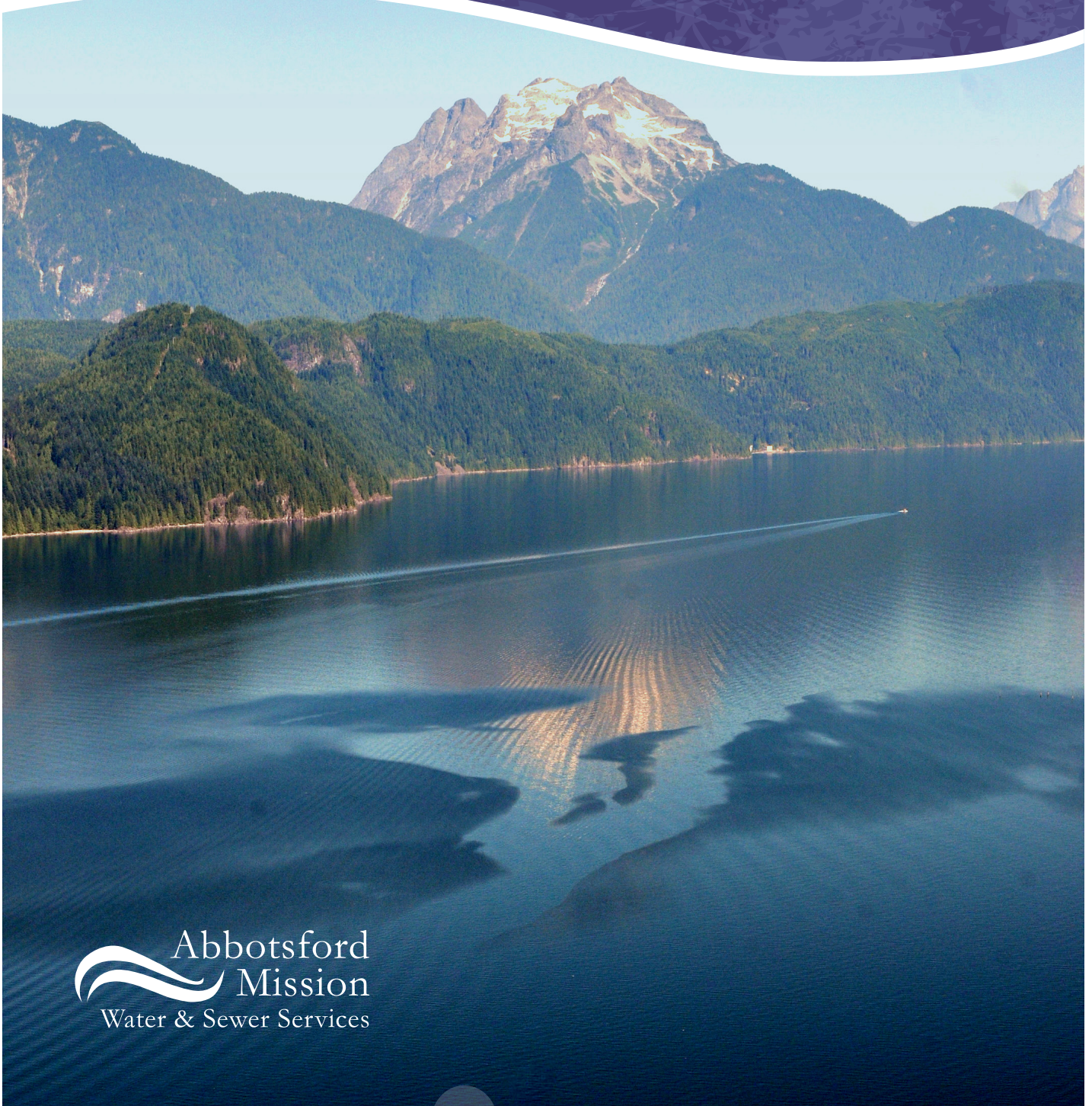


# our water matters

A Water Conservation  
Resource Kit for Teachers  
Grades 11–12



 Abbotsford  
Mission  
Water & Sewer Services

Learn. Inspire. Act.

[www.ourwatermatters.ca](http://www.ourwatermatters.ca)



Commercial reproduction  
of **Our Water Matters** is prohibited.

Classroom materials in this document may be reproduced  
for educational purposes only.

Material in this publication was developed and prepared  
specifically for the Abbotsford Mission Water & Sewer Commission by:

Knowledge2Action: S. Marazzi & K. Perry  
[info@knowledge2action.org](mailto:info@knowledge2action.org)

Thornley Creative Communications  
[www.thornleycreative.com](http://www.thornleycreative.com)

City of Abbotsford Engineering Department  
[www.abbotsford.ca](http://www.abbotsford.ca)

PLEASE NOTE: Website addresses (URLs) are provided  
throughout this learning kit for reference and additional research.  
Every effort has been made to ensure these sites are  
up-to-date at the time of publication.

December 2013 Edition 1



[www.ourwatermatters.ca](http://www.ourwatermatters.ca)





## Welcome to Our Water Matters!

**Our Water Matters** is a learning resource kit for high school teachers and students addressing **water conservation**. The aim of this environmental citizenship education program is to promote a culture of water stewardship in the local communities of Abbotsford, Mission, and beyond.

These B.C. curriculum aligned resources give students the opportunity to:

- Develop an understanding that water is a precious and limited resource.
- Gain an awareness that water is a precious and shared community resource.
- Explore practical ways of incorporating water-wise actions in everyday life.







*“As children of a culture born in a water-rich environment, we have been slow to learn how important water is to us. We understand it, but we do not respect it enough.”*

William Ashworth,  
Nor Any Drop to Drink, 1982



**Thank you for your interest in water and for inspiring your students to use it wisely.**  
**Our Water Matters!**

Be sure to tap into [www.ourwatermatters.ca](http://www.ourwatermatters.ca) for community water information, and educational materials and initiatives!

## Why Teach About Water

Educating youth about the value of water, their water supply, water quality, and the importance of responsible water practices is an important investment in our future.

## Format & Organization

The **Our Water Matter Matters** resources are developed by teachers for teachers. Fully understanding the time constraints that teachers face, this resource kit is designed to include everything a teacher will need to *make a splash* in the classroom. Your resource kit includes:

- **At a Glance** – An overview of activities, themes, key objectives, and curriculum links.
- **Water Facts & Background Information** – Key facts & information about water in Abbotsford, Mission, and beyond.
- **Five Lesson plans with Ready-to-Use Classroom Worksheets.**
- **Field Trips** – Real Community Water Connections outside the classroom.
- **Water Action Projects** – Suggested capstone projects giving students the opportunity to put together water knowledge and action.
- **Water Library** – The **Our Water Matters Library** linking students to key resources to support water research activities.

## Also in this Kit:

- **Dying for a Drink** – links teachers & students to water issues in the developing world.
- **A Waterfall of Resources** – links teachers to more water education resources.

## The Canadian Atlas Online (Canadian Geographic)

**Our Water Matters** provides connections & links to **The Canadian Atlas Online** (CAOL) Learning Centre. <http://www.canadiangeographic.ca/atlas/intro.aspx?lang=En>

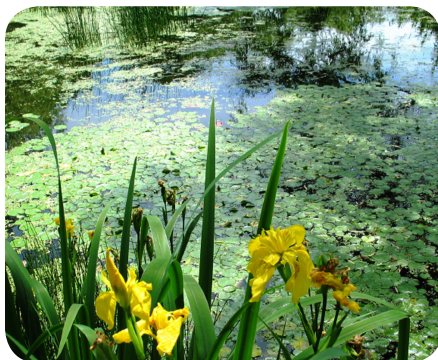




# Our Water Matters

Learn – Inspire - Act

Grades 11–12 🍎 For the Teacher



## Step Outside the Classroom & Discover Water in Your Community!



### Field trip ideas in your backyard:

- Visit the **Norrish Creek Water Treatment Plant** where students can learn about their water from source to tap. Meet with the experts who will provide a guided tour. See supporting classroom materials.
- Visit the **Abbotsford Entertainment & Sports Centre (AESC)** where students can learn about the benefits of rainwater harvesting in their community. Yes, the Abbotsford Heat hockey team is playing on rainwater ice! See supporting classroom materials.
- **Coming soon! Visit the Water-Wise Demonstration Garden at Mill Lake** in Abbotsford and **The Rain Garden** in Mission (7th & Grand St) where students can learn about water-wise garden designs and water conservation strategies.

### To book your field trip:

City of Abbotsford  
Engineering Department  
604-864-5514  
[eng-info@abbotsford.ca](mailto:eng-info@abbotsford.ca)



*"Direct experience with the environment, both individually and in groups, is an important and vital way to learn about sustainability. These opportunities must be provided for the studies to be relevant, because they help provide students with a deeper understanding of natural systems and the impact humans have on those systems."*

BC Ministry of Education Environmental Learning and Experience:  
An Interdisciplinary Guide for Teachers (2007)  
[www.bced.gov.bc.ca/environment\\_ed/](http://www.bced.gov.bc.ca/environment_ed/)





## Learning about Water: A Multidisciplinary Approach

**Our Water Matters** embraces an integrated and multidisciplinary approach across all curriculum subjects. The use of a multi-disciplinary approach to water studies ensures that students will develop a comprehensive *tool-kit* to make water-wise decisions, both for the present and the future. Additionally, students will re-consider water from not only a personal perspective, but also in terms of their local and the global community.

## Curriculum Alignment

**Our Water Matters** is linked to B.C. curricula and global environmental citizenship education.

These resources in this kit support:

- The integration of environmental concepts across the curricula as addressed in the B.C. Ministry of Education 2007 publication, **Environmental Learning and Experience** fostering and supporting the integration of environmental concepts across all B.C. subjects and grades.
- The vision of **UN's Education for Sustainable Development (ESD)** emphasizing a holistic, multidisciplinary approach to developing the knowledge and skills needed for a sustainable future.



*"Facilitating environmental education in the learning of all subjects, rather than isolating it, models for students how the environment is connected to their daily lives and relationships within their communities."*

Environmental Learning and Experience: An interdisciplinary Guide for Teachers  
B.C. Ministry of Education, 2007





*“Water education has to occur at all levels and in across all subjects to equip young people with the skills, knowledge, and values required for positive societal responses for a sustainable future”.*

ESD-WATER, UNESCO, 2010

## Key Documents for Teachers

### Integrating Environmental Learning Across All Subject Areas

#### B.C. Ministry of Education

- **Environmental Learning and Experience Curriculum Maps – K-12 Curricula (2008)**  
This teacher’s resources consists of a set of Environmental Learning & Experience (ELE) Curriculum Maps developed to support environmental learning by connecting learning outcomes across K-12. More at: [http://www.bced.gov.bc.ca/environment\\_ed/ele\\_curricmaps.htm](http://www.bced.gov.bc.ca/environment_ed/ele_curricmaps.htm)
- **Environmental Learning and Experience: An Interdisciplinary Guide & Video Clips for Teachers (2007)**  
This teacher’s resources supports the implementation of many of the curriculum packages and is complemented by web resources to support environmental learning in diverse subjects like science, social studies and language arts. More at: [http://www.bced.gov.bc.ca/environment\\_ed/](http://www.bced.gov.bc.ca/environment_ed/)

#### Government of Canada

- **The Framework for Environmental Learning and Sustainability in Canada (2002)**  
This document sets out an agenda for environmental learning in Canada. It addresses the values that serve as a foundation for environmental learning, and ideas and strategies for increasing knowledge, capacity and action. More at: [http://www.bced.gov.bc.ca/environment\\_ed/why.html](http://www.bced.gov.bc.ca/environment_ed/why.html)

#### UN Decade of Education for Sustainable Development – ESD (2005-2014)

- The UN’s ESD vision of education emphasizes a holistic, multidisciplinary approach to developing the knowledge and skills needed for a sustainable future, as well as the changes in human values, behaviour, and lifestyles. Water education is central to UN ESD.

Water & ESD <http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/water/>

# Grades 11–12: Curriculum Alignment

## A Selection of Rationales, Goals and PLOs

from the BC Ministry of Education  For the Teacher



**Our Water Matters** is linked to provincial curricula and global environmental education in the promotion of **responsible environmental citizenship**. The learning resources and activities in this kit support:

- The integration of environmental concepts across the curricula as addressed in the **B.C. Ministry of Education** 2007 publication, *Environmental Learning and Experience* fostering and supporting the integration of environmental concepts across all B.C. subjects and grades.
- The **UN's Education for Sustainable Development** (ESD) vision of education emphasizing a holistic, multidisciplinary approach to developing the knowledge and skills needed for a sustainable future.

### B.C. Ministry of Education

**Our Water Matters** is connected to the following subject areas and Performance Standards as outlined by the BC Ministry of Education. The content is taken from the IRPs and Performance Standard text to outline where **Our Water Matters** connects specifically to provincial curricula.

**Our Water Matters** is connected to the following subject areas as outlined by the BC Ministry of Education:

## Social Studies

### Social Studies 11

#### Skills and Processes

It is expected students will:

- Apply critical thinking—including questioning, comparing, summarizing, drawing conclusions, and defending a position—to make reasoned judgments about a range of issues, situations, and topics.
- Demonstrate effective written, oral, and graphic communication skills.
- Demonstrate skills and attitudes of active citizenship, including ethical behaviour, open-mindedness, respect for diversity, and collaboration.
- Demonstrate effective research skills, including: accessing information, assessing information, collecting data, evaluating data, organizing information, presenting information, citing sources.

### Human Geography

It is expected students will:

- Assess environmental challenges facing Canadians, including: global warming, ozone layer depletion, fresh water quality and supply.

### Civic Studies

#### Skills and Processes

It is expected students will:

- Apply critical thinking skills — including questioning, comparing, summarizing, drawing conclusions, and defending — to a range of issues, situations, and topics
- Demonstrate effective written, oral, and graphic communication skills.
- Demonstrate skills and attitudes of active citizenship, such as ethical behaviour, open-mindedness, respect for diversity, and collaboration.

#### Informed Citizenship

It is expected students will:

- Demonstrate a knowledge of historical and contemporary factors that help define Canadian civic identity, including:
  - roles of individuals in society governance, rights and responsibilities, culture, language, heritage, community, environment, geography, and international relations.

#### Civic Action

It is expected students will:

- Evaluate the citizen's role in civic processes locally, provincially, nationally, and internationally.
- Implement a plan for action on a selected local, provincial, national, or international civic issue.

### Geography 12 – Gradational Processes

It is expected students will:

- Describe the features and processes associated with running water, ground water, glaciers, wind, waves.
- Explain how climate affects human activity.



## Science

### Science & Technology 11

#### Natural Resources and Environment

It is expected students will:

- Describe the major natural resources found in British Columbia.
- Discuss the impact of society on natural resource management and the environment.

### Geology 12

It is expected students will:

- Evaluate the importance of ground water.

### Sustainable Resources 11 & 12

#### Career Topics

It is expected students will:

- Research career and job opportunities in resource industries and related services.

## Career and Personal Planning

It is expected students will:

- Apply research skills to acquire information related to job possibilities and career interests.
- Assess their transferable skills and relate them to occupational and lifestyle choices.
- Analyse changes taking place in the economy, environment, and society, as they relate to current labour-market information.
- Evaluate the contributions to society of various types of work



# Grades 11–12: At A Glance

## A Summary of Activities, Objectives, Curriculum Links and Action Outcomes

 For the Teacher



### Key Objectives:



Develop an understanding that water is a precious and limited resource.



Gain an awareness that water is a shared and valuable community resource



Explore practical ways of incorporating water-wise actions in everyday life



Inspire others to value, protect, and conserve water

Lesson	Objectives	Ready to use Handouts, Worksheets & Teaching Aids	Real Community Water Connections
<b>1. Our Water Matters</b>	<ul style="list-style-type: none"> <li>Gain an understanding that water is Earth's most precious resource</li> <li>Develop an understanding that water is a limited resource</li> <li>Realize that looking after water is a shared responsibility</li> </ul>	# 1. Values & Attitudes about Water # 2. Your Water Journey # 3. Test the Waters – Quiz # 4. Why Care about Water? # 5. <b>The Our Water Matters Library</b>	Invite a <b>Water Expert</b> to talk about <b>Water Matters</b> to your classroom!
<b>2. Where Does My Water Come From?</b>	<ul style="list-style-type: none"> <li>Develop an understanding of where water in Abbotsford and Mission comes from</li> <li>Create a poster board of Abbotsford &amp; Mission's waterways</li> <li>Develop an initial understanding of how water is managed in the community and the professions behind water management</li> </ul>	# 1. Where Does Our Water Come From? # 2. How to Create a Poster Board # 3. Exploring Water Professions (Profile Cards)	Field trip to the <b>Norrish Creek Water Treatment Plant</b> .  Invite Water Professionals to your classroom to explore water careers
<b>3. Our Watershed Matters</b>	<ul style="list-style-type: none"> <li>Gain an understanding of watersheds and the importance of protecting them</li> <li>Realize the importance of groundwater in BC &amp; Canada</li> <li>Make connections between watershed protection and the provision of clean and safe drinking water</li> </ul>	# 1. Our Watershed Matters # 2. Protecting Our Watershed # 3. Let's not take our abundance of Clean Water for Granted	Invite a <b>Water Expert</b> to your Classroom to hear first hand the importance of <b>watershed protection</b>
<b>4. Discovering Your Water Footprint</b>	<ul style="list-style-type: none"> <li>Develop an awareness of the daily water footprint (direct &amp; indirect use)</li> <li>Explore the connections between water and population growth</li> <li>Develop an appreciation for water as a precious, shared, and limited community resource</li> </ul>	# 1. Discovering Our Water Footprint (Part I & Part II) # 2. Water for Breakfast! How much Water Are You Wearing today? # 3. The Water Footprint in Our Community # 4. How Much Water Do We Use in Our Community?	Invite a <b>Water Expert</b> from the City of Abbotsford to talk about <b>community water</b> and the <b>water footprint</b>
<b>5. Reducing Your Water Footprint</b>	<ul style="list-style-type: none"> <li>Gain an understanding of the importance of water stewardship</li> <li>Explore practical ways of incorporating water-smart actions in everyday life</li> <li>Develop an initial understanding of rain water as a renewable natural resource and the potential for rainwater harvesting (RWH)</li> <li>Get involved in an action project to protect water and inspire others to value, protect, and conserve water</li> </ul>	# 1. Water Stewardship: What is it? # 2. Water at Home (Part I & II) # 4. A Water-Smart Action Plan # 5. Welcoming Rain in your World! # 6. Turning Rain Drops to Hockey Drops! # 7. Putting it Together (10 Water Action Projects!)	Host <b>Conversations about Conservation</b> in your classroom  Field Trip: The Abbotsford Sports & Entertainment Centre (AESC) – <b>A RWH Community Project</b>



**Classroom Consumables are available with this kit.** Refer to the section **A Waterfall of Resources** at the end of this kit for a complete list.



To book a **field trip** or invite the Water Experts to your classroom, contact City of Abbotsford Engineering Department at 604-864-5514 or [eng-info@abbotsford.ca](mailto:eng-info@abbotsford.ca).



# Grades 11–12: Tap Into Water Facts



For the Teacher

## Water on Earth

- About 70% of the Earth's surface is covered in water. However, 97% of the planet's water is too salty for humans, animals and plants. Another 2% of the water is held as glacial ice at the north and south poles. Only 1% of the Earth's water is available for human use!
- There is no new water. The water that is on the Earth now is the same water that dinosaurs drank!

## Water Supply in Abbotsford and Mission

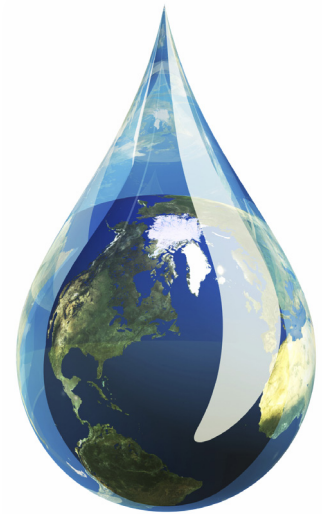
- The Abbotsford Mission Water & Sewer Commission (AMWSC) supplies bulk water to the City of Abbotsford and the District of Mission who then distribute water to residents and businesses.
- The water supply system consists of two surface water sources: Norrish Creek and Cannell Lake, 19 groundwater wells, two water storage reservoirs and 86 km of high pressure, steel water transmission mains.
- This system supplies and delivers approximately 135 to 155 million liters per day (L/d.).

## Water Use in Abbotsford and Mission

- There are approximately 170,000 residents in Abbotsford and the District of Mission in 2013.
- Each Abbotsford and Mission resident consumes anywhere from 200 to 440 litres per day (L/d).
- On an average day, Abbotsford and Mission use 75 million liters a day (L/d)...that's enough to fill an Olympic sized swimming pool 150 times!
- Summer water consumption can almost double!

## Water Use at Home and in the Garden

- Dripping taps are the biggest water wasters. Fixing a dripping tap can save up to 300 litres per day (L/d).
- A running tap pours out seven to twelve litres a minute!
- A leaking toilet can waste up to 2500 litres per day (L/d).
- Less than 3% of municipally water is used for drinking and the rest goes down the drain, down the toilet and onto our gardens.
- An average garden hose pours out approximate 20 - 40 litres of water per minute! A lot of water can be wasted when gardening or washing the car if you don't turn the hose off.



Want to know more about water in  
Abbotsford and Mission?  
Visit [www.ourwatermatters.ca](http://www.ourwatermatters.ca)

# Lesson 1: Our Water Matters!

## Grades 11–12



For the Teacher



### Key Objectives:



Gain an understanding that water is Earth's most precious resource



Develop an understanding that water is a limited resource



Realize that looking after water is a shared responsibility

## Overview

In this lesson, students will learn about Earth's most precious resource: Water. They will learn that the percentage of freshwater is miniscule when compared to that of saltwater. This first lesson will also introduce students to the [Our Water Matters Library](#) listing key resources, research, institutions, and networks addressing the theme of water.

**Tags:** freshwater, renewable freshwater, groundwater

**Time Required:** 90 min approx. + time to write Journal 1 and research topics (selected by student)

## Teacher Preparation

### Ready-To-Use Materials & Worksheets

This lesson plan features three activities and five ready-to-use classroom worksheets/handouts:

- # 1. [Values & Attitudes About Water](#) (statement strips)
- # 2. [Your Water Journey: Why Care about Water?](#)
- # 3. [Test the Waters](#) – Quiz (Student Copy + Teacher's Copy)
- # 4. [Why Care about Water?](#)
- # 5. [The Our Water Matters Library](#)

**Internet** enabled computers are needed to support research activities and video viewing.



*"The amount of moisture on Earth has not changed. A hundred million years ago –when dinosaurs were roaming the Earth, the planet had the same amount of water it has now."*

Sandra Postel, lead water expert for National Geographic's Freshwater Initiative and the director of the Global Water Policy Project.





# Lesson 1: Our Water Matters!

## Grades 11–12



For the Teacher

## Background Notes & Learning Activities

### Activity 1: Exploring Attitudes & Values about Water

#### Water Talk:

##### **How do you use water? How often do you think about water?**

Students focus on water use in their daily lives and in their community. Encourage students to explore all water uses such as recreation activities (swimming, canoeing, ice skating), showering, washing dishes, doing laundry etc.

- Arrange students in small groups. Place statement strips from [Worksheet #1: Exploring Attitudes & Values about Water](#) face down on desks. The objective of the following activity is for students to explore their attitudes and values about water. Students pick up one strip at a time and discuss the statement. As they continue to pick up the statement strips, they explore connections between the previous statements.
- Elicit feedback comments and encourage a discussion on the value of water in their community, in B.C., in Canada, and the Planet. **What would happen if all of a sudden water did not come out of your tap?** Complete the discussion with the strip “water is everybody’s concern no matter where we live” and focus on water as a shared responsibility.

Conclude with the strip statement **“Why study about Water?”**. Distribute and discuss [Handout #2: Your Water Journey](#) and discuss the importance of learning about water. Discuss the quote at the top of this handout: **“People can only protect what they love, but they love only what they know.”** Philippe Jacques Cousteau Sr (1910-1997).



### Activity 2: Testing the Waters

- The main objective of this activity is to dispel myths about water and water abundance as well as to give students the opportunity to improve their overall water literacy.
- Distribute [Worksheet: # 3 Testing the Waters](#). Students are given approximately five minutes to complete the quiz. See the Answer Key/Teacher’s Copy. Upon completion, ask: **What was new? What surprised you? Why should we think about water? How should we re-think water?**

#### Summary of Statement Strips

Lesson 1: Our Water Matters!  
Grades 11–12  
Worksheet 1: Exploring Values & Attitudes About Water

For the Student  
Abbotsford  
Mission  
Water & Sewer Services

**Cut the sentence strips.**  
Turn them face down on the desk. Pick up one statement at a time and discuss it. Be prepared to share your ideas with the whole class.

I know where my water comes from.

Water is the most precious resource on Earth.

The amount of water I use at home & at school doesn't really affect others.

Water is everywhere in Canada! What's the big deal?!

Water is a vital resource for my community.

Rain... we get plenty of it. So what?!

Water is everybody's concern no matter where we live.

Why learn about water?!

www.ourwatermatters.ca

13

# Lesson 1: Our Water Matters!

## Grades 11–12



For the Teacher



### Activity 3: Video: *Why Care About Water?*

2.29 minutes

This short is a **National Geographic** video narrated by Sandra Postel, the National Geographic Freshwater Fellow and by Alexander Cousteau, explorer for National Geographic. Available at:

<http://video.nationalgeographic.com/video/environment/freshwater/env-freshwater-whycares/>

The video is also available at:

<http://www.youtube.com/watch?v=Fvkzjt3b-dU&feature=fvvr>

**The main message in the video:** there is the same amount of water on Earth today as there was when the dinosaurs roamed. Just less than one percent of the planet's water is available to meet the daily drinking water, sanitation and food needs of nearly seven billion people and millions of other species!

In this video students will learn that **water needs to be cared for and protected**.

Using **Worksheet # 4: Why Care About Water**, students take notes and answer the questions.

Main issues highlighted in the video:

- Water is the basis of life.
- Though water covers 70% of Earth, more than 97% is salty & not available for human consumption. Another 2% is fresh water is locked in snow and ice, leaving us less than 1% for human consumption.
- This miniscule amount of 1% is used for drinking, agriculture, industries, nature, sanitation, and the food needs of nearly 7 billion people and millions of other species.
- 4,800 people die every day from a water-related disease.
- We are over-using water and over-pumping our ground water.
- 70% of what we extract from rivers, lakes, and aquifers goes to agriculture.
- Water is a global issue but also a very local issue.
- The time to conserve is NOW!

### Ask students:

What surprised you in the video? Do you think we value water enough? Is the presence of freshwater on Earth eternal?





# Lesson 1: Our Water Matters!

## Grades 11–12



For the Teacher

### Water Demonstration: Water is a Limited Resource

**Materials:** jug, tablespoon scoops, water

**Demonstration:** Teachers may consider doing the following demonstration to show that the percentage of freshwater is miniscule when compared to that of saltwater: 70% of the Earth's surface is covered in water. However, 97% of the planet's water is too salty for humans, animals and plants. Another 2% of the water is held as glacial ice at the north and south poles. Only 1% of the Earth's water is available for human use.

Let's assume we can put all the Earth's water in this 4L bucket. However, most of this is ocean water.



Why can't we use all of this water? Too salty!

Take out 125 mL (1/2 cup) of water from the bucket. This represents all of the fresh water on Earth.



However, most of this water is found in glaciers and frozen lakes and therefore can't be used!

Now take out 30 mL (2 1/2 tbsp.) of water from the fresh water.



This represents the water that is available for human use for the **WHOLE** Earth. All of us on Earth (over 7 billion people) need to share from the same global well.

### Water Talk:

- **What are the implications of knowing we have only 1% fresh water available for the entire Earth?** Limited resource, 1% needs to be shared among 7 billion people, every single personal action affects this limited supply. By 2025, the world population is projected to reach 8 billion. Because we undervalue water, we tend to overuse it and waste it. The apparent abundance of water in Canada is deceptive.
- **The next time we turn on the tap what will we consider?** Our personal water use affects others. We must learn to become water-smart.
- **How might our individual water use affect your community water resources?** We typically use more than we need. Water is a shared resource. We also need to be careful not to pollute or harm our water supply & source.
- **How can we change our daily actions to protect water resources?** Think about our daily water use, use it wisely, conserve, and inspire others to do the same!
- **Conclusion: Why should we re-think and re-assess our attitudes about water?**
  - Water=Life. We cannot live without it.
  - Water is a limited resource.
  - We use water every day at home, at school, and at work. In most cases we take it for granted. How we use and reuse water will help define the future of our community, country, and Planet.

# Lesson 1: Our Water Matters!

## Grades 11–12



For the Teacher



### Written in Water Journal Entry

The journals in **Our Water Matters** are intended as a form of formative self-assessment, an opportunity for students to think about their newly acquired water knowledge. The journals also afford an opportunity for dialogue between each student and the teacher.

**Journal Entry 1:** *What were your thoughts about water before the lesson? After the lesson? What surprised you? Why should we value water? Why is water everybody's responsibility?*



### Show What you Know!

#### Student Learning & Assessment

It is expected that students who have participated in this lesson, will be able to:

- Create a **water fact sheet** demonstrating that water as a limited and precious resource and/or a pie chart of water limits explaining why we should value water/
- Create a **poster** entitled ***Time to Rethink Water!***
- **Essay.** Respond in writing to the statement: *The amount of moisture on Earth has not changed. The water dinosaurs drank millions of years ago is the same water that falls as rain today.*

**Note!** These activities can be linked to any of the Action Projects listed at the end of this resource kit.

### Introduce your students to:



#### The Our Water Matters Library

A list of key resources, research, institutions, and networks addressing the theme of water. This handout aims to encourage students to dive deeper into **water matters**.



### Dive Deeper!

Have students choose one of the questions from **Testing the Waters Quiz** for further exploration. Refer students to the **Our Water Matters Library**.

# Lesson 1: Our Water Matters!

## Grades 11–12

### Worksheet 1: Exploring Values & Attitudes About Water

#### Cut the sentence strips.

Turn them face down on the desk. Pick up one statement at a time and discuss it. Be prepared to share your ideas with the whole class.

I know where my water comes from.



Water is the most precious resource on Earth.



The amount of water I use at home & at school doesn't really affect others.



Water is everywhere in Canada! What's the big deal?!



Water is a vital resource for my community.



Rain... we get plenty of it. So what?!



Water is everybody's concern no matter where we live.



Why learn about water?!





# Why Care about Water?

## Dear Student,

You may wonder **Why Water?** Because water is one of our most precious, yet undervalued resources and because **YOU** are part of the solution!

You are about to embark on a water journey. Through a series of activities, you will discover just how precious water is and the importance of caring for it.

## Your Water Journey begins with KNOWLEDGE!

This means gaining a deeper understanding of water in your community through investigation, study, research, and exchange of ideas. You will have an opportunity to learn about your water source, how water travels from source to tap and what happens in between, water quality, the water footprint, and water conservation.

## Why study about water? Because...

- We need to have a better understanding of water to protect our H<sub>2</sub>O!
- We need an opportunity to rethink water, our attitudes about water, and the importance of caring for our water.

## Making a Difference in Your Community

Improving your water knowledge will enable your actions to be better informed. You will be more effective in helping with water matters in your community. You will also be better equipped to tell others about the importance of water!

As you go through the **Our Water Matters** learning activities:

1. Consider daily the water choices you make – do not take water for granted;
2. Involve others in your water journey – family, friends, neighbours, etc. by sharing your water knowledge and ideas;
3. Use the **Our Water Matters Library** to dive deeper into water matters (see separate handout);
4. Keep up with news about water in your community and participate in local events;
5. **Spread your water knowledge** – create your own water blog, organize a Water Assembly, start a Water-Smart Club, a Water Conservation Group, a Blue Club!



Remember that each of us has an exciting opportunity to make a difference in our community and beyond!



*"People can only protect what they love, but they love only what they know."*

Philippe Jacques Cousteau Sr (1910-1997), explorer, ecologist, innovator, photographer, author, and researcher.



**Many drops fill a bucket.**



**our water matters**

# Lesson 1: Our Water Matters!

## Grades 11–12

### Worksheet 3: Testing the Waters

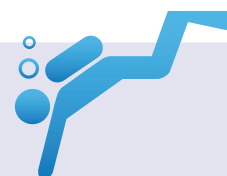
## How much do you really know about your H<sub>2</sub>O?

- What percentage of your body is water?
  - 60%
  - 70%
  - 90%
- 70% of the Earth is covered in water. What percentage of water is available for human use?
  - 25%
  - 40%
  - 1%
- A hundred million years ago, the planet had:
  - More water than it has now
  - Less than it has now
  - The same amount of water that it has now
- How much of the world's freshwater supply does Canada have?
  - 5%
  - 7%
  - 9%
- Most of Canada's water is found:
  - On the surface
  - Underground
  - Elsewhere
- What is Canada's per capita water consumption?
  - 280 litres a day
  - 300 litres a day
  - 340 litres a day
- How much water does the average 15-minute shower use?
  - About 100 litres of water
  - About 200 litres of water
  - About 300 litres of water
- An average garden hose uses:
  - 10 litres per minute.
  - 20 litres per minute
  - 30 litres per minute
- Which country is the world's top producer of hydroelectric power?
  - The United States
  - Canada
  - Russia
- What percentage of Canada's energy is supplied by water?
  - 50%
  - 60%
  - 70%
- How much water is used to make a cotton t-shirt?
  - 800 litres
  - 1,000 litres
  - 2,000 litres
- Of potatoes, rice, poultry, beef, which one uses the most water to provide 500 calories?
  - Rice
  - Poultry
  - Beef
  - Potatoes
- What are the biggest threats to water?
  - Climate change
  - Floods
  - Droughts
- How many people in the world do not have access to drinkable water?
  - 500 million approximately
  - 680 million approximately
  - 880 million approximately
- How many people die every day from water related diseases?
  - Approximately 475 people die every day
  - Approximately 1,400 people die every day
  - Approximately 4,800 people die every day



## Water Tip!

**Need to look up water terminology? Water concepts? Water definitions?** Go to the **Canadian Geographic Glossary of Terms**. Simply search by first letter! Each term is illustrated by great photography! Check it out at <http://www.canadiangeographic.ca/atlas/glossary.aspx?lang=En>



## Dive Deeper!

Choose **ONE** topic from **Test the Waters** to research.

Start your research by visiting:

<http://environment.nationalgeographic.com/environment/freshwater/freshwater-101/>



Check out the **Our Water Matters Library** for a list of key water resources to help with your research.

Sources: Canadian Geographic, Environment Canada, Living Water Smart B.C., Organization for Economic Cooperation and Development (OECD), UNWater

# Lesson 1: Our Water Matters!

## Grades 11–12

### Worksheet 3: Testing the Waters Answer Key



1. What percentage of your body is water?
- 60%
  - 70%**
  - 90%

2. 70% of the Earth is covered in water. What percentage of water is available for human use?

- 25%
- 40%
- 1%**

*More Info:* About 70% of the Earth's surface is covered in water. However, 97% of the planet's water is too salty for humans, animals and plants. Another 2% of the water is held as glacial ice at the north and south poles. Less than 1% is available for human use!

3. A hundred million years ago, the planet had:

- More water than it has now
- Less than it has now

- The same amount of water that it has now**

*More Info:* A hundred million years ago – when dinosaurs were roaming the Earth, the planet had the same amount of water it has now. The amount of water on Earth never changes but its form and location moves around the earth in rivers, aquifers, oceans and clouds. Water is constantly being recycled as it evaporates, condenses, and as it trickles back down to Earth as precipitation.

4. How much of the world's freshwater supply does Canada have?

- 5%
- 7%**
- 9%

*More Info:* With 7% percent of the world's renewable freshwater, Canada ranks fourth among the league of water-rich nations, after Brazil (18%), China (9%), and the United States (8%). "Renewable freshwater" means water that is replaced in any given year through rain and snowfall. More information on renewable freshwater in Canada at Natural Resource Canada at: <http://atlas.nrcan.gc.ca/site/english/maps/freshwater>  
Report: Freshwater Supply and Demand in Canada at: <http://www.statcan.gc.ca/daily-quotidien/100913/dq100913b-eng.htm>

5. Most of Canada's water is found:
- On the surface
  - Underground**
  - Elsewhere

*More Info:* In Canada, there is more water underground than there is on the surface! Water collects in aquifers, formations of rock that yield water when tapped for a

well. Groundwater often emerges naturally at the surface, forming a spring or flowing into a river or lake. In addition to providing us with drinking water, groundwater is also used for livestock, irrigation, aquaculture and mineral and hydrocarbon extraction. An estimated 750,000 British Columbians drink groundwater. Hundreds of groundwater aquifers provide water for industries, municipalities and rural homeowners in B.C. More on groundwater in Canada at: <http://www.canadiangeographic.ca/watersheds/map/?path=english/themes/groundwater>  
<http://www.livingwatersmart.ca/water-act/groundwater.html>

6. What is Canada's per capita water consumption?

- 280 litres a day
- 300 litres a day

- 340 litres a day**

*More Info:* The average Canadian household consumes approx. 340 litres a day. This is an extravagant level when compared with other countries. When comparing Canada to other industrialized countries, our per capita water footprint is almost double that of the United Kingdom at 1,258 m3 per year. Canada's per capita water consumption is 65 percent above the average, second only to the United States. Developing countries typically use 10 times less water than developed countries.

7. How much water does the average 15-minute shower use?

- About 100 litres of water
- About 200 litres of water

- About 300 litres of water**

8. An average garden hose uses:

- 10 litres per minute.
- 20 litres per minute (20 - 40 litres)**
- 30 litres per minute (20 - 40 litres)**

9. Which country is the world's top producer of hydroelectric power?

- The United States
- Canada**
- Russia

*More info:* Canada is the world's top producer of hydroelectric power, creating over 60 percent of its electricity through the use of dams. Quebec, British Columbia and Manitoba are especially dependent on hydropower — 75 percent of their electricity comes from hydro dams. <http://www.canadiangeographic.ca/watersheds/map/?path=english/themes/harnessing-water>

10. What percentage of Canada's energy is supplied by water?

- 50%
- 60%**
- 70%

*More Info:* 60 percent of electricity produced in Canada comes from hydropower—energy harnessed from the movement of water down rivers.

11. How much water is used to make a cotton t-shirt?

- 800 litres
- 1,000 litres
- 2,000 litres**

12. Of potatoes, rice, poultry, beef, which one uses the most water to provide 500 calories?

- Rice
- Poultry
- Beef**
- Potatoes

*More Info:* Beef uses more than 4,900 liters of water to produce 500 calories. By comparison, poultry takes 1500 liters, rice 251 liters, and potatoes 89 liters.

13. What are the biggest threats to water?

- Climate change**
- Floods
- Droughts

*More Info:* Water is the primary medium through which climate change influences Earth's ecosystem. Water levels, temperatures and flow will affect food supply, health, industry, transportation, and ecosystem integrity. Higher temperatures and changes in extreme weather conditions are projected to affect availability and distribution of rainfall, snowmelt, river flows and groundwater, and further deteriorate water quality. More information on climate change in Canada at: <http://www.pics.uvic.ca/insights/>

14. How many people in the world do not have access to drinkable water?

- 500 million approximately
- 680 million approximately
- 880 million approximately**

15. How many people die every day from water related diseases?

- Approximately 475 people die every day
- Approximately 1,400 people die every day

- Approximately 4,800 people die every day**

*More Info:* Almost 4,000 of these are children. Children under five are particularly vulnerable to water related diseases.



# Lesson 1: Our Water Matters!

## Grades 11–12

### Worksheet 4: Why Care About Water?

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services



**Watch the video and answer the following questions.**

Video Title \_\_\_\_\_

Produced by \_\_\_\_\_

Narrated by \_\_\_\_\_

1. What are the key issues and concerns highlighted in the video?

---

---

---

2. What are some of suggestions expressed in the video?

---

---

---

3. What surprised you?

---

---

---

4. What can **you** do about it?

---

---

---

### **The Hydrological Cycle; *What is it?***

The continuous circulation of water - on the Earth, below its surface and above in the air - is called the hydrological cycle. Throughout this cycle, water continuously changes states between solid, liquid and vapour. Individual water molecules come and go, but the amount of water on Earth remains the same.



### **Water Tip!**

**Water is the Earth's most vital resource. How you use and reuse water will help define the future of our planet.**



## Welcome to **Our Water Matters Library!**

### Get active and water-smart in your research!

Have you ever received an assignment to do research and you headed straight to Google? That is one way but not the only way! Here you will find key water resources to include organizations research institutions, universities, and more to help you **dive deeper into water matters**.

#### Two key water resources:

##### **Water Matters**

**[www.ourwatermatters.ca](http://www.ourwatermatters.ca)**

This is a very important website as your local water knowledge is stored here!

**Dip into your local water website** and soak up key facts & info about water in Abbotsford and Mission.



##### **Living Water Smart – B.C.'s Water Plan**

**[www.livingwatersmart.ca](http://www.livingwatersmart.ca)**

Another important water resource to help you learn more about BC's water plans!

**Living Water Smart** is the B.C. government's vision and plan to keep our water healthy and secure for the future. Here you will find key information about water stewardship in B.C., water governance, water legislation, etc.

Be sure to check out the great Resources section!



#### **Water Tip!**

**Remember your Water Knowledge Sources!**  
Always cite and validate your sources of knowledge and information.

# Lesson 1: Our Water Matters!

## Grades 11–12

### Handout 5: Our Water Matters Library

 For the Student

 **Abbotsford Mission**  
Water & Sewer Services



#### **British Columbia Water and Waste Association** (BCWWA) <https://bcwwa.org/>

BCWWA is a not-for-profit organization dedicated to safeguarding public health and the environment on matters related to water. Great online resource library! Be sure to tap into info & knowledge about **BC Drinking Water Week** – it happens every May. Direct link at <http://www.drinkingwaterweek.org/>



#### **Canadian Atlas Online**

<http://canadiangeographic.ca/atlas/>

A great resource by **Canadian Geographic**. You can explore maps, dive into water themes, and play a variety of games and quizzes. Also, a great resource if you need to look up water terminology, water concepts, and water definitions.



#### **Canada Water Week**

<http://canadawaterweek.com>

Lots of information on the water footprint. Here you will also find a very cool interactive Water footprint Infographic! Direct link: <http://canadawaterweek.com/cww/english.html>



#### **David Suzuki Foundation**

<http://www.davidsuzuki.org/>

Features a great section on freshwater. The David Suzuki's Foundation aims to protect the diversity of nature and our quality of life, now and for the future.



#### **Environment Canada**

<http://www.ec.gc.ca>

Water pages <http://www.ec.gc.ca/eau-water/>  
A great resource if you are researching water in Canada featuring key info & research on water quality, water quantity, water pollution, water governance and legislation, and climate change.



#### **Ministry Environment (B.C.)**

<http://www.gov.bc.ca/env/>

Water pages <http://www.env.gov.bc.ca/wsd/>  
A great resource if you are researching water and sustainable environments. A wealth of information, if you want to learn more about watersheds and groundwater!



#### **Natural Resources of Canada**

A great resource if you want to learn more about the distribution of freshwater.

<http://atlas.nrcan.gc.ca/site/english/maps/freshwater>



#### **Pacific Institute for Climate Solutions (PICS)**

<http://www.pics.uvic.ca/insights/>

Check out Climate Insights 101 – here you will find a simple introduction to climate change through a series of short videos.



#### **The National Water Research Institute (NWRI)**

<http://www.ec.gc.ca/inre-nwri/Default.asp?lang=En&n=0E7169DE-1>

Environment Canada's National Water Research Institute is the largest freshwater research centre in Canada.



#### **The Stockholm International Water Institute (SIWI)**

<http://www.siwi.org/>

SIWI is a policy institute studying solutions to the world's escalating water crisis. SIWI focuses on the following five water themes: water and climate change, the water-energy-food nexus, water governance, transboundary water management, and water economics.



#### **The Water Institute – University of Waterloo**

<http://water.uwaterloo.ca>

A great website to visit if you are interested in water science, technology, management, and governance.



#### **Water Footprint Network**

[www.waterfootprint.org](http://www.waterfootprint.org)

A website if you want to learn more about water footprint accounting, water footprint impact assessment, and wise-water use by countries, businesses etc. Check out the great water footprint product gallery and the online glossary!



#### **United Nations Websites:**

##### **UNWATER**

<http://www.unwater.org/>

##### **UN Decade for Action - UN Water for Life –**

<http://www.un.org/waterforlifedecade/>

##### **UNESCO – Water**

<http://www.unesco.org/new/en/natural-sciences/environment/water/ihp/about-ihp/>



## Water Tip!

### **Remember your Water Knowledge Sources!**

Always cite and validate your sources of knowledge and information.



# Lesson 2: Where Does Our Water Come From?

Grades 11–12

 For the Teacher



## Key Objectives:



Develop an understanding of where water in Abbotsford and Mission comes from



Create a poster board of Abbotsford & Mission's waterways



Develop an initial understanding of how water is managed in the community and the professions behind water management

## Overview

In this lesson, students will learn where their water comes from, how it travels from source to tap, and what happens in between. A **field trip** to the **Norrish Creek Water Treatment Plant** is suggested to support the learning outcomes in this lesson and lesson 3. *See field trip details.*

**Tags:** infrastructure, watershed, water treatment, water treatment plant

**Time Required:** 60 min + time to research & create a poster board

## Teacher Preparation

**Background Notes:** Water in Abbotsford and Mission

### Ready-To-Use Materials & Worksheets

This lesson plan features two activities and three ready-to-use classroom worksheets/handouts:

- # 1. **Where Does Our Water Come From?** (Group Research Assignment)
- # 2. **How to Create a Poster Board**
- # 3. **Exploring Water Professions in the Community**

### Photo Gallery:

Satellite images of the Norrish Creek and Cannell Lake Watersheds, poster **Our Water System**

### Classroom Consumables:

My Water System Map, The AMSWC Water Supply Diagram.

\*Several classroom consumables are available from the *Abbotsford Mission Water & Sewer Commission*. See a list at the back of the kit.

**Internet** enabled computers are needed to support research activities and video viewing.



# Lesson 2: Where Does Our Water Come From?

## Grades 11–12

### Background Notes & Learning Activities

## Background Notes & Learning Activities

### Water Talk: Introducing Water in Abbotsford & Mission

#### Where's the Water in Your Backyard?

Elicit rivers, creeks, ponds, lakes in the community. The City of Abbotsford has over 700 kilometres of watercourses and ditches, as well as numerous lakes, ponds and wetlands. Most carry flows to the Fraser River, but some in the southwest corner of the City connect to the Nooksack River in the US. A map of local waterways is available on the City of Abbotsford's website at: [www.abbotsford.ca](http://www.abbotsford.ca) and/or at: <http://www.abbotsford.ca/Assets/Abbotsford/Engineering+Department/2009-04-16+Creeks+and+Streams+Map.pdf>



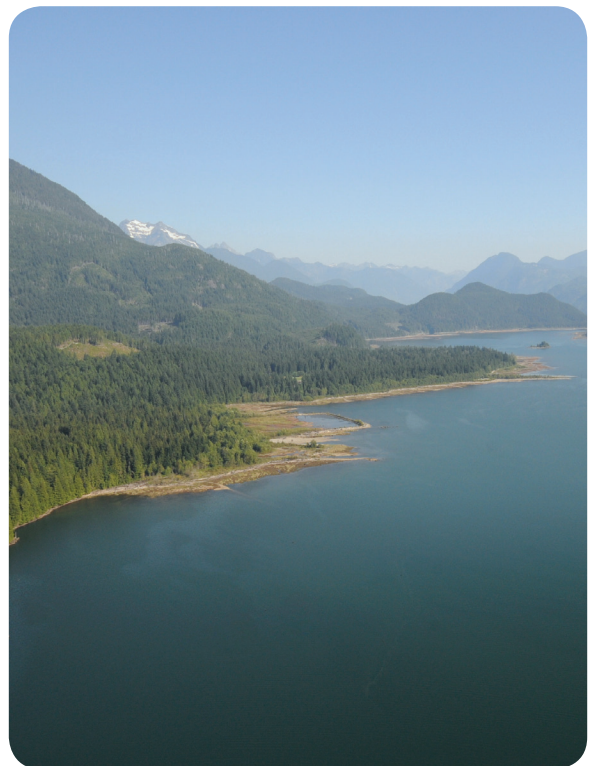
Place a glass of water on the desk and ask students: **Who can tell me where our water comes from?** Elicit/Introduce ideas, listing them from broad (e.g. Ocean/lake/river) to more specific (reservoir/watershed). **See Teacher's Background Notes.**

- **How does water get to your home? What happens on the journey from the source to your tap that makes water clean and safe to drink?** Elicit/introduce that the process by which water is purified so that it will be safe to drink is called water treatment. Refer to the poster **Our Water System** to show key water features and how water travels from Cannell Lake and Dickson Lake to their homes in Abbotsford & Mission.

#### What is a watershed?

Why is a watershed important in your community? Give students a basic definition. **Note!** Students will have the opportunity to learn more about watersheds in Lesson 3.

*A **watershed** is an area of land where all the surface water drains into the same place, whether it's a creek, a stream, a river or an ocean. All precipitation that falls on a watershed ends up flowing downhill to the same place. A watershed is a landscape feature also referred to as a catchment or drainage basin.*



Source: [www.canadiangeographic.ca/watersheds](http://www.canadiangeographic.ca/watersheds)

# Lesson 2: Where Does Our Water Come From?

## Grades 11–12

 For the Teacher



### Activity 1: Where Does Our Water Come From?

- Hand out the [Worksheet Assignment # 1: Where Does Our Water Come From?](#) and [Handout #2: How to Create a Poster Board](#). Internet enabled computers are required for this research activity.



Introduce students to:  
[www.ourwatermatters.ca](http://www.ourwatermatters.ca)  
their community water  
website featuring local  
water knowledge.

- Students work in pairs to research and create an **information poster board** of their water system. Hand out copies of satellite images of the Norrish Creek & Cannell Lake Watersheds, the AMWSC Water Supply diagram, and provide links to Google maps and/or Canadian Geographic: <http://www.canadiangeographic.ca/watersheds/map/index.aspx?path=english/>
- Students may choose to exhibit their poster boards during a relevant community event such as Drinking Water Week (May). Check the Environmental Calendar and the [www.ourwatermatters.ca](http://www.ourwatermatters.ca) website



### Step Outside the Classroom & Discover Water in Your Community!

#### What happens from source to your tap?

Find out by booking a trip to the **Norrish Creek Water Treatment Plant** where students can learn about their water source and the treatment of water. Meet with the experts who will provide a guided tour.

#### To book your field trip, contact

City of Abbotsford Engineering Department  
604-864-5514  
[eng-info@abbotsford.ca](mailto:eng-info@abbotsford.ca)

### Activity 2: Exploring Water Professions

#### Water Talk: How is water managed in your community? Who are the water professionals?

- **How is water managed in your community?**  
Elicit/Introduce that the City of Abbotsford and the District of Mission work together to manage a joint water system that serves the residents of Abbotsford and Mission under the name Abbotsford Mission Water and Sewer Commission (AMWSC). See Background Notes accompanying this lesson.
- **Who looks after water?**  
**Who are the people behind the water?**



**Video Suggestion:** Consider showing **The People Behind the Water** - an excellent video (13:39) showing the people, activities, and processes involved in providing clean safe drinking water.

**About the Video:** *The People Behind the Water* video is B.C. Water & Waste Association's story of the journey of our water, told through the eyes the people who work to provide safe clean drinking water and protect the environment. Available at: <https://www.bcwwa.org/bcwwa-news/269-people-behind-the-water-video.html>

- Distribute page 1 and the profile cards from [Handout #3: The People behind the Water in Our Community: Exploring Water Professions](#). Students work in small groups to read and discuss the profiles of each Water Expert in the Community. **What are some of the water professions in your community? What are some of the activities performed by these water experts? How does their work make a difference in our community? How did they become interested in water? What did they study?**
- Invite students to explore environmental professions and profiles at **ECO Canada - Environmental Career Organization** [www.eco.ca](http://www.eco.ca)
- The *Environmental Career Awareness Lesson Plans* featured at ECO bridge the gap between environmental education and career exploration. <http://www.eco.ca/public/services/educator/lesson-plans/240/>



# Lesson 2: Where Does Our Water Come From?

Grades 11–12

 For the Teacher

## Invite a Water Expert to your Class!

Learn more about:

- Your Community Water Source
- Water Conservation
- Water Careers

### Contact

City of Abbotsford Engineering, 604-864-5514  
eng-info@abbotsford.ca



## Written in Water – Journal Entry

The journals in **Our Water Matters** are intended as a form of formative self-assessment, an opportunity for students to think about their newly acquired water knowledge. The journals also afford an opportunity for dialogue between each student and the teacher.

**Journal Entry 2:** *Did you know your water source before this lesson? What surprised you about your local water? Why do you think it is important to know where your water comes from?*



## Show What you Know!

### Student Learning & Assessment

### Student Learning & Assessment

It is expected that students who have participated in this lesson, will be able to:

- Design a **quiz** testing local water knowledge.
- **Essay.** Respond in writing to the statement: *Everyone should know where their water comes from!*
- Create a **brochure** about your waterways to be distributed in your community to inform about local water.

**Note!** These activities can be linked to the **Action Projects** listed at the end this resource kit.

## Dive Deeper!



### Water Quality

- **What factors influence water quality? How is water quality monitored in B.C.? In your community?** Have students start their research by going to Environment Canada's water pages at: <http://www.ec.gc.ca/eau-water/> and click on *water quality*.

Water quality in your community:  
[www.ourwatermatters.ca](http://www.ourwatermatters.ca)

Direct link: <http://www.ourwatermatters.ca/Water-Quality-FAQs>

### Water Governance in Canada and B.C.

- Water governance:  
Environment Canada's water pages <http://www.ec.gc.ca/eau-water/> and click on *Water Governance and Legislation*.
  - For BC legislation go to Water Rights & Legislation at [http://www.env.gov.bc.ca/wsd/water\\_rights/index.html](http://www.env.gov.bc.ca/wsd/water_rights/index.html)
  - **Living Water Smart** - BC Drinking Water Protection Act [www.livingwatersmart.ca](http://www.livingwatersmart.ca)

## Encourage students to use the



## The Our Water Matters Library

# Lesson 2: Where Does Our Water Come From?

## Grades 11–12

 For the Teacher



### Background Notes

#### Water Management

- The City of Abbotsford and the District of Mission work together to manage a joint water system that serves the residents of Abbotsford and Mission under the name Abbotsford Mission Water and Sewer Commission (AMWSC).
- The AMWSC supplies bulk water to the City of Abbotsford and the District of Mission, who in turn, distribute the water to their respective customers. The AMWSC water system is operated by the City of Abbotsford.

#### Water Supply

The water supply systems for Abbotsford & the District of Mission consist of:

- Two surface water sources: Norrish Creek and Cannell Lake.  
Norrish Creek is the primary water sources and provides approximately 85% of the system supply. It is located northeast of Mission and is fed by Dickson Lake. Cannell Lake which provides approximately 10% of the water supply, is a surface reservoir located north of Mission with limited capacity due to its small catchment area of 2 km<sup>2</sup>.
- Dickson Lake, located approximately 10 km upstream of the water treatment plant, serves as a storage reservoir to supplement flow to Norrish Creek.
- 19 groundwater wells.
- 2 water storage reservoirs: Maclure Reservoir is located in the west region of Abbotsford and has a capacity of 28.6 ML. Mt. Mary Ann Reservoir, on the east side of Mission, has a capacity of 6.8 ML. The combined total volume of 35 ML is approximately equal to a tank the size of a soccer field with a height of 2.5 stories (7.5 m).
- 86 km of high pressure, steel water transmission mains.

Capacity: This entire system can supply and deliver approximately 135 to 155 million litres per day (MLD).

#### Water Use

- On an average day Abbotsford and Mission consume approximately 60-80 million litres per day (MLD). That's enough water to fill an Olympic-sized swimming pool 25 times.
- In the summer, water consumption can almost double due to outdoor water use.

The current water system can supply and deliver approximately 135 to 155 million litres per day (MLD). In 2007, water demand on the peak day consumed over 95% of this available capacity.

#### Water Treatment

All water drawn from Norrish Creek is filtered at the Norrish Creek Water Treatment Plant through either sand filters or a membrane filter facility.

- All filtered water is chlorinated before it flows into the clear well and the transmission system. At Bell Road, ammonia is added to form chloramines and soda ash is added to raise pH.

#### Water Quality

- Within the province of BC, water quality requirements are stipulated under the Drinking Water Protection Act
- Abbotsford and Mission's drinking water continually meets or exceeds quality standards set out in the BC Drinking Water Protection Act and the Canadian Guidelines for Drinking Water Quality.
- The British Columbia Drinking Water Protection Act requires that all water suppliers produce an annual water quality report that is reviewed by the local Drinking Water Officer and published for public access.
- Water Quality reports are published at [www.ourwatermatters.ca](http://www.ourwatermatters.ca)

#### More about water in...

- Abbotsford & Mission [www.ourwatermatters.ca](http://www.ourwatermatters.ca)
- British Columbia [www.livingwatersmart.ca](http://www.livingwatersmart.ca)

Sources: The AMWSC Water Master Plan 2011, Our Water Matters website, Statistics Canada. 2012. Abbotsford, British Columbia (Code 5909052) Census Profile. 2011 Census. Statistics Canada Catalogue no. 98-316-XWE. Ottawa.

# Lesson 2: Where Does Our Water Come From?

## Grades 11–12

### Worksheet 1 - Group Assignment



- Where does your water come from?
- The tap is only the final stop!
- How does it get from source to your tap?
- What happens in between?

#### Assignment: My Community Water System

With a partner, research your water system with the aim of creating a poster board. Your **poster board** should include:

1. A detailed **map** of your water system showing how water gets from source to tap
2. Key information and facts about your water system

**See instruction below.**

*\*Leave some room on your poster board. You may wish to add additional info as you continue to learn more about water.*

#### How is water managed in our community?

- The City of Abbotsford and the District of Mission work together to manage a joint water system that serves the residents of Abbotsford and Mission under the name Abbotsford Mission Water and Sewer Commission (AMWSC).
- The AMWSC supplies bulk water to the City of Abbotsford and the District of Mission, who in turn, distribute the water to their respective customers. The AMWSC water system is operated by the City of Abbotsford.

#### Time to do some research!

1. **Research your local water waterways using the following resources:**
  - a) Our Water System poster
  - b) A Google Satellite Map. Surf your watershed! Where is it? Locate Norrish Creek & Cannell Lake. Google it or go to the Canadian Geographic site <http://www.canadiangeographic.ca/watersheds/map/index.aspx?path=english>
  - c) The AMSWC Water Supply diagram and Satellite image of the Norrish Creek & Cannell Lake Watersheds
  - d) The **Our Water Matters** website. at [www.ourwatermatters.ca](http://www.ourwatermatters.ca)  
Pay special attention to the sections: Water Use, Water System & Water Quality



2. Using these sources, locate the following:

- a) Waterways - Fraser River, Cannell Lake, Dickson Lake, Norrish Creek
- b) Landforms - locate mountainous areas, residential areas, and the city of Abbotsford & the District of Mission
- c) Locate the Norrish Creek Water Treatment Plant, the two water reservoirs, and at least 4 groundwater wells.

Refer to the handout **How to Create a Poster Board** and follow the guidelines below:

#### Map Elements

Your map should include at least the following:

- Fraser River
- Cannell Lake
- Dickson Lake
- Norrish Creek
- Norrish Creek Water Treatment Plant
- City of Abbotsford
- District of Mission
- 2 Water Reservoirs –Maclure Reservoir & Mt. Mary Ann Reservoir
- At least 4 groundwater wells
- Water paths - one from Cannell Lake to Mission and one from Dickson Lake to Abbotsford

Provide a KEY/LEGEND of symbols.

Clearly label all features.

Use colour to show water, land, mountains, etc...



#### Information on your poster

Your poster board should include answers to the following questions:

- Where does our drinking water come from? A well? A river? A lake? A reservoir along the river?
- What are the main water sources? What are the current source capacities? What is Dickson Lake used for?
- What happens to your water to make it clean and safe for drinking? Where is your water treatment plant? What is done there? How is water quality monitored? How many tests are done annually?
- How is water treated before it gets to you? What is added, what is removed?
- Give your poster board a title & be creative with captions and presenting facts...let your imagination flow.





# Lesson 2: Where Does Our Water Come From?

## Grades 11–12

### Handout 2: How to Create a Great Poster Board!

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services

**A poster board is a great way to share your water knowledge and get information across to other people!**

#### Getting started:

1. **Organize** all of your water information and research. Decide what key facts you want to put in your poster board, and how you want to organize them. Poster boards are more effective with key facts organized in an easy and reader-friendly way.
2. **Choose a background color.** Make it bright and eye catching, but not so bright that it will overwhelm the message!
3. **Be creative & different!** Add water pictures or graphics. Also use your drawings or illustrating skills, or look online for images in the public domain that you can use.
4. **Utilize text features to organize your information!** Consider a catchy title, or headline, or creative captions. Use water words! Brainstorm “water expressions” i.e. *soak up these facts...*, *tap into this...*, *get the drift?* A poster board is a lot like the front page of a newspaper.
5. **Write out everything you are going to include.** Write short paragraphs for background info and explanations and design attractive, **easy-to-read boxes, charts, and graphs** to summarize key information.
6. **Find Your Voice!** While writing, remember to let your writing come alive. Use appropriate key vocabulary especially if it involves technical language or scientific vocabulary. Consider using expressive language. Find a way to speak directly to your audience - you can use “*Did you know?*”, “*Next time you...*”, “*It’s helpful to read...*”
7. **Font & Size.** Make the poster easy to read! Consider your font color and size. For readability, it is usually best to use one or two fonts for headlines, boxes, charts, and captions. You can use bold, italics and different sizes to create contrasts between the different parts of the poster.



**www.ourwatermatters.ca**

Dip into [www.ourwatermatters.ca](http://www.ourwatermatters.ca) to soak up key info about water in Abbotsford and Mission. This is your local water source – local water knowledge is stored here.



#### Dive Deeper!

Dive deeper into **Water Quality**. What factors influence water quality? How is water quality monitored in B.C.? In your Community?

- Start your research by going to **Environment Canada’s** water pages at:  
<http://www.ec.gc.ca/eau-water/>  
and click on water quality.  
<http://www.ec.gc.ca/eauwater/default.asp?lang=En&n=2C3144F5-1>
- Water quality in your community:  
[www.ourwatermatters.ca](http://www.ourwatermatters.ca)  
Direct link: <http://www.ourwatermatters.ca/Water-Quality-FAQs>
- Consult the **Our Water Matters Library** for more key sources



#### Check out the The Our Water Matters Library

This will help you in  
your water research!

## Lesson 2: Where Does Our Water Come From? Grades 11–12



### Handout 3: Exploring the Water Professions in Our Community

#### Who Makes It Happen? What Do They Do!

Clean and safe drinking water is provided to us every day. We turn on our faucets and there it is! However, few of us give little thought to the people behind the scenes that secure our supply of water, protect public health, and the environment.

- An entire team of dedicated professionals in every community is required to ensure safe drinking water travels from source to tap. These professionals treat the water to the highest standards, design state-of-the-art treatment and distribution systems, lay down the pipes, and then distribute the water to each home and business.
- When the water is used, another group of committed professionals create the system for collecting wastewater for treatment, design and build innovative treatment facilities to meet growing environmental standards, and return the treated water back to the environment.

Every level of these professions is essential, demanding, and a rewarding career choice!

#### Profile Cards -

Read the profile cards in your group. Identify:

- What are some of the water professions in your community?
- What are some of the activities performed by these water professionals? How does their work make a difference in our community?
- How did they become interested in water? What did they study?

#### Get Your Water Career Flowing!



Studying the environment, water, and being water literate is vital for today and for the future. Check out **ECO Canada - Environmental Career Organization** [www.eco.ca](http://www.eco.ca)



## Profile 1

### Water Planning & Processing Engineer

### Exploring Water Professions



#### Education:

Environmental-  
Chemical Engineering

B.ASc in Environmental-  
Chemical Engineering,  
University of Waterloo

#### This is what I do in our community:

- Work with a team to ensure that the community receives safe potable water.
- Monitor water quality data and use my water knowledge to ensure our community continues to have the necessary treatment processes to convert raw water into safe drinking water.
- Plan new infrastructure and infrastructure upgrades required to ensure a continued supply of safe drinking water.
- Analyze and report water quality results to the public and Health Authorities.
- Write reports to City Council and the Water Commission, recommending actions to improve the supply of safe drinking water.
- Work with consultants to explore solutions to the various challenges of supplying safe drinking water such as watershed management, infrastructure design, etc.



#### Why Water?

- I love working with water! Water is the basis of life.
- I enjoy working in the area of water quality and turning contaminated water into drinking water.
- I feel that working in the water industry is more likely to have a net benefit on the planet, as opposed to many other industrial sectors.
- I also enjoy working in a team and feel that working to ensure safe potable water to the community is a very rewarding profession.



## Profile 2

### Water Project Engineer

### Exploring Water Professions



#### Education:

Civil Engineering -  
University of Alberta

#### This is what I do in our community:

- Ensure an adequate supply of safe drinking water to the community.
- Work with consultants to develop designs for new infrastructure such as pipelines and water treatment equipment.
- Work to improve current operations, provide a more reliable system, and improve capacity of the system.
- Review studies and reports to determine future options for the system, such as new sources of water supply, existing system capacity and constraints.
- Liaise with other users of our watershed to ensure that activities do not have a detrimental impact to the water quality.
- Manage construction projects, working with the consultants and contractors.
- Write and present reports to City Council and the Abbotsford Mission Water & Sewer Commission (AMWSC) regarding issues related to the water supply system.
- Work with the City's operations staff to ensure that new projects address operational issues that they encounter.



#### Why Water?

- I am passionate about water, public health and about protecting our environment!
- Every project I work on has an impact on the community, although often hidden in the background.
- Many people take for granted the ease of access to high quality drinking water and how inexpensive it is. I think of people around the globe who don't have access to clean water or have to walk great distances for water, and am reminded how fortunate we are in Canada.
- I am passionate about public education on water. There are many misconceptions about water. Understanding and valuing water as a precious resource is vital to a sustainable future.
- By working with others to provide safe, clean water to residents, I am contributing in a very meaningful way to my community. A community's well-being and future is tightly bound to water.



## Profile 3

### Water Planning Engineer

#### Exploring Water Professions



#### Education:

Civil Engineering  
South Bank University,  
London, U.K.

Masters degree at  
Imperial College,  
London U.K.

#### This is what I do in our community:

- Plan new infrastructure and infrastructure upgrades required to ensure a continued supply of safe drinking water.
- Write reports to City Council and the Water Commission, recommending projects to pursue.
- Work with consultants to explore opportunities and solutions to the various challenges of supplying safe drinking water such as watershed management, infrastructure, etc.
- Work within a team to ensure that the community has enough water. I specifically contribute to this goal by being part of water structure upgrades and future planning.



#### Why Water?

- I have always loved fluid mechanics at university and knew that was the area I wanted to work in!
- Planning future water supply infrastructure is one of the most rewarding jobs I have had.
- I look forward to going to work every day!



## Profile 4

### Director of Water & Solid Waste

#### Exploring Water Professions



#### Education:

Bachelors of  
Applied Science-UBC

#### This is what I do in our community:

- Oversee the water supply and solid waste planning for the City of Abbotsford.
- Lead, guide, and work with my team to ensure we have an adequate supply of good quality water and that the solid waste generated by the homes and businesses in the community is disposed of in a sustainable manner.



#### Why Water?

- I have always had a long-standing passion for the environment; both water and solid waste are closely connected to the environment.
- When I was going to university I had a summer job working for the City of Vancouver working in the waterworks department. It was at this time that I realized that I wanted to be an engineer in a municipality, particularly in the area of water and solid waste.
- Water supply and solid waste (garbage, recycling, composting) play a crucial role in shaping our communities. It is very important to each home and business in our community.
- All of our projects have an impact on the environment; it is a challenge to ensure that we minimize the impact that our community is making.
- I enjoy working in a profession that contributes so significantly to the well-being of my community.

## Profile 5

### Director of Utility Operations

### Exploring Water Professions



#### Education:

Earned an apprenticeship in plumbing  
Built infrastructure so I knew how to build  
BCIT - garnered a diploma in Civil and Structural Technology

#### This is what I do in our community:

I monitor the operations and maintenance of:

- the water supply system- 2 surface sources and 19 wells complete with disinfection
- the water distribution systems –pipes, valves, hydrants, etc...
- waste water collection for the city—pipes, manholes, lift stations
- the waste water treatment –JAMES plant
- the storm water collection –pipes manholes—detention tanks

I also serve as President of the BC Water & Waste Association.



#### Why Water?

- I have always had a passion for water and for the how and why of the mechanics of the operations.
- I enjoy working in a team to provide clean health drinking water to residents .



## Profile 6

### Water Conservation Program Coordinator

### Exploring Water Professions



#### Education:

Studied Biology- UBC  
Masters in Environmental Science-  
Hong Kong University of Science and Technology

#### This is what I do in our community:

- Develop, manage, and deliver water efficiency programs for the Abbotsford Mission Water & Sewer Commission.
- Help residents and businesses in Abbotsford and Mission save water and money. This means that future drinking water infrastructure can be deferred, which helps protect the environment and saves money.
- Participate in educational and awareness programs and represent the Water & Sewer Commission at public events
- Undertake scientific research and write technical reports
- Prepare cost estimates, reports, studies, and recommendations to related work.
- Prepare educational and awareness brochures & materials for community.
- Develop and implement water conservation education programs for schools in Abbotsford and Mission.
- Manage water conservation summer staff.
- Prepare applications for grants and other funding sources as well as coordinating with other levels of government, Environmental NGOs and private companies on various conservation initiatives.

#### Why Water?

- I've always been passionate about safeguarding the environment!
- My first degree was in conservation biology and geography. My specific interest in water and waste started in graduate studies.
- I completed my Masters in Hong Kong focusing mainly on environmental impact assessments, which look at the impacts of projects and infrastructure on the environment.
- I was also worked as an educator and learned about the importance of educating the public and youth about water.
- Education is one of the most effective vehicles for supporting and promoting water conservation activities and water efficient practices in the community.

# Lesson 3: Our Watershed Matters

## Grades 11–12

 For the Teacher

3

### Key Objectives:

1

Gain an understanding for the importance of watersheds

2

Realize the importance of groundwater for B.C. & Canada

3

Make connections between watershed protection and the provision of clean and safe drinking water

## Overview

In this lesson, students will learn about the importance of watersheds and groundwater. They will also make connections between watershed protection and the provision of clean and safe drinking water.

**Tags:** aquifer, erosion, groundwater, sediment, turbidity, watershed

## Teacher Preparation:

**Time Required:** 90 min + time for research activities

### Ready-To-Use Classroom Materials & Worksheets

This lesson plan features three activities and three ready-to-use classroom worksheets/handouts:

- # 1. **Our Watershed Matters** – Handout/Backgrounder
- # 2. **Protecting Our Watershed** (Student Worksheet & Teacher Answer Key)
- # 3. **Let's not Take our Abundance of Clean Water for Granted** - article by David Suzuki + Worksheet

### Erosion Demonstration – Teacher Instructions

**Erosion demonstration materials:** 2 plastic cups, a pan with 2 inches of water, a container to pour water with, ½ cup of soil, some grass clippings, and a spoon

**Photo Gallery:** Norrish Creek, Cannell Lake, Groundwater, Well head

### Classroom Consumables

Poster Our Water System

Several classroom consumables are available from the Abbotsford Mission Water & Sewer Commission. See list at the back of the kit.

**Internet** enabled computers are needed to support research activities.



*"The river moves from land to water to land, in and out of organisms, reminding us what native peoples have forgotten: that you cannot separate the land from the water, or the people from the land."*

Lynn Noel, from 'Voyages: Canada's Heritage Rivers'



# Lesson 3: Our Watershed Matters

## Grades 11–12

 For the Teacher



## Background Notes & Learning Activities

### Activity 1: Our Watershed Matters!

- **Review** the term **watershed**.

A **watershed** is an area of land where all the surface water drains into the same place, whether it's a creek, a stream, a river or an ocean. All precipitation that falls on a watershed ends up flowing downhill to the same place. A watershed is a landscape feature also referred to as a catchment or drainage basin. Simply put, a watershed is the land upon which precipitation (such as rain) falls and flows to a common, watery place.

Source: [www.canadiangeographic.ca/watersheds](http://www.canadiangeographic.ca/watersheds)

### Water Talk:

**Why is your watershed important? Why does it matter?** Why should you protect your watershed?

Explain that a watershed is extremely important because it is the watershed that provides our community with drinking water as well as water for recreation, irrigation and industrial activities. Watersheds are also significant for plants and animals as they provide food and water. Review local watersheds (Lesson 2).

- **Write the following quote on the board and elicit comments:**

*"The river moves from land to water to land, in and out of organisms, reminding us what native peoples have forgotten: that you cannot separate the land from the water, or the people from the land."*

Lynn Noel, from 'Voyages: Canada's Heritage Rivers'

- **How might our land activities affect our watersheds? What is the connection between watersheds activities and **water quality**. What are some activities/environmental factors that might harm the quality of the water in your watershed?** Explain that what happens on land affects our watershed. Urban population and urban land-use practices exert enormous pressure on watersheds. Industrial pollution, agricultural runoff, erosion and logging, untreated sewers and more can affect water quality not just in one watershed but in all others downstream. The connection between activities on land and water in a watershed is an important concept for students to understand so they can take correct steps to care for their water source. It is much more expensive to clean water when it's dirty.

- Consider doing the **water erosion demonstration** in your class, since erosion and the resulting sediment in water is an issue for water supply and treatment. Use the demonstration to help explain the process and introduce the terms: **Watershed, Groundwater, Erosion, Turbidity and Sediment**.
- **What is WASTE? What kind of waste may result from recreational activities?** Waste is defined as any substance or object discarded for any reason, whether part or all. Substances include cans, papers, chemicals, etc.
- **Logging in Norrish Creek** - A long history of logging in the Norrish Creek watershed has been linked to landslides and turbidity. As erosion and the resulting sediment in water is a significant issue for water supply and treatment, consider doing an **erosion demonstration** in class to help students understand this. See separate Erosion Demonstration. Share the images in the Picture Gallery.
- **What is groundwater and why is it so important?** As stated in the opening quiz **Testing the Waters**, in Canada there is more water underground than there is on the surface! This subterranean water is known as groundwater. It collects in aquifers, formations of rock that yield water when tapped for a well. Groundwater often emerges naturally at the surface, forming a spring or flowing into a river or lake. **Prince Edward Island** relies entirely on groundwater. More information on groundwater at: <http://www.canadiangeographic.ca/watersheds/map/index.aspx?path=english/themes/groundwater> and some of the effects.
- Students continue to explore the connection between human activity and watersheds by working in pairs or small groups to complete **Worksheet #1: Our Watershed Matters**. Land activities that affect watershed. See answer key. Go over answers with the class.



# Lesson 3: Our Watershed Matters

## Grades 11–12

 For the Teacher

### Activity 2: Let's Not Take Our Clean Water for Granted!

#### Water Talk:

- What would you do if you turned the tap on and all of a sudden dirty water came out instead of clean water?! Do you think we take clean water for granted?
- Distribute [Handout/Workseet # 2: Let's Not Take Our Abundance of Clean Water for Granted](#) (article David Suzuki & Worksheet). Students read and complete the worksheet.

### Activity 3: Rock the Boat - Debating Recreational Activities in Watersheds

Plan an in-class discussion or debate. Students work in a group to explore and develop the points of view that could be considered in answering:

- **How do recreational activities affect watersheds?**  
Encourage students to review the information learned on the impact of land activities on groundwater.



#### Step Outside the Classroom & Discover Water in Your Community!

##### What happens to your water before it gets to your tap?

Find out by booking a trip to the **Norrish Creek Water Treatment Plant** where students can learn about their water source and the treatment of water. Meet with the experts who will provide a guided tour.

##### To book your field trip, contact

City of Abbotsford Engineering, 604-864-5514  
eng-info@abbotsford.ca



#### Written in Water – Journal Entry

The journals in **Our Water Matters** are intended as a form of formative self-assessment, an opportunity for students to think about their newly acquired water knowledge. The journals also afford an opportunity for dialogue between each student and the teacher.

**Journal Entry 3:** *Did you know about watersheds and groundwater before this lesson? What was new to you? What surprised you?*



#### Show What you Know!

#### Student Learning & Assessment

It is expected that students who have participated in this lesson, will be able to:

- Create a **public info sign** to be displayed in your local watershed explaining why it is important to care and protect watersheds.
- **Geocache** your Watershed! Learn about **Geocaching** and create the relevant pamphlets. See box below.
- Create a **brochure** to inform the public how land activities affect water.
- Draw a **diagram** to show the process and effects of erosion. Label the following terms in your display: groundwater, turbidity, erosion and sediment.
- **Essay.** Respond to: Groundwater - so important!
- **Essay.** Respond to: What we do on land, in our cities and in our waterways greatly affects our watersheds. We must act now to protect our water heritage.

**Note!** These activities can be linked to the **Action Projects** listed at the end of this resource kit.

# Lesson 3: Our Watershed Matters

## Grades 11–12

 For the Teacher



### Dive Deeper!



Have students dive deeper into

#### **Watersheds:**

- Ministry of Environment B.C.  
[http://www.env.gov.bc.ca/wsd/plan\\_protect\\_sustain/groundwater/aquifers/absumas.html#what](http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/aquifers/absumas.html#what)
- Canadian Geographic section Protecting Your Watershed. <http://www.canadiangeographic.ca/watersheds/map/?path=english/themes-list>
- Canadian Geographic: Groundwater  
<http://www.canadiangeographic.ca/watersheds/map/?path=english/themes/groundwater>

#### **Groundwater**

- National Geographic blog “Water Currents – Ideas & Insights about the World of Freshwater” See special blog on groundwater. <http://newswatch.nationalgeographic.com/2012/08/13/our-oversized-groundwater-footprint/>
- B.C. Ministry of Environment  
[http://www.env.gov.bc.ca/wsd/plan\\_protect\\_sustain/groundwater/index.html](http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/index.html)

#### **Groundwater & Climate Change**

- The effects of climate change on watersheds are numerous, impacting both water quantity and quality: <http://www.canadiangeographic.ca/watersheds/map/?path=english/themes/climate->

Encourage students to use the



### **The Our Water Matters Library**

This will help them get active in their water research!



### **Geocaching your Watershed!**

#### **Get your students geocaching!**

**What is geocaching?!** This is an exciting project of Environment Canada. Students can research their local watershed and develop information pamphlets about what they have learned. This knowledge will then be transferred to the public who visit their watershed location through geocaching.

Check out this link: <http://www.ec.gc.ca/geocache/default.asp?lang=En&n=E923094B-1>



### **More Watershed Learning Resources at:**

**Canadian Geographic –**  
[www.canadiangeographic.ca](http://www.canadiangeographic.ca)

Click on **Protect your Watershed** or direct link at:  
<http://www.canadiangeographic.ca/watersheds/map/?path=english/learning-resources-list>



# Lesson 3: Our Watershed Matters

## Grades 11–12

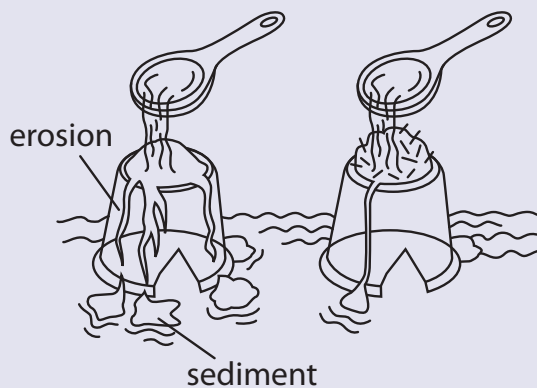


For the Teacher



For the Student

### Erosion Demonstration



#### Demonstration:

As erosion and the resulting sediment in water is an issue for water supply and treatment, use the demonstration of erosion to help explain the process. Use the demonstration to introduce the terms: Watershed, Groundwater, Erosion, Turbidity and Sediment.

**Ask Students:** Do you know what happens to your water before it gets to your tap?

- How is water turned into safe drinking water?
- What are some environmental factors that might harm the quality of the water in your watershed?

#### Preparation:

Fill the pan with 1" of water, and set it on a table where the students can observe. Cut a small triangle in the rim of each cup. Turn the cups upside down and place a mound of soil onto one of the cups, label it A. Take another scoop of soil and mix it with the grass clippings, place this scoop of soil onto the other cup, and label it sample B.

**Sample A** represents a hillside where major logging has taken place; lack of vegetation can cause erosion when it rains.

**Sample B** represents a hillside where less erosion will occur because of the vegetation. Trees and other vegetation are important to watersheds because they slow runoff, protect land from erosion, reduce water temperatures, and can even clean water.

Have a container of water ready to use in the demo.

### Demonstration

#### Display the prepared demonstration.

Tell the students that the cups represent two sections of land that are part of a watershed. Review the term watershed as an area of land where all the surface water drains into the same place, whether it's a creek, a stream, a river or an ocean. All precipitation that falls on a watershed ends up flowing downhill to the same place. The 2 sections of land are slightly different as one is mostly soil and the other contains vegetation that could be trees, plants and grasses.

Scoop 1 tablespoon of water from the container and tell the students this represents rain.

#### Ask:

- What will happen if this much rain falls on the hillside? Pour the tablespoon of water on one hill and repeat with the other hill.
- What did you observe? (maybe little or nothing, or the dirt soaked up the water, or the soil is falling into the water). Let the students know that the water travelling through the soil is called groundwater.
- What will happen if this much water (rain) falls on the hillside again? Note student predictions (continue to repeat this process until the soil from sample A begins to noticeably fall into the water more than sample B)

Tell students that as soil gets saturated with water it is unable to hold the water so the water will flow into lakes and rivers and it will take the soil with it - **erosion**. The soil that falls into the water is called **sediment**. The sediment builds up to make the water cloudy and this is called **turbidity**.



# Lesson 3: Our Watershed Matters

## Grades 11–12

### Handout 1 (Part 1)

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services

## Watershed Review!



### What is a watershed?

A watershed is an area of land where all the surface water drains into the same place, whether it's a creek, a stream, a river or an ocean. All precipitation that falls on a watershed ends up flowing downhill to the same place. A watershed is a landscape feature also referred to as a catchment or drainage basin.

Source: [www.canadiangeographic.ca/watersheds](http://www.canadiangeographic.ca/watersheds)

### Did you know?

**Everyone lives in a watershed!** No matter where you live, work or play, you are in a watershed! You might also be surprised to know that watersheds are more than just water. A watershed is an area of land where water flows across or through on its way to a particular water body, such as a stream, river, wetland or coast. Think of it as the land upon which precipitation (such as rain) falls and flows to a common, watery place.

**Watersheds come in all shapes and sizes!** They can be very large, spanning several provinces, or so small that they only encompass a small stream or wetland area. They cross provinces and national boundaries. A popular definition of the term "watershed" is communities connected by water.

**Groundwater. Why is it so important?** We can't talk about watersheds without talking about **groundwater!** Subterranean water is known as groundwater. In Canada there is more water underground than there is on the surface! It collects in aquifers, formations of rock that yield water when tapped for a well. Groundwater often emerges naturally at the surface, forming a spring or flowing into a river or lake. Groundwater is a resource of great importance, particularly as water is a limited resource.

**Who needs groundwater?** Approximately one in four Canadians (eight million people) rely exclusively on groundwater for their water needs. In addition to providing us with drinking water, groundwater is also used for livestock and irrigation. Groundwater is readily contaminated and extremely difficult — and, in some cases, impossible — to clean up. It's important to protect groundwater everywhere, because groundwater can travel hundreds of kilometres underneath the Earth's surface and eventually empty into lakes and rivers.



**Take a Guess!** Which province in Canada relies entirely on groundwater?

Sources: Canadian Geographic, Environment Canada

### Review! Water in my Community:

- Water in my community is supplied by Norrish Creek (85%), Cannell Lake (10%) and 19 Ground water wells (5%).
- More than 10,000 water tests are done annually to make sure your water is safe to drink.
- Drinking water in Abbotsford and Mission continually exceeds the standards set out by the Canadian Drinking Water Standards Guidelines.
- Water from Norrish Creek is filtered by slow sand or ultrafiltration membranes at the Norrish Creek Water Treatment Plant.

### What are some Environmental Challenges that affect my water source?

- A long history of logging in the Norrish Creek Watershed has been linked to landslides and turbidity.
- The recreational use of the Norrish Creek watershed for camping and water sports is a problem since these activities can harm watersheds.

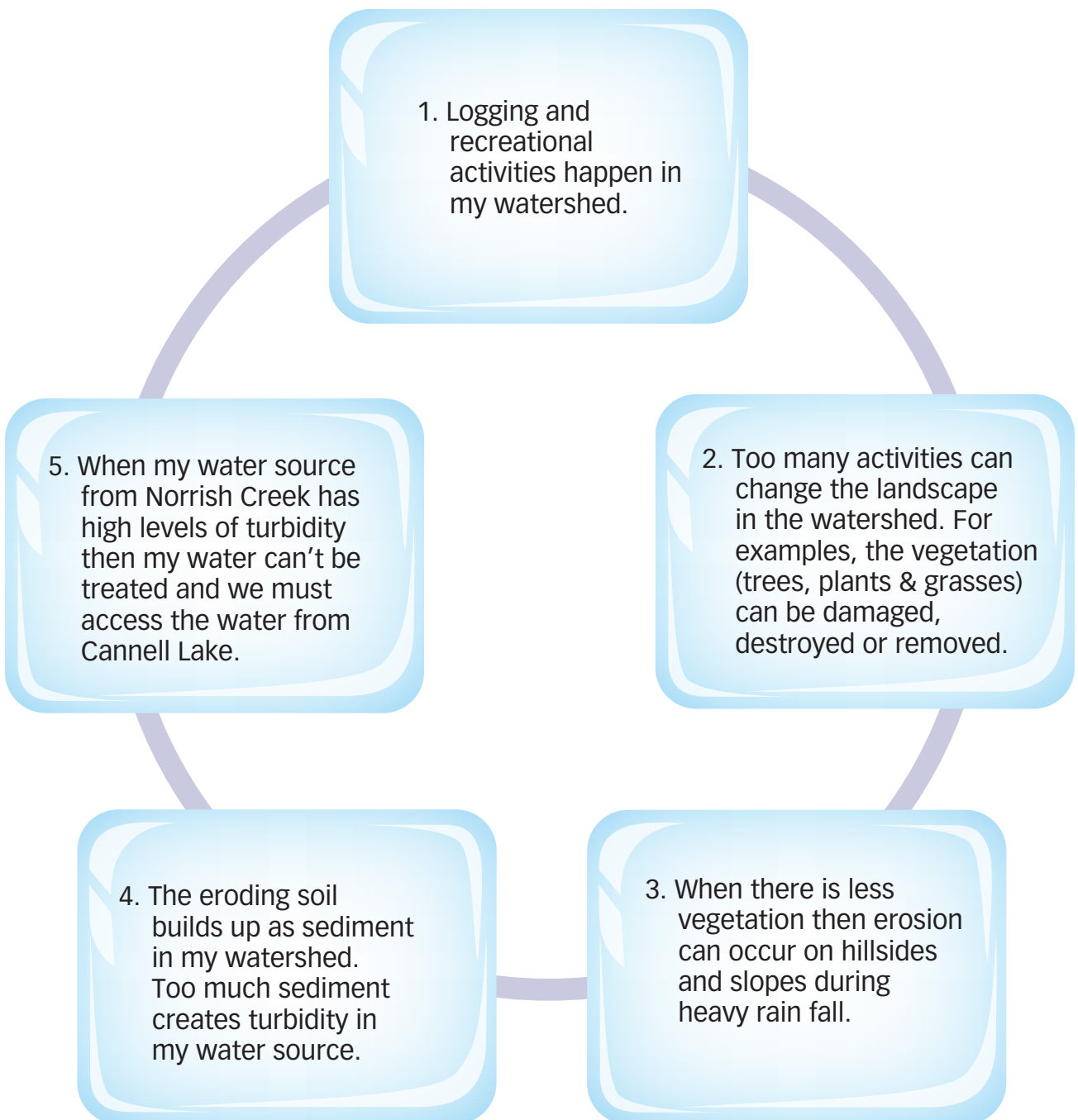
(AMWSC- Water Master Plan 2010)



*"The river moves from land to water to land, in and out of organisms, reminding us what native peoples have forgotten: that you cannot separate the land from the water, or the people from the land."*

Lynn Noel, from 'Voyages: Canada's Heritage Rivers'

### **What Happens in My Watershed When Logging & Recreation Activities Take Place**





# Lesson 3: Our Watershed Matters

## Grades 11–12

### Activity 2: Protecting Our Watershed

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services

#### What we do on land, in our cities and in our waterways greatly affects our watersheds!

The first step in preserving the health of your watershed is to understand what threatens its health and productivity. Although all of the threats outlined here may not exist currently in your particular watershed, it is important to remember two things:

- Pollutants can travel many kilometres downstream from their source.
- Future practices may introduce new threats of pollution – but knowledge, awareness and environmental responsibility could help reduce their potential impacts.



#### Dive Deeper!

Dive deeper into watershed matters:

- **Canadian Geographic – Protect your Watershed**  
<http://www.canadiangeographic.ca/watersheds/map/?path=english/themes-list>
- Canadian Atlas Online Watersheds  
[http://www.canadiangeographic.ca/atlas/themes.aspx?id=watersheds&sub=watersheds\\_flow\\_canadaswatersheds&lang=En](http://www.canadiangeographic.ca/atlas/themes.aspx?id=watersheds&sub=watersheds_flow_canadaswatersheds&lang=En)

Complete the chart below:

Why are watersheds so important? Why do they matter?	What are some land activities that may affect my water source?	What is groundwater? Why is it important? Why protect it?

Write down actions you can take to protect your local watershed.

---

---

---

---

---

---

---



#### Check out the The Our Water Matters Library!

This will help you in your water research!

# Lesson 3: Our Watershed Matters

## Grades 11–12

Answer Key: Protecting Our Watershed

**What we do on land, in our cities and in our waterways greatly affects our watersheds!**

Why are watersheds so important? Why do they matter?	What are some land activities that may affect my water source?	What is groundwater? Why is it important? Why is it important to protect our groundwater?
<ul style="list-style-type: none"> <li>• It is the watershed that provides us with drinking water!</li> <li>• It also provides us with water for recreation, irrigation and industrial activities.</li> <li>• Watersheds not only allow an area for water to drain and seep into the ground, they provide important habitat for both aquatic and terrestrial wildlife.</li> <li>• Watersheds support industries, which can sometimes put stress on a watershed, and have a number of recreational uses.</li> </ul>	<ul style="list-style-type: none"> <li>• Development of roads can impact watersheds.</li> <li>• Industrial pollution, agricultural runoff, erosion from logging, untreated municipal sewage and faulty septic systems can all affect watersheds.</li> <li>• Trees and other vegetation are important to watersheds because they slow runoff, protect land from erosion, and reduce water temperatures.</li> <li>• Pesticides and fertilizers can all reach watercourses through sewers, runoff, and infiltration.</li> <li>• animal waste, livestock manure, if stored uncovered and exposed to rain, can cause bacterial contamination of marine shellfish.</li> <li>• Chemical leakage from landfills or industrial waste-disposal sites can also dirty groundwater.</li> <li>• Oil and gasoline, dripped onto roadways from cars and eventually flushed into the ocean by the rain, contain many compounds that are toxic to marine life.</li> <li>• Pollutants within your watershed can also impact the economy and jobs, and can degrade the health and wellness of humans.</li> <li>• Traffic and travelling throughout the area can degrade land and oil.</li> </ul>	<ul style="list-style-type: none"> <li>• Groundwater is a good thing to know about as Canada has more groundwater than surface water!</li> <li>• Approximately one in four Canadians (eight million people) rely exclusively on groundwater for their water needs (mainly in rural areas).</li> <li>• In addition to providing us with drinking water, groundwater is also used for livestock, irrigation, aquaculture and mineral and hydrocarbon extraction.</li> <li>• Groundwater is readily contaminated and extremely difficult — and, in some cases, impossible — to clean up. In Canada, groundwater-contamination problems are increasing, due to the growing number of toxic compounds used in industry and agriculture.</li> <li>• It's important to protect groundwater everywhere, because groundwater can travel hundreds of kilometres underneath the Earth's surface and eventually empty into lakes and rivers.</li> </ul>

## Lesson 3: Our Watershed Matters Grades 11–12

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services



### Let's Not Take Our Abundance of Clean Water for Granted

By David Suzuki

CNEWS  
May, 2010

Article available at  
<http://www.cbc.ca/news/goinggreen/reusing-water.html>

If you're reading this in Canada, chances are that you can go to your kitchen and pour yourself a glass of cold, clean drinking water straight from the tap. If you've had a stressful day, you can run yourself a nice warm bath.

That's not the case in some parts of the world, where a woman may have to walk many kilometres with her children just to fill a bucket with murky water, which she must then carry back over the parched landscape. Canadians who have travelled outside of the tourist resorts in nearby Mexico know that abundant and clean water is never taken for granted there.

In the U.S., climate change is expected to reduce flows in major rivers, including the Rio Grande and Colorado, by as much as 20 per cent this century, according to an Interior Department report. With an increase in droughts over the past several decades, these areas are already experiencing challenges in supplying growing populations with water for drinking, irrigation, power generation, and recreation.

We often take our abundant and clean water for granted here in Canada, but we shouldn't. To begin, climate change is altering precipitation patterns, increasing drought in some areas and flooding in others, and it's reducing the amount of water stored in glaciers, snow packs, lakes, wetlands, and groundwater.

At the same time, demand for water and threats to clean supplies are both increasing, as our populations grow and as industry, especially in the energy sector, continues to require greater amounts. Despite technological improvements, the tar sands use considerable amounts of water and pollute rivers

and groundwater. Hydraulic fracturing, or fracking, requires massive amounts of water to extract natural gas from shale deposits, and the process is known to contaminate water supplies. Nuclear power plants also require vast amounts of water.

The consequences of water shortages and contamination are severe and numerous. Many of us remember the tragedy in Walkerton, Ontario, in 2000, when seven people died and as many as 2,300 became ill after drinking from wells containing high levels of E. coli bacteria. It's an issue that many First Nations people here have to deal with every day. In fact, around the world, water-related illness is one of the leading causes of death, mainly in the developing world. Health authorities estimate that unclean water kills three million people a year, including close to two million children who die of diarrhea because of bad water. Worldwide, researchers estimate that as many as half of the people in hospital are there because of waterborne diseases.

Water shortages also mean less is available for irrigation, which has a severe impact on our ability to grow food. University of Alberta ecology professor David Schindler has argued that "Water scarcity will become one of the most important economic and environmental issues of the 21st century in the western prairie provinces." A Senate report last year concluded that summer flows in many Alberta rivers are already down by about 40 per cent from where they were a century ago.

We must also consider what will become of people as water becomes more scarce and contaminated. Along with the other issues around climate change, this could trigger massive refugee crises.

Fortunately, solutions exist. As individuals, we can conserve water. Canadians use twice as much water per capita as Europeans and many times more than people in most parts of the world.

By raising awareness of our consumption and by installing low-flow plumbing and using landscaping that doesn't require much water, we can all make a difference.

Governments have a huge role to play as well. To start, metering and disincentives for high water use can help with conservation. But most importantly, governments must tackle the challenge of climate change. Along with the benefits of protecting clean water supplies and human health, addressing climate change will also strengthen the economy. An analysis conducted last year by the Western Climate Initiative showed that addressing climate change and fostering clean-energy solutions could lead to cost savings of about US\$100 billion by 2020 for the Initiative's member states and provinces.

***We can't live without clean water.  
That's something we all have to think about!***

David Suzuki Foundation  
[www.davidsuzuki.org](http://www.davidsuzuki.org)





Norrish Creek WTP





Cannell Lake



Groundwater Well Head





# Lesson 3: Our Watershed Matters

## Grades 11–12

### Worksheet 3: Let's Not Take Our Water Quality for Granted

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services



**Title of Article:**

**Date, Author Source:**

---

---

---

---

1. List five issues/concepts expressed in this article.

---

---

---

---

---

2. Do you deem the article objective and reliable? Why?

---

---

---

3. What is the author's opinion of the issue/s?

---

---

---

4. What is your opinion of the issue? Support your opinion.

---

---

---

5. Why is this issue important?

---

---

---

# Lesson 4: Discovering Our Water Footprint

Grades 11–12

 For the Teacher

4

## Key Objectives:

1

Develop an awareness of the daily water footprint (direct & indirect use)

2

Explore the connections between water and population growth

3

Develop an appreciation for water as a precious, shared, and limited community resource

## Overview

### Background

Fresh water is a renewable resource, but it is also a finite resource. Around the world and in our own backyard, there are numerous signs that human water exceeds sustainable levels. All human activities use water: drinking, cooking, washing, manufacturing, livestock, agriculture, municipal use, producing goods, etc. An important first step to protecting water is to become more aware of our daily water footprint.

### Lesson Overview

In this lesson, students will learn about the water footprint at home, in their community and in the products they use.

**Tags:** water footprint, direct water use, indirect water use, municipality, average day demand, peak day demand.

## Teacher Preparation

**Time Required:** Two one hour lessons + assignments

### Ready-To-Use Materials & Worksheets

- Activity 1: Discovering Our Water Footprint  
Worksheet 1: **Part I: Water At Home, Part II: Product Water Footprint**  
Worksheet 2: **Water for Breakfast!** How much Water Are You Wearing today?
- Activity 2: Water in Our Community  
Worksheet 3: **The Water Footprint in Our Community**  
Worksheet 4: **How Much Water Do We Use in Our Community?**



### Videos:

1. **FAO 101;**
2. **Food & Water;**
3. **Taste the Waste of Water;**
4. **Population Growth;**
5. **Water Explained through Colored Water.**



**Internet** enabled computers are needed to support research activities, water footprint accounting activities and video viewing.



*"Ultimately, if we are to sustain Canada's water supplies, we all have to better understand how we use water as individuals, communities, and as consumers."*

Lorne Taylor, Alberta Water Research Institute

# Lesson 4: Discovering Our Water Footprint

## Grades 11–12

 For the Teacher



### Background Notes & Learning Activities

#### Activity 1: Discovering Our Water Footprint

##### Water Talk:

**What is a Water Footprint?** The water footprint refers to the volumes of water consumption that are 'behind' our daily consumption. Elicit/Introduce: **Direct Water Use**, **Indirect Water Use**.

- **Direct water use** is when you turn on a tap and water comes out *i.e. drinking a glass of water, cooking with water, showering, watering the garden, flushing toilets, etc.*
- **Indirect water use** is when you use a product or service that required water to be used for its production, *i.e. it takes 1700 litres to produce a 100 gr chocolate bar* (Source: The Water Footprint Network).

The water footprint is a way of measuring our direct and indirect water use. It is the total volume of freshwater that is used to produce the goods and services consumed by an individual or a community or produced by a given business.

##### Ask/Elicit: Why learn about our water footprint?

- The best way to attempt to reduce our water footprint is to be aware of it!
- The water footprint helps us to understand the link that exists between our daily consumption of goods and the problems of water depletion and pollution that exist elsewhere, in the regions where our goods are produced.

##### Water At Home (direct water use).

**Ask/Elicit:** *How much water do you think you use at home?* Students explore their direct water use by completing [Worksheet - Part I: Water at Home](#). Students are encouraged to think of all the ways they use water on a daily basis *i.e.* brushing their teeth, watering indoor plants, cooking with water, rinsing, gardening, etc. Students guess their annual water use at home and then calculate their water use by visiting [www.waterfootprint.org](http://www.waterfootprint.org)

**How else do you use water? What is the Water Product Footprint?** Students explore their indirect water use by completing [Part II: The Water Product Footprint](#). Students learn that their water footprint goes well beyond water use in your home.

##### Answers - Water Product Footprint

*How many liters of water are you wearing today?*

A t-shirt = 2,700 liters; A pair of jeans = 9,800 liters!

*How many litres of water are used to produce the following?*

100 g of chocolate = 1,700 liters; A hamburger = 2,400 liters; 400,000 litres of water from start to finish. That's enough to ice eight NHL regulation-sized rinks.

Source: The Water Footprint Network

Distribute [Handout #2: Water for Breakfast! How much Water Are You Wearing today?](#) Through this project students discover how much water is embedded in every day products and share this new information through an engaging medium of their choice.

#### Conclusion: Why Should You Care About the Water Footprint?



- Freshwater is a scarce resource; its annual availability is limited and demand is growing.
- The water footprint of humanity has exceeded sustainable levels and is unequally distributed among people.
- Water connects us all. We all draw from the same global well! This makes water everybody's responsibility.



# Lesson 4: Discovering Our Water Footprint

## Grades 11–12

 For the Teacher

### Extension Activity: Exploring the link between food production and water.



Consider showing the video  
**FAO Food & Water, 2012** (2:11 min).  
Available at: <http://www.youtube.com/watch?v=5ZeRtsQFqHg&NR=1&feature=endscreen>

#### About the Video:

- A large quantity of water is needed to produce the food we eat every day. More water than most of us think!
- 70% of the blue water withdrawals at global level go to irrigation. Irrigated agriculture represents 20% of the total cultivated land but contributes 40% of the total food produced worldwide.
- All human activities use water: drinking, cooking, washing, producing food, paper, clothes, etc. It takes about 1500 liters of water to produce 1 kg of wheat, but it takes 10 times more to produce 1kg of beef!



### Water for Thought...

#### Should Food labelling Show Water Footprint?

Invite students to read and discuss:

*Should Food Labelling Show the Water Footprint?*

<http://www.treehugger.com/clean-water/should-food-labelling-show-water-footprint.html>

**The Water Footprint Network** – An internationally recognized organization dedicated to increasing the water footprint awareness and understanding of how consumption and production of goods and services relate to water use and impacts on fresh-water systems.

### Activity 2: Water in Our Community

#### Water Talk:

**Ask/Elicit:** *How well do you know your own backyard?*  
How many people live in Abbotsford and Mission?  
What are the main industries? How is water used in our community? Why is water a precious community resource?

- Introduce the theme of community water. Distribute **Worksheet # 3: The Water Footprint in Our Community**. In small groups students discuss water use in their community. Upon completion, they share answers and insights with the whole class.

- *How many people live in your community? In B.C.?*

#### Answers:

Abbotsford: 133,407 (CENSUS 2011)

Mission: 36,426 (CENSUS 2011)

British Columbia: 4,620,384 (CENSUS 2011)

Sources: Statistics Canada <http://www12.statcan.ca/census-recensement/index-eng.cfm>

### Background Notes – Water in Our Community

- **Population Growth and Water in Abbotsford and Mission.** Abbotsford is the 5th largest municipality in B.C. The combined populations of Abbotsford and Mission are expected to grow from approximately 170,000 (2011 Census) to over 250,000 by 2031. **Community profile information** at: <http://www.abbotsford.ca/> and at <http://www.mission.ca/>
- **Average water consumption per person per day in Abbotsford and in Mission.** Each Abbotsford and Mission resident consumes anywhere from 200-440 liters of water per day. British Columbians are some of the highest water users in the world!
- **Average daily water consumption: Abbotsford and Mission together.** On an average day, in a typical year, Abbotsford and Mission use about 75 million litres of water per day (MLD).
- **Water Use.** Water in the community is used for residential use, manufacturing, livestock, poultry and dairy operations, greenhouse operations, municipal use such as sewer cleaning, street cleaning, vehicle washing, irrigation of municipal parks and gardens, swimming pools, children's waterparks, ice rinks, and firefighting.

# Lesson 4: Discovering Our Water Footprint

## Grades 11–12

 For the Teacher



- **Main industries.** Abbotsford's main industries are agriculture, transportation, and manufacturing. Mission's main industries are forestry and agriculture. Potable water supplied by the AMWSC is not permitted for agricultural irrigation. However, the production and processing of food is important to our region.
- **Residential water use** accounts for approximately 50% of the total water demand in Abbotsford and an estimated 60% in Mission.
- **Invite students to learn more about water use in their community** by visiting [www.ourwatermatters](http://www.ourwatermatters) (click on Water Use).
- Distribute [Handout # 4: How Much Water Do We Use in Our Community?](#) Students review, interpret, and discuss the info & data with the aim of creating a poster/ power point/pamphlet to inform others and share information about water use in our community.
- **Elicit: What conclusions can you draw from this information?** Peak day demand has a substantial impact on our local water system, since water treatment plants and pipelines must be designed and built to meet demands that are far greater than what is required during most days of the year. **It is important we understand and value water, spread our water knowledge to others, and promote water-wise practices at school, at home, and in the community.**
- Students create a poster/pamphlet/power point *Water Use in my Community* to demonstrate and share their newly acquired knowledge about water uses in their community.

Sources: Abbotsford Mission Water & Sewer Commission, Living Water Smart

### Activity 3: Water and Population Dynamics

#### Water Talk:

**How many of us are there in the world? What is the connection between water and population growth?**

- One of the biggest challenges communities face today is the collective demand we put upon water.
- Water demand is expected to escalate due to anticipated municipal growth in the residential, industrial, commercial and agricultural sectors. Historically, rates of consumption and pollution have been rising faster than population, both in Canada and globally.



Consider showing the following two videos to facilitate students' understanding of water and population growth:

**Video 1: Population Growth Explained through Colored Glasses (2011)**, 2:32 min. Available at: <http://www.mentalfloss.com/blogs/archives/134293>  
**About the video:** A short, beautifully shot video: a visual explanation of how the human population got to 7 billion, using tinted water dripping into and out of seven glasses — one for each continent. The U.N. forecasts suggest the world population could hit a peak of 10.1 billion by 2100 before beginning to decline. How do we manage water resources in light of these population dynamics?

**Video 2: Population Growth (2010)**, 5:05 min. Available at: <http://www.youtube.com/watch?v=b98JmQ0Cc3k>

**About the video:** The growing world population affects food and water supplies, ecological balance, and the overall quality of life for everyone. This animation presents a variety of facts and projected statistics to reveal the severity of our growing population on our Planet.



### Read, Take Notes, Discuss!

Students read *Humanity's Growing Impact on the World's Freshwater* (Article) Sandra Postel, National Geographic, 12 Feb 2, 2012: <http://newswatch.nationalgeographic.com/2012/02/17/humanitys-growing-impact-on-the-worlds-freshwater/>



# Lesson 4: Discovering Our Water Footprint

Grades 11–12

 For the Teacher



## Water for Thought...

**Water is a limited resource.** We can, however, make a significant contribution to reducing our “direct water footprint” by rethinking water, reassessing our daily attitudes about water, and by incorporating water-smart actions in our everyday life at home and at school. ***More on reducing the water footprint in the next lesson!***



## Written in Water – Journal Entry

The journals in **Our Water Matters** are intended as a form of formative self-assessment, an opportunity for students to think about their newly acquired water knowledge. The journals also afford an opportunity for dialogue between each student and the teacher.

### Journal Entry 4:

Water Footprint: *What surprised you the most about the water footprint? How do you think we can address the dynamics between population growth and water?*



## Show What you Know!

### Student Learning & Assessment

It is expected that students who have participated in this lesson, will be able to:

- Create a one-page **poster/pamphlet/power point** entitled *Our Oversized Footprint*
- **Write a Water Footprint Quiz** and survey your family and friends!
- Create and design an interactive **Water Footprint Product Gallery**

**Note!** These activities/projects can be linked to any of the **Action Projects** listed at the end of this resource kit.



## Dive Deeper!

Have students review the **Canada Water Week** website to learn more about virtual water, Canada’s water footprint, how Canada’s water footprint compares with other countries, etc.

<http://canadawaterweek.com>  
- click on About Water Footprint

## Waste Food, Waste Water



Consider showing this award winning video ***Taste the Waste of Water*** (August, 2012) 5:52 min highlighting how food waste accounts for significant water waste because of the water used to grow and produce food.

Video clip available at: <http://newswatch.nationalgeographic.com/2012/08/29/waste-food-waste-water-a-message-from-world-water-week/>

## Encourage students to use the



## The Our Water Matters Library

This will help them get active in their water research!



# Lesson 4: Discovering Our Water Footprint

## Grades 11–12

### Worksheet 1: Part 1 – Water at Home

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services

#### The Water Footprint. *What is it?!*

The **water footprint** refers to the volumes of water consumption and pollution that are 'behind' your daily consumption.

- The water footprint is an indicator of water use that looks at both direct and indirect water use of a consumer or producer. People use lots of water for drinking, cooking and washing (direct use), but even more for producing things such as food, paper, cotton clothes (indirect), etc.
- The water footprint of an individual, community or business is defined as the total volume of freshwater that is used to produce the goods and services consumed by the individual or community or produced by the business.

Source: The Water Footprint Network



#### *How do you use water at Home?*

With your partner or in a group, brainstorm all the ways you use water on a daily basis. Don't forget about the garden!

*Ex: take a shower*

---

---

---

---

---

---

---

---

---

---



#### **Guess!** **Your Water Footprint at Home?**

*How much water do you think you use in one year? **Take a Guess!***

\_\_\_\_\_ litres.

Now to [www.waterfootprint.org](http://www.waterfootprint.org) organization and check your water footprint!

*So...what is your water footprint at home?*

\_\_\_\_\_ litres a year

*Are you above or below the national average?*

#### Water Use at Home

**Tap into these facts! Did you know?**

- The average 15-minute shower uses about 300 liters of water. Cutting your shower time in half could save up to 300 bathtubs of water a year!
- A leak in your home that drips once a second may not sound like a very big problem. However, it can easily add up to as much as 16 bathtubs worth of wasted water in just one month!
- An average garden hose uses up to 38 litres per minute!
- A running tap pours out seven to twelve litres a minute!
- A leaking toilet can waste up to 2500 litres per day (L/d)!

Sources: Abbotsford Mission Water & Sewer Commission, Living Water Smart



#### **Water Tip!**

**Standard toilets...the biggest home water guzzlers!** A standard toilet can use up to 20 liters per flush whereas a low flow toilet uses under 6 liters per flush. **This can save you up to 14 litres each time you flush!**

# Lesson 4: Discovering Our Water Footprint

## Grades 11–12

### Worksheet 1: Part 2 – Product Water Footprint

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services

#### Product Water Footprint. What is it?!

*In addition to water at home, have you ever thought of other ways you use water every day?*

Did you know that the average Canadian consumes almost 6,400 litres of water every day, which, to put it in context, is more water than a daily 10-minute shower produces in two months!

#### How is this possible?!!

Much of that water – over 90% – is embedded in the food you eat, the clothes you wear and the products you use every day.

*Source: The Water Footprint Organization*

Most of us do not have the slightest idea about the sheer volumes of water involved in our daily lives. **Your water footprint goes well beyond just water you use in your home!** All the food you eat, the clothes you buy and the products you use have a water footprint of their own, and when you consume them, that becomes part of your water footprint! We are talking lots of water!

#### How many liters of water you are wearing today?

Take a guess!



A t-shirt:

\_\_\_\_\_



A pair of jeans:

\_\_\_\_\_

#### How many litres of water are used to produce the following? Take a guess!



100g of chocolate:

\_\_\_\_\_



A hamburger:

\_\_\_\_\_



A car:

\_\_\_\_\_

Now check your answers by reviewing:

**The Water Footprint Network** at  
[www.waterfootprint.org](http://www.waterfootprint.org) (click on Product Gallery)



#### Water for Thought...

*Why bother to learn about the water footprint? Why care about it?*

---

---

---

---

---

---

---

---



**Interested  
in Water  
Footprint  
Accounting?**

Visit the **Water Footprint Network**  
[www.waterfootprint.org](http://www.waterfootprint.org)

What is the *Water Footprint Network*? It is an international network dedicated to sustainable, fair and efficient use of fresh water resources worldwide by:

- Promoting the 'water footprint', as an indicator of direct and indirect water use of consumers and producers.
- Increasing the water footprint awareness and understanding of how consumption and production of goods and services relate to water use and impacts on fresh-water systems.
- Encouraging water-wise uses and practices by individuals, communities, countries and businesses.

## Lesson 4: Discovering Our Water Footprint

### Grades 11–12 Activity 2:

#### Water for Breakfast? How Much Water Are You Wearing Today?

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services

With a partner, choose **ONE** of the activities to share your knowledge about the water footprint.

#### Water for Breakfast!

Make a Poster, Fact Sheet, or other to show your *Breakfast Water Footprint* (or your lunch water footprint) from the toast to the eggs you eat!



#### How Much Water Are You Wearing Today?

Make a Poster, Fact Sheet, or other to show how much water you are wearing today from the t-shirt to the shoes you are wearing!



#### Water Tip!

**Sugar.** A real water-hogger! Did you know that sugar is one of the main water consuming ingredients in a soft drink?



#### Water for Thought...

**Should Food Labelling Show Water Footprint?** Check out this article:  
*Should Food Labelling Show Water Footprint?*  
<http://www.treehugger.com/clean-water/should-food-labelling-show-water-footprint.html>

#### Dive Deeper!



#### Learn more about national footprints!

What is Canada's water footprint? What factors contribute to our water footprint? How does Canada compare with other countries?

Visit the **Water Footprint Network:**  
[www.waterfootprint.org](http://www.waterfootprint.org)



# Lesson 4: Discovering Our Water Footprint

## Grades 11–12

### Worksheet 3: The Water Footprint in Our Community

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services

In your group discuss:

#### How Well Do You Know Your Backyard?

How many people live in your community? What are the main industries? How is water used? How much water is used? What are the dynamics between population growth and water?

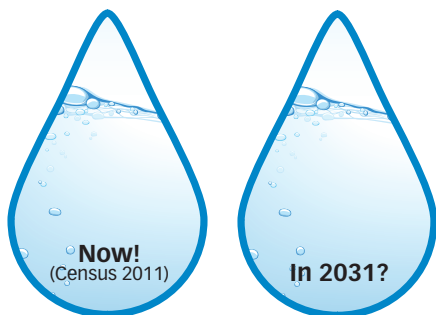
#### 1. How many people live in your community? In B.C.? Take a guess!

Your Guess	Don't know? Go to Statistics Canada*!
Abbotsford: _____	Abbotsford: _____
Mission: _____	Mission: _____
British Columbia: _____	British Columbia: _____

\*Statistics Canada <http://www12.statcan.ca/census-recensement/index-eng.cfm>

#### Predict the Future!

How many people do you think will live in Abbotsford and Mission in approximately 20 years?



Learn more about your community's profile.

**Abbotsford:** <http://www.abbotsford.ca/>

**Mission:** <http://www.mission.ca/>



#### Water for Thought...

##### Water and Population Dynamics

What is the connection between water and population growth?

#### 2. How is water used in our community?

With a partner discuss:

- How is water used in our community?
- Why is water a vital community resource?

#### 3. How much water are we using in our community?

- On an average day, in a typical year, how much water do Abbotsford and Mission use?

Take a guess? \_\_\_\_\_

Not sure? Check your community water website at [www.ourwatermatters.ca](http://www.ourwatermatters.ca) click on **Water Use**.

#### Assignment: Water in Our Community

Read *How Much water Do We Use in our Community?* See handout # 4.

Review the information and interpret the data. What information can you draw from this data?

- Create a poster board, a pamphlet, or a power point aimed at informing others how water is used in our community. Include: key stats & facts.
- How does B.C. compare in water consumption with the Canadian average?
- How does your community compare with the Canadian average?
- What are your community's future goals etc.?

## Lesson 4: Discovering Our Water Footprint Grades 11–12

### Handout 4: How Much Water Do We Use in Our Community?

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services

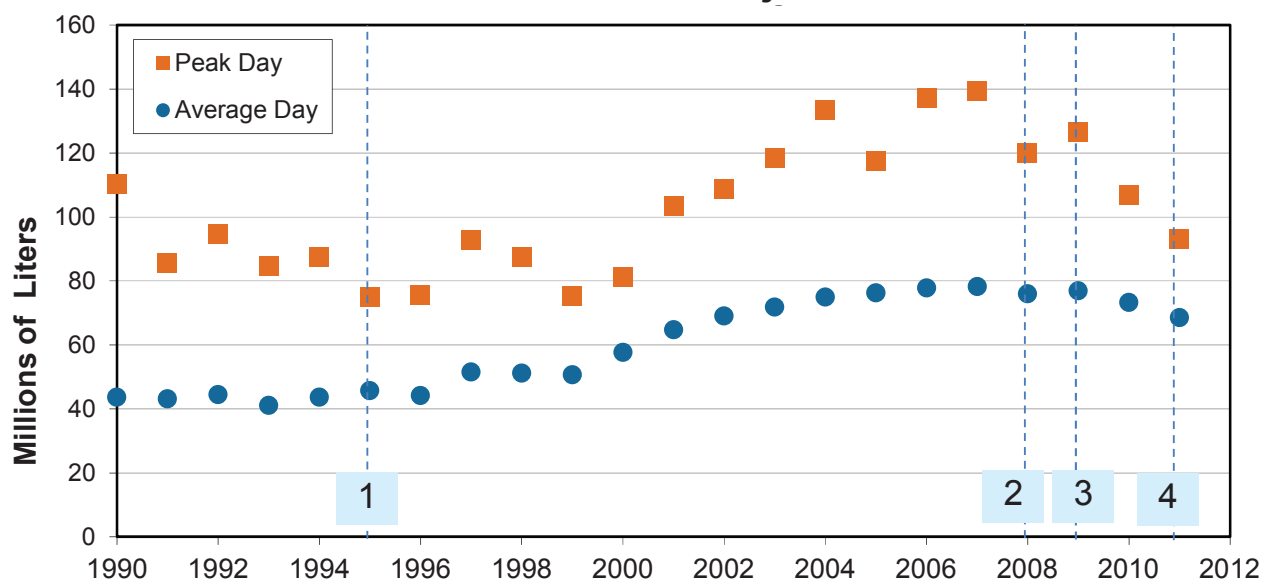
### What is Peak Day Demand (PDD)?

“Peak Day” is the day of the year on which the greatest volume of water is consumed.

During the warm summer days, water consumption can almost double, primarily due to outdoor water use. Our peak day water use over the last 5 years ranged from 139 MLD in 2007 to 93 MLD in 2011. Peak day demand has a substantial impact on the water system, since water treatment plants and pipelines must be designed and built to meet demands that are far greater than what is required during most days of the year.



### ADD and PDD by Year



- 1 – Twice per week lawn sprinkling restrictions started, morning & evening allowed
- 2 – Twice per week lawn sprinkling restricted to morning only
- 3 – Full lawn sprinkling ban for 3-weeks in 2009 and then again in July & August 2010
- 4 – Twice per week morning lawn sprinkling resumed, and increased conservation programming

Promoting water conservation and efficiency helps reduce both peak and average day demands.

# Lesson 5: Reducing our Water Footprint

Grades 11–12

 For the Teacher

5

## Key Objectives:

1

Gain an understanding of water conservation – *why and how?*

2

Explore practical ways reducing our water footprint by incorporating water-smart actions in everyday life

3

Develop an initial understanding of rain water as a renewable natural resource

4

Inspire others to value, protect, and conserve water

## Overview

### Background

Satisfying humanity's water demands while simultaneously protecting the ecological support functions of freshwater systems will be one of the most important challenges of the 21st Century. In the face of these challenges, **each individual effort can make a significant difference towards a sustainable use of fresh water.**

### Lesson Overview

In this lesson, students explore the importance of water conservation. They will learn how individual water choices at home and at school can make a difference. Students will also gain an introductory understanding of rainwater harvesting as an important way of reducing the water footprint.

**Tags:** steward, water stewardship, water ethic, conservation, sustainability, municipality, climate change, rainwater harvesting.

## Teacher Preparation

**Time Required:** 3 x 1 hour lessons + student research activities + take home activities

### Ready-To-Use Materials & Worksheets

- Activity 1: Water Stewardship  
Worksheet 1: **Water Stewardship – What is it?**
- Activity 2: Water Conservation  
Worksheet 2: **Water Conservation – Why?**
- Activity 3: Reducing our Water Footprint  
Worksheet 3: **Water at Home** (Part I & II) - Take Home  
Worksheet 4: **A Water-Smart Action Plan**
- Activity 4: Rain: Harvesting Change for the Future  
Worksheet 5: **Welcoming Rain in Your World!**  
Handout # 6: **Turning Rain Drops into Hockey Drops**

### Videos:



- **10 Tips for Conserving Water** – by Trigger Change 2:27 min,
- **Rain Water Harvesting: India** 1:32  
<http://www.youtube.com/watch?v=wWnhYIIKYOU>

**Internet** enabled computers are needed to support research activities, water footprint accounting activities and video viewing.



*“Environmental stewardship broadly defined is an ethic that recognizes the need to conserve and restore ecosystems for current and future generations of all species. Water stewardship is not just a technique. It is a philosophy and a commitment to value water, and act in an environmentally, socially and economically sustainable manner.”*

Stewardship Centre for British Columbia



# Lesson 5: Reducing our Water Footprint

## Grades 11–12

 For the Teacher



## Background Notes & Learning Activities

### Activity 1: Water Stewardship – *What is it?*

#### Water Talk:

##### **What is a *steward*? What are the qualities of a *steward*?**

Elicit/Introduce the word steward as someone who takes good care of what is entrusted to him/her.

- Distribute Handout # 1: **Water Stewardship - What is it?** Students work in pairs or in a group to discuss & gain an initial understanding of Water Stewardship, Water Conservation, and Sustainability. Upon completion, students share their notes & insights with the whole class.

<b>Water Stewardship....</b> What is it? What does it mean at a practical level?	<b>Water Conservation...</b> What is it? How does it relate to water stewardship?	<b>Sustainability...</b> How are water stewardship and water conservation connected to sustainability?
<ul style="list-style-type: none"> <li>• Taking good care of your water! Being responsible for the sustainability of water and aquatic ecosystems, now and for the future.</li> <li>• Recognizing our collective responsibility to retain the quality and abundance of water</li> <li>• Being responsible for management of water resources and striving to reduce the consumption of renewable and non-renewable resources.</li> <li>• Managing natural capital in a way that conserves all of its values, be they environmental, economic, social or cultural.</li> <li>• <b>Water stewardship</b> Encompasses a wide range of actions and activities of individuals, communities, groups and organizations acting alone or in partnership, to promote, monitor, conserve and restore ecosystems.</li> </ul>	<ul style="list-style-type: none"> <li>• Doing the same with less, by using water more efficiently or reducing where appropriate, and being careful not to waste water.</li> <li>• <b>Water conservation</b> means being water-smart, using water wisely, and embracing conserving practices at home, at school, in your community so that there is enough for everybody.</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainability is a long-term responsibility, which has environmental, economic, and social dimensions, and encompasses the concept of stewardship and the responsible management of water resources.</li> <li>• The ability to support and preserve water for today and tomorrow.</li> <li>• <b>Sustainability</b> means living well for all, now and in the future, within the means of the environment.</li> </ul>

Sources: Environment Canada, Living Water Smart, Stewardship Centre for B.C

#### **More about water stewardship at:**

Living Water Smart [www.livingwatersmart.ca](http://www.livingwatersmart.ca); B.C. Ministry of Environment <http://www.env.gov.bc.ca/wsd/>

# Lesson 5: Reducing our Water Footprint

## Grades 11–12

 For the Teacher

### Activity 2 – Water Conservation: *Why?*

#### Water Talk:

**Why is water conservation important? Who benefits from water conservation?** Distribute [Worksheet #2 - Water Conservation: Why?](#) students work in pairs/groups to discuss the importance of water conservation. Students are also invited to explore water conservation in the context of the dynamics between: **water & population growth**, **water & climate change**, and **water & energy**, etc.

#### Part I -

#### Why do we need to conserve water?

##### Background Notes

- **Water is a vital but finite resource.** Water is essential to all life on earth. Water sustains the human population and is vital for all natural ecosystems. As the human population rapidly climbs past seven billion, the finiteness of Earth's freshwater is becoming ever more apparent and pressing. Review [Test the Waters Quiz \(Lesson 1\)](#).
- **It takes water to make everything!** The explosion of demand for all manner of products is draining rivers, shrinking lakes, and depleting aquifers. Review [The Water Footprint \(Lesson 4\)](#).
- **We are using too much water; B.C. residents use more water than the Canadian average!** B.C.'s water abundance is deceiving. BC has a substantial, but finite water supply. Canada's per capita water consumption is 65 percent above the Organization for Economic Cooperation and Development (OECD) average, second only to the United States.
- **Water is not always available where and when it is needed** to support human, industrial and ecosystem needs. *Note: A major portion of B.C.'s renewable water supply flows north, away from the more densely populated southern portions of the province.*
- **Nature needs water too!** Satisfying humanity's water demands while simultaneously protecting the ecological support functions of freshwater systems will be one of the most important challenges of the 21st Century.
- **There is no substitute to water!** Water is non-replaceable, and for this reason if no other, we have to come to the realization that water should be treated very differently than other resources.

- **We need to work towards meeting the future demands in our community.** Abbotsford & Mission are growing communities. Eventually the municipalities will require additional potable water beyond what is currently provided by the existing water sources and infrastructure.
- **Our climate is changing!** Water is the primary medium through which *climate change* influences Earth's ecosystem. While our population and our economy continues to grow, increasing the demands and pressures on our water resources, many areas of the province already experience the effects of seasonal limitations and climate change on their water supplies.
- **Water and Energy. What is the connection?** Reducing the amount of water used saves energy! Reducing water consumption is thus good for air quality, the climate and the overall environment. Supplying water to home taps requires energy to capture, clean, store, and distribute water. From the water source to the tap, transporting water requires energy intensive infrastructure. Wastewater is treated in an energy intensive process before it is released back into the water cycle..

Sources: Canadian Geographic, Environment Canada, Living Water Smart B.C., Organization for Economic Cooperation and Development (OECD).



# Lesson 5: Reducing our Water Footprint

## Grades 11–12

 For the Teacher



### Part II - Who benefits from water conservation? How?

Everyone benefits from better use of our water resources.

- **The Environment:** Water conservation reduces our impact on the environment. The withdrawal of fresh water from an ecosystem should not exceed its natural replacement rate. Conserving water will help preserve the environment by minimizing necessary diversions and decreasing pollution. It protects wildlife habitat and improves water quality.
- **Our community:** As population grows in Abbotsford and Mission, the strains placed upon the environment and its critical ecosystems will increase. Water conservation reduces the amount of water withdrawal from the community's source supplies and can also reduce utility bills.
- **Municipality:** Water conservation reduces the need for treated drinking water and wastewater treatment, as well as water infrastructure. It also improves ability to adapt to uncertainties such as climate change and population growth.

### Conclusion:

**So... in practical terms what does it mean to be a *water steward*?** It means respecting, valuing, and conserving water. It means taking responsibility for how we use and care for water at home, at school, and in our communities. It also means inspiring others to do the same!



### Conversations About Conservation

**Do you want to learn more about water in your community?  
Invite a Water Expert your classroom!**

British Columbia's natural resources combined with its dedicated water and wastewater professionals in your community allow us to enjoy high quality drinking water that is clean and safe.

**Find out who the water professionals are in your community by inviting them to your class to speak about water matters and the importance of water conservation.**

#### Contact:

City of Abbotsford Engineering Department  
604-864-5514  
[eng-info@abbotsford.ca](mailto:eng-info@abbotsford.ca)



# Lesson 5: Reducing our Water Footprint

## Grades 11–12

 For the Teacher

### Activity 3: Reducing our Water Footprint - *How?*

#### Water Talk:

##### Water conservation starts with YOU.

Water conservation is an area where each individual can make a significant difference.

- In the face of this planet's overwhelming environmental challenges, each individual effort to protect water quality is vital. Together, **individual actions can and do make a difference** to water quality and the environment as a whole. *Review the activity **Exploring Values & Attitudes about Water**.*

- **Water Conservation at home.** You can reduce your 'direct water footprint' by embracing water-smart actions such as turning off the tap while brushing your teeth, fixing leaks, using less water in the garden, etc.



**Consider showing the video: 10 Tips for Conserving Water** (by Trigger Change) 2:27 min  
<http://www.youtube.com/watch?v=-1cIOWuEmF>

- **Ask/Elicit: What conservation strategies do you already use on a daily basis?** In groups, students brainstorm water conservation strategies at home:

##### In the House:

1. Run the water only when you're ready to rinse.
2. Use only a small amount of water in a tub or take a shower instead.
3. Fix the leaks in the kitchen.
4. Fix the leaks on the hose.
5. Use a dish squeegee\* to scrape dishes rather than rinsing.
6. Only use a full washing machine when doing laundry.

##### In the Garden:

7. Follow water restrictions.
8. Water the garden in the cool temperature of the morning.
9. Use a rain barrel to collect rainwater.
10. Lawns and gardens require only 5 millimetres of water per day during warm weather and even less is needed during spring and fall. Don't over-water in anticipation of a shortage. Soil cannot store extra water.
11. Use a bucket and sponge to wash your car.
12. Wait until the dishwasher is full and then start it.
13. Use a bowl or put a plug in a sink to wash vegetables.
14. Attach a spring loaded sprayer to your hose.
15. Use a broom to clean the driveway instead of a hose.
16. Use a moisture meter for the garden.



[www.ourwatermatters.ca](http://www.ourwatermatters.ca)

We invite teachers to check [www.ourwatermatters.ca](http://www.ourwatermatters.ca) regularly for water, challenges, competitions, and other venues where student can share their water knowledge.

- Students take home the **Worksheet 3: Water At Home (Part I & II)** and complete it with their family. Once completed, students discuss the results of their worksheet: How water-smart are you at home? What areas are you doing well with and what areas need improvement? How can you help others understand the importance of water conservation?
- Hand out **Worksheet # 4: Water Smart-Action Plan**. Students identify a goal and develop an action plan for better water conservation strategies at home. Discuss: what would you like to achieve? What goal would you like to work towards?

#### Water at School

- Discuss water at school: How can the value of water, water stewardship, and water conservation be promoted in your school?
- Invite a discussion on Nelson Mandela's statement: "Education is the most powerful weapon you can use to change the world." How can you inspire others to value, protect, and conserve water? Focus on the role of awareness the importance of sharing their water knowledge with peers, teachers etc. through social media, projects, assemblies, photography, etc.

#### Introduce your students to:

##### Living Water Smart

**What is Living Water Smart?** Living Water Smart is the B.C. Government's vision and plan to keep our water healthy and secure for the future. Living Water Smart sets the direction for changes to water management and water use.

[www.livingwatersmart.ca](http://www.livingwatersmart.ca)

# Lesson 5: Reducing our Water Footprint

## Grades 11–12

 For the Teacher



### Activity 4: Rain: Harvesting Change for the Future!




#### Rain Talk:

Hand out [Worksheet # 5: Welcoming Rain in Our World!](#)

Students work in pairs to provide answers. **Answer key:**

- **What are the three wettest cities Canada?**  
1. Abbotsford; 2. Halifax; 3. St. John's
- **How much rain does Abbotsford get annually?**  
Abbotsford gets about 1,575 mm (62 inches) of water a year.
- **On average, how many days a year does it rain in Abbotsford?** 171 days of rain a year.
- To meet the growing demands for fresh water, we need to develop alternative water supplies. **One solution is rainwater harvesting (RWH)!**
- Introduce the term renewable resource vs non-renewable resource. Some resources are able to replace themselves (renewable), while others can only be used once (non-renewable).

#### Consider showing the video:

 **Rain Water Harvesting: India** 1:32. A short and moving video introducing rain as an important alternative resource in India. Main message: *Rain belongs to each one us. How do we keep it and share it?* Available at: <http://www.youtube.com/watch?v=wWnhYIIKYOU>

#### What is RWH? Background Notes

- Rainwater harvesting (RWH) has been practiced for centuries and refers to any system that collects rainfall and stores it for future use. RWH is the collection of run-off rainwater for domestic water supply, agriculture and environmental management.
- People collect and store rainwater in buckets, tanks, ponds and wells. Rainwater can be used for multiple purposes ranging from irrigating crops to washing, cooking and watering your garden.
- Rainwater is renewable, sustainable and a high quality water source for your home and business. It is soft, neutral in pH, free from disinfection by-products, salt, minerals and other natural and man-made contaminants that cause staining, pipe corrosion or odour.

- As well as being “nature’s watering agent” for gardening, disinfected rainwater is an excellent water source for general household use – either on its own or as a supplement. Rain water is completely safe provided it is collected, stored, and disinfected correctly.
- **Elicit different ways rainwater can be used.** In times of low water availability, water held in rain barrels and cisterns may be used for gardening or other non-potable needs: washing the driveway, flushing toilets, washing cars, household cleaning, laundry, and filling ice rinks!
- **Ask/Elicit:** *What potential can rainwater harvesting offer to enable increased human well-being whilst protecting our environment?*



### A cool rainwater harvesting project in your community: the Abbotsford Entertainment & Sport Centre (AESC)!

- Yes, the Abbotsford Heat hockey team plays on rainwater! The *AESC Rain Water Harvesting Project* captures rain water and snow melt runoff from the AESC roof, reusing the water for ice production and maintenance.
- Distribute [Handout # 6: Turning Raindrops into Hockey Drops](#) for further information on the *AESC Rain Water Harvesting Project*. Encourage students to read the article: **AESC Ice to be Made from Rainwater** mentioned at the bottom of the handout (Available at: <http://www.abbynews.com/news/128332033.html>).

# Lesson 5: Reducing our Water Footprint

Grades 11–12

 For the Teacher



## Field trip idea!

**Take your class to the Abbotsford Entertainment and Sports Centre (AESC)!**

**What do rainwater and hockey have in common?** To learn more about this RWH project take your class to the AESC!

**To book your field trip, call**  
City of Abbotsford Engineering, 604-864-5514



## Written in Water – Journal Entry

The journals in **Our Water Matters** are intended as a form of formative self-assessment, an opportunity for students to think about their newly acquired water knowledge. The journals also afford an opportunity for dialogue between each student and the teacher.

### Journal Entry 5:

*What surprised you in this lesson? What was new to you? How much did you know about water conservation before the lesson? Why is water conservation an important topic? Rain...had you thought of rain as a valuable renewable natural resource. What did you learn about rainwater harvesting?*



## Show What you Know!

### Student Learning & Assessment

It is expected that students who have participated in this lesson, will be able to:

#### Water Conservation

- Create a **poster board, pamphlet, power point** identifying issues related to Earth's supply of freshwater and describe methods of conserving it.
- Create a one page **Water-Smart-Tips** about water at home. What are some of the biggest water wasters? Add water conservation tips!

#### Rainwater Harvesting

- Design a **poster** explaining rainwater harvesting and its benefits
- Write an **essay** *Rain: A gift from the Sky!*

**Note!** These activities/projects can be linked to any of the **Action Projects** listed at the end of this resource kit.



## Dive Deeper!

Encourage students to learn more about the following:

- **What are your community's water conservation goals?** Tap into our local water website at [www.ourwatermatters.ca](http://www.ourwatermatters.ca) and check the *Water Efficiency Plan Booklet 2012* (you will find it under Public Consultations).
- **Research one of the following:**
  - Water & Population Growth
  - Water & Climate Change
  - Water & Energy

### Encourage students to use the



## The Our Water Matters Library

This will help them get active in their water research!



# Lesson 5: Reducing our Water Footprint

Grades 11–12

Worksheet 1 - Water Stewardship – *What is it?*

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services



## Talk About It!

Record your notes in the bubbles.

**What are the  
qualities of a steward?**

**What is a steward?**

**What is water  
stewardship?**

**Water  
conservation?**

**Water  
conservation?  
Why and How?**

## Lesson 5: Reducing our Water Footprint

Grades 11–12

### Worksheet 2: Water Conservation – *Why?* (Part 1)



For the Student

Abbotsford  
Mission  
Water & Sewer Services

#### Part 1 - WHY is Water Conservation Important?

Record your notes in the bubbles.



**Water Tip!**

***Water Has No Substitute. Use it Wisely!***

# Lesson 5: Reducing our Water Footprint

## Grades 11–12

### Worksheet 3: Water Conservation – *Why?* (Part 2)

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services

## Part 2 – WHO benefits from water conservation? WHAT are the benefits?

WHO benefits?	WHAT are the benefits?



### Dive Deeper!

**What are your community's water conservation goal?** Tap into local water website at [www.ourwatermatters.ca](http://www.ourwatermatters.ca) and check the *Water Efficiency Plan Booklet 2012* (you will find it under Public Consultations).

- **Learn more about one of the following:**
  - Water & Population Growth
  - Water & Climate Change
  - Water & Energy
- **Read the Water Blog:**  
*Our Oversized Groundwater Water Footprint*  
By Sandra Postel, 13 August 2012  
<http://newswatch.nationalgeographic.com/2012/08/13/our-oversized-groundwater-footprint/>



### When using water remember that...

- **Water is a valuable resource**  
Water is essential for the health and well-being of society, and the environment.
- **Water is a finite resource**  
Water availability is limited by many factors including geographic location, water quality, weather and seasonal flows.
- **Water is a renewable resource**  
The water we use is part of the hydrological cycle — another user waits downstream.
- **Water is a shared resource**  
Water sustains life on earth. It is a common resource and we all need to share it.



### Water Tip!

***Water = Life. Let's Share!***



# Lesson 5: Reducing our Water Footprint

## Grades 11–12

### Worksheet 4: Water at Home (Part 1)

Tell your family you have been learning about water conservation in class. Share with them some of your new water knowledge and then work with your family to complete this worksheet. Find out how Water Smart you are!

#### In All Areas of the Home

We fix leaks on taps, toilets and shower heads.

**YES or NO**

**Tip:** Dripping taps are the biggest water wasters. Fixing a dripping tap can save up to 300 litres drinking water per week. Place a few drops of food coloring in the toilet tank. If the food coloring is seen in the bowl without flushing, there is a leak.

We use aerators on all of our taps.

**YES or NO**

**Tip:** Aerators can save up to 7.5 litres of water per minute.

#### In the Kitchen & Laundry Room

We use our dishwasher only when it's full.

**YES or NO**

**Tip:** Wait until you have full loads. Use water and energy-saving cycles.

We use a bowl of water or a plugged sink to rinse vegetables.

**YES or NO**

**Tip:** Fill the kitchen sink with water to wash and rinse dishes & food instead of letting the water continually run.

We use our washing machine only when it's full.

**YES or NO**

**Tip:** Wait until you have full loads. Use water and energy-saving cycles.

#### In the Bathroom

We turn off the tap when brushing our teeth.

**YES or NO**

**Tip:** Turn off the tap to brush teeth and wash. A running tap pours out seven to twelve litres a minute!

We take showers that are less than 5 minutes

**YES or NO**

**Tip:** Taking shorter showers can save approximately 19 litres of water per minute depending on the type of showerhead.

We use a low flow toilet.

**YES or NO**

**Tip:** A low-flow toilet uses 6 litres of water per flush instead of an older toilet that uses 13 or more litres of water per flush.

#### Outside

We follow the water restrictions.

**YES or NO**

**Tip:** Water restrictions are important. They are designed to optimize water use and protect our water availability.

We use a bucket and sponge to wash our car instead of running the hose continuously.

**YES or NO**

**Tip:** Use a bucket of water to wash your car instead of letting the garden hose continually run. If you use a garden hose to rinse your car, turn the water on and off as needed.

We use a Rain Barrel to collect rain water.

**YES or NO**

**Tip:** 25mm of rainfall collected on a 93m<sup>2</sup> area can collect over 2,000 L of water which can be used for non-potable water uses- garden/lawn irrigation, laundry, flushing toilets. Harvested water contributes to water conservation and reduces water demands in urban area.

We water our garden during the early morning hours.

**YES or NO**

**Tip:** Watering in the morning reduces the amount of water that is lost through evaporation.

**How many times did you circle yes?**

**10-12**

Excellent! You are saving hundreds of litres of water each month. Share your Water Smart Tips with family, friends, and neighbors.

**6-9**

You're starting to tap into water conservation.

**0-5**

Are you a water waster?

# Lesson 5: Reducing our Water Footprint

## Grades 11–12

### Worksheet 5: Water at Home (Part 2)

**Now with your family decide how you can become even more Water Smart!**

Read these additional suggestions or think of some of your own.

1. Run the water only when you're ready to rinse
2. Use only a small amount of water in a tub or take a shower instead
3. Fix the leaks in the kitchen
4. Fix the leaks on the hose
5. Use a dish squeegee to scrape dishes rather than rinsing
6. Only use a full washing machine when doing laundry.
7. Water the garden in the cool temperature of the morning
8. Use a rain barrel to collect rain water
9. Irrigate lawn with only 1 inch of water a week
10. Use a bucket and sponge to wash your car
11. Wait until the dishwasher is full and then start it
12. Use a bowl or put a plug in a sink to wash vegetables
13. Follow water restrictions
14. Use a timer attachment on your hose for garden irrigation
15. Use a spring loaded water hose sprayer (attached to your hose)
16. Use a broom to clean the driveway instead of a hose
17. Use a moisture meter for garden



Write a paragraph to share & explain what you learned after completing **Water at Home**.

---

---

---

---

---

---

---

---

---

---

# Lesson 5: Reducing our Water Footprint

## Grades 11–12

### Worksheet 6: A Water-Smart Action Plan

Fill in the action plan by choosing at least three areas where you can be even more Water-Smart at home! Decide where you might wish to improve your water conservation strategies. Share your plan with your family to **MAKE IT HAPPEN!**

Areas Where We Can Be Even More Water-Smart! <i>e.g. sometimes we water our garden during the day.</i>	Water Smart Solutions <i>e.g. we will water our garden only in the morning or evening.</i>	Water Smart Plan <i>e.g. we will buy a timer for our hose so it will only water at a certain time and for only a limited amount of time.</i>
<b>In the Kitchen &amp; Laundry Room</b>		
<b>In the Bathroom</b>		
<b>Outside</b>		
<b>Additional Ideas</b>		



# Lesson 5: Reducing our Water Footprint

## Grades 11–12

### Worksheet 7: Welcoming Rain in Your World!

 For the Student

 Abbotsford  
Mission  
Water & Sewer Services

#### Rain for thought...

- What are the three wettest cities Canada?
- How much rain does Abbotsford get annually?
- On average, how many days a year does it rain in Abbotsford?



#### Rain: A Gift from the Sky!

Have you ever noticed how much it rains in Abbotsford and Mission? We receive a great deal of rain each year making it a readily available resource for our community.

With the average person in Abbotsford consuming approximately 250-300 litres of water per day, and in Mission about 400 to 450 litres of water per day, collecting and using your rainwater can contribute significantly to saving water!

#### Do you know ...

*How many litres of water can be collected when  
1mm of rain falls on 1 acre of land?*

**1 mm of rain falling on 1 acre = about 4047 litres of water!**



# Lesson 5: Reducing our Water Footprint

## Grades 11–12

### Worksheet 8: Welcoming Rain in Your World!

#### Reusing Your Rain!

*Can you think of ways in which collected rainwater can be used?*

Write 5 ways in which you could use rainwater in your home and in your garden.



**We recycle newspapers, pop cans, plastic ...why not **RAIN**?!**  
**Don't just go **green**. Go **blue** too!**

# Lesson 5: Reducing our Water Footprint

## Grades 11–12

### Handout 9: Turning Rain Drops into Hockey Drops

 For the Student

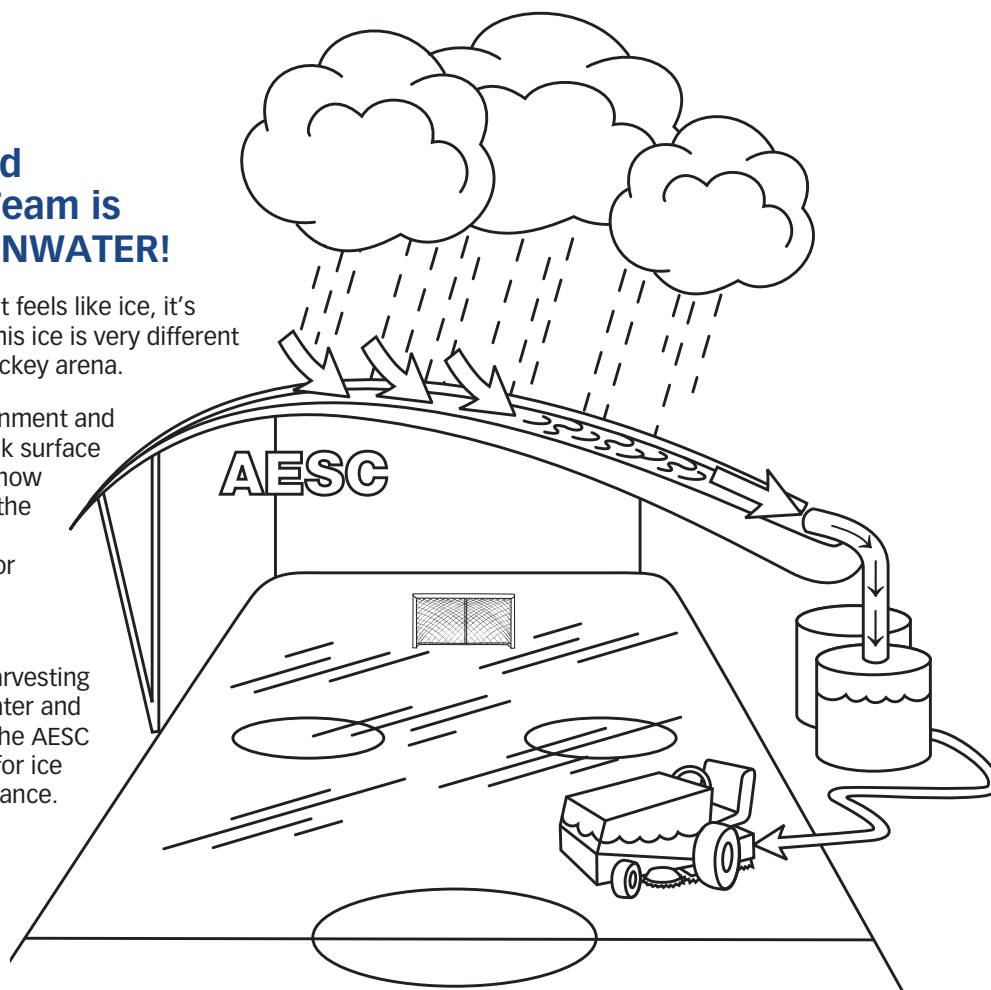
 Abbotsford  
Mission  
Water & Sewer Services

### The Abbotsford Heat Hockey Team is playing on RAINWATER!

It looks like regular ice, it feels like ice, it's slippery like ice — but this ice is very different from ice in any other hockey arena.

The Abbotsford Entertainment and Sports Centre (AESC) rink surface is made from rain and snow run off from the roof of the building. It is the first professional grade indoor ice-hockey arena to use rainwater!

The AESC Rain Water Harvesting project captures rain water and snow melt runoff from the AESC roof, reusing the water for ice production and maintenance.



### Tap into these AESC facts...

- One million litres of water is required each hockey season to make and maintain the ice
- Creating the initial playing surface requires 38,160 litres
- 370,000 litres (10,000 litres per game, 37 home games a season) is needed to maintain it during play
- An additional 420,000 litres is used for practices and community rentals

### Now tap into these water saving facts!

#### Do you know...?

- *How big is the AESC roof?*  
The roof is 1333 m<sup>2</sup>. (12,000 sq. ft) and is capable of collecting up to 1,736,000 litres (448,560 US Gals) per year!
- *How much rain is the AESC rainwater system capable of harvesting?*  
The AESC rainwater harvesting system is capable of generating 30,000 litres of water for every 25mm (one inch) of rain!

**This rainwater harvesting project saves approximately 830,000 litres of water each season saving up to 1 million litres of water per year!**

To learn more about this community Rainwater Harvesting project go to  
<http://www.abbynews.com/news/128332033.html>



# Water in the Developing World

 For the Teacher  For the Student



## Dying for a Drink



### Water Beyond Your Community

You have been exploring and learning about water in your community...now stretch your water explorations to the global community: Learn about **water in the developing world**.

### Water = Life

Water is not only a resource, it is a life source! Clean water is essential for life, but most of us in the developed world take it for granted. In developing nations, however, the search for safe drinking water can be a daily crisis.

### Did You Know...

- 4,800 people die every day from preventable diseases associated to safe drinking water, inadequate sanitation and poor hygiene. That equals 11 jumbo jets crashing every year. Nearly all deaths, 99 percent, occur in the developing world.
- A Canadian taking a five-minute shower uses more water than the average person in a developing country uses for an entire day!

### Abbotsford 4 Ethiopia

A global cause right in your own backyard! **Run for Water** helps rural communities in Ethiopia to get clean drinking water.

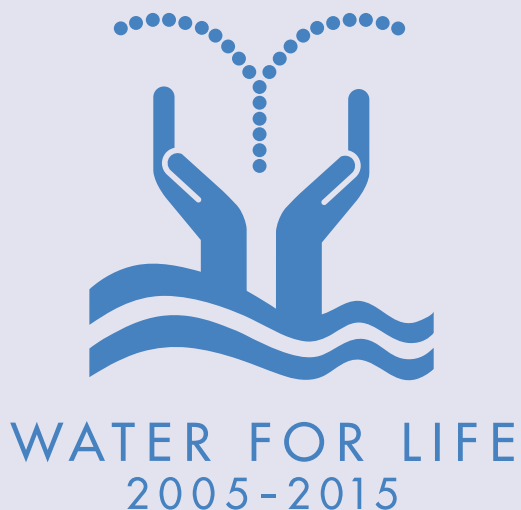
[www.runforwater.ca](http://www.runforwater.ca)

#### Why Ethiopia?

Ethiopia is one of the poorest countries in the world, renowned for its long period of droughts and famines. There are over 85 million people living in Ethiopia, yet almost 60% of the population lacks access to safe, clean water (UN Water, 2011).



*Water is a shared responsibility regardless of where you live!*



## Learning about Water in the Developing World – *Where to begin?*

Start your global water explorations by visiting **UNWater** at <http://www.unwater.org/> and the **International Decade for Action – Water for Life 2005- 2015** at <http://www.un.org/waterforlifedecade>

### Explore important water themes:

- Water and food security
- Water scarcity
- Water as a basic human right
- Gender and water
- Water quality
- Water and the Green Economy
- Water and cities
- Water & Climate Change

## Water is a Basic Human Right!

On 28 July 2010, through Resolution 64/292, the United Nations General Assembly declared **water as a basic human rights** explicitly acknowledging clean drinking water and sanitation as essential to the realization of all human rights. This resolution calls upon countries, organizations, and individuals to raise awareness for water in the developing world and help provided safe, clean, accessible drinking water and sanitation for all.

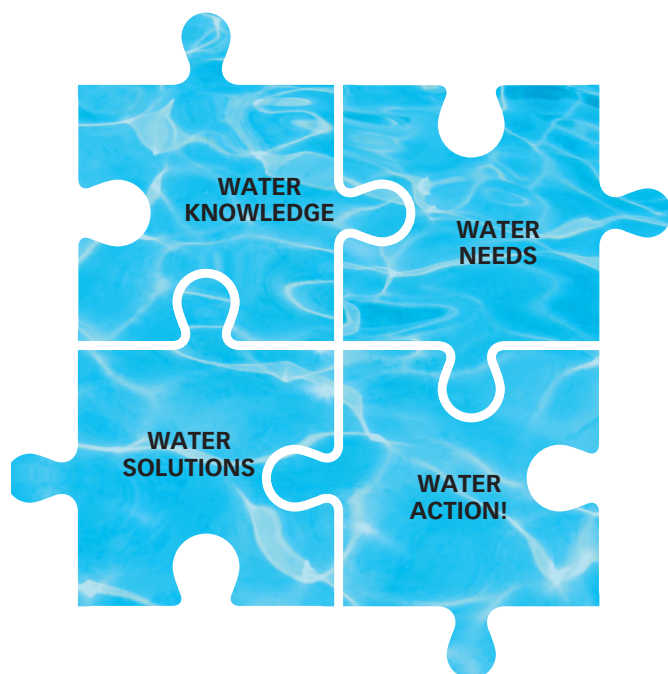


## Water Stats: Maps & Graphs!

**New!** Check out the **UN Water Portal** featuring maps, tables, and charts on indicators, at either country or global level. <http://www.unwater.org/statistics.html>



## Putting It Together: Water Knowledge + Action



***“Without knowledge  
action is useless and knowledge  
without action is futile.”***

### Water Action Ideas!

Make a difference at home, at school, in your community! Browse through the projects below find an action project that is right for you and go for it!

#### Consider some of the water topics you have covered:

- Your Water Source
- Watershed Protection
- Water Quality
- Water in Your Community
- Water at Home
- The Water Footprint
- The Water Product Footprint
- Rainwater Harvesting

### Share your knowledge by:

- Designing a poster
- Organizing a water-themed assembly
- Creating an awareness campaign in your school to raise awareness for water and the importance of protecting it.
- Starting a Water Club in your school
- Designing and implementing a water conservation action plan for your school
- Writing a newspaper article
- Writing and performing a play or skit
- Using social media to design a website or create a Facebook page
- Creating a water-smart game
- Creating an advertisement
- Drawing or painting
- Photography
- Geocaching info at:  
[www.geocaching.com](http://www.geocaching.com) and  
[http:// www.ec.gc.ca/geocache/default. asp?](http://www.ec.gc.ca/geocache/default.asp?lang=En&n=E923094B-1)





## Other ideas!

**Create a Water weblog/online journal.** Not sure how to create your own blog? Try the free online tutorial at <http://weblogs.about.com/c/ec/2.htm>

**Research an organization, an NGO, a foundation, an agency** committed to water protection. Check the [Our Water Matters Library](#) to get you started!

**Write an article** raising awareness for water protection and the importance of water Conservation. Submit it to your local paper. Check out the Water Calendar below.

**Create a Poster/Pamphlet/PowerPoint:** *Why is Water Conservation important in our community?*

**Write an essay or newspaper article for your School or Community:** *We are addicted to over-consuming water, and we don't even know it!*

Create a poster **Rain: A Gift from the Sky**. Explain rainwater harvesting and its benefits for the community.



## Water Essays

**Write an essay** responding to one of the following statements or quotes.

1. *Water is not only a resource, it is a life source. We all share the responsibility to ensure a healthy, secure and sustainable water supply for our communities, environment, and economy – our quality of life depends on it.*
2. *"Environmental stewardship broadly defined is an ethic that recognizes the need to conserve and restore ecosystems for current and future generations of all species. Water stewardship is not just a technique. It is a philosophy and a commitment to value water, and act in an environmentally, socially and economically sustainable manner."*  
*Stewardship Centre for British Columbia*
3. *"Ultimately, if we are to sustain Canada's water supplies, we all have to better understand how we use water as individuals, communities, and as consumers."*  
*Lorne Taylor, Alberta Water Research Institute*
4. *"As the world charts a more sustainable future, the crucial interplay among water, food, and energy, it is one of the most formidable challenges we face."*  
*Ban-Ki Moon, Secretary-General of the United Nations*
5. *"Water is life. Water is finite. All the water on Earth now is all there ever was—and ever will be. It's all about sharing it –with nature and each other."*

# Grades 11–12: A Waterfall of Resources



For the Teacher



## Classroom Consumables

The following are available for display and use in your classroom:

- Our Water System poster
- Tattoos & Buttons
- Bookmarks
- 10 tips for Water Wise Gardening Seed Paper
- Flow Bags
- Moisture Meter
- It Just Takes One Measurement Tool
- Dish Squeegee
- Hose/Faucet Timer
- Leak Detector Tablets for Your Toilet
- Faucet/Showerhead replacements

To receive these items contact:

City of Abbotsford, Engineering Department  
eng-info@abbotsford.ca

## Celebrate Water in your Classroom!

- Canada Water Week – <http://canadawaterweek.com/>
- World Environment Day – <http://www.unep.org/wed/>
- World Water Day – <http://www.unwater.org/worldwaterday/>
- Earth Day Canada – <http://www.earthday.org/>
- Earth Day in the World – <http://www.earthday.org/>

## Teacher's Resources

More environmental learning resources:

- **BC Green Games** – <http://www.bcgreengames.ca/>
- **Canadian Council for Geographic Education** – <http://www.ccge.org/resources/>
- **Canadian National Geographic** – <http://canadiangeographic.ca/>
- **Earthcare Canada – EarthCARE Canada** – <http://www.earthcarecanada.com>
- **Environment Canada – Water** – <http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=65EAA3F5-1>
- **Green Learning** – <http://www.greenlearning.ca>
- **Our Water Matters** – [www.ourwatermatters.ca](http://www.ourwatermatters.ca)
- **Living Water Smart** – [www.livingwatersmart.ca](http://www.livingwatersmart.ca)
- **Run for Water** – [www.runforwater.ca](http://www.runforwater.ca)
- **Walking the Talk**, The BC Sustainability Education Network  
<http://www.walkingthetalk.bc.ca/>
- **Waterbucket** – <http://www.waterbucket.ca>

## More Water Cool Ideas to Inspire your Students to Learn about Water!

### At School

- Have students share their water conservation knowledge through assemblies, daily announcements, art projects, poetry and posters.
- Global Water! Tap into the **Run for Water** curriculum at [www.runforwater.ca](http://www.runforwater.ca).
- Invite a **Water Ambassador in your Community** to come into your class.

### In Your Community & B.C.

- **Celebrate your H<sub>2</sub>O during B.C. Drinking Water Week!**  
It happens in May every year. For more details tap into <http://www.drinkingwaterweek.org/>  
[www.ourwatermatters.ca](http://www.ourwatermatters.ca).
- \*Take your students on a field trip to:
  - The **Abbotsford Entertainment & Sport Centre** (AESC).  
<http://www.abbotsfordcentre.ca>
  - The **Norrish Creek Water Treatment Plant**.
- **Run for clean water in Ethiopia!**  
An event in Abbotsford, visit <http://abbotsford.runforwater.ca/>.

For more information, contact  
City of Abbotsford  
Engineering Department  
604-864-5514  
eng-info@abbotsford.ca  
and visit [www.ourwatermatters.ca](http://www.ourwatermatters.ca)

## Notes

[illegible]







[www.ourwatermatters.ca](http://www.ourwatermatters.ca)