FortWhyte Alive
HUMAN. NATURE.

BLUE PLANET

Grade 8
2 Hours

Thank you for booking our “Blue Planet” program at FortWhyte Alive. This program is designed to help your students learn about water. Students will have the opportunity to sample water quality, hike through a watershed, assess various methods of water purification, and consider water conservation strategies locally and globally.

Appropriate Dress for Your Field Trip

To ensure that students get the most out of their FortWhyte experience, we ask that they be appropriately dressed for a 2-hour outdoor excursion. All of our programs include time outdoors, regardless of weather. Comfort and safety are key in making this an enjoyable and memorable experience.

Suggestions for Outdoor Dress

Layering of clothing is very important in maintaining body temperature and in remaining dry. Four thin garments may offer the same degree of warmth as one thick overcoat, but the four layers allow much greater flexibility. Layers can be shed or added as temperature, wind, exertion, or other variables dictate.

Waterproof outer layers are also important. Rain may get us wet but so will dew on grass, melting snow on pants and puddles in the spring. Boots in the winter are always important to keep moisture out and heat in.

***Please share this information with other teachers that are coming to FWA with your group.**

GOAL

To gain an understanding of water on a global scale, both in nature and in the lives of humans.

OBJECTIVES

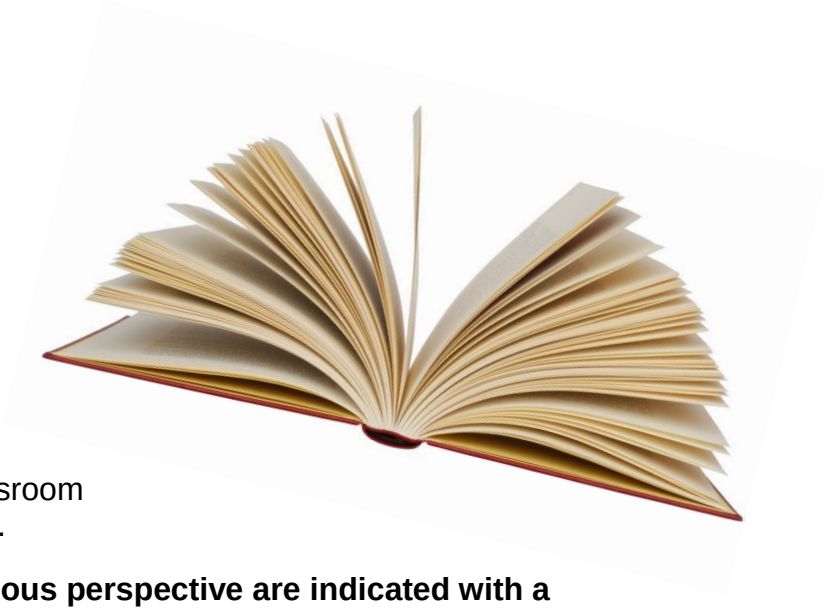
Students will:

1. Learn about the hydrologic (water) cycle, and observe how water moves through a watershed.
2. Evaluate ways of treating water for drinking.
3. Recognize the limitations of water resources on Earth.
4. Identify some causes of water pollution and the impact of invasive species.
5. Make a plan to take some simple actions to conserve water in their lives.

VOCABULARY

Chlorination:	The process of adding chlorine to purify water for drinking.
Condensation:	The process by which a gas or vapour changes to a liquid.
Deposition:	Occurs when sediment falls into a wetland from fast moving water as the water slows.
Erosion:	The wearing away of the earth's surface by water or wind action.
Evaporation:	The process by which a liquid changes into a gas or vapour.
Filtration:	A physical process for cleaning water by passing it through filters.
Gas (vapour):	The state of matter distinguished by low density, great expansion and contraction with changes in pressure and temperature, the ability to diffuse readily, and the spontaneous tendency to become distributed uniformly throughout any container.
Hydrologic (water) cycle:	The cycle of evaporation and condensation that controls the distribution of Earth's water as it evaporates from bodies of water, condenses, precipitates, and returns to those bodies of water.
Invasive Species:	Invasive species are organisms that have been introduced, on purpose or by accident, into new location outside their region of origin. The introduction of a new species is usually due to human activity, but sometimes an invasive species can out-compete and even replace native species.
Liquid:	The state of matter in which a substance exhibits a characteristic readiness to flow, little or no tendency to disperse, and relatively high incompressibility.
Percolation:	The downward movement of water through openings in the soil to replenish aquifers underground.
Precipitation:	Any form of water, such as rain, snow, sleet or hail that falls to the earth's surface.
Solid:	A substance having a definite shape and volume that does not flow readily from one container to another.
Transpiration:	Transpiration is the process by which moisture is carried through plants from roots to small pores on the underside of leaves, where it changes to vapor and is released to the atmosphere. Transpiration is essentially evaporation of water from plant leaves.
Watershed:	The land area that drains water into a stream, river or lake.

LITERATURE CONNECTIONS



All of the books listed below relate to the theme of water, are recommended for young adult readers, and are available through the Winnipeg Public Libraries and/or the Manitoba Education Instructional Resources Library. You may wish to make these titles available in your classroom surrounding your 'Blue Planet' field trip.

Books and activities with an Indigenous perspective are indicated with a medicine wheel.

Fiction

> **Dead Water Zone** by Kenneth Oppel
> **A Long Walk to Water** by Linda Sue Park
> **Song of the Water Boatman** by Joyce Sidman
> **Flush** by Carl Hiaasen
> **Paddle-to-the-Sea** by Clancy Holling

Non-Fiction

> **One Well: The Story of Water on Earth** by Rochelle Strauss
> **All the Water in the World** by George Ella Lyon
> **Running Dry: The Global Water Crisis** by Stuart A. Kallen
> **Power Struggles: Hydro Development and First Nations in Manitoba and Quebec** by Martin Thibault and Steven Hoffman
> **Bottlemania: How Water Went on Sale and Why We Bought It** by Elizabeth Royte
> **Flush!: Treating Wastewater** by Karen Coombs
> **The Manitoba Clean Water Guide** (e-text available through Manitoba Education Library)
> **Liquid to Gas and Back** by J.M. Patten
> **Drinking Water (dvd)** by New Dimensions Media (Manitoba Education Library)
> **When the Rivers Run Dry** by Fred Pearce
> **The Nature of Things: Save My Lake (DVD)** by David Suzuki

PRE-VISIT ACTIVITIES

WAYS OF THE WATER CYCLE (2 lessons)

Science

Students first learn about the hydrologic cycle (water cycle) in elementary school. The concept that there is a finite amount of water cycling through various states of matter on our planet should be familiar to your students. In Grade Eight, however, students have the opportunity to revisit the hydrologic cycle in greater depth. Listed below are some ideas for introducing students to new vocabulary and water cycle concepts:

- The link below is a hands-on simulation where students become water molecules and record patterns within the hydrologic cycle as they move from station to station. Other than dice, all materials can be downloaded: **http://www.srh.noaa.gov/jetstream/atmos/ll_whatacycle.htm**
- The words *percolation* and *transpiration* will likely be new to students (see vocabulary list). Discuss how the process of percolation filters water and how transpiration is possible due to water's polarity (water molecules are "sticky" and pull each other upwards through plants even against gravity).
- Canada possesses 20% of the world's fresh water, 9% of which is available for human use. How do Canada's water bodies impact weather systems across the continent of North America? Does all of Canada's water consistently stay within Canada? How does our treatment of water as Canadians impact the global water cycle and water conservation worldwide?

WHOSE WATERSHED IS THIS? (1-3 lessons)

Science/Social Studies/Visual Art

Explore the concept of watersheds with your students. A watershed is the land area that drains water into a particular body of water. A watershed can be very small or very large. Ultimately, a watershed is defined by the highest ridges of land surrounding a water body. In mountainous regions, watersheds include the area from mountain peaks right down to the valley where lakes and rivers are found. On the prairies, watersheds are less dramatic but are still defined by the movement of water from higher to lower elevation.

To demonstrate a watershed take your class outside and make a mountain of student backpacks. Cover the backpacks with a plastic tarp and notice the natural hills and valleys that are created. Have students predict where water will flow and then pour a bucket of water over the backpack mountain. How many different small watersheds can students identify? Where does all of the water end up?

Explore the area around your school and look for evidence of where water flows when it rains. Where will the water from the schoolyard end up? Winnipeg's surface water flows toward the Red River and then towards Lake Winnipeg. Examine watershed maps to locate which watershed your school falls into.

> Canadian watersheds
> **https://ec.gc.ca/eaudouce-freshwater/default.asp?lang=en&n=D72B6AF9-1**

> Manitoba's watersheds
> **http://www.gov.mb.ca/mit/floodinfo/floodoutlook/watersheds_data_maps.html**

> Lake Winnipeg Watershed
> **http://www.canadiangeographic.com/educational_products/tiled_map_lake_winnipeg_watershed.asp**

Using one piece of paper for each student in your class, create a meandering "river" that runs through each piece of paper. This can be accomplished by lining up the papers side by side and drawing two parallel lines across them. Include curves to make each section of river unique. Tell each student that they have just purchased a stretch of riverbank and can do whatever they like with it. Encourage students to draw their vision of how they would like to develop their riverbank (e.g. a house, a factory, a nature preserve, an amusement park, etc.). Once students have completed their drawings have them attach the complete river back together. Does any one person actually own a river? Discuss how the choices of people all throughout a watershed can impact each other. Lake Winnipeg's watershed is home to over 7 million people and over 20 million livestock. Lead a class discussion about the significance of protecting watersheds.

WATER: A CHEMICAL ATTRACTION

Science

At a molecular level, water is composed of two Hydrogen atoms and one Oxygen atom. Visit **http://imnh.isu.edu/digitalatlas/hydr/basics/main/chmtxt.htm** for student-friendly information on water's chemical composition and properties including pH, the fact that water is a universal solvent, its polarity, conductivity, and physical properties.

You can also access FortWhyte's *Liquid Assets* newsletter archives with a wealth of water information and activity ideas at:
https://www.fortwhyte.org/foreducators/teacherpd/slowtheflow/

Test your school's water quality or head out into your community to test water quality in a variety of natural and man-made locations such as ditches, ponds, or wetlands. FortWhyte Alive and South Central Eco Institute offer Riverwatch, a program that provides equipment and guidance monitoring water quality within Manitoba. Visit **www.fortwhyte.org/watermonitoring** for more information. You can also Order a water testing kit from a laboratory supplier. In Canada, Boreal Laboratories provides several options for ordering water quality testing kits (search **www.boreal.com** for "water monitoring kits").

INVADERS

Science

During the Blue Planet program at FortWhyte, students will discuss the impact of the growing invasion of zebra mussels on the Lake Winnipeg ecosystem.

Learn more about the invasive species that currently call Manitoba home by visiting the Invasive Species Council of Manitoba at **http://invasivespeciesmanitoba.com/site/**. You can also learn more about zebra mussels specifically at **http://www.gov.mb.ca/stopthespread/ais/index.html**.

Using the resources available, ask students to create a "Not Wanted" advertisement, in the style of the Wild West, about a Manitoba invasive species of choice. They should include the name of the species, an illustration or photograph, where it originated, where it is now found, how it spreads and how it is impacting the ecosystem.

While Common Carp already impact Manitoba waterways, just south of the US border, the Silver Carp are also pushing their way in our direction. This free online game can help to teach students about the impact of Silver Carp in a fun way. Visit **https://educators.brainpop.com/lesson-plan/invasive-species-lesson-plan-the-invasion-game/**

More lesson ideas are available in FortWhyte's Liquid Assets Invasive Species issue at **https://www.fortwhyte.org/wp-content/uploads/2014/08/SlowTheFlow-LiquidAssets-Fall-2016.pdf**.

WATER TEACHINGS (1-3 lessons)

Social Studies

The four elements, including water, are included in the teachings of the Medicine Wheel. Water is a sacred, integral, and life-giving force afforded the utmost respect in First Nations culture. Water is part of all ceremonies and women are its keepers. To learn more about traditional Indigenous perspectives on water visit the following sites. Invite an elder to your classroom or participate in a First Nations event or ceremony:

> Aboriginal Women, Water and Health: Reflections from Eleven First Nations, Inuit, and Métis Grandmothers: **http://www.onwa.ca/upload/documents/womenandwater.pdf**

> Lake Winnipeg Water Walk: **http://lakewinnipegwaterwalk.ca/a-personal-statement-to-help-you-understand-my-passion-katherine-morrisseau-sinclair/**

> Mother Earth Water Walks: **http://www.motherearthwaterwalk.com/?page_id=11**

POST-VISIT ACTIVITIES

YOUR LIFE WITHOUT WATER

Science/Social Studies

How many ways do your students use water every day? Some uses, like drinking, bathing, and cooking, are obvious. But there are many ways that we rely on water that are not as evident. Encourage students to think about how water is used in processes like food and clothing production, resource extraction, and manufacturing. How does Canada's water footprint measure up to that of other countries? What can students do to reduce their personal water consumption or get involved in water conservation? Visit the links below to find out!

> Water Footprint Calculator (National, Product, and Personal): **http://environment.nationalgeographic.com/environment/freshwater/change-the-course/water-footprint-calculator/#**

> **Slow the Flow** is a free, local water conservation curriculum enrichment program, created by the City of Winnipeg Water and Waste Department and FortWhyte Alive. The program offers curriculum-linked lesson plans, in-class and take-home activities, PowerPoint presentations to introduce lesson concepts, and much more. Contact **slowtheflow@fortwhyte.org** to receive a free copy. Visit **www.fortwhyte.org/slowtheflow** to learn more.

> **Yellow Fish Road** is Yellow Fish Road™ offers free classroom presentations to schools about water quality and stormwater pollution prevention in the City of Winnipeg. These fun, interactive, inquiry based, water education programs link to curriculum. A culminating action project involves storm drain painting, a way for students to raise awareness in their community about pollution entering local waterbodies through stormdrains. To book a presentation or inquire about completing a stormdrain painting project with your students, please contact **winnipegyfr@tucanada.org**. For more information, visit **https://www.fortwhyte.org/foreducators/teacherpd/yellowfishroad/**

WOULD YOU DRINK IT?

Science/Math

In the program Blue Planet students are introduced to four methods of water purification—iodization, chlorination, ceramic filtration, and a basic filtration kit. Water that appears clear and clean is not necessarily always the healthiest for human consumption. Likewise, water that has been purified for humans is not always the healthiest for plants or animals. So what does it take to make water drinkable?

> Visit **http://water.epa.gov/learn/kids/drinkingwater/watertreatmentplant_index.cfm** for a student-friendly introduction to common practices for drinking water purification.

> Visit **http://www.winnipeg.ca/waterandwaste/water/treatment/plant.stm** for a detailed description of Winnipeg's water treatment process and a wealth of other information about Winnipeg's drinking water.

What other methods of water treatment are used around the globe and which countries/regions lack access to clean drinking water? Desalination technology is a growing field which allows fresh water to be made from salt water.

> Read about Israel's latest desalination technology at **http://www.water-technology.net/projects/sorek-desalination-plant/**

Do you know how many people on our planet lack access to clean drinking water and sanitation? In many parts of the world plumbing is not standard and water must be carried from source to home.

> Visit **http://water.org/water-crisis/water-facts/water/** for student-friendly facts and information on global water access.

> Use the following activity to have students experiment with carrying different quantities of water and estimate what each quantity could be used for **http://www.globaleducation.edu.au/teaching-activity/we-all-need-water-mp.html#activity1**

WATER ISSUES IN MANITOBA, CANADA, AND THE WORLD

Science/Language Arts

Water continues to be at the core of political, environmental, and humanitarian issues close to home and all around the globe. Encourage students to research one of the issues below.

Links are provided as simple jumping-off points:

- United Nations Water: **http://www.unwater.org/**
- Assembly of First Nations Water Policy: **http://www.afn.ca/index.php/en/honoring-water**
- Lake Winnipeg Foundation: **http://www.lakewinnipegfoundation.org/**
- Manitoba Flooding Information: **http://www.gov.mb.ca/flooding/fighting/**
- Manitoba Hydroelectric Station sites: **https://www.hydro.mb.ca/corporate/facilities/hydraulic_stations.shtml**

EXTENDING WATER ACROSS THE CURRICULUM

Science/Social Studies/Visual Arts/Math/Language Arts

Water is a theme that lends itself well to cross-curricular planning. Here are some jumping off points that can help extend learning about water throughout the curriculum.

- Create watercolour artwork, have students plan a school-wide water festival, or design math problems based on water consumption.
- Invite in guest speakers to talk about water science, connect to Manitoba's history through our historic waterways, or increase your students' outdoor skills with a paddling course.
- Our bodies are composed 70% of water and science has shown that proper hydration improves brain functioning. Encourage students to drink water, conserve water, and appreciate water in all areas of their lives!