



## Teaching the Local Water Cycle

Teaching about the water cycle can be made more realistic and valuable for students by incorporating what they know about water—where it comes from, what happens to it after they use it, and what problems are associated with its use. These materials, part of a unit called "The Broken Water Cycle", will help teachers facilitate place-based learning about water for upper elementary and middle school students.

**[All Teaching the Local Water Cycle Unit & Lesson Plans » \(/educators/teaching-materials/teaching-local-water-cycle#node\\_curriculum\\_project\\_full\\_group\\_lesson\\_plans\)](/educators/teaching-materials/teaching-local-water-cycle#node_curriculum_project_full_group_lesson_plans)**

## Where does our water go? A wastewater travel log

### Objectives

Students trace water through the community, and understand that simple processes involving filtration, gravity and microbes clean wastewater

## Lesson Overview

Many people never stop to think about where the water that goes down the drain or flushes down the toilet goes. This lesson and field trip has been revealing for students and adults alike! It begins with a classroom activity to learn about water systems, pollution and water filtration. A field trip to the local wastewater treatment plant allows students to follow the treatment process.

### Time:

A 30 minute class session, a one hour field trip, and a 20 minute follow-up. The first class session should be several days or weeks before the field trip

**Setting:** Classroom and nearest wastewater treatment plant

### Materials

#### Pre field trip pollution/filtration investigation

- Large, clear container with a lid (used to put “dirty water”) containing several cups of clear water and 3-
- 4 inches of clean sand at the bottom
- One copy of the “who dirtied the water?” story (attached below)
- A few tablespoons of various types of fake pollution placed in small containers (can be altered):
- Lemon juice, small pieces of litter, vegetable oil, kool-aid, mud, salt, water with food coloring, clear water
- Plastic soda or water bottle for every 4-6 students, with bottom cut off and lid removed
- 2 large cotton balls or handful of cotton filling per bottle
- 1-2 cups of sand
- 1-2 cups of gravel
- A handful of small rocks
- Plastic cup for each group of 4-6 students
- Basin or bucket for the filtered water to drain into

#### For field trip to wastewater treatment plant:

- 1 “wastewater travel log” per student
- 1 “wastewater travel log for chaperones” for each chaperone
- Clipboard and pencil per student
- 4 Compound microscopes with slides and eye droppers (optional)

#### Story (optional):

- “Excuse me, is this the way to the drainpipe”? by Ellen Fry and Frank Aho. Download below.
- 4 copies of labels to accompany story (attached below)
- 8 envelopes, 4 labeled “town or city” and 4 labeled “the countryside” to accompany story
- Bottle of bottled water and a bottle (identical to the first) of the school’s tap water
- A small cup or glass for each student

## Procedure

### Setting up the Lesson

1. Contact your local wastewater treatment plant and ask for a tour. In our experience, wastewater treatment plants have been very welcoming to field trips, and have not charged. If it is possible to walk to the treatment plant from the school, even better.

2. Visit the treatment plant and adapt the attached travel log as necessary.
3. Ask the staff at the treatment plant if they are willing to put a sample of water from the aerobic pool under a compound microscope for students. This is the pool that contains microorganisms that eat the solid waste, and it is fascinating to see them "chomping away" under a microscope!
4. Prepare the small containers of fake pollution, adjusting the materials and story so that it is most suitable to your community. The attached story was adapted from "Who Dirtied the Water?", Water Resources of the Catskills, Module 1 of the Catskills: A Sense of Place.
5. Print one copy of the "Excuse me, is this the way to the drainpipe"? story by Ellen Fry and Frank Aho, and print the attached labels and prepare labeled envelopes.
6. Prepare the materials for the model bottle filters, the student will build the models themselves them.

## **Lesson**

### **Make dirty water**

1. Create student groups that represent each character in the Who Dirtied the Water story. Stand in the front of the room with the large clear container half full with clear water and a few inches of sand. Explain that this represents water from a local stream, including the water in and below the stream bed. Now, call up one group at a time and have one student read their paragraph, and another pour the pollution in the stream sample. Continue until the stream sample is completely polluted. Be sure to make the point that while we can see some of the pollutants, we can't see them all. In reality pollution is rarely visible. Place the closed container in a visible place in the classroom. You can either go directly to the filtering activity, or have the sample sit for several days, weeks or months! The sample will likely change and may become quite smelly, all the better for elementary school students!

### **Before leaving for the field trip, try filtering the dirty water**

1. We implemented this activity after realizing that the first group to visit the wastewater treatment plant did not understand the idea of filtering, which is an important last step in treating wastewater. Ask the students what they know about filters. Many may only be able to relate to a coffee filter that their parents might use at home. Tell that we are going to open up the dirty water and try to filter it. Ask, "Do you think this will get the pollution out"? Explain that some pollution can be filtered out, but some cannot. Give them the materials they need to build a filter and ask how they would construct it.
2. After they have built their filter give them some polluted water and ask them to filter a small amount at a time and write down what the filtered water looks and smells like.
3. Ask them what this polluted water represents, and how polluted stream water might be similar and different to wastewater. A class list of similarities and differences may be helpful. While wastewater may have pollution in it, that would mainly be pollution that is put down a drain or toilet. Wastewater is mainly human waste, soap and other cleansers.

### **Field trip to the wastewater treatment plant**

1. Before leaving give turn on water in a classroom sink or water fountain. Tell them that the class

will be following the journey of that water. Give students a travel log and have them fill out the first question.

2. If the class is walking to the plant, have them count the number of manholes they see along the way. Explain that these manholes sit above the sewage pipes, and are used to repair the pipes.
3. When they arrive to the plant they should begin the tour at the first stop in the journey of water and follow the water as it gets cleaner. In each box they should draw and describe each stop along the wastewater treatment journey. The chaperone copy has answers that will allow them to help the students.
4. If possible, view and draw the microbes from the aeration pool before leaving the plant.
5. Now that they understand what happens to water that leaves their home and school, ask what happens to water before it arrives to the tap? Where does it come from? Is it treated? The staff of the wastewater treatment plant will be able to answer those questions for the students.
6. If the class is walking, they can count the small plates that cover the valves which connect buildings to municipal drinking water. These are often the size of a jam jar lid.
7. If possible, contact the staff at the drinking water treatment plant and have a similar field trip.

### “Excuse me, is this the way to the drainpipe?”

1. Read this story upon returning from the field trip. As you are reading, relate back to what they saw at the treatment plant.
2. When completed, give each group of students one copy of the labels, one envelope that reads “town or city” and one envelope that reads “countryside”. Ask them to place the correct labels in the correct envelopes. This can be used on an individual basis, and also can be used as an assessment.

### Lesson Resources

[dirty\\_water\\_story.pdf](http://www.caryinstitute.org/sites/default/files/public/downloads/lesson-plans/dirty_water_story.pdf) ([http://www.caryinstitute.org/sites/default/files/public/downloads/lesson-plans/dirty\\_water\\_story.pdf](http://www.caryinstitute.org/sites/default/files/public/downloads/lesson-plans/dirty_water_story.pdf)) (pdf, 46 KB)

[wastewater\\_travel\\_log.pdf](http://www.caryinstitute.org/sites/default/files/public/downloads/lesson-plans/wastewater_travel_log.pdf) ([http://www.caryinstitute.org/sites/default/files/public/downloads/lesson-plans/wastewater\\_travel\\_log.pdf](http://www.caryinstitute.org/sites/default/files/public/downloads/lesson-plans/wastewater_travel_log.pdf)) (pdf, 120 KB)

[drainpipe\\_story.pdf](http://www.caryinstitute.org/sites/default/files/public/downloads/lesson-plans/drainpipe_story.pdf) ([http://www.caryinstitute.org/sites/default/files/public/downloads/lesson-plans/drainpipe\\_story.pdf](http://www.caryinstitute.org/sites/default/files/public/downloads/lesson-plans/drainpipe_story.pdf)) (pdf, 206 KB)

[Labels for drainpipe story.pdf](http://www.caryinstitute.org/sites/default/files/public/downloads/lesson-plans/Labels_for_drainpipe_story.pdf) ([http://www.caryinstitute.org/sites/default/files/public/downloads/lesson-plans/Labels\\_for\\_drainpipe\\_story.pdf](http://www.caryinstitute.org/sites/default/files/public/downloads/lesson-plans/Labels_for_drainpipe_story.pdf)) (pdf, 9 KB)

### NYS Standards

MST 1 - Mathematical analysis, scientific inquiry, and engineering design

MST 4- Physical setting, living environment and nature of science

MST 6- Interconnectedness of mathematics, science, and technology (modeling, systems, scale, change, equilibrium, optimization)

ELA 1- Language to collect and interpret information and understand generalizations

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