

Section I: Water Use

The Polaris Institute is an Ottawa-based non-governmental organization that has been in existence since 1997. Our main goal is to enable citizen movements to develop new methods, strategies and tools in order to bring about democratic social change. As a result, most of our past educational work has focused on helping students to develop the critical thinking and leadership skills necessary to bring about on-the-ground action.

Full resource accessible online at: www.polarisinstitute.org/education

Other water education resources available at this site:

- Investigating Local Water (*Gr.9 Science: Biology—Sustainable Ecosystems*)
- Water Perspectives: Conflict and Action (*Gr.10 Civics and Citizenship*)

Section I of II: Water Use & Availability

Gr.9 Issues in Canadian Geography, academic (2013) *CGC1D

Description: *Section I* is meant to create an awareness of our own water use—how much is available to us? How much do we use in everyday tasks? How do our perceptions about water availability impact: (1) how we use it; and (2) decisions we make with regards to potential risks to water resources? Activities include: a quiz to gauge students' awareness and perceptions around freshwater supplies and what impacts them; a personal water use inventory (water audit and/or water use habits questionnaire); and a critical thinking assignment in which students consider a scenario where water resources (and their safety) are in conflict with another resource and its production (oil). *Section II* provides the next steps for looking at water resource availability in Canada, as well as globally.

The three main goals of *Section I: Water Use* are to develop an awareness of:

1. How we *view* water, both personally and as a society.
2. How we *use* water, both personally and as a society.
3. How our *views*, related to water, impact how we *use* it.

IMPORTANT NOTE FOR TEACHERS: Although designed to meet expectations from the *Gr.9: Issues in Canadian Geography* Ontario secondary school curriculum, this resource may also provide useful activities for *Gr.12: Environment & Resource Management*. We encourage you to use this resource as you see fit—that is, to take the activities, ideas and information presented here and make them your own. Good luck!

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10-Question quiz to get a sense of students’ awareness and perceptions around:

- (a) Global and Canadian freshwater sources/ supplies;
- (b) The influence of environmental, economic, social and political factors on water supplies in Canada and around the world

Activity 2: Personal Water Use Inventory 7

[OPTION 1] *Water Audit*: Students complete a take-home activity where they record their direct water usage over a 24-hr OR 1-week period

[OPTION 2] *Water Use Habits Questionnaire*: Students complete an in-class activity where they answer a series of questions related to their personal water use habits. During the activity, they create a visual representation of their water use—includes an exploration of both direct and indirect (“virtual”) water use.

Activity 3: Water Resources in Conflict 23

An independent assignment where students explore a proposed pipeline project which has the potential to put water resources in danger. Students must consider both the positive and negative aspects of proceeding with the project, as well as actions or processes that might help to resolve or mitigate the conflict. Option to incorporate discussions on Aboriginal rights and issues as associated with resource extraction and transportation projects.

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Activity 1: What About Our Water?

Learning Goal: To develop an awareness of how we *view* water, both personally and as a society.

Curriculum Expectations (*Gr.9 Issues in Canadian Geography, academic, 2013, *CGC1D*):

Strand B: Interactions in the Physical Environment B1. The Physical Environment and Human Activities: Analyse various interactions between physical processes, phenomena, and events and human activities in Canada	B1.1: Analyse environmental, economic, social, and/or political implications of different ideas and beliefs about the value of Canada's natural environment, and explain how these ideas/beliefs affect the use and protection of Canada's natural assets
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Description: 10-Question quiz to get a sense of students' awareness and perceptions around:

- (a) Global and Canadian freshwater sources/ supplies;
- (b) The influence of environmental, economic, social and political factors on water supplies in Canada and around the world

Time required: 60-min* **If you choose to complete all suggested components with your class*

Materials & Preparation:

- (BLM 1.0) Quiz: What About our Water? (p.4); *1 copy to display at front of class*
- (BLM 1.0) Quiz: What About our Water? *Teacher Key* (p.5-6); *1 copy for teacher*
- SMARTboard/ Elmo/ LCD projector

Engagement Strategy: [10-min]

- Before introducing the quiz, read aloud and/or post on the board the following three questions:
 - Do you think it is important to conserve water?
 - Do you think Canadians should be concerned about Canada's fresh water supplies?
 - Do you know what source the water in your home comes from? (If yes, write it down)
- Have each student record answers, individually, on a sheet of paper (or in a class journal, if they have one).
- **Teacher's Choice:** You may ask students to answer a simple "Y/N" to the questions, or leave it up to each individual to decide how much thought/ effort they want to put into their answer. To provide students with more specific direction, you can ask them to spend more time reflecting on the questions and developing an argument to support their "Y/N" answer. One option may be to have them answer "*why/ why not?*" for the first two questions.

Teaching Strategy: [45-min]

Introduction [5-min]

- Plan to do the quiz with the whole class, together (instead of handing it out for individuals to complete).
- Explain to students that they are going to do a short quiz to test their knowledge/ awareness and perceptions/ beliefs about freshwater resources.
 - [OPTIONAL] Ask each student to make a physical note (on a paper they can later hand in) of any questions/ thoughts that come up while doing the quiz. Each person must come up with at least one question or thought for the activity.

- Set up the activity (as per *Teacher’s Choice—Quiz Activity Options*)

Teacher’s Choice—Quiz Activity Options [Quiz: 15-min; Answers & Discussion: 15-min]

- Put the quiz questions up (one at a time) on the SMART board/ Elmo/ LCD projector.
- Going through one question at a time, read aloud and have students either record their answers (1) individually; (2) in pairs; or (3) in small groups.
 - *Note:* If you decide to have students work together in small groups, you could choose to make this activity into a team competition. Have students work together to decide on the correct answers (T/F) to all of the questions. Teams then submit their answers and the one who scores the highest, wins.
- Go over all of the answers at the end of the quiz
 - Were any answers surprising? Which ones? Discuss a few as needed. Refer to (*BLM 1.0, *Teacher Key**), p.5-6 for detailed information you can share with your students about the quiz answers.

Wrap-up [10-min]

- Ask students to **Think-Pair-Share**:
 - **Think:** Allow students who have not done so already to write down one question or thought that came up for them during the quiz activity (related to the questions).
 - **Pair-Share:** Have students pair up to discuss their question or thought with their partner. Ask students to record at least one additional question or thought that *came out of their discussion with their partner* (either about their own question/ thought, or their partner’s).
- Ask each student to submit their questions/ thoughts from the **Think-Pair-Share** activity to you as a “ticket out of the classroom” for the day.

Assessment (as learning):

- Before the activity, ask students to reflect on three questions (see **Engagement Strategy**).
- During the activity, ask students to jot down a relevant question or thought they have during the completion of the quiz (perhaps a *key learning/ take-away*) (see **Teaching Strategy**).
- After the activity, have students discuss in pairs the question or thought they jotted down. As a “ticket out of the classroom,” students must submit their original question/ thought, along with an additional question/ thought that came from the discussion they had with their partner (see **Teaching Strategy, Wrap-up**).

Differentiated Instruction: Present the quiz by reading aloud the questions *and* providing the questions in text via the SMART board/ Elmo/ LCD projector. Reveal each quiz question one at a time so everyone in the class works at the same pace. There is also the option of completing the quiz in pairs or small groups, which may be advantageous for some students.

Extension:

- Have student(s) delve deeper into the questions or thoughts they had during the activity by doing some research and presenting something short to the class about their inquiry/ findings.
- Have student(s) research and develop their *own* questions (that could be used in a similar quiz). Have students swap questions and learn more about freshwater resources through their own research, and that of their peers.

(BLM 1.0) Quiz: What About Our Water?

Answer *True (T)* or *False (F)* to the following questions:

Questions	T/F
1. Fresh water makes up 20% of all water found on earth.	
2. Of the freshwater found on earth, almost 70% is tied up in glaciers and permanent snow.	
3. Water scarcity affects almost 3 billion people each year.	
4. Bottled water is safer and better regulated than tap water.	
5. The Great Lakes make up the largest supply of fresh surface water in the world.	
6. The Great Lakes supply water to ~5% of the population of Canada.	
7. Water can be owned and managed by private corporations.	
8. Only 1% of the waters of the Great Lakes are renewed each year by snow melt and rain.	
9. After experiencing years of declining water levels and pollution, today the Great Lakes are healthier than ever.	
10. The average Canadian uses 275-L of water daily.	

(BLM 1.0) Quiz: What About Our Water?

Teacher Key

Answer **True (T)** or **False (F)** to the following questions:

Questions	T/F
<p>1. Fresh water makes up 20% of <u>all water</u> found on earth.</p> <p><i>Answer: It is actually only a little over 2% (~2.5)! The rest is saltwater.</i> Source: www.naturecanada.ca</p>	F
<p>2. Of the freshwater found on earth, almost 70% is tied up in glaciers and permanent snow.</p> <p><i>Answer: This is indeed true, but it may also surprise you to learn that about 30% of freshwater is <u>groundwater</u>; therefore, only a very small percent of water (< 0.5%) accounts for surface water in the form of lakes, rivers and streams.</i> Source: www.great-lakes.net</p>	T
<p>3. Water scarcity affects almost 3 billion people each year.</p> <p><i>Answer: Around 2.7 billion people experience a period of at least one month of water scarcity, each year. Water availability is impacted by both quantity and quality (and most often, a combination of both). For example, if there is a lesser <u>quantity</u> of water available, this limited amount is put under additional stress (because it is at higher risk for overuse, and also pollution).</i> Source: www.waterfootprint.org</p>	T
<p>*4. Bottled water is safer and better regulated than tap water.</p> <p><i>Answer: Laws that regulate bottled water are less strict than those that regulate tap water. Bottled water is categorized as a food and regulated under the Food and Drug Act, while tap water is regulated by Guidelines for Canadian Drinking Water Quality. Only 6% of bottled water factories were tested in 2010, and the government now only does surveillance if it gets a complaint (despite the fact that between 2000-2010, 27 out of 49 bottled water products were recalled). Furthermore, about 20% of bottled water is actually taken from municipal tap water instead of spring water sources (including Coke's Dasani and Pepsi's Aquafina).</i> Source: www.insidethebottle.org</p>	F
<p>5. The Great Lakes make up the largest supply of fresh <u>surface</u> water in the world.</p> <p><i>Answer: The Great Lakes—Superior, Michigan, Huron, Erie and Ontario—and their connecting channels form the largest fresh surface water system on Earth, roughly 20% of the world supply (or 1/5th). They provide 95% of the fresh surface water supply in North America.</i> Sources: www.great-lakes.net, www.naturecanada.ca, www.canadians.org</p>	T

<p>6. The Great Lakes supply water to ~5% of the population of Canada.</p> <p><i>Answer: They provide drinking water to 8.5 million Canadians; the population of Canada is ~35.1 million. This is ~24% of Canadians who get their water from the Great Lakes (including 8 of Canada’s 20 largest cities), therefore it is almost one-quarter or 25% of the population!</i></p> <p>Source: www.naturecanada.ca, www.ec.gc.ca/eau-water</p>	F
<p>*7. Water can be owned and managed by private corporations.</p> <p><i>Answer: Water services categorized as “private” are completely owned and managed by a for-profit corporation, who have responsibilities towards their shareholders. This means that private water service providers lack a <u>primary</u> responsibility toward the residents in their jurisdiction who <u>rely</u> on these water sources. “Public” water services are owned and operated by a city/ municipality (and their staff). They have a primary responsibility towards the residents who consume these water resources.</i></p> <p>Source: Refer to http://watercanada.net/2009/the-public-good/ for more information.</p>	T
<p>*8. Only 1% of the waters of the Great Lakes are renewed each year by snow melt and rain.</p> <p><i>Answer: Therefore, if we consume (& export) more than 1% of the volume of water in the Great Lakes each year, the lake levels decline. Agricultural export is an example of one way that we remove water from a watershed (i.e., water stored in foods is removed when this food is transported elsewhere). Other factors impact lake levels as well, including drought. The water levels in the Great Lakes have been below their long-term averages over the past 14 years, and in 2013, two of the lakes reached record lows.</i></p> <p>Source: www.ec.gc.ca/eau-water, www.nytimes.com</p>	T
<p>9. After experiencing years of declining water levels and pollution, today the Great Lakes are healthier than ever.</p> <p><i>Answer: We wish this were the case! Although many measures have been put in place to help protect them, problems such as: pollution, climate change, over-extraction, invasive species, and wetland loss are all taking their toll. The Lakes are particularly sensitive to pollutants because they are retained in the system for a long time, becoming concentrated. In addition, about 7.6 million litres are extracted and “consumed,” daily, from the Great Lakes.</i></p> <p>Source: www.canadians.org, www.epa.gov/greatlakes</p>	F
<p>10. The average Canadian uses 275-L of water daily.</p> <p><i>Answer: This is equivalent to ~4.5 baths! In 2009, unmetered households used a daily average of 376 litres per person compared to 229 litres per person by metered households. Breakdown of residential (indoor) water use in Canada: toilet – 30%; bathing and showering – 35%; laundry – 20%; kitchen and drinking – 10%; cleaning – 5%. Therefore, bathroom-related water use makes up ~2/3^d of total home indoor use!</i></p> <p>Source: www.ec.gc.ca</p>	T

Note: Questions marked with asterisk* may be worth spending more time on, or exploring in more depth, with your students.

Materials & Preparation:

- Chalkboard/ whiteboard/ SMARTboard/ chart paper (whatever is available)
- **Direct Water Use Calculations** → print 1 copy per student (double-sided)
 - (*BLM 1.1*) Direct Water Use Calculations—DAILY (p.11-12) **OR**
 - (*BLM 1.2*) Direct Water Use Calculations—WEEKLY (p.13-14)

Engagement Strategy*: [15-min]

Part A [5-min]

- As a class, create a list of all the ways we use water directly in our daily lives. Record these on the board/ chart paper (or have a student do this). If necessary, prompt students to add water uses that are represented (and calculated) on (*BLM 1.1*)/ (*BLM 1.2*), p.11-14.
 - *e.g.*, dish washing, laundry, toilet, showering/ bathing, cooking, drinking, face/ hand washing, tooth brushing, *etc.*
- As a class, try to arrange these “Uses of Water” from: uses the least amount of water, to uses the most amount of water

Part B [10-min]

- On their own, have students estimate how much water is needed for each of the recorded “Uses of Water” (*e.g.*, taking a bath = ~80L).
- Pair students up to compare their estimates. Have them discuss and modify their estimate to one both partners are comfortable with. Then, have them record their estimate on the board/ chart paper at the front of the class.
- Discuss with students the variety of estimates represented—what can we conclude from this activity?
 - *It is difficult to estimate the quantity of water we use in our everyday tasks!*

***Note:** If time is short (or Part A runs long), you may want to simply do Part B as a class and have students *guess* aloud the approximate amount of water used for each of the “Uses of Water” listed, and then reveal the *actual* amount of water used for each task [refer to (*BLM 1.1*)/ (*BLM 1.2*), p.11-14].

Teaching Strategy: [60-min]

Introduction [15-min]

- Explain to students that for homework, they will be keeping track of their water use over the next day: (*BLM 1.1*) Direct Water Use Calculation – Daily, **or** week: (*BLM 1.2*) Direct Water Use Calculation – Weekly.
- Explain the data collection sheet to students (*i.e.*, how & where to record water use). Give practical tips for how to remember to keep track of the information.
 - *E.g.*, Attach the sheet to a clipboard you keep with your phone; leave the collection sheet in the bathroom, where most of your water use is likely to take place
- You will probably need to go over each item on the sheet, answering any questions students have. **Be sure to familiarize yourself with the recording sheet (and activity). It is strongly suggested you try it yourself for a day (or week) to see what your students will be responsible for!**
- Assign activity for homework. Be clear about when the activity will start and finish, when you will be taking it up again as a class, and what the expectations for completion are.
- [OPTIONAL] Explain how to complete the calculations on the sheet (by going over examples with the class). *Note:* This should only be assigned to complete as part of the homework if your class is advanced. Otherwise, take it up in class once the data has been collected allowing students in-class time to complete calculations.

Take-up [30-min]

- Occurs after 24-hrs OR 1-week (depending on data collection period)
 - Note: Make sure students *know* and are *reminded* of when the data must be collected by (and calculations completed, if you have assigned this as part of the homework)
- If calculations have not been explained/ completed, go over this process with your students. Provide an appropriate amount of in-class time for calculations. Those who have not completed the activity may work with a partner who has completed it *or* be assigned an alternate task.
- Assign someone in the class to compile the overall data from their classmates (daily or weekly total usage). Have them calculate a class average for water use for the assigned period of time (*i.e.*, one day or one week). Since this is not a small amount of work, offer them extra credit or other incentive to complete the task.

Discussion/ debrief [15-min]

*Questions below were based on those found in *Water: An Amazing and Precious Resource*. (2011). Earth Day Network (Washington, US). <<http://edu.earthday.org/water-amazing-and-precious-resource>>

- Were you surprised by your daily personal water use? Did you think that you used more or less water in one day/ one week? How does your personal total compare to the class average? If it is very different, why might this be (*e.g.*, missing or inaccurate water use data)?
- How much of your total water was actually used, and how much went down the drain without being used? Can you identify some things you could change to use less water during certain activities?
- How much more water do you use on a daily or weekly basis, other than what actually comes from the faucet?
 - Prompt students by asking what other things water is used for (*e.g.*, manufacturing of goods, growing food, resource extraction, *etc.*)
 - Explain the concept of “*virtual*” water (for information, see **Background Information – Water Footprints & Virtual Water**, p.18)
- How do you think your water usage compares to other people in Canada?
- Conditions such as drought, pollution, rising population, and unequal distribution of natural resources threaten our water supply, even in Canada.
- Consider:
 - Access to water: physical geography & climate
 - How do these influence *availability* of water? (consider: drought, current & future impacts of climate change)
 - What might happen if we were faced with extreme water shortages?
 - Cost would go up, our usage would have to go down, access would be less reliable, conservation practices would become more common, *etc.*
 - Access to water: urban *vs.* rural areas; low-income *vs.* middle-upper class
 - Do you have a well, or is your water metered and paid for?
 - Is water quality monitored and managed?
 - For example, there are still many rural communities in Canada that are on regular boil-water advisories, particularly several Aboriginal communities in the North.

Assessment (*as and of learning*):

- Before the activity, students reflect on their existing knowledge of how much water is used to perform common, daily tasks (see **Engagement Strategy**)
- During the activity debrief (see **Teaching Strategy**), record observations of student participation. Provide opportunities for students who did not engage in the conversation to record their thoughts and submit them to you, or talk to you one-on-one about their experience doing the water audit.
- After the activity and debrief, have students write a short blog post or journal response related to their experience recording and reflecting on personal water use. Have them address the question: “How can/ do I contribute to the sustainable use of water resources in my day-to-day life?”
 - *Collect, read and return to students with your feedback*
- Collect students’ data sheets, and using a checklist, assess the following learning skills & work habits:
 - **Responsibility:** Did the student complete the at-home task?
 - **Organization:** Did the student keep an accurate, neat record of water usage?
 - **Independent work:** Was the student *successful* at completing the at-home task?

Differentiated Instruction: If you do not think students will be willing or able to perform this at-home task, as an alternative you might choose to collect daily or weekly water use data, yourself. Ask students to work together to compile and calculate *your* personal water use information (in pairs). You could then have students submit a short report to you that includes: (1) a summary of your water use; (2) where your water use was highest/ lowest (*e.g.*, flushing the toilet/ drinking water); and (3) recommendations for reducing your water use.*

*Note: Be sure to caution students that they have to provide thoughtful and realistic recommendations, not silly suggestions (*e.g.*, not showering all week!).

Furthermore, if students are engaged with *this* activity, then you can assign the water audit to *them* for the following week (and perhaps set a challenge for them to try to ‘beat’ your tally by using strategies to reduce their water use).

Extensions: Have students further explore their “water footprint” by visiting a computer lab to complete a detailed calculation of their water use at <www.waterfootprint.org>.

(BLM 1.1) Direct Water Use Calculation - DAILY

Activity	Day/ Date:		Water Use per Activity	Your Total Daily Water Use (L)
Dish washing <i>*Hand or machine</i>	About how many <u>sinks</u> full of dishes did <u>you</u> dirty, today?	= _____	x 35 litres	= _____ L
	OR			
	About how many times do you run your dishwasher per week? _____ ÷ # people ÷ 7 days	= _____		
Laundry (washing machine)	About how many loads of laundry is done each week, at home? _____ ÷ # people ÷ 7 days	= _____	x 150 litres (top-loading)	= _____ L
			x 95 litres (front-loading)	
Toilet (flushing)	How many times did you flush a “regular” toilet?	= _____	x 13 litres (regular)	= _____ L
	How many times did you flush a “low-flow” toilet?	= _____	x 6 litres (low-flow)	= _____ L
Shower <i>*Find out if you have a “low-flow” showerhead</i>	How many minutes did you spend in the shower, today?	= _____ min	x 23 L/min (regular)	= _____ L
			x 7.5 L/min (low-flow)	
Bath <i>*Do you fill the tub halfway, or to full?</i>	Approximately how many baths do you take each week? _____ ÷ 7 days	= _____	x 75 L (half)	= _____ L
			x 150 L (full)	
Cooking	How many cooked meals did you eat? _____ ÷ # people	= _____	x 23 L	= _____ L
Drinking water	How many full glasses of water did you drink?	= _____	x 0.25 L	= _____ L
Faucet	About how much time did you spend running the faucet? (e.g., hand-washing, face-washing, tooth-brushing, etc.)	= _____	x 17 L/ min (regular)	= _____ L
			x 5.5 L/min (low-flow)	

TOTAL WATER USED TODAY:

= _____ L

***Add up the final column on the previous page.**

Other ways I used water today: _____

FURTHER INSTRUCTIONS:

To get an average “weekly” water use calculation, multiply your final total by 7

TOILET: To determine if your toilet is “low-flow” (generally, newer toilets will indicate the L/flush on them). If it is 6L or less, it is considered “low-flow.” If you’re still not sure, look up the brand and model online to determine L/flush for the unit. If you’re still not sure, consider it a “regular” toilet.

SHOWER: To determine if you have a “low-flow” showerhead. If you are unsure, do a test. Run the shower on full blast for 10 full seconds and catch the water output in a basin. Measure the contents of the basin (in L) and multiply by 6. Round to the nearest half litre. This is your shower’s water use per minute!

FAUCET: Feel free to estimate (e.g., for every time I brushed my teeth or washed my hands/face, the water ran for ~__ seconds/minutes).

Water Stats Sources:

1. Environmental Protection Agency (US). *How Much Water Do You Use?*
<<http://www.epa.gov/region1/students/pdfs/gwa21.pdf>>
2. Frontenac Stewardship Council (Ontario, CA). *Water Unit, Gr.8 Science Curriculum*. Lesson #10: The Water Shed. (2012).
3. Holzhauser, Brenna. Earth Day Network (Washington, US). *Water: An Amazing and Precious Resource*. (2011).
<<http://edu.earthday.org/water-amazing-and-precious-resource>>
4. Population Connection (Washington, US). *Water, Water, Everywhere* (2010).
<http://www.populationeducation.org/sites/default/files/water_water_everywhere.pdf>
5. Water 1st International (Washington, US). *Global Water and Sanitation Awareness Curriculum*. (2012).
<http://www.water1st.org/wp-content/uploads/2012/10/Water1st_Curriculum.pdf>

(BLM 1.2) Direct Water Use Calculation - WEEKLY

Record your water use with tick marks in the appropriate column. See instructions on next page.

<u>Activity</u>	MON	TUE	WED	THU	FRI	SAT	SUN	Weekly total	Water per activity	Total Water Used (L)
Dish washing								_____	x <u>35 litres</u> # people in household	= _____
Laundry (washing)								_____	x 150 litres (top-loading)	= _____
								_____	x 95 litres (front-loading)	= _____
Toilet (flushing)								_____	x 13 litres (regular)	= _____
								_____	x 6 litres (low-flow)	= _____
Shower <i>*record in minutes (in boxes provided)</i>								_____ min	x 23 L/min (regular)	= _____
								_____ min	x 7.5 L/min (low-flow)	= _____
Bath								_____	x 75 L (half)	= _____
								_____	x 150 L (full)	= _____
Cooking								_____	x <u>23 L</u> # people in household	= _____
Drinking water <i>(# glasses/day)</i>								_____	x 0.25 L	= _____
Faucet <i>*estimate # min per day, record in boxes</i>								_____ min	x 17 L/ min (regular)	= _____
								_____ min	x 5.5 L/min (low-flow)	= _____

TOTAL WEEKLY WATER USE:

*Add up the final column on the previous page.

= _____

INSTRUCTIONS:

1. DISH WASHING: Record a tick mark for each load of dishes washed in your home, each day. Divide your final number (water use in L) by the total number of people in your home.

2. LAUNDRY: Record a tick mark for each load of laundry washed in your home this week. Divide your final number (water use in L) by the total number of people in your home.

3. TOILET: Record a tick mark for each time you flushed the toilet, each day. Determine if your toilet is “low-flow” (generally, newer toilets will indicate the L/flush on them). If it is 6L or less, it is considered “low-flow.” If you’re still not sure, look up the brand and model on the internet to determine L/flush for the unit. If you’re still not sure, consider it a “regular” toilet.

4. SHOWER: Record how many minutes you spent in the shower each day. If you forget to record it, make an estimate of your shower time. Determine if you have a “low-flow” showerhead. If you are unsure, do a test. Run the shower on full blast for 10 full seconds and catch the water output in a basin. Measure the contents of the basin (in L) and multiply by 6. This is your shower’s water use per minute!

5. BATH: Record a tick mark each day you had a bath this week. Consider: Did you fill the tub halfway, or to full?

6. COOKING: Record a tick mark for each **full**, cooked meal you ate (each day).

7. DRINKING WATER: Record a tick mark for each full glass of water you drank (each day).

8. FAUCET: Record approximately how many minutes you spent running the faucet (each day). Feel free to estimate (e.g., for every time I brushed my teeth or washed my hands/face, the water ran for ~__seconds/minutes).

Water Stats Sources:

1. Environmental Protection Agency (US). *How Much Water Do You Use?*
<<http://www.epa.gov/region1/students/pdfs/gwa21.pdf>>
2. Frontenac Stewardship Council (Ontario, CA). *Water Unit, Gr.8 Science Curriculum*. Lesson #10: The Water Shed. (2012).
3. Holzhauer, Brenna. Earth Day Network (Washington, US). *Water: An Amazing and Precious Resource*. (2011).
<<http://edu.earthday.org/water-amazing-and-precious-resource>>
4. Population Connection (Washington, US). *Water, Water, Everywhere* (2010).
<http://www.populationeducation.org/sites/default/files/water_water_everywhere.pdf>
5. Water 1st International (Washington, US). *Global Water and Sanitation Awareness Curriculum*. (2012).
<http://www.water1st.org/wp-content/uploads/2012/10/Water1st_Curriculum.pdf>

[OPTION 2] Water Use Habits Questionnaire

Learning Goal: To develop an awareness of how we *use* water, both personally and as a society.

Curriculum Expectations (Gr.9 Issues in Canadian Geography; academic, 2013, *CGC1D):

<p>Strand B: Interactions in the Physical Environment</p> <p>B1. The Physical Environment and Human Activities: Analyse various interactions between physical processes, phenomena, and events and human activities in Canada</p>	<p>B1.1: Analyse environmental, economic, social, and/or political implications of different ideas and beliefs about the value of Canada’s natural environment, and explain how these ideas/beliefs affect the use and protection of Canada’s natural assets</p>
<p>Strand C: Managing Canada’s Resources and Industries</p> <p>C1. The Sustainability of Resources: Analyse impacts of resource policy, resource management, and consumer choices on resource sustainability in Canada</p>	<p>C1.4: Analyse the roles and responsibilities of individuals in promoting the sustainable use of resources (e.g., managing one’s own ecological footprint, making responsible consumer choices, recycling, advocating sustainable resource-use policies and practices)</p>

Description: Students complete an in-class activity where they answer a series of questions related to their personal water use habits (*BLM 1.3*), p.20. During the activity, they create a visual representation of their water use—for each question, students are asked to add a certain number of paperclips to a chain to represent their personal impact in terms of water usage [e.g. *Question:* Do you leave the water running while brushing your teeth? Yes (add 2 clips)/ Sometimes (add 1 clip)/ No (add 0 clips)]. This activity also incorporates some questions about “virtual” water use (our indirect uses of water), as well as accompanying discussion (see *Background Information*, p.18-19).

Materials & Preparation:

- Chalkboard/ whiteboard/ chart paper (whatever is available)
- SMART board/ Elmo/ LCD projector
- (*BLM 1.3*) Chain Reaction—How Much Water Do You Use? (p.20)
 - 1 copy to project for class
- (*BLM 1.4*) Teacher Reference Information – ‘Chain Reaction’ (p.21-22)
 - 1 copy for teacher
- Large paperclips (preferably coloured, blue suggested), ~40 per student
- Envelope packets (1 per pair of students, containing ~80 paperclips each)
- [OPTIONAL] (*BLM 1.2*), p.13-14*

Engagement Strategy*: [15-min]

Part A [5-min]

- As a class, create a list of all the ways we use water directly in our daily lives. Record these on the board/ chart paper (or have a student do this). If necessary, prompt students to add water uses they haven’t yet thought of (e.g., dish washing, laundry, toilet, showering/ bathing, cooking, drinking, face/ hand washing, tooth brushing, etc.).

- As a class, try to arrange these “Uses of Water” from: uses the *least* amount of water, to uses the *most* amount of water. Refer to (*BLM 1.2*) for guidance.

Part B [10-min]

- On their own, have students estimate how much water is needed for each of the recorded “Uses of Water” (*e.g.*, taking a bath = ~80L).
- Pair students up to compare their estimates. Have them discuss and modify their estimate to one both partners are comfortable with. Then, have them record their estimate on the board/ chart paper at the front of the class.
- Discuss with students the variety of estimates represented—what can we conclude from this activity?
 - *It is difficult to estimate the quantity of water we use in our everyday tasks!*

***Note:** If time is short (or Part A runs long), you may want to simply do Part B as a class and have students *guess* aloud the approximate amount of water used for each of the “Uses of Water” listed, and then reveal the *actual* amount of water used for each task [refer to (*BLM 1.2*)].

Teaching Strategy: [45-min]

Water Use Habits, Questionnaire [30-min]

(*BLM 1.3*) Chain Reaction—How Much Water Do You Use? (p.20)

- Explain that in order to examine how we *use* water every day, students will be answering a few questions related to their water use habits.
- Go through question #1 on (*BLM 1.3*) with students. Explain the use of the paperclips with each question; depending on their answer, students will add a certain number of paperclips to their ‘chain’ to represent their individual water use.
- Distribute paperclips to students (~40 per student or ~80 per pair → use envelope to distribute)
 - **Note:** You will want to ask students to refrain from bending the extra clips out of shape, as you’d like to re-use them.
- Continue with the questionnaire as a class activity, revealing one question at a time.
- Discuss with students the implications of certain questions, as needed (this will be particularly important with the final 5 questions regarding “virtual,” or indirect water uses).*
 - *Refer to (*BLM 1.4*) – Teacher Reference Info: ‘Chain Reaction’ (p.21-23)

Note 1: If acquiring enough paperclips for this activity is too much of an expense or hassle, you can simply have students record and tally their ‘score.’ However, having some alternative visual representation can be a good way for students to actually ‘see’ the different impacts of their choices when it comes to water use.

Note 2: While setting up this activity, be careful to emphasize that everyone is starting from *different places/ capabilities* in terms of their personal water use, and that this activity is not meant as a comparison between students but rather a personal awareness activity.

Discussion/ debrief [15-min]

- Explain that you will make a statement, and then ask students to position themselves on either side of the room depending on whether they “agree” or “disagree” with the statement. Students who are undecided may remain in the middle of the room. You may want to place a sign on each side of the room (on opposite walls)—one saying “AGREE,” and the other, “DISAGREE”
- After each statement is read, and students have positioned themselves, ask one or more students from each ‘section’ (agree/ disagree/ undecided) to explain their position or response.

Here are a few **possible statements** you may want to make. You can also make up some of your own:

- I was surprised by: (a) the score I received on the questionnaire related to my water habits; **OR** (b) the length of my paperclip chain representing my water use habits
 - Follow-up Q (for individuals): *Why/ why not? Why do you think your score was high/low?*
- I identified uses of water in my everyday life I had never thought about before*
 - *This will most likely be represented in “*virtual*” or indirect water uses; feel free to open up a short discussion with students about virtual water (refer to **Background Information: Water Footprints & Virtual Water**, p.18-19)
 - Follow-up Q (for individuals in “AGREE” section):
 - *Which uses of water had you never considered before? Were they surprising? Why/ why not?*
- I identified areas of my life where I could reduce my water use
 - Follow-up Q (for individuals): *Where could you reduce your water use? OR Why can't you further reduce your water use?**
 - *Prompt these students to think critically about their *virtual* water use (such as in transportation or other consumer choices)

Assessment (as and for learning):

- Before the activity, students reflect on their existing knowledge of how much water is used to perform common, daily tasks (see **Engagement Strategy**).
- During the activity, students are provided an opportunity to reflect on their own behaviour and thinking, and how this relates to their personal water use (see **Teaching Strategy, Water Use Habits Questionnaire**).
- During the activity debrief (see **Teaching Strategy**), record observations of student participation. Provide opportunities for students who did not engage in the conversation to record their thoughts and submit them to you, or talk to you one-on-one about their experience doing the questionnaire.
- After the activity and debrief, have students write a short blog post or journal response related to their experience reflecting on personal water use. Have them address the question: “How can/ do I contribute to the sustainable use of water resources in my day-to-day life?”
 - *Collect, read and return to students with your feedback*

Differentiated Instruction: If you think your students lack the maturity to take this seriously in a group format (where comparisons between students may get out of hand), distribute the questionnaire to complete individually (*BLM 1.3*) and have them record their score. In a class journal or on a piece of paper, have students write down any questions or thoughts they have about the questionnaire (*e.g.*, students may have questions about how eating meat increases their indirect water use). As a class, take up these questions and discuss/ explain as needed [referring to (*BLM 1.4*) Teacher Reference Info: ‘Chain Reaction’].

Extension: For [OPTION 1]: Water Audit, take daily or weekly totals of water use (in L) and try to compare this with something of equal volume that is easy to visualize (*e.g.*, size of a closet, 4 full bathtubs, *etc.*)

Background Information – Water Footprints & Virtual Water

Virtual water: The amount of water consumed in the production process of a good or service is called “virtual water.”¹ It includes both water consumed and polluted.

E.g., COTTON T-SHIRT: Virtual water is present in...

- water needed to grow the cotton crops
- water needed to process the cotton into useable fibre in a factory
- water needed in the manufacturing process of the t-shirt itself
- water needed to extract the fossil fuels used to run the machinery, transport the cotton and t-shirts, *etc.*

Water Footprint: The measure of both direct and indirect (*i.e.*, virtual) water use. Can be calculated for many purposes and scales (*e.g.*, for an individual, a corporation, a product, or even an entire country!).²

The main difference between a “virtual water” use calculation and a “water footprint” calculation is that the latter takes into account where the used water is *located* (geographically) and the water *source*. Therefore, this information provides more insight into assessing the impacts of production on water resources in specific regions.²

Sources:

¹ Leaky Exports: A Portrait of the Virtual Water Trade in Canada. (2011). The Council of Canadians. <<http://www.canadians.org/sites/default/files/publications/virtual-water-0511.pdf>>

² Water Footprint Network. (2014). University of Twente, the Netherlands. <www.waterfootprint.org>

For more information, refer to:

<<http://www.iwawaterwiki.org/xwiki/bin/view/Articles/WaterFootprint>>

Water Footprint Calculator:

<<http://www.waterfootprint.org/index.php?page=cal/WaterFootprintCalculator>>

Water Footprint Assessment Tool:

<<http://www.waterfootprint.org/tool/about-the-tool/>>

Examples of Virtual Water

Examples of Agricultural Uses of Water		
1 kg beef	requires...	15,000-50,000 L**
1 dozen eggs		2,060 L
1 loaf bread		570 L
1 kg apples		180 L
1 cup coffee		140 L
1 kg potatoes		90 L
1 cup tea		35 L
Examples of Industrial Uses of Water		
1 L gasoline	requires...	10 L
1 kg steel		210 L
1 kw electricity		300 L
1 kg paper		840 L (4x than for steel)
1 kg synthetic rubber		2,520 L (3x than for paper)
1 kg aluminum		8,400 L
1 car		378,500 L
Sources:		
<ul style="list-style-type: none"> • Larkin, P. Gr.8 Water Resource. NatureWorks Learning. • Population Connection (Washington, US). <i>Water, Water, Everywhere</i> (2010). <http://www.populationeducation.org/sites/default/files/water_water_everywhere.pdf> • Water Footprint Network. (2014). University of Twente, the Netherlands. <www.waterfootprint.org> <ul style="list-style-type: none"> ○ This website also contains downloadable resources ○ http://www.waterfootprint.org/tool/home/; Go to teaching tools (Resources section) 		
<p>**There is a huge variation around the globe, as the water footprint depends on variable factors, such as: the type of production system, and the composition and origin of the animal feed.</p>		

(BLM 1.3) Chain Reaction—How Much Water Do You Use?

MY DIRECT WATER USE:

1. When I shower, I take:

Less than 5 min	1 paperclip
5-10 min	2 paperclips
More than 10 min	3 paperclips

2. The shower at home has a low-flow showerhead:

Yes	0 clips
I don't know	1 clip
No	2 clips

3. I _____ shut the water off when brushing my teeth:

Always/usually	0 clips
Sometimes	1 clip
Rarely/never	2 clips

4. I use the toilet to flush unnecessary things (like used Kleenex, bugs, etc.):

Rarely/never	0 clips
Sometimes	1 clip
Always/usually	2 clips

5. At home we practice “if it’s yellow, let it mellow...if it’s brown, flush it down!”

Always/usually	0 clips
Sometimes	1 clip
Rarely/never	2 clips

6. My house has a low-flow (<6L/ flush) toilet:

Yes	0 clips
I don't know	1 clip
No	2 clips

7. After wearing an outfit, I wash it:

Only when dirty	0 clips
After I wear it two or more times	1 clip
Every time, even when it's not dirty	2 clips

8. My family keeps a jug of cold tap water in the fridge:

Yes	0 clips
No	1 clip

9. At home, we drink bottled water rather than tap water (but we don't have to):

Yes	4 clips
No	0 clips

10. We only run the dishwasher or washing machine when they're full:

Don't have either machine	1 clip
Always/usually	1 clip
Sometimes	2 clips
Rarely/never	3 clips

MY INDIRECT WATER USE:

1. In my diet, I am:

Vegetarian	2 clips
Omnivore (I eat meat!)	5 clips

2. I get a drive to school, instead of taking the bus:

Rarely/never	0 clips
Sometimes	1 clip
Always/usually	2 clips

3. I buy my clothes new:

Rarely/never	0 clips
Sometimes	1 clip
Always/usually	2 clips

4. I use paper unnecessarily:

Rarely/never	0 clips
Sometimes	1 clip
Always/usually	2 clips

5. I eat fast-food/ processed foods:

Rarely/never	0 clips
Once a month	1 clip
Once a week	3 clips
More than once a week	5 clips

My score: _____ clips

(BLM 1.4) Teacher Reference Info – ‘Chain Reaction’

Direct Water Uses

- 1. Shower time:** Depending on the type of showerhead (standard vs. low-flow) and the amount of time spent showering, you could save up to 8x the amount of water used! At the lower end, a 2-min shower with a low-flow showerhead could “cost” you ~15L* of water (based on a flow rate of 7.5L/min*), whereas a 10-min shower with a standard showerhead dispenses upwards of ~230L* (with a flow rate of 23 L/min*).

Note: These numbers are based on estimated rates of flow, combined from a variety of sources [see **Water Stats Sources in (BLM 2.1) and (BLM 2.2)]. It should be noted that there was a high degree of variability between some sources, and the numbers provided here are approximations. Have your students do their own at-home investigations for more precise data!*

- 2. Low-flow showerhead:** You can save up to one half of your water use with a low-flow showerhead. These generally have an aerating function, which adds air to the running water to reduce flow, and therefore water consumption. Some also have a “shut-off” button which allows you to easily stop water flow without having to shut off the tap and re-regulate the water temperature when you’re ready to rinse off!
- 3. Brushing teeth** (unnecessary running of water): If you were to brush your teeth for the recommended 2-min without shutting off the tap, this could run you 10-40L per brushing (based on a flow of 5L/min for an aerated faucet, and 20L/min for a non-aerated faucet).
- 4-6. Toilet flushing:** Toilet flushing accounts for 30% of water use in the home, second only to showering/ bathing. A low-flow toilet, at the high end, uses ~6L/ flush. A standard toilet typically uses ~13L. Again, this is a water savings of >50% with a low-flow model. Therefore, to avoid water waste, it is in your best interest to avoid unnecessary flushing...in your household, you can decide what this looks like (*i.e.*, a mellow, yellow toilet)!
- 7. Laundry:** A lot of unnecessary clothes-washing can really add up in terms of your weekly water usage. Not only does it wear down clothes faster, it uses somewhere between 95-150L water per cycle (front-loading washers are more water-efficient than top-loading ones).
- 8. Drinking water:** Running the water from the tap to make it cold can result in unnecessary water waste. Keep a jug of water in the fridge, making sure to rinse it periodically when you empty it (every 3-days or so).
- 9. Bottled water:** It takes 3-L of water to produce 1-L of bottled water (not to mention, it costs 2000x more energy to produce bottled water than tap water!)
- 10. Full loads:** Both washers and dishwashers run more efficiently with full loads, vs. half ones. It is also believed that dishwashers (when run at full) are *more* water efficient than hand-washing dishes (just think of the amount of water that could be wasted while running the tap to make it hot, not to mention during rinsing).

Indirect Water Uses

Virtual water: *the volume of water consumed or polluted in creating a product (measured over the entire production process).*

1. **Eating meat:** There is water involved in growing crops (e.g., grains & vegetables), and animals eat these crops to grow, themselves. Therefore, a diet that includes meat will generally have a higher “virtual” water content (or “water footprint”) than one that does not.

There is a huge variation with respect to the estimated amount of water it takes to raise and produce animals for consumption. For beef cattle, the water footprint depends on factors that vary, such as: the type of production system, and the composition and origin of the animal feed. However, estimates range from 15,000-50,000L of water needed to produce 1 kg of beef.

2. **Drive to school:** It takes 10-L of water to produce 1-L of gasoline...more water than you would need to consume after, say, walking to school! Taking the bus, however, means the fuel consumed (and the associated water costs) is spread out over all of the other people taking the bus with you. Everyone reduces their impact!
3. **Buying new clothes:** Cotton accounts for 40% of the global textile industry. It takes about 2,720-L of water to grow and produce one cotton t-shirt. This is equivalent to what one person might drink over 3 years! By buying used clothing, you are reducing the demand for new t-shirts to be manufactured.
4. **Paper waste:** It takes 840-L water to grow and manufacture 1-kg paper, so make sure paper use is necessary, and use both sides!
5. **Fast/ processed food:** There are water costs involved in the production and packaging of fast/ processed foods.

Sources:

1. Environmental Justice Foundation. *Cotton and Water*. <<http://ejfoundation.org/cotton/cotton-and-water>>
2. Environmental Protection Agency (US). *How Much Water Do You Use?*
<<http://www.epa.gov/region1/students/pdfs/gwa21.pdf>>
3. Frontenac Stewardship Council (Ontario, CA). *Water Unit, Gr.8 Science Curriculum*. Lesson #10: The Water Shed. (2012).
4. Holzhauer, Brenna. Earth Day Network (Washington, US). *Water: An Amazing and Precious Resource*. (2011).
<<http://edu.earthday.org/water-amazing-and-precious-resource>>
5. Population Connection (Washington, US). *Water, Water, Everywhere* (2010).
<http://www.populationeducation.org/sites/default/files/water_water_everywhere.pdf>
6. The Polaris Institute (Ottawa, ON). *Bottled Water Facts and Stats* <www.insidethebottle.org>
7. Water 1st International (Washington, US). *Global Water and Sanitation Awareness Curriculum*. (2012).
<http://www.water1st.org/wp-content/uploads/2012/10/Water1st_Curriculum.pdf>
8. Water Footprint Network. (2014). University of Twente, the Netherlands. <www.waterfootprint.org>

Activity 3: Water Resources in Conflict

Learning Goal: To develop an awareness of how our *views*, related to water, impact how we *use* it.

Curriculum Expectations (Gr.9 Issues in Canadian Geography; academic, 2013, *CGC1D):

Strand A: Geographic Inquiry and Skill Development	
A1. Geographic Inquiry: use the geographic inquiry process and the concepts of geographic thinking when investigating issues relating to Canadian geography	
Strand B: Interactions in the Physical Environment	
B1: Analyse various interactions between physical processes, phenomena, and events and human activities in Canada	B1.1: Analyse environmental, economic, social, and/or political implications of different ideas and beliefs about the value of Canada’s natural environment, and explain how these ideas/ beliefs affect the use and protection of Canada’s natural assets
Strand C: Managing Canada’s Resources and Industries	
C1: Analyse impacts of resource policy, resource management, and consumer choices on resource sustainability in Canada	C1.3 Analyse the influence of governments, advocacy groups, and industries on the sustainable development and use of selected Canadian resources C1.4: Analyse the roles and responsibilities of individuals in promoting the sustainable use of resources (e.g., managing one’s own ecological footprint, making responsible consumer choices, recycling, advocating sustainable resource-use policies and practices)

Description: In Activities 1 & 2, we explored our assumptions and *views* on water, as well as how we *use* water in our day-to-day lives. Activity 3 consists of a brief wrap-up discussion about the influence of our views (ideas/ beliefs) on the use and protection of water resources. There is also an assignment that can be used to further contextualize this discussion (addressing Overall Expectations B.1 and C.1, above).

Time required: 30-min

Materials & Preparation:

- Guiding questions for discussion (see **Engagement Strategy**)
- (BLM 1.5) Water Resources in Conflict—Assignment; 1 copy per student (3-pgs)
- (BLM 1.6) Water Resources in Conflict—Assignment *Teacher Key*; 1 copy for teacher

Engagement Strategy: [15-min]

Guiding question for discussion: Does how we *view* water resources impact how we *use* them?

Q1: Before completing Activities 1 & 2, did you make any assumptions about water... in Canada? In Ontario? In your city/ town/ community?

- E.g.,* Did you assume water would always be “available” to you? Why/ why not?
Did you think about your water use differently at certain times of the year? Why/ why not?
Have your views (about water availability) changed? Why/ why not?

Q2: Do you think Canadians, as a whole, make certain assumptions about water resources? If so, what are they? What evidence leads you to believe Canadians make these assumptions?

- E.g.,* Canadians appear to assume Canada is a “water-rich” country. Canada is portrayed as such in the global media, and we don’t experience enough water availability shortages in our country for it to be considered a priority to protect and conserve water resources.

Q3: How might these assumptions affect our water use in Canada...now? In the future?

- E.g.,* Put simply, if we abuse our water now, we will likely experience a water future where even more caution around water resources will be necessary (not only at an environmental level, but also relating to political, economic and social issues).

Teaching Strategy: [15-min]

- Introduce the assignment on p.25-27 (*BLM 1.5*). Your class will probably need you to go through each question with them, to make sure they are clear on what is being asked. For those questions that are more opinion-based, give students an example of what type of response they might give. Refer to (*BLM 1.6*) Teacher Key (p.28-30) for this purpose.
- Be sure students are clear about the expectations around the assignment (*e.g.,* you are collecting them for marking, students may ask for your assistance/ guidance during the process, the assignment due date, *etc.*)

Assessment (of learning):

- Collect the assignment (*BLM 1.5*) for marking. There is no rubric provided, but you may wish to make your own.
- Consider whether: (1) students have demonstrated critical thinking skills in their answers; (2) it is evident students have put a lot of thought into their responses; (3) students who struggled with the assignment sought out your help and asked good questions, *etc.*

Differentiated Instruction:

- Some of your students may struggle with this assignment in written form. You could conduct a verbal assessment with these students, or pair weaker students with stronger ones for this assignment.

Extension:

- Have students do some more research on this case study issue by typing “Line 9 pipeline” in an internet search engine.
- Have students explore the context of Aboriginal rights and issues as associated with resource extraction (*e.g.* the Alberta Tar Sands and the Athabasca River) and transportation (*i.e.,* pipelines, tankers).
 - Searches to try: “First Nations + tar sands;” “First Nations + line 9 pipeline;” “Northern gateway pipeline + BC First Nations”

(BLM 1.5) Water Resources in Conflict—Assignment (p.1 of 3)

Throughout our investigations on “water use,” you have explored the idea of how our views on water resources can influence how we use (and protect) these resources.

This assignment will be for homework. You will have ____ days to complete it. You may come to me for assistance if needed, but you must be able to demonstrate that you have done some research about the topic, already. Good luck!

ASSIGNMENT

1. Consider the following scenario.

In point form, write down the key points in the box below.

An oil and gas company has put in a proposal to Canada’s National Energy Board to move heavy crude oil through one of their existing pipelines. The pipeline, which runs through a number of communities in Southern Ontario, was not built to move this type of substance. Studies suggest that it is only a matter of time before a leak or spill occurs, due to the corrosive properties of this oil. One of the biggest concerns is the impact to local water quality if a spill happens. Cleaning up oil from a spill will be challenging, as this form of oil generally sinks in water, instead of floating on the top. In addition, chemicals need to be mixed with the oil to allow it to flow through the pipeline. If a spill were to occur, these chemicals would evaporate into the air, creating a toxic cloud of vapours that would affect local air quality and could make people sick. However, this project also has the potential to create revenue from the oil exports that it would allow.

Key points:

(BLM 1.5) Water Resources in Conflict—Assignment (p.2 of 3)

2. Which two natural resources are in conflict in this scenario?

_____ and _____

3. Describe the major conflict, as you see it, in one sentence:

4. What sort of beliefs about the value of each of these resources (see Q#2) do you think is reflected by the...

(a) Oil and gas company:

(b) People opposed to the project:

(BLM 1.5) Water Resources in Conflict—Assignment (p.3 of 3)

5. In point form, list some of the potential impacts (both positive and negative) you see from this project:

**Hint: Consider not only environmental, but also economic, social and political impacts!*

Negative	Positive

6. What actions and/or processes might help resolve the conflict?

7. Do you think your personal choices help promote the responsible use of water resources? Name one thing that you could do to make a difference.

(BLM 1.6) Water Resources in Conflict—Assignment (p.1 of 3)

Teacher Key

Throughout our investigations on “water use,” you have explored the idea of how our views on water resources can influence how we use (and protect) these resources.

This assignment will be for homework. You will have ____ days to complete it. You may come to me for assistance if needed, but you must be able to demonstrate that you have done some research about the topic, already. Good luck!

***Note:** There are very few “right” or “wrong” answers. The student must demonstrate that they have put in sufficient thought and utilized critical thinking skills.

ASSIGNMENT

1. Consider the following scenario.

In point form, write down the key points in the box below.

An oil and gas company has put in a proposal to Canada’s National Energy Board to move heavy, crude oil through one of their existing pipelines. The pipeline, which runs through a number of communities in Southern Ontario, was not built to move this type of substance. Studies suggest that it is only a matter of time before a leak or spill occurs, due to the corrosive properties of this oil. One of the biggest concerns is the impact to local water quality if a spill happens. Cleaning up oil from a spill will be challenging, as this form of oil generally sinks in water, instead of floating on the top. In addition, chemicals need to be mixed with the oil to allow it to flow through the pipeline. If a spill were to occur, these chemicals would evaporate into the air, creating a toxic cloud of vapours that would affect local air quality and could make people sick. However, this project also has the potential to create revenue from the oil exports that it would allow.

Key points:

- Pipeline moves through several communities (in Southern Ontario)
- Pipeline is not built to move heavy, crude oil
 - Studies show a spill is likely
- The oil is hard to clean-up if it gets in the water
- There will be impacts to both water and air quality if a spill occurs
- This project would allow for additional oil exports, creating revenue for the economy

2. Which two natural resources are in conflict in this scenario?

OIL and WATER

(BLM 1.6) Water Resources in Conflict—Assignment (p.2 of 3)

Teacher Key

3. Describe the major conflict, as you see it, in one sentence:

This proposal creates a risk to local water resources, but if allowed to go ahead, it would contribute to the economic advancement of the oil and gas industry in Canada.

4. What sort of beliefs about the value of each of these resources (see Q#2) do you think is reflected by the...

(a) Oil and gas company:

They believe that oil/gas is more important than protection of water resources. And/or, there's a belief that money can mitigate any harm to water resources that comes from the project.

(b) People opposed to the project:

Perceive that the risk of the project exceeds the rewards; some may believe that oil and gas are not a natural resource that we should continue to exploit at all costs, particularly to the potential destruction of local water resources.

5. In point form, list some of the potential impacts (both negative and positive) you see from this project:

Hint: Consider not only environmental, but also economic, social and political impacts!

***Note:** I would expect students to touch on only a handful of these.

	Negative	Positive
Environmental	<p><i>If a spill were to occur:</i></p> <ul style="list-style-type: none"> • Impacts to local ecosystem (and all life that depends on it) • Impacts to drinking water quality 	<ul style="list-style-type: none"> • Using an existing pipeline means another line does not need to be built (reduced environmental impact/ footprint)
Economic	<p><i>If a spill were to occur:</i></p> <ul style="list-style-type: none"> • Potential lawsuits from people (families, businesses) affected • Extremely costly and time-consuming clean-up • Cost of repair to pipeline to maintain operations 	<ul style="list-style-type: none"> • Economic gain due to easier export of in-demand resource (oil) → <i>critical thinking: who gains?</i> • Using an existing pipeline means another line does not need to be built, which would be costly

(BLM 1.6) Water Resources in Conflict—Assignment (p.3 of 3)

Teacher Key

<p>Social</p>	<ul style="list-style-type: none"> • Social backlash and protests due to controversial/ high-risk nature of project (and potential impacts to environment, people) <p><i>If a spill were to occur:</i></p> <ul style="list-style-type: none"> • Possibility of severe illness or even death (people, wildlife) • Damage to company name/ reputation • Media attention 	<ul style="list-style-type: none"> • Canada will be seen as a larger player in the economic export of oil <p><i>If a spill were to occur:</i></p> <ul style="list-style-type: none"> • More attention brought to issue (leverage more public support against project)
<p>Political</p>	<ul style="list-style-type: none"> • Incongruity between environmental protection and economic gain creates political tension, divides constituents • Lack of political will/ attention to project concerns could result in violence 	<ul style="list-style-type: none"> • Canada gains international recognition and power as a larger player in the economic export of oil • Local action groups become established, to lobby for or against the project

6. What actions and/or processes might help resolve the conflict?

- Consultation process to hear and address public concerns about the project
- Subjecting the project to an environmental assessment before giving it the “go-ahead”
- Demonstrating proof of “due diligence” (in inspecting the pipeline and making any necessary alterations/ repairs), ensuring that every possible safety precaution has been taken
- Creating a comprehensive spill-response plan; if it does not demonstrate a clear ability to mitigate negative impacts to water quality, the project should be rejected

7. Do your personal choices promote the responsible use of water resources?

Name one thing that you could do *differently* to make a positive impact.

- Pay more attention to my “virtual” water consumption (*i.e.*, transportation, local vs. imported foods, production & manufacturing, *etc.*)
- Get involved in local water issues; know what is happening and seek ways to promote responsible use and protection of water resources
- Start at home—find ways to help reduce my household’s water consumption, and learn about ways to protect water quality through the products we buy (*e.g.*, biodegradable dish detergents, laundry soaps, and shampoos)
- ***Etc...***

Acknowledgements

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We welcome any and all feedback on this educational resource.

Appendix A: Curriculum Expectations

Issues in Canadian Geography (Gr.9), CGC1D – academic

Strand A: Geographic Inquiry and Skill Development	
A1. Geographic Inquiry: use the geographic inquiry process and the concepts of geographic thinking when investigating issues relating to Canadian geography	
Strand B: Interactions in the Physical Environment	
B1: Analyse various interactions between physical processes, phenomena, and events and human activities in Canada	B1.1: Analyse environmental, economic, social, and/or political implications of different ideas and beliefs about the value of Canada’s natural environment, and explain how these ideas/ beliefs affect the use and protection of Canada’s natural assets
Strand C: Managing Canada’s Resources and Industries	
C1. The Sustainability of Resources: Analyse impacts of resource policy, resource management, and consumer choices on resource sustainability in Canada	C1.3 Analyse the influence of governments, advocacy groups, and industries on the sustainable development and use of selected Canadian resources C1.4: Analyse the roles and responsibilities of individuals in promoting the sustainable use of resources (e.g., managing one’s own ecological footprint, making responsible consumer choices, recycling, advocating sustainable resource-use policies and practices)

Note re: curriculum

Although designed to meet expectations from the *Gr.9 Issues in Canadian Geography* Ontario secondary school curriculum, this resource may also provide useful activities for ***Gr.12 Environment & Resource Management***.