

Who Polluted the Potomac?

Introduction:

As human populations have increased and land uses have changed, many of our rivers have become polluted. This example demonstrates that, just as we each contribute to the problem, we must also be part of the solution.

Materials:

1 clear gallon jar or bowl of water

1 black plastic film canister per student (often available for free from film processing stores)

Canister Labels (see Props)

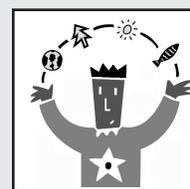
Canister Ingredients - All ingredients are safe for students to handle.

DRY INGREDIENTS

| Character | Ingredients |
|-------------------|------------------------------|
| Trees | Leaves (dry) |
| Construction Site | Soil (dry, clayish) |
| Person Fishing | Fishing line or dental floss |
| Farmers | Baking soda |
| Gardeners | Baking soda |
| Beach Party | Litter, assorted |
| Family Picnicking | Litter, assorted |

WET INGREDIENTS

| Character | Ingredients |
|------------------------|--|
| Barnyard | Water+ Instant Coffee granules |
| Washing the Family Car | Water+ 1 drop dishwashing soap |
| Antifreeze | Water+ 1 drop green food coloring |
| Mysterious Liquid | Water+ 1 drop red food coloring |
| Homeowner | Water+ 1 drop yellow food coloring+ Toilet paper |
| Coal Mine | Vinegar |
| Electric Power Plant | Vinegar |
| Commuters | Vinegar |
| Motorboats | Water+ 1 drop each red and green food coloring |



People, Resources
and the
Environment

Concept:

The histories of local rivers provide insight into the effect population growth has on a natural resource and the cumulative impact of individual actions.

Objectives:

Students will be able to:

- ◆ List the principal pollutants in our nation's rivers.
- ◆ Draw connections between individual actions and results at the community level.
- ◆ Develop strategies for minimizing and counteracting environmental problems.
- ◆ Identify local services associated with waste management.

Subjects:

Science, Social Studies, Language Arts, Civics, Economics, Family and Consumer Sciences, Geography, Health, History

Skills: Critical thinking, listening and observing, role playing, understanding cause and effect

Method:

Through an interactive story, students experience the pollution of a local river over time, and propose methods to protect the river from current and future pollution.



Procedure:

1. Prepare and label the film canisters as described in the materials section, enough for each student to have at least one canister. There are sixteen different canister labels, so for large classes, some students will have identical canisters.
2. Fill a clear jar or bowl halfway with water. Place the container in a location that can be seen by all students.
3. Distribute one canister to each student. Ask them to keep the canisters closed and upright, and not to reveal the identities of their character or contents.
4. Explain that you will tell a story about the river, and that each of them will play a part in the story.
5. Read the following story. Add emphasis as you read each bolded character name, and pause after each question to give the students time to think and respond.

Discussion Questions:

1. Who polluted the Potomac?

Everyone played a role.

2. What effect did the increasing population have on the health of the river? Can you think of any ways that population increases helped the river?

In this situation, population growth led to increases in pollution sources and decreases in open space and in available wetlands, which filter water. However, the increase in population also led to stronger environmental laws, more efficient uses of resources and public services like sewage treatment plants.

3. Think about the pollution contained in the canisters. Could something be done to prevent those types of materials from entering the water? How?

Possible answers might include: Implementing soil erosion control at the construction site, applying smokestack technology at the power plant, etc.

4. Challenge students to come up with ways to clean up the water in the jar; after all, everything has to go somewhere. Once this type of pollution has entered the river, how can we get it out? How can we clean up the river?

In the classroom, solids can be strained using a kitchen strainer or netting. Students may also find coffee filters or absorbent cotton helpful. In reality, humans clean up waterways using a variety of methods. Examples include using nets to retrieve large items, chemical treatment or introducing organisms that filter or digest pollutants from the water.

5. Do you think that it is easier to prevent pollution, or to clean it up later?
Have them explain their ideas.

Preventing pollution is known to be a more effective approach to ensuring clean waterways.

6. What could each of us do to help improve the health of our river by preventing some of this pollution?

Possible answers might include: biking or walking instead of driving, conserving water, picking up litter, pulling weeds instead of spraying them, etc.



Follow-up Activity:

Although this activity relates the story of the Potomac River and the history of Washington, DC, similar situations exist in many watersheds throughout the country. You may wish to use the story of the Potomac as an example for comparison with your local river, or you may want to adapt the story to special concerns within your local watershed. Students can search for local services on a city or county web site or you can ask a local government official to visit your class and discuss your region's facilities and programs for waste and pollution management.

This activity was adapted by permission from Hard Bargain Farm Environmental Center, Accokeek, MD.

Story: Who Polluted the Potomac?

For many thousands of years, people have lived on the banks of the Potomac River. They hunted in the forests, harvested foods from wetlands, and caught fish in the river.

Imagine that the jar of water in front of you was taken from the Potomac River by a Native American about 500 years ago.

- How does it look to you?
- Does this look like water that you might drink? swim in? eat fish from?

One of the first explorers to visit the river kept a journal of his discoveries. He wrote about the Native American villages, the tributaries of “sweet water,” and seeing so many fish that he and his crew tried to scoop them out with a frying pan.

Soon colonists began to arrive. They found fertile land for farming, forests teeming with wildlife, and a river that provided ample food and water. It was an outstanding environment for settlement, and the colonists prospered.

- How do you think the colonists used the river?

(Possible answers might include: bathing, food, drinking and cooking water, transportation, etc.)

- Do we use our rivers in the same way/s today? What are the similarities and differences in the way we use the river?

(Students may immediately recognize direct similarities like transportation and food, but may not realize that the water they use everyday also may come from a local waterway to their tap.)

The river has changed a lot since it was first explored. This is the story of those changes. Listen for the name of the character printed on your canister. When you hear your character named, open the canister, and dump its contents into the river.

Years went by, and occasional storms drenched the area. High winds whipped through the **trees** and blew leaves into the water.

Gradually, the city of Washington, DC, grew on the banks of the Potomac. Developers cleared wetlands and forests to build houses and businesses. Rains washed loose soil from **construction sites** into the river.

- Is this water safe to drink? (If the response is “no,” ask if the river had leaves or soil in it when explorers first drank from it).
- Would you swim in it? Is it safe for wildlife?

At first, the city was small. Upstream, **farmers** planted crops to feed the city’s growing population. Some of these crops grew right up against the banks of the river, and fertilizer washed off the land and into the water. Other farmers kept pigs and other animals in their **barnyards**. As rainwater drained out of the barnyard, it carried some of the manure into a little creek behind the farm. The creek flows into the river.

- Would you drink this water now? Would you swim in it? Go boating on it?
- Is it safe for wildlife?

As the city grew, more and more people began to move to the nearby countryside. These rural houses are not connected to the city sewer system. Waste water from these houses flows into septic tanks under the ground. One **homeowner** has not maintained the septic tank and poorly treated sewage seeped into the river.

To meet the electricity needs of the city, area officials decided that they would need to generate more power. Far upstream, a **coal mine** was dug. Rain water drained down into the mine shaft and soaked the piles of wastes and scraps from mining. This made the rainwater become acidic—sort of like a strong vinegar. Then the acid water trickled off the banks and back out into the river.



To burn the coal, and produce the power, an **electric power plant** was built along the river. Gasses coming out of the smokestacks combine with moisture in the air to form acids. The pollution falls back to earth as acid rain or smog.

- Would you drink this water now? Would you swim in it? Go boating?
- How could we determine if this water was safe for wildlife?

(Possible answers might include: noticing evidence of dead animals, testing for pH levels with litmus paper or chemical testing, viewing water samples under a microscope, performing organism counts, etc.)

Now, Washington, DC is one of the largest metropolitan areas in the country. Traffic congestion is a big problem for **commuters** who drive their cars to and from work. Car exhaust fumes (just like power plant fumes) cause acid rain. If a car is not kept in good repair it might also leak oil or other fluids, which will be washed off the pavement and into the river with the next rain.

And how do the residents of the city and its suburbs spend their time? In one neighborhood, lots of **gardeners** are out working in their yards. Many of them are using weed killers and insect sprays to keep the lawns pretty. The next rain will wash these poisons into a little creek nearby, and then into the river.

One father is teaching his daughter how to change the **antifreeze** in their truck. They pour out the used

antifreeze into the driveway. Antifreeze is sweet tasting and can poison animals that lick it. It can also get into the nearby creek and poison fish.

Nearby, a boy **washes the family car**. The soapy water rushes down the driveway into the storm drain; the storm drain empties into the river. The grease and grime on a car can contain asphalt from the roads, asbestos from the brakes, rubber particles from the tires, toxic metals, and rust. If the boy had gone to a local car wash, the water would have been treated before it returned to the river.

Next door, a family is cleaning out their garage. They find an old rusty can with a tattered skull and crossbones label still stuck on it. What could it be? It looks dangerous and they want to get rid of it before someone gets hurt. But how? Junior gets an idea: "Let's pour it down the drain out by the curb!" So the **mysterious liquid** goes down the storm drain. The poison is out of sight – but is headed for the river.

On nice days, many people head down to the river. Some zoom up and down the river in **motorboats** and don't notice that a little engine oil leaks into the water. A group of friends have spread blankets on the shore for a **beach party**. Lots of families are **picnicking** in the parks, too. Some of these people have left trash on the shore. With the next storm, that trash will wash into the river. On the shore a **person fishing** snags a hook on a log, and breaks off the nylon fishing line.