



## 7. What Can Happen to Water in a Human Environment?

### 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.

### Overview

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

### Science and Math Skills

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

### Standards

- Organisms can survive only in environments where their needs can be met.
- All organisms cause change in their environments. Some changes are detrimental, others are beneficial.

### Time

Setup: 20 minutes

Class: 60-90 minutes

### Materials

Have students bring pictures of water sources (lakes, rivers, faucets, oceans, etc.) to class.

Per class:

- Enough blue or white plastic (trash) bags, not separated, bulletin board paper or blue plastic wrap (approximately 6 meters) to create a "river" running through the classroom
- River inhabitants
- 5 plastic shoe box containers or small buckets, 1 per group (1-2 cup size)
- 1 large bucket or pitcher for teacher to collect water from each river site (1 - 2 gallons)
- 1 large plastic bucket or tub for final water source, the "lake" (3 - 4 gallons)
- 1 small bar of mild soap
- 4 small cups (bathroom size) with 1 tablespoon of sand (to represent fertilizer used in farming) in each
- 4 small, dirty toy cars
- 4 cups (bathroom size) of water with food coloring added
- 4 small cups (bathroom size), each containing about 1/2 oz. of cooking oil
- Paper towels
- Students' science journals
- Pollutant sites along the river signs (see Setup).
- Water cycle transparency (see attached PDF in this document)

- copy of *Water Recycles* from [www.kidzone.ws/](http://www.kidzone.ws/)
- *Tillena's Big Adventure* story (a PDF of the story is attached in this document)

### Setup

One or two days before conducting this activity, ask students to cut out pictures of water and water sources from magazines or newspapers and bring the pictures or photographs to class.

Before conducting the activity, fill each of the five plastic containers with about 2 inches of water. Have students conduct this activity in groups of 4 students.

Prepare a transparency of the Water Cycle PDF. Copy each of the river site signs for each group.

### Safety

1. Follow all district and school laboratory safety procedures.
2. Use caution with food coloring. It can stain clothing and other materials.
3. Be aware of any skin allergies children may have to soap.
4. It is good laboratory practice to have students wash hands before and after laboratory investigations

### Background

We usually think of water as a liquid. However, if this important resource were not continually cycling among its three states (liquid, solid, gas), 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 through 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 United States 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.

We use water in many ways, and not just in our homes. Farmers use water to produce crops and raise livestock. Many factories need water to make products. Water also is used in power plants that make electricity.

Since water is essential for our bodies and many of our daily activities, we need to take care of our water sources to be sure they are not contaminated with materials that could 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. Since 1974, the law has been amended in several ways to address new issues.

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. A variety of additional water treatments lower the quantities of specific pollutants still left in water. Finally, water is disinfected, usually with chlorine, to remove coloration and to kill disease-carrying bacteria and some viruses. For additional activities in this series, see K-5 Teacher Resources at <http://www.bioedonline.org/k%2D5/>.

### Procedure

1. Gather the students in front of you in a semi-circle. Ask them to share pictures of water sources they have brought to class. Connect their answers to the story *Tillena's Big Adventure* (a PDF of the story is attached in this document). 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 water cycle transparency.
3. Explain that students will investigate how different water 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 the "river" and that you will collect their "used" water in a bucket as if they were pouring it into the river.
4. Divide students into five groups and seat each group along the proposed river route.
5. Choose one group to be near the source of the river and begin to weave the river through the classroom, past each group, until it ends at the larger plastic container, which represents the lake.
6. Give each group one of the following props and the river site sign that matches their position on the river.
  - Children at home: bar of soap, small container of water, paper towels
  - Car wash workers: dirty toy cars, small container of water
  - Auto repair shop: small cup of oil, small container of water
  - Farmers on farm: fertilized dirt (represented by sand in the dirt), small container of water
  - Chemical factory: cup of food colored water, small container of water
7. Visit the first group. Explain that they are children at home who wash their hands before eating, brush their teeth, take baths, wash clothes, etc. Ask each child to wash his/her hands in the container, using the soap. Tell the students your bucket represents the river. Pour the dirty water from the students' container into your bucket. 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).
8. Proceed to the next place—group of students—on the river. Ask this group to swish their dirty cars in the container of water and then pour their dirty water into the river (your bucket). Ask, *What has happened to the water used by these*

people? Will it go somewhere else along the river?

9. Follow the river to the next place/group of students. Explain that the car repair shop has changed the oil in several vehicles and let the oil spill onto their floor. Then they washed down their repair shop floor and let the oily water flow into the street gutter. Ask students at this spot to pour the oil into their water and then pour their dirty water into the river (your bucket). Ask, *What has happened to the oil? Will it move with the river?*
10. Visit the next place on the river/group of students. Explain that these students own a farm on which they grow crops that they have fertilized. When they water their fields, some of the fertilizer and even the soil itself is eroded or washed into the river. Ask students to sprinkle a bit of their fertilized soil (sand) into their plastic container and then to pour their dirty water into your bucket (the river). Ask, *Where did some of the fertilizer and soil go? Will it stay in the river? Is it good for the river?*
11. Proceed to the next spot on the river. Explain that the chemical plant located here has had an accidental spill of some of its product. Ask the students to pour their colored water into their plastic container and then to pour that water into the river (your bucket). Ask, *What will happen to the chemical waste now? Is it good for the river water?*
12. Now follow the river to the end—to the larger plastic tub. Explain that the river ends in this “lake”. Pour the contents of your bucket into the lake. Ask students to come up to the lake to look at the 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?*

13. Ask, *How do we use water every day?* Make sure students 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.
14. Ask the students to record the various sources of pollution they observed in their classroom river by drawing or writing in their science journals.
15. During this activity, the class has created polluted water. Ask students, *Would you want to drink this water? Why or why not? What did we put in the water? How can we clean up the lake water? Is it safe to pour into the drain or sewer system? Would it be safe to pour on the ground?* Discuss ideas that students present. You may wish to create a list of possible solutions on the chalkboard.
16. Explain that our drinking water usually goes through a filtering process that makes the water safe for us to use.
17. Create a water filter: cut a 20-ounce plastic soda bottle 2/3 of the way up toward the spout and insert the top 1/3, facing down, in the bottom of the bottle. In this funnel-like section, place 1 coffee

filter, 1 square of cheesecloth, and 1/4 cup aquarium charcoal.

18. Carefully and slowly pour the dirty water sample through the filter. Ask students, *What do you notice about the water coming out of the filter, compared to the water going in? Ask, What does the filter look like, now that the dirty water has gone through it?*
19. Ask, *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.

### **Extensions**

- Ask students to come up with ways that they can help protect the natural resource, water.
- Use a home filtering system (e.g., "Brita") to filter the dirty water and compare this water to that filtered by the "homemade" filter used in the class experiment.



# Children at Home



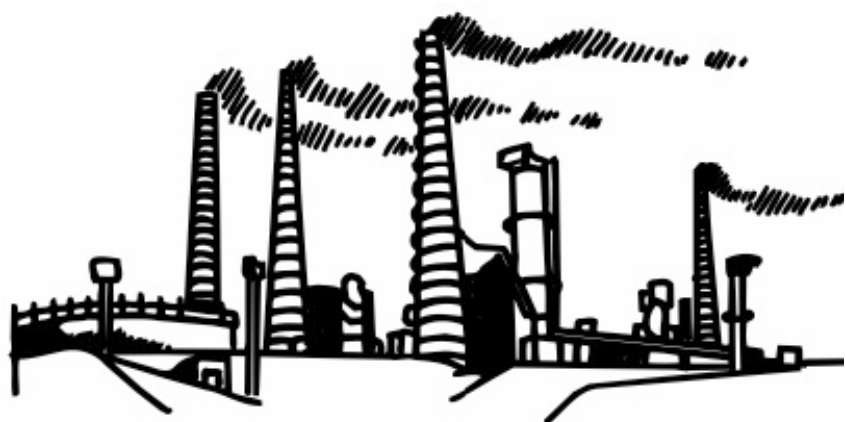
# Car Wash Workers

# Auto Repair Shop





# Farmers on a Farm



# Chemical Factory

# Tillena's Big Adventure

By Barbara Tharp and Paula Cutler

Draft text for story to accompany  
My World and Me unit:  
***RESOURCES AND THE ENVIRONMENT***



Tillena Lou's a turtle,  
As curious as can be!  
She likes to look around  
Just to see what she can see.

Her mother says it's not safe  
To stray too far from home,  
But often curiosity  
Just makes her want to roam.

Sunning on her special log,  
Ready for another day,  
Tillena needs her breakfast,  
Then she will be on her way.

Soon she spies a water snail,  
The kind she likes to eat,  
And with a crunch and a munch,  
She has her delicious treat.

Now she holds her breath and dives,  
Underwater to a spot  
Where she finds some flower roots  
That are tangled in a knot.

They are from water lilies,  
Tasty to Tillena Lou!  
They're another favorite food,  
And her brothers like them, too!

A very full Tillena  
Climbs up the bank of grass,  
Out of the clear, fresh water  
Onto a smooth dirt path;

Tillena Lou's a turtle,  
As curious as can be!  
She likes to look around  
Just to see what she can see.

On the path in from of her  
There are many wondrous things:  
Ants and worms and butterflies  
With fluttering, outstretched wings.

Above the little turtle  
Is a blue and cloudless sky.  
The birds are singing in the trees-  
And squirrels nibble nuts nearby.

This is where they all belong-  
A natural place to be.  
Here they have all that they need  
To live most comfortably.

The tiny, little tutele  
Has wandered far from home;  
It's just curiosity  
That makes her want to roam!

Tillena Lou's a turtle,  
As curious as can be!  
She likes to look around  
Just to see what she can see.  
She is lost and so she looks

To her left and to her right.  
Then she sees in front of her  
A really scary sight!

Two giant feet block her path,  
They are standing in the leaves.  
Tillena tries to get away.  
As she ducks into the weeds.

A hand reaches down and grabs  
A startled Tillena Lou.  
So she pops inside her shell,  
Because that's what turtles do.

Stuffed deep into a pocket  
Where it's dark and warm inside,  
The tiny, tucked-in turtle  
Takes a bumpy, bouncy ride.

The ride stops and Tillena,  
Feels she is all alone,  
So she crawl from the pocket  
To a place unlike her home.

The puzzled little turtle  
Stands near a big white box.  
It makes a loud sloshing noise  
As it wildly shakes and rocks.

This box is not at all like  
Anything she's has EVER seen!  
No friend at home on the lake  
Has a strange swishing machine.

**Tillena Lou's a turtle,  
As curious as can be!  
She likes to look around  
Just to see what she can see.**

Is this a place for PEOPLE?  
She just has to find out more.  
Cautiously, she backs away  
And heads through an open door.

Tillena goes exploring  
And she very quickly finds  
A room that filled with smells  
Of many different kinds.

From her spot beside a chair  
Tillena can clearly see  
A PERSON at the table  
Eating apples voraciously.

Now another big white box  
Suddenly is opened up—  
Cool air whooshes out from it  
As someone fills up a cup!

Now everywhere she turns,  
She sees something that is new!  
This is a real adventure  
For little Tillena Lou.

The trees are in clay buckets  
And fish in a big glass bowl.  
Water's inside a place to sit  
And it flushes down a hole!

There is a big box that talks  
With moving pictures inside,  
And small switches turn on lights  
When it is dark outside.

**Tillena Lou's a turtle,  
As curious as can be!  
She likes to look around  
Just to see what she can see**

There is no sky above her.  
No grass between her toes;  
No log or clear blue lake,  
Not a single thing she knows.

Tillena wants to leave now—  
She has seen enough today.  
This is not a place for her  
To live the turtle way.

Suddenly, four spotted legs  
Come scampering through the door:  
This must be her chance to leave,  
So she scoots across the floor!

No one seems to notice,  
Hasty Tillena Lou  
As she lands upon the porch,  
Then, scurries off there, too.

With no stops to look around  
She sets off across the lawn.  
On the way there's much to see,  
But she just hurries on.

Now at home beside the lake  
She's as happy as can be.  
She is back where she belongs,  
Snuggled underneath her tree.

**Tillena Lou's a turtle  
As curious as can be.  
She still wants to look around  
But much more cautiously!**



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