come up and look at the polluted water.

### Stage 4: Filtration

#### Part 1: Filtering one contaminant

1. Before the lesson mix up bottles of water contaminated with only one of the contaminants used in the pollution stage of the activity. You should have two small soda bottles of water with vegetable oil, sand, or soap. Make sure that the concentrations of contaminant in these bottles is similar to the concentration of each contaminant in the combined mixture.
2. Have each student construct their own filter
  - a. Fold the coffee filter in half
  - b. Rubber band the coffee filter around the end of the plastic funnel
  - c. Place a small cotton ball in the mouth of the funnel



3. Distribute to each group of students either soapy water, oily water, or sandy water. Before they test their filters have them use the worksheet to predict whether their filter will effectively remove the contaminants from the water.
4. Have the students filter their contaminated water. Have them mark down observations about whether their contaminant was removed by the filter.
5. Have the students compare with the rest of the class to see how the filters worked on the other contaminants

#### Part 2: Multiple Contaminants

1. Have students make fresh filters
2. On the worksheet students can predict whether it will be harder to effectively filter multiple pollutants
3. Have each student bring one small cup to the front of the room and collect some of the water that was contaminated in stage 3 of the lesson.
4. Students should filter this water and take observations. They can mark down their observations on part two of the worksheet.

#### Part 3: Conductivity - 7th and 8th grade extension

One of the contaminants added to the mixed water was salt. In this segment of the lesson, older students can observe this increased salinity with a conductivity meter.

1. Test the conductivity of the tap water being used in this activity
2. Test the conductivity of the mixed solution before it is filtered
3. Test the conductivity of the mixed solution after it is filtered.
4. Students can record the conductivity measurements in the second worksheet.
5. This part of the lesson demonstrates that the salt dissolves in the water and can't be removed through physical filtration.

#### Stage 6: Discussion

Discuss with the students what the takeaways of the lab were.

- What didn't the filter remove?
- What pollutants are there in real life that we didn't include?
- How can we best deal with water pollution?



Conductivity Data  
(Worksheet 2)

Conductivity of tap water	
Conductivity of mixture before filtering	
Conductivity after filtering	

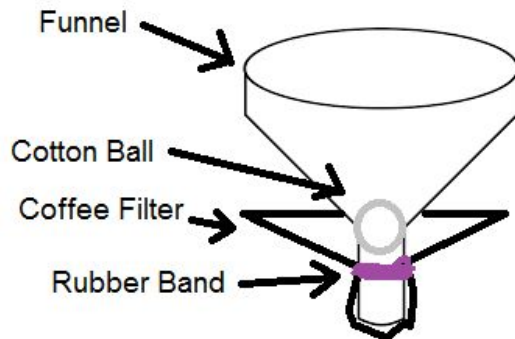
1. When was the conductivity highest?
  
2. Based on the conductivity, was the filter effective at removing salt from the solution? Support your answer by referring to the data.

## Water Pollution Student Instructions

### Activity 1:

#### Part one: Filtering one contaminant

1. Construct your filter as demonstrated by the teacher



2. Fill out question one on your worksheet
3. Pour water with only one contaminant through your filter, fill out question two on your worksheet
4. Compare with your peers to see if the filter worked on their contaminants, fill out question three on your worksheet.

#### Part two: Filtering many contaminants

1. Construct a fresh filter
2. Fill out question two on your worksheet
3. Collect a cup of the class contaminated water and filter it. Mark down your observation on the worksheet

### Activity 2: Conductivity

1. Test the conductivity of tap water
2. Test the conductivity of the water in your mixture after all the contaminants have been added
3. Test the conductivity of the mixture after it has been filtered
4. Record your data and draw conclusions about the effectiveness of the filters on dissolved contaminants.