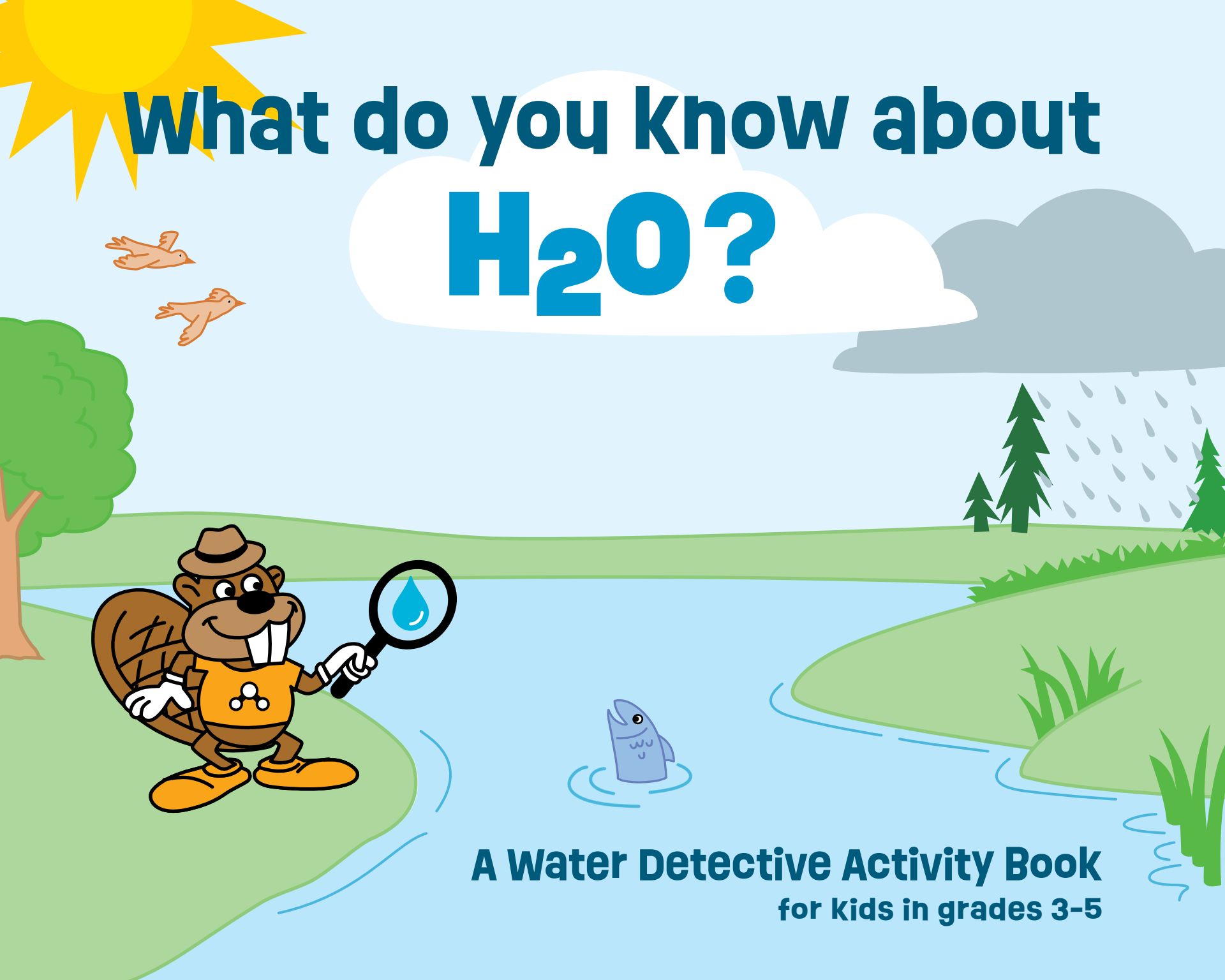
What do you know about H_2O?



A Water Detective Activity Book

for kids in grades 3-5

Our Region's Water

Water is our number one natural resource. Across the region, we use millions of gallons of water each day at home, at school, and in local businesses.

In fact, almost every part of our community depends on water. But where does it come from? Where does it go? How do we use it? How much do we use? How can we conserve it?

Lucky for you, this book is full of all sorts of fun puzzles and games that will teach you how to be water smart.

So, what do you know about H_2O?

Words to Know

Look for these boxes throughout the book to learn new water words. Find even More Words to Know on page 26.

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Hello Detective, Leavitt Beaver here.

I am glad you are on the case! Look for a magnifying glass throughout this book to learn more cool things about water.

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Note to grownups:

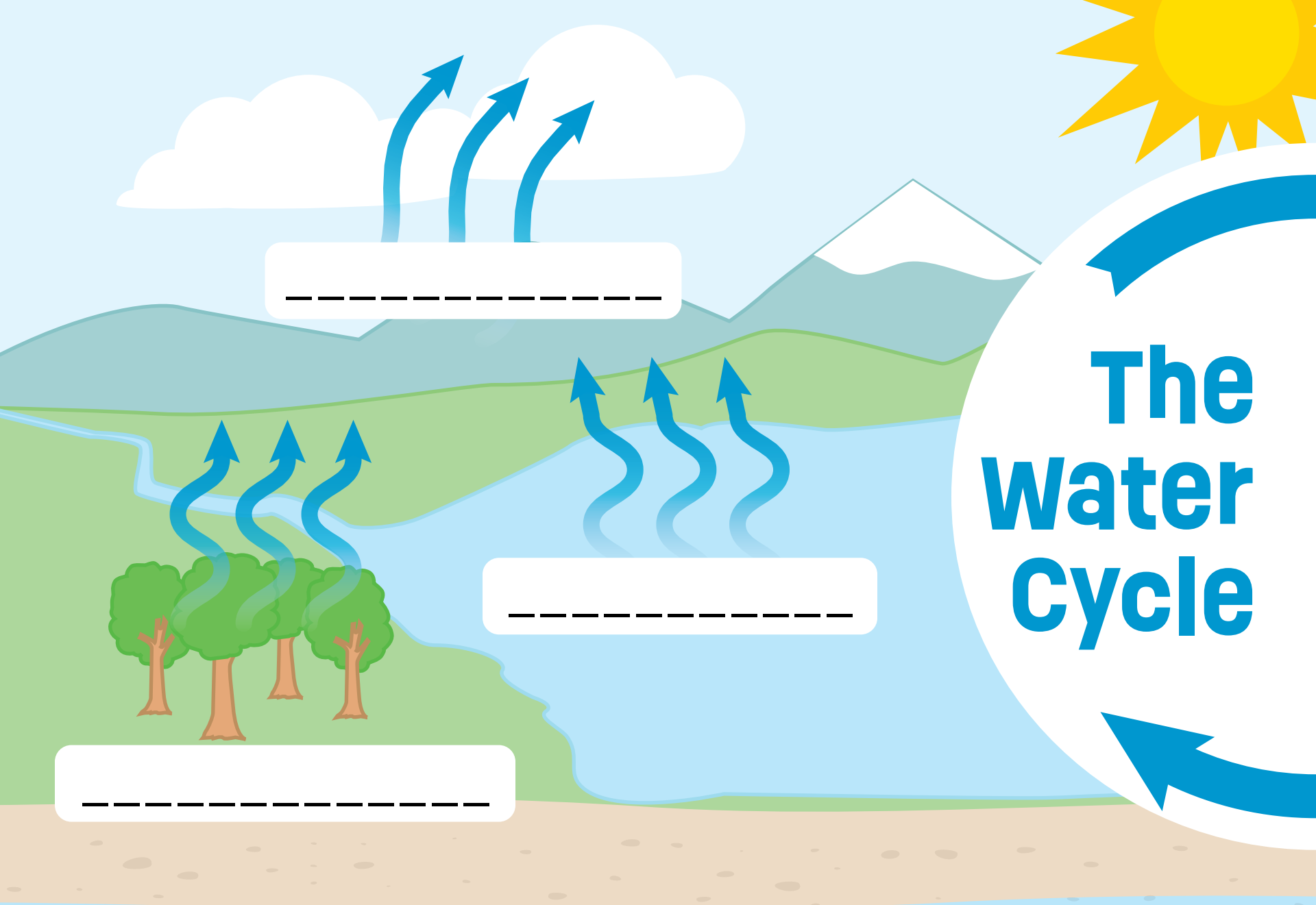
Get more information on how to use this activity book at home or in the classroom at

regionalH2O.org/WDYK

REGIONAL WATER PROVIDERS CONSORTIUM

regionalH2O.org

The Water Cycle



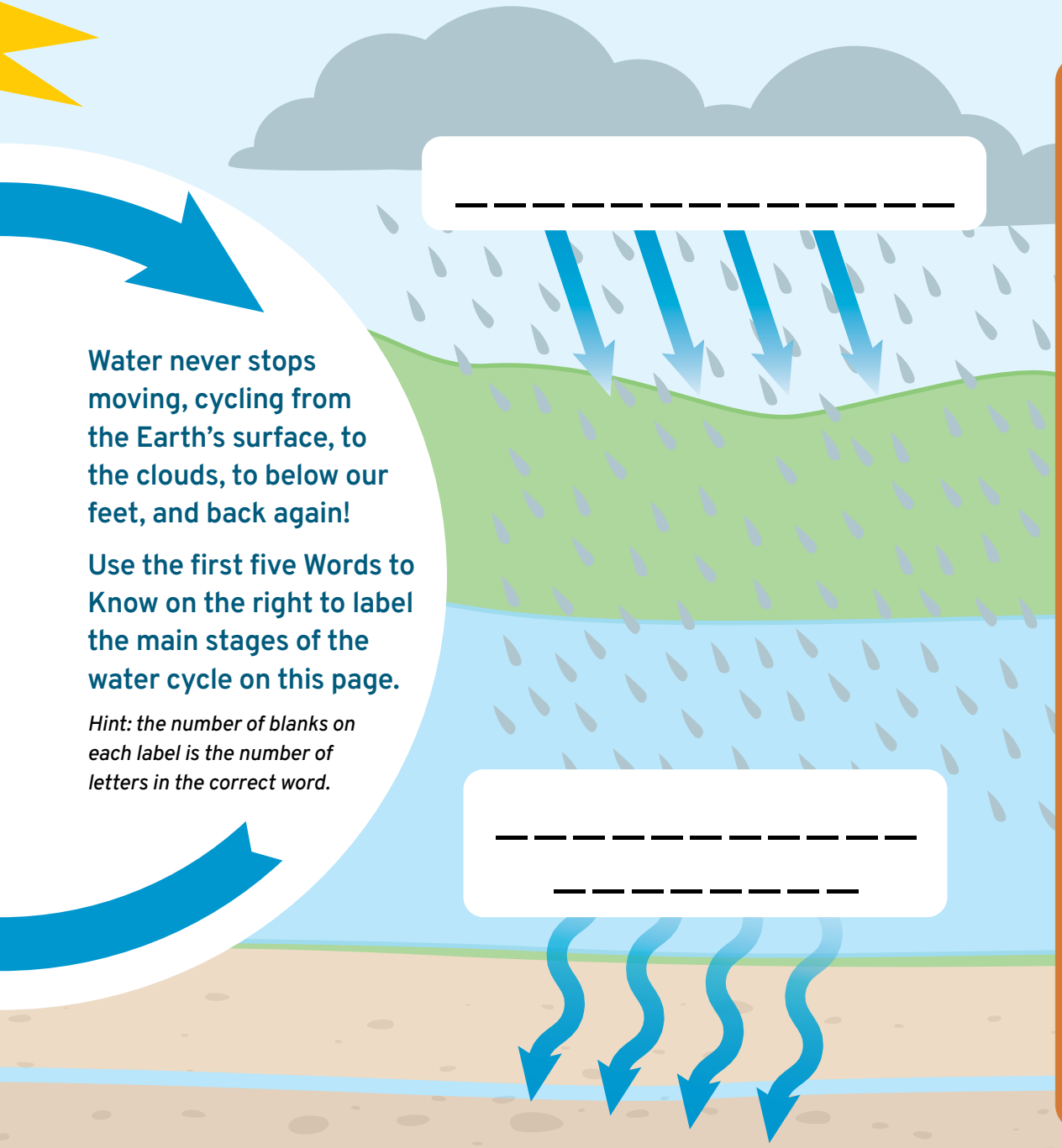
You've Found a FUN FACT!

Each water molecule is made up of 2 hydrogen atoms and 1 oxygen atom. That's why it's called H_2O!

Water never stops moving, cycling from the Earth's surface, to the clouds, to below our feet, and back again!

Use the first five Words to Know on the right to label the main stages of the water cycle on this page.

Hint: the number of blanks on each label is the number of letters in the correct word.



Words to Know

Condensation [kahn-den-SAY-shuhn]
Water changing from a gas to a liquid (the opposite of evaporation). Water vapor (water in gas form) in the air becomes liquid water droplets. This is how clouds form!

Evaporation [ee-vap-uh-RAY-shuhn]
Water changing from a liquid to a gas (the opposite of condensation). Liquid water in places like lakes and rivers changes to a gas (water vapor) and rises into the air.

Precipitation [pruh-sip-uh-TAY-shuhn]
Any liquid or solid water falling from the sky to the Earth's surface. This can be rain, hail, sleet, or snow.

Groundwater recharge
[GROWND-wah-tuhr ree-CHARj]
Water soaking into the soil deep enough to refill underground aquifers.

Transpiration [tran-spuh-RAY-shuhn]
Plants releasing extra water into the air through their leaves. Plants use this process to cool down and to move water (and nutrients) up from the roots to the rest of the plant.

Water cycle [wah-tuhr SIGH-kuhl]
The name of the natural process of water moving from the sky to the Earth and back again. The cycle includes condensation, evaporation, precipitation, groundwater recharge, and transpiration. It is also called the hydrologic cycle.

Streams of Science

Choose the answer for each question by circling the letter **A**, **B**, or **C**. There is only one right answer for each question.

1. Which of the following is not part of the natural water cycle?
   - A. Evaporation
   - B. Condensation
   - C. Water treatment plant
2. What is the scientific name for the natural water cycle?
   - A. Hydrologic cycle
   - B. Spin cycle
   - C. Atmospheric circulation
3. What do scientists call water evaporating from the leaves of plants and trees?
   - A. Transpiration
   - B. Conservation
   - C. Precipitation
4. Which of the following make up a water molecule?
   - A. Liquids, gases, and solids
   - B. 2 hydrogen atoms and 1 oxygen atom
   - C. Dinosaur spit, vapors, and clouds
5. What are the three states of matter that water can exist in?
   - A. Oregon, Georgia, and Maine
   - B. Solid, gas, and liquid
   - C. Condensate, plasma, and magma
6. What is the name for an area of land where water drains to a single body of water like a river?
   - A. Geographic region
   - B. Upland area
   - C. Watershed
7. Which word names the part of the water cycle when water soaks into the soil?
   - A. Groundwater recharge
   - B. Evaporation
   - C. Transpiration
8. How much of the Earth's water is fresh and can be used for drinking?
   - A. More than 75%
   - B. Less than 1%
   - C. About 50%
9. What is water found above ground (like rivers and lakes) called?
   - A. Groundwater
   - B. Surface water
   - C. Tap water
10. Which of the following is not an example of precipitation?
    - A. Rain
    - B. Fog
    - C. Hail

It's a Match

Draw a line from each word to its definition.

Need a hint? Find the definitions for each word in this book.

water source	An area of land where water (like rain or snowmelt) collects into one place (like a lake or river)
potable water	A river, lake, or groundwater aquifer where water providers get water
drought	Water that is safe to drink
surface water	A long period of dry weather without precipitation (like rain) that causes a water shortage
aquifer	Water found underground in aquifers
water cycle	The process of a liquid turning into a gas like water turning into vapor
evaporation	Water falling from clouds as rain, hail, sleet, and snow
watershed	Water that is above ground such as streams, lakes, rivers, ponds, wetlands, and oceans
groundwater	An underground layer of rock and sediment that holds groundwater
precipitation	The movement of water from the sky to the Earth and back, which includes precipitation, condensation, and evaporation

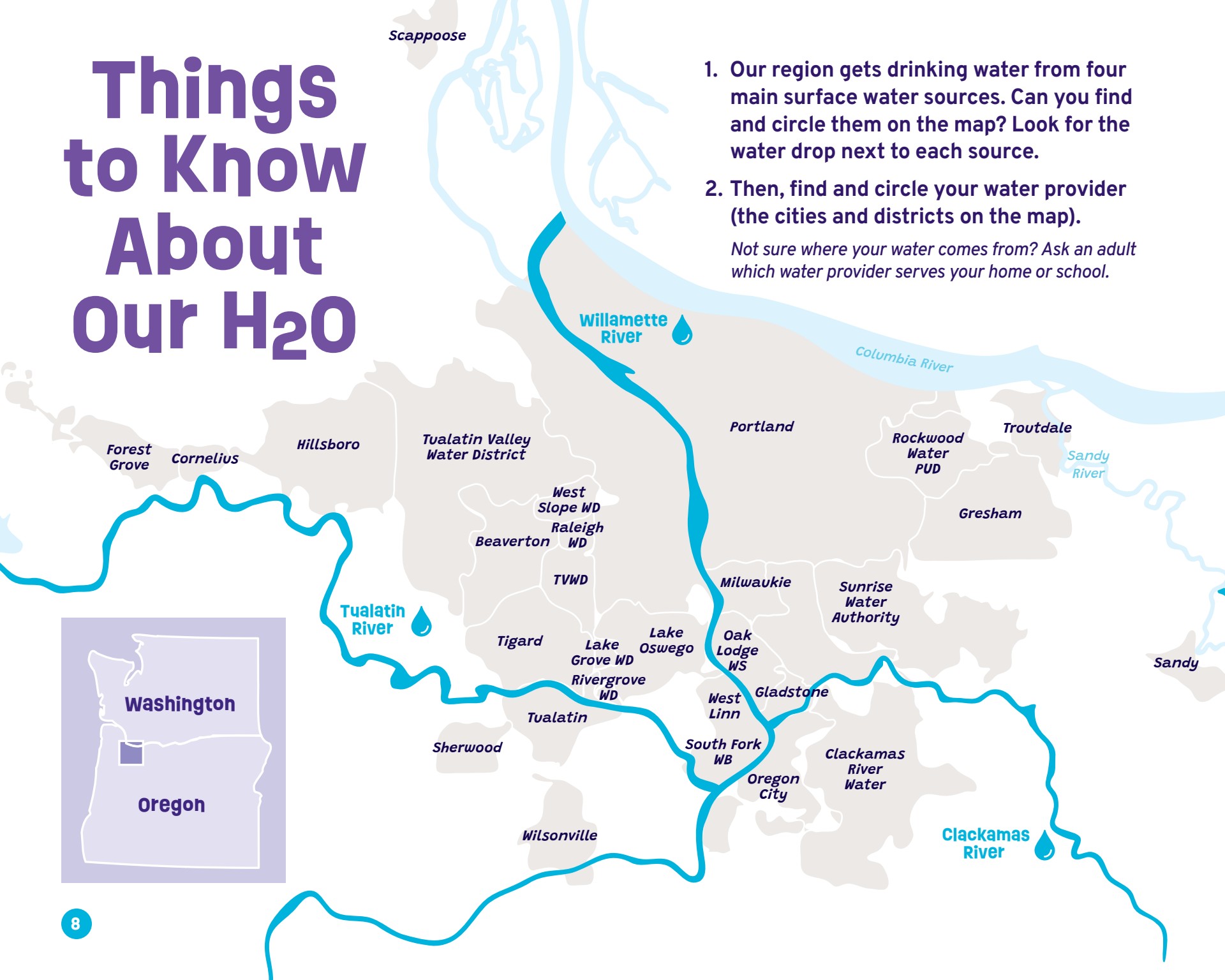
You've Found a FUN FACT!

Clouds are made up of billions of tiny drops of water. A typical cloud weighs around 1 million pounds!

Things to Know About Our H_2O

1. **Our region gets drinking water from four main surface water sources. Can you find and circle them on the map? Look for the water drop next to each source.**
2. **Then, find and circle your water provider (the cities and districts on the map).**

Not sure where your water comes from? Ask an adult which water provider serves your home or school.



Words to Know

Groundwater [GROWND-wah-tuhr]
Water that fills aquifers, layers of soil, sand, and rocks, deep underground.

Surface water [SURR-fuhss wah-tuhr]
Water that is above ground such as in streams, lakes, rivers, ponds, wetlands, and oceans.

Water provider [wah-tuhr pruh-VIGH-duhr]
An organization that delivers safe drinking water to homes, schools, and businesses.

Water source [wah-tuhr sorss]
A river, lake, or groundwater aquifer where water providers get water. Water providers then make the water safe to drink and deliver it to people.

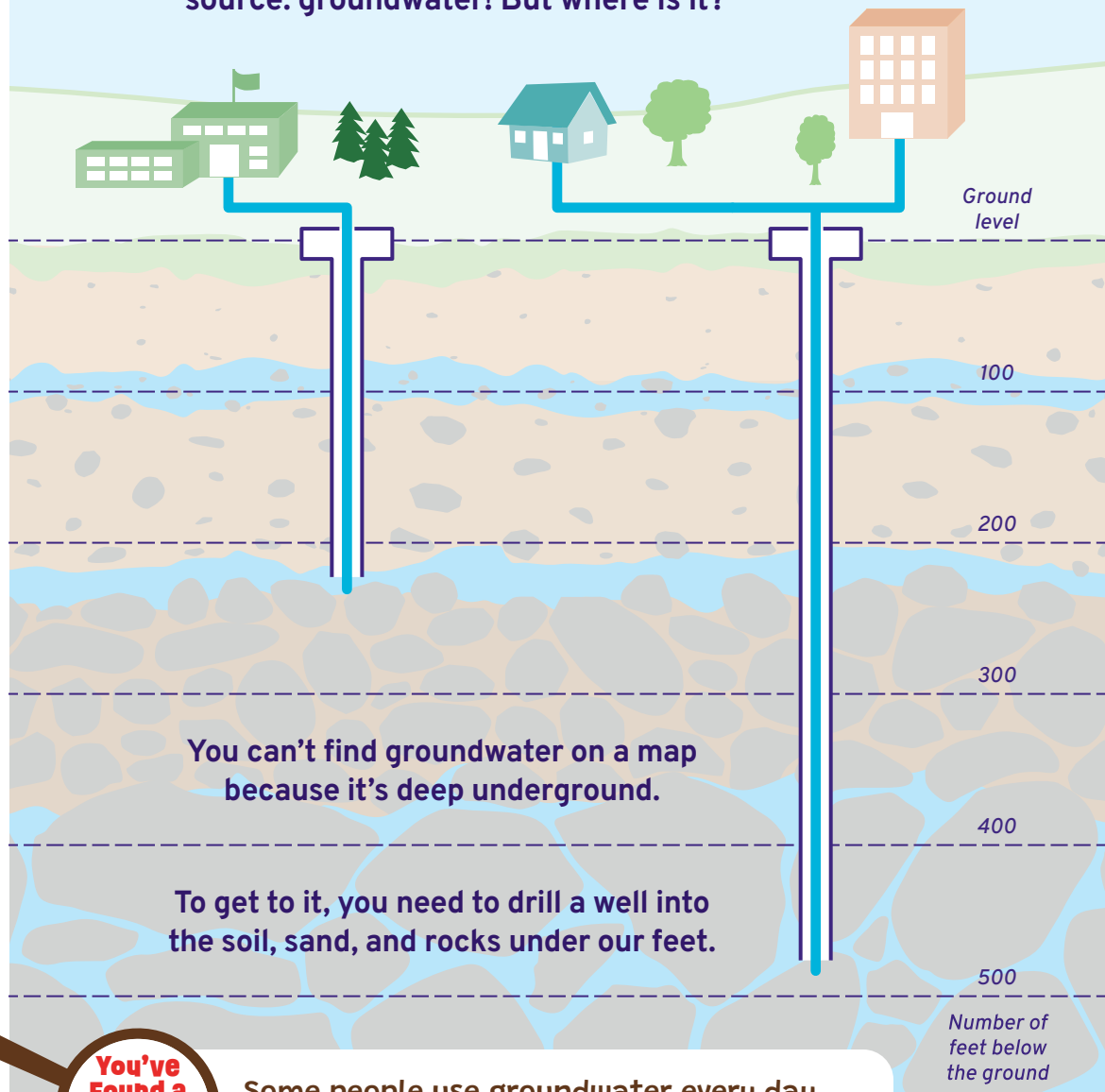
Well [wel]
A deep hole drilled in the ground to get water from underground aquifers.

Water Provider Name Key

There are many different kinds of organizations that provide water to people across our region. Below is a list of initials you'll see on the map and what type of water provider they refer to.

WD = water district
PUD = peoples utility district
WB = water board
WS = water services
TVWD = Tualatin Valley Water District

The region has another important water source: groundwater! But where is it?



You can't find groundwater on a map because it's deep underground.

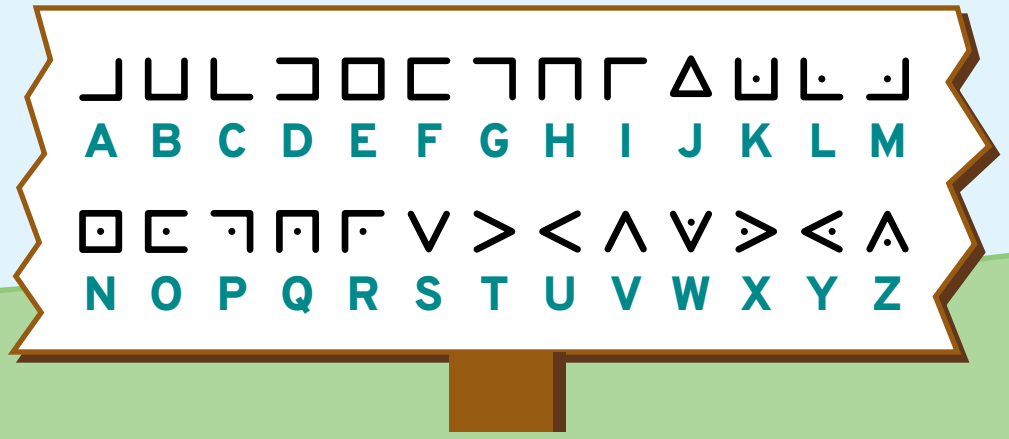
To get to it, you need to drill a well into the soil, sand, and rocks under our feet.

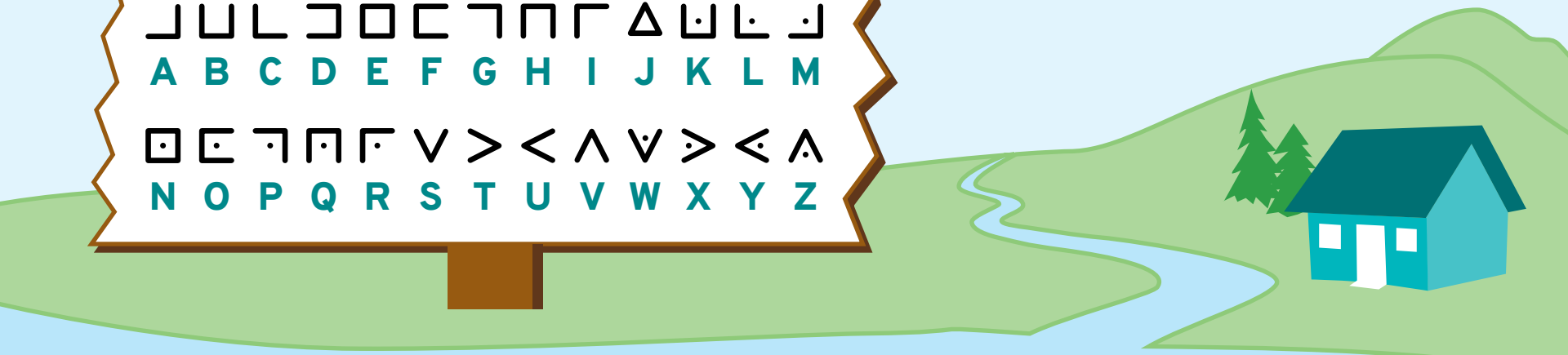
You've Found a FUN FACT!

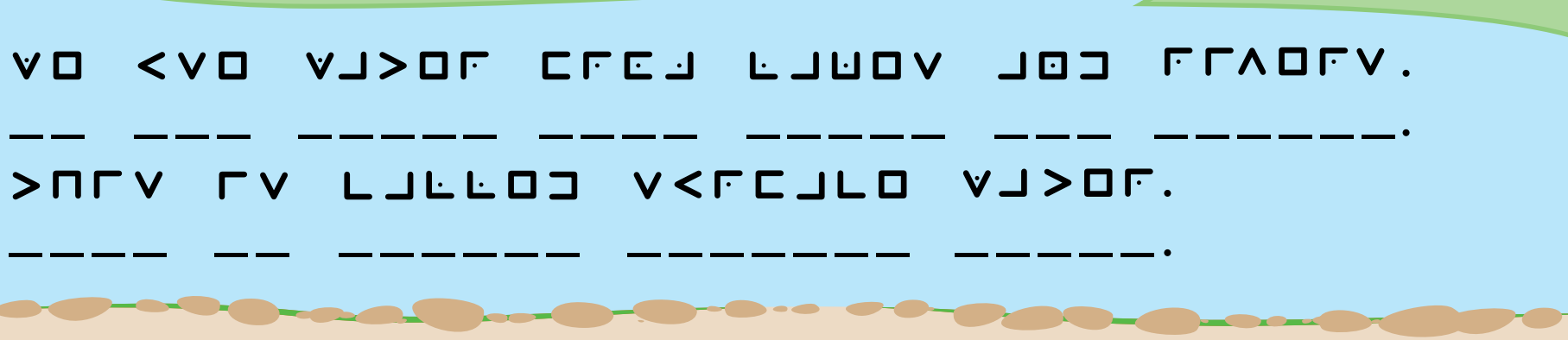
Some people use groundwater every day. Even more people use it some of the time. It just depends on which provider supplies water to your home, school, library... well, everywhere you go!

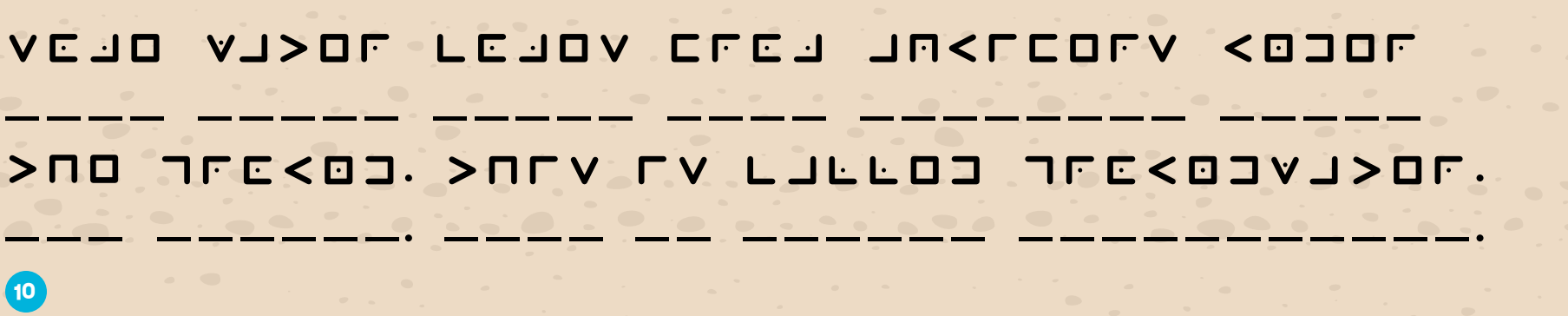
Crack the Code

Turn on a faucet and water flows.
But where does it come from?
Decode the secret messages below to find out.





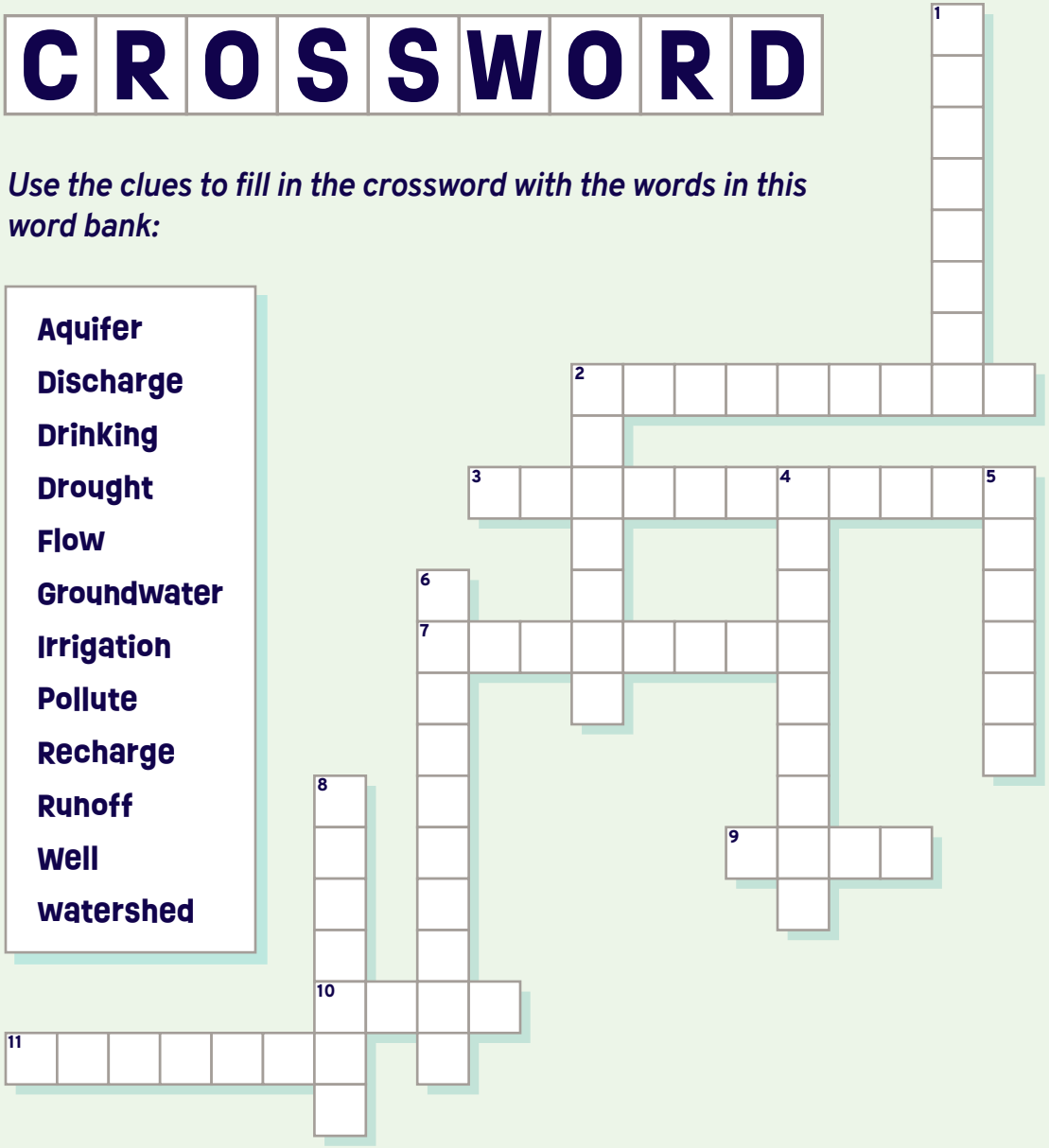




Water CROSSWORD

Use the clues to fill in the crossword with the words in this word bank:

- Aquifer
- Discharge
- Drinking
- Drought
- Flow
- Groundwater
- Irrigation
- Pollute
- Recharge
- Runoff
- Well
- watershed



ACROSS

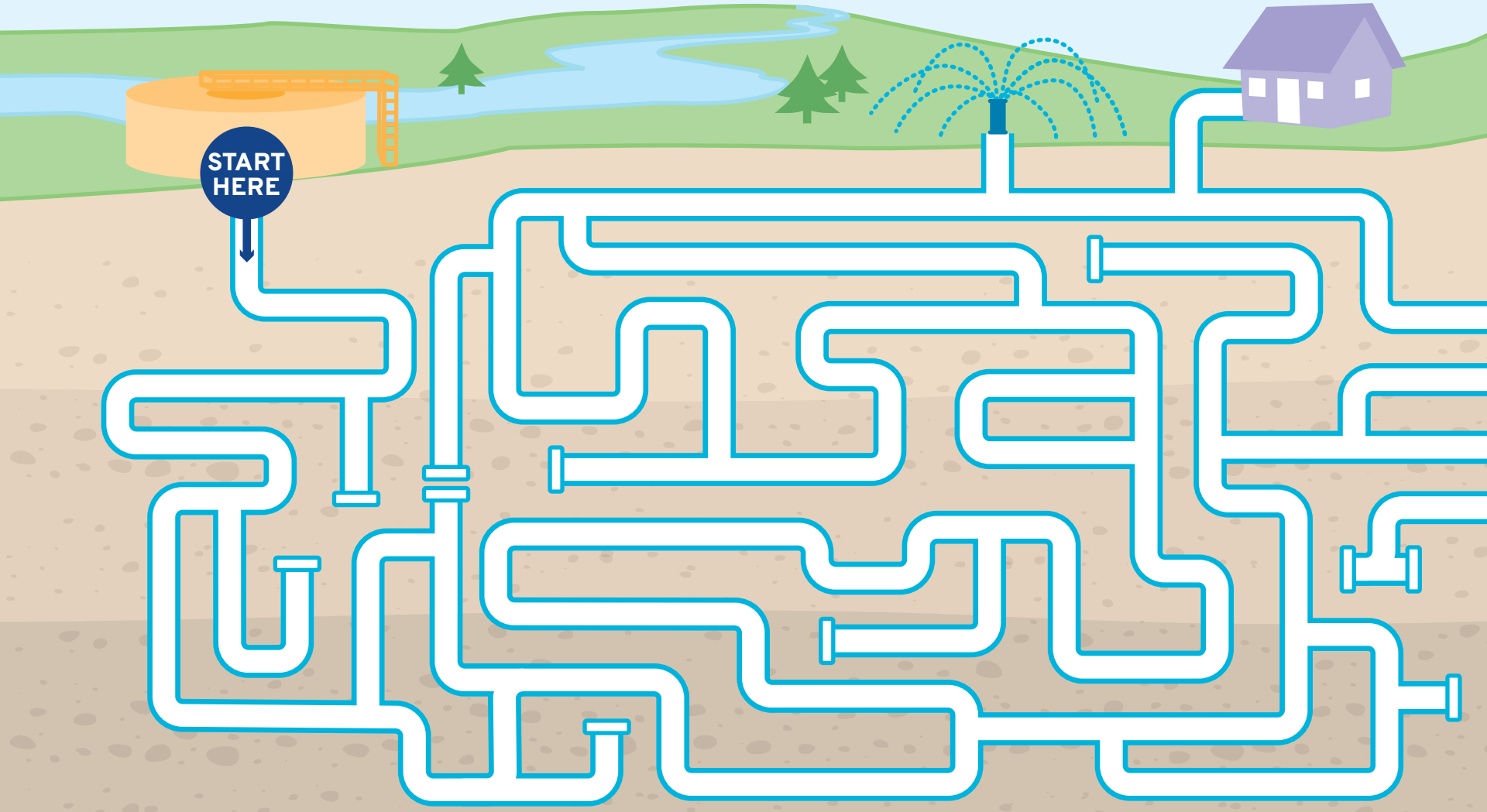
2. Groundwater leaves the ground and enters a lake or stream in a _____area
3. Type of water that is found deep underground in an aquifer
7. Part of the water cycle when water soaks deep into the ground refilling the spaces between rocks and sediment in underground aquifers
9. Name for a deep hole in the ground that people built to get groundwater from an aquifer
10. Word used to describe the movement of water from one location to another
11. To _____is to add a harmful substance to water that makes it dirty or unsafe to use

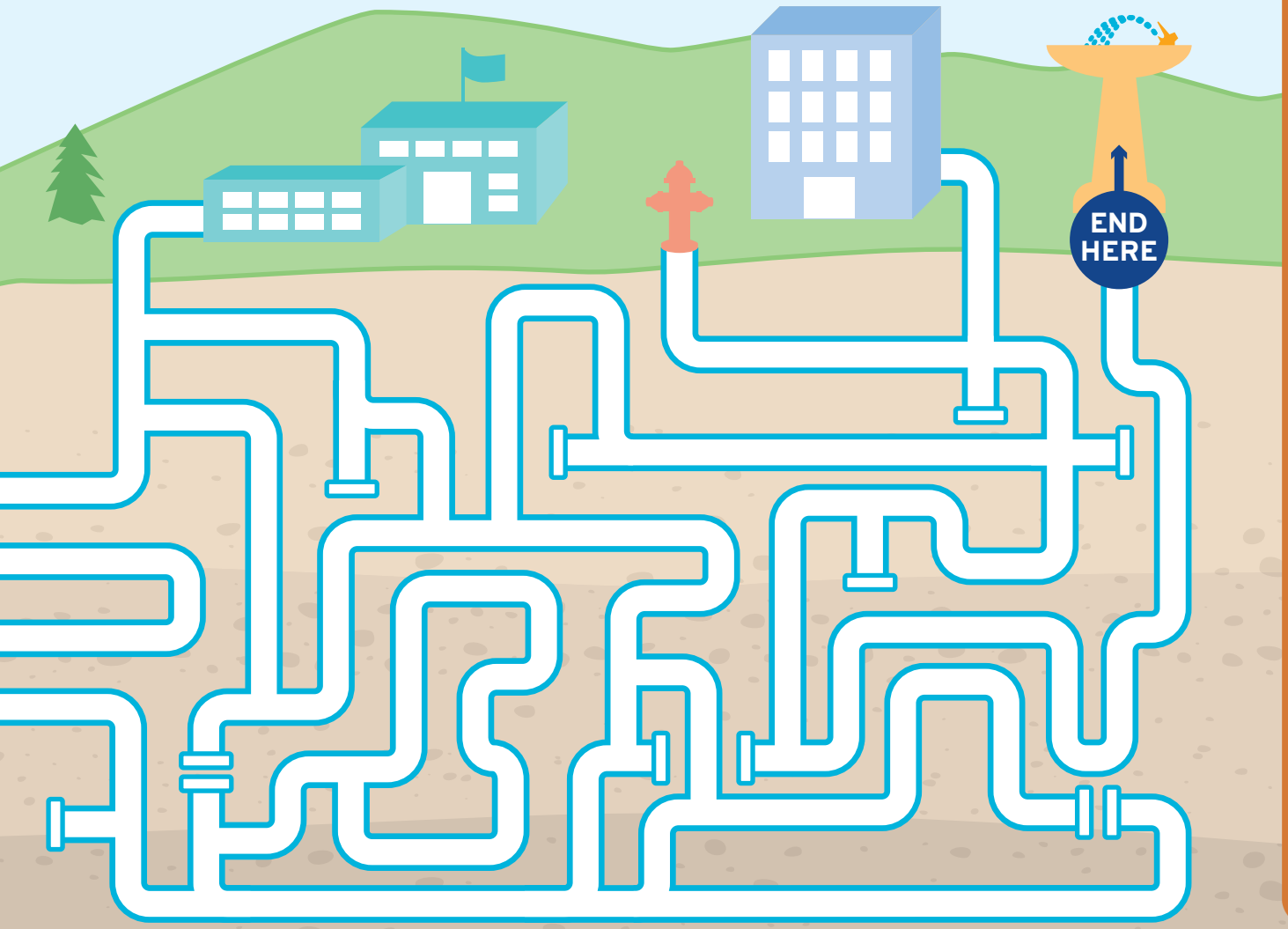
DOWN

1. Groundwater is an important source of _____water for many Oregon communities
2. Name for a long period of dry weather that causes a water shortage
4. An area of land where water (like rain or snowmelt) collects in one place
5. Water on the Earth's surface that flows over the ground instead of soaking into the soil
6. Name for when people add water to crops or other plants to help them grow
8. Place where groundwater is found that is made up of many layers of soil, sand, and rock

Amazing Water

Hundreds of miles of pipe keep our drinking water flowing, right beneath our feet! Can you trace the path of the drinking water from the reservoir to the water fountain? Be sure to stop at the sprinkler, house, school, hydrant, and office building along the way. Our water system is all connected — isn't that amazing?





Words to Know

Treatment plant
[TREET-muhnt plant]
A place that brings in water from a source (like a river or stream) and cleans it to make it safe to drink.

Pipes [pIEps]
Tubes that move water from its source to your tap (sinks, showers, water fountains, and more).

Storage capacity
[STOR-ij kuh-PASS-uh-tee]
The total amount of water that a reservoir can hold.

Reservoir [REZ-uhr-vwar]
A place that stores water, such as a tank, pond, or lake. It can be natural or built by people. Some reservoirs are above ground, and some are buried under the ground.

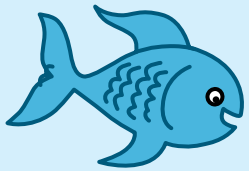
You've Found a FUN FACT!

Underground pipes bring drinking water to almost 500,000 homes and businesses across the region.

Water Words

Draw a line to connect each description to the correct word.

Need a hint? Find descriptions for all of the words in this book.



well

storage capacity

water system

hydrant

treatment plant

reservoir

pump station

pipes

dam

water meter

A hole drilled into the ground to reach an underground water source

An upright pipe that can provide firefighters with water from underground pipes

Tubes that come in many sizes and carry water from its source to local schools, businesses, and homes

A facility that makes water safe for people to use and drink

A structure that holds back water on a river

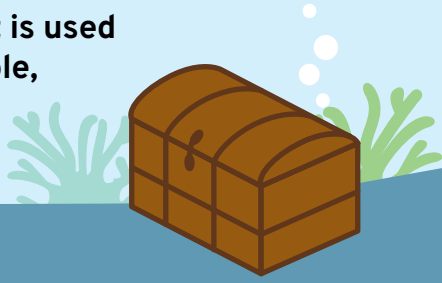
A natural or built place that stores water, like a tank, pond, or lake

A device that measures how much water a home or business uses

The amount of water that tanks and reservoirs can hold

A series of connected pipes, storage tanks, pumps, and other parts that delivers water to homes, schools, and other buildings

A building with pumps and other machinery inside that is used to move water from one location to another (for example, up or over a big hill)



Water Word Search

Look across and down to find the water words in the puzzle below.

AQUIFER
CONDENSATION
CONDUIT
CONSERVATION
CONSUMPTION
CONTAMINATION
DISINFECTION
DISTRIBUTION
DROUGHT
EVAPORATION
GROUNDWATER
HYDRANT
INTAKE
IRRIGATION
PIPES
POTABLE
PRECIPITATION
PUMP
RESERVOIR
SOURCE
SURFACE WATER
TRANSMISSION
TREATMENT PLANT
VALVE
WATER CYCLE
WATER METER
WATER SYSTEM
WATERSHED

See a word you don't know? Find its definition in this book.

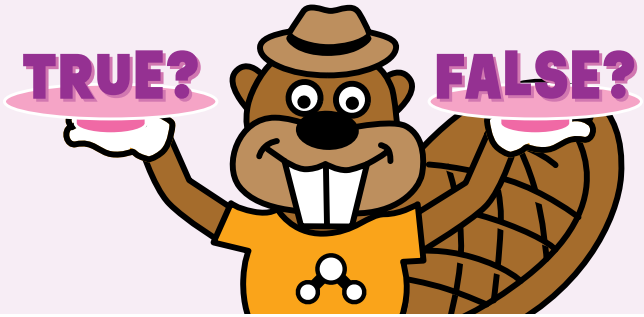
W	T	R	E	A	T	M	E	N	T	P	L	A	N	T
A	T	E	P	W	A	T	E	R	S	H	E	D	R	I
S	S	U	R	F	A	C	E	W	A	T	E	R	O	U
I	O	R	E	W	E	O	C	A	R	I	T	T	H	S
R	U	N	C	A	U	N	O	M	B	N	E	R	R	O
R	R	N	I	T	E	D	N	N	A	T	T	A	U	D
I	C	R	P	E	A	E	S	L	R	A	E	N	S	I
G	E	O	I	R	U	N	U	G	R	K	W	S	D	S
A	C	E	T	M	T	S	M	R	H	E	A	M	R	I
T	D	A	A	E	V	A	P	O	R	A	T	I	O	N
I	I	T	T	T	I	T	T	U	E	Q	E	S	U	F
O	S	S	I	E	P	I	I	N	S	U	R	S	G	E
N	T	P	O	R	O	O	O	D	E	I	C	I	H	C
W	R	U	N	H	T	N	N	W	R	F	Y	O	T	T
P	I	M	Y	I	A	D	O	A	V	E	C	N	M	I
I	B	P	Y	B	B	E	S	T	O	R	L	T	T	O
P	U	O	V	A	L	V	E	E	I	U	E	S	E	N
E	T	I	T	W	E	I	S	R	R	E	L	Y	E	V
S	I	E	W	A	T	E	R	S	Y	S	T	E	M	R
C	O	N	S	E	R	V	A	T	I	O	N	Y	T	I
M	N	C	O	N	T	A	M	I	N	A	T	I	O	N
H	Y	D	R	A	N	T	E	C	O	N	D	U	I	T

Moving across the rows from left to right, use the remaining letters to fill in the blanks below and reveal the hidden message.

_____ __ ___ _____, _ _____ ___ _____ _____.

____ __ ___ _ __ __ ____ __ ___ __ _____ _____ ____.

Know Your H_2O



Some of the statements below are true. Others are false.
Circle **T** for True or **F** for False for each statement below.

As air rises and cools, the water vapor in it will condense and turn into clouds.	T *or* F
When the sun dries up water in lakes and streams, it turns into ice.	T *or* F
Groundwater is an important source for drinking water in our region.	T *or* F
Snow isn't a type of precipitation.	T *or* F
Water molecules are made up of 2 hydrogen atoms and 1 oxygen atom.	T *or* F
The water you drink has been around for millions of years.	T *or* F
Half of the water on Earth is freshwater that people can drink.	T *or* F
The water from your kitchen faucet and the water from your bathroom faucet come from the same water source.	T *or* F
Most water used at home is used in the kitchen.	T *or* F

You've Found a FUN FACT!

Less than one percent of the Earth's water is fresh (not saltwater like the oceans) and can be used for drinking.

How Water Smart Are You?

Answer the questions to see how much you know about H_2O.
There is only one right answer for each question.

1. When should you run the water while you're brushing your teeth?
   - A. Only to wet my toothbrush and rinse.
   - B. I run the water until I remember to turn it off, about a minute.
   - C. The whole time. Remember to brush for two minutes!

2. What should you flush down the toilet?
   - A. Just the three P's: pee, poop, and toilet paper.
   - B. Sometimes I use it as a trash can for tissues after blowing my nose.
   - C. Money

3. What's the most water-smart way to bathe?
   - A. A five-minute (or less) shower. I get clean and get out!
   - B. A nice bubble bath filled almost to the top of the tub. I need to relax after a long day at school!
   - C. Who needs to bathe, really?

4. When should you do laundry?
   - A. When there's half a load of dirty clothes.
   - B. When there's a full load of dirty clothes.
   - C. Whenever I want to wash my favorite shirt.

5. Which of the following are ways to save water when washing dishes?
   - A. Scrape food off your plate rather than rinsing.
   - B. Run a fully loaded dishwasher rather than washing dishes by hand if possible.
   - C. A and B

6. Why is conserving water at home important?
   - A. It makes sure we have enough for the future.
   - B. It saves water for other uses.
   - C. A and B

7. What should go into a storm drain?
   - A. Gum wrappers
   - B. Rain
   - C. Motor Oil

8. If you see a leak at home or at school, what should you do?
   - A. Nothing – just ignore it.
   - B. Tell an adult so it can be fixed right away.
   - C. Wait a week to see if it stops.

9. On average, where do we use the most water at home?
   - A. Kitchen
   - B. Bedroom
   - C. Bathroom

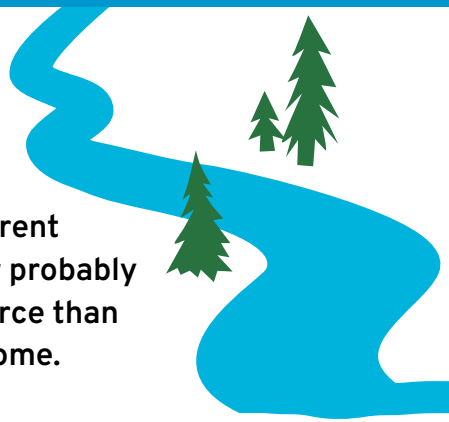
10. Which of the following actions will not conserve water?
    - A. Taking shorter showers.
    - B. Finding and fixing water leaks quickly.
    - C. Turning off the light when I leave the room.

You've Found a FUN FACT!

One of the most common places to find water leaks at home is the toilet.

10 Fun Facts About Water

1 If you visit a friend or family member in a different city, their drinking water probably comes from another source than the water you drink at home.

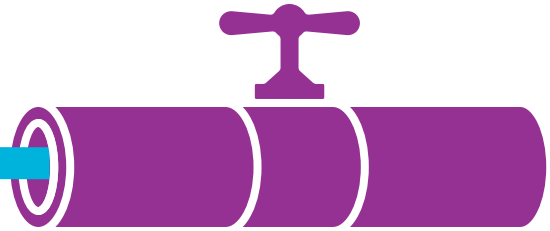


3 The water that we use at home and school is treated so that it is safe to drink.

2 We use 2 or 3 times more water in the summer than in the winter. This is because summertime activities like watering gardens and washing cars use a lot of water.

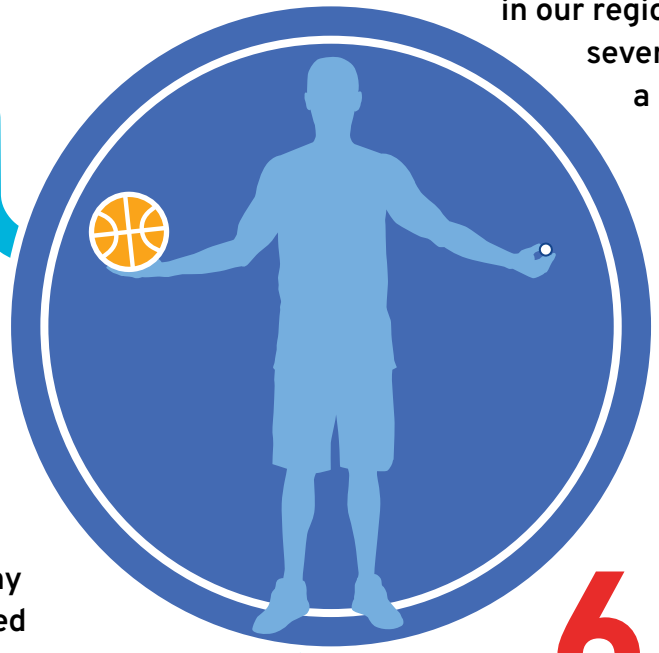
10 There are a lot of rules that make sure your tap water is safe to use and drink. Way more rules than for bottled water! Plus, tap water doesn't come in a plastic bottle, which means less garbage in our landfills.

9 Largest use of fresh water in the United States? Irrigating crops.



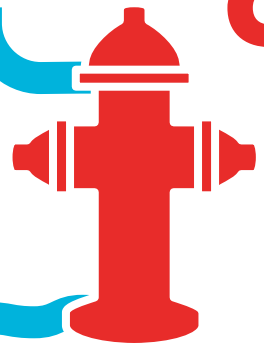
4 There are more than 7,000 miles of water pipes in our region. That's more than the distance from Portland, Oregon, to Portland, Maine, and back!

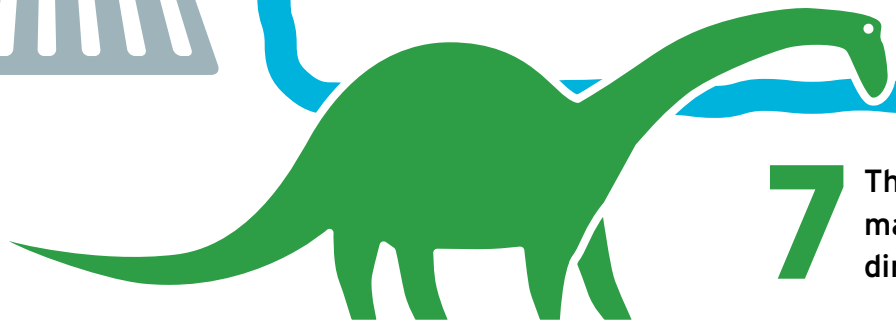
5 Most pipes that bring water into homes are about the size of a quarter. The largest water pipes in our region are over seven feet tall (or just a little taller than most basketball players).



8 Water that goes into many storm drains is not treated before it flows back to our local waterways. Only rain should go down the drain.

6 Many hydrants have the year they were made stamped on them. Can you find the oldest fire hydrant in your neighborhood? How old is it?

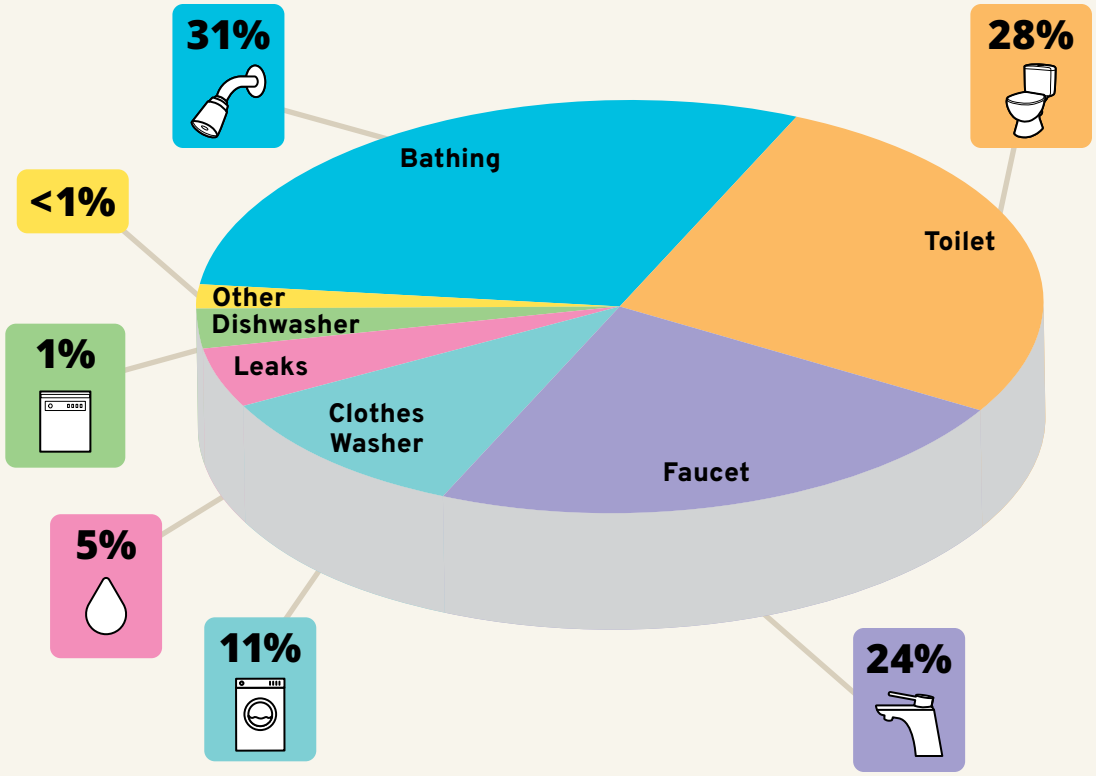




7 The water you drink today could be made of the same molecules that a dinosaur drank millions of years ago.

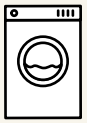
How We Use Water at Home

We all have a role to play in saving water at home. Start by learning about all the different ways we use water indoors and where we use the most water *(hint: it's in the bathroom!)*.



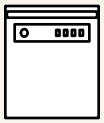
Where do we use the most water at home?

Rank the following from lowest water use (1) to highest water use (5).



Clothes Washer

#



Dishwasher

#

Toilet

#

Bathing

#

Faucet

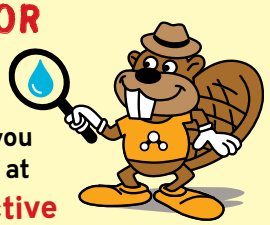
#

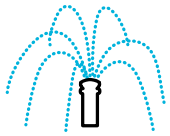
Now it's your turn.

Circle all the ways that your family uses water at home.

CALLING ALL JUNIOR LEAK DETECTIVES!

Are you ready for your first assignment? Find out how you can help find leaks at home at **regionalH2O.org/detective**



drinking		flushing the toilet		taking showers/ baths	
washing hands		cooking		cleaning	
filling a pet's water bowl or aquarium		brushing teeth		doing laundry	
watering indoor plants		watering outdoor plants		car washing	

You've Found a FUN FACT!

Washing a full load of dishes in the dishwasher actually uses less water than washing the same amount of dishes by hand!

10 Ways to Use Water Wisely

bathtub

scrape

refrigerator

brushing

dripping

dishwasher

shower

sprinkler

trash

toilet

dishes

Use the words on the list to the left to fill in the blanks below. Discover what you can do to save water and keep local water bodies healthy with these easy tips:

1. Save water by taking a five-minute _____. If you take a bath, only fill the _____ halfway.
2. Run the _____ only when it's full instead of washing just a few dishes at a time.
3. When watering your lawn or garden, your _____ should only wet the plants, not the pavement.
4. Tell an adult if you see a _____ faucet. Even a slow drip can waste a lot of water!
5. You can help keep local waterways healthy by picking up _____ like candy wrappers or plastic water bottles in your neighborhood.
6. Turn off the water while _____ your teeth. Running the faucet for 2 minutes twice a day can waste more than 20 gallons of water each week!
7. Don't use your _____ as a trash can. Used tissues and baby wipes should go in the wastebasket.
8. Keep a pitcher of cold water in the _____ for drinking instead of running the water at the tap until it gets cold.
9. When possible, wash _____ with a dishwasher instead of by hand. A running faucet can use the same amount of water in just 4 minutes as it takes to do a whole load in the dishwasher!
10. Once you finish a meal, make sure to _____ food scraps into the compost or trash can instead of rinsing them off your plate.

Life Without Water?!

Think about all of the activities you and your family need clean water for each day. How would your life be different without clean water?

Use this page to draw a comic or write 3-5 sentences that describe what a day without water would be like.

Need more room? Use another piece of paper.

Our Water Use + Adds Up +

Solve each problem using addition or multiplication.
The problems are ordered from easiest to hardest.
Some problems are marked as **CHALLENGE** problems.

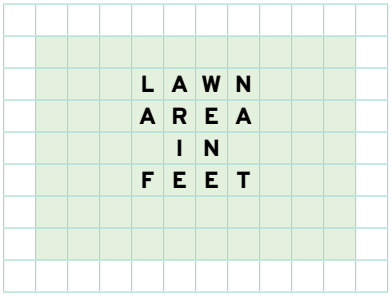
1. The Rodriguez family used 435,697 gallons of water last year. What digit is in the hundreds place? Circle the number below:

   435,697

2. Sam's shower uses 2 gallons of water per minute. If they take a 15-minute shower, how much water do they use?

   A. 15 gallons
   B. 30 gallons
   C. 45 gallons

3. Rakim is watering his family's garden. The garden is 10 feet long and 7 feet wide. What is the area of the garden in square feet?



   A. 17 square feet
   B. 44 square feet
   C. 70 square feet

4. A leaking faucet that drips 60 times per minute wastes 192 gallons of water each month. How many gallons of water are wasted in 3 months?

   A. 384 gallons
   B. 576 gallons
   C. 768 gallons

5. Zack uses around 49 gallons of water each day. About how much water does he use in 7 days? Round Zack's water use to the nearest 10 and solve.

A. 280 gallons
B. 350 gallons
C. 500 gallons

6. Lydia showers for 25 minutes each week. Luis showers for 21 minutes each week. If their showers each use 2.5 gallons of water per minute, how much water do they use in total each week?

PERSON	MINUTES	WATER USE	TOTAL WATER USE
Lydia		2.5	
Luis		2.5	
		Total for both:	

A. 115 gallons
B. 230 gallons
C. 287.5 gallons

7. **CHALLENGE:** The average home toilet uses 1.28 gallons of water per flush. If each person in a family of 4 flushes the toilet 5 times per day, how much water does the family use in total to flush the toilet each day? *Hint: create a table like the one in question 6 to help you solve this challenge.*

8. **CHALLENGE:** Leah's bathtub holds 70 gallons of water when it's full. When Leah takes a bath, she fills her bathtub up ¾ of the way, or 75% full. How many gallons of water does Leah use to take a bath?

More Words to Know

Aquifer [AK-wuh-fuhr]
Underground layers of rock and sediment (like sand and gravel) that hold groundwater.

Cloud [klowd]
As air rises and cools, the water vapor in it will condense into tiny water droplets. The drops move closer to each other to form clouds. It takes billions of drops to make a cloud!

Conduit [KAHN-doo-wit]
A very large pipe that moves water from the source to treatment plants and then to town.

Contamination [kuhn-tam-uh-nAY-shuhn]
When something harmful (called a "contaminant") gets into water and makes it unsafe to drink.

Consumption [kuhn-SUMP-shuhn]
The amount of water used by a person, family, business, or school during a period of time. Water consumption is measured with a water meter.

Dam [dam]
A structure built to hold back water on a river.

Disinfection [dis-in-fek-shuhn]
The act of destroying harmful microorganisms (like germs).

Distribution system
[diss-truh-BYOO-shuhn SISS-tuhm]
Pipes that carry water to homes, businesses, fire hydrants, and other water users.

Drought [drowt]
A long period of dry weather that causes a water shortage over time, leading to negative effects on plants, animals, and people.

Fire hydrant [FIGH-uhr HIGH-druhnt]
An upright pipe where firefighters can connect to a water supply, sometimes just called a "hydrant."

Flow [flOH]
The movement of water.

Groundwater discharge
[GROWND-wah-tuhr diss-CHARj]
Water flowing out of aquifers into surface water (like rivers or lakes) or onto the Earth's surface.

Intake [in-tAYk]
The place where surface water is pulled from its source into a pipe.

Irrigation [EEr-uh-GAY-shuhn]
When people add water to crops or other plants to help them grow.

Pollution [puh-LOO-shuhn]
When a harmful substance is added to water making it dirty or unsafe.

Potable water [POH-tuh-buhl wah-tuhr]
Water that is safe to drink.

Pump [pump]
A machine that moves water from one location to another or increases water pressure. The building pumps are in is called a pump station.

Runoff [RUN-ahff]
Water that flows over the ground instead of soaking into the soil.

Transmission system
[tranz-MISH-uhn SISS-tuhm]
Large water pipes that carry water from sources, treatment plants, or pumps to storage areas like tanks and reservoirs.

Valve [valv]
A device (like a gate) that controls the flow of water through a pipe by opening and closing.

Water conservation
[wah-tuhr kahn-suhr-VAY-shuhn]
Using water wisely by saving it whenever you can.

Water meter [wah-tuhr mee-tuhr]
A device used to keep track of the amount of water passing through a pipe.

Water system [wah-tuhr SISS-tuhm]
A water system can be natural or built by humans. A natural water system is a river and all its branches. A built water system is a series of pipes, tanks, pumps, and hydrants that are connected together to deliver water.

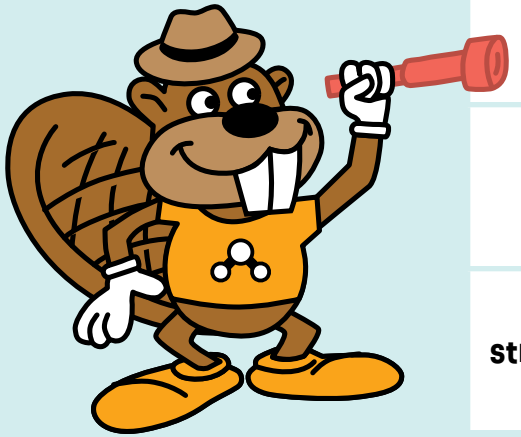
Watershed [wah-tuhr-shed]
An area of land where water (like rain or snowmelt) collects in one place like a stream, lake, or river.

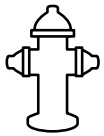
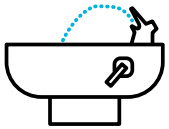
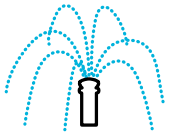
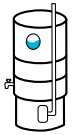
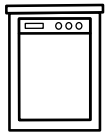
Water vapor [wah-tuhr VAY-puhr]
Water in gas form.

H_2O Scavenger Hunt

Now that you know more about your drinking water, it's time to do a water scavenger hunt! How many of the following items can you find in and around your home, school, and neighborhood?

Be safe! Let an adult know before you start your search, or bring them with you!



fire hydrant		water tank (outside)		drinking fountain	
showerhead		garden hose		reusable water bottle	
clothes washer		steam		outdoor water spigot	
water meter lid		sprinkler		home water heater	
toilet		faucet		puddle	
glass of water		ice cube		pet water bowl	
river, stream, lake, or pond		dishwasher		cloud	

The Regional Water Providers Consortium provides leadership in the planning, management, stewardship, and resiliency of drinking water in the Portland, OR metropolitan region.

Get more information and resources at **regionalH2O.org**.

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