

SAMPLE KWL CHART

	What I think I KNOW	What I WANT to know	What I have LEARNED
Beavers and their dams			
Human-made dams and hydroelectric generation			
Stave Falls			
Hydrologic Cycle			

BEAVERS

Common Name

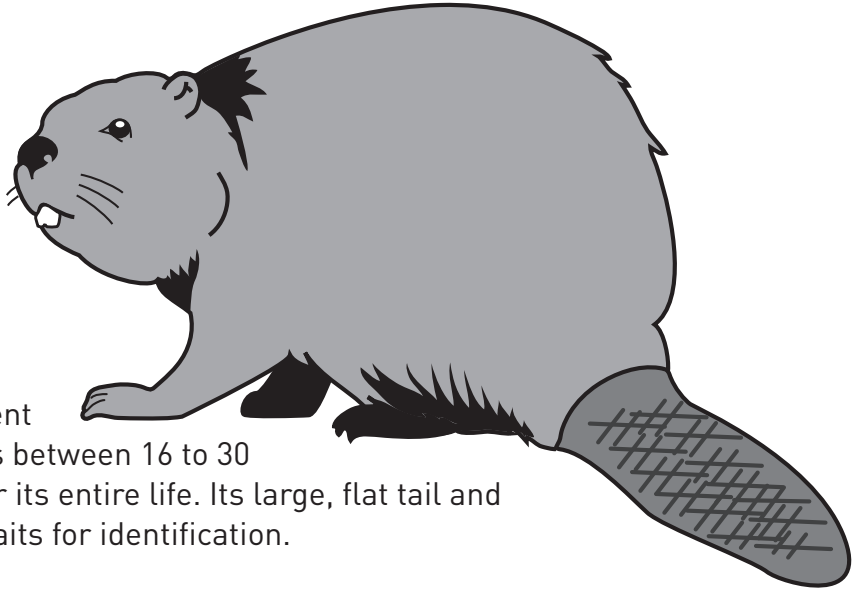
American Beaver

Scientific or Latin name

Castor canadensis

Description

The largest of North America's rodent family, this aquatic mammal weighs between 16 to 30 kilograms and continues to grow for its entire life. Its large, flat tail and enormous front teeth are helpful traits for identification.



Lifespan

15 to 20 years

Population in British Columbia

400,000 to 600,000

Food

Beavers are herbivores and eat only plants. The plants they eat include bark and inner bark (cambium) of several tree species (aspen, willow, alder, birch, and others) and aquatic pond plants. Occasionally beavers eat grains or grasses they find on land.

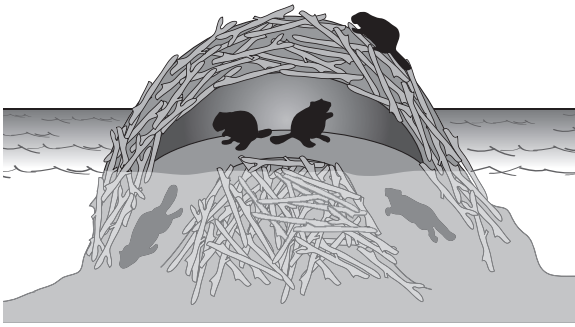


Habitat

Freshwater environments wherever enough tree supplies for building and food can be found, especially near running water.

Range

Found throughout North America north of Mexico and south of arctic regions. Not found in deserts or large areas without trees.



Den

Usually found in still water, beaver lodges are dome-shaped piles of sticks and mud. After building the lodge, beavers hollow out an underwater entrance and living area in the centre. In moving water, dens may be dug out of stream or river banks.

Predators

Bear, lynx, cougar, river otter, coyote, wolf and fox.

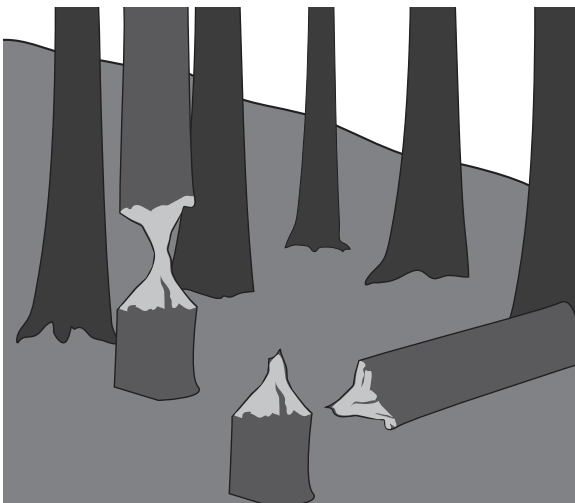


Behaviours

As they are mostly nocturnal (active at night) animals, beavers' activities are often unseen to us. They are certainly busy creatures, cutting down hundreds of trees per year for food, dams and lodges. They also make canals to transport branches from beyond the pond area. They slap their tails to alert one another to predators and intruders who enter their territory. The tail slapping can be heard 100 metres away.

Beaver Dam

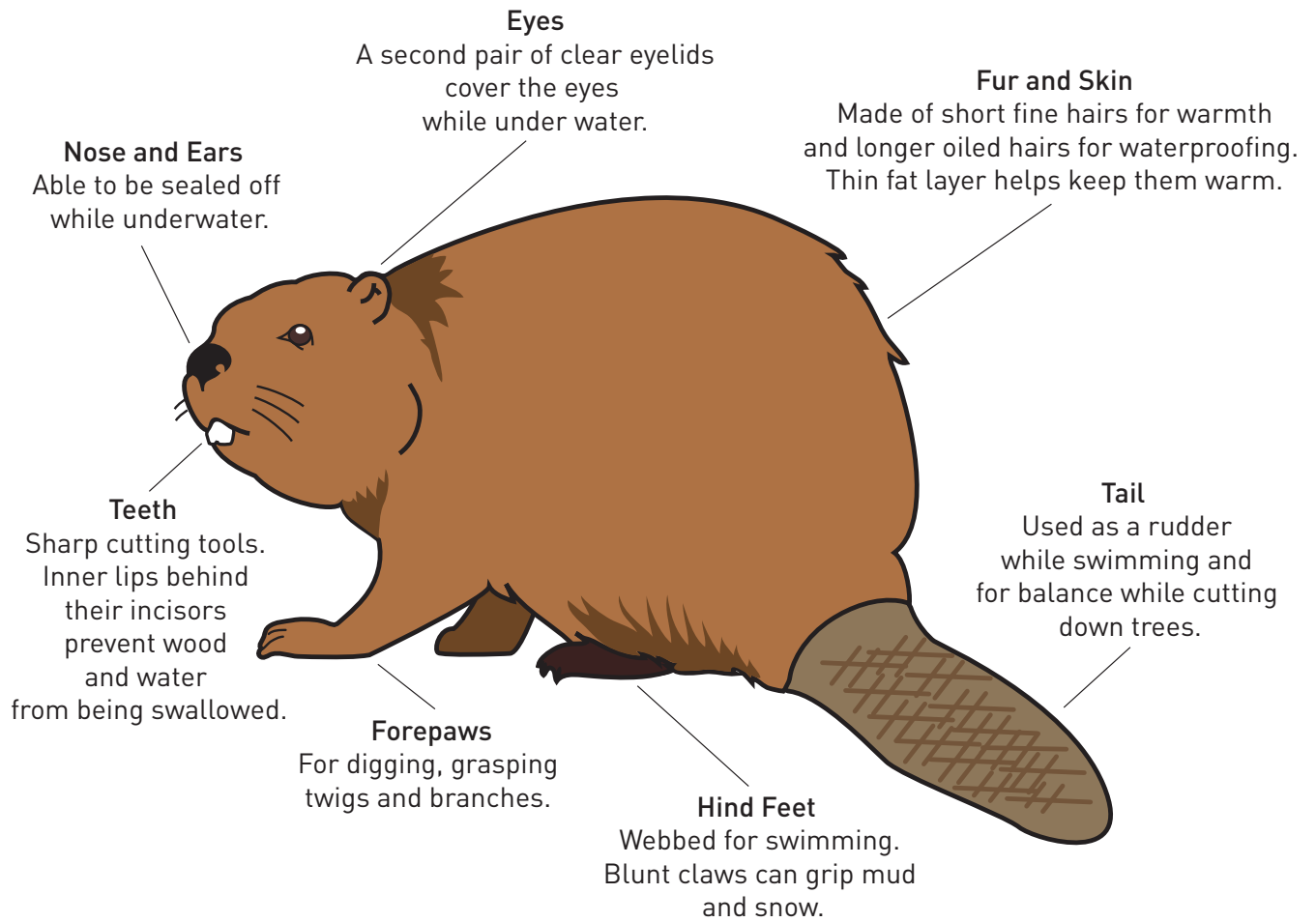
Constructed to allow travel and safety from predators, beaver dams are made of sticks, mud and stones. The largest known, found in Montana, can be seen from space!



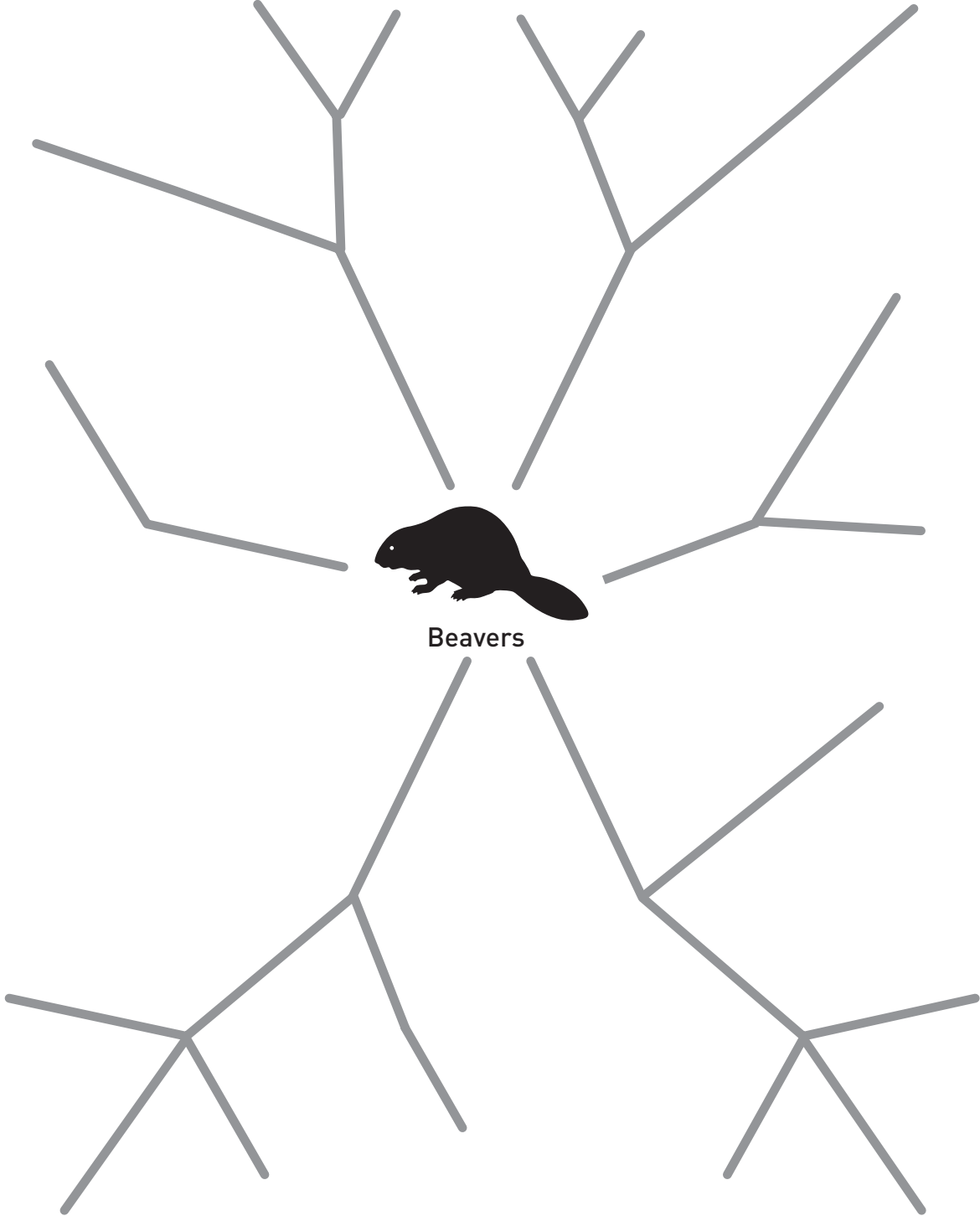
Beaver Dam Impact on environment

Beavers' tree-cutting and dam-building alter forests, and humans can find their activities a nuisance if property is flooded or damaged. The ponds created by beaver dams also create important habitat for insects, fish, birds, and amphibians such as frogs. Also, beaver dams can control sudden floods and improve water quality.

CREATURE FEATURES



SAMPLE MIND MAP



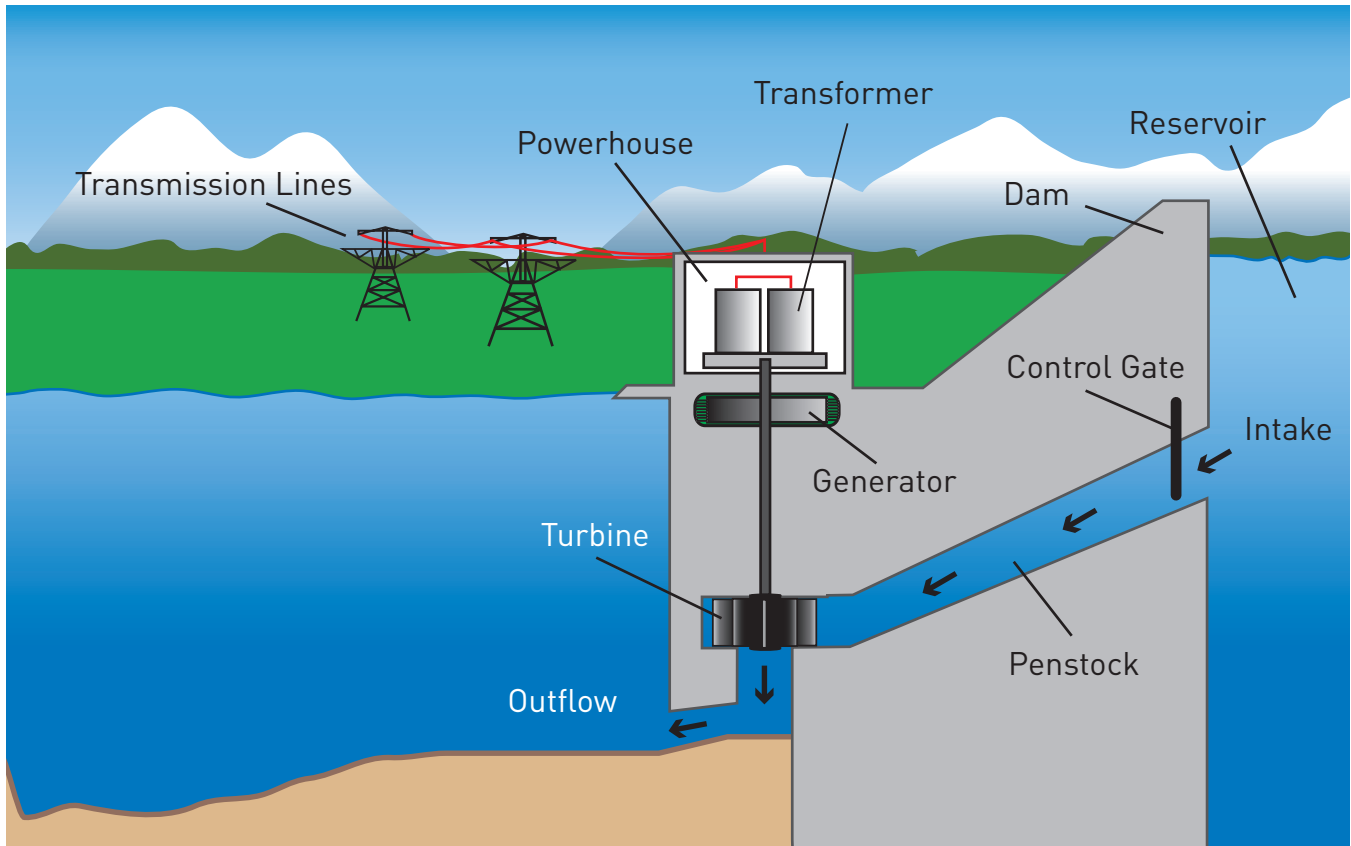
MIND MAP RUBRIC

Name: _____ Date: _____

The rubric below can help you develop your mind map by showing you what is expected. After you have created it, use the criteria to assess how you did and note where improvements can be made.

Criteria	Level of Achievement			
	Beginning	Developing	Capable	Powerful
A central image that clearly represents the topic <ul style="list-style-type: none"> - image is clearly connected to entire topic 				
Main themes or ideas radiate from centre <ul style="list-style-type: none"> - organization is evident - each theme has supporting details 				
There is a connected structure <ul style="list-style-type: none"> - connections are made between themes where appropriate - details connect to more than one theme where appropriate 				
Use of colour <ul style="list-style-type: none"> - colour improves the appearance of the map - colour adds to the organization of the map 				
Care taken to do a good job <ul style="list-style-type: none"> - map is neat and clear - words are easy to read - pictures / images are appropriate 				

HYDROELECTRIC GENERATION



How does a hydroelectric dam work?

1. Water falls on mountains as rain or snow.
2. A dam stops/slow the flow of a river to create a reservoir.
3. The reservoir is filled.
4. Water enters intake and flows downhill in penstocks.
5. The turbines inside the powerhouse are turned by force of falling water.
6. Electrical charge is created.
7. Transformers change electricity from low to high voltage.
8. Electricity travels along transmission lines to substations and distribution lines so that it can be used.

Note: the moving water make the turbines spin; then the water continues to flow through the dam and down the river. Hydroelectricity is renewable, because the energy from the water is used, but no water is ever removed from the natural hydrologic cycle (water cycle). The water is never “used up.” Hydroelectricity is clean, because the water is not polluted as it moves through the turbines.

AQUA DROPS BY STAVE FALLS

Hello, my name is Aqua, and I am a drop of water. I have been here since the beginning, and there are few places on planet Earth that I have not travelled. In fact, I'm almost always on the move. I could tell you stories of being frozen in a glacier that would make you shiver, or tell you about the time I went over a gigantic waterfall — and survived! Being a drop of water can take you to some very interesting places. I have been inside trees and seaweed, bugs and animals, soil and swamps. I can take several forms: solid, liquid, or gas. I've been thrown as a snowball, flowed through rivers to the ocean, streamed down human cheeks as a tear and even helped to form a rainbow once.

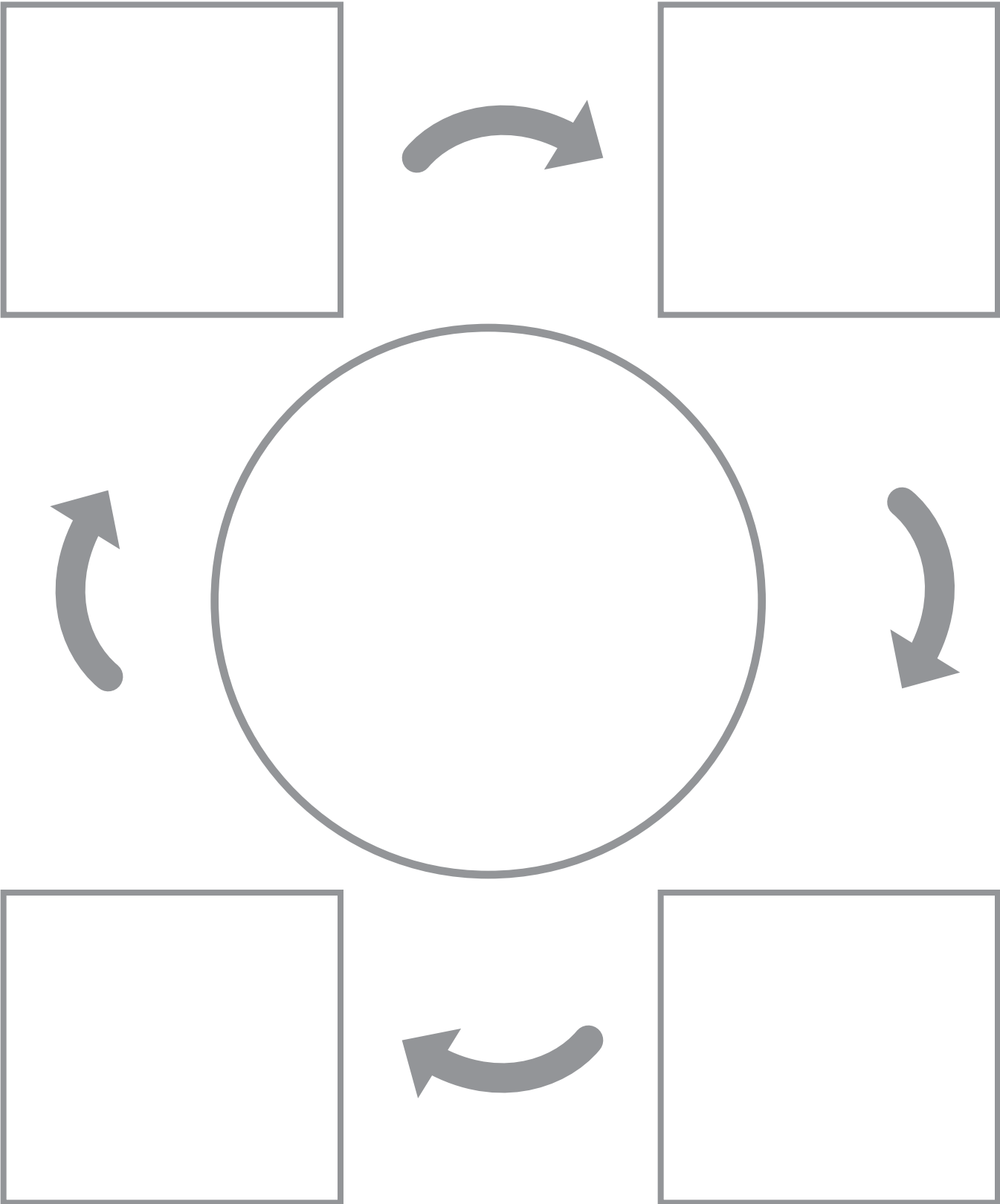
But today I want to tell you a story that happened not too far from here and is still happening every moment of every day. It's also a story that has a lot to do with you. It all started one warm summer day in the Pacific Ocean. I was just about to become part of a huge wave when I was heated up and turned into water vapour — that's a gas. I was lifted thousands of feet up into the sky until I cooled and became part of a fast-moving cloud.

My cloud, and many others, was blown towards a snow-capped mountain range when we all got squished together; and that's when things got stormy. Before I could say "H₂O," I was zooming down to Earth with the other drops raining down next to me. Some of us landed on trees and plants, others on the ground, and I made a splash in a beautiful lake; a reservoir actually. And that's when things got interesting.

Now, being a water drop I'm used to being pulled downhill by gravity, so when I started moving that way I wasn't surprised. I approached a huge concrete wall that I later learned was a dam. Suddenly I was sucked into an opening in the dam — the intake — and shot down a giant tube called a penstock. Just when I thought things couldn't go any faster, they did. I was soon spinning around the wheel of a large machine — a turbine. The energy of all the water drops forced the turbine to whirl around, and that energy was transformed into electricity.

The electricity travelled down transmission lines to a substation and then on to many places like your house. Maybe it was used to heat up water for your shower or dry your clothes for school. Meanwhile, I was flung out of the turbine, and before I knew it, the wild ride was over. I was shot through the outflow and into a lazy flowing river. By the time you hear this story, who knows where I could be? Can you imagine?

FLOW CHART SAMPLE



STAVE FALLS – A SPECIAL PLACE

heritage site:

a physical structure or landscape that is of great historical importance

Stave Falls is a special place for many reasons. As you learn about the changes that have happened there over time, try to imagine what the environment and life of the people who have lived there might have been like. On your visit to the **heritage site**, you will become a part of the living history too and perhaps make a special discovery of your own.

The history of the Stave Valley began long before people ever explored its wilderness. About 10,000 years ago, much of B.C. was covered in ice sheets. They were over a kilometre thick in places! As temperatures warmed, the ice sheets melted, leaving behind deep valleys, lakes, and small **glaciers**.

glacier:

a large mountain feature made of ancient ice and snow

First Nations people known as the Kwantlen, members of the Sto:lo Nation, were the first to settle here, with village sites at Stave Falls and Ruskin and at the place where the Stave and Fraser rivers meet. They knew the Stave River as “the source.” The Kwantlen were hunters, fishers and traders who found uses for nearly all that nature offered here, including food, shelter, tools, clothing and medicine. Like many First Nations groups throughout B.C., many were killed by **smallpox**, reducing their community from several thousand to less than 200 members today.

smallpox:

a contagious and possibly fatal disease for humans

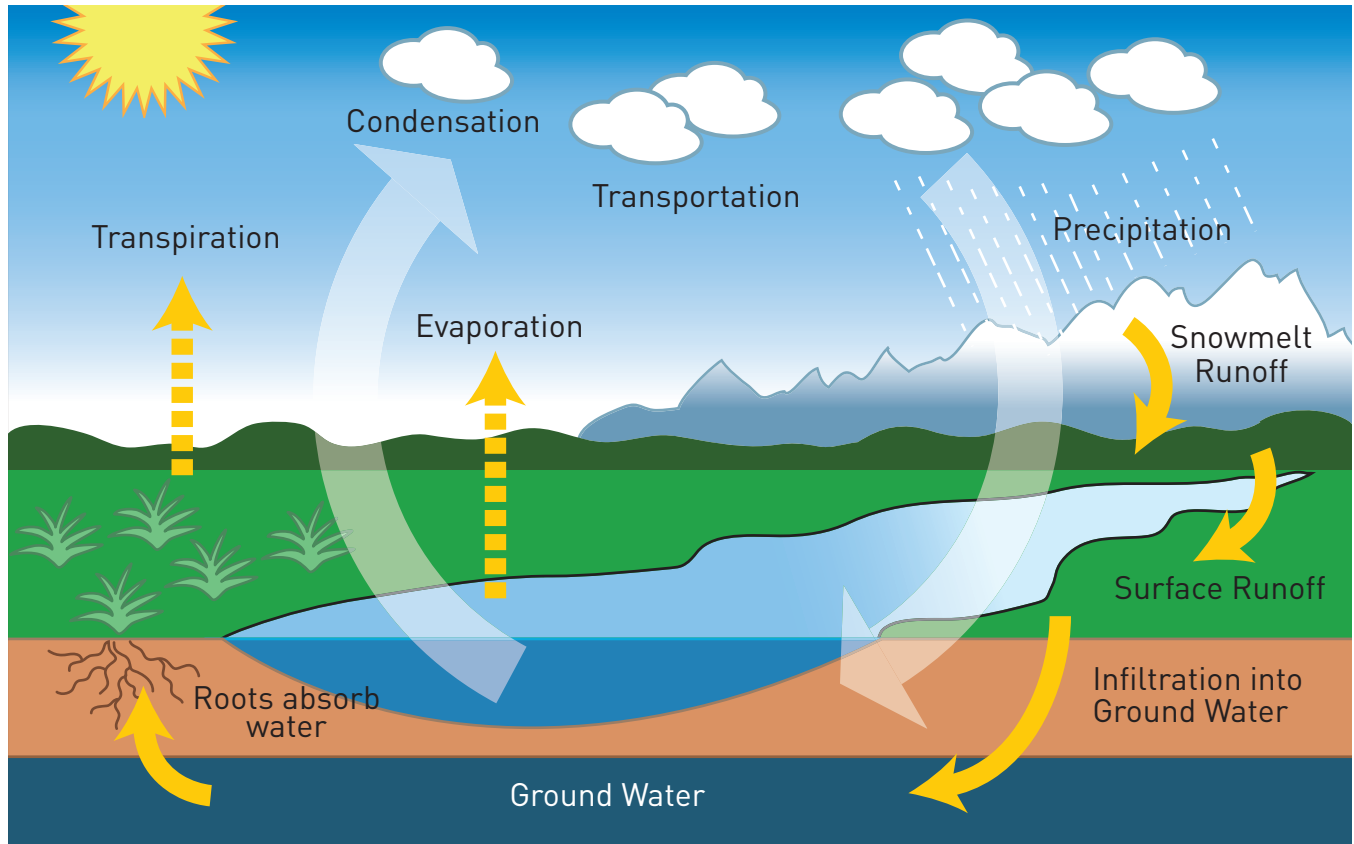
Later, European settlers arrived in search of natural resources to use and trade such as animal furs, lumber and fish. In fact, white pine trees cut down in the area were made into **staves**. The barrels were filled with goods to be shipped to other parts of the world. The most recent name of the valley, river and falls comes from the staves that formed the barrels.

staves:

wooden strips used to make barrels

In the early 1900s, people began to think about transforming the energy of the rushing river into electricity. After several failed attempts, construction on a dam at Stave Falls began in 1909, and electricity began flowing from the site to nearby New Westminster and Vancouver in 1912. A small but vibrant town was built to house workers and their families. It included a schoolhouse, dining and dance hall, bakery, bunkhouse and several homes. In the 1950s, the town was dismantled and buildings were demolished as workers moved to nearby towns. Finally, after supplying reliable and clean energy for over 80 years, the 1912 Power House at Stave Falls closed in 2000. It soon re-opened as the new visitor centre that you will be exploring with your class. A new, more efficient power house was created in 1999 and can be seen across from the visitor centre.

HYDROLOGIC CYCLE



Hydrologic Cycle

1. Precipitation (water falling to the earth as rain or snow)
2. Ground water or run-off (water that has been absorbed by the soil or funnelled into rivers or creeks)
3. Evaporation (water changing from liquid to gas form due to heat from the sun)
Transpiration (water changing directly to vapor (gas) from plants)
4. Condensation (cooling of water vapour into cloud)
5. Transportation (water vapour moving from one place to another)

SCAVENGER HUNT

The Stave Falls area is home to a variety of living things and historical treasures. Use your observation skills and senses to discover them.

Name _____

- Beaver (or signs)
- Bald Eagle
- Duck
- Raven
- Loon
- Canada Goose
- Woodpecker (or signs)
- Bird's nest
- Garter snake
- Frog
- River Otter
- Squirrel
- Deer
- Spider
- Spider web
- Banana Slug
- Cedar
- Douglas Fir
- Salmonberry
- Waterfall
- MV Shirley
- Others _____
- _____
- _____

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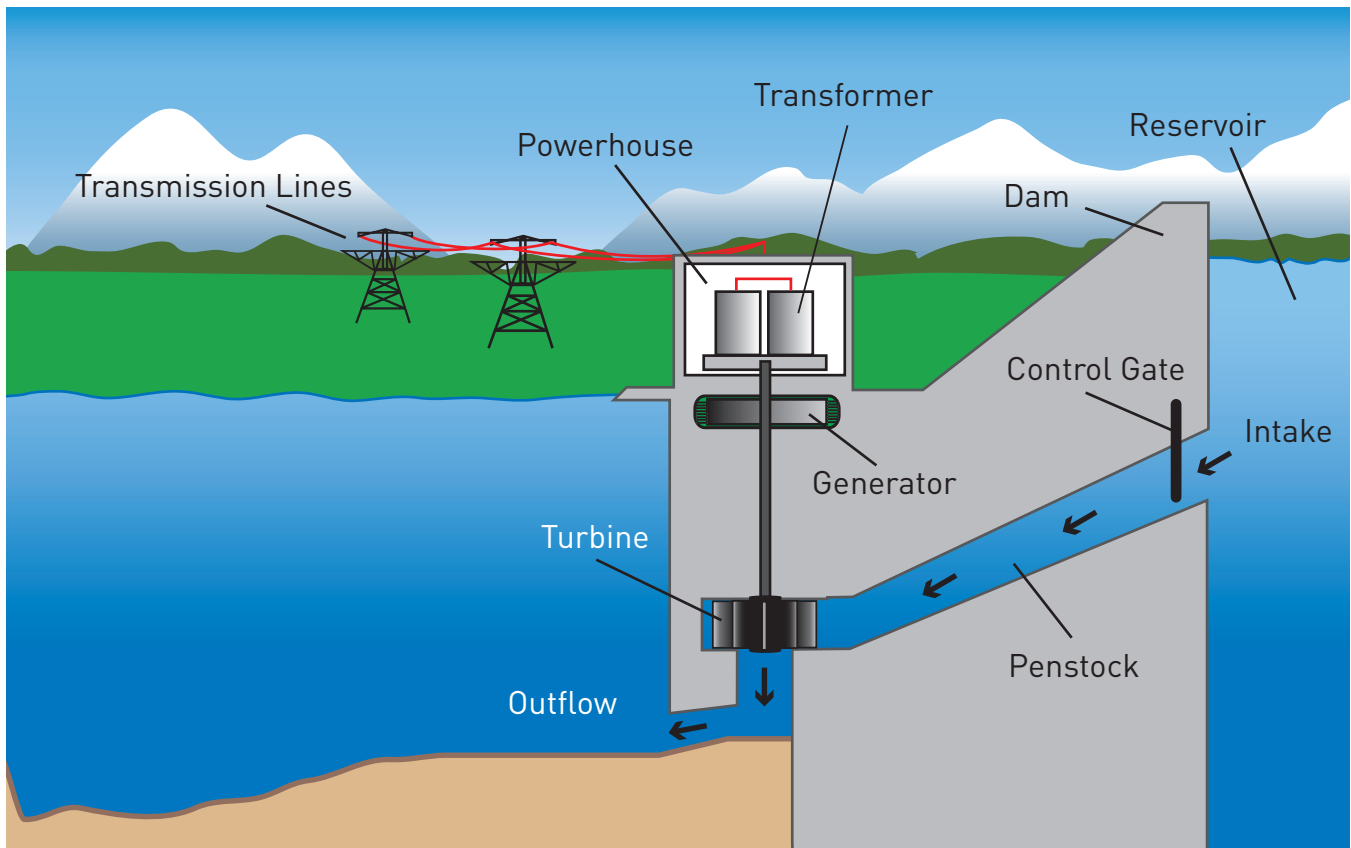
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STAVE FALLS TIMELINE

1. **1792:** Captain George Vancouver enters Burrard Inlet
2. **1808:** Simon Fraser navigates the river that later bears his name
3. **1821:** Electric motor invented
4. **1827:** Hudson's Bay Company builds Fort Langley on the Fraser River
5. **1867:** Canada enters Confederation with four provinces
6. **1871:** British Columbia becomes a province
7. **1880:** Light bulb is patented by Thomas Edison
8. **1885:** "The Last Spike" completes the Canadian Pacific Railway
9. **1886:** Gasoline engine invented
10. **1893:** Radio invented
11. **1897:** Klondike Gold Rush begins
12. **1907:** Building of Power House at Stave Falls begins, washing machine invented
13. **1912:** Stave Falls generates electricity for public use
14. **1914 – 1918:** World War I
15. **1916:** Canadian women given right to vote
16. **1930s:** The Great Depression
17. **1939-1945:** World War II
18. **1962:** BC Hydro created
19. **1969:** NASA lands on the Moon
20. **1973:** Personal computer invented
21. **1977:** Cell phone invented
22. **1983:** Hayward Lake Recreation Area opens. Internet invented
23. **1999:** New Stave Falls powerhouse comes into service
24. **2000:** Original Stave Falls plant shuts down
25. **2001:** New Stave Falls Visitor Centre opens
26. **2010:** Vancouver Winter Olympic Games

HYDROELECTRIC GENERATION

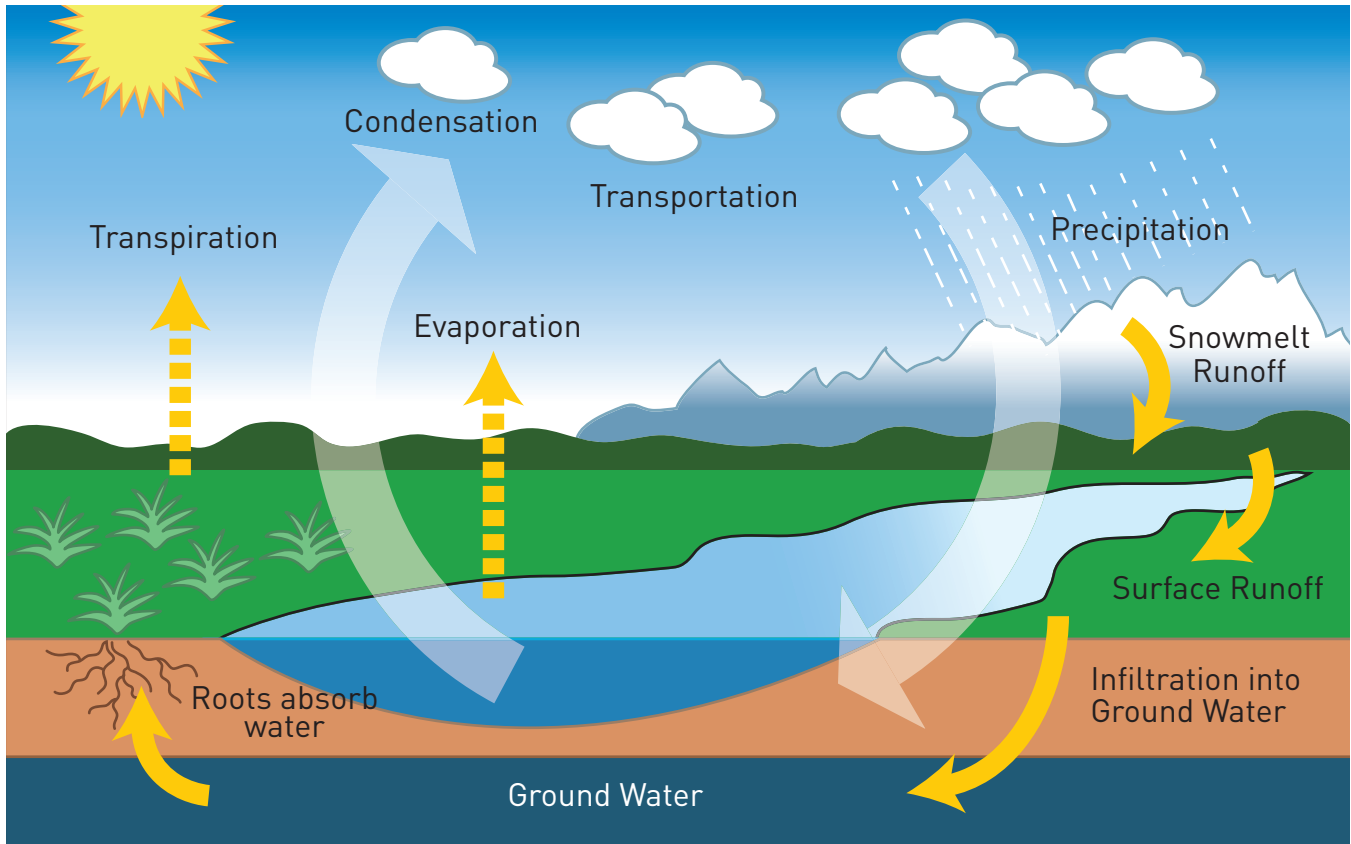


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DRAMA ASSESSMENT RUBRIC

Criteria	Level of Achievement			
	Beginning	Developing	Capable	Powerful
Listening Listened to and followed teacher instructions Listened to other group members Allowed all ideas to be heard				
Participation Got involved Gave best effort Encouraged others				
Understanding Demonstrated the process clearly Asked questions for clarification if necessary Stayed within the time limit				
Cooperation Offered ideas and listened to others Provided positive feedback Able to compromise when necessary				

HYDRO POWER: THINKING OF OUR FUTURE

Hydroelectricity: A renewable source of energy made by the force of moving or falling water

Conservation: the protection and preservation of a valuable thing for future use

Following your trip to the Power House at Stave Falls, you now know how 95 percent of B.C.'s electricity is produced. However, you may be surprised to learn that the method for producing electricity varies around the world.

Everywhere on our planet, electricity is created by using the Earth's natural resources and converting them into electric power. Some of the resources used are renewable; that is, the Earth replenishes or replaces them even after they are used. Solar, wind, tidal, geothermal and bio-fuel are examples of renewable resources. Resources that we use that cannot be replaced are called non-renewable. Examples include fossil fuels such as coal, oil and natural gas, and uranium used for nuclear power.

As long as enough water continues to flow, hydroelectricity can be produced as a clean energy source. During the electricity generation process, water moves through a turbine to produce electricity, then continues to flow down the river, so it doesn't leave the water cycle (and doesn't get used up). In this province, BC Hydro produces the electricity that most people use. BC Hydro carefully looks at the impacts of generating electricity and plans for a future with more green energy in the electric system.

For all of us, being aware of our energy use, using only what we need and using our energy wisely will help to conserve all resources for future generations. It is the actions that we take today that matter most.

In the activity *Where Do You Stand?* you and your classmates have the opportunity to look at your thinking and actions about resource conservation. Hopefully you will be reminded of the ways you are already helping to save resources and making a difference with your daily choices.

WHERE DO YOU STAND? STATEMENTS

1. I use natural resources every day.
2. I need natural resources to survive.
3. Carpooling, walking or cycling to school saves natural resources.
4. Coal and fossil fuels are renewable resources.
5. Wearing a sweater and turning down the heat conserve energy.
6. I know why I should turn the tap off while I brush my teeth.
7. Of the 3 Rs, reducing is the hardest.
8. Most of the electricity in B.C. comes from hydroelectricity.
9. Wind, tidal and solar power are examples of renewable resources.
10. I took an action today to conserve a natural resource.
11. Everything I use comes from the Earth.
12. Gold is the most valuable resource.
13. Hydroelectricity is a clean source of electricity. (Clean means it doesn't create pollution when it is generated.)
14. Conserving resources is hard to do.
15. Hydroelectricity is a renewable energy source.
16. Fish are a non-renewable resource.
17. Technology can solve our environmental challenges.
18. My conservation actions can make a difference.
19. I will share what I know about conservation with others.
20. The present is better than the past and the future will be better than the present.

STUDENT REFLECTION

Name _____ Date _____

Please take some time to think about your experience at Stave Falls. What did you think and learn during your visit? Answer the questions below as best as you can and be prepared to share your answers.

1. The most interesting thing I learned during my trip to Stave Falls was...

2. A part of the field trip I would like to learn more about is...

3. I was able to get the most out of the field trip because I...

4. Something I am left wondering about is...

5. One area in which I think I could improve on my next trip is...

6. If I was in charge of planning this field trip next time I would...

7. One last thing I would like to mention is...
