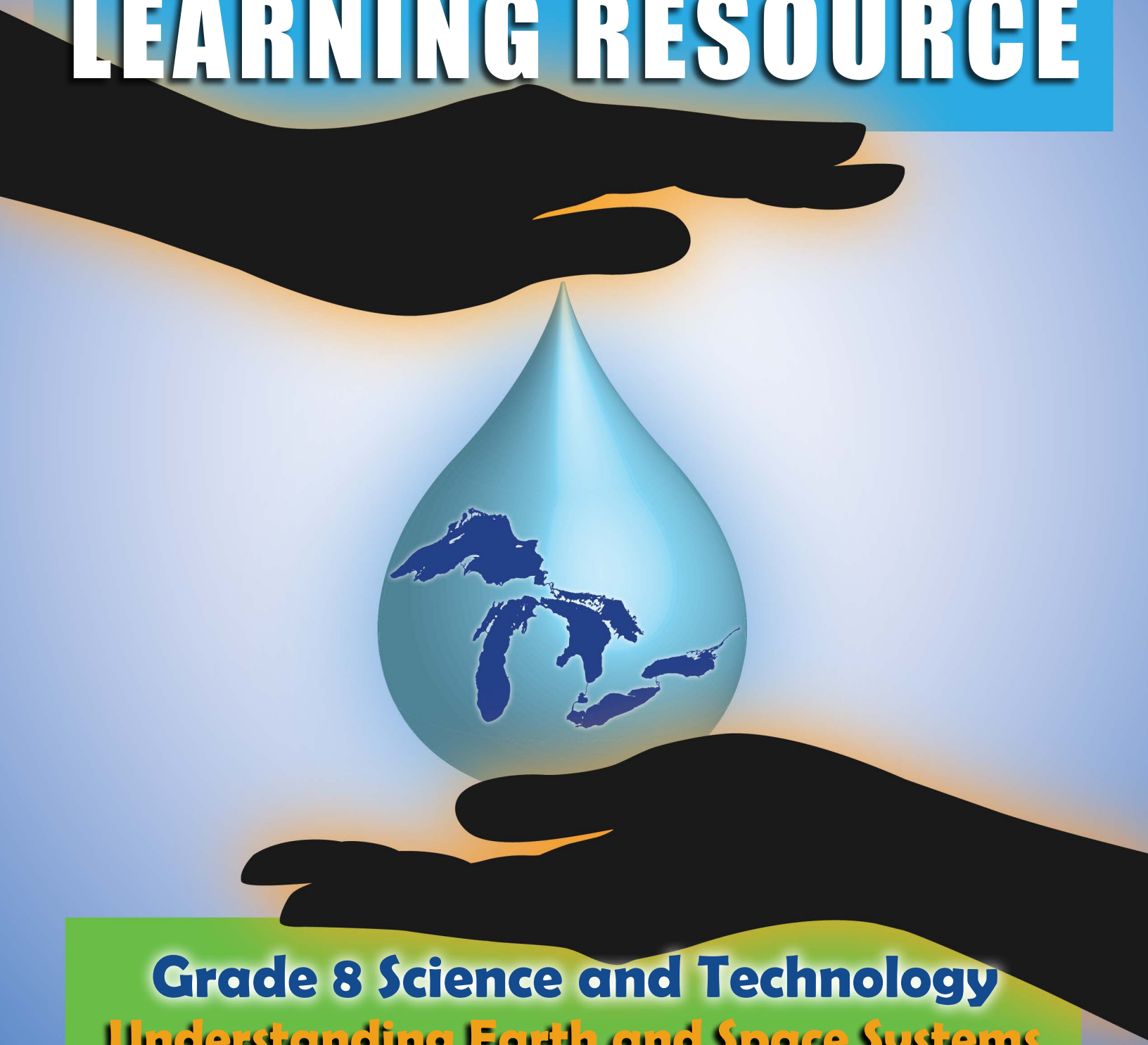
GREAT LAKES TEACHING & LEARNING RESOURCE



Grade 8 Science and Technology

Understanding Earth and Space Systems

Water Systems

toronto ZOO

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THE FERA LEARNING CYCLE FOR INQUIRY-BASED LEARNING

1.1 - INTRODUCTION

BEFORE YOU BEGIN . . .

1. FOCUS

In your groups, and without conducting any research, brainstorm three things you already know about the North American Great Lakes. Record this information on a mind map.

2. EXPLORE

Choose one of the Great Lakes. Use the Internet to research this lake and record three new facts that you have learned from this exploration process.

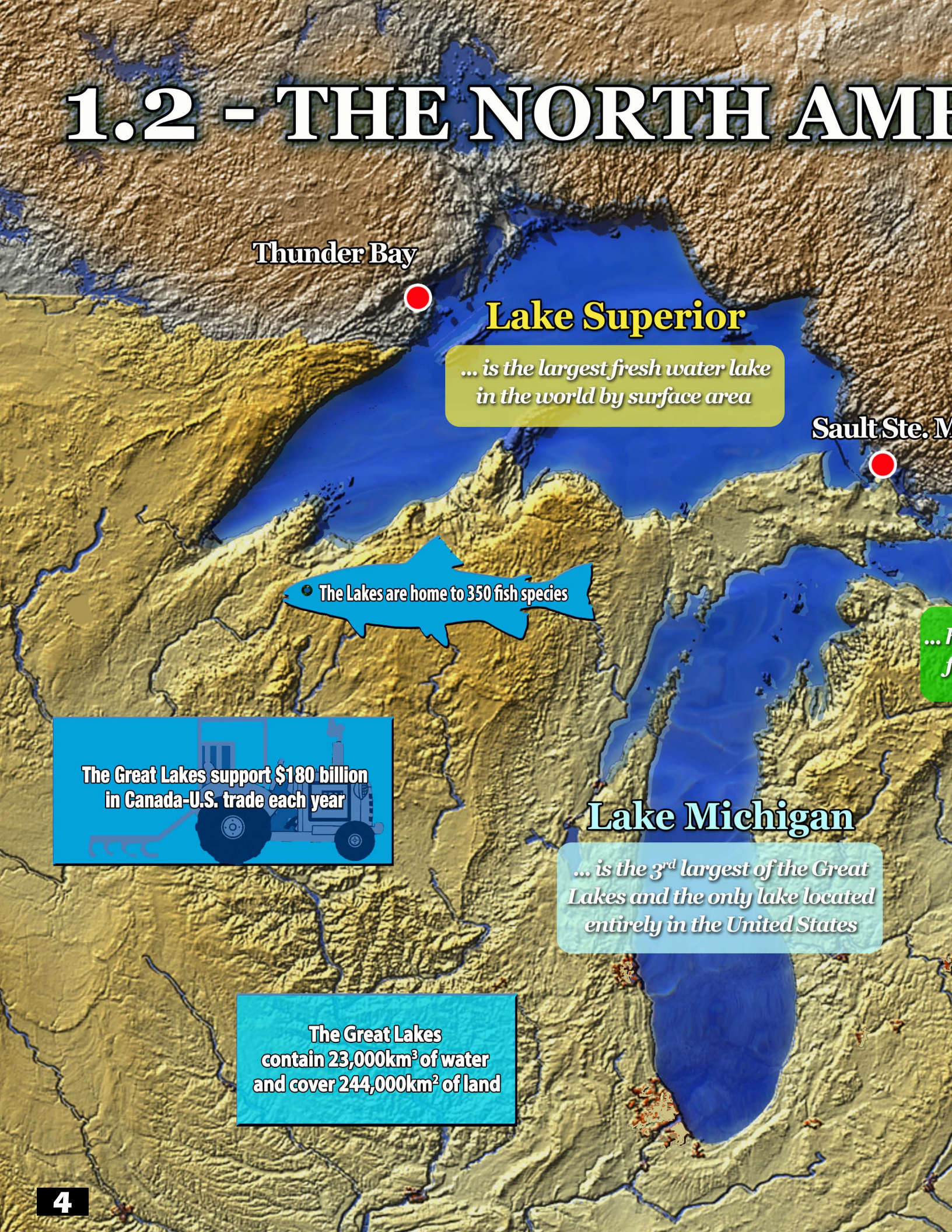
3. REFLECT

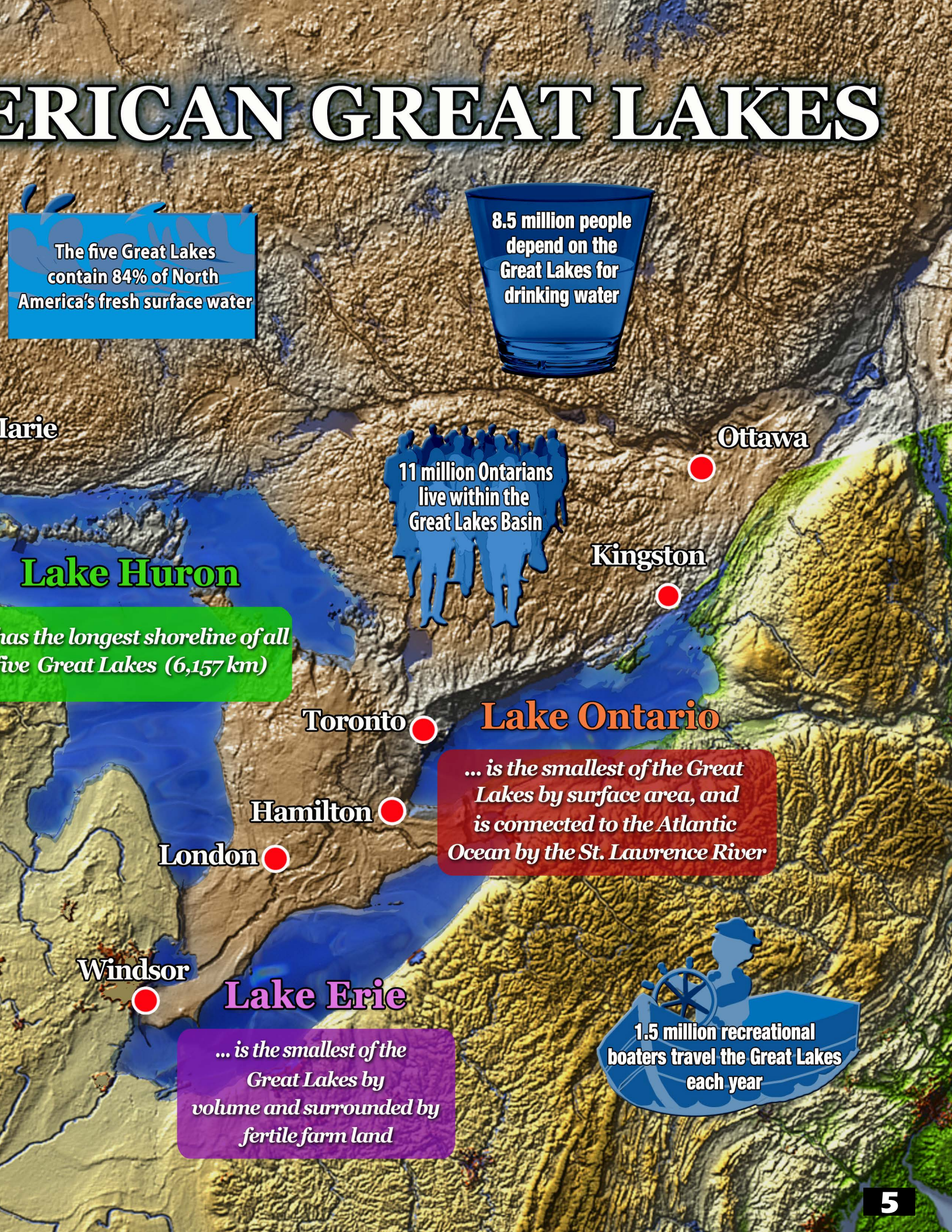
Continuing in your groups, discuss how accurate your initial answers were and whether you discovered any new or surprising findings.

4. APPLY

Assemble your initial answers and research findings for peer sharing. Your group will now present this information to the class.

1.2 - THE NORTH AME




ERICAN GREAT LAKES
The five Great Lakes contain 84% of North America's fresh surface water
8.5 million people depend on the Great Lakes for drinking water
Iarie
11 million Ontarians live within the Great Lakes Basin
Ottawa
Kingston
Lake Huron
has the longest shoreline of all five Great Lakes (6,157 km)
Toronto
Lake Ontario
... is the smallest of the Great Lakes by surface area, and is connected to the Atlantic Ocean by the St. Lawrence River
Hamilton
London
Windsor
Lake Erie
... is the smallest of the Great Lakes by volume and surrounded by fertile farm land
1.5 million recreational boaters travel the Great Lakes each year

1.3 - WHERE IS YOUR

A **watershed** (also called a 'drainage basin' or a 'catchment'), is an area of land that naturally absorbs water from rain or melting snow. The water accumulates, makes its way to the lowest point and joins another water body such as a lake, river, wetland or groundwater source.

There are three primary watersheds in Ontario:

1. **The Great Lakes - St. Lawrence**
2. **Southwestern Hudson Bay**
3. **Nelson River**

The Subwatersheds of the Great Lakes - St. Lawrence (Ontario Ministry of the Environment)

There are five subwatersheds that drain into the four Great Lakes which border Ontario. These five subwatersheds can be divided into even smaller watersheds such as the Moira River watershed in Belleville.

WATERSHED?

Ontario's watersheds play important roles in the local ecosystem by:

1. **Providing a natural reservoir for storing water.**
2. **Releasing excess water as runoff during times of heavy rain or melting snow.**
3. **Enabling beneficial chemical processes to take place (e.g. filtration and nutrient management by wetlands).**
4. **Providing habitat for various species including fish, birds, reptiles, insects and mammals.**

To maintain healthy and sustainable watersheds, Ontario Conservation Authorities ensure conservation, restoration and responsible management of water, land and natural habitats.

YOUR TURN . . .

1. FOCUS

In your groups, decide in which of the three primary watersheds you reside. Provide reasons to support your answer.

2. EXPLORE

You will now explore Ontario's watersheds in greater detail.

a. Using the Ministry of Natural Resources watershed map, determine whether you selected the correct primary watershed. Explain your reasoning.

b. Next, use the Conservation Ontario website to find your local Conservation Authority's website.

c. Using the resources available from your local Conservation Authority, determine in which subwatershed you reside. Describe its location and the specific roles it plays in your local ecosystem, for example: the location of the drainage basins, the water pathways, the wetland, lake, river or groundwater where this water flows.

3. REFLECT

In your groups, discuss your findings. Include three things that you have learned and three questions that you still have about your community's subwatershed.

4. APPLY

In your groups, create a map to show where your subwatershed is located. You will share your map and your reflection findings with the rest of the class. As an extension, conduct additional research to see if you can find answers to the three questions that you still have about your community's subwatershed. You may also wish to contact your local Conservation Authority to get more information.

References for Scenario 1

Conservation Ontario. (n.d.). FAQs. Retrieved from Conservation Ontario: http://www.conservation-ontario.on.ca/about-us/faqs

North Shore Visitor Guide. (2014, February 24). Lake Superior Fun Facts. Retrieved from http://www.lakesuperiordrive.com/lakesuperior/

Ontario Ministry of Natural Resources. (2013, July 9). Watersheds - Ontario Government, Ministry of Natural Resources. Retrieved from Ontario Government, Ministry of Natural Resources: http://www.mnr.gov.on.ca/en/Business/Water/2ColumnSubPage/STEL02_163599.html

The Canadian Encyclopedia . (n.d.). Lake Ontario. Retrieved from http://www.thecanadianencyclopedia.ca/en/article/lake-ontario/

U.S Environmental Protection Agency. (2012, July 5). Retrieved from U.S Environmental Protection Agency: http://www.epa.gov/greatlakes/facsheet.html

Wisconsin Department of Natural Resources. (n.d.). Lake Superior. Retrieved from Environmental Education for Kids: http://dnr.wi.gov/org/caer/ce/eek/nature/habitat/lakesuperior.htm

2.1 – HOW MUCH DO YOU KNOW ABOUT OUR H_2O?

Morning rituals often begin by rummaging through your clothes in search of what to wear - a pair of jeans, a t-shirt, or maybe 2,700 litres of water?

A leaking faucet that drips once per second adds up to around 8,000 litres of water per year.

That's right. It can take over 2,700 litres of water to produce that one cotton t-shirt that you are about to put on!

Almost 90 percent of the water we use isn't obvious; it's 'hidden' in the food, energy, and products we use daily.

The average Canadian consumes about 6,400 litres of water each day - enough water to fill 30 bathtubs, or up to 3 fire trucks!

DID YOU KNOW?

1. It takes more than 38 litres of water to produce one slice of bread.
2. Approximately 2,400 litres of water are used to produce a hamburger.
3. It takes more water to manufacture a new car (about 148,000 litres) than to fill an above ground swimming pool.
4. 3,785 litres of water are required to produce a 4L bag of milk.

Source: U.S. Environmental Protection Agency, 2013

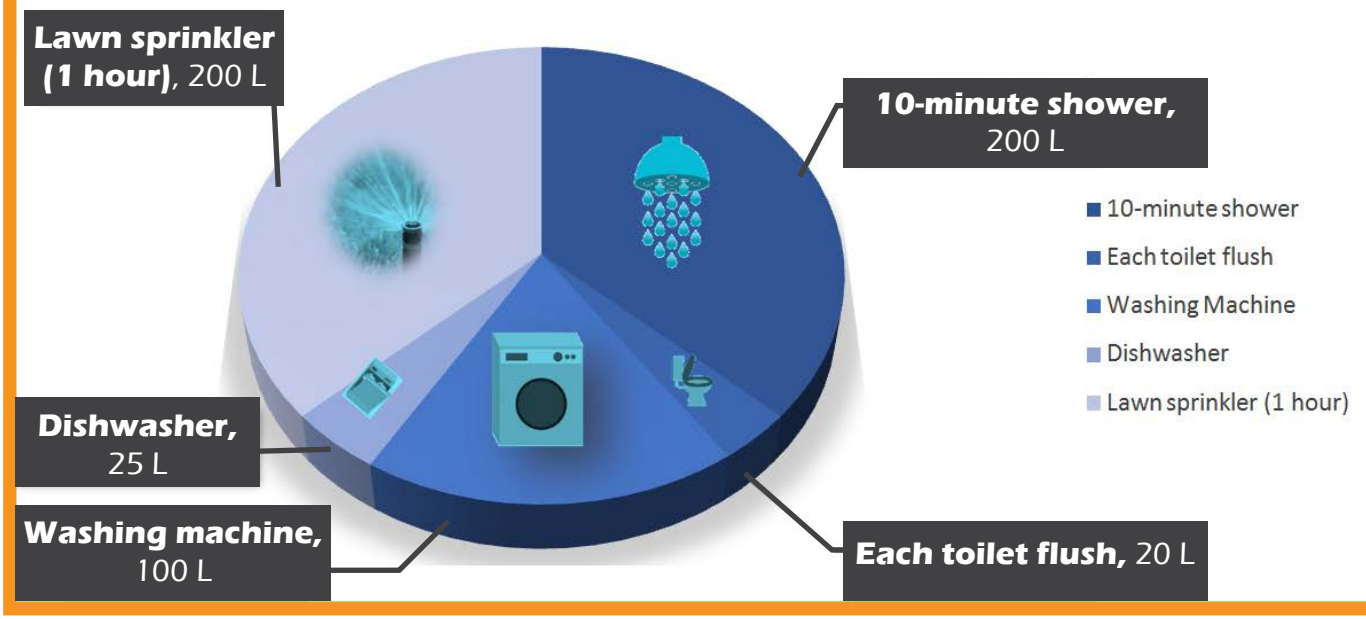
= **2 litres**

Here are some of the top water consuming activities in an average household:

- A ten minute shower uses up to 200 litres of water.
- For each toilet flush, we could use up to 20 litres of water (depending on the age of the toilet).
- Washing machines can use up to 100 litres of water per wash and dishwashers can use up to 25 litres of water per wash, regardless of how many items have been placed inside.
- Running a lawn sprinkler non-stop for one hour uses 200 litres of water and watering during the daytime results in 50% of that water evaporating into the air.

Some of our water use is **consumptive**. For example, the water we use for cooking and drinking is consumptive which means that it does not get returned to the water source after we use it. When water is returned to the source immediately after it used, such as to generate electricity at hydroelectric power stations, it is **non-consumptive**.

Top Water Consuming Activities in an Average Household



So How Does Canada Rank in Water Consumption?

The term **water footprint** refers to the amount of water used by an individual, group of people, business, or country. Canada's average water footprint is 2,333m^3 for one person a year, compared to the global average of 1,385m^3 a year per capita.

For a country with only 35 million people, Canada ranks second highest in terms of its water footprint among developed nations. Consider how you contribute to this statistic.

Global Water Footprint (Select Countries)

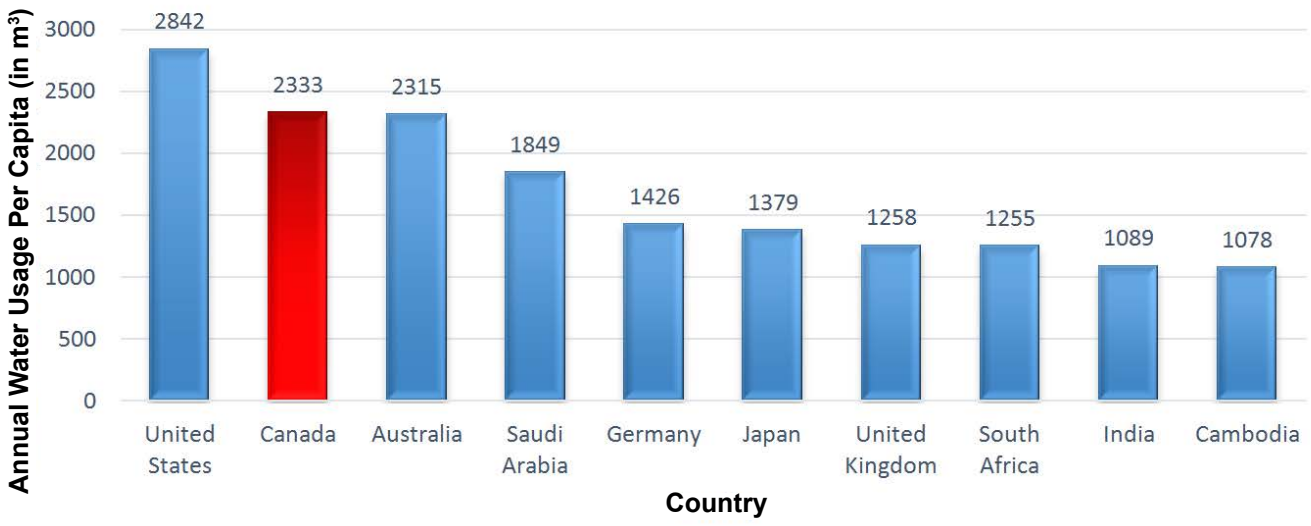


FIGURE IT OUT

1. **Describe the mathematical steps that you would take to convert cubic metres to litres.**
2. **For each of the countries shown on the graph, use the steps that you have created to convert their water footprints from cubic meters to litres.**
3. **Can you now describe the steps to convert litres back into cubic metres? Try it and explain how you can tell if your steps are correct.**

YOUR TURN . . .

1. FOCUS

Discover your water footprint. Take a look at how much water you use at home on an average day, week, month and year.

With examples, describe what, where, when and how this water is being used. How much of this water is for consumptive use? How much of it is for non-consumptive use? You may use the Water Footprint calculator to help you with your calculations.

2. EXPLORE

Select a country of your choice and research how much water the average individual or household in that country uses in a day, week, month and year.

With examples, describe what, where, when and how this water is being used. How much of this water is for consumptive use? How much of it is for non-consumptive use? You may use the Water Footprint database to help you with this task.

3. REFLECT

Compare and contrast your water footprint with your selected country's water footprint and the global average. Identify and consider any specific similarities and differences that you have noticed. Your teacher might ask you to use this list in a "Think, Pair, Share" activity.

4. APPLY

In a medium of your choice, create a well-defined action plan to reduce **your own** water footprint. In your action plan, you must also explain why it is important for Canadians to reduce their overall water footprint.

You will present **your footprint, your selected country's footprint** and **your action plan** to the class for further discussion.

To calculate your household water footprint, visit:
http://www.waterfootprint.org/?page=cal/WaterFootprintCalculator

To discover a country's water use per capita, visit:
http://www.waterfootprint.org/?page=cal/waterfootprintcalculator_national

References for Scenario 2

United States Environmental Protection Agency . (2013, December 16). Water Trivia Facts. Retrieved from United States Environmental Protection Agency : http://water.epa.gov/learn/kids/drinkingwater/water_trivia_facts.cfm

Water Footprint Network. (2014). Water Footprint. Retrieved from Water Foot print Network: http://www.waterfootprint.org/?page=cal/waterfootprintcalculator_national

3.1 – BLUEPRINTS FOR SUSTAINABILITY

When you turn on a faucet, flush the toilet or hop in the shower, do you ever wonder where this water comes from?

The Source of Our Water

Depending on where you live in Ontario, your water comes from groundwater, surface water or a combination of the two.

Surface water, as the name suggests, is water that is at the earth's surface. Examples include lakes, rivers, ponds and streams. Groundwater on the other hand is water located beneath the earth's surface and is often found in soil, or cracks in rocks known as **aquifers**.

Rural Well

In Ontario, some residents rely on surface water while others rely on water **wells** that are connected to an aquifer as their main source of fresh water. In larger cities and towns, especially those near the Great Lakes, the water supply often comes from a surface water source, including the Great Lakes.

DID YOU KNOW?

- 1 in 4 Canadians depend on groundwater to meet their daily needs.
- In PEI, the entire population of the island relies on groundwater.
- In New Brunswick and Yukon Territory, more than 60 percent of the residents depend on groundwater.
- Less than 3 percent of the water processed at a municipal water treatment plant is used for drinking purposes.
- An average of 14 percent of municipal piped water is lost to pipeline leaks.

For urban residents, water goes through a filtration or **chlorination** process to remove bacteria, viruses and other unwanted materials like dirt and debris before arriving at our homes.

Our Wastewater

In urban communities, any water that flows down our drains continues its journey through the sewer system, where it ends up at a **wastewater** treatment plant that removes contaminants from the water. The decontaminated water is then returned to the natural water system while leftover solid materials may be converted into fertilizer for agricultural use.

In rural communities, wastewater often ends up in a **septic tank**. From there, the liquids and solids are separated from one another. Bacteria help decompose organic matter in the water before it seeps back into the ground in an area called a **leaching bed**, where any remaining contaminants are removed through natural filtration by soil and gravel.

Wastewater

Ashbridges Bay Wastewater Treatment Plant, Toronto

Septic Tank System

Controlling the Flow: Stormwater Management

Stormwater Sewer

As you can see, the process of getting water to our homes and returning it back to its source can be quite complex. Luckily, there are many systems in place to help keep our water flowing. But what about the water that comes down as rain or from melting snow and ice?

Many cities and towns have a **stormwater** system that collects water from rain, snow and ice. This water is then treated and redirected to a surface water source, which helps prevent flooding in our communities.

Any remaining water that does not end up in a sewer and that is not absorbed by the ground will find its way as **runoff** to a nearby body of water, collecting any contaminants and debris along its path. In rural areas, the ground absorbs water from rain, snow and ice. Acting as a natural filter and a sponge, some water makes its way back to the natural system while some water is retained underground.

FIGURE IT OUT

Stormwater management is not perfect. A large rain storm can easily overwhelm a city's stormwater system and its other natural defences, causing major flooding.

1. **Conduct a web search on floods that have occurred in Ontario within the last five years.**
2. **Select one of these flood events and explain why the flood occurred. What measures have been implemented to prevent future floods?**
3. **What would you do in the event of a flood?**

Sustainability in the 21st Century

By now, you can see that water plays an important role in our lives and that sustainable communities require systems that utilize and manage water efficiently. This means finding creative solutions to problems such as stormwater management.

In the City of Toronto, developers are now required to include a green roof on commercial and condominium buildings, where plants, trees and shrubs are grown on the rooftop. Green roofs, which are examples of low impact development, help absorb water from rain, snow and ice, reducing the load on stormwater sewers and the risk of flooding. They also help keep buildings cooler in the summer by absorbing some of the sun's radiation.

Green roof on top of the MEC building in Toronto

Underground pipes carrying water for cooling

In the southern part of the city, a deep water cooling system uses a network of pipes to draw cold water from Lake Ontario to help cool downtown office buildings in the summer. Since this lake water can be as cold as 4°C, no additional air conditioning is required.

This engineering innovation means lower electricity use and a more sustainable city.

YOUR TURN . . .

1. FOCUS

Before starting any research, brainstorm where you think your water comes from and where it might be going when it leaves your house. Do the same for how you think stormwater is managed. Record your answer in a chart or mind map and briefly explain why you have made your answer.

2. EXPLORE

Using the web, determine whether your water comes from a surface water source or a ground water source. Compare and contrast your initial answers to how water arrives at your home, where it goes when it leaves your home and how stormwater is managed. Note the similarities and differences between your initial answers and your research. You will need to visit your community's website or the Ministry of Environment website to gather some of these facts.

3. REFLECT

Be prepared to discuss your findings with your peers. For example, were all, some or none of your initial answers correct? If so, which ones and why? What surprised you the most? Why?

4. APPLY

It's now your turn to take control of the flow. You have the option of designing and presenting, in a medium of your own choice, **ONE (1) of the following:**

a. A community in Ontario (real or fictitious) that is built (or modified) to utilize and manage water in a sustainable way. You must describe the flow of water into and out of buildings and how you plan on managing stormwater and runoff. You must also explain why you decided on this design and clearly state the features that enable water to be used and managed in a sustainable way.

b. A device or system that addresses a specific water management issue. For example, water filtration, bioremediation of wastewater, a state-of-the-art septic or wastewater treatment system, drip irrigation system, deep lake cooling, water recycling system, etc.

c. A new and effective flood protection plan that can be adopted by a specific community in Ontario.

No matter which option you pick, remember that you will need to base your designs on solid research. As long as your research is accurate, you can be as creative as you would like.

References for Scenario 3

Canada Mortgage and Housing Corporation. (n.d.). Research Highlights . Retrieved from Canada Mortgage and Housing Corporation: http://www.cmhc-schl.gc.ca/publications/en/rh-pr/tech/01-121-E.htm

Canadian Water Network. (2014, February 26). New Canadian Leadership Group to Strengthen Municipal Water Management. Retrieved from Canadian Water Network: http://www.cwn-rce.ca/news/meet-the-water-optimists-new-canadian-leadership-group-to-strengthen-municipal-water-management

CBC. (2013, July 9). Toronto floods leave power system 'hanging by a thread'. CBC. Retrieved from http://www.cbc.ca/news/canada/toronto/toronto-floods-leave-power-system-hanging-by-a-thread-1.1304807

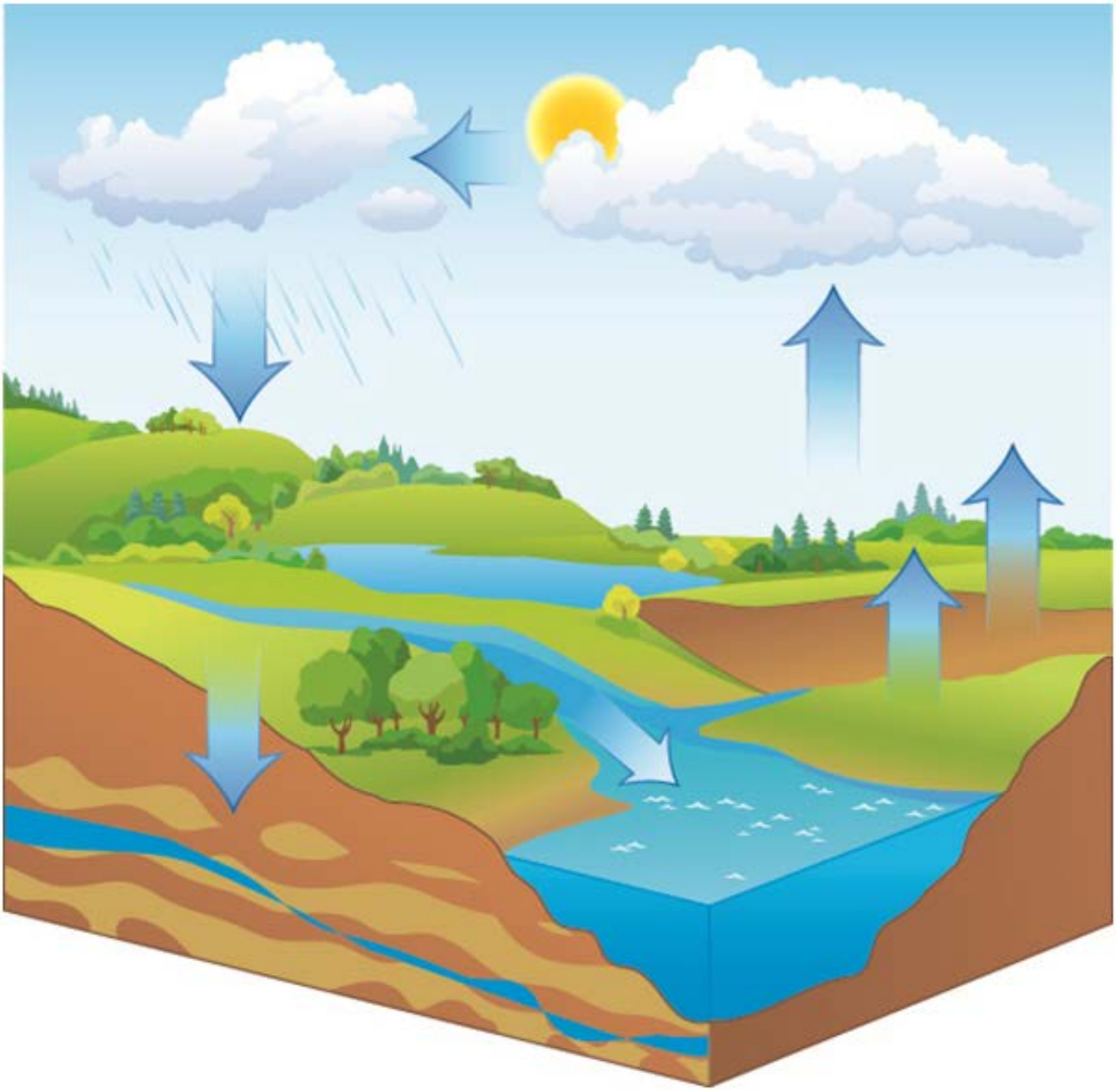
Environment Canada. (2013, December 11). Municipal Wastewater Treatment Indicator. Canada. Retrieved from https://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=2647AF7D-1

Pollution Probe. (n.d.). Sources of Drinking Water. Retrieved from Pollution Probe: http://www.pollutionprobe.org/report/chapter2_3.pdf

Powers, L. (2013). Urban flooding likely to worsen, say experts. CBC. Retrieved from http://www.cbc.ca/news/canada/urban-flooding-likely-to-worsen-say-experts-1.1324834

Statistics Canada. (11, December 2013). Section 3: The demand for water in Canada. Retrieved from Statistics Canada: http://www.statcan.gc.ca/pub/16-201-x/2010000/part-partie3-eng.htm

4.1 – THE WATER CYCLE



BEFORE YOU BEGIN . . .

1. FOCUS In your groups, and without conducting any research, brainstorm the steps of the water cycle.

2. EXPLORE Go online, explore and label each step of the water cycle on the above diagram.

3. REFLECT Discuss how you think the water cycle contributes to the flow of water coming into and out of the Great Lakes.

4. APPLY Be prepared to share your findings with the class.

4.2 – FROZEN OVER

Many of us check the weather before heading out to school. However, we often don't question why it will be warm, or cold, sunny or rainy. The Great Lakes play a significant role in shaping local weather conditions within the Great Lakes Basin.

During the 2013-2014 winter season, you may have noticed an influx of snow and ice, as well as cooler than normal temperatures. If you live near one of the Great Lakes, you may have witnessed how quickly they froze over.

During this season, ice cover over the Great Lakes was at its second highest level in recorded history, with 91 percent of the lakes' surface area covered by thick sheets of ice.

So why is ice cover over the Great Lakes an important phenomenon?

Great Lakes ice cover in February 2014 (NASA, 2014)

DID YOU KNOW?

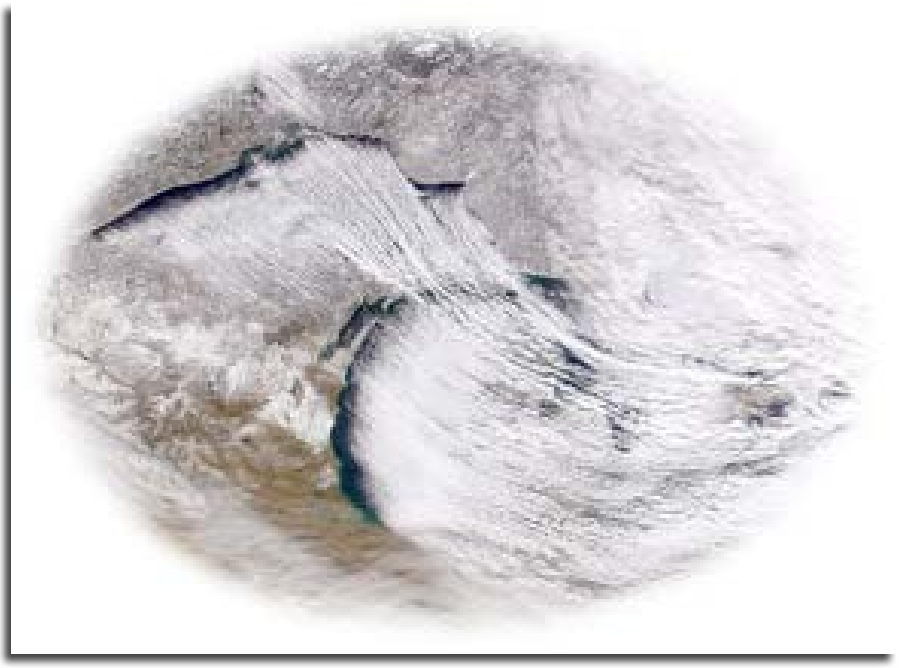
- 99 percent of water in the Great Lakes is from the melted water of ancient glaciers.
- 90 percent of Ontario's population lives within the Great Lakes Basin.
- In the winter, the energy absorbed by lake water is released into the atmosphere, and the air over the water is warmer than it is over the land.

Ice Cover on the Great Lakes

Beginning in the fall and continuing into the winter season, the intensity of the sun's rays decreases, resulting in cooler temperatures. Land and the air above it change temperature faster than the waters of the vast, deep Great Lakes. As a result, the Lakes remain warm in the early winter and ice is slow to form on the surface. When cold winter air passes over the warmer water, the air warms and gathers water vapour. This air will cool again as it passes back over land, changing the water vapour to snow.

The Effects of Climate Change

While weather changes occur daily, **climate** remains consistent long term. In other words, climate is a trend of what the average weather has been like over a period of at least 30 years. Reports indicate that climate change will significantly impact the Great Lakes, affecting water levels, ice cover, and daily weather for years to come.



Bands of lake-effect snow over the Great Lakes, as seen from space (NASA, 2014)

In Ontario, the average annual temperature has increased by 0.5°C over the last 100 years and temperatures may continue to increase by 2°C to 5°C in the next 50 to 75 years. The Great Lakes' shorelines and coastal ecosystems will also be affected by this climate change.

Marshland in Presqu'ile Provincial Park near Brighton, Ontario

For example, a one-metre drop in Lake Ontario's water levels will increase the size of the beach at Presqu'ile Provincial Park, which is located south of Brighton, Ontario. If water levels continue to decrease, the park's two islands will become joined together, placing one of the biggest water bird colonies in Ontario in jeopardy. At present, the water separating these islands acts as a natural barrier that protect the birds from predators such as skunks and racoons.

ICE COVER

NOAA – Ice Cover on the Great Lakes

http://www.glerl.noaa.gov/pubs/brochures/ice/ice.pdf

CLIMATE

Environment Canada – Historical Weather Data

http://climate.weather.gc.ca/

YOUR TURN...

1. FOCUS

In your group and without conducting any research, think back to the last three years.

- Discuss and record what you remember about the winter weather conditions in your community over these three years.
- For example, try to remember whether it was warm or cold, whether there was significant precipitation etc. Then do the same for the summer weather conditions. Take note of whether any patterns exist and prepare a conclusion that you will share with the class.

2. EXPLORE

It's now time to conduct a weather experiment.

- Review the National Oceanic and Atmospheric Administration's (NOAA) publication on Great Lakes ice cover. Record the maximum ice coverage for 10 years.
- Now select a community in Ontario other than your own. Make a prediction about whether you think there is a relationship between the amount of Great Lakes ice cover and the average spring and summer weather conditions (e.g. temperature and precipitation).
- Once you have a prediction, visit Environment Canada's Climate Data website to retrieve the weather data from April to September in your chosen community.
- For each of the years shown in the NOAA publication, calculate the **average** spring and summer temperatures.
- Then calculate the **average** precipitation in the spring and summer for those same years.
- Describe whether any patterns exist between winter ice cover and the average spring and summer temperatures.
- Describe whether any patterns exist between winter ice cover and average precipitation for those spring and summer months.

3. REFLECT

As a group, discuss your findings. For example, were all, some or none of your initial answers correct? If so, which ones and why? What surprised you the most? Why?

4. APPLY

Your group will now present this data and findings to the class.

- Using a table of values, create a well-labelled scatterplot with the ice cover data as your independent variable and temperature as your dependent variable.
- Now create a second well-labelled scatterplot with ice cover data as your independent variable and precipitation as your dependent variable.
- Develop a conclusion about whether there is any relationship between winter ice cover on the Great Lakes and the spring/summer weather conditions for your chosen community. Support your conclusion with an explanation.

EXTENSION

If you observed a relationship between winter ice cover and the weather conditions, test it to see if it holds true by monitoring the upcoming spring and summer season.

If no relationship exists, think about another community in Ontario that you would like to try this experiment on. Do you think the results will be the same or different? Explain and support your hypothesis.

References for Scenario 4

Bosher, J. (2010). Our Great Lakes. Alive. Retrieved from http://www.alive.com/articles/view/22658/our_great_lakes

Oguz, A. (2009). Will global warming cause a rise in sea level? Science Activities, 46(1), 17-20. Retrieved from http://search.proquest.com/docview/231102420

Perlman, Howard (2014). The Water Cycle. US. Geological Survey. Retrived from http://water.usgs.gov/edu/watercycle.html

Rosanne, W. F. (2005). A long walk to the water's edge. Science Activities, 42(2), 30-35. Retrieved from http://search.proquest.com/docview/231198935

Rosanne, W. F., & Victor, J. M. (2009). How is coastal temperature influenced by the Great Lakes and the ocean? Science Activities, 46(3), 20-26. Retrieved from http://search.proquest.com/docview/231203385

5.1 – TAKING CHARGE

As you are learning, our lives are interconnected with the water that surrounds us. The Great Lakes nurture our physical well-being and help sustain the vibrant ecosystem on which we depend. Without water, these life-sustaining systems would cease to exist.

Given the importance of our Great Lakes, many individuals and groups have taken the lead to preserve this fundamental resource. Explore some of these organization's initiatives and think about how you can become a **Great Lakes Steward**.

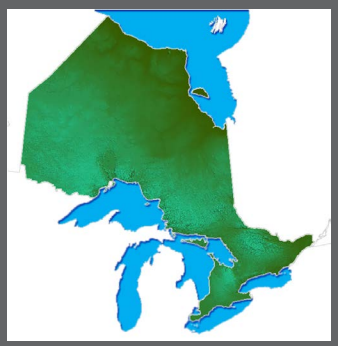
Sierra Club Ontario:

A grassroots association working toward environmental sustainability at national and international levels.

Their work in Ontario focuses on the Great Lakes ecosystem, the Greenbelt, and Green Energy.

1. Great Lakes from Space

2. Green energy graphic



3. Geography of Ontario

A major accomplishment was their leading role in the agreement of Great Lakes jurisdictions to stop the creation of new water pathways out of the basin.

Sierra Youth Coalition (SYC):

An extension of the Sierra Club, this program operates in 50 high schools and over 80 universities and colleges.

Youth run current campaigns geared toward creating a bottled-water free zone, and encouraging campuses to reduce their emissions, among other environmental initiatives.

OF THE GREAT LAKES

McMaster Initiative for Water (MI Water):

Creates awareness of our fresh water crisis.

The group planted vegetation on the third floor of their student centre for a green roof project that many cities in Toronto have adopted to solve issues of storm water influx.

In Hamilton's Keith neighbourhood, they were also successful in increasing the number of tree requests from three to seventy-five within a two-month period.

This active approach has been implemented in different campuses across Canada, such as at McMaster University in Hamilton, Ont.

While most of these initiatives work to raise awareness of water sustainability for environmental reasons, one group also examines the economic importance of water quality.

The Central Algoma Freshwater Coalition:

A not-for-profit organization that is dedicated to restoring watersheds throughout the central Algoma Region.

The Blue Economy Initiative:

Leads research and advocacy projects centred on water preservation by outlining water's value within Canadian economy, including:

- Value of water in food production
- Global water opportunities
- Development of wastewater management

A volunteer-run organization established in 2000, the Kawartha Lake Stewards are dedicated to improving water quality in the Kawartha Lakes.

Kawartha Lake Stewards Association:

They represent 40 cottager associations in Ontario and partner with three levels of government, as well as local businesses. They test for various environmental concerns affecting the lakes such as algae and phosphorous, invasive species, and the management of aquatic plants.

Kawartha Lakes Map
(Courtesy of creativecommons)

You can do your part in helping reduce stormwater pollution by joining the Yellow Fish Road.

Yellow Fish storm drain painting
(Courtesy of creativecommons)

YELLOW FISH ROAD:

This program calls attention to the fact that storm drains are pathways to larger bodies of water including rivers, lakes, and streams.

This can be detrimental to aquatic species who are exposed to the untreated water.

Yellow paint is used to draw a fish near storm drains to remind people that the water going down the drain will eventually end up in natural water bodies.

People who participate in the program learn about their water supply and how they can protect it from chemicals.

To inform residents of what the symbol of a yellow fish means, volunteers distribute brochures and pamphlets to explain this cause.

YOUR TURN . . .

1. FOCUS

As a class, brainstorm a list of organizations and government agencies that currently exist to protect bodies of water or help to increase awareness about managing and utilizing water effectively. These organizations or agencies should be local.

2. EXPLORE

In your groups, select one of these organizations and conduct a web search to find out their vision, mission and values. In addition, review some of their existing initiatives and determine how successful they have been in achieving their objectives.

3. REFLECT

Discuss your findings with your peers. For example, explain why you think they were successful or unsuccessful in achieving their stated objectives. Would you consider participating or supporting their initiatives? Why or why not? If you were a member of this organization, what is the next initiative that you would recommend? Why?

4. APPLY

It's now your turn to become a Great Lakes Steward and to take charge of our Great Lakes. In your groups, choose **one (1)** of the following activities for your summative activity:

i. Visit a body of water connected to the Great Lakes, or the Great Lakes themselves, and conduct a habitat assessment. Remember to follow the safety rules that are posted in your science classroom! You will evaluate the water's ability to support life (e.g. fish, mussels and other aquatic species). Form conclusions about the health of that water body by discussing the chemical, physical and biological characteristics of the water body. Provide recommendations on how you might solve any issues that you have discovered.

ii. Select a local water issue of your choice and have it approved by your teacher. This issue could be a current issue or a hypothetical issue. For example, you may want to research how an oil spill might affect the Great Lakes or what would happen if the water levels were to decrease significantly. Be creative, yet scientific. Use the scientific method to help you with this task.

iii. Conduct a simplified environmental assessment of the proposed Island Airport expansion in Toronto. Provide pros and cons and final recommendations. Justify your recommendations with specific examples.

iv. Create an action plan to address nutrient loading and its contributions to algal blooms in the Great Lakes.

v. Explore the three different types of well water systems that are used in Ontario. Compare and contrast each type, select one that you would recommend to a new home/cottage owner in the Community of _____, explain why and construct a digital or physical model.

Regardless of which option you pick, you will present your work in a medium of your choice (e.g. a report, poster, video, social media campaign etc.). Be creative!

References for Scenario 5

Kawartha Lake Stewards Association. (n.d.). Kawartha Lake Stewards Association. Retrieved from Kawartha Lake Stewards Association: http://klsa.wordpress.com/

McMaster Initiative for Water. (2012, September 9). Home. Retrieved from McMaster Initiative for Water: http://miwater.webs.com/

Sierra Club Ontario. (n.d.). About Us | Ontario Chapter. Retrieved from Sierra Club Ontario: http://ontario.sierraclub.ca/en/about-us

The Blue Economy Initiative. (n.d.). The Blue Economy Initiative. Retrieved from Guiding Framework: http://www.blue-economy.ca/about/guiding-framework

The Central Algoma Freshwater Coalition. (n.d.). Central Algoma Freshwater Coalition. Retrieved from Central Algoma Freshwater Coalition: http://www.centralalgomafreshwatercoalition.ca/

Yellow Fish Road. (n.d.). Yellow Fish Road. Retrieved from About: http://www.yellowfishroad.org/index.asp?p=2037

Check out these websites for more useful information

Conservation Ontario, Watersheds 101.
http://www.watersheds101.ca/learn-about-watersheds/what-is-a-watershed

WWF Canada, Your Water Footprint.
http://www.wwf.ca/conservation/freshwater/waterfootprint/

Environment Canada, Groundwater.
https://www.ec.gc.ca/eau-water/default.asp?lang=En&n=300688DC-1#sub2

US Geological Survey, Groundwater: Wells.
http://water.usgs.gov/edu/earthgwwells.html

City of Toronto, Wastewater.
http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=8d3cfe4eda8ae310VgnVCM10000071d60f89RCRD

Ottawa Septic System Office. Septic Smart – Understanding Your Homes Septic Systems.
http://www.rvca.ca/osso/things_to_know/septic_information.html

GLOSSARY

Aquifer: An underground formation of permeable rock or loose material which can produce useful quantities of water when tapped by a well. (Environment Canada)
Climate: Average atmospheric conditions over long periods of time. (NASA)
Consumptive water use refers to water that is removed from an immediate water environment. Examples include, evaporation, agriculture, human consumption. (USGS)
Leaching bed: After passing through a septic tank wastewater ends up here, flowing through perforated pipes into surrounding sand/soil. Bacteria break down remaining materials and the soil acts as a physical filter to complete water filtration process. (Ottawa Septic System Office)
Non-consumptive water use refers to water that is used or withdrawn and remains in the same location/returns to the same water system. Examples include hydroelectric power generation, recreational boating. (Colorado State University)
Precipitation: When water falls from saturated clouds as rain, snow or hail. (Environment Canada)
Runoff: Similar to stormwater, runoff is excessive rain or snowmelt is not absorbed by the soil. The excess water flows over saturated land into creeks and ditches and is visible as creeks and rivers swell from the excess water influx. (Environment Canada)
Septic tank: An underground tank which collects household wastewater. The tank allows solids and liquid materials to separate and other particles to filter out of the water before it enters the leaching bed. (Ottawa Septic System Office)
Stormwater: Water from rain and melted snow that is not absorbed by the ground. This water flows over natural and man-made surfaces directly into a water body, or is collected by a storm sewer and discharged into a natural area. (City of Pickering)
Wastewater: The mixture of liquid and solid materials emptied down the sinks, drains and toilets of residences and businesses. (City of Toronto)
Water footprint: The volume of water used in daily life – includes drinking water, water for personal hygiene, water used to produce food, clothing and other goods and services. (WWF Canada)
Watershed: - An area of land that catches rain and snow and drains/seeps into a marsh, stream, river, lake or ground water source. (Conservation Ontario)
Well: A cylindrical hole in the ground, deep enough to reach the water table. (USGS)

What does it mean?

Use the space below to rewrite the definitions in your own words. Grab an extra sheet of paper for more writing space!

toronto zoo