

INTERMEDIATE

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WATERSHED LESSON

Presentation Preparations

Materials List:

- **Water Demonstration items:**
 - 2 clear containers – each large enough to hold about 500 ml of water and one labeled "World's Water"
 - 1 tablespoon measure
- **Watershed Poster**
- **Word cards** for Watershed activity table's section headings (see page 12)

Presentation set-up:

1. Assemble **Water demo** materials for page 4: two jars, one empty and one filled with water and labeled "World's Water" along with the tablespoon measure.
2. **Watershed Poster** is used beginning on page 6- Watershed Processes
3. **Activity Board or chalkboard** for creating watershed table to go with discussion on page 7. (See page 12 for sample. Optional: use section heading titles on cards.)

INTERMEDIATE WATERSHED LESSON

GRADES 4 - 7

BACKGROUND INFORMATION

Fact:

Did you know?

- The Earth is known as the **'water planet'**
 - Approximately **70% of its surface** is covered in water
 - Water can be found in all 3 states: **liquid, solid, gas**
 - Water never stays in the same form or in one location; it is constantly **changing**
 - Water on our planet moves in a cycle called the **'Water Cycle'**

Fact:

Did you know?

- Survival of all living things depends on water
 - Every **plant and animal** depends on water
 - Fish, plankton, etc. live inside water
 - Humans, trees & plants grow and maintain their structure and function using water
 - **Clean, fresh drinking water** is necessary for humans to survive

Fact:

- In the Earth's Oceans, Lakes, Rivers
 - Just over **97%** of all water on Earth is '**salty**' and is found in our oceans.
 - Approximately **3%** of the Earth's water is considered **fresh**.
 - Most of this is not usable because it is **trapped** as ground water and in glaciers.
 - Only about **0.3%** of the world's fresh water is **available** for drinking.

Now let's demonstrate how much water on Earth is drinkable...

WATER DEMONSTRATION

Materials: Two clear containers that can each hold about 500 ml of water and one tablespoon measure. One container should be filled with 500 ml of water.

- Hold up the container with 500 ml of water for everyone to see
 - ‘This represents all the water in the entire world, how much do you think would be fresh and available to drink?’
 - Ask for a volunteer to help out.
- Then say ‘My helper is going to pour the water out of the container that represents the water that is **not** drinkable and the water left inside the container represents the water that **is** drinkable’.
 - Have the class tell when the student should stop pouring the water.

Students will be amazed at the amount of water that is not drinkable and how little is available for human consumption and will usually want to stop too soon.

- Presenter should then take over to show students the actual quantities. Stop pouring once you have poured out 97% (485ml) of the water and explain that all the water poured out is ‘salty’ and found in our oceans. The water left in the container (3%, 30 ml or one tablespoon) is considered fresh.
- Explain that some of the water left is not drinkable because it is either trapped underground or in glaciers. Ask the students again to say when to stop pouring once the ‘drinkable’ amount is left in the container.
- Stop when there is about 3 ml (1/2 teaspoon) left in the container and explain that the amount left represents all the fresh water on the planet.

This demo really surprises the students and helps them to realize that clean water is a very limited and valuable resource that we should all understand and help protect.

USES OF WATER

We have demonstrated how much water on the Earth is **drinkable** and now we are going to discuss the **Uses of Water**.

Fact:

Did you know?

- You could live without food for up to three weeks, but you could only last three or four days without water.

Question: Raise your hand if you used water this morning before you left for school. Can you tell me some ways that you used water today?

Answers:

1. **Flush toilet**
2. **Shower** or bath
3. **Clothes** – washed in water
4. **Clean dishes** – washed in water
5. **Breakfast** – cooked in water or contain water
(i.e. oatmeal, juice concentrate)
6. **Brush teeth** with water

Fact:

Did you know?

- On average you probably used water at least 6 times in the morning.
That is approximately 40 gallons or 1.5 bath tubs full.

Question:

What are some ways people use water outside their home?
Take a few possible answers...

Answers:

- **Travel** – get from place to place – i.e. Ferries, boats
- **Recreation** – fishing, boating, skating, swimming, etc.
- **Cleaning things** – washing cars, quads, motorbikes, etc.
- **Manufacturing** – making products such as: plywood, clothing, food

- **Agriculture** – irrigate crops that grow food – i.e. corn, wheat, fruit trees, vegetables, etc.
- **Hydro Power** – water from rivers to produce electricity
- **Gardening** – water lawns, flowers, and gardens

WATERSHED PROCESSES

We have learned:

- that Earth is the 'water planet'
- about uses of water

Now we are going to learn about **Watersheds...**

Question:

Has anyone heard of **watersheds** and can you tell me something about them or what they are?

Definition:

A watershed includes all of the water and all of the land that drains into a common area such as a river or lake. A watershed is high on the edges and low in the centre where the waters flow.

Fact:

No matter where you live, work or play, you are **always** in a watershed.

What are Watershed Processes and how do they work?

Show :

*Using the **watershed poster**, follow the path that water takes:*

Inputs

- **Precipitation** (rain or snow) on the mountains
Note: *remember the 'water cycle' from our earlier discussion*
-3 states: liquid, solid, gas
-water is constantly changing and moving

Outputs

Small Watersheds

- flowing into tributaries (streams)

Larger Watersheds

- into rivers
- or underground that can be obtained by wells
- down to lakes in the valley bottoms
- out of the lakes into rivers again

Giant Watersheds

- then into the ocean

We are now going to learn more about small and large watersheds.

SOURCES OF WATER IN A WATERSHED

Fact:

Water comes from different sources on our planet.

Question:

Can you name some of the sources?

- *If needed – remind the students that some sources were just mentioned during the initial discussion.*
- *Take a couple of answers and write them on the board.*

Answers:

Lakes, rivers and streams, groundwater, wetlands, glaciers and snow

Note:

*If using, place the titles from the word cards on the **Activity Board** or simply use a chalkboard table. (See **page 12** for sample table.)*

- *Add to the list under each component as you give the students more information.*

Let's look at each source of water in a watershed...

1. Lakes, Rivers and Streams

- Lakes, rivers and streams make up **drainage networks** or 'watersheds'.
- Melting waters escape by the streams and rivers and are natural **drainage channels** for water on the surface.
- Rivers then **flow into lakes**. The importance of lakes is their ability to **store water** during times of plenty and release the water gradually.

Fact:

Canada is famous for its number of lakes. There are about **two million** lakes of all sizes covering 9% of the country.

Question:

Can you name some local lakes and rivers?

2. Groundwater

- Groundwater is water **found beneath the Earth's surface**, much like giant sponges.
- Groundwater is **connected with lakes and rivers** and often emerges as streams.
- Groundwater is an important **source of freshwater** that supplies towns, agricultural and industry.

Fact:

In Canada, there is more water underground than on the earth's surface.

Question:

Do you know a very small province in Canada that depends on groundwater for its entire water supply?

Answer:

Prince Edward Island

- Groundwater is accessed by drilling a well underground
 - i. Have students name a person they know or a town that uses a well for their water.
 - ii. Have the students identify the source of their community's water.

*(**Note:** This information may be a good subject for students to research.)*

3. Wetlands and/or Riparian Areas

- Riparian areas are the **strips of land** that border lakes, rivers and streams.
- They are an area of relatively **shallow water** that can keep water long enough (and still enough) to let **wetland plants and soils develop**.
- These areas act to **filter** sediments, excess nutrients and pesticides.
- Wetlands help rivers by **reducing peak flow** during floods and **maintaining flow** in rivers during dry periods.
- The Forest Industry **protects riparian** areas by:
 - i. Ensuring a **soft footprint** in sensitive areas
 - ii. Leaving **buffer zones** along **stream banks and wetlands**
 - iii. **Protecting** fish and wildlife habitat
 - iv. Ensuring water quality against **sediment and erosion**

- A **healthy riparian** area increases benefits to: fish and wildlife habitat, soil erosion, late season flow of streams, and water quality.

Question: Can anyone name any local wetlands?

Answer: Ponds, rivers and lakes in your area...

4. Glaciers

- These are huge **masses of ice** in the high mountains with frozen freshwater.
- The ice **melts in the hottest part of the summer** and feeds rivers during hot summer weather when other sources of water may be scarce.

Question: Can anyone name areas in British Columbia or Alberta where you might find glaciers?

Answers: Headwaters of the Adams River, Blue River, Glacier National Park,
Banff National Park...

5. Snow

- A major **reservoir of water** released during the spring melt
- One type of **precipitation besides rain** that is critical to maintaining watershed levels
- **Water levels** are generally high in watersheds after snow melts and then decrease during the summer.

HEALTHY WATERSHEDS

We have just learned about:

- Earth as the ‘water planet’ & water cycles
- Amount of water on Earth
- Uses of water
- How a watershed works

Now we are going to learn about how a **healthy watershed** is maintained.

Fact:

Did you know?

- Trees and other plants help our watersheds

HOW NATURE KEEPS A WATERSHED HEALTHY

1. Water Quality – What is the role of trees and plants?

- Roots of trees and other plants **absorb water** and **filter** pollutants and sediment through their roots.
- Some water is **used within the body** of the tree or plant, but most travels up through the tree or plant to the **leaves or needles**. When water reaches the leaves, it is exposed to the air and the sun’s energy and then is easily **evaporated** – this process is called **transpiration**.

2. Erosion – What is it?

- The roots of trees and other plants prevent erosion by **slowing runoff** water and **stabilizing stream banks**.
- The roots act like giant **sponges**, soaking up the rain during storms, and **gradually releasing** it over the days and weeks ahead.
- When a hillside or slope is **not covered** in trees or other plants, the rainwater picks up soil and debris as it runs down the hillside, depositing mud and silt in the streams and rivers called **sediment**.

3. Soil Compaction – How do trees and plants prevent soils from becoming ‘compacted’?

- **Roots** push through the soil and **prevent it from packing together** too tightly, allowing rain and melting snow to easily absorb into the earth.
- Some **pollutants** will be **filtered** out as the water moves through the soil on its way to the lake.

- When water **evaporates** from the soil, it leaves pollutants behind.

PROTECTING OUR WATERSHEDS- HOW WE CAN HELP

1. What we can do to protect our watersheds?

- Conserve water at home:
 - i. Turn off tap while brushing teeth
 - ii. Shorter showers
 - iii. Turn taps on halfway not full
 - iv. Water yard in cooler periods
 - v. Sweep driveway instead of washing
 - vi. Reduce water settings for small laundry loads

- When spending time in or near a watershed:
 - i. don't leave garbage or pollution behind when you leave
 - ii. use an electric motor or paddles when boating, instead of a gas motor, so gas does not spill into the water
 - iii. don't drive through wetlands or streams with motor bikes, quads or horses, as it could pollute or damage the sensitive environment
 - iv. use environmentally- friendly paint balls
 - v. stay on main roads and trails when riding or walking to reduce erosion

WATERSHED TABLE
(TO ACCOMPANY DISCUSSION ON PP 7-9)

SOURCES OF WATER IN WATERSHEDS

Lakes, Rivers, Streams	Ground- water	Wetlands, Riparian Areas	Glaciers	Snow
Drainage networks	Water under Earth's surface	Border lakes, rivers and streams	High in the mountains	Stores water
Channels for surface water	Connected with lakes and rivers	Shallow water with plants and soils	Masses of ice	Release water during spring melt
Rivers flow to lakes	Major source of freshwater	Act as filters	Frozen freshwater	High water levels after spring melt
Stores water		Purify water	Feed rivers during hot summer	
		Helps with water quality		

HEALTHY WATERSHEDS

Water Quality Trees & Plants	Soil Erosion Trees & Plants	Preventing Compaction Trees & Plants	Watershed Protection People
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Review Quiz

1. Water & Watersheds

- a. In what three states can water be found?
- Liquid, solid, gas
- b. How much of the Earth is covered in water?
- 70 %
- c. Of the Earth's water, what percentage is fresh water?
- 3 %
- d. How much water do we generally use in the morning?
- 40 gallons or 1.5 bathtubs full
- e. What is a 'watershed'?
- All the water and land that drains into a common area such as a river or lake
- Watersheds are high on the edges and low in the centre where waters flow

2. Lakes, Rivers & Streams

- a. What makes up the drainage networks?
- Lakes, rivers and streams
- b. How do lakes release the water?
- Water is stored and then released gradually
- c. About how many lakes are in Canada?
- 2 million

3. Groundwater

- a. Where is groundwater found?
- Under the Earth's surface
- b. How do we access groundwater?
- Springs or drilling wells
- c. What province relies only on groundwater?
- PEI

4. Wetlands and/or Riparian Areas

- a. Where would we find wetlands and/or riparian areas?
- Strips of land that border lakes, rivers and streams
- b. What filters through the wetland and/or riparian area?
- Sediments, excess nutrients, pesticides
- c. Why is it important to protect wetlands and/or riparian areas?
- Benefits include protecting fish and wildlife, preventing soil erosion, allowing for late season flow and improved water quality

5. Glaciers & Snow

- a. Where do we find glaciers?
- High in the mountains
- b. At what time of the year do glaciers feed rivers?
- In the hottest part of the summer
- c. In what season does snow release the water?
- In the spring
- d. In what season do water levels decrease from snow melt?
- In the summer

6. Watershed Health

- a. How do trees and plants help with water quality?
- Roots absorb water and filter pollutants - Evaporation and transpiration
- b. What is soil erosion?
- Soils from the edges of lakes, rivers and streams that flows into the water
- c. How do trees and plants help so soils do not become compacted?
- The roots grow through the soil and prevent it from packing together
- d. How can we protect our watersheds?
- Take any reasonable answer