



RESOURCES AND THE ENVIRONMENT

# River Ecology

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from *Resources and the Environment Teacher's Guide* and for *Tillena Lou's Big Adventure*.

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This activity is part of the Resources and the Environment teaching unit. The *teacher's guide* may be used alone or with integrated unit components. The Resources unit is comprised of the guide, *Tillena Lou's Big Adventure* (storybook), and two supplements: *The Reading Link* and *The Math Link*. For more information on this and other educational programs, contact the Center for Educational Outreach at 713-798-8200, 800-798-8244, or visit <http://www.bioedonline.org/>

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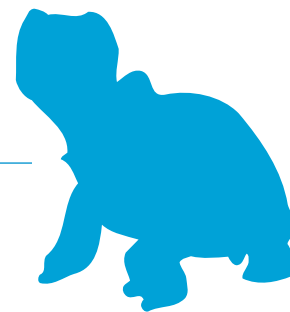
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# River Ecology

Students simulate activities that can affect a water source, like a river as it flows from one place to another within a community.



We usually think of water as a liquid. However, if this important resource were not continually cycling among its three states, the world's stores of freshwater quickly would become depleted or too polluted to use. Fortunately, our supply of fresh water continually is collected, purified, and redistributed as part of the water cycle.

Each of us uses water in many ways each day. Some of these uses are essential for life. For example, it is recommended that we drink 8 to 10 glasses of water each day to stay healthy. About half the drinking water used in the US comes from lakes and rivers. The other half comes from springs and wells that reach water located deep underground. Because water sources are connected, pollutants travel from one part of the system to another. Much of our water has to be treated to make it safe to drink. Chlorine, for example, is added to water in most places to kill germs that make us sick. Sometimes, without knowing it, we do things that harm our water supplies. When we use too much fertilizer or pesticide on our lawns, gardens or fields, some of it can end up being washed into rivers and lakes. Once there, it can harm fish and other animals. It also can make water unsafe for drinking. Harmful chemicals can seep deep into the ground and pollute water sources there. Farmers use water to produce crops and raise livestock. Factories need water to make many products. Water is used in power plants that make electricity. Since we use water in many ways, we need to take care of our water sources.

Because water is essential for our bodies and also many of our daily activities, it's important that the water we use is not contaminated with materials that might harm our health. The Safe Drinking Water Act of 1974 required the Environmental Protection Agency (EPA) to establish national standards for drinking water quality. The EPA sets maximum allowable concentration levels for pollutants that can harm humans.

Wastewater treatments can involve up to three levels of purification. First, water is filtered mechanically to remove debris and large particles. Next, biological wastes are removed by mixing the waste with bacteria and other microbes, which use the waste as food. Solids that settle out during this process are removed as sludge. Additional advanced water treatments lower the quantities of specific pollutants still left in water through a variety of means. Finally, wastewater is disinfected, usually with chlorine, to remove water coloration and to kill any remaining disease-carrying bacteria and some viruses.

## SETUP

One or two days before conducting this activity, ask students to find

## CONCEPTS

- Water circulates continually through the water cycle
- Water is used in many ways each day.
- Because of the water cycle, polluted water can move from one water source to another.
- It often is possible to prevent pollution of water sources.
- Organisms cause change in the environment.
- All organisms depend on their environment.

## SKILLS

- Observing
- Predicting
- Generalizing
- Following directions
- Sequencing
- Communicating

## TIME

**Setup:** 15 minutes each day

**Class:** 30 minutes first day, 30 minutes second day

## MATERIALS (see Setup)

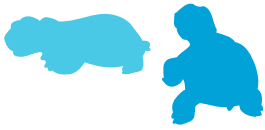
### Teacher Materials

- 24 portion-sized cups
- 6 clear plastic bags, qt-size
- 5 medium-sized tubs or plastic containers
- 5 rolls of clear tape (or share)
- 4 bottles of food coloring, different colors
- 4 small toy cars
- 2 large, clear tubs or containers
- 2 tbs cooking oil
- 1/2 cup of soil
- Bar of mild soap (small)
- Blue or white plastic trash bags, about 6 meters, unseparated
- Paper towels
- Pictures of water sources, and animals that live in or near a river
- Water

### Materials per Student

- Copy of "My Science Journal," page





## OPTIONAL DEMONSTRATION

Demonstrate for the whole class (or allow students to work in groups) an activity that attempts to clean the pollutants out of the water from the polluted river.

1. Hold up a clear plastic cup of the water from the river container. Ask, *Would you want to drink this water? Why or why not? What did we put in the water in our previous activity?* Make sure the students name all of the contaminants in the water. Ask, *How do you think we could clean this water? Record their ideas on the board.*
2. Explain that our drinking water usually goes through a filtering process so that it is safe for us to use.
3. To create a water filter, cut a 20-oz plastic soft drink bottle into two parts, 1/3 of the way from the top of the bottle. Insert the top part, with its opening down in the bottom part (no cap)
4. Place 1 coffee filter, 1 square of cheesecloth, and 1/4 cup aquarium charcoal into the funnel-like section.
5. Carefully and slowly pour a dirty water sample through the filter. Ask, *What do you notice about the water going into the filter? What does the filter look like now that the dirty water has gone through it? Would you like to drink this water now? Why or why not? Is it safe?* Point out that processed wastewater must pass EPA standards before it is safe to drink.
6. Use a home filtering system (e.g., "Brita®") to filter the dirty water and compare it to the filtered water of the class experiment.

(or draw and color) pictures of water sources and animals living in or near a river.

On the day you conduct this activity, unroll, but do not separate, about 6 meters of blue or white plastic trash bags. The connected trash bags will model a river.

One large tub will be used to collect water from students. The other large tub will model the river's end (a lake).

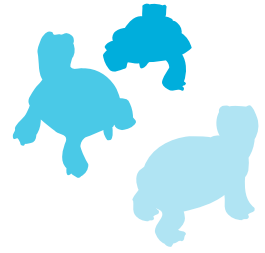
The class will be divided into five groups. Make a large name card for each group (see list below) and prepare props as follows.

Fill each of the 5 medium-sized tubs with about 6 cm of water. Fill 20 portion-sized cups half full of water. Provide Groups 1–4 with four cups of plain water.

1. **Children at Home** – Place the bar of soap in a plastic bag (students will share) and provide paper towels to dry their hands.
2. **Car Wash** – Rinse four toy cars in water, then roll them in dirt. Shake off the dirt. Place the cars in a plastic bag.
3. **Auto Shop** – Measure 1/2 tsp of cooking oil into four portion-sized cups.
4. **Farm** – Place 1/8 cup of the soil into each of the 4 plastic bags.
5. **Chemical Plant** – Take 4 of the portion-sized cups of water and add food coloring in order to make one cup of red water, one cup of blue, one cup of yellow, and one cup of green.

## PROCEDURE

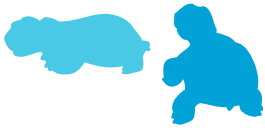
1. Gather the students in front of you in a semi-circle. Ask them to share the pictures of water sources they brought to class. Connect their answers to the story, *Tillena Lou's Big Adventure*. Ask, *Does Tillena Lou have a source of water nearby?* Place the pictures on a bulletin board.
2. Review the water cycle with the students using the illustration from the activity, "Making a Water Cycle."
3. Tell students they will investigate how different activities in a community might affect a river and a lake. Explain that each group will be located at one of five different places along a "river," and that you will collect their "used" water in a bucket, as if they were pouring it into the river.
4. Divide the students into five groups and seat each group throughout the room where the river will flow, in the order as listed above. Place the "Children at Home" near the source of the river. Begin to weave the "river" through the classroom, past each group, until it ends at the large plastic container that represents a lake.
5. Give the five groups their props, as described in Setup.
6. Visit the "Children at Home." Explain that they wash their hands



before eating, brush their teeth, take baths, wash clothes, etc. Have each student use the soap and small cups of water to wash his/her hands in the group's container of water. Tell students your tub represents the river. Have students pour their container of water into the tub. Ask, *What has just happened to the water used by these people?* Explain that usually our "dirty" household-use water is sent through a sewer system and purified, but if it were not, it could end up in the water source, i.e., the river.

7. Proceed to the "Car Wash." Have students use their cups of water to help clean the dirty cars in their container of water, then pour the dirty water into your tub. Ask, *What just happened to the water used by these people? Will it go somewhere else on the river?* Explain that most car wash facilities filter their wastewater and route it to water treatment plants.
8. Go to the "Auto Shop." Explain that the auto shop changed the oil in several vehicles and let oil spill on the floor. Then they washed the floor, letting the oily water flow into the street gutter. Have students pour the oil in their large containers of water, then pour it into your tub. Ask, *What happened to the oil? Will it move with the river?*
9. Visit the "Farm." Explain that the farmers often spread fertilizer on the soil to grow more crops. When they water their fields, some of the fertilizer and soil erodes or is washed into the river. Have students add their soil and cups of water to their containers of water, then pour the dirty water into your tub. Ask, *Where did some of the fertilizer and soil go? Will it stay in the river? Is it good for the river?*
10. Finally, go to the "Chemical Plant." Explain that the plant where they work had an accidental chemical spill. Have students add their colored water to their container of water, then empty it into your tub. Ask, *What will happen to the chemical waste now? Is it good for the river water?* Clarify for students that modern chemical plants have safeguards in place to prevent contamination in the event of a chemical spill. If the safeguards were not in place, the chemicals could end up in the water supply.
11. Follow the river to the end—to the large plastic tub. Explain that the river has ended in this lake. Pour the contents of your bucket into the lake. Have students come up to the "lake" to look at its water. Ask, *What do you see? Can you see evidence of what you added to the river from your community?* Give students an opportunity to respond before explaining that pollution comes from many sources and that everyone can help to prevent it. Ask, *Would you like to drink this water? What would happen to the animals living in the river if the water was polluted?*
12. Ask the class, *How do we use water every day?* Make sure students





## EXTENSION

Ask students to come up with ideas and ways that they can help keep the natural resource, water, safe.

understand that water is needed for numerous reasons (for personal use by individuals and for commercial uses, too), that it originally comes from lakes, rivers, etc., and that it generally is sent to purification plants and on through pipelines to us. Emphasize the importance of not polluting the water sources in our communities.

13. Have students record the various sources of pollution they observed in their classroom river by drawing or writing on a “My Science Journal” page.