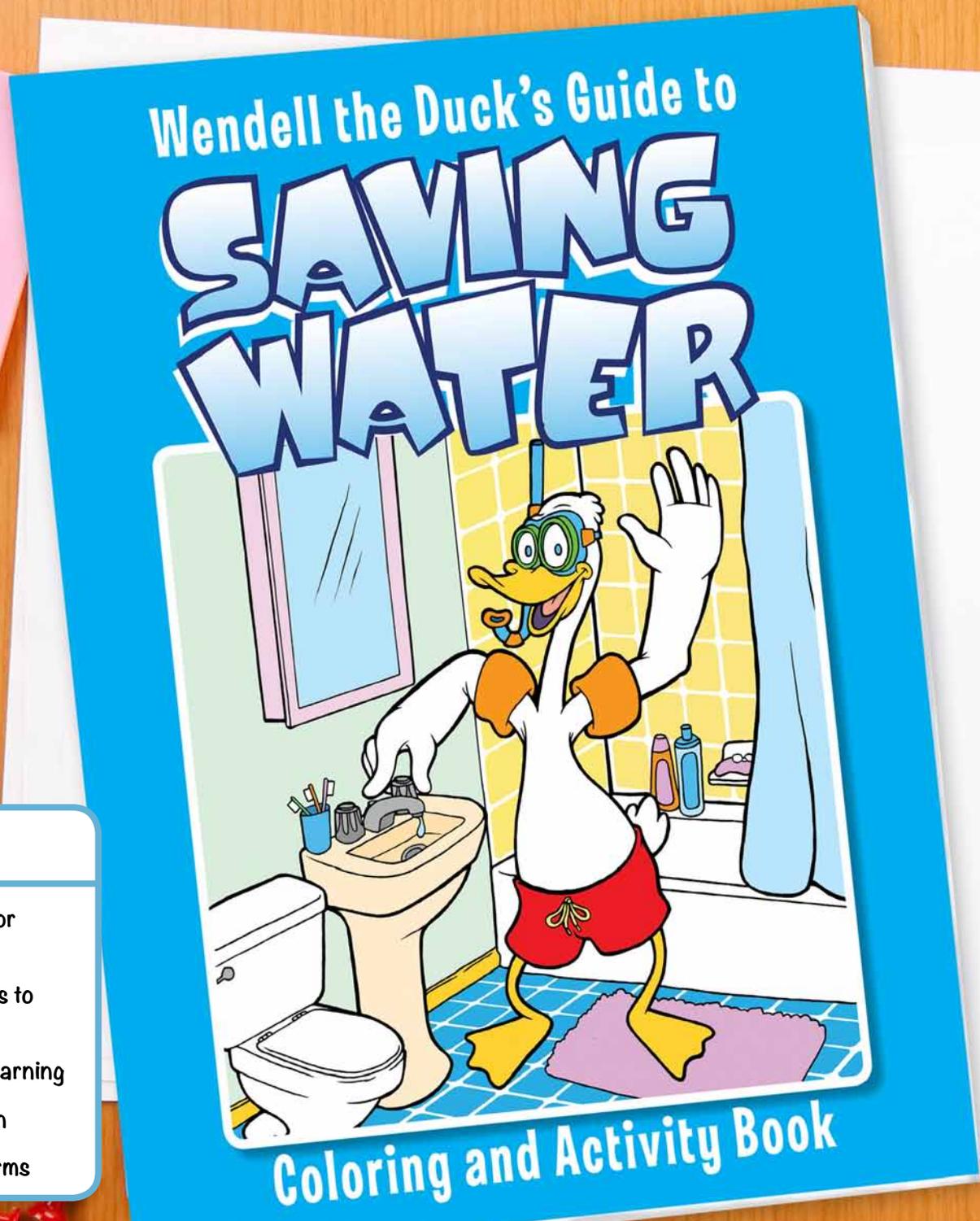




The Educator's Guide to:

Wendell the Duck's Guide to Saving Water



Inside

- Essential questions for student inquiry
- Ready-to-use lessons to engage and explore
- Activities to extend learning
- Standards correlation
- Glossary of useful terms

Introduction

Water is everywhere and we use it every day! This guide, a supplement to the kids' book *Wendell the Duck's Guide to Saving Water*, provides educators and parents with essential background information, practical lessons, and hands-on investigations for educating children about water use and conservation. Large group activities ideal for the classroom and small group activities suitable for the home are designed to enhance student learning. Essential questions and lesson plans are linked to curriculum requirements and explore themes within topics such as science as inquiry, Earth science, and science in personal and social perspectives. The guide's activities aim to help children acquire skills that are significant in their developmental process—to collect, organize, and communicate ideas.

Essential Questions

What is water?

Water can be found in Earth's oceans, lakes, rivers, streams, and ponds, in glaciers and ice sheets, and even in the air as clouds! In fact, water covers most of the planet—about 70% of it! Most of the water on Earth is salty, so we can't drink it. The water we drink is called **freshwater**, but there isn't a whole lot of it.

Where does freshwater come from?

Freshwater can be found on Earth's surface in lakes or rivers, underground, or as ice in icecaps and glaciers. Most of the water we drink comes from the surface or the ground. When it rains, freshwater flows from rivers into lakes or **reservoirs** and into underground basins called **aquifers**.

What do we use water for?

Water is a very important **natural resource**, and we rely on it every day. We use water for bathing, for drinking, for washing our dirty clothes and dishes, for flushing the toilet, for watering plants, and for brushing our teeth!

How is our water made safe to drink?

Before our drinking water reaches our faucets, local **water utilities** pipe water from surface and groundwater reservoirs and filter it to remove **pollutants** and other things that could make us sick. Drinking water helps us stay active and healthy!

How does water get to our homes?

Water travels to our homes, schools, and businesses from reservoirs and aquifers through many underground tunnels and pipes. Water may travel a very long way to get to our faucets!

What happens to water when it goes down the drain?

Did you ever wonder what happens to the water that goes down the drain? Water that has been used is called **wastewater**. When water goes down the drain or toilet, it travels through pipes to a place called a **wastewater treatment plant**. There the wastewater is cleaned before it is put back into a nearby ocean, river, or lake.

What can you do to save water in your home?

There are many ways to save water at home and at school. Everyone can become a water saver!

Water Conservation Tips

- Turn off the faucet when you brush your teeth. Don't let the water run!
- Be a leak detective! Tell an adult if you see any drips or leaks.
- Take a speed shower. You use four gallons of water for every minute in the shower!
- Remind an adult to only wash full loads of laundry and to turn on the dishwasher only when it's full.
- Use a bucket of water, not the hose, to wash your bike.
- Fill your glass halfway so you don't waste water. If you have leftover water, use it to water a thirsty plant or give it to your pet.
- Make sure your sprinkler is watering your plants and grass, not the house or street! And if it's going to rain, you don't need the sprinkler at all.

Lessons to Engage and Explore!

I. Building an Aquifer, and Groundwater Pollution

Introduction

Drinking water is supplied to many homes from underground reservoirs called aquifers. An aquifer is an underground reservoir where water is stored in layers of clay, sand, gravel, and rock. Sometimes chemicals and other pollutants from the surface can enter an aquifer and contaminate the drinking water supply. When this happens, special steps must be taken to clean the water so it is safe for people to drink. This cleaning process is called **groundwater remediation**.

Objectives and Learning Goals

Students will learn how freshwater is stored within an aquifer. Students will learn how a drinking water supply within an aquifer may be contaminated by pollution. Students will learn about the concept of remediation

Time and Groups

60 minutes; groups of 2 students

Materials

Clear plastic cups, white sand, gravel, warm water, multicolored sprinkles, small spoons

Activity Procedure

- ▶ Divide the students into groups of two.
- ▶ Have students pour about $\frac{1}{4}$ inch of sand into the bottom of a clear plastic cup, pour warm water into the cup until it reaches the top of the sand, and then pour $\frac{1}{4}$ inch of gravel on top of the sand. The sand and gravel represents layers of earth, and the water represents freshwater within the aquifer.
- ▶ Near the edge of the cup, students should carefully drop 10–15 colored sprinkles into the cup. Wait 1–2 minutes for some of the sprinkles to dissolve (You might need to add a few more drops of water). This represents the pollution.
- ▶ The students will see that some of the dye from the sprinkles sinks down into the groundwater. Ask the students to use a small spoon to remove as much “pollution” as they can by scooping out the floating sprinkles. They will see that some types of pollution are harder to remove than others. It is easy to remove the solid sprinkles but not so easy to remove the dye that has sunk into the aquifer!

Follow-Up Questions

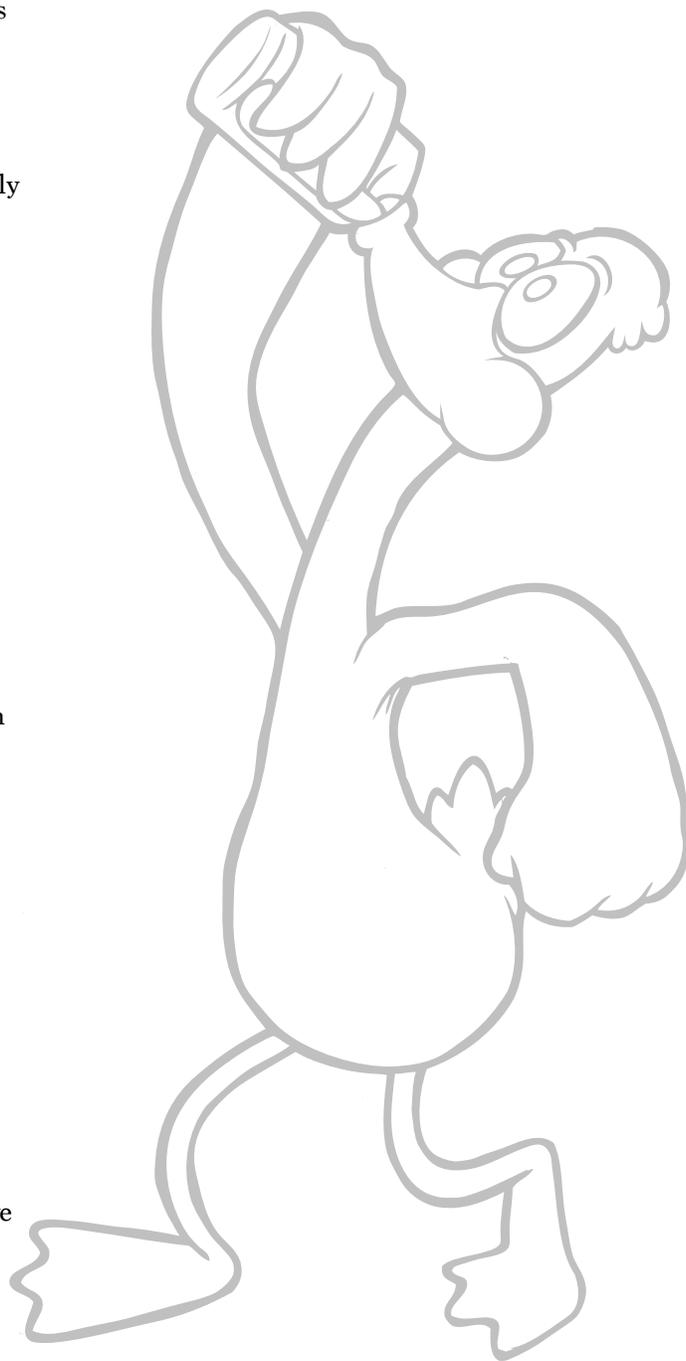
Make a drawing of the aquifer and its layers. How can pollution enter an aquifer?

Does the pollution reach the drinking water supply?

How can we prevent pollution from entering aquifers that supply our drinking water?

How can we remove pollution from an aquifer?

Why is ground-water remediation important?



2. Spreading Water Conservation Awareness

Introduction

Now that you know how to conserve water at home and in school, spread the word!

Objectives and Learning Goals

Students will learn to communicate water-saving ideas to their school community.

Time and Groups

45-60 minutes; small groups of 2-3 students

Materials

Poster paper, markers, colored pencils, and/or crayons

Activity Procedure

- ▶ Divide the students into small groups.
- ▶ Ask students to create posters to hang up around the school to spread their water conservation ideas!

Follow-Up Activity

Organize a water-saving event at school. Ask kids to brainstorm ways to involve their community. For example, the school community could participate in a speed shower contest or become leak detectives for the day.



3. Water Savers and Wasters Sorting Game

Introduction

Thanks to Wendell the Duck, you have learned many ways to save water at home, which means saving money for your family, too!

Objective and Learning Goals

Students will review water-saving tips learned from Wendell the Duck. Students will be able to apply these tips to other areas in their life, such as at school or friends' houses. Students will learn to work together in large group activities.

Time and Groups

45 minutes; a full class activity that can easily be adapted to an individual or small group activity for home

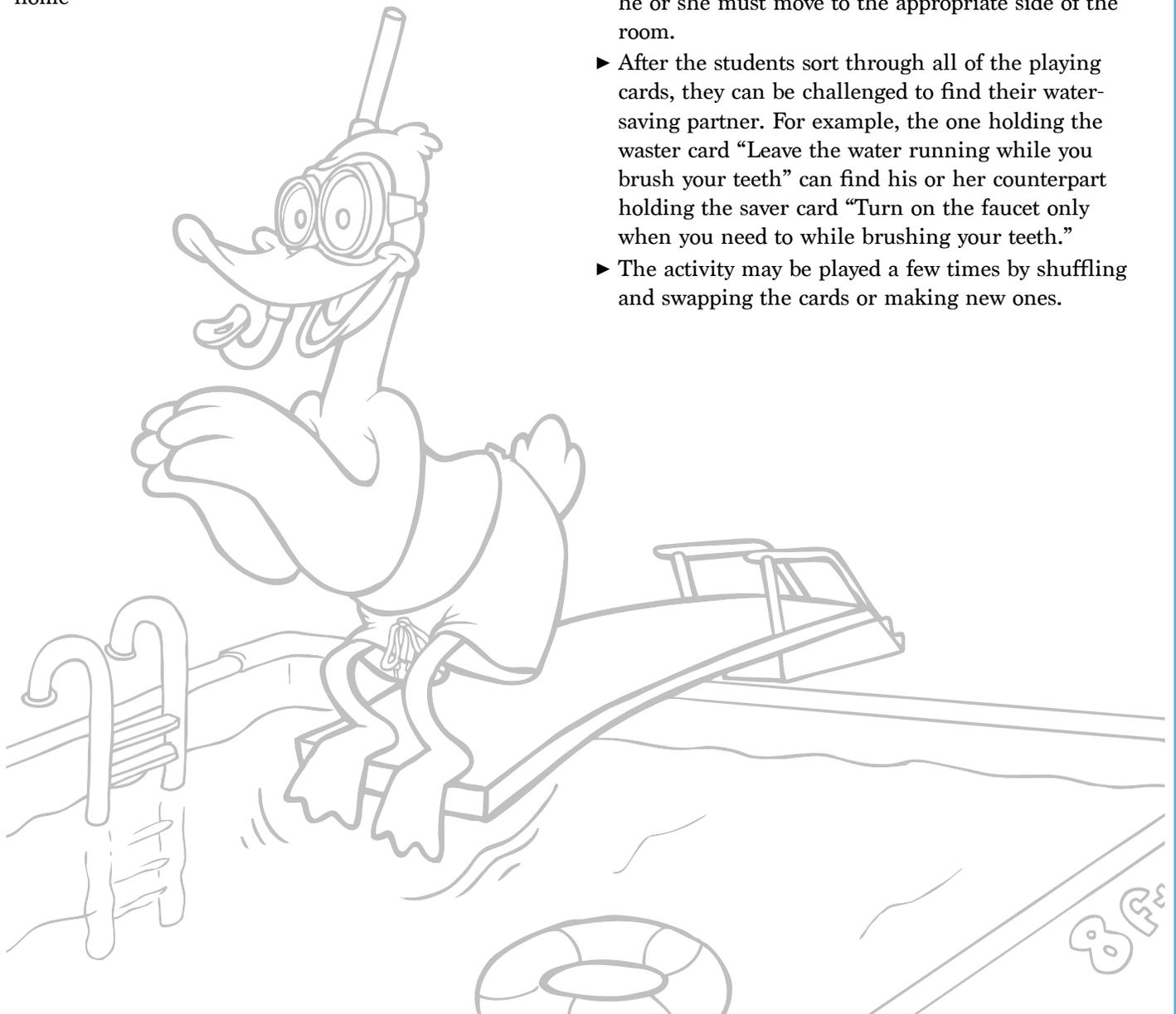
Materials

Paper or cardstock, scissors, colored pencils

Activity Procedure

First make the playing cards: ask each student to write down one water saver tip or one water waster tip on a precut paper card. Students may also include an illustration on their card, but remind them not to write "saver" or "waster" on the card. Collect and shuffle the cards.

- ▶ Divide the classroom in half—one side for water savers and the other for wasters.
- ▶ One by one, give each student a saver or waster card from the deck.
- ▶ After the student reads the card aloud to the class, he or she must move to the appropriate side of the room.
- ▶ After the students sort through all of the playing cards, they can be challenged to find their water-saving partner. For example, the one holding the waster card "Leave the water running while you brush your teeth" can find his or her counterpart holding the saver card "Turn on the faucet only when you need to while brushing your teeth."
- ▶ The activity may be played a few times by shuffling and swapping the cards or making new ones.



At Home Activities to Extend Learning!

1. Water Use Audit

Overview

Have you ever wondered how many gallons of water you use each day? But what's a gallon? A gallon is a measurement of liquid. You can think of it as the amount of liquid that can fit into a big bottle of milk or a big can of paint.

Exploration

With an adult helper, record your water usage in gallons using the information below.

Water Use:

1. Showers! Every minute in the shower equals 4 gallons of water. Figure out how many gallons of water you use in the shower per day by multiplying the number of minutes spent in the shower by 4.

$$\underline{\hspace{2cm}} \text{ (number of minutes)} \times \underline{\hspace{2cm}} \text{ (4 gallons)} = \underline{\hspace{2cm}} \text{ (total gallons of water used in the shower!)}$$

2. Baths! Each bath uses about 36 gallons of water. Figure out how many gallons of water you use in the bath per day by multiplying the number of baths per day by 36.

$$\underline{\hspace{2cm}} \text{ (number of baths)} \times \underline{\hspace{2cm}} \text{ (36 gallons)} = \underline{\hspace{2cm}} \text{ (total gallons of water used in the bath!)}$$

3. Toilets! Each flush of the toilet uses about 2 gallons of water, and on average each person in the house will flush about 4 times per day. That's about 8 gallons per person. Figure out how many gallons of water you use by multiplying the number of flushes by 2.

$$\underline{\hspace{2cm}} \text{ (number of flushes)} \times \underline{\hspace{2cm}} \text{ (2 gallons)} = \underline{\hspace{2cm}} \text{ (total gallons of water used by the toilet)}$$

4. Laundry! Each load of laundry uses about 30 gallons of water. Figure out how many gallons of water you use by washing clothes each day by multiplying the number of laundry loads by 30.

$$\underline{\hspace{2cm}} \text{ (number of laundry loads)} \times \underline{\hspace{2cm}} \text{ (30 gallons)} = \underline{\hspace{2cm}} \text{ (total gallons of water used for laundry)}$$

5. Outside! Using the hose to wash your bike uses about 6 gallons of water each minute. Figure out how many gallons you use by multiplying the number of minutes you use the hose by 6.

$$\underline{\hspace{2cm}} \text{ (number of minutes)} \times \underline{\hspace{2cm}} \text{ (6 gallons)} = \underline{\hspace{2cm}} \text{ (total gallons of water used by the hose)}$$

6. Faucet! We use the faucet for washing up and brushing teeth. Faucets use about 2 gallons of water per minute. Figure out how many gallons you use by multiplying the number of minutes you use the faucet by 2.

$$\underline{\hspace{2cm}} \text{ (number of minutes)} \times \underline{\hspace{2cm}} \text{ (2 gallons)} = \underline{\hspace{2cm}} \text{ (total gallons of water used by the faucet)}$$

7. We use water in other ways, too. Can you name a few? Add up all the gallons you use each day to find out your total water use per day. On average, each person uses about 100 gallons a day!

Extension

Share and compare the total number of gallons of water you use per day with friends and family!

2. Water at Home

Overview

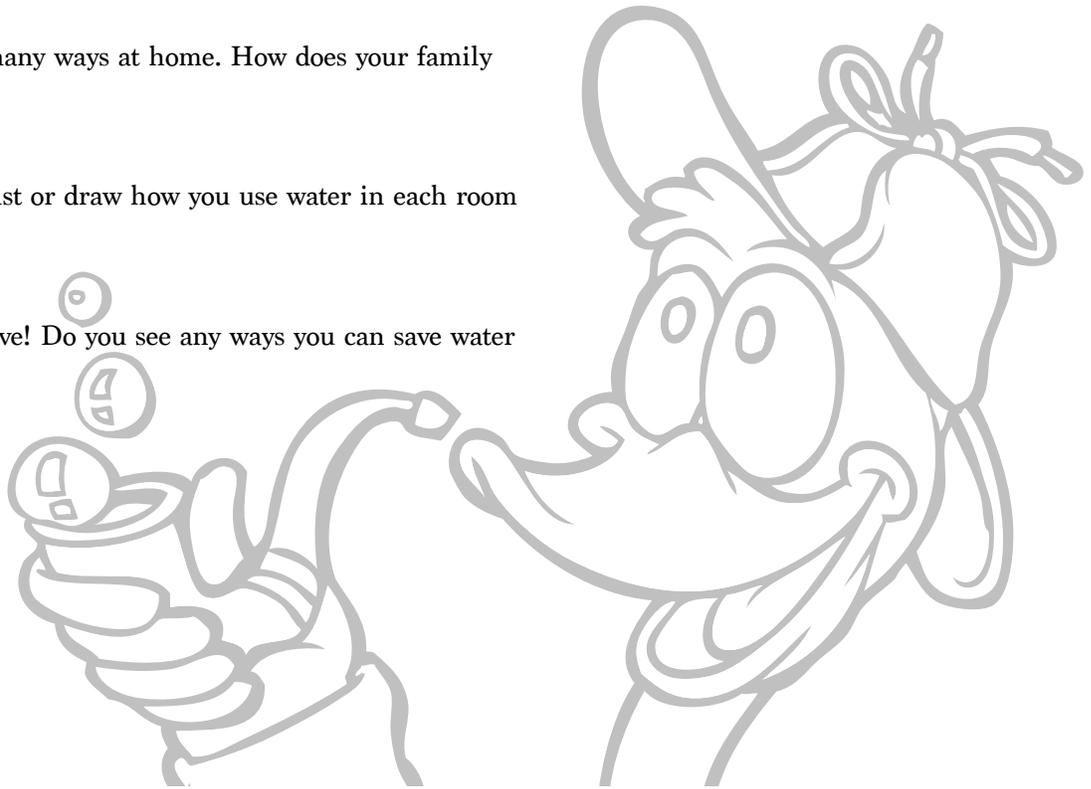
Families use water in many ways at home. How does your family use water?

Exploration

With an adult helper, list or draw how you use water in each room of the house.

Extension

Be a water saver detective! Do you see any ways you can save water in your home?



Glossary of Useful Terms

Aquifer An underground area that contains groundwater.

Contaminants Pollutants such as oil, salts, or chemicals found in groundwater that makes it unsafe for people to drink.

Freshwater Water that does not have a lot of salt, used for drinking, bathing, and washing.

Groundwater remediation Methods used to remove pollutants from contaminated groundwater.

Natural resource Materials that grow or develop on or in the earth, such as water, minerals, and trees.

Pollutant Anything in our waterways that is harmful and unnatural.

Reservoirs A place where water collects until it is used to supply homes, businesses, and schools.

Wastewater Water that has been used and must be cleaned before it's released back into the environment.

Wastewater treatment plant A place where used water is cleaned.

Water conservation Making choices to save water.

Water utility The organization that provides drinking water and wastewater services to your home and community.

More Questions for Kids to Think About and Review!

How would life be different without running water at home and at school?

Where does your drinking water come from? Why should we conserve it?

What are some other ways we can save water?

How does freshwater get to your house?

Correlation to Standards

This educator's guide can be correlated to the standards listed below for students in grades K–5. The activities provided in this guide allow children to use appropriate techniques to collect, organize, communicate, and visualize data. Selected lessons also enable the use of mathematics to ask questions and form conclusions.

National Science Education Standards K–4

Content Standard A: Science as Inquiry, A1. Abilities necessary to do scientific inquiry, A2. Understanding about scientific inquiry

Content Standard D: Earth and Space Science, D1. Properties of earth materials

Content standard F: Science in Personal and Social Perspectives, F3. Types of resources

Next Generation Science Standards K–5

Scientific and Engineering Practices: Asking questions and defining problems; Planning and carrying out investigations; Analyzing and interpreting data; Obtaining, evaluating, and communicating information

Disciplinary Core Ideas: ESS2.A: Earth Materials and Systems; ESS2.C: The Roles of Water in Earth's Surface Processes; ESS3.A: Natural Resources; ESS3.C Human impacts on Earth systems

Crosscutting Concepts: Scale, Proportion, and Quantity; Systems and System Models; Influence of Engineering, Technology, and Science on Society and the Natural World

Common Core Standards

English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects K–5

Reading: Informational Text

Key Ideas and Details: CCSS.ELA-LITERACY.RI.K.1, 1.1, 1.2, 1.3, 1.4, 1.5; CCSS.ELA-LITERACY.RI.K.2, 1.2, 2.2, 3.2, 4.2, 5.2
Craft and Structure: CCSS.ELA-LITERACY.RI.K.4, 1.4, 2.4, 3.4, 4.4, 5.4

Integration of Knowledge and Ideas: CCSS.ELA-LITERACY.RI.K.8, 1.8, 2.8, 3.8, 4.8, 5.8

Range of Reading and Level of Text Complexity: CCSS.ELA-LITERACY.RI.K.10, 1.10, 2.10, 3.10, 4.10, 5.10

Writing

Text Types and Purposes: CCSS.ELA-LITERACY.W.K.1, 1.1, 2.1, 3.1, 3.1.A, 3.1.B, 4.1, 4.1.A, 4.1.B, 5.1, 5.1.A, 5.1.B

Production and Distribution of Writing: CCSS.ELA-LITERACY.W.K.5, 1.5, 2.5, 3.5, 4.5, 5.5

Research to Build and Present Knowledge: CCSS.ELA-LITERACY.W.K.8, 1.8, 2.8, 3.8, 4.8, 5.8

Speaking & Listening

Comprehension and Collaboration: CCSS.ELA-LITERACY.SL.K.1, K.1.A, K.1.B, 1.1, 1.1.A, 1.1.B, 1.1.C, 2.1, 2.1.A, 2.1.B, 2.1.C, 3.1, 3.1.A, 3.1.B, 3.1.C, 3.1.D, 4.1, 4.1.A, 4.1.B, 4.1.C, 4.1.D, 5.1, 5.1.A, 5.1.B, 5.1.C, 5.1.D

Presentation of Knowledge and Ideas: CCSS.ELA-LITERACY.SL.K.5, 1.5, 2.5, 3.5, 4.5, 5.5

Language

Vocabulary Acquisition and Use: CCSS.ELA-LITERACY.L.K.4, 1.4, 2.4, 3.4, 4.4, 5.4

Mathematics Standards K–5

Counting & Cardinality: CCSS.MATH.CONTENT.K.CC.B.4, B.4.A, B.4.B, B.4.C; CCSS.MATH.CONTENT.K.CC.C.6

Operations & Algebraic Thinking: CCSS.MATH.CONTENT.K.OA.A.1, 1.OA.A1, 2.OA.A1, 3.OA.A1, 4.OA.A1, 5.OA.A1

Measurement & Data: CCSS.MATH.CONTENT.K.MD.B.3; CCSS.MATH.CONTENT.1.MD.C.4

References

- NOAA Education Resources, www.education.noaa.gov
- The USGS Water Science School, water.usgs.gov/edu
- U.S. Environmental Protection Agency, water.epa.gov
- National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). Common Core State Standards. Washington, DC: Authors.

This book is published by Project Energy Savers. For information about Project Energy Savers, go to www.projectenergysavers.com

Notice: This book was produced by Project Energy Savers™, LLC. Neither Project Energy Savers™, LLC. nor any person acting on behalf of Project Energy Savers™, LLC. makes any warranty, expressed or implied, with respect to the use of any information disclosed in this booklet, or assumes any liability with respect to the use of, or for damages resulting from the use of, any information contained in this booklet. The recommendations, statistics and information provided are strictly for the purposes of informing the user.