

# Pollution Limbo

**Adapted from:** “Reaching Your Limits” in *Project Wet: Curriculum & Activity Guide*. Bozeman: The Watercourse and the Council for Environmental Education, 1995.

**Grade Level:** Basic

**Duration:** 45 minutes

**Setting:** classroom

**Summary:** Students participate in a limbo game in which the limbo pole is raised or lowered depending on whether various actions improve or degrade water quality.

**Objectives:** Students will be able to explain the necessity of water quality standards and identify actions that help and hurt water quality.

**Vocabulary:** none

**Related Module Resources:**

- Module activities:
  - “Parts Per Million”
  - “Pollution PI”
- Additional Module Resources Fact Sheets:
  - [The ABC’s of Environmental Regulation: Water Pollution](#)
  - “Nitrate in Ecosystems and Drinking Water”
  - “Lead in Drinking Water”

**Materials (Included in Module):**

- Limbo cards (helpful and harmful actions cards) [Pollution Limbo Module Activity Envelope]
- Standards cards (raise, lower, same) [Pollution Limbo Module Activity Envelope]

**Additional Materials (NOT Included in Module):**

- Meter or yard stick(s)
- 1 full index card per student (cut in half to save time)
- Limbo music (optional)

**ACADEMIC STANDARDS:** (ENVIRONMENT AND ECOLOGY)

7<sup>th</sup> Grade

4.3.7.A Identify environmental health issues.

- Identify alternative products that can be used in life to reduce pollution.

4.3.7.B Identify how human actions affect the health of the environment.

- Identify land use practices and their relation to environmental health.
- Identify residential and industrial sources of pollution and their effects on environmental health.

10<sup>th</sup> Grade

4.3.10.A Describe environmental health issues.

- Identify the effects on human health of air, water and soil pollution and the possible economic costs to society.
- Explain the costs and benefits of cleaning up contaminants.

4.3.10.B Explain how multiple variables determine the effects of pollution on environmental health, natural processes and human practices.

- Explain how human practices affect the quality of the water and soil.

12<sup>th</sup> Grade

4.3.12.A Analyze the complexity of environmental health issues.

- Identify invisible pollutants and explain their effects on human health.

**BACKGROUND:**

You may have noticed in the last few years that your local water company (the ones that supplies your drinking water), has sent you an annual Water Quality Report. This reports the standards set by the Federal Environmental Protection Agency (EPA) and the Pennsylvania Department of Environmental Protection (DEP). It also reports how your water measures up. The established standards and the constant monitoring are attempts to avoid transmitting health problems via the community water supply. The taste and smell of the water are also factored in. (See the module activity, “Parts Per Million,” for additional information on water quality standards.)

Water treatment plants use several steps to fully clean drinking water. The water from local reservoirs, rivers, or aquifers is filtered to remove large debris and then the sediments are left to settle out. Finally measures are taken to kill the pathogens (disease-causing organisms) through disinfection by adding chlorine or radiation by using ultraviolet light.

How difficult it is to treat the water depends on how much pollution the water contains when it enters the treatment plant. Humans can add pollution by contributing to urban and agricultural runoff problems

or allowing industrial plant discharge to enter the waterways. Sometimes an area faces problems caused by the local geology. For instance, arsenic or lead may naturally occur in the surrounding rocks and the water is contaminated as it travels through them.

Whether the problem is caused by humans or not, water treatment plants strive to meet or exceed the standards. If the standards are not met, the plant will need to find a way to adjust their treatment methods or find a new source of unpolluted water. Often these solutions are costly and the added costs may be passed on to the consumers.

### **OVERVIEW:**

Students will play a Limbo game in which they examine various human actions and decide the effects of that action on water quality. If the action helps water quality, the limbo pole is raised; if it hurts water quality, the pole is lowered representing the extra effort needed to clean the water.

### **PROCEDURE:**

#### **Teacher Preparation:**

Contact the water company that supplies your school and /or community. Ask them to send you a classroom set of their latest water quality report.

***NOTE:** This activity should be preceded by the “Parts Per Million” module activity so that students have a basic understanding of water quality standards and concentrations.*

#### **Student Activity:**

1. Review the concepts of concentrations and parts per million (ppm). Use examples such as:
  - a) If you lined up 1 million white cars, the line would stretch across the U.S. Imagine five of those cars are blue. That would be 5 ppm.
  - b) Determine the concentration of blue jeans in the classroom. Count how many students are wearing jeans out of the total number of students. For instance, if six students out of 25 are wearing jeans, the concentration would be 6 parts per 25. What if there was a rule that limited the concentration of blue jeans in any classroom? How could that be enforced? Explain that federal and state agencies set limits on concentrations for contaminants in drinking water. Water companies that treat water need to meet these standards or make adjustments to their treatment process or supply in order to comply.
2. Pass out the Water Quality Reports from the local drinking water company. What is the source of water? In what units does the company measure some of the compounds? What are the standards for each? What are the actual detected levels? Note that the amounts are given in ppm or even ppb (parts per billion).
3. Why is water treated? Discuss health issues. Look at the report to see if any specific concerns are listed within it.

4. Why aren't all contaminants removed? Discuss the practicality and expense involved.
5. Give each student two cards. On one card they should write a human action or event that would help to improve water quality. On the other, they should write a human action or event that harms water quality. Collect the cards, shuffle them and turn them upside down. (You may want to read through them first and pull out repeats. You could avoid repeats by making a class list on the board and assigning each student actions to write on the cards. Erase the board before the next step.) NOTE: As an alternative to this step, or if the stack of cards needs supplemented, use the Limbo Cards provided with the module.
6. Explain the Limbo game: The meter stick represents the standard set by the Federal Environmental Protection Agency and Pennsylvania Department of Environmental Protection. (The stick will start at the average height of the students.) The first person in line will flip over the first card, read it aloud, and decide if the action improves the water quality or harms the water quality. If the action improves water quality, the stick will be raised three inches to represent the easier time the water company would have in treating the water. If the action read is harmful to water quality, the stick will be lowered three inches to represent the increased effort needed to clean the water. Each student will then follow the first and try to make it under the stick. Depending on the students' flexibility, teachers may want to set certain guidelines for what constitutes making it under and the consequences for not making it under. Consider allowing students to make it under using untraditional limbo moves (i.e., crawling or crabwalking) and instead of eliminating students that touch the stick or ground, have them become the stick holders or full-time card readers for a round.
7. The next time through have the second student in line read the card and make the decision. Allow everyone else to follow him/her under.
8. When students are unable to make it, explain that the water quality standard was not met because the water was too polluted. The water treatment system will have to be changed to improve the process or the water company will need to find a new unpolluted source.

**DISCUSSION:**

How did you feel when you didn't make it under the Limbo stick? *Answers will vary.*

What is one harmful action that you do regularly that is harmful to water quality? One helpful action? *Answers will vary.*

What is one action you do that is harmful to water quality and that you could stop? One helpful action you could start? *Answers will vary.*

What happens if a water treatment plant does not meet the federal and state standards? *The drinking water supply is contaminated with compounds that can cause health problems for people and waterborne pathogens can infect people.*

Give an example of a product harmful to water quality. Then give an example of an alternative product that accomplishes the same task but does so without harming water quality. *Instead of Drano, use baking soda and vinegar to unclog a drain. Use rechargeable batteries instead of disposable ones. Instead of ant killer, sprinkle chili powder or cream of tartar at their point of entry.*

Industries are often thought of as major contributors to pollution but people's homes may cause water pollution as well. Name some common ways people harm water quality in and around their homes. *Washing cars, pesticides and herbicides, over fertilizing, allowing erosion, littering, spilling used oil, not cleaning up pet waste, and using toxic chemicals instead of safer alternatives.*

Which pollutants discussed so far are invisible (or nearly so) and could cause contamination without people realizing it? *Fertilizers, pesticides and herbicides will be carried away in runoff and would probably not be seen. Many cleaning chemicals would also be dissolved in water.*

### **EVALUATION:**

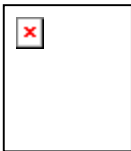
- As a quiz or Exit Ticket (needs to be handed to the teacher on the way out the door), have each student write down five actions they can personally engage in that help improve water quality and five that harm water quality.
- Send kids home for a search of possible sources of pollution. Ask them to find at least ten sources of pollution in and around their homes. Then tell them to list ways to fix the problems.

### **EXTENSIONS AND MODIFICATIONS:**

- Set up a row of limbo sticks. Each one represents a different compound's standard. You can use the ones listed on the Water Quality Report such as nitrate, barium, trihalomethanes, lead, copper, and sulfate. For each standard draw one of the Standards Cards which will tell you to raise or lower or keep the stick the same. Students must then consecutively limbo under each one of them. Doing successfully represents the complete treatment of one "batch" of water.
- Instead of using drinking water standards, do the above Extension activity with parameters measured during Creek Connections water monitoring. Each student then represents an aquatic organism; if they make it under each stick, they are able to survive in that habitat.
- Tour a water treatment plant or have a representative from the local water company talk to the students.

**NOTES (PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):**





## HANDOUT : POLLUTION LIMBO GAME PIECES

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<p><b>I throw my pop can in the recycling bin instead of out the car window and onto the street.</b></p>	<p><b>I raked leaves directly into the storm sewer at the edge of my lawn.</b></p>
<p><b>While walking my dog around the neighborhood, I use a pooper scooper to pick up after him.</b></p>	<p><b>I called ChemLawn to treat my lawn with herbicides to get rid of those dandelions.</b></p>
<p><b>I helped my class plant trees alongside a creek.</b></p>	<p><b>After painting my kitchen, I dumped the extra oil-based paint down the drain.</b></p>
<p><b>I participated in River Sweep. My family and I picked up litter along the local creek.</b></p>	<p><b>Instead of using the creekside trails, I created my own up and down the banks.</b></p>
<p><b>While brushing my teeth, I turn the water off until I need it again.</b></p>	<p><b>I rake up all the grass clippings after mowing and put them in a garbage bag for trash pick-up.</b></p>

<p><b>While camping, my family emptied the trailer's septic system at the campground sanitary station.</b></p>	<p><b>When I changed the oil in my car, I dumped the old oil on the edge of the driveway.</b></p>
<p><b>At the beginning of every boating season, we check to make sure our boat is not leaking gas or oil.</b></p>	<p><b>I added extra fertilizer to the tomatoes in my garden so they will grow faster this year.</b></p>
<p><b>I use fish hooks that dissolve so that lost hooks won't leave lead in the water.</b></p>	<p><b>I used Draino to dissolve clogs in my kitchen and bathroom sinks.</b></p>
<p><b>I vote for representatives and senators that support clean water laws.</b></p>	<p><b>I wash my car in the driveway with soapy water and rinse it with a hose.</b></p>
<p><b>When my car started leaking antifreeze, I took it to a mechanic to be fixed right away.</b></p>	<p><b>I rinsed my paintbrushes in the gutter.</b></p>

<p><b>I spread kitty litter on the oil stain in my driveway to soak up the oil. Then I swept it up and threw it away.</b></p>	<p><b>I clean my walkway and patio with a hose.</b></p>
<p><b>I purchased notebooks made of recycled paper even though they were a little more expensive than the usual ones.</b></p>	<p><b>When I put an addition on my house, a lot of the soil eroded away from the construction area.</b></p>
<p><b>I dropped off my old kitchen cleaners and old paint cans at the Community Toxic Roundup.</b></p>	<p><b>When I leave the room, I usually leave the lights on along with the TV since someone will probably be in soon to watch it.</b></p>
<p><b>I used baking soda and vinegar, followed by hot water to clear a clogged drain.</b></p>	<p><b>I like to drink cold water so I let the faucet run until the water is cold before filling up my glass.</b></p>
<p><b>I take my used motor oil to an oil recycling center.</b></p>	<p><b>I usually ask my friend for a ride to work even though it is a short walk.</b></p>

<b>I keep bird seed in the bird feeder to attract birds that eat insects.</b>	<b>When I am cold in the winter time, I turn up the thermostat.</b>
<b>I built a bat house to attract bats to my backyard so they will eat insects like mosquitoes.</b>	<b>It is easier for me to burn my newspapers than to bundle them for weekly recycling pick-up.</b>
<b>I pick up litter along the street as I walk to my bus stop.</b>	<b>I spread pesticides around my house to stop the ants from getting in.</b>
<b>When deciding between two similar products, I usually buy the one packaged in less wrapping.</b>	<b>I collect the used plastic bags from the grocery and recycle them on my next trip there.</b>
<b>I give my old toys to charity rather than throwing them in the garbage.</b>	<b>I take cloth bags to the grocery store so I do not have to use plastic bags to carry my groceries.</b>

**Raise**

**Same**

**Lower**

**Raise**

**Same**

**Lower**

