



SCIENCE  
**SPOTLIGHT**

**NATURE'S FUNNEL:  
WATERSHEDS**

This project was taken with the financial support of the Government of Canada.



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# Nature's Funnel: Watersheds

## Origin Story: WHERE DO SNOW MELTS AND RAINFALLS DRAIN?

It has been raining heavily on a gloomy Saturday afternoon. Have you ever wondered: where does all the rainwater go? Maybe you thought of a huge funnel that could drain all the water into one spot. This is what a **watershed** is. A watershed is a region or area of land that drains water through rivers and streams into a body of water such as a lake or the ocean. Aside from rainfall, snow melting in the spring also drains into a watershed.

Protecting the animals and plants that live in the watersheds is important. This is what **watershed management** is all about. It includes processes that protect the land, forest and water resources that are being used - for example, reducing the pesticides and fertilizers that can run off into nearby bodies of water.

## How Does Climate Change Affect LAKE WINNIPEG?

For many years now, climate change has been impacting watersheds all over the world. Canada's Lake Winnipeg watershed is a good illustration of this. Located in central Manitoba, Lake Winnipeg is the largest lake in Manitoba, and the second largest watershed in Canada with an area of almost **one million square kilometres**, or forty times the size of the lake itself! Can you imagine how many species of plants, animals, insects and birds live here?!

But did you know that Lake Winnipeg is considered the 'most threatened lake' of the world's great lakes? This is mainly because of something called **eutrophication**. Eutrophication is the process in which a water body, like lakes and rivers, gets overloaded with **nutrients**, such as phosphorus and nitrogen. This leads to overproduction of algae and plankton, which consume oxygen from the water. Eutrophication in Lake Winnipeg is a critical environmental problem, as it leads to poor water quality and it negatively impacts the amount of oxygen available for aquatic species to survive. Eutrophic waters are susceptible to becoming a "**dead zone**", as it eventually becomes incapable of supporting life.

So, how does climate change contribute to this problem?

First, let's talk about where the extra nutrients come from. Humans are the common link, both through industrial and residential **sewage run-off** from cities and towns, and agricultural run-offs of **pesticides** and **fertilizers**. Run-offs happen when nutrients or chemicals from those sources get channeled naturally or artificially into the water system.



Dale Wrubleski, Pascal Badiou, and Gordon Goldsborough, Coastal Wetlands of Manitoba's Great Lakes (Canada) (The Wetland Book, 2018), 594, fig. 2.

This is the main problem of the excess nitrogen and phosphate that ends up in the lake, feeds into algae, and results in excessive growth called **algal blooms**. The image above shows how residential development threatens the ecological integrity of coastal wetlands on Lake Winnipeg.

This is where climate change comes in. Changes in climate affect precipitation patterns and river flows, which then influence the nutrients in a watershed, just like in Lake Winnipeg. As the temperature continues to rise, the ability of the lake to hold **dissolved oxygen** decreases. In addition, the more intense storms and the more ice melting we experience, the more **flooding** there will be. Floods wash off agriculture and livestock pesticides and fertilizers or overload sewage systems. The excess ends up in lakes, causing algal blooms. As the population of algae continues to increase, there is less and less oxygen available for other animals and plants to live, and this could result in the lake becoming a dead zone.

Balance is key. Having too many nutrients is detrimental to the health of Lake Winnipeg. In 2007, the Province of Manitoba and the Government of Canada launched the **Lake Winnipeg Basin Initiative** program that aims to address the challenges affecting the health of Lake Winnipeg. Since then, multiple projects have been funded to help resolve the issues. For example, programs such as the Indigenous Engagement in the Lake Winnipeg Basin to Build Watershed Resilience, and Restoring Wetlands with **Indigenous Communities** and Landowners within Lake Winnipeg Basin are projects that focus on supporting collaborative efforts between Indigenous communities and watershed organizations to restore watersheds and expand on previous research about Manitoba's Great Lakes.

# Time for **GENACTION!**

## Try This at Home: **HANDS-ON, MINDS-ON!**

Doing a hands-on, minds-on experiment is helpful when understanding science concepts. Try creating your own watershed model at home!

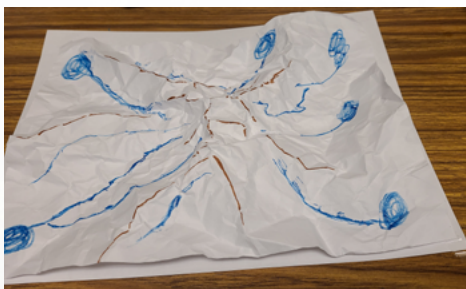
### You will need:

- two pieces of printer paper
- one blue washable marker
- one brown or red washable marker
- spray bottle with water (alternative: a cup of water)
- tape

### Steps:

1. Crumple one sheet of paper into a ball.
2. Gently unfold your crumpled ball on top of the other sheet without unfolding all the wrinkles. Tape the corners of your crumpled paper to the other paper. Note: you want to unfold your paper where it has high points and ridge lines - like a valley or a mountain.
3. Using the blue marker, start tracing the lines where your water would flow, starting uphill, and then circling your marker at the bottom, creating a lake.
4. Using your other marker, trace the ridge lines on your paper.
5. Spray or sprinkle water into the paper and see how the water flows! Did the water flow the way you expected it? What happened to the ridge lines?

What you just observed is similar to how rainfalls and melted snow end up in drainage or watersheds such as lakes, rivers, or streams!



## **MEET OUR LOCAL SCIENCE HERO:**



Meet **Dr. Pascal Badiou**, a research scientist with Ducks Unlimited Canada's Institute for Wetland and Waterfowl Research. His research focuses on the ecology of wetlands and large shallow lakes.

### **What inspires or motivates you to study wetlands and watersheds?**

"I am inspired to study wetlands and specifically small prairie wetlands as they are often overlooked and undervalued due to their small stature but punch well above their weight in terms of the ecosystem services they offer to society."

### **Why should youth learn about wetlands and watersheds?**

"Wetlands are critical to maintaining healthy watersheds and understanding their role in water quality, water quantity, biodiversity, and carbon sequestration [the process of capturing and storing carbon] is important to ensuring these services exist into the future and are not lost due to human impacts."

### **What is the best part of being a research scientist?**

"The best part of being a research scientist is getting to work in nature while developing a better understanding of how ecosystems like wetlands are critical to maintaining a healthy environment."

## **Climate Action: CONSERVE AND SAVE!**

Everything that we do affects the bigger environment around us. Being mindful of how we use the resources available to us today, will help create a more sustainable future.

Conservation is one way that we can help! Remember, your actions do not have to be big. Check out the list below on how you can help conserve the resources we have and help save the watersheds.

1. Turn off the faucet when not in use.
2. Take shorter showers.
3. Increase your awareness of watershed protection.
4. Grow plants that do not require a lot of water, fertilizer, and pesticides.
5. Use homegrown compost as fertilizer in your garden.
6. Use phosphate-free detergents.
7. Do not drain oil into the storm drain or streets.
8. Drive less - walk and bike more. Car exhaust and fluid leaks also contribute to water pollutants.

# Climate Change

## Past, Present, and Future

Earth is the only planet in the solar system known to support life. What makes our home so special? Earth has an atmosphere, a layer of gases between our planet and space. Some of these gases, like carbon dioxide, are called **greenhouse gases**. They are crucial parts of our atmosphere; they trap in the heat of the sun, similar to how heat is trapped in a greenhouse, or in a car on a hot day. This process, called the **greenhouse effect**, keeps Earth's temperature warm enough for living things to thrive.

The sun's rays hit our round, tilted planet unevenly. This uneven heating of Earth's surface leads to differences in temperature, which drives weather patterns. We call the patterns in temperature and weather over long periods of time **climate**. Different parts of the world have vastly different climates; it depends on how much heat they receive, as well as what landscape features are nearby. Water, mountains, ocean currents, and forests all impact our climate. In turn, living things around the world have adapted to the climate they live in.

Something, though, is changing. Over the past two hundred years, humans have been burning fossil fuels, such as coal and oil, to make energy to power our daily lives. Fossil fuels are made from decomposed plant matter and microscopic life millions of years old. This matter is full of carbon, and, burning it releases, or emits, billions of tonnes of **carbon dioxide** gas into the atmosphere every year. When too much carbon dioxide is emitted, the delicate balance of greenhouse gases maintaining

Earth's climate is upset. More and more heat is trapped, causing the planet to warm. Weather patterns change, water levels rise, storms get worse.

Climate has changed many times throughout Earth's history, from ice ages to periods much hotter than today. So why is this time any different? Scientists agree on two things. One, temperatures are rising faster than they ever have in documented climate history. Two, this climate change is driven by human activities, due primarily to greenhouse gas emissions.

Climate change is already impacting people's ways of life all over the world. Powerful storms, droughts, forest fires, and floods are threatening people's access to food, water, and safe homes.

The most important step we can take to prevent serious climate change is to reduce greenhouse gas emissions. Incredibly brave and caring people around the world are finding new ways to reduce emissions and make our communities climate resilient every single day. And you can join them! These Science Spotlights are here to help us learn more about climate change and how you can take action.

## Our Commitment to the Decolonization of Science

Institutions of GenAction initiative respect and affirm the inherent and Treaty Rights of all Indigenous Peoples across what we now know as Canada. We give thanks to the Indigenous Peoples who care for this land since time immemorial and pay respect to their traditions and ways of knowing. We acknowledge their many contributions to innovations in Science, Technology, Engineering, and Mathematics, past and present, and are committed to deepening engagement and collaborating with Indigenous Peoples as partners in order to advance truth and reconciliation and the decolonization of science.

