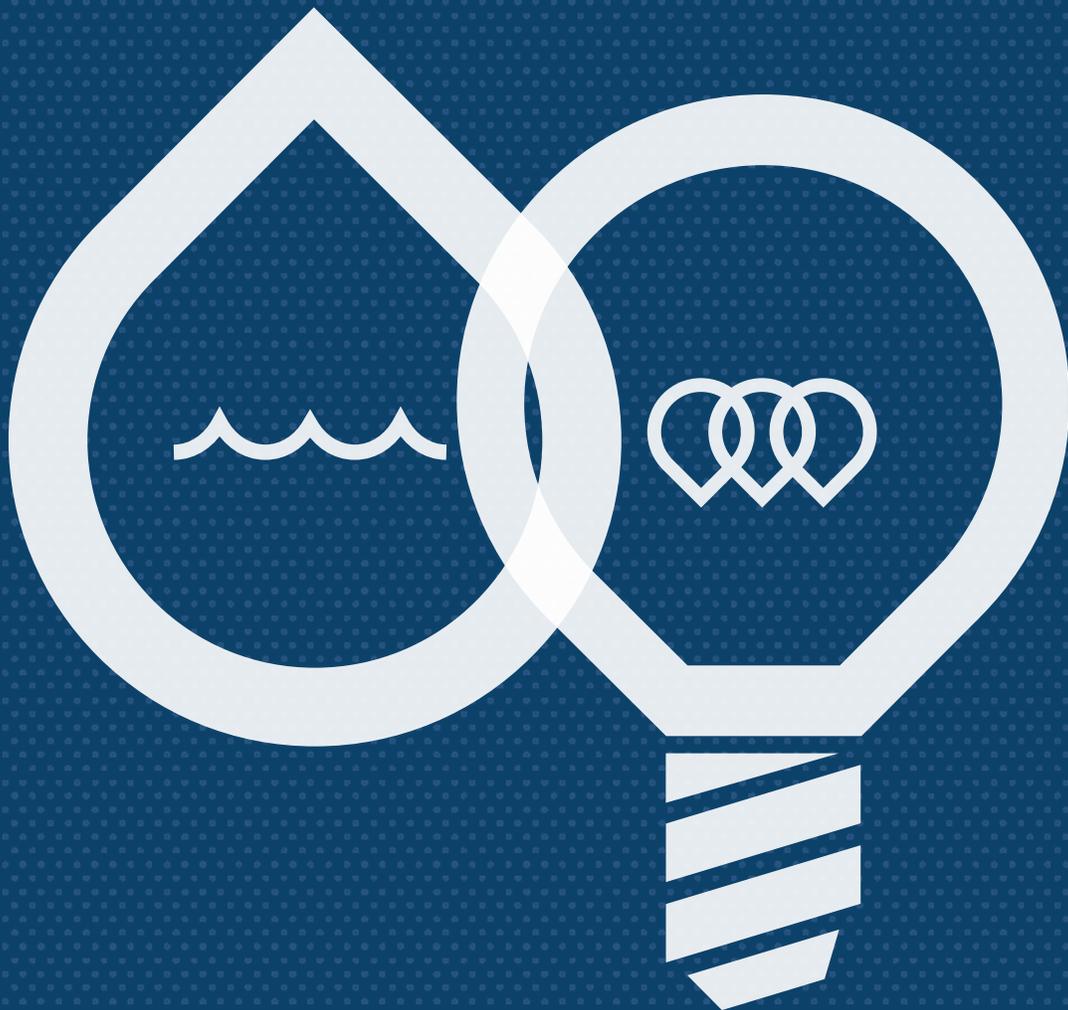


What's your

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The Collaborators are:

- Canadian Fertilizer Institute
- Ducks Unlimited
- East Interlake Conservation District
- FortWhyte Alive
- Green Manitoba
- International Institute for Sustainable Development
- Keystone Agricultural Producers
- Lake Winnipeg Foundation
- Lake Friendly
- Manitoba Museum
- Manitoba Conservation Districts Association
- Nutrients for Life
- Oak Hammock Marsh Interpretive Centre
- Province of Manitoba, Conservation and Stewardship
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- Red River Basin Commission
- Rivers West

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- Penny Ross
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- Taylor Yusishen

The Sponsors are:



What's it all about?



What is the Lake Friendly Accord?

The Lake Friendly Accord and Stewards Alliance, and partnerships and initiatives between the Manitoba government and other jurisdictions, will leverage more than \$1 billion to better co-ordinate efforts to improve all waterways in the Lake Winnipeg basin. The majority of funding is dedicated to reducing nutrient pollution from waste water.

As Manitobans we have a special connection to water. From our lakes and rivers to our streams and wetlands; water not only defines our landscape but who we are. The Lake Winnipeg watershed is an area of approximately 1,000,000 square kilometres encompassing parts of four Canadian provinces and four U.S. states. Water within this watershed eventually drains into Lake Winnipeg, Manitoba's largest lake and the tenth largest freshwater lake in the world, on its way to Hudson Bay.

Lake Winnipeg is a valuable resource for our region providing ecological, social and economic benefits, as well as offering unique recreational opportunities. The benefits we enjoy from Lake Winnipeg depend on its water quality. As Manitobans, we depend on clean water to drink, clean water in which to swim and clean water for food production.

Unfortunately, many of our activities can have a negative effect on our water quality. While some water quality problems originate from natural sources, human activities affect both the quality and quantity of our water. If we want to protect our water quality, Manitobans of all ages must learn that we are all part of our watershed, and we all have an important role to play in ensuring we have fresh clean water for generations to come.

Building on the objectives of the *Lake Friendly Accord*, the H2OIQ resource is designed to provide educators with user-friendly information, tools and resources to fully explore issues related to water and the Lake Winnipeg watershed, while meeting curriculum objectives. The workbook is adaptable for any freshwater lake, as the issues surrounding lake health are not exclusive to Lake Winnipeg. If we truly want to protect the Lake Winnipeg watershed, we must encourage our children to learn, understand and appreciate the wonders and the vulnerability of watersheds in general. We encourage you to use, modify and adapt the resources to fit the needs of your community.

The organizations in support of this workbook are committed to working together with educators and students to provide easily accessible and locally relevant, engaging and memorable information and activities. The goal of this collaborative effort is to focus on the importance of the Lake Winnipeg watershed and provide an opportunity to connect to our most precious resource that way we can all do our part in protecting water quality globally.

We Believe...

Water is our most precious resource

Water is vital to life. Manitoba has an abundance of water and it plays an important role in our daily lives yet often, water may be taken for granted. With less than 1% of the water on earth available for drinking water, it is imperative that the water we have is treated with the utmost care.

We are all connected to our water

The more we recognize, understand and reinforce our connection to water, the more we will feel compelled to protect it.

We can all live within our limits

Everything we do has an impact on water. We cannot create a bigger planet to accommodate our growing population or water demands. As water is a finite resource, we must begin to live within the limits of nature and make the appropriate changes to both the perception of water and water uses.

Personal Decisions + Collective Action = Change

We all play a part in making change. Small changes in our everyday actions and choices can have a profound impact on water. It is important to take collective action when tackling watershed issues. Joining together to achieve a common goal can be a powerful force for change.



Personal Decisions + Collective Action = Change

How This Book Works

There are activities available, related to each section of the book. They have been separated and identified for different audiences:

Build Awareness

Represented by a cluster of unhatched frog eggs.



Build Awareness

These activities help students:

- build an understanding of the importance of clean air and water for all living things.
- recognize that clean water is becoming increasingly scarce.
- recognize our own personal water usage and connection to water pollution.
- recognize we are all part of a watershed no matter where we live.
- recognize that access to clean water is a basic human right around the world, and that water plays a significant role in cultural groups, including First Nation peoples.

Increase Your Understanding

Represented by a tadpole.



Increase Your Understanding

These activities help students:

- identify contributing factors to declining water quality.
- identify substances that may pollute water, related environmental, economic and societal impacts of pollution, and ways to reduce or eliminate effects of pollution.
- identify the various natural processes and human activities that affect our water and environment.
- describe examples of the consequences of human actions on our water.

Get Connected

Represented by a frog.



Get Connected

These activities help students:

- understand the cycles that affect our water and our environment.
- investigate the social, economic and environmental impact of sustainability.
- discuss potential consequences of, and ways to, address water quality worldwide.
- discuss actions by all to protect and preserve our water.
- explain the effects of nutrients on our water.



Water and Our Environment



Summary:

In Chapter One, students will gain an understanding of what a watershed is, what watershed they live in, and why watersheds are important. To help students connect with water, it is important to foster a relationship with their watershed. Learning the fundamentals about watersheds sets the stage for students to feel engaged with their local community and part of the solution.



Guiding Questions:

- What is my watershed? Who and what shares my watershed?
- How does water travel through the watershed?
- What is the health of our watershed?
- How is water used?
- Why are wetlands important?

What's the Point?

In this lesson, students will identify:

- the watershed in which they live.
- that watersheds are home to a wide variety of plant and animal species and are necessary to maintain biodiversity.
- that all life forms require water for survival.
- the earth's watercycle; there is always the same amount of water on the earth.
- the ability of water to carry substances.
- natural and human processes affecting the health of the watershed.

In this lesson, students gain:

- the ability to identify, describe, and outline watersheds.
- an understanding of where our water comes from and where it goes.
- an understanding of why watersheds are important.
- an understanding that all life forms require water for survival.

This lesson leads to an appreciation of:

- the need for water conservation and watershed stewardship.
- the ways the natural environment shapes our daily lives.
- the importance of wetlands.
- our dependence on water for survival.

1.1 The Lake Winnipeg Watershed



Lake Winnipeg is a large shallow lake that contains less water than many other large lakes. On average, Lake Winnipeg is only 12 metres deep with its deepest point at 36 metres.

What is a watershed?

No matter where you live, work or play you are in a watershed. A watershed is an area of land to which all the water on the surface or under the ground flows, such as a river, lake or ocean.

Watersheds can be characterized by the contours of the landscape, the vegetation covering the land, soil and rock formations, and the prevailing patterns of climate in the region and drainage patterns to a water body; they are not defined by municipal, provincial, or federal boundaries but by natural boundaries.

All the water that falls to the ground as either rain or snow moves across the landscape. It flows from higher points to lower points. As it flows downward it fills, creeks and streams until it eventually reaches lakes on its final journey to the ocean.

Imagine that your bathtub or large wash basin is a watershed and the drain in the basin is a river. All the water that falls inside the tub will eventually go down the drain. Like the water in our bath tubs, the water that leaves the tub has other things with it like dirt and soap. Water flowing to our lakes also carries with it things it has picked up along the way.

What watershed are we in?

Watersheds can vary in size, depending on one's perspective, from a backyard area to the huge Lake Winnipeg watershed. We all live in a watershed (actually many nested watersheds) and most of Manitoba is in the Lake Winnipeg watershed, the second largest watershed in Canada! The Lake Winnipeg watershed is so huge it includes parts of four provinces and four U.S. states and is nearly one million square kilometres. The Lake Winnipeg watershed is home to more than 6.5 million people. The boundaries of the Lake Winnipeg watershed are: west to the Rockies, south to Minnesota and South Dakota, and east to the shores of Lake Superior.

Lake Winnipeg was formed about 12,000 years ago when the most recent glacier began to melt and pool in an area between the low-relief Interior Plains and the south-western Canadian Shield. Lake Winnipeg is a large shallow lake that contains less water than many other large lakes. On average, Lake Winnipeg is only 12 metres deep with its deepest point at 36 metres.

Compared to other lakes, water passes through Lake Winnipeg very quickly, at an average of three to five years. This is relatively fast compared to other large lakes, such as Lake Superior, where the water residence, or time it takes for water exchange, is 191 years. Because of the relatively short water exchange time, improvements we make in the Lake Winnipeg watershed will be seen fairly quickly.

In our watershed, all the water that flows over the land, or under the ground, including water that comes from the glaciers in the Rocky Mountains, flows into Lake Winnipeg on its way to Hudson Bay and out to the ocean.



Why are watersheds important?

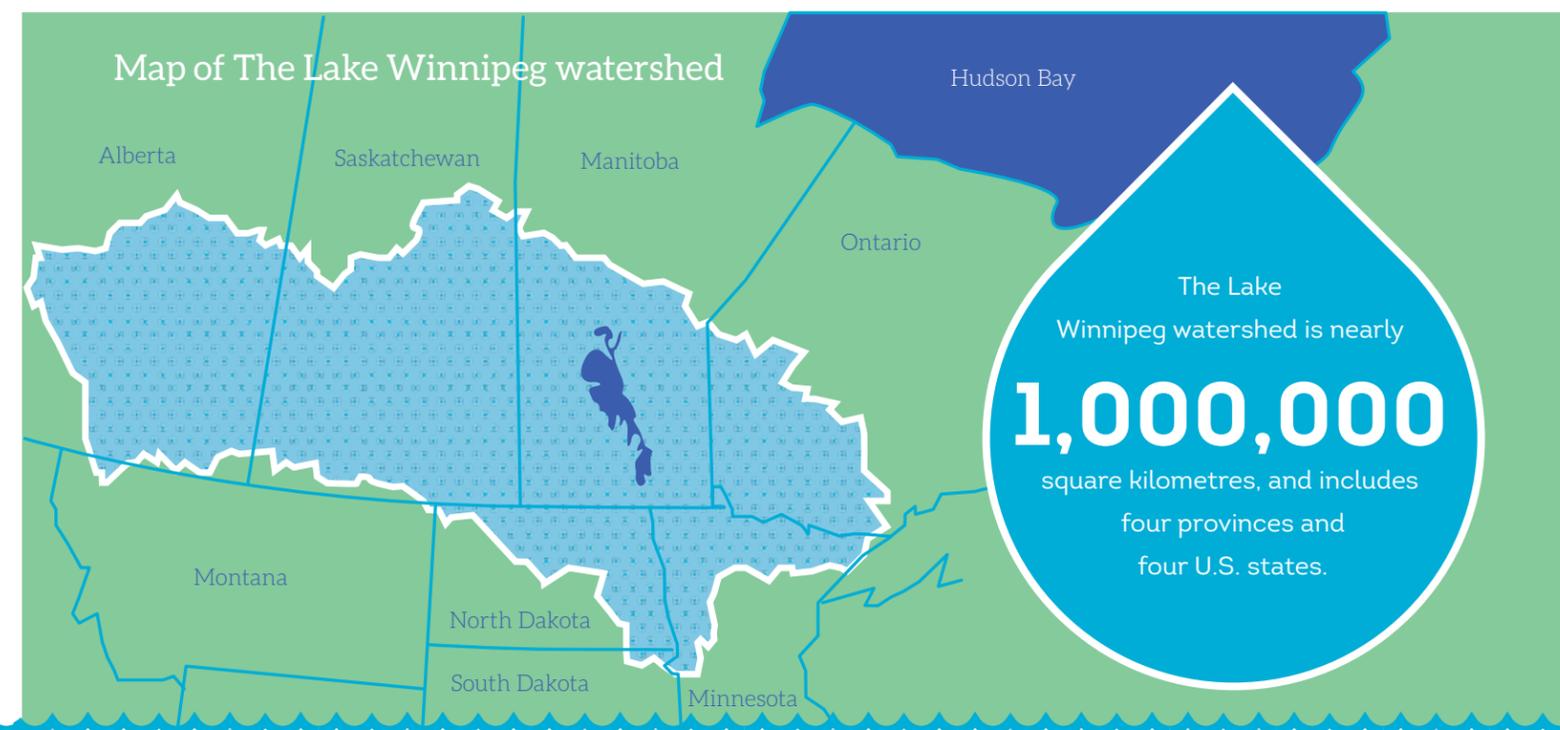
As watersheds are the source of all the water we use they are vital to the circle of life. As water enters the watershed as rain or snowmelt, it soaks into the ground replenishing underground water sources and gathering in wetlands, ponds, and creeks that feed larger streams and rivers. Watersheds provide us with water for drinking, habitat for people and wildlife to live in, soil in which to grow our food, and the streams, rivers, and lakes we use for fishing, boating, swimming, and water skiing.

A healthy watershed acts like a sponge, absorbing, storing, filtering and slowly releasing water back to the landscape. We all share the benefits of having a healthy watershed.

Why are wetlands important?

Wetlands play a critical role in the protection of our water. Wetlands store, clean, filter, and release water. Wetlands also mitigate floods, provide habitat, and provide food and opportunities for the bioeconomy.

From an Indigenous perspective, watersheds are vital to the circle of life. When we speak of the circle, we say it often represents renewal, interconnectedness, and equality. The circle is continuous; everyone and everything is connected within it and we are all the same.



Fast Facts

- The Lake Winnipeg watershed or drainage basin is about 40 times larger than the surface area of Lake Winnipeg, making it one of the largest watersheds in the world.
- The Lake Winnipeg watershed is the second largest watershed in Canada.
- The average annual precipitation in Manitoba ranges from 400 millimetres in northern Manitoba to 600 millimetres in the southeastern corner.
- Winter snowfall serves as water storage, when the snow melts in the spring, Manitoba's rivers and streams carry large amounts of water that serve as important spawning grounds for fish.
- The word for Lake Winnipeg in Cree is "Winnipi," which means muddy, dirty water.
- Indigenous peoples of Canada include the First Nations, Métis and Inuit.

Here are a few examples of activities related to the Lake Winnipeg watershed



1. How Does Water Flow?

This simple and useful activity involves taking sheets of aluminum foil and having students make "hills" and then spraying the bumpy surface with coloured water to see where the water flows.



2. Caring for our Watersheds

This activity is a high school competition open to grades 7 - 12 where students are asked to write a 1,000 word proposal on how they can help their watershed. There is significant funding available for the top proposals as well as project implementation.



3. Delineating a Watershed

Using contour maps and acetate sheets, students connect areas of highest elevation to determine the area's watershed boundaries and flow patterns.

You can get more resources at LakeFriendly.ca



Resources 1.1

1. Watershed graphics from Conservation Ontario are useful visual diagrams. conservationontario.ca
2. Lake Winnipeg Research Consortium. lakewinnipegresearch.org
3. The Watershed Observer is a publication of the Lake Winnipeg Foundation sharing news on the Lake Winnipeg watershed. lakewinnipegfoundation.org
4. Managing the Water's Edge - Riparian Assessment is a field guide describing the riparian health assessment of Manitoba. thinktrees.org
5. Watershed Dynamics by Cornell Scientific Inquiry Series NSTA Press provides practical resources to extend students' investigations into local water quality and land-use issues. The book is available for purchase. nsta.org
6. The Manitoba Water Protection Handbook. This handbook is intended for Manitobans living and working in urban and rural areas with an interest in keeping our waters clean. gov.mb.ca
7. Project Wet – Programs for Educators at Oak Hammock Marsh Interpretive Center. oakhammockmarsh.ca

1.2 Who Shares My Watershed?

Our watershed is shared with four provinces and four U.S. states. Inter-provincial and international activities and practices affect Lake Winnipeg.



What is Biodiversity?

The diversity of all life on earth and the ecosystems that sustain them.

Who lives in my watershed?

Our watershed neighbours include all of the people who live and work in the watershed area as well as all of the plants, organisms and domestic and wild animals that call this area home. All life depends upon water and water is essential to maintain life and biodiversity in our watershed. A healthy watershed encourages “biodiversity”, or the variety of living things and the ecosystems that sustain them. Maintaining biodiversity is necessary to sustain a healthy ecosystem.

We share our watershed with our neighbours to the south, east and west.

Our watershed is shared with four American states, as well as three Canadian provinces. Activities in all these provinces and states affect Lake Winnipeg, which adds complexity to implementing policy and programs to reduce pollution to lakes and rivers. The highest percentage of phosphorus to Lake Winnipeg comes from the Red River, with about half originating in the U.S. and half from Manitoba. That means that Manitoba must lead by example, and work with our neighbours to reduce nutrient (nitrogen and phosphorus) loading.

How is water used in my watershed?

Water is a constant in our daily lives. We need it to drink, cook and clean. We need it for waste disposal, fire protection, watering our lawns and gardens and washing our cars. We also need water to grow our food. Farmers use water for watering crops and feeding livestock.

Animals that live on farms, wild animals, birds and pets all need clean water to drink. Studies have shown that cattle that have access to clean water are healthy and gain more weight. Fish and organisms that live in Lake Winnipeg and all the other lakes and rivers in Manitoba also need clean water for survival. Water is used in many ways that you would never expect. The amount of water used to make a product is called “virtual water.” For example: it takes 2,400 litres of water to make one (150g) hamburger; one (250g) cotton t-shirt uses 2,700 litres and one pair of leather shoes uses 8,000 litres. From making automobile tires to hamburgers, water is essential in almost every item we use.

Fast Facts

- Manitoba has 900 trillion litres of surface water which covers approximately 16% of the province.
- More than 70% of the flow in our streams originates outside of Manitoba.
- Manitoba is the only province in Canada where all water in the rivers eventually flows north.
- It takes 3 litres of water for a cow to produce 1 litre of milk.
- 70% of all phosphorus enters Lake Winnipeg via the Red River.
- Rapid decline in biodiversity has an impact on the planet’s environmental health.

Here are a few examples of activities related to “Who shares my watershed”



1. All Critters Big and Small

Ask students to list all mammals, amphibians, birds and insects that rely on water from the Lake Winnipeg Basin. Then have the students share their list with peers in the class.



2. Rainy Day Hike - Project WET

Students are introduced to urban watershed concepts and stormwater issues through an investigation of school buildings and grounds.



3. Color Me a Watershed - Project WET

Through interpretation of maps, students observe how development can affect a watershed.

You can get more resources at LakeFriendly.ca

70%
of all phosphorus
enters Lake Winnipeg
via the Red River.



Resources 1.2

1. Watershed maps can be used to illustrate how watersheds are formed.
gov.mb.ca/sd/water/watershed/cd/index.html
caringforourwatersheds.com/canada/manitoba/watershed-information/
2. USDA Watershed Learning Animation Video "What's a watershed? And why does it matter?" illustrates the importance of watersheds.
youtube.com

1.3 The Movement of Water through the Lake Winnipeg watershed



The pipes distributing drinking water for the City of Winnipeg originate in Ontario and travel over 156 kilometres to bring drinking water into the city!

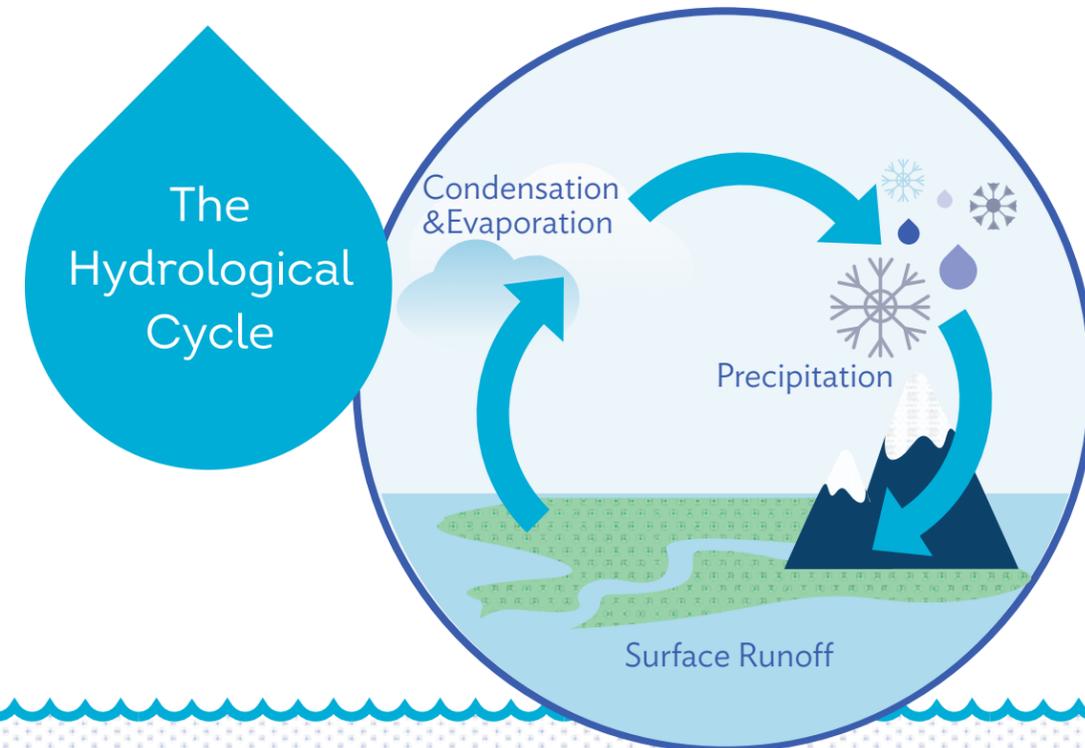
What is the water cycle?

Take a good long look at the water in the glass next to you. Can you guess how old it is? Although the water in your glass may have fallen from the sky as rain just last week, the water itself has been around for as long as the earth has. When the first fish crawled out of the ocean onto the land, your glass of water was part of that ocean. When the apatosaurus walked through lakes feeding on plants, your glass of water was part of those lakes. When knights and squires took a drink from their wells, your glass of water was part of those wells. The earth has a limited amount of water and that water keeps going around and around in what we call the water cycle.

How does water move in the natural environment?

As rain falls, some of the water soaks into the soil and into the ground. The water in the soil is absorbed by plants and the water in the ground becomes groundwater. Groundwater is water found in spaces between soil or rock particles below the surface. Some water moves downhill as runoff, eventually finding its way into larger bodies of water such as rivers, lakes and oceans, becoming surface water. Watersheds are defined as the land area from which surface runoff drains into a stream, channel, lake, reservoir or other body of water.

Water also evaporates into the atmosphere where it can cool, condense and fall to the ground as precipitation again. Water changes its state and location in the water cycle, but remains constant in quantity on earth.





What is non-point source pollution

Non-point source describes pollution that enters from multiple sources across urban and agricultural lands.

How does water move in human created environments?

Our everyday activities can greatly impact the environment. Cities and towns have many people and businesses that all need water. Water going into and out of your house must be carefully handled and properly treated in order to keep the water healthy. Basic needs for drinking water and waste management must be addressed.

We use a system of pipes that are buried under lawns and roads in our communities to move water. These pipes distribute drinking water and collect waste water from homes, businesses, and industries. The pipes distributing drinking water for the City of Winnipeg, for example, originate from Shoal Lake, Ontario, and travel over 156 kilometres to bring drinking water into the city! Other communities may transport their water from more local surface water or underground sources and may store the water in big water towers or in water reservoirs. In cities, waste water is transported away from homes through a system of pipes carrying it to a treatment facility. In more rural and cottage areas, many people use septic fields or holding tanks for household waste water.

Because cities and towns have many hard surfaces such as roads and buildings, water must also be channelled appropriately when rain or other precipitation falls. Storm drains are used to collect and move this water to retention ponds or often directly to streams and rivers without any form of treatment.

How do rural communities access drinking water and how is their household waste treated?

When we look at a rural landscape and compare it to a city landscape, the differences are obvious. Rural landscapes consist of open fields, farmland, and forests. People who live in rural areas are more spread out on larger properties than city inhabitants. There are fewer houses and streets, office buildings, shopping malls and huge parking lots. Since there are fewer impervious surfaces and no storm drains to carry stormwater away, most stormwater soaks into the ground. However, excess water on agricultural land is undesirable, therefore a complex network of drains have been built across our province. In some areas, wetlands (nature's kidneys) have been drained to speed up the removal of excess water from agricultural land. Unfortunately, this drainage water also carries with it contaminants that can degrade water quality. More must be done to ensure these valuable nutrients stay on the land where they can be used by growing groups, rather than moving into waterways where they fuel the growth of algal blooms.

Many rural residents have farms and grow crops or raise livestock. Most people in rural areas get their drinking water from underground wells that are drilled on their property. Unlike city drinking water, water from underground wells does not go through a purification process at a filtration plant. Because the water is often not treated before it goes into the home,



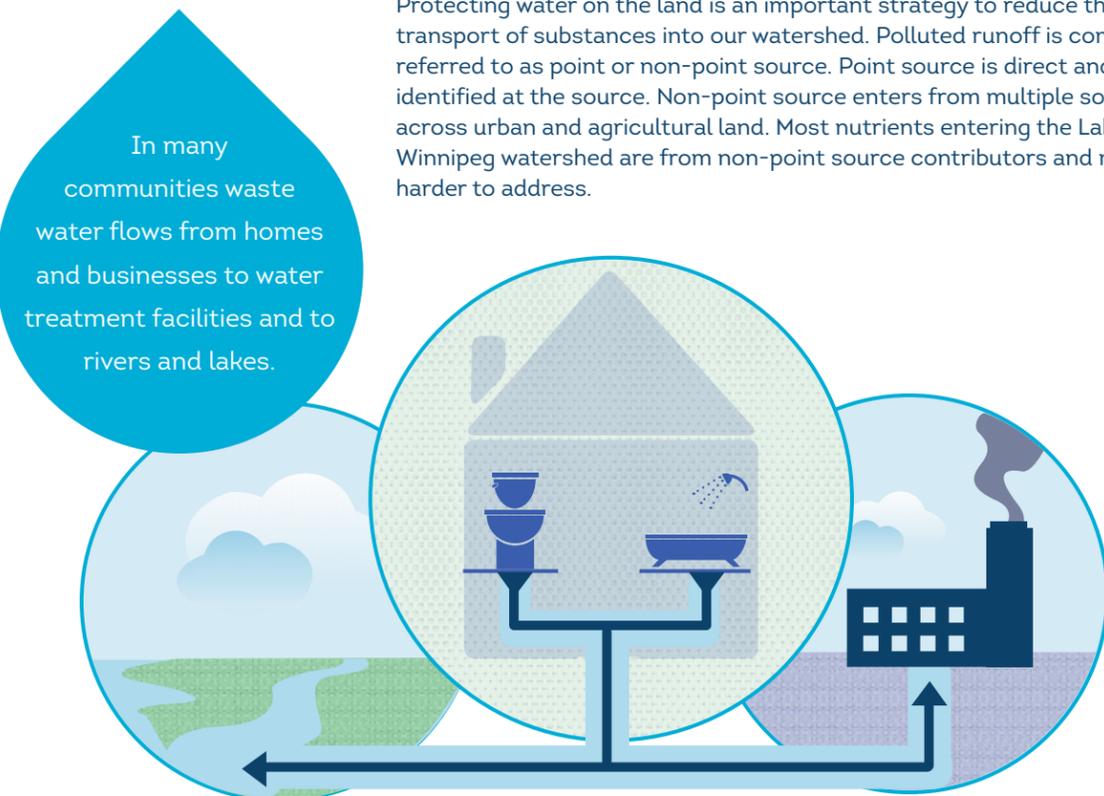
the location and protection of the well is very important. When pollution is carried into the soil it is considered groundwater pollution. To make sure the water is safe to drink, it should be tested on a regular basis.

For rural residents, waste water often goes from the house into a septic or holding tank. Liquids from septic tanks move from the tank to the ground into areas called septic fields. Solids must be pumped out by a pumper truck and taken to a sewage treatment facility on a regular basis. It is important to maintain septic tanks and septic fields so that they do not contribute to the pollution of surrounding water sources.

Stormwater must also be managed on a rural landscape to ensure runoff that may contain nutrients or pollutants does not enter our waters.

What travels in water?

As water flows it collects and transports substances that are found on the land to our lakes, rivers and streams. These substances can include nutrients, sediments, pet and animal wastes, pesticides, fertilizer excess, automobile fluids, de-icing products, grass clippings, cigarette butts and other litter. As these substances enter our watershed, they can reduce the quality of our water, affecting the health of all who live in the watershed. Protecting water on the land is an important strategy to reduce the transport of substances into our watershed. Polluted runoff is commonly referred to as point or non-point source. Point source is direct and can be identified at the source. Non-point source enters from multiple sources across urban and agricultural land. Most nutrients entering the Lake Winnipeg watershed are from non-point source contributors and much harder to address.





Fast Facts

- Between the oceans, the ice caps, and the atmosphere, the amount of water remains constant.
- The majority of nutrients entering Lake Winnipeg are non-point source.
- The City of Winnipeg gets its water from Shoal Lake, Ontario. This water travels by a series of pipes in an aqueduct over 156 kilometres before it reaches your tap.
- The watershed draining to Lake Winnipeg extends from Lake Superior in the east, from west of Banff in the west, and from northern South Dakota in the south.
- The Lake Winnipeg watershed flows to Hudson Bay.
- The majority of water entering into the Lake Winnipeg watershed is from spring runoff.



Resources 1.3

1. The Hydrologic and Carbon Cycles: Always Recycle Crash Course is a quick and informative video for students on the hydrological cycles.
[youtube.com/watch?v=2D7hZpIYICA](https://www.youtube.com/watch?v=2D7hZpIYICA)
2. Manitoba Forestry Association offers the Manitoba Envirothon which has provided Manitoba's high school students a unique and fun way to learn about the environment and current issues. Envirothon is a hands-on learning program which helps students develop important skills such as critical thinking, study skills and teamwork.
thinktrees.org/what-we-do/manitoba-envirothon/
3. The Water Stewardship Division of the Manitoba Government provides a fact sheet about private wells.
gov.mb.ca/sd/about/water-stewardship/index.html

Here are a few examples of activities related to "The Movement of Water through the Lake Winnipeg watershed"



1. Fred the Fish and the Urban Stew

See what happens to Fred the Fish as he swims downstream from a protected wilderness area, through the city, to a lake. (From Rivers West, Water on the Land)



2. Reservoirs: What goes up must come down

Students learn how clean, treated water is delivered to homes, schools and businesses in the urban setting.



3. What happens to all that precipitation?

Provide the students with a basic copy of the hydrological cycle visuals only, no text. Ask students to fill in text, explaining the process of the hydrological cycle.

You can get more resources at LakeFriendly.ca

1.4 The Processes and Cycles of Watersheds – Nutrient, Carbon and Phosphorus Cycles

What are the processes affecting watershed health?

The water quality of the Lake Winnipeg watershed is a direct result of both human and natural processes. The effects of human and natural processes on our watershed are far-reaching, influencing our health, culture, environment and economy. The following processes affect our watershed:

Natural Process

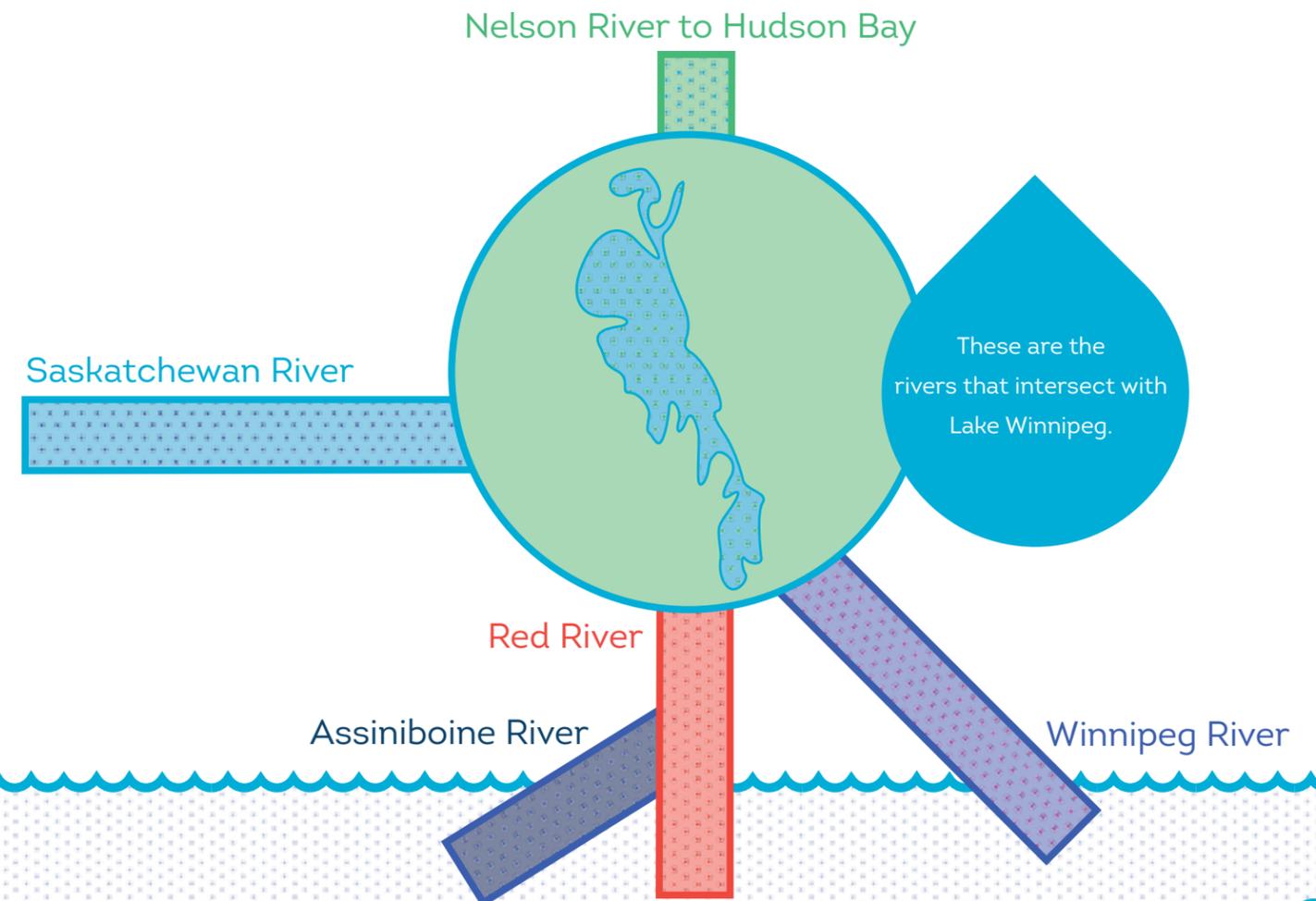
- The water cycle is the movement of water on, above and below the surface of the earth. The amount of water on earth stays the same, but is constantly in motion through the process of evaporation, condensation, precipitation, runoff and collection.
- The carbon cycle is the movement of carbon between land, atmosphere, oceans and organisms, as it gets recycled and reused throughout the biosphere. There is a fixed amount of carbon in the world, therefore a change in carbon intake or output at any stage of the cycle will result in consequences to another stage.
- The nutrient cycle describes the uptake, use, release and storage of organic and inorganic matter by living organisms and their environment. Nutrients such as phosphorus and nitrogen are essential plant nutrients, but in excess, can lead to eutrophication and proliferation of algae and other aquatic plants in lakes and rivers within the Lake Winnipeg watershed.
- The food web is a system of interconnected and interdependent food chains, through which nutrients are passed from one species of living organisms to another. Food webs help us see how plants and animals are connected in many ways.
- Commercial activities such as farming, fishing and other industries and habitat alterations affect the watershed.
- Human processes also affect agriculture, industry, recreation and our every day actions.

How do these processes affect the Lake Winnipeg watershed?

Various processes affect the Lake Winnipeg watershed in many ways. For example, increased amounts of nutrients from all activities can create algal blooms in a lake. As the algae dies, it sinks to the bottom of the lake, and decomposes. The water then becomes depleted of oxygen. This can affect life forms (e.g., fish and mussels) that require dissolved oxygen to survive.

Fast Facts

- The majority of water flow entering Lake Winnipeg is from four rivers: the Saskatchewan River, the Red River, the Assiniboine River and the Winnipeg River. Of these rivers, the Winnipeg River delivers the majority of the water.
- The Red River contributes 70% of all phosphorus entering Lake Winnipeg.
- Phosphorus is an essential plant and animal nutrient found in all living cells. But excess phosphorus contributed from fertilizers, manure, detergents, municipal and domestic sewage and industrial waste, can degrade the quality of water.
- About 8,000 tonnes of phosphorus enters Lake Winnipeg each year and only a small fraction of that actually leaves the lake and flows down the Nelson system. The majority is retained in the lake's sediment.



What is carbon?

Carbon is the fourth most abundant element in the universe and it plays a crucial role in the health and stability of the planet through the carbon cycle. It is a naturally abundant nonmetallic element that forms the basis of most living organisms.

What are nutrients?

Nutrients such as phosphorus and nitrogen are essential plant nutrients, but in excess, can lead to eutrophication and proliferation of algae and other aquatic plants in lakes and rivers within the Lake Winnipeg watershed.



Here are a few examples of activities related to “The Processes and Cycles of Watersheds – Nutrient, Carbon and Phosphorus Cycles”



1. Brainstorm

What are some things that can be done to help keep stormwater clean?



2. Field study of life in water habitats

This lesson is designed to help students see the relationship between biodiversity and water quality, helping students move towards an examination of biodiversity and environmental conditions on a larger global scale.



3. Land use and watershed health

This activity gets students thinking about how different land uses can sometimes affect watershed health.

You can get more resources at LakeFriendly.ca



Resources 1.4

1. United Nations, UN water for facts and diagrams.
unwater.org
2. Ducks Unlimited Canada “Delivering a wetland field trip” offers the chance for students to apply what they learn in the classroom to real-world, hands-on learning experiences.
education.ducks.ca
ducks.ca/resources/educators/field-trip-guide/
3. Video: ‘Nitrogen & Phosphorus Cycles: Always Recycle!’ outlining the importance of nitrogen and phosphorus cycles and organisms’ need for nutrients.
[youtube.com/watch?v=leHy-Y_8nRs](https://www.youtube.com/watch?v=leHy-Y_8nRs)
4. Lake Friendly: Do What Matters.
lakefriendly.ca
5. Nutrients for Life offers videos on major scientific and social topics related to plant productivity and feeding the world.
nutrientsforlife.ca
6. Exhibit and interactive simulation, “Lake Winnipeg: Shared Solutions” explores water flow and nutrient sources in the Lake Winnipeg watershed.
manitobamuseum.ca/main/visit/science-gallery/lake-winnipeg-shared-solutions/



The Value of Water



Summary:

In Chapter Two, students will learn that water is the only known substance that is necessary to sustain life, how our water needs are different from our wants, the historical role of water, and the things that can impact our water. While some organisms need less water to survive, every organism we know of needs water for survival. In fact, without water, life on earth would never have begun. Water shapes our lives. Water facilitated the discovery of Canada as voyageurs paddled the great rivers, today, our decisions and actions in the social, economic and environmental spheres, continue to impact the quality and quantity of water in our watershed.



Guiding Questions:

How is water used?

What is the difference between our water needs and our water wants?

How has water influenced history?

What is the First Nations perspective of water?

What's the Point?

Students will identify:

- how water is used and shared in watersheds.
- what happens when water becomes polluted.
- which of our water uses are needs and which are wants.
- sustainable water management.
- that water is unequally distributed around the world.
- the Indigenous perspective of water.
- historical and current water-related uses.
- how the historical role of water has shaped Manitoba's landscape.

In this lesson, students gain:

- an understanding that all living things need water to live.
- knowledge that if we wish to conserve our water for future use, our needs and wants of water need to be distinguished.

This lesson leads to an appreciation of:

- the relationship between water, society and views of needs and wants.
- an historical awareness of the role of water in developing our communities.

2.1 Our Ecosystem – Water for Humans, Plants and Animals

How do humans, plants and animals use water?

All living things need water to live. We drink water every day. Fish live in water. Plants need to be watered. What happens when you forget to drink water? What would happen to fish in an aquarium if you took out all of the water? What would happen if you forgot to water your plants?

Humans are dependent on water for all of our needs, such as washing, cleaning, cooking and growing our food. Much of our fresh water is used outdoors for watering lawns, flower beds and vegetable gardens, as well as washing cars and filling swimming pools. Water is also used by humans for industries to generate electricity, manufacture goods, and transport people and products. Because we are dependent on water for all of our needs, it is critical that we maintain fresh, clean water.

From an Indigenous perspective, water is essential to life itself. Many plants and animals live in water or must be near water to survive. For example, fish must live in water to survive because they get oxygen from the water. Beavers live in the water for part of the time, but must breathe air outside of the water to survive. Water lilies must have their roots in the mud at the bottom of the pond, but also need sunlight to survive. Some plants, like algae, live in the water all of the time.

How are humans affected when our water is polluted?

We use water every day but sometimes our use of it can affect its quality. It is easy to see garbage or debris floating in the water, water with soap suds, or even the sheen of oil on the water's surface, but many pollutants are not obvious to the naked eye. When pollutants mix with water they may be invisible but can still be harmful.

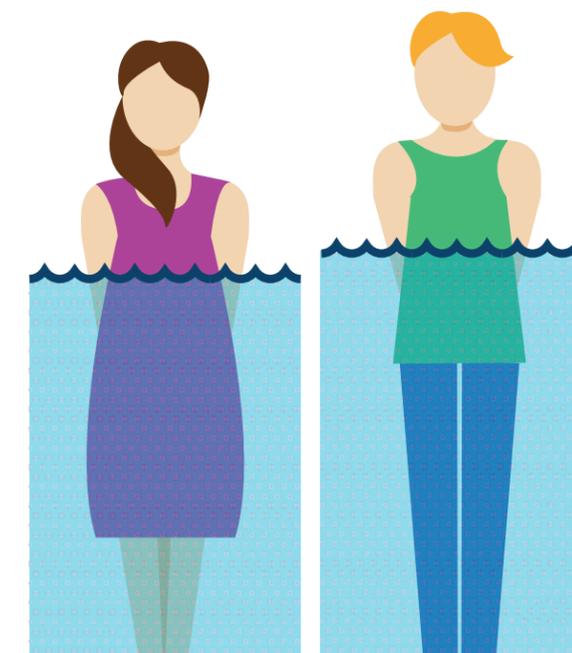
Some pollutants can be removed from water more easily than others. Sometimes removal of polluting substances is very difficult and expensive or even impossible. Preventing pollution in the first place is important. Pollutants that are not removed will affect the quality of our drinking water for humans, plants and animals.

"Water is not essential to life. It is life itself."

French author, Saint-Exupéry

Fast Facts

- Plants contain even more water than animals do – most of them are anywhere from 90% to 95% water.
- You can survive about a month without food, but only five to seven days without water.
- An adult's body weight is made up of 60% water.
- Water allows humans to eliminate wastes, to regulate body temperature and to transport nutrients, vitamins and minerals throughout the body.
- Approximately 70% of earth's fresh water is used for irrigation.
- Approximately 20% of earth's fresh water is used for industry.
- Approximately 10% of earth's fresh water is used for domestic water use.
- 20 million poultry, 14.3 million pigs, 9.9 million cattle and 500,000 sheep live in the Lake Winnipeg watershed requiring clean water for survival.





Here are a few examples of activities related to “Our Ecosystem – Water for Humans, Plants and Animals”



1. Water Geography

In this activity students discuss the difference between a desert and a rain forest and how water affects what can live in each habitat. They compare the types of plants and animals that live in a desert and rain forest. Could they switch places? Could a cactus live in a rainforest or an orchid live in the desert?



2. Outdoor Walk

In this activity students are led on a walk of your community to find sources of water (e.g., puddles, sewers, rain barrels, rivers, and sprinklers). Discuss how the water is being used. Look for different creatures in and around the water source. What do they see? How do the creatures they see depend on the water? Where does the water come from and where does it go? Discuss the differences between the types of water you see. What sources of water could the students drink? Is any water being wasted? What are some ways that water could be conserved? (e.g., collecting rainwater in barrels to water plants rather than using a hose)



3. Water audit

This take-home activity will help students identify how many litres of water they use at home.

You can get more resources at LakeFriendly.ca



Resources 2.1

1. Manitoba Education Library provides Manitoba Kindergarten through Grade 12 educators with curriculum implementation support such as storybooks, educational research, and professional development materials (1118 Portage Avenue).
edu.gov.mb.ca
2. Lake Winnipeg Foundation.
lakewinnipegfoundation.org
3. ‘The Hydration Rap’ is a fun video on the importance of hydration.
youtube.com/watch?v=oSxOksXkm-Q
youtube.com/watch?v=kcfGCds4u_Q
4. Exhibit, Explore Lake Winnipeg: A live Lake Winnipeg ecosystem, specimens and food webs. The Manitoba Museum’s science gallery.
manitobamuseum.ca/main/visit/science-gallery/lake-winnipeg-shared-solutions/

2.2 Water Needs versus Wants



65% of all water use occurs in the bathroom: bathing and showering account for about 35% of water use and toilets for 30%.

What are water needs and water wants?

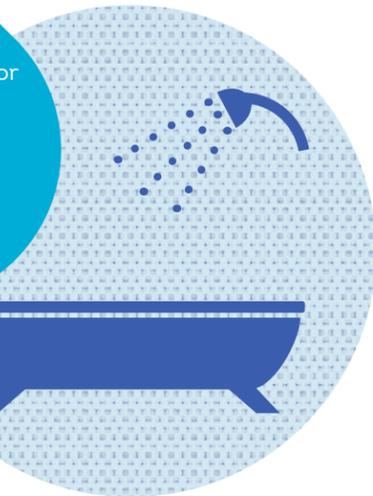
As we have learned, humans, plants and animals all need water for survival. Water is a basic necessity of life and therefore we need clean drinking water. On the other hand, a want is defined as a possession that one could survive without. For example if our car was dirty, we would survive. So a clean car is not a “need” although we may “want” a clean car.

Determining our needs from our wants is about sustainable water management. Sustainable water management requires that our water uses are not more than what we need or is available. Over the long term, plant and animal communities cannot survive if we overuse our natural resources. We must all strive to manage our water sustainability. Managing our water sustainability means we must use it without compromising the ability of future generations to meet their own needs. Sustainability calls us to find a balance between our social, economic and environmental demands.

How much is too much?

The world’s freshwater resources are unevenly distributed in time and space. Of global water resources, a large fraction is available in Canada and as a result, Canadians are at the top of water consumption. Many things we use or produce use vast amounts of water that are not always evident. The use of “virtual water,” or water that is unseen and unaccounted for must be considered when we examine our individual and collective impact on water. By identifying which of our water uses are needs and which are wants, we can all be better at conserving water and move towards more sustainable water management practices.

Baths and showers account for
35%
of household water usage.



Toilets account for
30%
of household water usage.



Fast Facts

- Water use has been growing at more than twice the rate of population increases in the last century.
- Water withdrawals are predicted to increase by 50% in developing countries and 18% in developed countries by 2025.
- Over 1.4 billion people currently live in a river basin where the use of water exceeds minimum recharge levels, leading to the desiccation of rivers and depletion of groundwater.
- 65% of all water use occurs in the bathroom: bathing and showering account for about 35% of water use and toilets for 30%.
- In Canada, the average residential water use is 327 litres per day.
- Excessive water use in Canada can be attributed to the lack of widespread water conservation practices and water pricing that does not promote efficiency.
- The three pillars of sustainability are social, economic and environmental.

Here are a few examples of activities related to “The Processes and Cycles of Watersheds – Nutrient, Carbon and Phosphorus Cycles”



1. Explore how much water we use.

This activity will teach students how simple actions such as turning the water off when washing their hands can help conserve water.



2. Hook

This activity demonstrates the world water supply through a hands-on engaging activity utilizing a two-litre container of water to represent all the water on earth.



3. Conserve Water!

This take-home activity is a tool for helping students learn more about water conservation and water needs and wants.



You can get more resources at LakeFriendly.ca



Resources 2.2

1. United Nations, UN water life for facts and diagrams.
unwater.org
2. The Conference Board of Canada is an independent research organization providing performance measurement indicators on a wide variety of topics including water usage.
conferenceboard.ca
3. The International Institute for Sustainable Development.
iisd.org
4. Red River Basin Commission.
redriverbasincommission.org

2.3 The Historical Role of Water



“The water is not just water, it is sacred. Every water is sacred. Every water is holy everywhere in the whole world. The water has a spirit, it has a soul, it has life in it. The Creator said to the water, ‘And your job, Water, is to move, to look for the humans, look for the birds, look for the bears, look for the deer.’ That is why the water is moving. It’s doing its job, going looking around for the life”

-Tom Porter, Indigenous Cultural Educator, Elder and Spiritual Leader.

What is the historical role of water?

Water has played a key role in the historical development of communities in the Lake Winnipeg watershed. Archaeological sites, such as The Forks in downtown Winnipeg, reveal that humans settled near convenient sources of water for a very long time. Most of the great ancient civilizations depended on water sources for their growth and development. Water facilitated development and expansion by providing a corridor for rapid transportation in the era of exploration and discovery in Canada. The Red River was the primary transportation corridor for thousands of years by the First Nations people and then by settlers. The Red River also provided a source of food and water. Many communities along the Red River and rivers throughout the watershed still depend on the rivers for drinking water and water for municipal, agriculture and commercial uses.

Canada’s First Nations people have a long and significant history of water use and value. From early on they have viewed water as a life-giving element for everything on earth. From oceans to underground wellsprings, water is like the blood that runs through our veins. First Nations people recognize that it is everyone’s responsibility to maintain clear and clean water in order to maintain biodiversity. For example, the First Nations people managed water during droughts by placing a taboo on killing beavers. This ensured that wetlands were maintained so there would be water to drink and for hunting and foraging in. The First Nations perspective is that all people have a responsibility to ensure water is protected for generations to come.

Water and Seven Generations

First Nations people have a long tradition of sustainability. Teachings such as the Seven Generations remind us to manage our precious resources. As we consider the choices we make now, we must acknowledge and respect how they impact the Seven Generations of the past, present and future.

Fast Facts

- The early residents of the earth created their civilizations around lakes, rivers, streams and seas.
- Modern societies are concentrated on the world's seaboard.
- Canada was explored and discovered by river transportation.
- There are five First Nation linguistic groups in Manitoba: Cree, Ojibway, Dakota, Ojibwa-Cree and Dene.
- The Red River is the only river on the Canadian prairies that flows north.
- The Red River Valley is the most densely populated region of Manitoba.

Here are a few examples of activities related to "The Historical Role of Water"



1. Read *Cave of Journeys*

Cave of Journeys is rich in curriculum content illustrating diverse historical stories and perspectives, the use of traditional ecological knowledge, and recognition of the value of water.



2. *The Kashechewan Crisis and other Indigenous water issues*

The article will introduce students to water problems on Canada's First Nation Reserves. After reading the article, ask students to research Manitoba's First Nation communities and their access to clean water.



3. Invite an Elder to speak to your class

You can get more resources at LakeFriendly.ca



Resources 2.3

1. Historical Places of the Red River, from Red River North. Provides information about the heritage along the Red River.
redrivernorthtourism.com/activities/historical-sites/
2. The Ways of Knowing Guide: Earth's Teachings. Toronto Zoo and Turtle Island Conservation. This guide attempts to provide insight to the ways of knowing of First Nations people that affirms the wisdom of Elders, utilizing fundamental truths and principals.
torontozoo.com/zootoyou
torontozoo.com/pdfs/tic/Stewardship_Guide.pdf
3. Our Responsibility to The Seventh Generation: Indigenous Peoples and Sustainable Development. International Institute for Sustainable Development, Winnipeg. This article speaks about Indigenous peoples' situation around the earth: on the one hand, policies and institutions have pushed them to the fringe of society and economy; on the other hand, the world is coming to understand their feeling that the current development path is not sound and that the survival of humanity is at stake. IISD believes that their message reinforces a fundamental value of sustainable development.
iisd.org/library/our-responsibility-seventh-generation
4. A First Nations spiritual and ecological perspective. BC Journal of Ecosystems and Management. A documentation of First Nations concerns and perspectives of water.
[click here to read the report](#)
5. Traditional Ecological Knowledge resource provides a brief overview of traditional learning.
thinktrees.org/resources/traditional-ecological-knowledge/



Factors that Impact Water



Summary:

In Chapter Three, students will identify how water is impacted daily by environmental, social and economic activities. Natural processes such as flooding and erosion; human activities such as mowing the lawn or washing the car; and economic activities such as manufacturing and food production can all have negative impacts upon the health of our watershed. Pollutants from environmental, social and economic activities are the most common factors that impact water. Pollutants in our water can create numerous problems for plants, animals and humans.



Guiding Questions:

How do natural and human activities affect water quality and quantity?

How do social impacts affect water?

How do economic impacts affect water?

What's the Point?

Students will identify:

- specific pollutants and how they affect the health of our watershed.
- the difference between point source and non-point source pollution.
- the role of agricultural and industrial development on our water quality.
- how flooding and erosion can cause an influx of material into our water.
- how climate change is impacting water.
- the role of humans introducing invasive species.

In this lesson, students gain:

- an understanding that both natural and human activities affect water quality and quantity from social, economic and environmental actions.

This lesson leads to an appreciation of:

- how natural processes shape the health of our watershed.
- our role in reducing pollution.

3.1 Environmental Impacts on Water



Excessive amounts of nutrients entering our waterways can lead to an overgrowth of aquatic plants such as phytoplankton and algae.



What is “eutrophication”

Eutrophication is about “obesity.” Oxygen depletion happens when algal blooms are extensive, and the bacteria aerobically decomposing the plant matter use up the oxygen. The plants themselves don’t use up the oxygen in their decomposition, per se. In fact, during the day, plants produce oxygen so aquatic plants are a source of oxygen in water along with aeration by winds. Blooms also block sunlight which can have various other effects on aquatic organisms.

How do natural processes affect water?

Water is a dominant process in landscape formation. As water moves across a landscape it erodes, transports and deposits materials and sediments that in turn sculpt the land. Erosion can occur naturally over centuries or is accelerated through human activity, such as removing natural vegetation along stream banks, allowing livestock to water in streams and cultivating fields and gardens close to streams. All of these activities decrease bank stability and increase sediment containing nutrients entering the water.

Flooding is one of many natural processes that affect water. Flooding of the Lake Winnipeg watershed is caused by a combination of factors including: wet ground in the fall, severe winter cold causing deep frost, heavy snowfall particularly during the latter part of winter, a late spring followed by sudden warming and quick snowmelt and above normal precipitation during spring snowmelt. High water and low water cycles are important for our watershed as they can affect nutrient availability and growing conditions. Flooding and excessive runoff from rain and snowmelt can cause an influx of nutrients, pollutants and other materials to enter our Lake Winnipeg, as large amounts of water flow over the land and into the ditches, creeks, rivers and streams into our lakes. This process can lead to eutrophication which really means there are too many nutrients available to aquatic plants; in other words, it is like the Lake is very “obese” and therefore, unhealthy.

There are many natural processes that can affect our water. When we think of environmental pollution, we think of chemicals from industry and car exhaust fouling our air and water. Although nutrients occur naturally, they too can be cause for concern. All living things require nutrients, such as phosphorus to grow and thrive, but too many nutrients can cause disruptions in the ecosystem. Excessive amounts of nutrients entering our waterways can lead to an overgrowth of aquatic plants such as phytoplankton and algae. These organisms eventually die and sink to the bottom of our lakes and in the process of decomposition they use up the oxygen causing the water to be too oxygen-depleted for other life to survive.

What are invasive species and how do they affect water?

Invasive species are plants, animals or other organisms that are growing outside of their country or region of origin and are out-competing or even replacing native organisms. In the Lake Winnipeg watershed, invasive species have been introduced. Humans are most often directly responsible for introducing a species to a new region, whether intentionally or unintentionally. Species such as the common carp, rusty crayfish, spiny water flea and purple loosestrife have a distinct advantage over our native species whose populations are kept in check by native predators, competitors or diseases.



Climate change will impact all Canadians and freshwater ecosystems are among the resources at particular risk! Canada's fresh water is particularly at risk as major river flows are affected and extreme weather events can contribute to more water moving over the land.

Invasive species can be introduced from bait buckets, fish tanks and from non-native plants. They can take over habitats reducing biodiversity and causing severe problems such as reducing and irreversibly altering habitats for native plants and species.

Prevention, early detection and rapid response are critical for saving the Lake Winnipeg watershed as biological invasions are one of the contributing factors for species extinction and loss of biodiversity.

Climate change and the Lake Winnipeg watershed

Climate change is affecting both the quality and quantity of our water. Warmer temperatures can increase evaporation and precipitation, affecting water levels and increasing the chances of flooding, erosion and severe weather events. Alternatively, in areas of Manitoba which experience periodic dry spells, the occurrence of droughts may be more frequent due to changing atmospheric conditions. Hotter summers would mean an increase of water consumption for irrigation that would directly affect the water table and result in the loss of wetlands. Climate change is a contributing factor in the loss of our wetlands; wetlands, which are critically important in keeping our water clean and mitigating flooding, are susceptible to changes in water quantity and temperature fluctuations. Rising temperatures may also affect the range of organisms, changing ecosystem composition and the extent of disease organisms.

A single purple loosestrife plant can produce over

300,000

seeds choking out native plants that make up the habitats where fish, birds and animals feed, seek shelter and rear their young.



Fast Facts

- Climate change is having a significant impact on weather patterns, precipitation and the hydrological cycle, affecting surface water availability, as well as soil moisture and groundwater recharge.
- Climate change is expected to reduce flow in major rivers by as much as 20% this century.
- As a result of climate change, the prairies may experience drier conditions in the future, with lower summer streamflows, falling lake levels, retreating glaciers, and water deficits.
- Approximately 1,800 years ago, a flood occurred in Winnipeg which was six times greater than our largest flood on record, the flood of 1826.
- The second largest Red River flood was in 1852 and third largest was in 1997.
- Tree rings help scientists study floods that occurred hundreds of years ago.
- A single purple loosestrife plant can produce over 300,000 seeds, choking out native plants that make up the habitats where fish, birds and animals feed, seek shelter and rear their young.
- During a drought, shared sources of water such as reservoirs, rivers and groundwater for wells are in jeopardy of running dry.
- In Manitoba, droughts can have a major impact on agriculture, recreation and tourism, water supply, energy production, and transportation.



Here are a few examples of activities related to “The Environmental Impacts of Water”



1. Incredible Journey story

The incredible story encourages students to write a creative story of how water travels through our watershed and what the water may encounter as it meanders toward Lake Winnipeg.



2. The Winnipeg Floodway: Pros and Cons

In this activity students will investigate the affect of the Winnipeg Floodway on the rural population surrounding Winnipeg.



3. Sum of the Parts - Project WET

Students demonstrate how everyone contributes to the pollution of a river as it flows through a watershed.

You can get more resources at LakeFriendly.ca



Resource 3.1

1. Controlling Water Runoff

A five minute video clip shows how the environmentally friendly design of a Visitor Centre controls nonpoint source water pollution. Discussion questions are provided.

pbslearningmedia.org/resource/watsol.sci.ess.water.runoff/controlling-water-run-off/

2. Aquatic Invasive species from Manitoba Conservation

This website provides lots of information on the invasive species found in Manitoba.

gov.mb.ca/sd/environment_and_biodiversity/invasive_species/fish_and_wildlife/index.html

3. Crapshoot the gamble with our water. History and concerns about sewage and water treatment are presented in this video available through the SDWF.

nfb.ca/film/crapshoot_the_gamble_with_our_wastes/

*Accompanying worksheet activity

safewater.org/operation-water-pollution-1/category/Crapshoot

3.2 Social Impacts on Water



Non-point source refers to contributions that enter our waterways over the land, including runoff. Point source contributions come from a specific source such as industrial processing plants or waste-treatment plants.

Point source and non-point source pollution

The total human population in the Lake Winnipeg watershed has grown from 2.5 million in 1974 to 6.5 million in 2007. As our communities grow, so have our actions affecting the health of the Lake Winnipeg watershed. For example, when we drive our cars the burning of fossil fuels releases pollution. This pollution enters the atmosphere and then falls to the surface with rain, entering our watershed. In addition, the generation of electronics, pharmaceuticals and paint waste can lead to water contamination if not properly recycled.

We all impact water in our day-to-day activities. Communities in the Lake Winnipeg watershed impact water through both non-point source and point source contributions. Non-point source refers to contributions that enter our waterways over the land, including runoff. Point source contributions come from a specific source such as industrial processing plants or waste-treatment plants.

Non-point source contributions and point source contributions can add pollutants and excess nutrients that may be harmful to humans, animals, aquatic life and our watershed in general. The specific effects of water pollution caused by human activities depend on what kind of pollution it is and where it occurs. For example, many water bodies near cities and towns can be polluted from manufacturing industries, health centres, waste water treatment facilities and individual actions. Nutrients entering our water from both non-point and point source can contribute to the over-enrichment and resulting excessive algal growth in Lake Winnipeg.

Non-point source and point source contributions can affect aquatic habitat, disrupting the natural food web. Toxins such as lead, mercury and cadmium are ingested by small organisms, which are later consumed by small fish and shellfish. Fish, birds and mammals higher on the food chain are then affected, and because of this bioaccumulation, can be killed by the pollutants in their habitat. Eventually, humans are affected by this process as we are at the top of our food chains. People can get sick by eating seafood that has been poisoned or by consuming contaminated water. We all have a role to play in ensuring toxins and excess nutrients do not enter our waters.



What is bioaccumulation?

Bioaccumulation refers to the process by which substances such as chemicals or pesticides accumulate in the body of an organism. Gradually, a high concentration of these substances build up within the tissue of an organism and it could be life threatening to the organism.





Fast Facts

- Reducing point source and non-point source pollution can decrease the amount of pollutants entering our watershed.
- A mowed lawn is considered a hard surface and is an unhealthy partner for the lake as not only can fertilizers and pesticides escape into water, but because the roots are so shallow it allows topsoil (and your land) to slowly wash into the lake!
- The soil and silt that enters the lake after running off your property can block sunlight and destroy aquatic plant habitat, covering fish spawning areas, increasing drinking water costs as well as make swimming less enjoyable.
- One drop of oil can render up to 25 litres of water unfit for drinking.
- Pharmaceuticals and personal care products such as antibiotics, fragrances and disinfectants that enter our waters can contain chemicals that can act as endocrine disruptors, and can affect the health of aquatic species.

Here are a few examples of activities related to “The Social Impacts on Water”



1. Balancing the Earth's Food Bank

In this activity, students take on the role of an agricultural expert (farmer) and make recommendations to the Earth Food Bank about how to farm in the future, keeping a focus on environmental impacts based on resources that farmers need.



2. Sparkling Water - Project WET

Students develop strategies to remove contaminants from waste water.



3. Point versus Non-point Source Pollution worksheet

This take-home worksheet will test students to identify point or non-point source pollution.



Resource 3.2

1. Nutrients for Life – Nourishing the Planet in the 21st Century Chapter 5
A series of activities and lessons to show how the challenge of feeding our world's growing population can be solved with science.
nutrientsforlife.org/for-teachers/video-library/
2. Whether it's for a mobile phone, old tires, or the paint from that reno you did last year, the Manitoba Eco Depot's new search tool and smartphone app will help you find the nearest depot to recycle it - anywhere in Manitoba.
gov.mb.ca/sd/wastewise/index.html
3. Exhibit: “Watershed of the Future” describes the nutrient sources in the Lake Winnipeg watershed.
manitobamuseum.ca/main/watershed-of-the-future-simulator-update-day-three-of-install/ngxinteractive.com/work/manitoba-museum-watershed-of-the-future-simulator/

You can get more resources at LakeFriendly.ca

3.3 Economic Impacts on Water



Wetlands can be described as nature's kidneys, providing a wonderful natural filter for water.

What roles do agricultural and industrial developments play in affecting water quality?

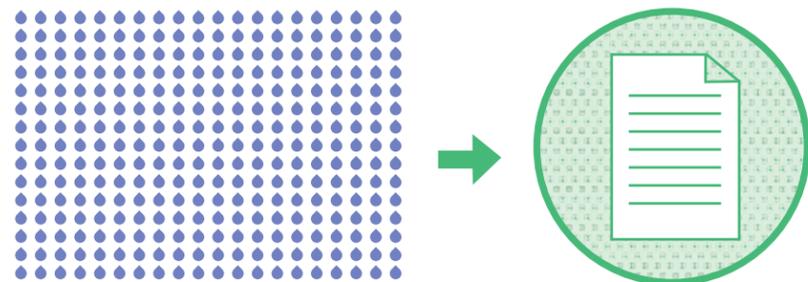
Much of the natural lands in the Lake Winnipeg watershed were once bogs, marshes, meadows and land that frequently flooded. Over the years, many of these natural wetlands that stored water have been altered to allow for the lands to be further developed through a network of ditches, dikes and diversion channels. This has reduced our capacity for water storage, altered natural drainage systems and caused destruction to spawning grounds.

Wetlands can be described as nature's kidneys, providing a wonderful natural filter for water. There has been a loss of as much as 70% of wetlands in some areas of the prairies. Wetlands have been drained primarily to make room for more agricultural production, industrial development and in some cases to accommodate urban development.

Industrial development in the Lake Winnipeg watershed can also have important effects on water as it can use vast quantities of water as well as contributing to polluted runoff if not managed properly. It is becoming increasingly important to have good land use planning for any new urban, agriculture or industrial development. The impacts on all aspects such as consumption, waste management and habitat disruption must be key considerations. Understanding the concept of Ecological Goods and Services is an important start in determining sustainable land use strategies. The loss of wetlands has contributed to the degradation of our water.

What are Ecological Goods and Services?

Humans benefit from functioning healthy, productive ecological systems. Ecological functions are the base resource that sustain life. Ecological Goods and Services are the direct health, social, economic and cultural benefits provided to humans by ecosystems and watersheds. This can include water filtration, erosion control, food mitigation, wildlife habitat, carbon sequestration and nutrient reduction. Globally, ecological systems have been declining as landscapes are converted from natural states for human use. Because of their importance it is crucial to reduce the threat of irreversible damage to our ecological systems and begin to see the value of these systems in their natural state.



Approximately
300
litres of water is
required to produce
1 kilogram of paper

Fast Facts

Large quantities of water are used to produce many of our daily goods, including:

- approximately 300 litres of water is required to produce 1 kilogram of paper.
- approximately 1,000 litres of water is required to grow 1 kilogram of potatoes.
- On the prairies, irrigation is the largest consumer of water.
- Ecological Goods and Services are provided naturally by the environment and are often impossible to duplicate.
- The value of agriculture in Manitoba in 2012 was 1.6 billion dollars.

Here are a few examples of activities related to "The Economic Impacts on Water"



1. Get the Dirt Out!

The results of this experiment will illustrate to students how human activities add materials to water that make water unfit for use or pollute the water.



2. Too Many Nutrients

This experiment highlights how farmers, foresters and homeowners can pollute water by improperly using chemical fertilizers.



3. What's Up in the Environment - Contaminated Water

Students will research the history of pollution of a local body of water. They will then be able to identify the pollution's effects on plants and animals and create an action plan to clean up the site.

You can get more resources at LakeFriendly.ca



Resources 3.3

1. Agriculture in the Classroom

Their mission is to lead in the development and distribution of accurate, balanced and current information for use as education resources in school curriculum.

aitc.mb.ca

2. Farming 4R Manitoba

The Province of Manitoba, the Canadian Fertilizer Institute (CFI) and Keystone Agriculture Producers (KAP) signed a 4R Nutrient Stewardship memorandum of understanding (MOU) that formalizes a joint commitment to support agriculture production and environmental protection through improved fertilizer use. Manitoba is the first prairie province to complete an arrangement with CFI on nutrient management and adoption/impact measurement.

fertilizercanada.ca/nutrient-stewardship/

3. Red River Basin Water Systems Grade 8 curriculum guide; Water cycle, watersheds and drainage systems, characteristics of rivers, erosion and deposition, human interventions to prevent erosion, water quality, flooding and technologies used to mitigate flooding are some of the outcomes or topics covered in this curriculum.

[click here to read the report](#)

4. Video: Pollution: Crash Course Ecology #11. This video is a great tool to teach high school students the impacts of pollution.

[youtube.com/watch?v=kdDSRRCKMiI](https://www.youtube.com/watch?v=kdDSRRCKMiI)

Who and What Depends on Clean Water?



Summary:

In Chapter Four, students will identify that all life is interconnected. Ecosystems are composed of living organisms and non-living factors in the environment, such as water, temperature, minerals and sunlight. Negative effects on any one aspect of an ecosystem will have negative effects on other organisms or aspects of that ecosystem. Water is finite in our biosphere and its quality is important to all life forms and so it must be managed sustainably. Water issues around world-wide and careful stewardship is important to sustain good quality water.

The economy related to Lake Winnipeg is important and water use and treatment must be monitored and controlled in order to assure present and future generations have adequate clean and healthy water.



Guiding Questions:

What does “interconnectedness” mean and how does it relate to water?

How is the Lake Winnipeg watershed linked with our economy?

How does the usage of water in the Lake Winnipeg watershed compare with other watersheds and other cultures?

What is the First Nations relationship to water?

What’s the Point?

Students will identify:

- that when changes are made in one part of the ecosystem other parts of the ecosystem are affected as well.
- examples of interconnectedness.
- that Manitoba’s economy is linked to the availability of water.
- that education and legislation have helped prevent the misuse of water in Manitoba.

In this lesson students gain:

- an understanding that either directly or indirectly, all of our actions affect the Lake Winnipeg watershed.
- the knowledge that nearly all of our economic activities depend on water.

This lesson leads to an appreciation of:

- how all of our actions affect the health of our watershed.
- the First Nations relationship with water.
- the importance of Lake Winnipeg in supporting local economies.

4.1 Interconnectedness of Our Ecosystem



No one knows what the “tipping point” may be, or just how “obese” Lake Winnipeg can get before it is seriously unwell.

Water and our ecosystem

Interconnectedness is a fundamental ecological concept. Processes and cycles of ecosystems are connected in intricate ways. Interconnectedness explains why, when changes are made in one part of the ecosystem, other parts of the ecosystem are affected, often in unanticipated ways.

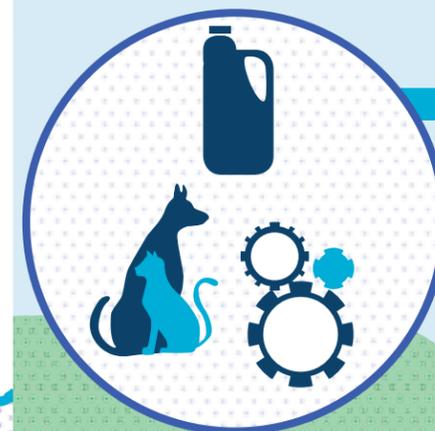
Nitrogen and phosphorus are essential nutrients used to promote plant growth. However, excessive amounts of nitrogen and phosphorus in the Lake Winnipeg watershed cause algal blooms. When these algae die and decompose there is a negative effect on the lake because oxygen is consumed from the water. Low oxygen levels in the water can harm or kill fish and other aquatic life.

Excess nutrients in the lake may benefit fish stocks as algae are the base of all food chains and webs. However, it is the excess algal blooms and their decomposition, which cause oxygen depletion. Oxygen depletion affects water factors such as temperature, changing the water conditions for all organisms. The overfeeding of Lake Winnipeg with excess nutrients is called eutrophication, which means the Lake could be considered to be “obese”. No one knows what the “tipping point” may be, or just how “fat” Lake Winnipeg can get before it is seriously unwell.

Water and climate change

As seasons change, temperature affects water in the Lake Winnipeg watershed. Lakes and rivers heat up in spring and summer and water evaporates. The evaporated water stays in the atmosphere until it condenses, forming clouds and precipitation, returning liquid water to the watershed. This process could be disturbed by changes in the global climate. For example, changes in precipitation patterns may affect the Lake Winnipeg watershed. Temperature and rainfall variations may: affect the availability of water; increase the frequency and severity of storms, floods and droughts; and disrupt aspects of ecosystems that maintain water quality, such as wetlands. Warmer water temperatures will also increase the rate of algal growth. The interconnectedness of our ecosystem is like a woven fabric, when one strand is pulled, others that at first glance may not appear to be connected, are affected.

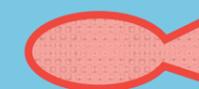
The Eutrophication Cycle



Nutrients come from many sources including pets, detergents and industrial by-products.

Excess nutrient runoff.

Increased algal growth can produce toxins and can degrade water quality.



Increased decomposition of dead algae depletes oxygen in water and can be harmful to aquatic life.



Fast Facts

- Toxins can travel around the world through our atmosphere. For example, PCBs and DDT from China have been found in the Columbian ice fields. As glaciers melt, these same toxins are released into our lakes and rivers and may end up in human bodies as well.
- Algae is the basis of the aquatic food chain.
- Nitrogen and phosphorus are essential nutrients, used to promote plant growth.
- Lake Winnipeg is experiencing excess blooms of algae from too many nutrients.
- Due to our location in the centre of the continent, Manitoba may be more vulnerable to changes in climate.
- Each year the average Canadian produces over five tonnes of greenhouse gas emissions, further accelerating climate change.



Resources 4.1

1. The Lake Winnipeg Research Consortium has a helpful lecture and video on the interconnectedness of our environment. Visit their website for contact information.
lakewinnipegresearch.org
2. Rooftop gardens and green roofs can help illustrate the interconnectedness of our environment. Contact and visit Oak Hammock Marsh, Manitoba Eco-Network or Manitoba Hydro.
oakhammockmarsh.ca
mbeconetwork.org/about/the-ecocentre/
hydro.mb.ca/corporate/history/mh_place_design_and_construction/
3. Eutrophication cycle depicts the natural process that occurs in an aging lake or pond where a body of water gradually builds up its concentration of plant nutrients. Read more at the link below.
scienceclarified.com/El-Ex/Eutrophication.html

Here are a few examples of activities related to “The Interconnectedness of our Ecosystem”



1. What You Do

Find objects from nature and discuss how the objects are connected to each other and to the things in our daily lives.



2. “Ecosystem Ecology: Links in the Chain- Crash Course Ecology #7”

This video is geared towards a high school audience and talks through the interconnectedness of our ecosystem.



3. Mayhem - Project WET 2.0

Students play a game of tag to simulate the effects of environmental stressors on macroinvertebrate populations.

You can get more resources at LakeFriendly.ca

4.2 Economic Development



Manitoba's economy and our watershed

Our economy depends on the availability of clean water. There are two basic ways in which we use water for economic development: instream and withdrawal uses. Instream uses include hydroelectric power generation, transportation, fisheries and recreation. These activities take place with the water remaining in its natural setting, "in the stream." Withdrawal uses include activities such as thermal power generation, mineral extraction, agriculture and manufacturing, where the water is removed from its natural setting for a period of time and for a particular use.

Agriculture, forestry, urban and recreational development are typical land uses in Manitoba that support economic development. These land uses depend on the availability of clean water. These uses can negatively affect Manitoba's water supply. In rural Manitoba, groundwater is the main source of water and can be negatively affected by various human activities. Like rural areas, urban areas require water for processing and manufacturing goods and services. Chemicals, pollutants and nutrients can be carried into the watershed if not properly treated. Both legislation and education have played important roles in supporting Manitoba's economy to keep our water clean. Many of our First Nations and Northern communities who live on the shores of Lake Winnipeg are dependent on the lake for their livelihood for things such as fishing, trapping and drinking water.

Manitoba's economy and Lake Winnipeg

Lake Winnipeg is an important socio-economic and cultural resource for residents who live along its shores, as well as for the entire province of Manitoba. Nearly 23,000 permanent residents live along the lake in 30 communities. Eleven of these communities are First Nations, with a population of approximately 14,000.

Lake Winnipeg supports commercial and subsistence fisheries, shoreline communities, and recreational uses. The current commercial fishery on Lake Winnipeg, the largest in Western Canada, is valued at \$21 million representing about 61% of the value of all commercial fisheries in Manitoba.

Lake Winnipeg is integral to the subsistence of fisheries-based communities and the traditional culture of First Nations. In addition to commercial and subsistence fishing, recreational fishing and bait fishing are also prominent on the lake and its tributaries and generate an estimated \$17 million annually to the provincial economy.

Lake Winnipeg also supports an important recreational and leisure industry offering beaches, cottaging, all season recreation, tourism, and ecotourism which are estimated to contribute \$110 million per year to the economy of Manitoba.

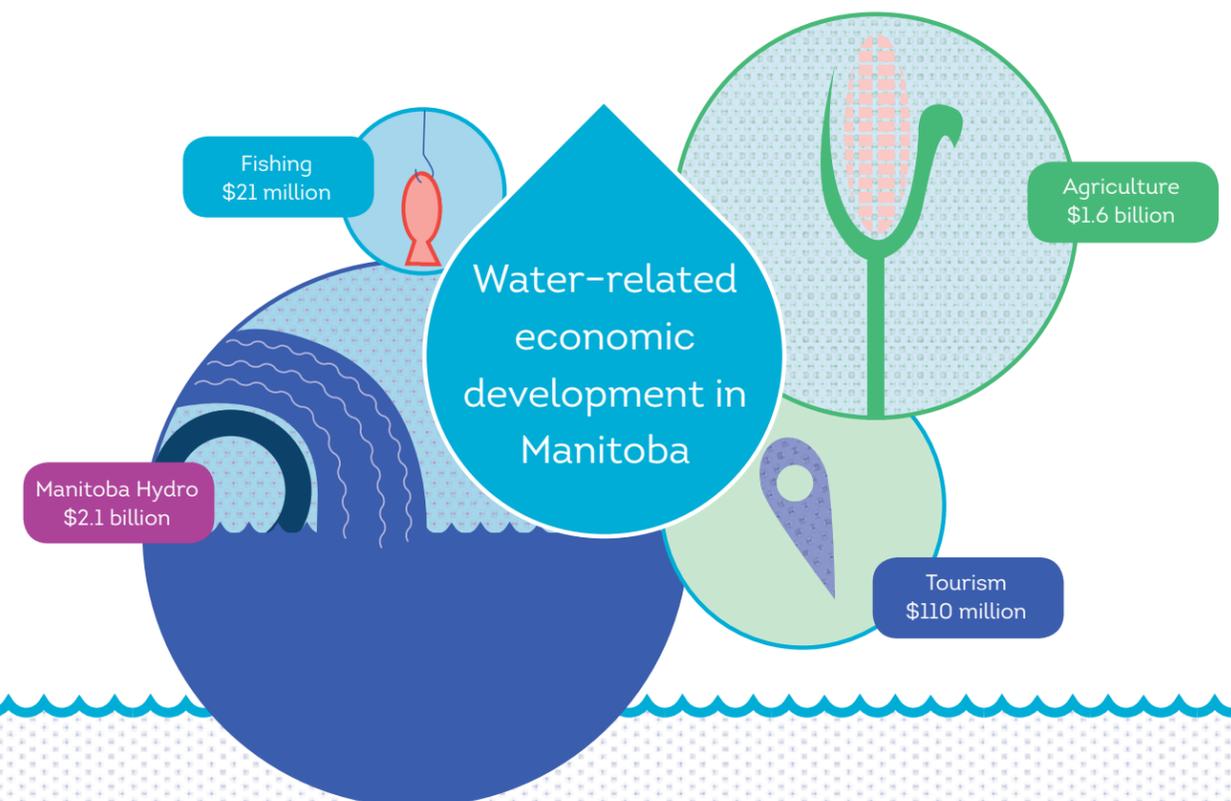


The Lake Winnipeg watershed and hydroelectricity

Manitoba Hydro is responsible for providing reliable and economical electricity to Manitobans. The Crown Corporation is also responsible for determining the province's future electricity requirements and for designing, constructing, maintaining and operating all the facilities needed to meet those requirements. Manitoba Hydro is a major supporter of independent research to better understand the lake ecosystem, to develop appropriate land use policies and for public education.

Virtually all of the electricity generated in Manitoba is from self-renewing water energy; on average, about 30 billion kilowatt-hours per year. The Winnipeg River, located about 100 kilometres from the City of Winnipeg, was the main source of hydroelectric power for Manitoba throughout the first half of the century. By the time the Winnipeg River was completely developed in the mid 1950s, the rich energy resources of Manitoba's northern rivers became attainable with the introduction of new technologies. These advances made it possible to transmit electricity over extremely long distances.

As well as being important to our economy, Lake Winnipeg is a source of drinking water for communities along the shores. Domestic use of water includes direct withdrawal of untreated water from the lake, as well as withdrawals from wells, tributaries, or local aquifers adjacent to Lake Winnipeg.





Fast Facts

- The Lake Winnipeg watershed is a large producer of hydroelectricity.
- At least 500,000 litres of water are required to produce one car, 10,000 litres of water are required to produce one kilogram of cotton t-shirts and 1,000 litres of water are needed to grow a kilogram of wheat.
- A single corn plant absorbs over 200 litres of water from the soil in one growing season.
- More than 23,000 permanent residents live in 30 communities along the shores of Lake Winnipeg, including 11 First Nations communities, some of whose livelihood is tied to the quality of the lake for fishing and trapping.



Resources 4.2

1. Manitoba Tourism supports the promotion of tourism in our province, leading to economic development.
gov.mb.ca/ie/manitoba/tourism
2. Manitoba Conservation is committed to delivering programs and services that result in a clean, healthy and diverse natural environment for current and future generations.
gov.mb.ca/sd/
3. Climate Change Impacts and Adaptation Division (CCIAD) leads the development of collaborative, national and sectoral science assessments that present the latest knowledge on climate change impacts and adaptation for Canadians. Publications available:
nrcan.gc.ca/climate-change/impacts-adaptations/what-adaptation/climate-change-publications/10766
4. (Book) Manitoba and Climate Change: A Primer, by IISD. This book outlines climate change and the factors that contribute to these changes. Opportunities and challenges facing Manitoba are discussed.
iisd.org/library/manitoba-and-climate-change-primer
5. Learn more about how electricity is generated in Manitoba.
hydro.mb.ca/corporate/teachers/

Here are a few examples of activities related to “Economic Development”



1. Land uses and water health activity

In this activity students will critically think about the impacts of various land uses on water health.



2. Bill 17: The Manitoba Environment Amendment Act

This activity is from the Lake Winnipeg: A Resource for Grade 12 Interdisciplinary Topics in Science, and encourages students to role-play how social and economic activities affect the health of Lake Winnipeg.



3. Greenhouse Gas Matchup

This activity helps students to identify what causes greenhouse gases.



You can get more resources at LakeFriendly.ca



6. Lake Winnipeg Regulation: A Closer Look (video). This series examines the history, role, and effects of regulation on Manitoba's largest lake. youtube.com/playlist?list=PLBF4E67A219DEE276
7. Visit the Manitoba Fisheries and Department of Fisheries and Oceans for grade specific fishery related activities. gov.mb.ca/sd/fish_and_wildlife/fish/fisheries_education_sustain_dev/education/edu_level/kindergarten.html
8. Ag in the classroom is a resource for lesson plans, free downloads, interactive websites and much more. aitc.mb.ca

4.3 Cultural Needs, Wants and Values



Many communities in Manitoba struggle to obtain access to clean drinking water and adequate waste water treatment.

Our water usage

The average person needs 30 to 50 litres of fresh water a day for drinking, cooking and sanitation. The average Canadian uses in excess of 300 litres of water a day! Compare this to others in our world who have access to 10 litres of water a day. In countries where water is in shorter supply or where large populations are competing for limited water resources, consumption is much less. Due to our perceived abundance of water, Canadians are the second highest per capita water consumers in the world. In Canadian homes, 30% of daily water use is for flushing the toilet, 35% for baths and showers, 20% for laundry and 5% for cooking/drinking. There are approximately one billion people in the world who do not have safe drinking water and yet we can shower daily, launder our clothes frequently and make lakes and rivers our playgrounds. It is important that we do not take water for granted as without due care, we could lose our wonderful water inheritance.

The availability of clean water

In some Manitoba communities having an adequate quantity of clean water is a major concern. This challenge faces municipalities in Manitoba as providing high quality water at affordable rates is not always possible. For example, small communities may not be able to afford conventional water purification and sewage treatment facilities. Many communities in Manitoba are still without a reliable source of drinking water. Adequate sewage and waste water treatment is also a growing concern as municipal, industrial and agricultural developments push the limits of many existing systems.

Indigenous relationship to water

Indigenous peoples in Canada, First Nations, Métis, and Inuit, have an interrelated connection with water and the land. Many First Nations people tell stories that explain the four elements: fire, water, earth, and air. The sun has heat and light and that was given to the earth upon its creation. Water was given the gift of purity and renewal. The earth was given the gift of healing and growth. The air has wind and from wind we have the gift of sounds and the breath of life itself. We are all related and everything in life is connected and influences everyone and everything around us. Water, earth, air, fire, nature, animals, birds, people: everything is interconnected.

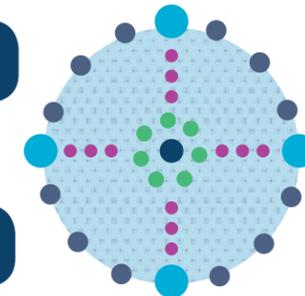
Water, earth, air, fire, nature, animals, birds, people, everything is interconnected.

North, Wind, Winter

South, Earth, Summer

West, Water, Fall

East, Sun, Spring





Fast Facts

- Canadians use twice as much water per capita as Europeans and many times more than people in most parts of the world. By raising awareness of our consumption, by installing low-flow plumbing and by using landscaping that doesn't require much water, we can all make a difference.
- About 20% of Manitobans rely on groundwater for their domestic water needs.
- About 3,400 First Nations homes do not have indoor plumbing and about 100 First Nations communities are under a drinking water advisory.
- In 2013 there were 69 boil water advisories in Manitoba.
- People settled in Manitoba because of the fertile soils and the access to clean water.
- Manitoba has approximately 19 million acres of farm land.



Resources 4.3

1. Social Studies and the Young Learner: Let's Teach Students to Prioritize. Reconsidering "wants" and "needs".
socialstudies.org/publications/ssyl/january-february2010/lets_teach_students_to_prioritize_reconsidering_wants_and_needs
2. Do what matters - Lake Friendly Practices and Actions. An excess of nutrients are harming Lake Winnipeg. These documents discuss ways in which we can help the lake recover.
lakefriendly.ca/act-now
3. Four Directions Teachings
The Seven Grandfathers (Love, Humility, Honesty, Courage, Wisdom, Generosity, and Respect) are traditional teachings given by the Creator to the Ojibwe to achieve harmony. The Ojibwe were taught that the Seven Grandfathers could not be used in isolation. To practice one without the other would amount to practicing the opposite of that teaching.
fourdirectionsteachings.com
4. Integrating First Nations and Métis Content and Perspective (Grade 2 Resource from Prairie School Division, Saskatchewan).
spiritsd.ca/learningresources/
5. Game: "Watershed of the Future" simulates the Lake Winnipeg watershed, including environmental, economic and social impacts of human activities. The Manitoba Museum's science gallery.
ngxinteractive.com/work/manitoba-museum-watershed-of-the-future-simulator/
6. Every year, Walk for Water events are organized to help build awareness about the water issue facing Lake Winnipeg.
lakewinnipegfoundation.org/walk-water

Here are a few examples of activities related to "Cultural Needs and Wants"



1. Money Down the Drain - Project WET 2.0

Through observation and simple calculations, students learn that a dripping faucet wastes a valuable resource.



2. Dealing with Scarcity

Students will work through a scarcity scenario in small groups to learn that certain resources are scarce and they will need to make important decisions every day.



3. Water for Survival

In this activity, students choose a developing country and research its water use comparing that country's water use to Canada's. Have students write a reflection about the differences in the amount of water used in the two countries.



You can get more resources at LakeFriendly.ca



Keeping Water Clean By Being Lake Friendly



Summary:

In Chapter Five, students will learn about the consequences of clean water shortages and ways they can help keep water clean. As Manitobans we have the opportunity to lead by example. Well-informed individuals can become good stewards of the Lake Winnipeg watershed and foster good water management worldwide, now and for the future.



Guiding Questions:

- What are the consequences of a shortage of clean water?
- How does our personal water use affect local water resources?
- How can we improve our relationship with water?

What's the Point?

Students will identify:

- why humans depend on clean water to survive.
- why clean, fresh water is important for the survival of all living things.
- what are the causes of a water shortage.
- how the lack of clean water can affect our environment and its biodiversity.
- what causes pollution.
- ecosystems.

In this lesson, students gain:

- an understanding that every personal decision affects local water resources.
- the knowledge of specific actions that they can take to help the Lake Winnipeg watershed.

This lesson leads to an appreciation of:

- the value of the Lake Winnipeg watershed.
- the positive impacts of personal changes.

5.1 Consequences of Clean Water Shortages



Less than 1% of the global water supply is available as drinking water.

Water on our planet

Water covers over 70% of our planet, and it is easy to assume that it will always be available and plentiful. However, fresh water- the water we drink and use in many ways in our daily lives, is incredibly rare. Three per cent of the world's water is freshwater, but only 1% is actually available for our use because the rest is tucked away in frozen glaciers or is otherwise unavailable.

Many of the water systems that keep ecosystems thriving, and provide fresh water to our growing human population have been put at risk. Many rivers, lakes and underground aquifers are overused or becoming too polluted for use.

Causes of Water Shortage

Water comes from many sources, yet as we overuse and misuse water, the availability of surface water and underground water in the Lake Winnipeg watershed is in jeopardy. The following are causes of water shortages:

Overconsumption

Human population growth in the last 50 years has more than doubled and is accelerating. This rapid growth with accompanying economic and agricultural development and industrialization has transformed how we use water and has increased water consumption. Today, 41% of the world's population lives in watersheds with water quantity issues.

Extreme weather

Climate change is also affecting the amount of water available for our use in the Lake Winnipeg watershed. As carbon dioxide and other greenhouse gases are released into the atmosphere, weather patterns are changing, potentially leading to extreme and unpredictable weather such as droughts and floods. These changes in the weather may lead to uncertain water availability.

Reduction of water quality

If water becomes polluted or otherwise unusable, all life depending on that water source will suffer. Some types of pollution and contamination are extremely difficult, if not impossible, to remove from water. Therefore, prevention of such pollution is of utmost concern.

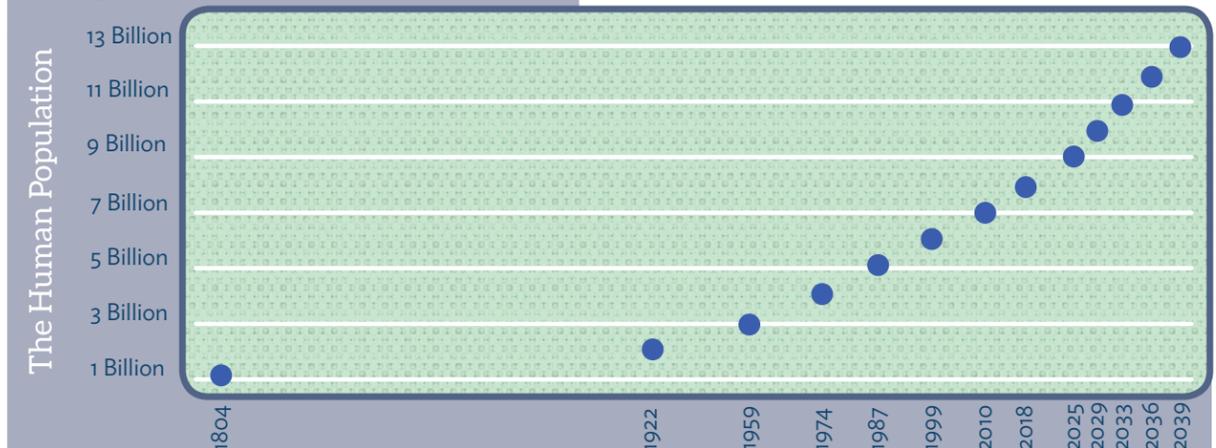
Consequences of the shortage of clean water

With the reduction of fresh, clean water for human use and the threat of water shortages, people will not get enough water to feed crops and livestock. Fish, wildlife and other plant life will begin to die off. This could lead to serious food shortages. The disappearance of fresh, clean water will cause ecological catastrophes on all levels, affecting all living things with dehydration, starvation and disease.

Fast Facts

- Over 1 billion people world wide lack access to clean safe drinking water.

Graph of Human Population Growth



The Year the Human Population Passes Another Billion

Here are a few examples of activities related to "Consequences of Clean Water Shortages"



1. Water Water Anywhere

Students will go through three different stations to experience the effects of water scarcity.



2. Ecosystems around Lake Winnipeg

Have the students identify what types of ecosystems exist around Lake Winnipeg.



You can get more resources at LakeFriendly.ca



Resources 5.1

1. The Ecokids Earth Day Canada website offers numerous resources on water conservation strategies.
ecokids.ca
 2. Resources For Rethinking (Learning for a Sustainable Future) is an online database where educators and the general public can search for resources on issues related to the development of an environmentally, socially, and economically sustainable society.
lsf-1st.ca/en/projects
-  The Lake Friendly website offers articles on the consequences of clean water shortage.
lakefriendly.ca

5.2 Treat All Water as if We Have to Drink it



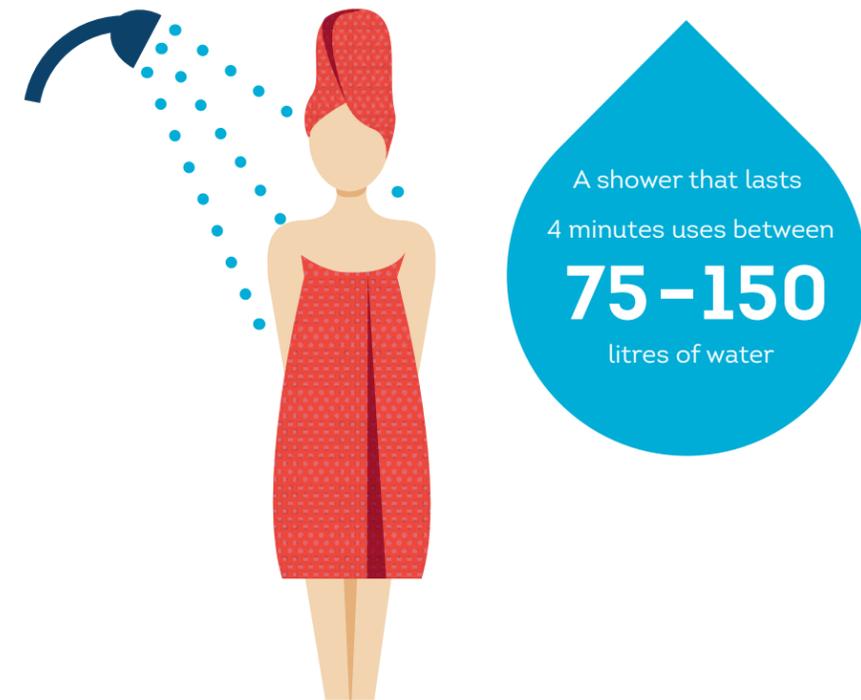
Lake Friendly practices can help us protect our water.

Water and everyday life

All of us use water in our everyday lives. The specific quantity and way we use water varies from person to person. Unfortunately, many people do not realize that their personal water use can have an impact on local water resources in good and bad ways. Water conservation is a tool to assist in meeting the needs of all water uses, including natural ecosystems, humans, agriculture and industries. Conservation itself is not the end goal but rather a means of trying to ensure that all who need water will have enough of it.

Research indicates that many Canadians are not aware of how much water they use and why they need to conserve water. More than half (52%) think, in general, that they are doing enough to conserve fresh water and 80% are confident that Canada has a long term supply of fresh water. Considering that the average Canadian is using at least twice as much water per year as the average European, there is much room for improvement in this area!

When we use water wisely, we ease the burden on waste water treatment plants. Using water wisely means not wasting it and minimizing the amount of contaminants entering our drains. Lake Friendly practices can help us make choices to conserve and protect our precious water resources. Lake Friendly practices can be implemented across all sections of our daily lives. For more information on how you can be Lake Friendly at home, at school, at work, on your farm or in your municipality, visit [Lake Friendly.ca](http://LakeFriendly.ca) "do what matters."





Fast Facts

- Installing water saving toilets and a water saving showerhead, turning off the tap while brushing your teeth and using less water in the garden will help reduce your water footprint.
- Eating less meat, drinking plain water instead of juice and replacing cotton clothes with clothes from artificial fibre can save a lot of water.
- Replacing an 18 litre per flush toilet with an ultra-low volume (ULV) six litre flush model represents a 70% savings in water flushed and will cut indoor water use by about 30%.
- Turning off the shower after soaping up, then turn it back on to rinse cuts down on water use. A four-minute shower uses approximately 75 to 150 litres of water.
- Garburators contribute an unnecessary amount of waste water to waterways, composting is a better choice.
- Rain gardens and rain barrels can reduce runoff water and nutrients from entering storm drains and reduce our water use.
- Buy ecological or Green Seal certified household and personal care products to reduce nutrients entering our waters.

Here are a few examples of activities related to “Treat All Water as if We Have to Drink It”



1. What you do (David Suzuki)

In this activity, student discuss our dependency on water in our day-to-day lives.



2. Turn that faucet off! (David Suzuki)

This take home activity asks students to compare their water usage when brushing their teeth.



You can get more resources at LakeFriendly.ca



Resources 5.2

1. Resources and maps of the world's water consumption.
waterfootprint.org/en/resources/
2. Flushing expired pharmaceuticals in the toilet is extremely harmful to the watershed. To find out where you can bring expired pharmaceuticals as well as used oil, unwanted, empty pesticide containers and other materials for safe and responsible recycling.
simplyrecycle.ca/about/recyclepedia/gov.mb.ca/sd/wastewise/a-z.html
3. Lake Friendly Do What Matters is a set of resources that explains what we can do across all sectors to work towards cleaner water.
lakefriendly.ca/act-now
4. The Manitoba Museum galleries provide a tour of Manitoba from north to south, exploring each biome of the province through immersive dioramas, artifacts, specimens and programming.
manitobamuseum.ca

5.3 Appreciation of Manitoba's Natural Environment



It is estimated that the economic benefits derived from Canadian wetlands are worth more than \$10 billion annually. Yet, most of Canada's wetlands have been eliminated.

What impact will Lake Friendly actions have on Manitoba's natural environment?

With 101,592 square kilometers of water in lakes and rivers, Manitoba has abundant fresh water to keep our environment healthy, our economy strong and our citizens happy. Fresh water is one of Manitoba's major natural resources and our daily actions and choices can harm or benefit the Lake Winnipeg watershed. By practicing Lake Friendly actions, we all can help preserve the health of our watershed for generations to come.

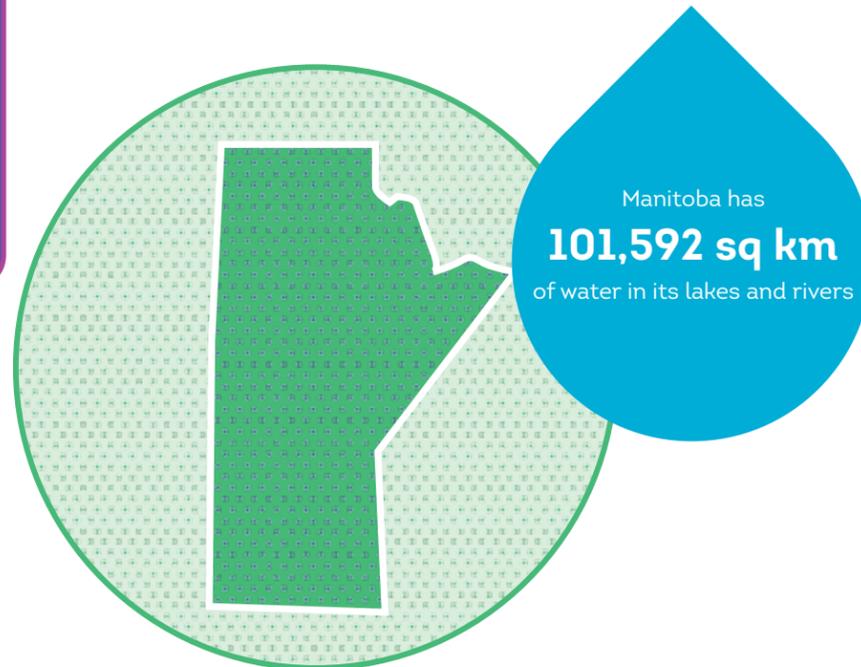
What is the importance of community awareness and involvement to ensure long-term health of our watershed?

Knowing your connection to the watershed you live in and how your daily actions impact both land and water is a first step toward a commitment to action.



What is MCDA?

The Manitoba Conservation Districts Association has recently created over 100 water related projects across Manitoba in an effort to keep water on the land.



Fast Facts

- Canada's rivers and lakes contain enough water to flood the entire country to a depth of more than 2 meters.
- Water represents 1/6 of Manitoba's total area with a total estimated volume of 900 trillion litres.
- Lake Winnipeg is the 10th largest freshwater body in the world.
- It is important to take oil and other chemicals to a hazardous waste management depot for proper disposal.

Here are a few examples of activities related to "Appreciation of Manitoba's Natural Environment"



1. Anatomy of a news article

In this activity, students will deconstruct a news article about Manitoba's natural environment. Students will identify and evaluate the main ideas in a news story and further analyze how details support the main ideas.



2. A toast to water

A fun activity in which students share a 'toast to water,' helping students to appreciate good quality water and its existence.

You can get more resources at LakeFriendly.ca





Resources 5.3

1. Pacific Streamkeepers Federation offers numerous resources for non-profits helping prompt action towards watershed preservation.
pskf.ca
2. The "Caring for our Watersheds" competition encourages youth to take action in their school and/or community. Students are mentored and funding is available to implement the proposed projects.
caringforourwatersheds.com
3. Ducks Unlimited Canada's, "Taking Action, Teacher and Student guide" helps teachers show students that they have the power to initiate change and practice watershed friendly action.
ducks.ca/resources/educators/
4. Manitoba Association of Watersheds supports Manitoba's 14 watershed districts in their efforts to protect Manitoba's soil, water, habitat, and climate.
manitobawatersheds.org/
5. The international Institute for Sustainable Development website includes resources on the wetlands and bioeconomy.
iisd.org/topic/watersheds-and-bioeconomy
6. Manitoba Habitat Heritage Corporation website includes valuable resources on land and water stewardship.
mhhc.mb.ca
7. Forest Stewardship Council website explains where sustainably managed forest products come from.
fsc.org

5.4 A Collective Call to Action



Federal, provincial, municipal and Indigenous governments, as well as private businesses, non-profits and residents all play a role towards establishing a collective call to action.

Who is responsible for managing the Lake Winnipeg watershed?

Water management in Canada is complex. As the Lake Winnipeg watershed is intersected by provincial, international and traditional boundaries, it must be managed on a watershed basis. Federal, provincial, municipal and Indigenous governments, as well as private businesses, non-profits and residents all play a role towards establishing a collective call to action. It is our responsibility to collectively and democratically advocate for change, participate in decision making and take individual action to manage and protect our precious water resources.

A number of significant events in Manitoba have highlighted the need for greater attention to water management in the Lake Winnipeg watershed, including recent flooding and droughts.

Planning for the future, Manitoba's Water Strategy identifies specific policy areas, related to strategies to tackle issues such as: water quality, water conservation, water use and allocation, water supply, flooding, drainage and education.

As we move toward greater coordination and strategies around protecting our water we must all understand and work towards a collective call to action. Although we are all part of the problem, we are also all part of the solution.

Fast Facts

- Everyone plays a role in managing our watersheds- federal, provincial, municipal and Indigenous governments as well as private businesses, non-profits, and residents.
- When purchasing detergents or cleaning products look for "phosphate free" on the label.
- Bufferstrips along waterways help trap sediments and filter nutrients and pesticides by slowing down runoff.
- Participate in municipal planning meetings to voice alternatives to drainage to manage runoff.



Here are a few examples of activities related to “A Collective Call to Action”



1. Water Scarcity

This lesson will help students understand the problem of water scarcity around the globe and understand how they can conserve water.



2. A Watershed Can't Defend Itself

Students will evaluate management techniques for protecting water resources including: litigation, awareness, habitat restoration and monitoring.



3. Are you a water protector or contaminator?

In this activity, students evaluate the role they play in water protection or contamination. Students will actively examine the products they use and processes they follow every day.



You can get more resources at LakeFriendly.ca



Resources 5.4

1. Lake Friendly.
lakefriendly.ca
2. Tapped Out Resources. This resource provides a list of actions students can do to make a difference.
osstf.on.ca/en-CA/resource-centre/curricular-materials-and-classroom-resources/common-threads/projects/tapped-out-world-water-crisis.aspx
3. Manitoba Water Protection Handbook.
gov.mb.ca/sd/pubs/water/lakes-beaches-rivers/water_protection_handbook.pdf
4. Government of Manitoba water quality resources
gov.mb.ca/sd/water/lakes-beaches-rivers/index.html
5. Human Activity and the Environment Stats Canada Reports
150.statcan.gc.ca/n1/en/catalogue/16-201-X
6. Lake Winnipeg Reports. A collection of reports about Lake Winnipeg.
lakewinnipegfoundation.org/lake-winnipeg-reports
7. Growing forward—policy framework.
gov.mb.ca/agriculture/growing-forward-2/about.html



Additional Lake Friendly Resources

4H

4h.mb.ca

An organization that develops innovative community leadership in youth between the ages of 8 and 21. In Manitoba, a partnership between the not-for-profit Manitoba 4-H Council and Manitoba Agriculture, Food and Rural Initiatives (MAFRI). The average age of a Manitoba 4-H member is 12.

Agriculture in the City

aginthecity.ca

A three-day event that offers a chance to explore the vibrant and innovative world of agriculture.

Agriculture in the Classroom

aitc.mb.ca

Their mission is to lead in the development and distribution of accurate, balanced and current information for use as education resources in school curriculum. Their organization will promote the development of critical thinking skills, related to the businesses of agriculture, food, bio-products and life sciences, in all Manitoba students. In coordination with commodity and industry-related organizations, AITC-M's programming, events and services will further develop future decision makers and entrepreneurs.

Envirothon - Manitoba Forestry Association

thinktrees.org/what-we-do/manitoba-envirothon/

For 17 Years the Manitoba Forestry Association has offered the Envirothon as a fun and unique way to learn about the environment and water issues.

Farming 4R Manitoba

fertilizercanada.ca/nutrient-stewardship/4rs-across-canada/manitoba/

The Province of Manitoba, the Canadian Fertilizer Institute (CFI) and Keystone Agriculture Producers (KAP) signed a 4R Nutrient Stewardship memorandum of understanding (MOU) that formalizes a joint commitment to support agriculture production and environmental protection through improved fertilizer use. Manitoba is the first prairie province to complete an arrangement with CFI on nutrient management and adoption/impact measurement.

Lake Winnipeg Foundation

lakewinnipegfoundation.org

The Lake Winnipeg Foundation is an environmental non-governmental organization (ENGO) seeking collaborative solutions to ensure a clean, healthy Lake Winnipeg and watershed now and for future generations. Guided by its Science Advisory Council, LWF works to achieve its goal through research, public education, stewardship and collaboration.

Manitoba Agricultural Museum

ag-museum.mb.ca

Immersing visitors in the past, present and future of prairie lifestyles through innovative and interactive experiences. Collecting, preserving and interpreting prairie heritage for all generations.

Manitoba Agriculture, Food and Rural Initiatives

gov.mb.ca/agriculture

They are dedicated to building a more stable and profitable agriculture and food sector and stronger communities across rural and northern Manitoba. They provide programs and services that support the growth and prosperity of the sector and the local economy.

Manitoba Beef Producers (MBP)

mbbeef.ca

The exclusive voice of the beef industry in Manitoba.

Manitoba Pork Council

manitobapork.com

They are committed to creating and fostering strong community links, to positively impact the communities in which we live, work and play.

Manitoba Eco Network

mbeconetwork.org

Facilitates environmental awareness and expands community connections by connecting Manitobans and providing environmental information and education.

Manitoba Habitat Heritage Corporation

mhhc.mb.ca

The Manitoba Habitat Heritage Corporation is a non-profit Crown Corporation, to the Minister of Conservation and Water Stewardship. They work in partnership with public and private agencies and organizations, and private landowners, to conserve, restore and enhance fish and wildlife habitat in Manitoba.

The Manitoba Museum

manitobamuseum.ca

The Manitoba Museum includes the Museum Galleries, Planetarium and Science Gallery, and offers on-site programs on a wide variety of curriculum areas. "Lake Winnipeg: Shared Solutions" is an interactive exhibit on the Lake Winnipeg watershed that opens in spring 2014. This exhibit features a science-based simulation of the watershed which allows students to make decisions on water stewardship and see the results of the choices, as well as a live fish tank, a historical overview of the watershed, and an action station which allows people to do their part to help Lake Winnipeg.

Nutrients for Life Foundation

nutrientsforlife.ca

Nutrients for Life is dedicated to bringing education resources to help teachers educate youth on a variety of important topics regarding sustainability and modern agriculture.

Resources 4 Rethinking

resources4rethinking.ca/en/

R4R.ca provides immediate access to more than 1000 quality classroom resources. Developed by Learning for a Sustainable Future, R4R.ca connects teachers to lesson plans, books, videos and other materials that explore the environmental, social and economic dimensions of important issues and events unfolding in our world today. R4R resources have been reviewed by experienced classroom teachers and matched to relevant curriculum outcomes for each province and territory.



Field Trips and Speakers

*Contact Information may no longer be accurate, see websites for more details

Manitoba Association of Watersheds

The Manitoba Association of Watersheds supports Manitoba's 14 watershed districts in their efforts to protect Manitoba's soil, water, habitat, and climate. Staff can provide information for their specific watershed and are available to provide presentations to schools and community groups. For more information: manitobawatersheds.org/contact

East Interlake Watershed District

Helps organize presentations, workshops, or bus tours for classrooms, councils and environmental groups. Contact them at (204) 642-7578 or visit eastinterlake.ca/

FortWhyte Alive

Recognizes that teaching the students of today the importance of maintaining thriving ecosystems, reducing pollution and protecting habitats will help ensure a healthy planet for the future. FortWhyte Alive offers a range of field trip activities to help meet your curriculum needs, fortwhyte.org/educators/school-programs/

IISD

The Staff at IISD offer presentations on numerous topics for adult and professional audiences. Although their work is most relevant to a policy or programming audience, they make presentations to community groups as well. Topics can include watershed management, Lake Winnipeg management and ecosystem goods and services. iisd.org/

Lake Winnipeg Foundation

The Lake Winnipeg Foundation is an environmental non-governmental organization (ENGO) seeking collaborative solutions to ensure a clean, healthy Lake Winnipeg and watershed now and for future generations. Guided by its Science Advisory Council, LWF works to achieve its goal through research, public education, stewardship and collaboration. It provides subsidies for school field trips, and also offers presentations to schools and community groups. **Contact: (204) 956 - 0436, lakewinnipegfoundation.org**

The Lake Winnipeg Research Consortium

Offers a unique Lake Ecology Field Program to grades 8 to 12 on board the research vessel the M.V. Namao in Gimli, in the spring and fall. Besides transportation, there is no cost. Contact Dr. Karen Scott at kjs@lakewinnipegresearch.org

The Canadian Parks and Wilderness Society – Manitoba Chapter

It is believed that protecting the rivers on the east side of Lake Winnipeg will help the overall health of Lake Winnipeg. Presentations on protecting east side rivers as a key to saving Lake Winnipeg can be arranged by contacting info@cpawsmb.org

The Manitoba Museum

"Lake Winnipeg: Shared Solutions" is an interactive exhibit on the Lake Winnipeg watershed that opens in spring 2014. This exhibit features a science-based simulation of the watershed which allows students to make decisions on water stewardship and see the results of the choices, as well as a live fish tank, a historical overview of the watershed, and an action station which allows people to do their part to help Lake Winnipeg. Contact: (204) 956-2830 manitobamuseum.ca

Manitoba Wildlands

Topics include water and climate change, water and energy, water and species, or water and forests. Call (204) 947-3076, info@manitobawildlands.org

The Mixedwood Forest Society

Offers presentations on how ecosystem protection is key to help preserve water quality: (204) 475-9608, lindy@frozen.ca

The Oak Hammock Marsh Interpretive Centre

Provides on site programming and can send an interpreter to your school to deliver theme programming. ohmic@ducks.ca oakhammockmarsh.ca

Available Grants

* May no longer be accurate, see websites for more details

Manitoba Grants for Education for Sustainable Development 2020

Manitoba Education and Manitoba Hydro continue to offer Education for Sustainable Development (ESD) Grants to promote sustainability in classrooms. Manitoba Education and Manitoba Hydro want to support schools in which educators work together to plan and teach ESD. The grants will provide up to \$2,000 to cover expenses, such as teacher release time, professional development, and teaching/learning resources for sustainability education. Manitoba Education staff will also provide grant recipients with planning support. edu.gov.mb.ca/k12/esd/grant/esd_20.html#grants

Lake Winnipeg Foundation (LWF)

The Lake Winnipeg Foundation is an environmental non-governmental organization (ENGO) seeking collaborative solutions to ensure a clean, healthy Lake Winnipeg and watershed now and for future generations. Guided by its Science Advisory Council, LWF works to achieve its goal through research, public education, stewardship and collaboration. It provides grants to community projects that address one of the eight key actions to reduce nutrient loading to the lake as identified in the Lake Winnipeg Health Plan. **Contact: (204) 956 - 0436 lakewinnipegfoundation.org/lwf-grants**

EcoLeague

EcoLeague is a youth empowerment program that challenges and motivates students across the country to help save the planet through community and school-based environmental action projects. Up to \$400 in funding is available per school for an Action Project. EcoLeague is a project of Learning for a Sustainable Future. lsf-lst.ca/en/projects/teacher-resources/action-project-funding

Caring for Our Watersheds

The Caring for our Watersheds program is sponsored by Agrium. Students are asked to think about their watersheds and how they can protect this most essential asset. Finding solutions is critical, and helping to lead the effort is everyone's obligation. caringforourwatersheds.com/contests/

ImagineAction - social action and environmental projects for K-12

ImagineAction offers teacher funding, resources and expert help for school-community action projects tied to the ImagineAction themes. imagine-action.ca/

WWF Canada - Go Wild School Grants Program

WWF-Canada will grant \$600,000 over three years, up to \$200,000 a year, to Canadian elementary and secondary schools. The grants will help reduce a community's impact on the environment, increase understanding of environmental issues and solutions, stimulate environmental leadership, and inspire students and communities to take action. wwf.ca/take-action/apply-for-funding/go-wild-school-grants/

Evergreen Foundation – School Ground Greening

Grants available - find out which grant program is right for your project. evergreen.ca/our-projects/school-board-collaborations-services/



Lake Friendly Books & Publications

Alice Chambers Memorial Library, Resource Centre

The Manitoba Eco Network operates the Alice Chambers Memorial Library, Resource Centre. The library is full of environmental resources in the form of books, reports, magazines, journals and DVD's. All material is available for free loan to the public.

"Clean Water Guide"

Manitoba's "Clean Water Guide" is an interactive online document providing information on how water moves through Manitoba.

digitalcollection.gov.mb.ca/awweb/pdfopener?smd=1&did=10653&md=1

"Discover a Watershed: The Watershed Manager Educators Guide DOWNLOAD"

This downloadable guide contains 19 science-based, multidisciplinary activities that teach what a watershed is, how it works and why we must all consider ourselves watershed managers. An extensive background section introduces readers to fundamental watershed concepts. Each activity adapts to local watersheds, contains e-links for further Internet research and is correlated to national science standards. store.projectwet.org/downloadable-water-activities/watershed-manager-educators-guide-download.html

"Dry spring: the coming water crisis of North America"

This is a publication by Chris Wood. As global warming heats up, our world is running out of fresh water – fast. Lakes, aquifers and rivers are disappearing but we consume more water than ever. What will this mean for North Americans? Dry Spring shows dramatically how water loss will devastate countless communities over the next 25 years, challenging some of our fastest growing regions – the arid plains of Western Canada, the cross-border Great Lakes Basin and the American Southwest. While unprecedented dryness afflicts these areas, violently wet storms will pummel many others. Wood concludes with inspiring examples of choices we can make that will help preserve our water for future generations.

"Healthy Water Healthy People Water Quality Educators Guide"

This 200-page activity guide for educators of students in grades six through university level raises the awareness and understanding of water quality issues and their relationship to personal, public and environmental health. Healthy Water Healthy People Water Quality Educators Guide will help educators address science standards through 25 original, interactive activities that link priority water quality topics to real-life experiences of educators and students. store.projectwet.org/healthy-water-healthy-people-kids-activity-booklet-download.html

"Eau Canada: the future of Canada's water"

This piece, edited by Bakker, Karen. Eau Canada assembles the country's top water experts to discuss our most pressing water issues. Perspectives from a broad range of thinkers; geographers, environmental lawyers, former government officials, aquatic and political scientists and economists – reflect the diversity of concerns in water management. Arguing that weak governance is at the heart of Canada's water problems, this timely book identifies our key failings, explores debates over jurisdiction, transboundary waters, exports and privatization and maps out solutions for protecting our most important resource.

ubcpres.ca/eau-canada

"Lake Winnipeg Water Stewardship: A Resource for Grade 8 Science"

The "Lake Winnipeg Water Stewardship: A Resource for Grade 8 Science" is designed to give a Lake Winnipeg focus to the Grade Eight Science water systems cluster. It provides context for which students can deepen their understandings about water systems and concepts related to sustainable development through a focused inquiry into Lake Winnipeg. The resource is available for free online at:

edu.gov.mb.ca/k12/esd/water/index.html

"Lake Winnipeg - A Resource for Grade 12 Interdisciplinary Topics in Science"

The "Lake Winnipeg - A Resource for Grade 12 Interdisciplinary Topics in Science" resource is designed to provide information to expose students through science investigations and problem-based approaches to learning of issues associated with Lake Winnipeg. It is available for free online at: edu.gov.mb.ca/k12/esd/lake_wpg/index.html

Project WET

Project WET (Water Education for Teachers) publications, training workshops and community events, teaches about worldwide water education. The centerpiece of Project WET is the "Project WET Curriculum and Activity Guide 2.0" containing 64 multidisciplinary water-related activities for students from Kindergarten through Grade 12.

projectwet.org/

Red River Basin Water Systems- Grade Eight Science supplementary Curriculum Guide for Teachers

Teachers wishing to use the Red River Basin to teach the water systems unit will benefit from this package. It coordinates a variety of information, such as local resources, and provides a wealth of background information and new ideas.

tourondcreekdiscovery.ca/

"Saving Lake Winnipeg, Robert William Sandford"

Internationally respected water analyst Robert Sandford speaks on behalf of the Central Great Plains in order to convince government, industry and society that drastic change is needed if we are to avoid similar troubles from plaguing other bodies of water throughout North America.

"Go With The Flow: Teaching and Taking Action for a Healthier Watershed"

This is a resource for teaching students from kindergarten to grade 12 how the planning, design, land use and stewardship of our school grounds impact the flow and quality of water through our local watersheds.

evergreen.ca/downloads/pdfs/GoWithTheFlow-StormwaterGuide.pdf

"Watersheds A Practical for Healthy Water"

Watersheds: A Practical Handbook for Healthy Water provides a fascinating overview of the fundamentals of ecology from the simple concept of a watershed to the biological intricacies of a wetland ecosystem and its implications on the environment. More than 100 illustrations, especially done for this book, help explain the numerous environmental issues and the intricate web of life that connect each of us to all other life on the planet through our involvement in the watershed cycle.

"Water Stewardship: A 30 day program to protect and conserve our water resources"

A publication by Gershon, David offers a common-sense approach to environmentalism in a program format accessible to any age group. Based on voluntary change and community support, these steps give neighbourhoods what they need to change the ingrained habits of how they use resources.

"WOW! The Wonders of Wetlands; An Educators Guide by: Environmental Concerns Inc. and The Watercourse"

This comprehensive guide is for anyone teaching about wetlands; it features 70 pages of background material in six chapters followed by more than 40 cross-referenced activities.



Lake Friendly Online Videos

Lake Friendly YouTube Page

Lake Friendly has an assorted videos related to freshwater in Manitoba.

youtube.com/user/lakefriendly

Good Transparency: Water Conservation

This short video (1:44 min) shows how to save water during our daily activities—such as washing and eating.

youtube.com/watch?v=GOLf2RbxmzE. No narration, just music and text.

GOOD: Drinking Water

In this 2:53 minute video, cartoons discuss causes and physical dangers of unsafe and contaminated water and the social and societal effects of unsafe drinking water.

youtube.com/watch?v=_R_upNQ0fJc&feature=channel

Sesame Street: Water Conservation

A 0:45 second cartoon from Sesame Street about conserving water in the home (brushing teeth).

youtube.com/watch?v=gtcZbNOZ08c

The Water Conservation Song

In this video, a group of grade five girls sing about the many ways to conserve water in daily activities.

youtube.com/watch?v=VHkozZYAIWo

Water Conservation tips: How to Conserve Water at Home

This is an excellent overview of ways to reduce water usage in the bathroom and outdoors, and covers devices that can be installed as well as non-monetary ways to reduce water consumption.

youtube.com/watch?v=4MDLpVHY8LE

Rain Barrel

This video highlights how rain barrels can help our watershed.

youtube.com/watch?v=HamURhj_S3E

Natural and Healthy Lawn Care

Improper lawn care can add excess nutrients to our watershed. This video highlights how to convert to and maintain an organic lawn.

youtube.com/watch?v=xtzGJjSjMs

Rain Garden PSA

In this seven minute video, the definition of a rain garden, benefits of a rain garden and how to construct a rain garden are explored.

youtube.com/watch?v=6Y_-nP4bFns

Get Your Lawn Off Grass

In this video, Professor Bill Freedman explains the environmental and aesthetic benefits to his grass-free lawn, made up entirely of native species in the heart of Halifax.

youtube.com/watch?v=8wW44JfaX0Q non grass front yards

Why Water Matters to Canadians

Fresh water is central to Canadian culture and identity. This short video shows why water matters to Canadians, from essential uses such as drinking and bathing, to recreational activities.

youtube.com/watch?v=9PJ5FxP0O6w

