Watershed Keepers:

A hands-on watershed kit for young explorers (Grades 4-6)

Where raindrops become rivers and knowledge becomes action. This kit combines Earth science and hands-on activities to engage young minds in water conservation and the wonders of their local watershed.

This education kit was created by the 2025 Youth Water Council, a group of high school students working to make a difference in the North Saskatchewan River watershed.

Abigail Morrish, Aven Yanch, Cynthia Johannessen, Mehar Randhawa, Humza Khan, Ilinca Tomuta, Joanna Zhu, Josie Camilleri, Manuthi Fernando, Paras Sharma, Samantha Chloe Sadili, & Tanya Chaudhary

Supported by NSWA:
Jillian Peterson, Kaila Belovich, Lauren Comba, Scott Millar

2025 YOUTH WATER COUNCIL

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Access student worksheets and other complementary resources built for this guide by visiting the Youth Water Council 2025 webpage:

Watershed Keepers:

A hands-on watershed kit for young explorers

The **Watershed Keepers EduKit** is designed for elementary students in Grades 4-6.

This kit will introduce students to the basics of watershed science through a series of hands-on, interactive activities divided into three topic categories:

A. WATERSHEDS AND THE WATER CYCLE

- What is a watershed: Build a watershed model
- Rain into rivers: Measure and track precipitation using a rain gauge

B. WATER QUALITY

- Pollution & watersheds: Using your watershed model
- Water quality testing: Testing for pH and chlorine
- Watershed Keepers Pledge

C. NATIVE PLANTS

- Nature walk & biodiversity assessment
- Grow Your Own Native Plant Garden
- Origami activity

CURRICULUM CONNECTIONS

GRADE 4: **Earth Systems:** Students investigate the systems of Earth and reflect on how their interconnections sustain life

- Understanding, Skills & Procedures

Living Systems: Students analyze organisms and relate external structures to functions.

- Skills & Procedures

Scientific Methods: Students investigate evidence and reflect on its role in science

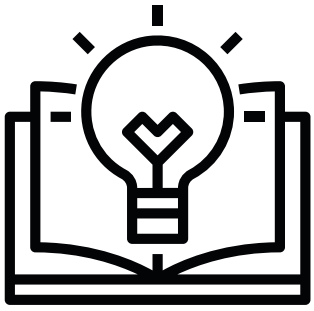
- Knowledge, Understanding, Skills & Procedures

GRADE 5: **Earth Systems:** Students analyze climate and connect it to weather conditions and agricultural practices.

- Knowledge, Understanding, Skills & Procedures

GRADE 6: **Living Systems:** Students investigate the characteristics and components of interactions within ecosystems

- Knowledge, Understanding, Skills & Procedures



NOTES ON SAFETY

Some of the activities included in this kit involve outdoor exploration. All classes undertaking this type of activity should do so with care. Risks, including sun and heat exposure, insect stings and bites, and trips and falls should be mitigated as much as possible through advance planning and site assessments.

During outdoor activities, students should adhere to ground rules, including:

- Avoid touching plants and flowers.
- Do not eat any plants encountered, even if berries or other plants look safe.
- If near open water, avoid going to the water's edge.

WHAT IS A WATERSHED?

This activity will help students understand how a watershed works by illustrating where and how water flows over a landscape.

STUDENT LEARNING OBJECTIVES:

- Predict where water flows within a watershed
- Observe drainage patterns in a watershed
- Understand how the water cycle works within a watershed
- Understanding influences on a watershed

This activity can be completed in small groups or as one large class.

DURATION: 1 class period

MATERIALS:

- Sheet(s) of white paper
- Water-based color markers
- Spray bottle of water
- Paper towel

OPTIONAL:

- Items to help demonstrate how a watershed works: A funnel, nesting dolls, or classroom sink
- *River Time Vortex* comic

BACKGROUND

A **watershed** is the area of land that carries **precipitation** (rainwater and snow melt) through soil, wetlands, and streams to a common point, such as a lake, river, or ocean.

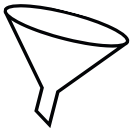
Water moves from high elevation areas to low areas. Both big and small differences in **elevation** shape how watersheds work.

Everything on the land can affect our shared water. Since all life on Earth relies on clean water, it is important we take care of our watershed!

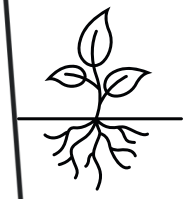
The **North Saskatchewan River watershed** is one of Alberta's major watersheds. The river begins in the Columbia Icefield **glaciers** in Banff National Park before flowing downstream through communities like Rocky Mountain House, Devon, and Edmonton. The North Saskatchewan River eventually flows into Lake Winnipeg before flowing into Hudson Bay and the Arctic Ocean.

Watersheds are really complex! Here are a few things that can help explain how different parts of watersheds work:

Funnel: The high parts of the funnel are like higher points of elevation on a landscape, like hills or mountains. As water moves down the funnel, it collects to a common point before draining out the bottom. Just like a funnel, a watershed brings all water to a common point like a river, lake, or ocean!



Nesting doll: There can be watersheds within watersheds! For example, the North Saskatchewan River watershed is part of a larger watershed that drains into Hudson Bay. But within the North Saskatchewan River watershed, there are smaller watersheds, like the watershed of a single lake, or smaller river.



Tree Roots: Watersheds and the rivers within them, are like roots of a tree. Tiny creeks flow down the landscape into larger creeks, which all flow into a common river.

WHAT IS A WATERSHED?

PROCEDURE: CRUMPLED WATERSHED MODEL

1. Have each group crumple a sheet of paper into a tight ball. Once crumpled into a ball, have each group partially smooth it out, being careful to leave some ridges.
2. Using markers, have each group/student color along the major ridges (high points) of the crumpled paper.
3. Once all major creases are coloured, using a spray bottle, have a teacher or responsible student generously spray the paper(s). Be sure to get all the coloured ridges wet!
4. Have students observe where the colour moves on the paper. What happened at the high and low points of the paper? Did the students predict how the colours would move?

TIP!

If doing this activity all together as a class, try using a large piece of chart paper.

Planning to complete the WATER TESTING section of this kit?
If so, hold onto your paper watershed model(s) to complete Water Quality, Activity 1.

EXTENSION

Did your students connect with this activity? Here are further questions for inquiry to enhance their learning.

- Using a map, can you identify what stream, river, or lake is closest to your home or school?
- Why does the North Saskatchewan River begin in the Rocky Mountains? (hint: What is found on top of mountains?)
- What did the siblings in the comic book discover about the watershed in the past? What did the Indigenous Elder teach them?

READ ALONG:
River Time Vortex Extravaganza: A Watershed Time Travel Story

Every Watershed Keepers kit contains a copy of this educational comic book about a brother and sister who go back in time and to see how the watershed looked in the past! The 2024 Youth Water Council created this comic in the hopes that readers would feel a greater connection to the watershed and all it does for us.

GLOSSARY

Watershed: The area of land that carries rainwater and snow melt through soil, wetlands, and streams to a common point, such as a lake, river, or ocean.

Elevation: The height of a landscape feature like a mountain, hill, or valley.

Precipitation: Any water that falls from the atmosphere, like snow, rain, or hail.

Glacier: A large, slow-moving mass of ice formed from accumulating compacted snow. They develop in regions where annual snowfall exceeds seasonal melt, typically in high mountain ranges or polar areas.

ADDITIONAL RESOURCE:
***Watershed Moments* Animated Series**

This video series, produced by NSWA and other water management organizations in Alberta, is available for free on YouTube.

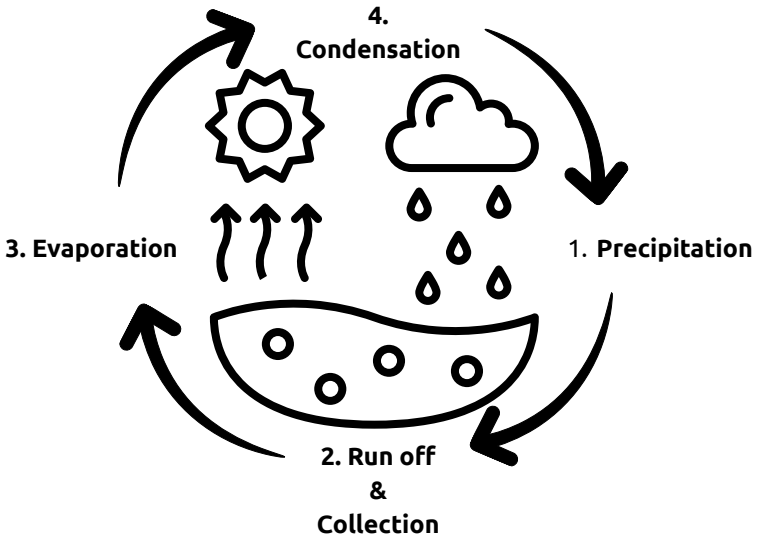
ABOUT: THE WATER CYCLE

Every living creature, from tiny bacteria to huge blue whales, relies on water to survive, whether it's salty or fresh, warm or cold. Here in Alberta, in the North Saskatchewan River watershed, water is vital to our diverse ecosystems, drives industries like farming and mining, and sustains over a million people!

All water on earth is recycled. That means the same water you use daily to brush your teeth, clean dishes, or swim in is the same water that all living things have used for billions of years! Just think: the water that comes out of your taps is the same water that a dinosaur once drank!

The water cycle is constantly happening all around us. The cycle is made up of different stages:

1. **Precipitation**
   Water that falls from the atmosphere.
2. **Run off & Collection**
   Water that moves through the watershed.
3. **Evaporation**
   Water that heats up and turns into vapour (water in gas form).
4. **Condensation**
   Water vapour in the air that clumps together, reforming liquid water.



Humans can impact the water cycle. Dams, loss of forests, and watering of crops (irrigation) are just a few ways that humans change how water moves through this natural cycle. Ensuring our water is clean and abundant is vital to the North Saskatchewan River watershed!

EARTH'S FRESH WATER: A DROP IN THE BUCKET

70% of the planet is water! But 97% of it is in the oceans as **saltwater** that humans cannot drink. Of the **freshwater**, an even smaller portion is accessible to drink from **groundwater** and **surface water.** The rest is held up in ice caps and glaciers or up in the atmosphere as clouds.

This activity will allow students to visualize the breakdown of all water on Earth.

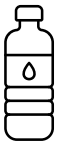
MATERIALS:

- Measuring cups & spoons
- 5 water bottles, clear cups, or other containers
- Blue food colouring or powdered drink mix
- Water!

Measure each portion the water into separate water bottles/containers. Use blue dye for a better visual!

Oceans (97% of all water)	486 mL
Ice caps & glaciers (2.38% of all water)	12 mL (~1 tbsp)
Groundwater (0.397% of all water)	2 mL (1/2 tsp)
Surface water (0.022% of all water)	One drop
Atmophere (0.001 % of all water)	Spray bottle mist

FRESHWATER (2.8%)



Only groundwater and surface water is available as drinking water. That is only 0.42% of all water on earth!

THE WATER CYCLE: PRECIPITATION

This activity will give students an opportunity to track and interpret precipitation to better understand the water cycle.

STUDENT LEARNING OBJECTIVES:

- Learn how to use a rain gauge
- Observe, track and analyze data over time
- Connect data to real-world observations about local weather patterns!

This activity is best completed as an entire class.

DURATION: 1 week, multiple weeks, or 1 month

MATERIALS:

- Rain gauge
- Precipitation tracking sheet

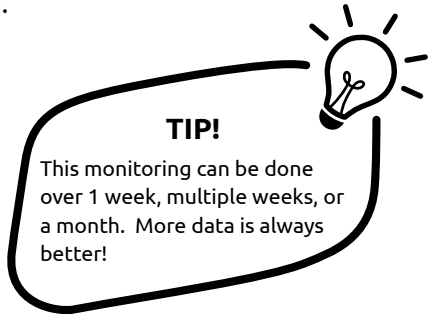
BACKGROUND

A **rain gauge** is a tool that measures how much rain falls in a certain area over a period of time. Scientists, farmers, and gardeners may use a rain gauge to understand weather patterns, schedule when crops get watered, or to track how much water plants need.

The North Saskatchewan River watershed usually receives rain as a primary form of precipitation between June and September. During the "shoulder season" months of April, May, October, and November, a mix of rain and snow can be expected!

PROCEDURE: OBSERVING & COLLECTING PRECIPITATION DATA USING A RAIN GAUGE

1. **Setting up the rain gauge**
   Place in the open and away from obstacles, like trees or buildings that could block rain. There are two options:
   - Insert the rain gauge in to the soil in an upright position so that the readings are level.
   - Mount the rain gauge with zip ties to a fence or pole using the holes at the bottom of the gauge. The rain gauge should be no higher than 1.5 meters/5 feet above the ground.
2. **Monitoring and recording precipitation**
   Each morning, check the rain gauge for precipitation. If rain has fallen, record how much accumulated. The marks on the side of the gauge record the amount of rain in millimeters. After reading the measurement, empty out the rain rauge.
3. **Evaluating and understanding precipitation data**
   Precipitation data is often reported as a weekly or monthly average. The Rain Gauge Worksheet in this EduKit will guide classes on how to evaluate and understand recorded precipitation data.



HOW DOES YOUR DATA COMPARE?

Monthly average precipitation in the North Saskatchewan River watershed by month (2014-2024)

January	13.3 mm	***July***	**81.8 mm**
February	14.6 mm	***August***	**59.9 mm**
March	14.3 mm	***September***	**38.5 mm**
April	20.3 mm	***October***	**19.8 mm**
May	**53.1 mm**	*November*	17.5 mm
June	**90.2 mm**	*December*	12.8 mm

*__Bold__ text indicates months where most precipitation falls as rain
Data collated from ACIS Historic Climate Data, 2014-2024.

FURTHER QUESTIONS FOR INQUIRY

- Compared to the provided monthly averages, was the amount of rain collected in the rain gauge above or below average?
- What do you think might happen if it rains a lot, too little, or not at all?
- Different parts of the watershed get more precipitation. Where do you think more rain and snow fall in the watershed: the mountains, Edmonton, or in downstream farming areas.

RAIN GAUGE WORKSHEET

Date	Amount of rain (mm)
Total number of days the rain gauge was checked: _____	Total rain collected (mm): _____

Precipitation data is often reported as a weekly or monthly average. To get the average amount of rainfall for a period of time, up all of the measured rainfall data.

*To calculate this, take the **Total rain collected (mm)** and divide it by the **Total number of days the rain gauge was checked.** This will give your class the average rainfall for the time period of collection!*

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POLLUTION & WATERSHEDS

This activity will show students how pollution moves through watersheds and introduce how actions on land can affect water quality.

STUDENT LEARNING OBJECTIVES:

- Observe how drainage patterns relate to how pollution moves through a watershed
- Understand how upstream pollution can affect downstream areas
- Define **point source** and **non-point source** pollution
- Consider personal impacts on watershed health

This activity will enhance learning from Watersheds, Activity 1.

DURATION: 1 class period

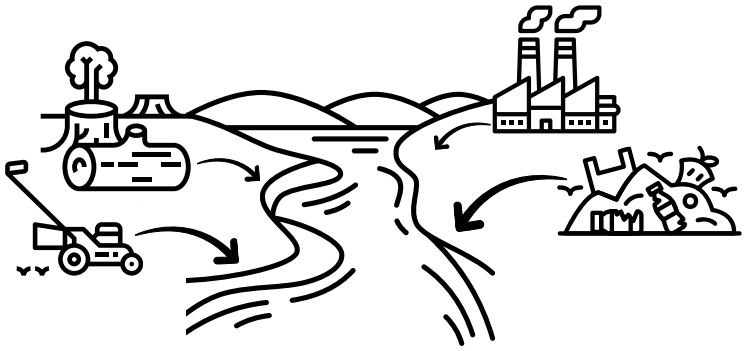
MATERIALS:

- Watershed model from **Watersheds, Activity 1** (wet or dry)
- Water-based color markers (darker colours)
- Spray bottle of water
- Paper towel

BACKGROUND

What happens on land is as important as what happens in the water! **Water quality** in rivers, lakes, and oceans reflects the health of the surrounding land.

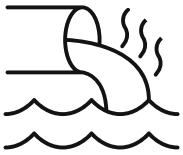
Everything, big and small, can impact water quality. Some actions, like planting native plants or protecting wetlands, can improve water quality in a watershed. Actions that can negatively impact water quality can include the spread of non-native species, the loss of natural habitat, or the spread of **pollution**.

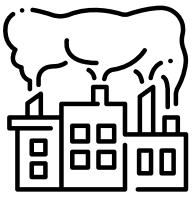


Water testing can show how healthy a river, lake, or stream is, and it can also help us find out where any pollution in the water is coming from. For example, if manure is found in the water, it is more likely that pollution came from a cattle farm, rather than a school field.

Pollution can be classified as **point source** and **non-point source**.

Point source pollution can be traced to one location. This type of pollution is often easier to manage because it can be found and fixed at the source. For example, if a sewer pipe is dumping unclean water in the river, that is a point source of pollution. If that pipe gets fixed or removed, and no longer dumps sewage, the pollution issues from that site will be fixed.





Non-point source pollution is pollution that comes from lots of different places all at once. It is difficult to determine exactly where non-point source pollution is coming from, and how to stop it.

Cities are places full of non-point sources of pollution. For example, during a rainstorm, litter, pesticides, and oil from cars can runoff into a river all at once from a single neighbourhood.

POLLUTION & WATERSHEDS

PROCEDURE

1. Return the paper watershed models made during **Watersheds, Activity 1**, to the student group(s).
2. Using a dark coloured marker, add a few scattered dots along a few of the paper's ridges (non-point source pollution).
3. On a separate ridge, add one large dark stripe (point source pollution).
4. Once the dark colours are added, using the spray bottle, have a teacher or responsible student generously spray the paper(s). Be sure to get all the coloured ridges wet!
5. Have students observe where the pollution moves on the paper.

TIP!

To compare how point and non-point source pollution move, try using different coloured markers in steps 2 and 3.

EXTENSION

Did your students connect with this activity? Here are further questions for inquiry to enhance their learning.

- Based on how the marker on the coloured paper moved, why do you think pollution tends to be a bigger problem further downstream?
- What are some examples of point and non-point source pollution that you see in your community?
- What are some ways you can help stop the spread of pollution to keep your local watershed clean and healthy?

GLOSSARY

Pollution: Anything that is in the air, water, or environment that has negative or undesirable effects.

Point source pollution: Pollution that can be traced back to one place.

Non-point source pollution: Pollution that comes from many places all at once.

Water quality: How clean or dirty water is. For human drinking use, this means free from pollutants and sediment. Aquatic life, like fish, might have a different "definition" of quality based on their needs for temperature, dissolved oxygen, and turbidity.

LEARN MORE:

Want to check out other watershed learning resources?

Find links to videos, activities, and further resources by scanning the QR code to visit: www.nswa.ab.ca/initiatives/youth-water-council/2025

WATER QUALITY TESTING

This activity will allow students to get hands-on experience testing water quality parameters and learn to interpret test results.

STUDENT LEARNING OBJECTIVES:

- Learn key water quality **parameters**, including pH, chlorine, dissolved oxygen (DO), water temperature, phosphates, nitrates, and turbidity
- Follow experimental procedures and learn how to interpret test results

DURATION: 1 class period

MATERIALS:

- pH strips
- pH test colour chart (on bottle)
- Chlorine test strips
- Chlorine test colour chart (sheet)
- 1-3 clean sample cups
- Pencil or pen

BACKGROUND

Water quality can have a big impact on ecosystem and human health. When water quality is good, it can safely be used for things like drinking, cleaning, and swimming. When water quality is bad, people, plants, and animals can all be affected - people may get sick, animals may leave their habitat, and plants may stop growing.

There are different ways we can check our water's quality. **Test parameters** are things that we can measure that will tell us how clean or safe our water is for a specific use. For example, water with chlorine in it might be good for swimming pools, but not good for watering plants.

The water quality of ponds, streams, and lakes is strongly shaped by the health of the watershed. After a rainstorm, any water that doesn't absorb into the ground, moves over the landscape as **runoff**. Runoff can pick up pollution as it travels to a nearby water body. This means that the water quality of that runoff can directly affect the plants and animals that rely on that water to survive.

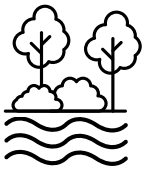
WATER QUALITY IN URBAN ENVIRONMENTS

This kit will allow you to test for pH and Total Chlorine. These two parameters are commonly used to assess water quality in urban environments. Chlorine is commonly used to disinfect tap water, and pH can indicate the presence of pollutants in the water.

WATER SOURCES AND TEST PARAMETERS

Precipitation: Since rain and snow fall from the sky, air pollution can affect its quality. Pollutants in the air, like carbon dioxide, can make precipitation acidic.

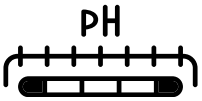
Tap water: Tap water is treated, meaning it is cleaned to ensure it is safe to drink and use. Tap water often has substances added to it, like chlorine, to prevent harmful bacteria from growing.



Open water: Open water comes from a natural source, like a pond, stream, or lake. Open water quality is affected by run off. This means many elements can end up in it and affect water quality parameters like pH and dissolved oxygen.

WATER QUALITY TEST: pH

These test strips will indicate the approximate pH of a given water sample. pH tests can be completed for tap water, rain water, and open water samples.



WHAT IS pH?

pH is a scale from 0 to 14, that measures how acidic or alkaline (basic) a mixture is. A pH below 7 indicates an acidic solution, 7 being neutral, and greater than 7 indicating an alkaline solution.

WHY DOES pH MATTER?

Aquatic animals are extremely sensitive to changes in pH levels. Having a pH range that is too high or too low could be dangerous for organisms. If an aquatic environment becomes more acidic, this may cause dissolved oxygen levels to drop, which puts even more stress on these underwater ecosystems.

WHAT AFFECTS pH LEVELS?

Rainwater: Pollution can cause greenhouse gases to combine with rain in the atmosphere, lowering the pH. This means areas with higher pollution often experience more acidic rain. Acidic rain can have negative impacts on terrestrial and aquatic ecosystems.

Tap water: It is important to check and ensure the water we are drinking is within a safe pH range! When pH of drinking water is too high or too low, it can cause older pipes to break down and weaken, allowing for more minerals to make their way into drinking water.

Open water: When chemicals like fertilizers and cleaning solutions leak or runoff into open water bodies, pH of water can change rapidly. These major, quick changes in pH can immediately impact aquatic ecosystems. This is why it is important to dispose of our waste correctly!

PROCEDURE

MATERIALS:

- pH test strips
- Sample container(s) (paper cups)
- Water sample(s):
  - Rainwater, tap water, open water

TIP!
You can use the rain gauge in this kit to collect a rainwater sample.

1. If testing tap water, turn on your faucet and allow it to run for 1 minute. Fill the provided sample cup halfway.

   If testing rainwater or open water, assemble materials before the class period.

2. Take one sample strip. Dip it in the water for 10 seconds, gently moving the strip back and forth.
3. After 10 seconds have elapsed, remove the strip and gently shake the excess water off. Hold the strip in the air for 15 seconds.
4. After the 15 seconds have elapsed, compare the colour of the strip to the Colour Chart. The closest colour match will indicate the approximate pH level of the sample.

UNDERSTANDING YOUR RESULTS:

Having pH results outside of the normal range means there are external factors, like pollution, are affecting water quality.

Understanding the quality of our water gives us insight into the overall health of the environment and helps guide the actions we can take to protect and improve it. By working together, we can care for our watershed and help create a more sustainable planet for all!

Water	Normal pH Range
Rainwater	5.0 - 5.8
Tap Water	7.5 - 8.0
Open Water	6.5 - 8.0

WATER QUALITY TEST: CHLORINE

These test strips indicate chlorine presence in a given water sample. Chlorine should only be detected in tap water. If chlorine is detected in rainwater or open water, that indicates pollution.

WHAT TYPES OF CHLORINE ARE WE TESTING FOR?

Free chlorine (Cl) is the type of chlorine that fights bacteria and microbes. Free chlorine is added to our drinking water. When testing tap water, this type of chlorine matters most.

Total chlorine (Cl) is the sum of all chlorine present in water. Total chlorine includes free chlorine and combined chlorine, which is chlorine that combines with other chemicals and is more stable.

WHAT AFFECTS CHLORINE LEVELS?

Tap Water: You might recall smelling chlorine at the local swimming pool. It is also used at **water treatment** facilities to ensure that tap water is free from bacteria and safe to drink. Adding chlorine to water is the most common way to disinfect tap water.

Rainwater: Total and free chlorine should not be found in rainwater. If found, the chlorine may have come from chemical pollution in the air from factories or wastewater facilities. If chlorine is released, this gas may mix in the atmosphere with water particles, later falling as polluted rain.

Open Water: Chlorine is not naturally occurring in open water. If chlorine is found in open water, it can remove bacteria that is essential to ecosystems. Chlorine may enter open water by people draining hot tubs or pools directly into stormwater drains, or if there are leaks water pipes.

PROCEDURE

COLLECT:

- Chlorine test strips & laminated colour chart
- Sample container(s)
- Water sample(s):
  - Rainwater, tap water, open water

TIP!

You can use the rain gauge in this kit to collect a rainwater sample.

1. If testing tap water, turn on your faucet and allow it to run for 1 minute. Fill the provided sample cup halfway.

   If testing rainwater or open water, assemble materials before the class period.

2. Take one sample strip. Dip it in the water for 10 seconds, gently moving the strip back and forth.

   The 'Free chlorine' pad will look slightly yellow even before it has been used.

3. After 10 seconds have elapsed, remove the strip and gently shake the excess water off. Hold the strip in the air for 15 seconds.

4. After the 15 seconds have elapsed, compare the colour of the strip to the colour chart. The closest colour match will indicate the approximate chlorine level of the sample.

Water	Normal Chlorine Range
Rainwater	0 mg/L
Tap Water	0.5-2.5 mg/L
Open Water	0 mg/L

UNDERSTANDING YOUR RESULTS:

If chlorine levels are detected in rainwater or open water, the water is considered polluted, as described above in the **WHAT AFFECTS CHLORINE LEVELS?** section.

Tap water should contain some chlorine, but the amount found in tap water varies. For example, during springtime, high levels of run off from melting snow means extra nutrients and bacteria enter waterways. When this happens, water treatment plants may add extra chlorine to tap water to ensure that chlorine levels are high enough to kill the extra bacteria.

The following are commonly tested water quality parameters.
Please note that this kit does not contain the materials to test for these parameters.

DISSOLVED OXYGEN

WHAT IS DISSOLVED OXYGEN (DO)?
Dissolved Oxygen (DO) refers to the small bubbles of oxygen gas that is found in liquid water. Fish and other aquatic species rely on DO to breathe.

DO is an important water quality parameter in open water, since higher DO supports healthier, more complex ecosystems. In tap water, higher DO levels improves taste.

DO	What Happens to Fish?
<4 mg/L	Not enough oxygen in the water. Most fish and aquatic species cannot survive. These DO levels can lead to fish kills for even the strongest species.
4-6.5 mg/L	Fish may become stressed, stop eating, or struggle to breathe. Long term exposure to these DO levels can lead to stunted growth and reduced fish health.
6.5-9 mg/L	Most fish can survive, though more sensitive species may become stressed.
>9.5 mg/L	Most fish are happy and thriving.

HIGHER DISSOLVED OXYGEN IS FOUND IN...
- Moving water, like rivers or streams, where water mixes with air when it splashes.
- Cooler water, like in mountain streams, since cold water can hold more oxygen than warm water.

LOWER DISSOLVED OXYGEN IS FOUND IN...
- Still water with lots of algae, decaying plants, and pollutants (extra nutrients). Algae growth and decomposition uses a lot of DO.
- Water that is covered by surface ice. During the winter, air cannot mix into water, so all the DO used by fish and other species is not replenished.

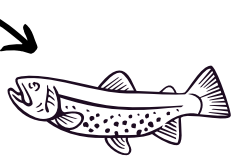
TIP!
If you would like to test for dissolved oxygen in your classroom, test tablets are available from lab suppliers in Canada, such as Flinn Scientific.

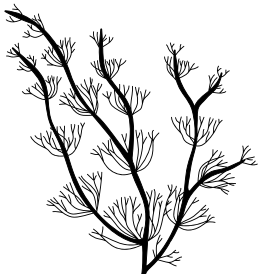
WATER TEMPERATURE

WHAT IS TEMPERATURE?
Temperature is a measure of how hot or cold something is. Water temperature is slower to change than air temperature.

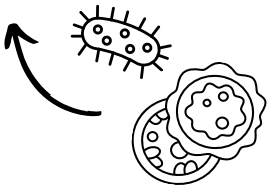
In Alberta, our harsh winters and hot summers means that water temperatures change season-to-season. Most of our aquatic species have adapted to Alberta's wide range of temperatures, though extreme temperature changes can be difficult for aquatic species to tolerate.

COOLER TEMPERATURES
Certain fish species, including several species of trout, rely on cold water to lay their eggs.





WARMER TEMPERATURES
Warmer temperatures can make plants, bacterial, and algae grow more quickly. While these things are part of healthy ecosystems, too much can lead to lower water quality.



DID YOU KNOW...
Warm water can be a type of pollution! Power plants and factories often use water in their operations, heating it up in the process. This water must be cooled down before it is released back to the environment, or else it can harm fish, plants, and other parts of aquatic ecosystems.

HOW DOES DISSOLVED OXYGEN AND TEMPERATURE AFFECTS US?

Dissolved oxygen and temperature are critical indicators of water quality. Extreme levels of dissolved oxygen and temperature can cause widespread problems, like harmful algal blooms and disruptions to the food chain because of fish kills. These changes can negatively impact whole ecosystems across the watershed!

The following are commonly tested water quality parameters.
Please note that this kit does not contain the materials to test for these parameters.

PHOSPHATES & NITRATES

WHAT ARE PHOSPHATES & NITRATES?

Phosphates and nitrates are essential nutrients for plant growth. In Alberta, our soil and lakes are naturally high in phosphates, though human activities can increase the levels of nutrients in open water.

While these nutrients are important, too much of them in the water can lead to too much plant and algae growth.

WHAT AFFECTS PHOSPHATE & NITRATE LEVELS?

Both natural and unnatural elements can affect phosphate and nitrate levels.

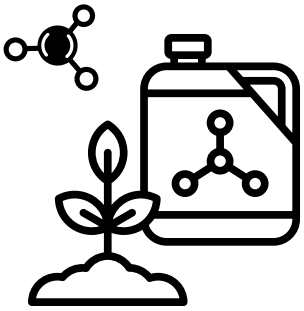
Alberta's geology, which naturally has high levels of nutrients, means that soil erosion and run off can add phosphates and nitrates to open water.

Runoff from fertilizers, manure, and accidental spills of wastewater can quickly increase nutrient levels in water. These nutrient increases can be avoided by practicing proper waste disposal and by using fertilizers responsibly.

THE IMPORTANCE OF ALGAE

Algae are simple aquatic organisms. If you have ever seen small green dots, clumps, or blobs in a lake, chances are that was algae. Algae are very common in lakes in Alberta and is the foundation of many aquatic food webs.

The amount of algae found in lakes in Alberta is closely tied to the amount of phosphorus in the water. When there is too much phosphorous, it can cause algae blooms that decrease water quality. In extreme cases, algae blooms can reduce dissolved oxygen and cause fish kills.



TIP!

If you would like to test for phosphates and nitrates in the classroom, easy Test Tablet kits are available from LaMotte.

TURBIDITY

WHAT IS TURBIDITY?

Turbidity is a measure of how clear water is. When water is clear, light can shine through it easily. When water is cloudy or hard to see through, it is described as turbid. Turbid water can be caused by factors like algae, plant material, or soil getting into the water.

When turbidity is high and there are a lot of extra material in the water, fish and other aquatic creatures have a difficult time breathing and finding their way around their environment. Additionally, the particles that make water turbid can also bring pollution and nutrients like phosphates and nitrates into the water.

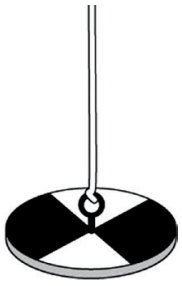
WHAT AFFECTS TURBIDITY LEVELS?

Turbidity changes are often connected to precipitation events that creates a lot of runoff. Algae blooms, dust and loose soil, or disturbance to the lake or stream bottom can lead to cloudier, more turbid water.

HOW IS TURBIDITY MEASURED?

A secchi disk is a tool that is used to measure the turbidity of water. The disk gets lowered into the water until it isn't visible.

The further down you can lower the secchi disk below the surface before it becomes invisible, the clearer the water is.



SECCHI DISK

TIP!

To illustrate turbidity for students, compare a glass of tap water to a glass of water with a teaspoon of cocoa mixed in. Which water do you think would be easier for a fish to see through or breathe in?

WATERSHED KEEPERS PLEDGE

This activity brings all the concepts included in the Watershed Keepers EduKit together, empowering students to take an active role in the enhancement of their watershed's health.

STUDENT LEARNING OBJECTIVES:

- Consider their personal role in the health of the watershed and local environment.
- Empower them to make personal and collective changes to improve watershed health.
- Apply experimental knowledge to environmental action.

DURATION: 1/2 class period

MATERIALS:

- 1 copy of The Watershed Keepers Pledge (colour)
- Pencil crayons/markers (1 per student)
- Tape/Sticky Tack (to hang The Pledge)
- 35 Stickers (2" x 2")
- 1 copy of the *River Time Vortex Extravaganza* Comic

PROCEDURE

1. Open with a class summary of previous learning concepts from the water quality testing activity.
2. Read the *River Time Vortex Extravaganza* Comic with the class. Ask students to consider what actions they can take to improve the health, security, and quality of the watershed (verbal or written).
3. Introduce The Pledge and have students recite it together as a class.
4. Pass it around for students to sign their name in the margin around The Pledge.
5. Hang The Pledge on a wall after all students have signed it and pass out the stickers to remind them of their promise as a Watershed Keeper!

WHAT DO WATERSHED KEEPERS DO?

- **Turn off the tap!** Don't let water go to waste and always make an effort to turn off the tap when it's not in use.
- **Think before they pour!** Always remember that whatever goes down the sink, toilet, or stormwater drain can end up in rivers, lakes, and our watershed. Never pour oil, paint, or harsh chemicals down the drain.
- **Garden mindfully!** The landscape is a part of the watershed too. Choose plants that naturally grow in your region since they need less water and help pollinators thrive. Consider leaving woody debris and leaves behind to give insects and bugs habitat in your garden! Water plants in the evening so water isn't lost to evapotranspiration.
- **Reduce, reuse, recycle... and don't litter!** Properly dispose of waste and make less of it in the first place by being conscious about what you buy. Reducing waste is the most powerful of the 3 R's! Reuse and recycle when possible.
- **Set a good example.** Share what you know with your family and friends. Help them learn how to become Watershed Keepers too!

NATURE WALK & BIODIVERSITY ASSESSMENT

This activity is an opportunity for classes to get outside and learn about the biodiversity present in their local watershed.

STUDENT LEARNING OBJECTIVES:

- Identify a variety of plant and animal species in a local natural area
- Compare different habitats (e.g., forest, meadow, stream) and the species found in each
- Recognize signs of ecological health or imbalance (e.g., presence of invasive species, litter, etc.)

DURATION: 1 class period

MATERIALS:

- Paper to record observations
- Pencil or pen
- *Watershed Keepers: Native Plant Guide,* available on the YWC webpage

SAFETY: Before heading outside, please conduct a site assessment and follow all district-recommended safety procedures.

BACKGROUND

Alberta is home to over 60,000 wild species across six distinct natural regions: the Boreal Forest, Rocky Mountains, Foothills, Grassland, Parkland, and Canadian Shield. Each region has unique ecosystems and wildlife, making our province a living classroom for biodiversity exploration!

The North Saskatchewan River watershed features 4 of Alberta's 6 natural regions, only missing the Grasslands and Canadian Shield.

WHAT IS BIODIVERSITY?

Biodiversity means all the different kinds of living things in one place. This includes things like animals, plants, bugs, and even tiny bacteria. All living things work together to make our natural environments healthy and balanced!

GET TO KNOW ALBERTA'S NATURAL REGIONS

1. The Boreal Forest is Alberta's largest natural region, with vast forests and wetlands. It provides habitat for species like the caribou and trumpeter swan.
2. The Rocky Mountains are home to rugged terrain and alpine ecosystems, which supports wildlife such as mountain goats and grizzly bears.
3. The Foothills are a transition zone between the plains and mountains. This region is rich in mixed forests and diverse wildlife.
4. Grasslands are characterized by vast, open prairies, perfect for species such as the burrowing owl and various native grasses.
5. Parklands are a blend of grasslands and forests, which is rich in various bird species and is a critical habitat for many animals.
6. The Canadian Shield is Alberta's smallest natural region, featuring unique geology and specialized flora. It makes up only 1.5% of the province!

NATURE WALK & BIODIVERSITY ASSESSMENT

PLANNING YOUR NATURE WALK

1. CHOOSING YOUR LOCATION: Choose a nearby natural area that is safe and accessible. This could be a local forest, a wetland, or even the school field. If possible, choose a location that includes different types of habitats as this will give students the opportunity to observe a wider variety of organisms.

2. GATHERING MATERIALS: It is encouraged that students are equipped with observation tools such as notebooks and pencils. If available, students may also choose to bring cameras, magnifying glasses, or binoculars with them on the nature walk. Ensure students are prepared for the weather (wear appropriate clothing, bug spray, sunscreen, etc.).

If appropriate, consider providing students with the identification guides available on the Youth Water Council 2025 webpage!

3. SETTING LEARNING OBJECTIVES: Before heading out, students should have an understanding of biodiversity and its importance. Introduce students to materials to help them identify various species and their roles in the ecosystem and observe interactions between organisms and their environment.

CONDUCTING THE BIODIVERSITY ASSESSMENT

4. OBSERVING AND RECORDING: Students are encouraged to note down different species or interesting things they see on their walk including plants, insects, birds, and other animals. They should also describe the habitats where organisms are found and record any interesting behaviors or interactions that are discovered. The NATURE WALK SCAVENGER HUNT worksheet may be used to guide student exploration.

TIP!

There is no right or wrong way to do a nature walk and biodiversity assessment!

Visit the Youth Water Council webpage for additional interactive games and activities that can enhance outdoor exploration.

5. USING IDENTIFICATION GUIDES: After the walk, have students share their observations and reflect on the variety of life they encountered. Challenge students to identify new or unknown plant and animal species.

How might the biodiversity observed during this walk differ if it took place in a different location, like in a farmer's field, in the mountains, or in a wetland?

REFLECTION

Ask students to think about how different species interact with each other and their environment.

By observing and reflecting on the diversity of life around them, students become more informed and responsible stewards of the environment.

In a journal, ask students to write about their nature walk and what parts of their local ecosystems they want to learn about next!

DID YOU FIND SOMETHING UNIQUE ON YOUR WALK?

Consider reporting your observations with a citizen science program, such as NatureWatch!

Citizen science data can help scientists across Canada track environmental change as it is happening.

Scan this QR code to visit: www.naturewatch.ca

NATURE WALK SCAVENGER HUNT

WHAT TO LOOK FOR DURING YOUR NATURE WALK & BIODIVERSITY ASSESSMENT:

Check off the items that you see or hear during your nature walk. Rather than collecting things you find along the way, try sketching or describing them in words.

JUNIOR EXPLORERS:

- ☐ A SMOOTH ROCK
- ☐ A LEAF LARGER THAN YOUR HAND
- ☐ A LEAF SMALLER THAN YOU THUMB
- ☐ SOMETHING YELLOW
- ☐ A PINECONE OR SEED POD
- ☐ A FLYING INSECT
- ☐ AN INSECT ON THE GROUND
- ☐ A FEATHER
- ☐ A BIRD CALL OR BIRD SONG
- ☐ MOSS
- ☐ SOMETHING BUMPY OR ROUGH
- ☐ SOMETHING MADE BY HUMANS
  If you find a piece of litter, pick it up, if it is safe to do so!

MASTER NATURALISTS:

- ☐ A PLANT GROWING ON A NON-LIVING THING
- ☐ A LEAF LARGER THAN YOUR HAND
  If the leaf has fallen, can you find the tree it came from?
- ☐ A LEAF THAT HAS BEEN CHEWED BY AN INSECT OR ANIMAL
  What do you think was eating it?
- ☐ A TREE WITH FLAT NEEDLES
- ☐ A PLANT WITH THORNS (BE CAREFUL!)
- ☐ A PLANT YOU CAN IDENTIFY
  What plant is it?
- ☐ SOMETHING DECOMPOSING
- ☐ ONE PLANT GROWING IN THE SHADE, AND ONE GROWING IN THE SUN
  How do the two plants differ?
- ☐ A SIGN OF THE SEASON
  For example, budding flowers, yellow leaves, or snow on the ground.

NOTES OR SKETCHES:

Activity adapted from *Five Minute Fieldtrips*, by CPAWs, GEOEC, & the Calgary Zoo (2002)

GROW YOUR OWN NATIVE PLANT GARDEN

This activity will allow students to undertake a collaborative stewardship project by planting a native plant garden in their school yard.

STUDENT LEARNING OBJECTIVES:

- Understand the importance of native plants and their role in local ecosystems
- Develop teamwork and communications skills to plant and maintain a shared garden space
- Practice scientific observation skills as plants begin to grow

DURATION: 1 class period
Ongoing maintenance of this garden will be required

MATERIALS:

- Youth Water Council seed package
- Trowel(s), small shovel(s), or cups to act as scoops
- Watering can
- Gloves, if desired

NOTE ON SAFETY: These seed should not be used unsupervised by students. Seeds should not be ingested.

NATIVE PLANTS, BIODIVERSITY, AND WATERSHED HEALTH

Native plants can play an important role in enhancing watershed health!

Native plants are adapted to local soil, climate, and wildlife. This means that they require less water and fertilizer than non-native species. In parkland and grassland regions, native plants have deep root systems that allows them to be drought tolerant, while also helping to anchor soil, reducing erosion and allowing rainwater to soak into the ground rather than running off.

Additionally, native plants provide essential habitat and food for wildlife. Pollinators, like bees and butterflies, are vital to healthy ecosystems. When native plants are abundant, these insect species thrive too.

TIP!
Several of the plants in this seed package support specific pollinator species. To make your garden even more pollinator-friendly, consider adding a bee house or bee bath.

Planting native species at home and at school is a simple step you can take to support pollinators and protect local watersheds. **Start small—even one native plant can make a difference!**

PREPARING FOR THIS ACTIVITY

The plants included in the Youth Water Council seed package are all species that are native to Alberta's parkland region. Because of this, these seeds are intended to be planted outside, rather than in the classroom.

If your school already has a garden bed, we recommend you sow these seeds there. If not, try to plant seeds in a site that:

- Is in full or partial sun
- Is away from busy areas, like playgrounds
- Is near a water source, like a hose or a door to the building

Gardens require maintenance! Develop a classroom schedule to water the garden during the growing season.

GET TO KNOW THE PLANTS IN THIS KIT

1 SMOOTH FLEABANE

- Blooms July and August
- Has pale pink-purple petals and a yellow center. As a part of the aster family, this plant looks like a daisy with very thin petals.
- This is a low maintenance plant that can do well in drought conditions.
- Like the name suggests, this plant repels fleas!

Fun fact! This is a very pollinator friendly plant. It blooms longer than most other flowers and attracts many types of pollinators.

2 SMOOTH BLUE ASTER

- Blooms August to October
- Has light blue-purple petals and a yellow center. As a part of the aster family, this plant looks like a daisy with thin petals.
- Smooth blue asters are the "host plant" for two different butterfly species. This means it is where these butterflies lay their eggs, and this plant is the only one that the hatched caterpillars will eat.

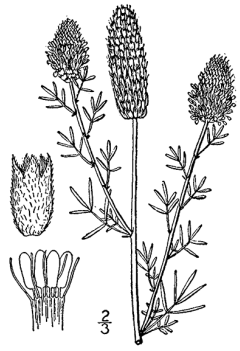
Fun fact! Smooth blue asters seeds are like a dandelion's: white, fluffy, and spread by the wind.

3 EVENING PRIMROSE

- Blooms July to September
- Has big, yellow, lemon-scented flowers.
- After their seeds are planted, evening primrose may take up to two years to produce flowers.
- In Alberta, there are ten different bee species survive off evening primrose pollen!

Fun fact! These flowers open in the evening, and close in the morning. That's why they are called Evening primrose.

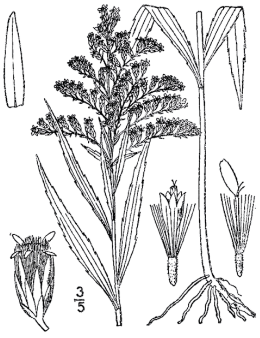
4 PURPLE PRAIRIE CLOVER



- Blooms June to September
- Has small purple flowers that grow in a tight clump along a cone-shaped flower head.
- As a member of the pea family, purple prairie clover can add nitrogen to the soil.
- After planting seeds, it may take two years for purple prairie clover to flower.

Fun fact! Unlike the small white or red clover you may find around your school field, Purple Prairie Clover is a native flower.

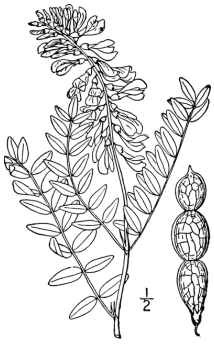
5 TALL GOLDENROD



- Blooms August to October
- Has small, dense yellow flowers
- When fully grown, tall golden-rod can reach up to 6 feet (2 meters) tall!
- This is a resilient plant, growing in many different moisture conditions. In time it may become dominant in a garden.

Fun fact! Goldenrod is not only an important plant for pollinators, it is also grazed by deer species and elk!

6 ALPINE HEDYSARUM



- Blooms from May to September
- Has long, bell-shaped pink and purple flowers
- Alpine Hedysarum can be found across Canada, from B.C. all the way to Newfoundland and Labrador.
- This plant has a positive symbiotic relationship with fungi and bacteria in the soil.

Fun fact! You might not guess by looking at them, but Alpine Hedysarum are legumes, meaning they are related to peas!

Images from: Britton, N.L. & Brown, A. (1913). An illustrated flora of the northern United States, Canada, and the British possessions. *Scribner's Sons.*

For detailed colour images, please refer to this EduKit's online supplemental materials, available on the Youth Water Council 2025 webpage

ORIGAMI: LIFE ABOVE AND BELOW

This activity will allow students to consider and learn about aquatic environments by creating origami designs, from underwater creatures to floating boats and plants.

STUDENT LEARNING OBJECTIVES:

- Learn how art can help people understand the natural world and appreciate diversity in life
- Allow students who are new to environmental exploration to engage with biodiversity in an accessible way

DURATION: 1 class period

MATERIALS:

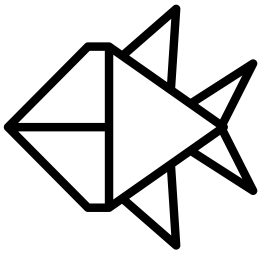
- Origami Paper (120 sheets provided in the EduKit)
- Pencil crayons or markers

NOTE: Detailed, step-by-step instructions for these origami designs are online. Follow each design's QR code below for details.

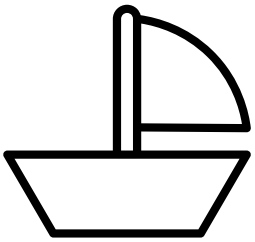
Guide students through the process of crafting their own origami from these four designs.

Once completed, students can use pencil crayons or markers to decorate their origami. Encourage students to be creative and appreciate the diversity between designs. Just like in nature, each individual will be different!

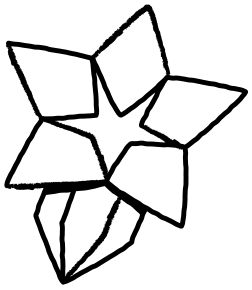
1 FISH



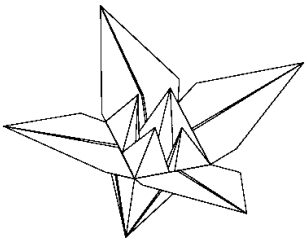
2 SAILBOAT



3 SIMPLE FLOWER



4 ADVANCED FLOWER



For detailed instructional videos, please refer to this EduKit's online supplemental materials, available on the Youth Water Council 2025 webpage.
Other origami designs can be found on the 'Origami Guide' website used for the sailboat and flower designs.

The Watershed Keepers Pledge

From us to the river,
I take this pledge as a child of the land
to preserve and protect our beautiful watershed.
I promise to be mindful of my actions,
prevent unwanted harm,
and respect all forms of life
that call this watershed home.
I shall take care of Mother Earth,
for it is ours to sustain for generations to come.