



Lesson 6

Sooke Lake Watershed: Drinking Water Quality



Learning Standards & Assessment



Time



Resources



Activities



Handouts



Video





Science

Big Ideas

- ▶ Water is essential to all living things, and it cycles through the environment.
- ▶ Forces influence the motion of an object.

Content

- ▶ Water sources including local watersheds
- ▶ Water conservation
- ▶ The water cycle
- ▶ Types of forces

Social Studies

Big Ideas

- ▶ Local actions have global consequences, and global actions have local consequences.
- ▶ Individuals have rights and responsibilities as global citizens.

Content

- ▶ How people's needs and wants are met in communities
- ▶ Relationships between people and the environment in different communities
- ▶ Rights and responsibilities of individuals regionally and globally
- ▶ Roles and responsibilities of regional governments

Lesson 6a : Drinking Water Quality

Purpose

The Sooke Lake Watershed lessons provide an opportunity for student to learn about where our drinking water comes from, what makes it is safe to drink and how it is delivered to our taps. They will also learn how it compares to bottled water. Build on drinking water knowledge with extension activities which include well water.

In this lesson, students will explore how precipitation and runoff form a watershed and how erosion can affect water quality. The experiments may be conducted separately.

Build on drinking water knowledge with extension activities that tap into well water and bottled water.

Preparation

- ▶ Optional- lyrics to the "Water Cycle" song, diagram of the water cycle, *Down the Drain and Back Again* video
- ▶ Photocopy student handout 'Sooke Lake Watershed- How's it flowing?' (1/student or group)
- ▶ Prepare materials for experiments

Procedure

Warm up- Water cycle and our drinking water

1. (Optional) Have students sing the "Water Cycle" song.
2. Display or draw a picture of the water cycle and review that all water on Earth is part of the water cycle including our drinking water. (lesson 5d, The Water Cycle answer key)
3. Can students deduce where our drinking water fits into the water cycle based on what they have learned? Circle precipitation and runoff. Our drinking water is precipitation that falls to Earth and then, as runoff, flows over land in streams and creeks into the Sooke Lake Reservoir. (Optional -replay *Down the Drain and Back Again* video, Chapter 4)

Transition: Explain that students will be exploring this part of the water cycle more closely through a series of experiments.



Educator's Kits, including hardcopy lesson plans and support materials, are available for loan through the CRD. For pickup locations, print-friendly materials and multimedia tools see www.crd.bc.ca/teacher or contact the CRD at 250.360.3133.

Teacher Resources

- ▶ Assessment Tool: "Sooke Lake Watershed: How is it flowing?"

Student Resources

- ▶ Handout: "Sooke Lake Watershed- How's it flowing?" (1/student or group)

Lesson Resources

- ▶ Capital Region Watersheds Map
- ▶ "Water Cycle Song Lyrics" (Opt.)
- ▶ "Water Cycle Diagram" (Less 5c)
- ▶ Video: *Down the Drain and Back Again*
- ▶ Water
- ▶ Towel or paper towel
- ▶ Pollutants (opt) - food colouring (chemicals- pesticides), molasses (oil, gas) crumbled cookie (animal droppings)
- ▶ Props (opt.)- toy car, toy boat, local animal toys

Exper. 1 - Erosion

- ▶ Paint tray OR a deep pan
- ▶ Soil
- ▶ Spray bottle or sport bottle of water (1-5)

Exper. 2 - Sink, Float

- ▶ Paint tray OR a deep pan (1/group)
- ▶ rocks, leaves, sticks, feathers (1/group)
- ▶ Water

Exper. 3 - Stopping Erosion

- ▶ Paint tray OR a deep pan (1/group)
- ▶ soil, rocks, sticks, moss, sponge (1/group)
- ▶ Spray or sport bottle of water

Exper. 4 - Pollution Solution

- ▶ water soluble markers (4 colours per group) per group)

Demonstration - Runoff and Watersheds

1. Ask students if they know the word "watershed"? Together breakdown the word into "water" and "shed" - the action of flowing in drops. (eg. shed tears) Explain that the circled area is like a "watershed"- an area of land where water under the land (groundwater) and "runoff" (rainfall and melted snow that flows over the land) flow into the same place such as a creek, stream, lake, river, or the ocean.

2. Pair students up or, if you have a document camera, have a student volunteer to help with a demonstration.

3. Have one partner cup their hands side by side. The other student will lightly spray water into their partner's hands - this is "precipitation". What happens? The water, called "runoff", flows through the creases in their hands (stream, creeks and rivers) and pools in their palms (lakes, reservoirs, oceans). Their hands, the area that drains the runoff into a body of water, are the "watershed".



Word Maps

1. Have students start Word Maps for "runoff" and "watershed".

Transition: *One pair of hands is one watershed, but like our class that has many pairs of hands, the Earth has many watersheds.*

Discussion - Watersheds in our Region

1. Display the "CRD Watersheds Map" outlining over 300 watersheds. Together identify watersheds of known locations, such as the school. Note: A watershed is usually named after the body of water where the runoff for the watershed collects.
2. Identify the Sooke Lake Watershed, and the Sooke Lake Reservoir within its boundaries-where our drinking water comes from. Invite students to take a closer look at runoff water in the Sooke Lake Watershed.

Experiment 1 -Erosion

1. Group students and distribute to each group: a tray with soil spread evenly, a spray bottle of water (or other container of water), the handout "Watershed: How's it flowing?"
2. Have students prop the tray up on one end and explain that the tray is a watershed and the bottom where the water collects is the lake (reservoir).
3. Have them complete the experiment and share their observations, e.g.:
 - that heavy rain can cause soil to flow into the "lake" - this is called "erosion"
 - that the soil causes the water to become "dirty" or "cloudy"
 - that if the water sits undisturbed, the soil will sink leaving clear water on top

NOTE: *It can take 2 years for water to flow from the north end of Sooke Lake Reservoir to the intake tower at the south end. Eroded material settles to the bottom of the lake.*

Experiment 2 - Sink, Float

1. Write the words “sink” and “float” on the board. Ask students if they know what these terms mean. Discuss as a class.
2. Have students conduct an experiment to explore which objects will sink and which will float: Distribute a leaf, stick, feather and a rock to each group, and one copy of the handout, “Sink or Float?”, to each student.
3. Ask them to look at the objects, and make a prediction as to whether they will sink or float. Have them record their predictions on the handout, then try it out to see what happens. If needed, add more water to paint trays.

Note: The intake tower has gates at different heights. The reservoir water is tested and the gates in the clearest water level are opened (usually the lowest-it is the coolest water and less cloudy than the surface, which can be churned by weather)

Assessment Opportunity

Discuss students’ conclusions as a class. Help students to see that the objects they tested that are heavier than water sank, while the objects that are lighter than water floated. Could erosion, sinking and floating effect our drinking water quality?

Experiment 3- Stopping Erosion

1. Provide students with rocks, clay, vegetation (moss or sponge to represent moss) or other materials to use to slow or divert water.
2. Have students share their observations e.g.:
 - that slowing down the flow of water helps reduce erosion
 - that placing rocks in the middle of the stream can cause erosion of soil elsewhere.
 - a layer of moss on top of the soil slows down erosion (absorbs the water, plant roots also hold soil in place)

Note: CRD staff maintain the drinking watershed and watch for and fight forest fires- the biggest concern for water quality since it removes vegetation, increases erosion and creates ash.

Experiment 4 – Other Watersheds – Pollution Solution

1. Have students draw a watershed on a piece of paper with the lake at the bottom of the paper or use a chalkboard, whiteboard or poster paper.
2. Post the paper on the wall. Optional - use a plastic table cloth or garbage bag to protect the wall and/or floor.
3. Use different colour water-soluble markers to draw possible pollutants in an unprotected watershed: a car, a boat, animal (e.g. feces), litter, fire (causes ash and erosion- tree and plant roots help hold soil in place).
4. Spray with water and watch as colours mix with runoff water flowing down the paper into the “lake” at the bottom of the page.

Note: Can conduct this experiment using paint trays and optional materials listed under lesson resources.

Discussion- Keeping it clean- What would you do?

1. Display the image of “Greater Victoria Drinking Water System” image OR in Google Maps, search “Sooke Lake” use Satellite or Earth view.
2. Encourage students to recognize that most water does not fall directly into the reservoir. Most of it flows in via streams or creeks, which feed run off and anything it picks up from the watershed (surrounding area) into the reservoir.
3. Tell students to imagine they have been asked to build a reservoir. Where would they build it? Why? How would they protect the drinking water in the watershed?
 - pick an isolated lake to be our reservoir (no houses, no factories or other industrial developments)

- limit access and activities in the watershed (guided public access only, no camping, no campfires, no hiking, no boating, no swimming)
- allow water time to settle



Assessment Opportunity

Have students add to their Word Maps and handouts to their Water Portfolios and revise the class Know, Wonder, Learned (KWL) chart.

Collect the students' handouts "Sooke Lake Watershed - How's it flowing?" and "Sooke Lake Watershed: Pollution Solution".



Curricular Competencies

Look for evidence that students are able to:

Science

- ▶ Questioning and predicting
 - Demonstrate curiosity and a sense of wonder about the world
 - Observe objects and events in familiar context
 - Ask questions about familiar objects and events
 - Make simple predictions about familiar objects and events
- ▶ Planning and conducting
 - Make and record observations
 - Safely manipulate materials to test ideas and predictions
 - Make and record simple measurements using informal or non-standard methods
- ▶ Processing and Analyzing
 - Compare observations with predictions through discussion
 - Identify simple patterns and connections
- ▶ Evaluating
 - Compare observations with those of others
 - Consider some environmental consequences of their actions
- ▶ Communicating
 - Communicate observations and ideas using oral or written language, drawing, or role-play
 - Express and reflect on personal experiences of place

Social Studies

- ▶ Use Social Studies inquiry processes and skills to ask questions; gather, interpret, and analyze ideas; and communicate findings and decisions
- ▶ Explain why people, events, or places are significant to various individuals and groups (significance)
- ▶ Recognize causes and consequences of events, decisions, or developments (cause and consequence)



Extensions and Adaptations

- ▶ Alternative materials for the experiments:
 - Replace the tray with a transparency sheet or white plastic bag on an angled surface
 - Replace the materials and pollutants with water soluble markers
- ▶ Experiments may be performed as demonstrations by the teacher, or completed as jigsaw exercises in which students are separated into working groups (all like numbered students together) and reporting groups (students numbered e.g. 1, 2 and 3) Each working group has a different experiment and reports the findings to the reporting group.
- ▶ Have students draw a picture of a recreational lake and compare with a lake used as a reservoir.
- ▶ Challenge students to suggest additional objects to predict and test in the sink or float experiment.
- ▶ Collect water from a creek or stream in an unprotected watershed. Compare it to tap water from the protected Sooke Lake Reservoir. What differences do you see, feel and smell? NOTE: Do not taste or drink water from an unprotected source.

For more information about:

1. Our drinking water watershed protection
<https://www.crd.bc.ca/service/drinking-water/watershed-protection/greater-victoria-water-supply-area>
2. General watershed information
<https://www.crd.bc.ca/education/our-environment/watersheds/watershed-basics>
3. Meet Ollie the Otter, our local Watershed Warden who will take you on a learning adventure right in the middle of a watershed!
<https://www.youtube.com/playlist?list=PLQHNA9wdaAUHd1AP7mtCYXxXt05VEWdy>
<https://www.crd.bc.ca/education/school-programs/for-k12-teachers/educator-guides-resources/watersheds>



Sooke Lake Watershed – How’s It Flowing?

Name: _____ Date: _____

Experiment 1 - Erosion.

Draw and write what you see.

My Observations	
Pour Water Lightly 	When I poured the water slowly...
Pour Water Heavily 	When I poured the water quickly...

My conclusion: Does the amount of water make a difference? What happens to the “lake” water?

Experiment 2- Sink or Float.

Make a prediction. Will each object sink or float?

Object	I predict it will...		I saw it...	
	Sink	Float	Sink	Float



Experiment 3- Stopping Erosion

Pour water lightly.

What did you do to slow down erosion? Draw it.



We used...

My observations:

My conclusion:

Pour water heavily.

What did you do to slow down erosion? Draw it.



We used...

My observations:

My conclusion:



Name: _____ Date: _____

Experiment 4- Other Watersheds Pollution Solution.

What could pollute water in an unprotected watershed? What are some solutions?

What caused it?	Pollution	Solution
car		

My watershed.

What watershed is your school in?

Where does the runoff water flow?

What kinds of pollution do you think could be in the runoff water?

What could you do to help prevent pollution of the runoff water?

WATER WISE

To protect the quality of the Sooke Lake Reservoir water, the Capital Regional District staff:

- Plant trees to help bring back the forest
- Watch for and fight forest fires (roots from plants and trees hold onto the soil)
- Only allow limited human access and keep pets out.



Sooke Lake Watershed – How’s It Flowing? - Answer Key

Name: _____ Date: _____

Experiment 1 - Erosion.

Does the amount of water make a difference? What happens to the “lake” water?

My Observations	
Pour Water Lightly 	<ul style="list-style-type: none"> ▶ that heavy rain can cause soil to flow into the “lake”. This is called “erosion” ▶ that the soil causes the water to become “dirty” ▶ that if the water sits undisturbed, the soil will sink leaving clear water on top
Pour Water Heavily 	

My conclusion:

Experiment 2- Sink or Float.

Make a prediction. Will each object sink or float?

Object	Sink	Float
Stick		✓
Rock	✓	
Leaf	✓	✓
Soil	✓	✓



Experiment 3- Stopping Erosion

Can you stop or slow down erosion?

We used...		My Observations
Pour Water Lightly 	E.G. STICKS, ROCKS, SPONGE	<ul style="list-style-type: none"> ▶ that slowing down the flow of water helps reduce erosion ▶ that placing rocks in the middle of the stream can cause erosion of soil elsewhere
Pour Water Heavily 		<ul style="list-style-type: none"> ▶ that spongy materials like moss soak up water, slowing down the flow into the lake

My conclusion:

Experiment 4- Pollution and Solution.

What could pollute water in an unprotected watershed? What are some solutions?

What caused it?	Pollution	Solution
Car, van, truck	Oil, gas, and other chemicals, erosion	No public traffic on roads
Boats	Oil, gas, and other chemicals	No recreational boating on lake
Campers and hikers	Litter (plastic bottle cap); going to washroom, erosion	Area closed to public
Forest fires	Erosion	No camping or hiking, staff watching for signs of fire and ready to fight fires

My watershed.

What watershed is your school in? For map, go to www.crd.bc.ca/teacher or use map on next page.

Where does the runoff water flow? *This is usually the body of water with the same name as the watershed, then out to the ocean, harbour, lagoon or bay.*

What kinds of pollution do you think could be in the runoff water? *Gas, oil, chemicals from vehicles and equipment that runs on gas, pesticides, litter...*

What could you do to help prevent pollution of the runoff water? *Not litter, plan a community clean up day, education campaign.*