

Grade 5 Activity



Activity 5.2 Alice in Waterland

Take a trip through your water faucet and learn more about your city's water system. Where does water come from? Where does it go?

Background

Water use is such an automatic and habitual daily activity that we often don't understand the consequences. Seldom do we connect the water that comes out of the faucet to its sources in the natural world.

A model that traces the dynamics of water is called the water cycle or the hydrologic cycle. The water cycle follows the path of water from when it falls in the form of rain or other precipitation on a *watershed* (the land area from which surface runoff drains into a stream channel, lake, ocean, or other body of water); to its travel as runoff that flows into streams, groundwater, lakes, reservoirs, estuaries and oceans; to its eventual return to the atmosphere through evaporation; to its formation into clouds; to its condensation in the form of precipitation as it falls on a watershed. The great storehouses of water—glaciers and icecaps—are also part of this cycle. All forms of life on Earth are dependent upon and affected by this cyclical journey of water.

In between water's source and the sea, we divert water from its natural course for our uses. About 8 percent of total water use in the U.S. is for domestic use, 33 percent is for agricultural purposes, and 59 percent is for industrial/commercial uses (U.S. Geologic Circular 1001). Each time we draw water from its natural setting or modify the natural journey of water, we are likely to have an impact on wildlife and habitats. For example, dams flood river and stream valleys, and draining wetlands removes water from natural wildlife nurseries.

Once water is diverted from its natural path and is used by humans, it is often contaminated or polluted. The effects of this polluted water may be devastating: salinity from irrigation damages soil's productivity, runoff containing agricultural fertilizers and pesticides impairs lake and river habitats, and toxic chemicals can poison human and wildlife water supplies. Contamination can enter the water cycle with damaging consequences for people, wildlife, and the environment.

Humans have choices in how we use and how we treat water. We can make decisions to use water respectfully and carefully, and conserve water as a part of our daily lifestyle. Water conservation reduces or prevents destruction of natural habitats by lessening the need for dams and other interventions. It also reduces the depletion of underground water stores which supply water for riparian and other habitats. Water conservation may also decrease wastewater discharges into sensitive environments such as estuaries.

In addition to conservation, we can also pay attention to what we put into water and the water cycle—being careful with potential toxins like pesticides, detergents, fertilizers, motor oils, aerosols, cleaning fluids

Science skills

- Visualizing
- Estimating
- Extrapolating
- Analyzing

Concepts

- Water is a precious resource.
- How people use water may affect terrestrial and aquatic wildlife.
- In coastal towns of California, treated water from household waste often goes into the ocean, and untreated runoff goes down storm drains, which can lead to the ocean as well.
- Becoming aware of the many ways in which water is used will help students adopt a wise water use ethic.

California Science Content Standards

Earth Sciences

3. Water on Earth moves between the oceans and land through the processes of evaporation and condensation. As a basis for understanding this concept, student will know:

3.d. The amount of fresh water located in rivers, lakes, underground sources, and glaciers is limited and that its availability can be extended by recycling and decreasing the use of water.

3.e. Students know the origin of the water used by their local communities.



California Mathematics Content Standards

Statistics, Data Analysis, and Probability

1.2. Organize and display single-variable data in appropriate graphs and representations (e.g., histogram, circle graphs) and explain which types of graphs are appropriate for various data sets.

Objectives

- Students will trace their domestic water to its source prior to human use and to its destination after use.
- Students will identify potential effects from human water use on terrestrial and aquatic wildlife.
- Students will identify, develop, and practice responsible water conservation behaviors.

Time to complete

Two 45-minute sessions, plus time to draw murals. Two-week homework.

Mode of instruction

May be conducted indoors or outdoors. Teacher reads text for visualization exercise, followed by whole class discussion. Students create a mural based on visualization. Students keep track of water use at home, create a chart with total use of water by the class's homes. Students create a list of water conservation practices.

Materials

1. "Water Use Worksheet," one for each student (double-sided, cut in half, week one and week two will go home separately)
2. Long sheets of butcher paper for murals
3. Art supplies for murals

Preparation

If possible, contact your local water district, water treatment plant, or wastewater district to inquire whether they have educational materials to send out, or conduct tours for students. Gather and organize local knowledge and educational resources of water sources such as local reservoirs and rivers, and wastewater discharge (to a river, groundwater, or ocean). Gather materials, photocopy and cut "Water Use Worksheet" (double-sided).



and powders, and caustic acids, as well as fuels and their byproducts. We can affect both the quantity and quality of available water through our personal and public conservation practices.

This activity encourages students to develop a greater awareness of water use and the effects of water use on wildlife and habitats. In addition, students are encouraged to develop a personal ethic of responsible water use, and demonstrate it through their actions.

Activity

1. Tell students they are going on a simulated field trip. Just like Alice followed the White Rabbit down the rabbit hole, they are going to shrink down to a size that will let them travel up their faucets at home and into their water pipes. *You may want to adapt the text so it will apply to your local settings. If you are in a rural community and many of the students have well water as their domestic source, you can convert the simulated field trip to begin at a faucet there at the school.* Even if this text does not apply to all students' situations, it can be used to explore a typical source of water and its routes somewhere in California.

2. Ask students to picture in their minds what you will describe for them in the following words:

"Are you comfortable? Good. Close your eyes, and picture yourself small enough to climb into the faucet in your kitchen at home...see yourself with magic powers that allow you to travel through the water that comes from the faucet to its origins... You will be able to pass through all the pipes, valves, and other barriers on the way... The first part of the journey takes you through the pipes in your house to where they connect to your water source... If you live on a farm or ranch, the source would probably be a well or perhaps a spring. In the city, the water source for your home probably would be far away... First you get into a water main, the pipe that carries water to all the houses and businesses in your neighborhood...then you follow the main until you come to a pumping plant where water pressure is maintained... Past the pumping plant is a place where the water is purified... This may be very complex—a place with filters, chemical tanks, and treatment equipment... Beyond the purification plant, the water may be in an aqueduct or open channels coming from a reservoir... The reservoir is a huge lake where water is stored... There are often trees and bushes on its edges... Wildlife is common, fish are usually abundant and people might use the site for boating and fishing... Natural streams usually flow into the reservoir... They drain large areas of the land's surface which are called watersheds... A watershed is the land area that catches and transports water through streams, underground flow, and rivers... The water in a watershed contains all the water that is naturally available for use by all living things in that area... If you want, stay here. Try to see the plants and animals that live in the area. Or, follow your route all the way back through the reservoir and channels and treatment plant and pumping plant to the water main and the pipes in your house and out your faucet. Now, open your eyes."

Outline

Before Class

1. Photocopy "Water Use Worksheet," one sheet, double-sided. Cut into two halves; the second half ("Week 2") will have the "Wise Water Use Tips" on the back. For students to be able to see changes in their water use habits, be sure the students do not see the tip sheet until the second week.
2. Gather art materials for mural.

During Class

1. Whole class discussion on water use.
2. Read visualization text for simulated field trip from faucet to reservoir.
3. Whole class discussion of journey.
4. Read visualization text for simulated field trip from drain to ocean, river, or septic tank.
5. Whole class discussion of journey.
6. Students create murals of upstream and downstream.
7. On a Friday, hand out "Water Use Worksheet, Week 1." The next Friday, hand out "Water Use Worksheet, Week 2." Make sure the "Wise Water Use Tips" are sent home with students for Week 2 ONLY.
8. Students collect data beginning Saturday and continue through the next Friday.
9. After data has been collected for Week 1, make master chart summarizing use. Brainstorm water saving ideas.
10. Students gather data for another week; tabulate results.
11. Compare water use tables for both weeks. ◆

3. After this simulated field trip, discuss as a group the journey of the water from its source to the faucet. Identify components of the journey. Emphasize places where wildlife habitat is affected—positively, negatively, or with unknown effects—by the intervention of people as they use the water or influence how water is to be used.

4. Have students create an "origins" mural on a single long sheet of butcher paper, depicting the origins and journey of water from their home to its source. Emphasize wildlife and habitat all along the way.

5. Repeat the process for a journey down the drain and into the wastewater system. Read aloud:
"Picture yourself small again. This time the journey will be down the drain in your sink. You move along through the used water system to a treatment site... If you live on a farm, the site will probably be a septic tank... A septic tank is usually a large concrete box... Here bacteria break down the substances carried in the water... Once the water is cleansed to the degree possible, it flows out through drainage fields and back into groundwater sources or streams... If you live in a city, there is much more water being used and large water treatment plants must attempt to cleanse the water before it is returned to rivers and streams... In these treatment plants there are great filters and holding tanks... The water must be held in place for solid substances to settle out by gravity... Air is often pumped through the waste water to increase the oxygen content so bacteria can break down the impurities more quickly... Eventually the treated water is released into rivers, streams, or the ocean... It again re-enters the natural habitat for wildlife... There it provides an essential component for continued life... If all was done well, animals, plants, and humans will safely re-use the water... It will nourish the crayfish caught by the raccoon... It will provide the pond for the turtle... It will provide the refreshing drink for someone like yourself in some downstream city... After you have followed the water out into the environment, open your eyes."



6. Repeat the discussion and create a “downstream” mural. Include places where humans and wildlife are affected—positively, negatively, or with unknown effects—by the re-entry of this water into the hydrologic cycle.

7. As a class, evaluate both murals—origins and downstream. Identify, list, and discuss places in which the quality of the water in the water cycle may be affected by human activities.

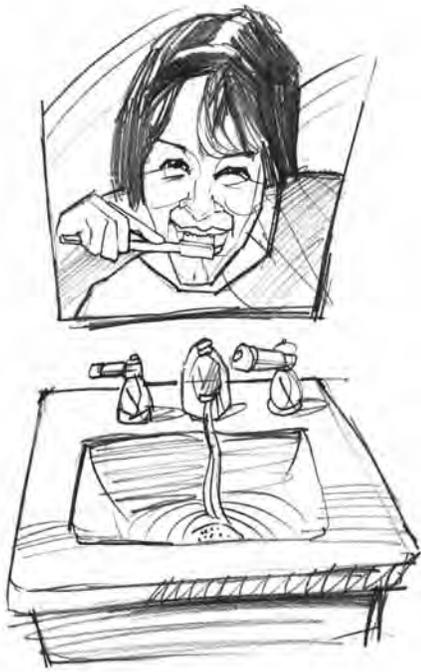
8. Now, shift the emphasis to the amount of water that people typically use. On a Friday, hand out the “Water Use Worksheet Week 1,” one for each student.

9. Ask students to keep track of how much water is used in their homes for seven days, from Saturday to Friday. Students may post the sheet on their refrigerator and have each family member help by putting a mark in the section designated after each water use. The miscellaneous section is for special uses not listed (filling a fish tank, bathing the dog). Students bring in their results on Monday.



10. On Monday, make a master chart on the board that summarizes total use in class’s homes for the seven days. Brainstorm places where water might be conserved. Challenge each student to reduce use and invite his or her family to join in. On Friday, hand out “Water Use Worksheet Week 2” with the “Wise Water Use Tips” on the back (preferable; you can photocopy onto another page if necessary). Students will monitor use for another seven-day period (from Saturday to Friday) while using the wise water use tips. Students bring in their results on Monday.

11. On Monday, tabulate results from Week 2. Compare class results with Week 1. Was there a significant reduction in water use? Hold a classroom discussion on what was easy to change and what was harder.



Results and reflection

1. Students draw and label a flow chart tracing water in their community: from where it comes—to their homes—to where it goes after leaving their home.
2. Using the “Water Use Worksheet Week 1,” have students total the number of gallons of water their families used in personal hygiene activities, home maintenance activities, and “other” activities. Have students create a chart or graph (for instance, a pie chart) to illustrate the three types of activities as a part of their family’s total water usage. Ask students what type of activity used the most water? The least? How are these facts illustrated by their chart or graph? Repeat this activity with “Water Use Worksheet Week 2.” Students compare the two charts for changes in their family’s water use.
3. Once the results are tabulated, discuss how wildlife, habitat, and humans benefit from human water conservation. Discuss potential appropriateness and effectiveness of water conservation behaviors. Discuss ways to protect the quality of water we use. List and discuss actions that each of us can take to reduce or prevent pollutants from entering the hydrologic cycle.
4. Have students name three ways they could conserve water. Ask how much water could they conserve using each method for a year? How might wild animals be affected by their water conservation actions?
5. Ask students for examples of ways that water quality can be affected negatively by human use. Ask for examples of actions people can take to protect the quality of water.

Conclusions

The water cycle recycles Earth’s water supply. Keeping water free of pollutants and using wise water conservation practices will keep our water supply usable for humans, plants, and wildlife. Students can make choices about the amount of water they use and what they put down the drain. The ocean is downstream from us all.

Extensions and applications

1. Locate your community’s water source. Visit it on a field trip.
2. Have students monitor water use in the school, and identify ways to conserve water. Dripping faucets? Running toilets? Runoff from watering plants?
3. Take field trips to purification plants and treatment plants.
4. Students may create a poster campaign to raise the awareness in the school or community about water conservation and water quality.

Adapted from

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Further references:

California Dept. of Water Resources Website, materials for classrooms and poster are available. www.owe.water.ca.gov/education



Water Use Worksheet

How Much Water Does Your Household Use?



WEEK 1	What it takes	What you do	How many times? ()	Total gallons
	3 gallons	Flushing a toilet		
	3 gal. (water left running) 1 gal. (water turned off)	Brushing teeth		
	5 gal./min. (old showerhead) 2.5 gal./min. (new showerhead)	Shower (avg. shower length ____)		
	40 gal. if full	Taking a Bath		
	10 gal.	Washing Dishes		
	40 gal.	Washing clothes		
	40 gal.	Watering lawn		
	40 gal.	Washing a car		
OTHER: estimate gallons used				



How Much Water Does Your Household Use?

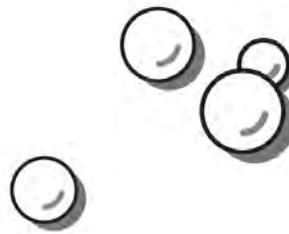


WEEK 2	What it takes	What you do	How many times? ()	Total gallons
	2.5 gal. (with a ½ gal. bottle in tank)	Flushing a toilet		
	3 gal. (water left running) 1 gal. (water turned off)	Brushing teeth		
	5 gal./min. (old showerhead) 2.5 gal./min. (new showerhead)	Shower (avg. shower length ____)		
	40 gal. if full/20 gal. if ½ full	Taking a Bath		
	10 gal.	Washing Dishes		
	40 gal.	Washing clothes		
	40 gal.	Watering lawn		
	0 gal. (carwash that recycles water)	Washing a car		
OTHER: estimate gallons used				



The ultimate test of man's conscience may be his willingness to sacrifice something today for future generations whose words of thanks will not be heard.

—**Gaylord Nelson**
Former Governor of Wisconsin
Founder of Earth Day



Wise Water Use Tips

Shower

Get yourself wet in the shower, then turn the water off while you lather up. Turn it back on to rinse off. Reduces the number of minutes shower is on. Or, ask your parents to purchase a low-flow showerhead. Any new showerhead made in the U.S.A. will use a maximum of 2.5 gallons/minute.

Brushing your teeth

Turn the faucet on briefly to wet your brush, then turn it off until you're done brushing and ready to rinse. Uses less than 1 gallon.

Washing clothes

Wait to run the washing machine until you have a full load. This reduces the number of loads you need to do.

Washing dishes

Wait to run the dishwasher until you have a full load. This reduces the number of loads you need to do.



Toilet

If your toilet was made after 1992, it uses an average of only 1.6 gallons/flush. If your toilet is older, try placing a plastic bottle filled with water in the tank. This reduces the amount of water used for each flush by the amount of water in the bottle.

Bathtub

Fill the bath only halfway, saves 20 gallons.



Washing a car

Take your car to a carwash that recycles water. Saves 40 gallons and reduces water pollution.

Watering your garden

Water just once per week, deeply, in the early morning to reduce evaporation. Keep a bucket in the bathroom and kitchen for when you're waiting for water to warm up. Use to water plants. Encourage adults to plant native and drought-tolerant plants to reduce watering even further.

Cleaning house

To clean the driveway or patio, use a broom instead of the hose. Save water, get exercise!