The Water Cycle in Squamish

Grades: 2-7

Subject, Science, Language Arts

Time required:20 minutes

Plus 30 mins. extension

Key Concepts:
The water cycle describes how water moves through its different states: liquid, gas, and solid - driven by the sun's energy. ;.

Objectives:
Students will recognize the limited amount of fresh water that is available to living things

SQUAMISH RIVERS & ESTUARY

Key Words:
water cycle, liquid, gas, solid, drinking

Skills:
Observing, gathering information, interpreting

Background:

In our solar system Earth is called the "water planet": seventy-one percent (71%) of our planet is covered in water. With this much water, it can be easy to forget that only a very limited amount is usable to humans. Water that is safe for human consumption is called potable water.

When our planet formed its oceans some 3.8 billion years ago there was a set amount of water on the earth. That amount remains the same today; the earth is a closed system. This means that there can be no additions or deletions made to the amount of water on our planet; water is a finite resource.

Water is simply recycled through a process called the water cycle, or the hydrological cycle. This cycle connects all forms of water on our planet; it connects the clouds in the atmosphere to the oceans and the rivers to the glaciers. Through this cycle Earth's water moves around the globe and in doing so connects with all the other cycles on Earth.

The water cycle includes all forms of water that can be found on Earth. Starting with water in the form we know best, **liquid**. Water in its liquid form includes all oceans, rivers, lakes, puddles, and the liquid water that forms on the surface of ice (glaciers).

Materials

- water
- 1000 ml beaker
- 50 ml beaker/cup
- 10 ml measure
- Eye Dropper
- Earth Ball
- Paper & pencils

The Water Cycle in Squamish

This water is exposed to the sun. The exposure to the heat from the sun causes it to change form; it changes from liquid to **gas**. The liquid water changes into water vapor, a gas. This process of change from liquid to gas is called **evaporation**. You can see the evidence of this water vapor in the air on cold days in the wintertime when you can see your breath. The process of us breathing out this water vapor is called **respiration**. Plants also lose water in a similar way; for plants this process is called **evapo-transpiration**. This term is derived from the combination of the ways a plant loses water; both the water on the plant's surface can evaporate (evapo) and the water within the plant itself can be lost to the atmosphere, which is called transpiration.

The water vapor, once in the atmosphere, is subject to global air currents. These can move the vapor long distances and therefore influence the climates all around the globe. As the water vapor in the atmosphere cools, it forms water droplets around very small dust particles; this process is called **condensation**. Once these water droplets have become large enough, they fall out of the sky due to gravity; this is called **precipitation**. Precipitation can be in the form of rain, or snow, or anything in between. The combination of condensation and precipitation is what first caused the Earth's oceans to form. Once the precipitation has reached the earth's surface it can do a variety of things; eventually it will return to either the ocean or the atmosphere. If the water becomes a part of a river or a stream, it is called **surface run-off**, and will reach the ocean quickly. As you know, water can also be held in lakes. Some of this water will evaporate up into the atmosphere again; and some of this water will become part of the living organisms that live in the lake. If the precipitation falls in the form of snow, the water can be held in glaciers or icecaps where it can be stored for a long time. Or it may simply melt the next day and join in the surface run-off water and journey back to the ocean.

Water that isn't taken up by glaciers, stored in lakes, or returned to the ocean by rivers right away can also become **groundwater**. This happens by a process called **infiltration**. Groundwater is water that is held in the pore spaces in the rocks and soil beneath our feet. The structure of the subsurface determines how and if the groundwater will flow. It can potentially flow downhill and pool in rivers and lakes, or if there is no slope to the subsurface the groundwater can simply pool and saturate the soil with water. Groundwater can also be stored underground in an **aquifer**, which is formed due to the rock structures of the subsurface.

We can think about watersheds to understand our **local water cycle**. A watershed, also called a catchment basin, is the area of land that all drains into one outlet. A watershed can give water to many ecosystems and human developments.

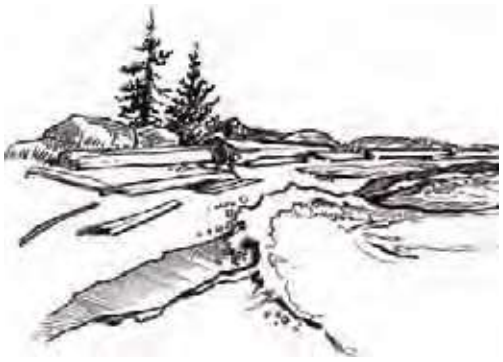
In the Squamish area, the primary source of water for human consumption is the Powerhouse Springs system of wells. However, during peak times of year – the summer months- these wells are combined with water from the Stawamus River and Mashiter Creek to cover the water needs of Squamish. The Powerhouse Springs well system is a system that extracts groundwater from aquifers rather than using surface run-off like the Stawamus River and Mashiter Creek. Using extracted groundwater is the preferable source of potable water because it needs less water treatment than surface run-off forms. There are a few disadvantages to using groundwater as the

The Water Cycle in Squamish

main source for potable water; these include: elevated mineral levels in the water, the need for well head pumps, and that there is a restricted supply (only so much can be held in one aquifer). Surface water sources (rivers and lakes) usually have a higher quantity of water, but the quality is much poorer due to turbidity caused by storms (rain and snow fall). This turbidity (mixing) can cause more extensive and expensive water treatment to need to occur in order to make the water safe for human consumption. The keys to safe drinking water for humans: have clean enough water (high enough quality) and having enough to feed the needs of an area (high enough quantity) while leaving enough water in the system for the environment.

Procedure:

1. Study an Earth Ball or map of the Earth and have students guess how much of the Earth's surface is covered in water. (71% of the earth's surface is covered with water.) Record the guesses on the board.
2. Ask students to construct a pie chart or graph with their ideas of how much water on Earth is found in the ocean; groundwater; frozen; or freshwater.
3. Take a beaker with 1000 ml of water. Tell them it represents all the water on Earth.



Pour out 28 ml of water into a100 ml cylinder or container. This represents the Earth's fresh water, about 3% of the total. Put salt in the remaining 972 ml to simulate the water found in oceans.

4. Almost 80% of the Earth's fresh water is frozen in polar ice-caps and glaciers. From the 28 ml, pour out 5 ml into a 10 ml measure and place the rest into an ice cube tray. The water in 10 ml measure (around 0.6% of the total) represents the non-frozen fresh water, while the water in the ice cube tray represents the water frozen in ice caps and glaciers.
5. From the 5 ml, pour out 4 ml to present the ground water in aquifers and underground streams. That leaves 1 ml of water that is surface water, found in lakes, rivers, streams, marshes, and wetlands.
6. From the remaining 1 ml, use an eyedropper to remove a single drop of water. Release this drop into a cup. This drop represents clean, fresh water that is available for human use, about 0.00003% of the total!
7. Read the following information:
   - 95% of the world's water is ocean water
   - 3.4% is ground water
   - 1.6% is frozen0.005% is water in lakes, streams & rivers
8. Refer students to the recorded guesses about the Earth's water to the figures above. Have students explain their reasoning for their initial guesses. How would they adjust their estimates now?

Extensions:

1. Have student do research water in Squamish. Where does their drinking water come from? Are there glaciers;

surface water; aquifers; and ocean water nearby? Where are they located?

2. Have students complete the Water Cycle in Squamish Word Search.

Evaluation:
1.Have students:

a. Describe the relative amount of fresh water that is available for living things.

Community Connections:
1. Have someone from the District of Squamish water utility come in to speak to the class about the community water supply and water conservation.

Taking It Home:

Complete a water audit of your home: how much water does your household use per day? Are there ways which you can conserve water?

Resource: This activity has been adapted from"Analyzing the World's Water Supply" from Water Stewardship (1995).

There are many worksheets on water audits: the City of Calgary (Water Services) has a good template. Google "Water Audit Worksheet" to see a selection of water audit forms.

For a great animated video clip on groundwater and why it should be protected go to:
www.leapingmedia.com/groundwater.html

References:

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Nat ural Resources Canada *(2008). Waterscapes Posters* from http://geoscape.nrcan.gc.ca

Name: _____

The Water Cycle in Squamish

Word Search

l n w f s h m n h
e a r a b g w i t
y n k l t o u a r
m o r e n e n r a
z a c s q t r l e
c x e e b i c e i
b h q r a b a k k
n q s i t n r t b
r i v e r s r k e

Find these words:

earth
ice
lake
river
snow
ocean
rain

Name: _____

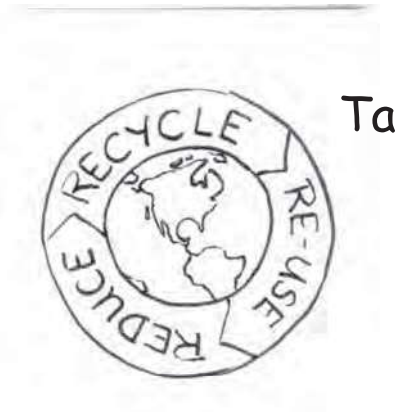
The Water Cycle in Squamish

Word Search

l	n	w	f	s	h	m	n	h
e	a	r	a	b	g	w	i	t
y	n	k	l	t	o	u	a	r
m	o	r	e	n	e	n	r	a
z	a	c	s	q	t	r	l	e
c	x	e	e	b	i	c	e	i
b	h	q	r	a	b	a	k	k
n	q	s	i	t	n	r	t	b
r	i	v	e	r	s	r	k	e

Find these words:

earth
ice
lake
ocean
rain
river
snow



Taking It Home…

Name: _____

List or draw five ways you and your family can save water at home:

_____

_____

_____

_____

_____

Did You Know??

Ways to Save Water at Home:

Turn off the tap when brushing your teeth or doing the dishes;

Limit your shower to under10 minutes;

Let your lawn go golden in the summer;

Use a watering can to water the summer garden rather than the sprinkler;

Run the dishwasher with a full load only.