Earth Issues: Our Lifestyles and the Environment

An Environmental Education Manual For Children Grades K Through 5

Original version developed by
CVRD, Engineering Services

Adapted for the RDN, 2008
with permission from the CVRD

Introduction

Purpose of the Program

This manual was put together with the belief that children can make a difference! The intended outcome for students is a better understanding of their individual actions and related impacts on our water resource. The quantity and quality of water resources are directly impacted by human activity including the amount each of us uses from day to day. Through the use of this manual we hope to give children the incentive to 'do their part' and the power to influence others to do the same.

Goals of the Program

- Provide useful background information on environmental issues allowing educators to instruct comfortably and in a relatively short period of time.
- Supply current, local and accurate information, in addition to background facts.
- To present separate sections on different topics to allow instructors to focus on a subject of choice if time is limited.
- Offer grade-specific activities and worksheets that are easily implemented and linked to the Provincially prescribed Integrated Resource Packages (IRP's).

Why We Do It

- It's good for the environment!
- Education, awareness and communication are fundamental components of developing a sustainable lifestyle for any community.
- The environmental education manual gives local government the opportunity to convey information about local environmental issues directly to community members.
- Each of us has a moral obligation to preserve the environment and its resources for future generations.

For Additional Information Please Consult:

Regional District of Nanaimo – Environmental Services Dept.
6300 Hammond Bay Road Nanaimo, BC V9T 6N2
Phone: (250) 390-6560 Toll-Free: 1-877-607-4111 Fax: (250) 390-1542 Email: envsrv@rdn.bc.ca

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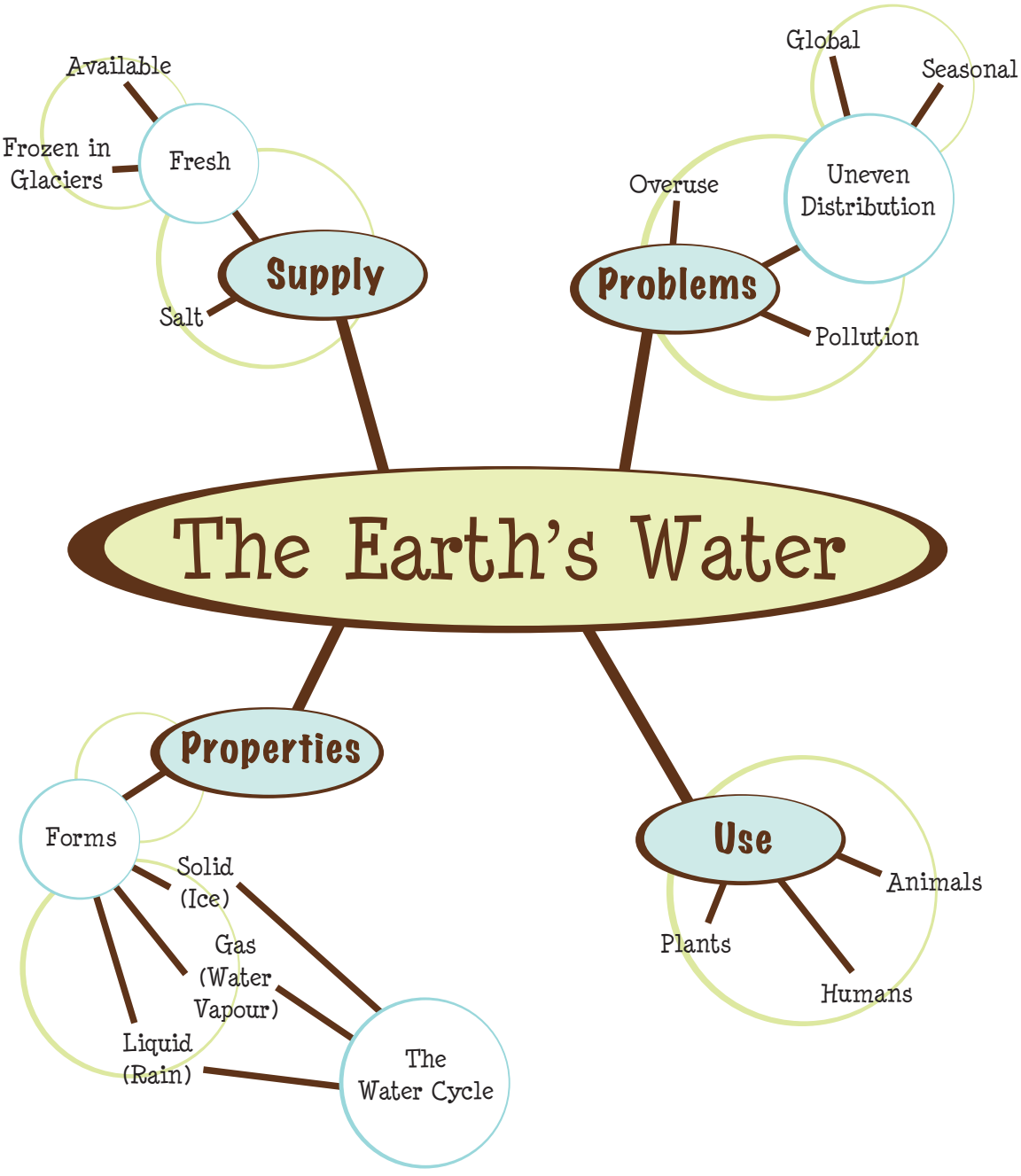
Acknowledgments

This manual was adapted from the Cowichan Valley Regional District's environmental guide entitled *Earth Issues: Our Lifestyle and the Environment.* The Regional District of Nanaimo would like to thank the CVRD's Engineering Services for generously allowing adaptation of this manual.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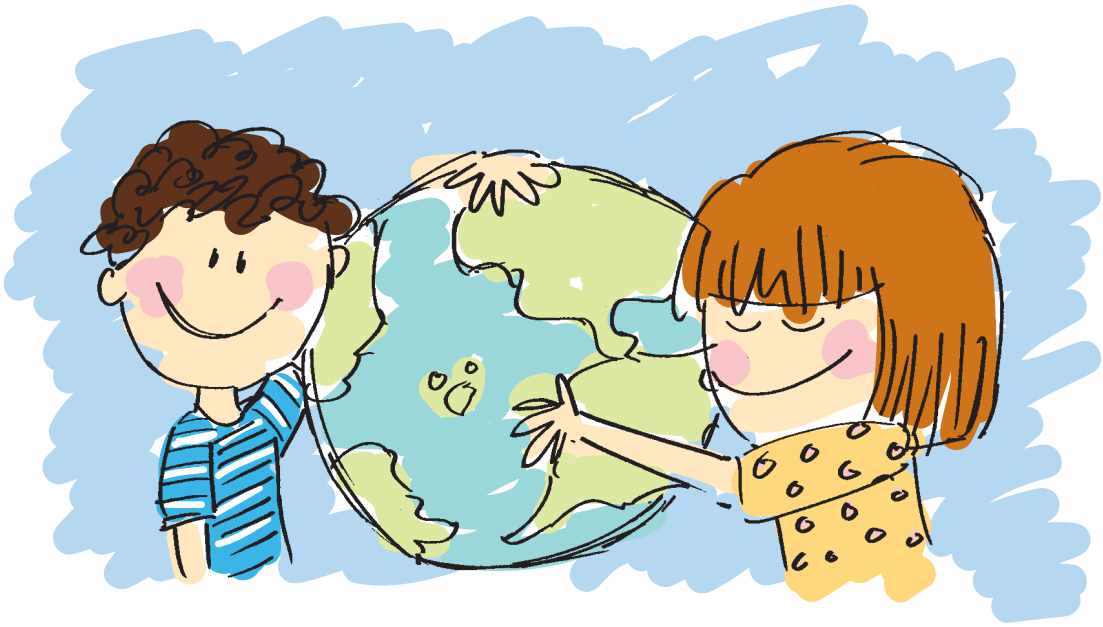
The Earth's Water

Objectives

After this section, students should be able to:

- Understand how water is recycled within the environment.
- Describe the impact of human use on water quality and provide examples of source/non-source pollution.
- Demonstrate how practices they carry out at home can reduce water consumption and preserve the integrity of this resource.
- Explain why saving water and keeping it clean helps protect people and wildlife.

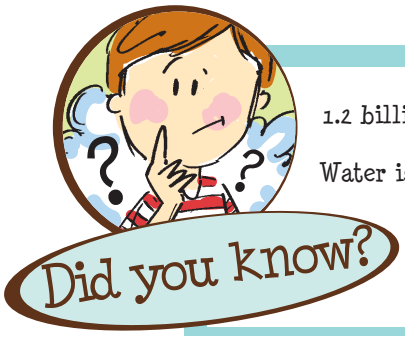


Water Vocabulary & Definitions

Conserve	To save or protect from harm or over-use and to avoid waste. E.g. Turning the tap off while brushing your teeth, or re-using a plastic bag instead of getting a new one at the store.
Groundwater	Water that comes from the ground. Rain, snow, and hail soak deep down into the soil until it can't go any further. It pools together deep underground and makes groundwater.
Natural Resources	Material such as trees, water , or the gas that runs your parents' car. These materials are valuable (cost money) and are used to make things useful to people. A shortage of natural resources can occur if we do not conserve the amount we use.
Pollution	Something that is harmful to humans, animals, plants, and trees. Pollution can get into our air, water or food. Smoke from burning leaves in your backyard, or leachate from landfills are both examples of pollution.
Renewable Resource	A natural resource that can replace itself as it is used. Trees are an example of a renewable resource. If we overuse a renewable resource, it may not replace itself to levels that can be used by humans.
Sewage	Used water and other material from toilets, bathtubs, washing machines and sinks that goes down the drain.
Water Cycle	A process where water from lakes, oceans and streams, evaporates into clouds. Once the clouds get too heavy they release all the water as rain and snow. The rain and snow falls into the ocean, lakes, rivers and soil only to repeat the cycle again!

1. The Water Cycle

Water always circulates through the water cycle (hydrologic cycle). It evaporates from oceans, falls on land as rain or precipitation, and returns to the sea by groundwater and rivers. Throughout the cycle, water continually changes from solid to liquid to gas over and over. Water is considered a renewable resource, but it must be conserved since it's not always returned where and when it is needed. Also, because the water we do use always returns with some degree of water quality decline, the less we use, the less we pollute. Using and degrading as little water as possible will allow us to spend less money restoring water to acceptable public standards, as well as avoid the upset of our natural ecosystems.



1.2 billion people in the world have no access to clean water.

Water is important to humans because it helps regulate our body temperature, carries food to organs and oxygen to body parts. It also helps us digest our food and remove waste from our blood. Without water, none of these things could happen.

The Water Cycle Vocabulary & Definitions

Condensation	Condensation is the process of water changing from a vapor to a liquid. As the vapor rises into the sky the temperature cools and the vapor changes into tiny water droplets that form into clouds.
Evaporation	The heat from the sun causes water to change from a liquid to a vapor. When water changes form like this it is called evaporation. Because the vapor is so light, it rises into the sky (atmosphere).
Infiltration (Recharge)	Some of the precipitation that reaches the Earth's surface seeps into the ground. This is a process called infiltration. It is important because it replenishes groundwater sources. Many people living in the RDN get their drinking water from a groundwater source.
Precipitation	When the tiny water droplets in clouds become too heavy, it falls to the earth as rain, snow, sleet or hail. This is called precipitation.
Runoff	This is the water we see filling streams, rivers, lakes and oceans.

The Water Cycle

The substances we put in our gardens (like pesticides and herbicides) are soaked up by plants through roots, but they often soak into the soil and groundwater, or flow into streams, lakes and oceans. Harmful substances do not go away when you flush the toilet or empty the sink; they end up in nature where they could potentially harm plants, animals or people.

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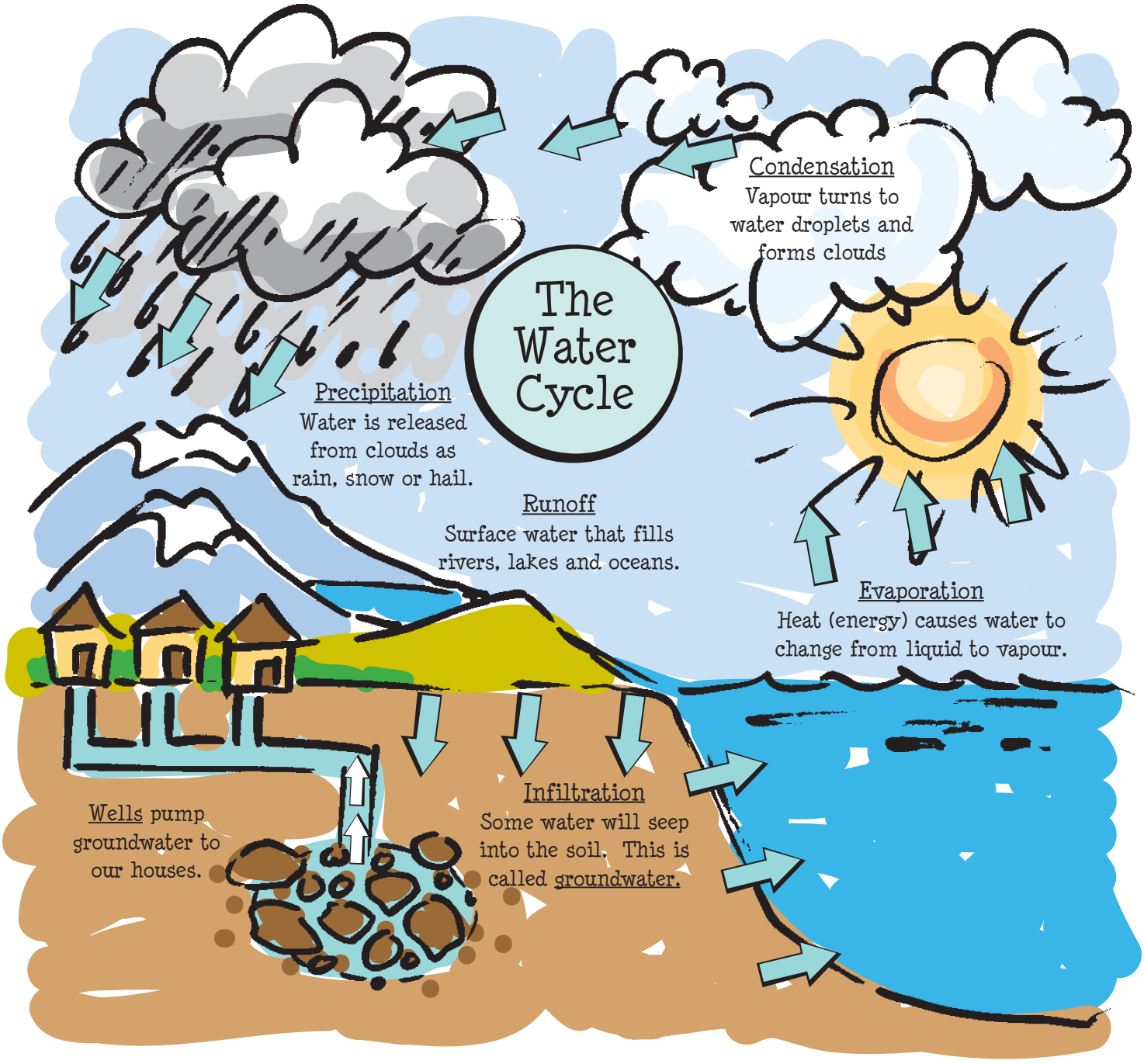
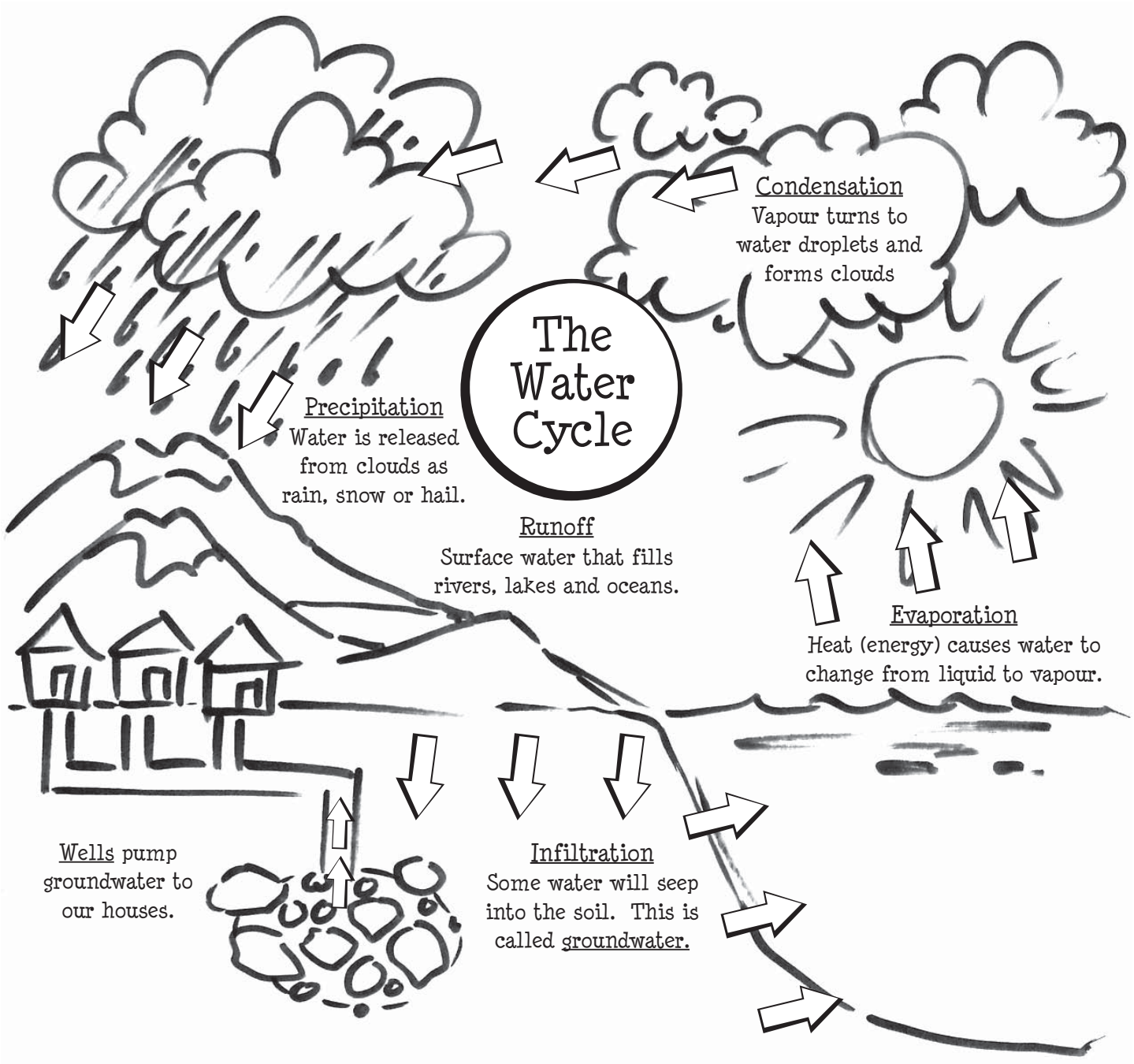


Water is constantly moving. For example, it can move quickly in a river or stream, especially after a heavy rainfall. Water can also move slowly like when seeping through the ground towards an aquifer. The above diagram is a simplified illustration of the water cycle. There are many places that water can be stored during the water cycle. Can you think of one?

1) Icecaps and Snow 2) Swamps and Wetlands 3) Plants



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A Mini-Water Cycle (4-5)

Materials

Aquarium or wide mouth jar with lids (or elastic bands with plastic wrap), gravel, moss, plants. Enough for each group of students.

Activity

To help students understand the water cycle and its importance to life, ask the students to construct a mini-water cycle. Place about 3 cm each of gravel, soil and moss (in that order) into the jar or aquarium. Plant daisies, ferns, buttercups, or other small flora in the jar. Water the plants with a spray bottle and cover. The plants will absorb moisture from the soil and discharge it through their leaves. Watch the water droplets collect on the inside of the container and fall back to the soil. In the earth's water cycle, this is known as condensation and precipitation. Get the students to observe their plants for a few weeks. What would happen if they added something to the water? Explain that this is a closed system; whatever you put in stays in.

IRP Outcomes

[SS] Demonstrate understanding of sustainability, stewardship, and renewable versus non-renewable natural resources.

[SC] Describe potential environmental impacts of using BC's living and non-living resources.

[MA] Recognize patterns in the environment.

2. Groundwater

Beneath us, there is something so important that we couldn't live here without it. You can't see it and you may not know it is there. It is groundwater. For many British Columbians, the water in your house taps comes from a groundwater source.

Groundwater is precipitation (rain, snow or sleet) that seeps into the soil below us. It moves downward (because of gravity) and fills up the spaces between particles of rock, gravel, sand and soil. The water in the lake or river that we see is called **surface water.**

These areas underground that hold a lot of water, and can be pumped with a **well** are called **aquifers**. The area above an aquifer is called the **unsaturated zone**. It still has water and you'll find plant roots here but not enough water to be pumped by a **well**.

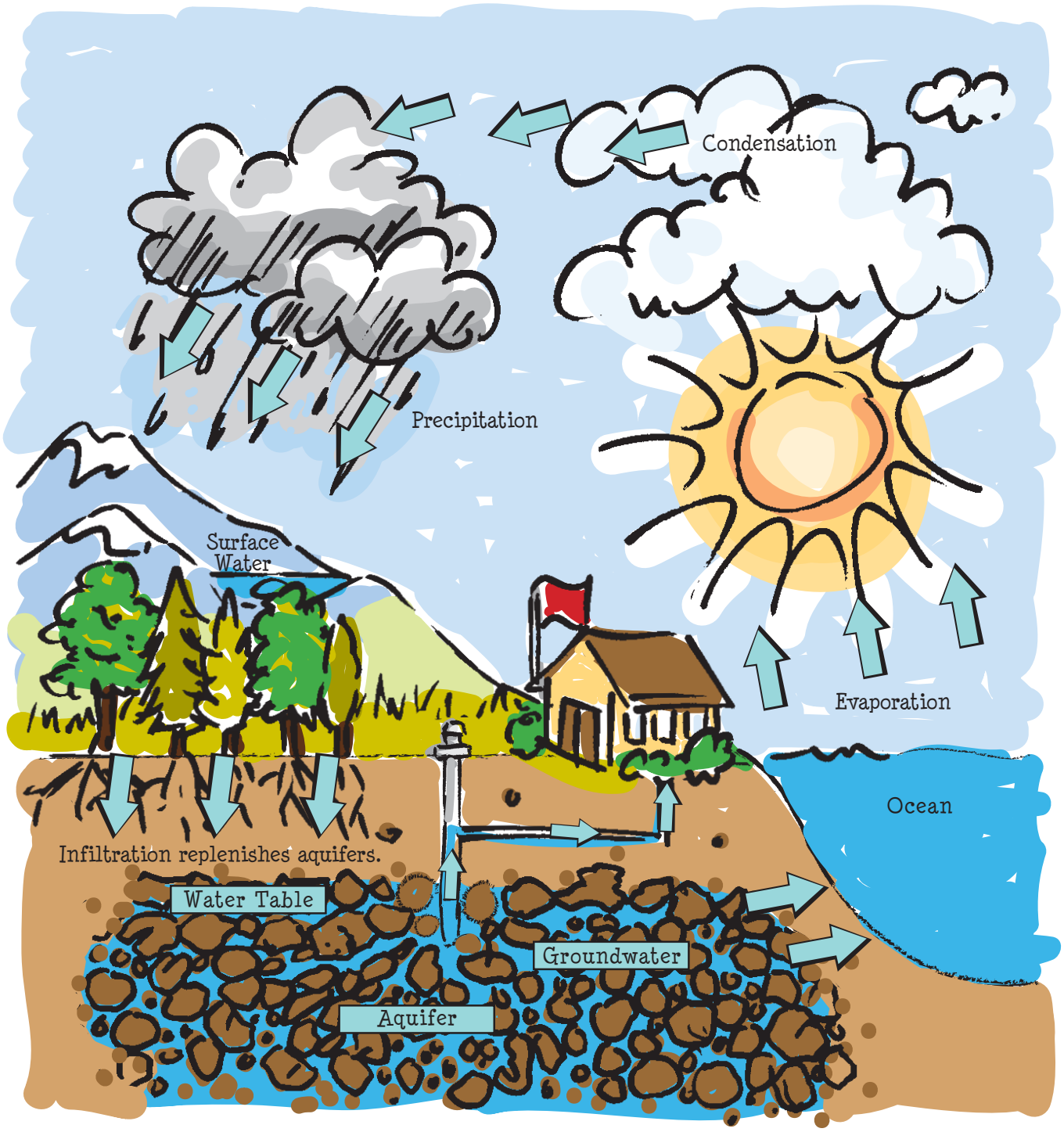
Groundwater and **surface water** can trade places. Groundwater can move through the ground into the ocean, or a lake, or stream. Surface water, like in a lake, can soak down into the ground and become groundwater.

Contamination and Pollution

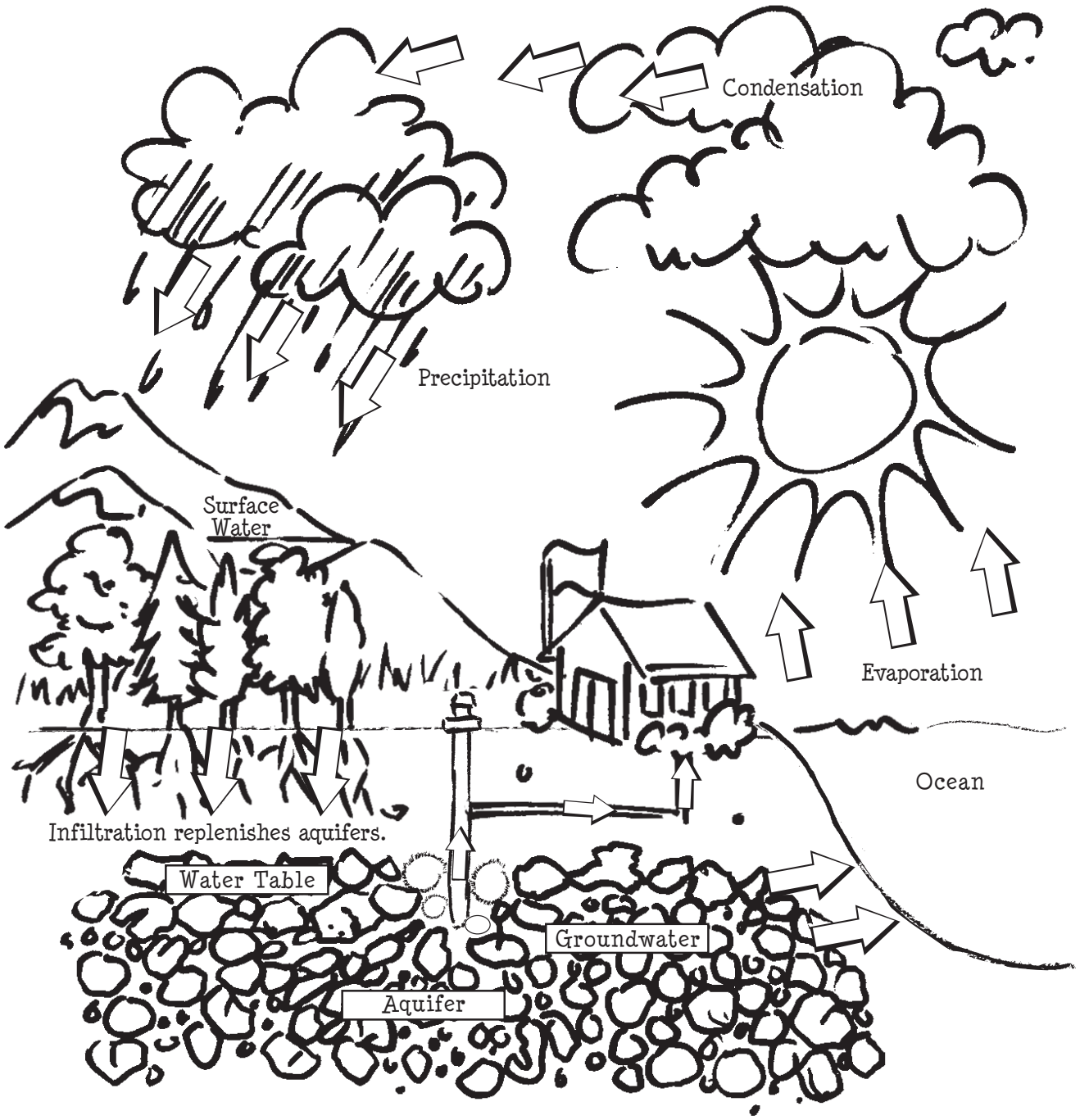
It's possible that anything seeping or leaking into the ground can cause groundwater to become polluted. This is why everyone must be careful about what they put on their lawns, the ground, and down their sinks and toilets.

Groundwater Vocabulary & Definitions

Aquifer	Areas underground with rock types that can hold large quantities of water. This water can be pumped with a well to provide people with a water supply.
Groundwater	Precipitation (rain, snow or sleet) that seeps into the soil below us. It moves downward (because of gravity) and fills up the spaces between particles of rock, gravel, sand, and soil. This water can be pumped with a well.
Surface Water	Water that is on the Earth's surface, such as a stream, river or lake.
Unsaturated Zone	The zone immediately below the Earth's surface where the pores contain both water and air, but are not totally soaked with water.
Water Table	The level of groundwater that is closest to the Earth's surface.
Well	A hole or shaft drilled into the ground for the purpose of withdrawing underground water supplies.



One in four people in BC rely on a groundwater source for drinking water. Groundwater is 'recharged' when a portion of water that falls as rain or snow seeps into the subsurface soil and rock. The amount of water that reaches aquifers depends on the amount of rain that falls, the types of soils present, and the amount of water that the soils already hold. If rains have occurred for a long time period the ground may be 'saturated.'



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Edible Earth Parfaits (4-5)

Objective

To teach about the geologic formations in an aquifer, how pollution can get into groundwater and how pumping can cause a decline in the water table.

Background

This 20 minute activity is a fun and easy way to understand the geology of an aquifer. You will build your own edible aquifer, learn about confining layers, contamination, recharge and water tables.

Materials

Blue/red food coloring (or substitute with red, grape or orange soda), vanilla ice cream (one 5-quart bucket yields 60 aquifers at one generous scoop per student), clear soda pop (7-Up, Sprite, etc), small gummy bears (or substitute chocolate chips, crushed cookies, cereal, crushed ice) to represent sand and gravel, a variety of coloured cake decoration sprinkles and sugars, drinking straws, clear plastic cups, ice cream scoop, spoons.

Activity

Fill a clear plastic cup 1/3 full with gummy bears, chocolate chips, or crushed ice (represents gravels and soils). Add enough soda to just cover the candy/ice. Add a layer of ice cream to serve as a "confining layer" over the water-filled aquifer. Discuss what a confining layer is/does.

Add more "sand/gravel" on top of the "confining layer." The "confining layer" is usually dense clay or rock. Water moves very slowly through this layer. Coloured sugars and sprinkles represent soils and should be sprinkled over the top to create the porous top layer (top soil). Now add the food coloring to the soda. The food coloring represents contamination. Watch what happens when it is poured on the top of the "aquifer." Point out that the same thing happens when contaminants are spilled on the earth's surface.

Using a drinking straw, drill a well into the center of your aquifer. Slowly begin to pump the well by sucking on the straw. Watch the decline in the water table. Notice how the contaminants can get sucked into the well area and end up in the groundwater by leaking through the confining layer.

Now recharge your aquifer by adding more soda which represents a rain shower.

Review what you have learned as you enjoy eating your edible aquifer.

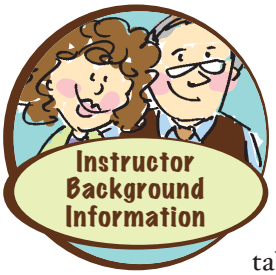
Warning: Check with your students before conducting this activity to see if anyone is diabetic or lactose intolerant. Make substitutions if needed.

Activity Source

Edible Earth Parfaits was adapted from "Making A Bigger Splash," co-published by The Groundwater Foundation and the US EPA, Region VII. For more information, visit www.groundwater.org.

IRP Outcomes

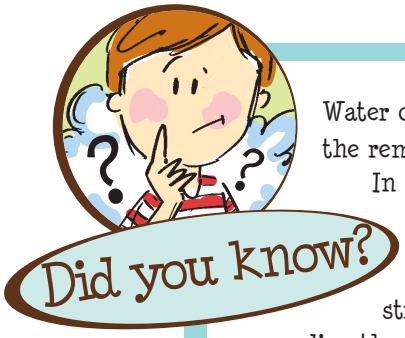
[SC] Analyze how BC's living and non-living resources are used.
[SC] Describe potential environmental impacts of using BC's living and non-living resources.
[SS] Explain why sustainability is important.



3. Water Conservation

The water in our aquifers isn't always at the same level. The top of the water table rises and falls, depending on how much it has rained, or how much we are pumping. What do you think might happen if there isn't much rain, like in the summer? What do you think might happen if people are using a lot of water? If you guessed that the aquifer might run dry, you're right. If the water level drops below the well, water can no longer be pumped from the aquifer and into our homes. This can happen if water is used up faster than it is 'recharged' (remember infiltration in the water cycle). It is called a **water shortage.** A water shortage means that the amount of water available is less than normal. During a water shortage people often must stop watering lawns and gardens, or filling up swimming pools.

To prevent a water shortage we must all conserve water. The term *water conservation* means that water resources will be used and managed in ways that will continue to benefit all of society.



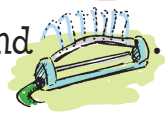
Water covers 70% of the earth's surface. However, 97% of this it salt water. Of the remaining fresh water, a 2% portion of this is polluted or held in ice caps. In total, a mere 1% of the earth's water is available for human use. Canada possesses only 7% of this total.

In forests, less than 1% of rainwater flows directly overland and into streams. In urban areas with pavement, as much as 25% of rainwater flows directly overland and into streams causing a rapid rise and fall of water levels.

Water Conservation Vocabulary & Definitions

RDN WaterSmart	In the Regional District of Nanaimo, we like to be smart about the care, preservation, protection, and use of water resources.
Water Conservation	Reducing the amount of water we use and waste so that good quality water is available for generations.
Water Efficiency	Using water in such a way as to minimize the amount that is used or lost to waste.
Water Shortage	The amount of water available is less than normal and there may not be enough to do regular activities.
Water Table	The level of groundwater closest to the Earth's surface.
Well	A pipe drilled into the ground which allows water to be pumped to the surface.

Water Wonders

 is important! Without  , there would be no  , or  . We need  for  ,  ,  ,  ,  ,  and  .

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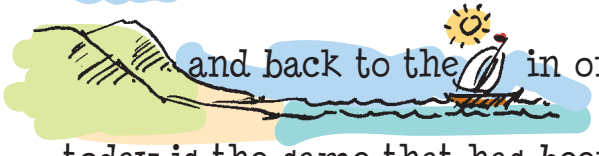
 moves from the  to the  to the  and back to the in one big  . The  on  today is the same that has been around for millions of years.

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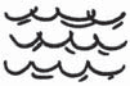
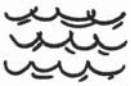
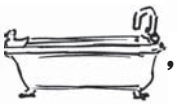
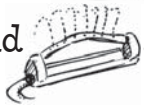
 is important! Without  , there would be no  , or  . We need  for  ,  ,  ,  ,  ,  and  .

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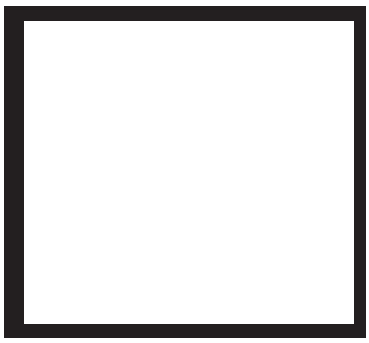
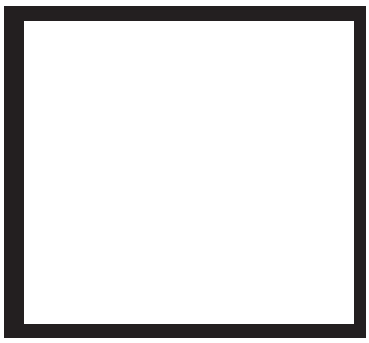
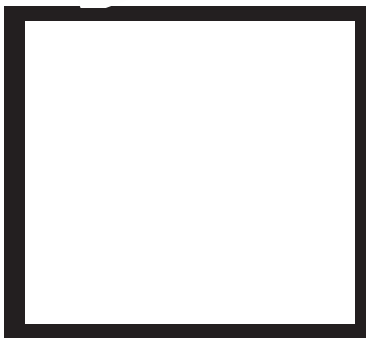
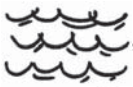
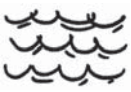
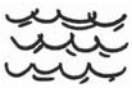
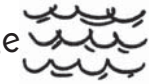




Most of the  is covered in  , but almost all of that  is  .  can't   . So it might like we have lots of  , but really we only have a  .

 moves from the  to the  to the  and back to the in one big  . The  on  today is the same that has been around for millions of years.

 might be  the same  that a drank!

Where Does Your Water Get Used? (K-5)

Materials

A copy of the 'How Water Wise Are You?' handout for each student.

Activity

For Teachers of Younger Students

Ask each question to the group. At the end of each question ask the students what they could do better to help the environment.

For Teachers of Older Students

Get the students to fill out the questionnaire thinking of how they use water at home. After they have finished, discuss what they could do to use less water around their homes.

IRP Outcomes

[SS] Identify strategies to address problems.
[SS] Demonstrate understanding of their responsibility to local and global environments.
[SS] Demonstrate understanding of sustainability, stewardship and renewable versus non-renewable resources.
[SC] Determine how personal choices and actions have environmental consequences.
[PP] Relate consequences to actions and decisions.
[LA] Apply various strategies to generate and shape ideas, new habits and choices.
[LA] Identify connections between ideas and information and their own experiences.

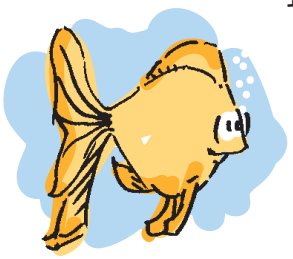
How Water Wise are You?

Fill out the questionnaire by thinking of ways you use water at home.

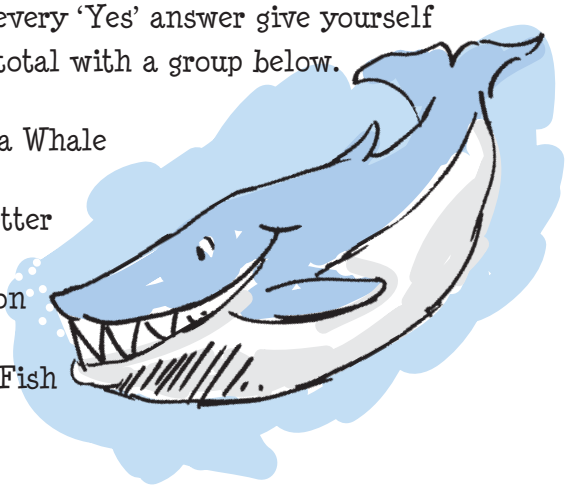
1) Do you turn off the taps when brushing your teeth?	Yes	No
2) After your shower or bath, do you use reuse towels before throwing them into the laundry?	Yes	No
3) Do you take showers rather than baths?	Yes	No
4) Does your shower take less than 5 minutes? (If you have to be reminded to come out then your answer is probably 'no').	Yes	No
5) Do you use the waste bucket rather than flushing garbage down the toilet?	Yes	No
6) If your clothes are clean after wearing them, do you put them back in your room rather than into the laundry?	Yes	No
7) Do you keep a container of drinking water in fridge rather than running the tap each time you want a drink?	Yes	No

Your Water Wise Score

For every 'No' answer give yourself 2 points. For every 'Yes' answer give yourself 0 points. Add up all your points and match your total with a group below.



12 - 14 points	Beluga Whale
8 - 10 points	Sea Otter
4 - 6 points	Salmon
0 - 2 points	Gold Fish



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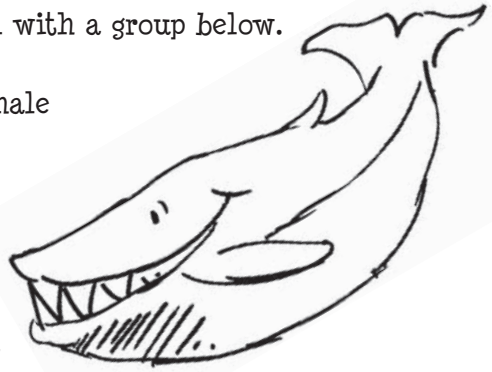
4 - 6 points	Salmon
0 - 2 points	Gold Fish



Reflections - Being Water Wise

Based on your results, what could you do at home to help save water and protect the environment?

Reflections - Being Water Wise

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More Resources

Websites

www.cycleoflife.ca The Cycle of Life website is full of exceptional tools for educators including education manuals, lesson plans, music, and activities.

www.unesco.org/education/tlsf
The United Nations Education, Scientific and Cultural Organization (UNESCO) has an education manual online on global and future sustainability.

www.epa.gov/water/kids.html US Environmental Protection Agency. Water for Kids. This site has educational materials, game and more.

http://ga.water.usgs.gov/edu/index.html The US Geological Survey (USGS) has excellent information on water science.

www.agwt.org The American Ground Water Trust (AGWT) promotes efficient and effective groundwater management.

www.bcgwa.org/waterwell/4conservation.html British Columbia Groundwater Association has an excellent website on Well Water Protection and Groundwater Stewardship for Rural Areas.

www.rdn.bc.ca Learn about Nanaimo's Zero Waste initiatives. This site provides links to other sites committed to Zero Waste. Click on "garbage and recycling".

www.ec.gc.ca
Environment Canada has information on all environmental concerns (by region).

www.cpaws.org Have your students tell their MP's or Prime Minister what they think about a current environmental issue in Canada. They can sign petitions and write letters to show their support.

Books

American Ground Water Trust. Well...What's All That Drilling About?
ISBN (10): 0-9641186-3-7
ISBN (13): 978-0-9641186-3-8
At time of printing this manual Well...What's All That Drilling About? was available online at www.agwt.org

Donnelly, Andrew. Water Pollution.
ISBN: 1567665101

Heindl, L. A. The Water We Live By: How to Manage it Properly
ISBN: N/A

Bloome, Enid. The Water We Drink!
ISBN: 0385003927

Cole, Joanna. The Magic School Bus: At the Waterworks
ISBN: 0590437399, 0590403613