

BC Urban Streams & Watersheds

A UNIT PLAN FOR **GRADE 7**

The Big Idea

Watersheds connect land, water, and life; changes in urban streams from human impacts and climate change affect biodiversity and the health of entire ecosystems.

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This unit plan was created by **Jennifer Walton**, BA, BEd, Diploma in Environmental Technology, Teacher in Greater Victoria, BC.
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This is published by **Engage with Nature-Based Solutions**. Engage with Nature-Based Solutions is an initiative to support communities who apply nature-based solutions to their local lands and waters. We acknowledge and take inspiration from Indigenous peoples, whose cultures and traditions support healthy ecosystems and the interconnection and importance of all living things.

Engage with Nature-Based Solutions is a collaboration between the **University of Victoria** and many local community organizations, and is funded by **Environment and Climate Change Canada**. The grant Principal Investigator is **Dr Kris Dubrawski**. The Program Lead is **Dr Maleea Acker**.

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Engage with Nature-Based Solutions: About the Initiative

Natural systems work. Natural systems – such as wetlands, estuaries, forests, and prairies – provide immense benefits to people and nature. They clean water, absorb floods, cool the climate, and remove carbon from the atmosphere. There is a pressing need to mitigate the stresses that human activity places on these natural systems. Urban development and climate change threaten biodiversity, fragment previously healthy ecosystems, increase droughts and flooding, and affect the security of our food and clean water.

Nature-based solutions support the health of natural systems, while addressing societal challenges. The design of these solutions are based on our planet's natural systems, working with, and for, nature. They increase climate-resilient natural capital (such as wetlands and forests) and provide ecosystem services (such as water filtration). Communities can use nature-based solutions to support the resiliency of our climate, environment, and human society.

Engage with Nature-Based Solutions is a new initiative to support communities who apply nature-based solutions to their local lands and waters. We acknowledge and take inspiration from Indigenous peoples, whose cultures and traditions support healthy ecosystems and the interconnection and importance of all living things.

We collaborate with communities, collect and curate resources, produce education modules, facilitate storytelling, and provide technical equipment (for monitoring and testing in the field). All of our work supports access, engagement, and education, and illustrates the impact and benefits of nature-based solutions.

→ Learn more at www.engagewithnbs.ca



**engage with
Nature-Based Solutions**

communities in local stewardship of lands & waters

About this Unit Plan

This BC Urban Streams & Watersheds unit plan for Grade 7 connects to the **Grade 7 curriculum** and the **Big Idea: Watersheds connect land, water, and life; changes in urban streams from human impacts and climate change affect biodiversity and the health of entire ecosystems.**

As a former Grade 7 teacher, and a current Environmental Science teacher and outdoor educator in Victoria, British Columbia, I designed this unit to help teachers guide their students in learning about British Columbia's watersheds through inquiry, experiential and project-based learning, and outdoor education.

Some of these lessons were inspired by collaborations with my colleagues, including former teaching partners Meaghan Thompson and Michael Jones.

Learning about British Columbia's watersheds through local streams provides an engaging way to connect students to their local streams and to the United Nations' Sustainable Development Goals.

Students can collaboratively connect Indigenous perspectives and ways of knowing to scientific evidence, as they contribute to finding solutions to local watershed issues like biodiversity loss and climate change.

Educators are encouraged to collaborate with local community organizations to learn more about environmental stewardship initiatives,

stream restoration, urban watersheds, riparian vegetation, water quality, salmon recovery, biodiversity, impacts of climate change, sustainability, and hopeful nature-based solutions when using this unit.

I firmly believe that students need to spend time outdoors in our watersheds if they are going to learn to appreciate the environment and ultimately want to protect it.

Topics on our changing climate, biodiversity loss, and impacts on watersheds can cause anxiety and stress in ourselves and students. While this unit is designed with hopeful nature-based solutions, please consider providing time in your discussions to allow students to process their climate emotions. Some helpful resources include Climate Mental Health Network's Climate Emotions Toolkit and Wheel at

<https://www.climatementalhealth.net/resources>

We hope this unit plan will be helpful to your classrooms. We would love to hear from you – how you found it useful, and any suggestions you have for improvement. Contact our team at info@engagewithnbs.ca.

– **Jennifer Walton**

BA, BEd, Diploma in Environmental Technology, MEd

Teacher in Greater Victoria,
British Columbia

BC's Curriculum: Grade 7

This unit plan was developed with Grade 7 classrooms in mind. The BC Ministry of Education lists a variety of Big Ideas, Competencies, and Content for the students to work towards, all of which are listed at <https://curriculum.gov.bc.ca/curriculum>. This BC Urban Streams & Watersheds unit plan supports multiple learning areas for Grade 7, including *Science, Arts Education, and Applied Design, Skills, and Technologies*.

The BC Ministry of Education also identifies a list of Core Competencies. (This text is extracted from <https://curriculum.gov.bc.ca/competencies> in 2026.) These are sets of proficiencies that all students need in order to engage in deep, lifelong learning: Communication; Thinking; and Personal & Social abilities.

COMMUNICATION

Encompasses the knowledge, skills, processes and dispositions we associate with interactions with others. Through their communication, students acquire, develop and transform ideas and information, and make connections with others to share their ideas, express their individuality, further their learning, and get things done. The communication competency is fundamental to finding satisfaction, purpose and joy.

THINKING

Encompasses the knowledge, skills and processes we associate with intellectual development. It is through their competency as thinkers that students take subject-specific concepts and content and transform them into a new understanding. Thinking competence includes specific thinking skills as well as habits of mind, and metacognitive awareness. These are used to process information from a variety of sources, including thoughts and feelings that arise from the subconscious and unconscious mind and from embodied cognition, to create new understandings.

PERSONAL & SOCIAL

The set of abilities that relate to students' identity in the world, both as individuals and as members of their community and society. Personal and social competency encompasses what students need to thrive as individuals, to understand and care about themselves and others, and to find and achieve their purposes in the world.

Suggested subject areas and core competencies under this program include:

English Language Arts:

Students will be able to develop the following curricular competencies using oral, written, visual, and digital resources:

- ✓ Access information and ideas from a variety of sources to build understanding.
- ✓ Apply appropriate strategies to comprehend written, oral, and visual texts, guide inquiry, and extend thinking.
- ✓ Think critically, creatively, and reflectively to explore ideas within, between, and beyond texts.
- ✓ Construct meaningful personal connections between self, text, and world.
- ✓ Respond to text in personal, creative, and critical ways.
- ✓ Exchange ideas and perspectives to build shared understanding and extend thinking.
- ✓ Use writing and design processes to plan, develop, and create engaging and meaningful literary and informational texts for a variety of purposes and audiences.
- ✓ Practice using conventions of English spelling, grammar, and punctuation.
- ✓ Identify how stories in First Peoples cultures connect people to the land.

Science:

Students will be able to inquire to:

- ✓ Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest.
- ✓ Make observations aimed at identifying their own questions about the natural world.
- ✓ Identify a question to answer or a problem to solve through scientific inquiry.
- ✓ Make predictions, observations, measure, and record data.
- ✓ Identify possible sources of error and suggest possible improvements to their investigation method.
- ✓ Experience and interpret the local environment.
- ✓ Identify First People's perspectives and knowledge as sources of information.

- ✓ Contribute to care for self, others, and community through independent or collaborative approaches.
- ✓ Transfer and apply learning to new situations.
- ✓ Generate and introduce new or refined ideas when problem solving.
- ✓ Communicate ideas, explanations, and processes in a variety of ways.
- ✓ Express and reflect on personal, shared, or others' experiences of place.

Social Studies:

Students will develop competencies needed to be active, informed citizens:

- ✓ Use Social Studies inquiry processes (ask questions, gather, interpret and analyze ideas, and communicate findings and decisions.)
- ✓ Develop a plan of action to address a selected problem or issue.
- ✓ Construct arguments defending the significance of individuals, groups, places, and developments.
- ✓ Ask questions, corroborate inference, and draw conclusions about the content and origins of a variety of sources (evidence).
- ✓ Explain different perspectives on issues, developments, or events by making inferences and comparing worldviews.

Mathematics:

Students will be able to apply and transfer mathematical competencies to:

- ✓ Develop, demonstrate, and apply mathematical understanding and communication by using measurement in relation to time, area, perimeter, etc. in design challenges.
- ✓ Connect mathematical concepts to each other and to other areas and personal interests (e.g., cross-discipline, daily activities, local and traditional practices, the environment, news events, and social justice).

Applied Design Skills and Technology (ADST):

Students will be able to develop the following curricular competencies when using the design thinking process (understanding context, defining, ideating, prototyping, testing, and sharing) to:

- ☑ Use materials, tools, and technologies in a safe manner, and with an awareness of the safety of others.
- ☑ Identify and evaluate the skills required for a task and develop those skills as needed.
- ☑ Use familiar tools and technologies to extend capabilities when completing a task.
- ☑ Choose to appreciate technologies to use for specific tasks.
- ☑ Demonstrate a willingness to learn new technologies as needed.

Arts Education (Visual Arts)

Students will be able to use a variety of creative processes and respond to the arts:

- ☑ Intentionally select and apply materials, movements, technologies, environments, tools, and techniques by combining and arranging artistic elements, processes, and principles in art making.
- ☑ Create artistic works collaboratively and as an individual using ideas inspired by imagination, inquiry, experimentation, and purposeful play.
- ☑ Express feelings, ideas, and experiences through the arts.

Associated Files

The lesson plans within this unit reference a variety of files that we've created or assembled for you to download from our website. Each is available in PDF, and many are also available in additional, easily editable formats.

SUPPLIED SUPPLEMENTS:

used in Lesson 1

CRD - Look Inside a Watershed (PDF)

ENBS - Introduction to Watersheds & Biodiversity presentation (PPTX · PDF)

used in Lesson 1 (Extension & Additional Resource)

CRD - Watershed Web of Life (PDF)

CRD - Wetland Birds Scavenger Hunt (PDF)

CRD - Rainwater & Watersheds (PDF)

used in Lesson 2

ENBS - Nature Journaling guidelines (RTF · DOCX · PDF)

ENBS - Nature Journaling evaluation (RTF · DOCX · PDF)

used in Lesson 2 (Additional Resource)

BC Curric - Indigenous Knowledge and Perspectives (PDF)

used in Lesson 3

ENBS - Urban Stream Design Sketching (PDF)

used in Lesson 4

ENBS - Biohooops Biodiversity Survey (RTF · DOCX · PDF)

CRD - Riparian Zone Ecosystem (PDF)

CRD - Native Species (PDF)

used in Lesson 5

ENBS - Biodiversity Campaign presentation (PPTX · PDF)

ENBS - Biodiversity Campaign student handout (RTF · DOCX · PDF)

ENBS - Biodiversity Campaign comic rubric (RTF · DOCX · PDF)

ENBS - Biodiversity Campaign film rubric (RTF · DOCX · PDF)

Global Goals - Annie Sunbeam 1 (PPTX · PDF)

used in Lesson 6

CALP - Coolkit Climate Change Urban Forestry (PDF)

used in Lesson 6 (Extension)

RUSH - Tree Equity brochure (PDF)

used in Lesson 7

Canadian Press - protect homes from rising threats article (PDF)

ENBS - Climate-Resilient Housing Design Challenge presentation (PPTX · PDF)

ENBS - Climate-Resilient Housing Design Challenge brief (RTF · DOCX · PDF)

ENBS - Climate-Resilient Housing Design Challenge map (RTF · DOCX · PDF)

ENBS - Climate-Resilient Housing Design Challenge evaluation (RTF · DOCX · PDF)

used in Lesson 8

CALP - Intro to Climate Change (PDF)

ENBS - Watershed, Climate Change & Biodiversity presentation (PPTX · PDF)

ENBS - Watershed, Climate Change & Biodiversity inquiry questions (RTF · DOCX · PDF)

ENBS - Watershed, Climate Change & Biodiversity profile (RTF · DOCX · PDF)

ENBS - Watershed, Climate Change & Biodiversity summit reflection rubric (RTF · DOCX · PDF)

used in Lesson 8 (Extension)

Learning Thorough Landscapes - Climate Change Dodgeball (PDF)

The complete set is available to download at: <https://engagewithnbs.ca/for-schools>

The Big Idea

Watersheds connect land, water, and life; changes in urban streams from human impacts and climate change affect biodiversity and the health of entire ecosystems.



LESSON 1

Introduction to Watersheds

Learning about British Columbia's watersheds through local case studies provides an engaging way to connect students to their watershed and local streams. In this two-part lesson, students study the key components of a watershed and begin thinking about the biodiversity found in our watersheds. They explore the case study of a stream, Bowker Creek in Victoria, BC. Students reflect on their own connections and experiences in their watershed, while considering the United Nations' Sustainable Development Goals **#14 Life Below Water** and **#15 Life on Land**.



Essential Questions

What is a watershed and what are its key components?

What is your connection to your watershed?

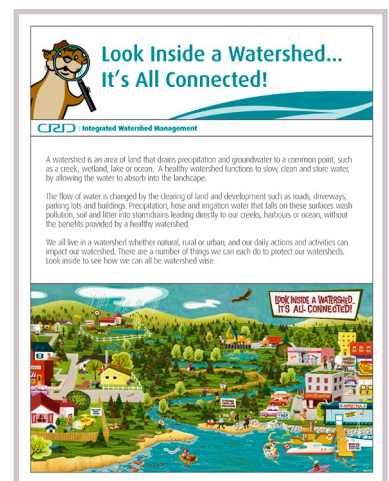
Objectives

Students will be able to:

- Define watersheds and describe how a watershed is part of a larger system.
- Identify the watershed in which they live.

Materials & Preparation

- SUPPLIED SUPPLEMENTS:
 - » *CRD - Look Inside a Watershed* (PDF)
 - » *ENBS - Introduction to Watersheds & Biodiversity presentation* (PPTX · PDF)
- Internet access, computer, projector, speakers
- Paper and writing tool



Introduction

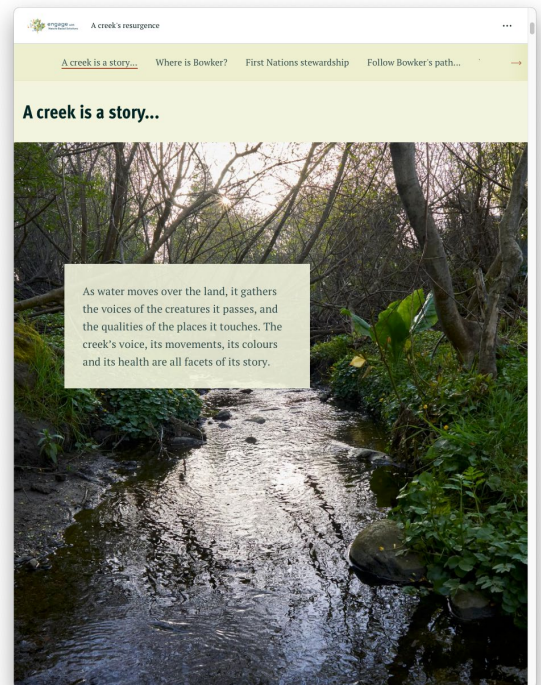
- Use the *ENBS - Introduction to Watersheds & Biodiversity presentation* slides guide your lesson.
- Check in with your students' prior knowledge about the water/hydrological cycle and understanding of watersheds and their functions.
- As a class, determine which watershed you live in.
- In small groups, brainstorm all the things that you would find in a watershed.

Activity, Part 1

- Watch the video, *Capital Regional District's Watershed Stewardship: We all live in a watershed*
<https://youtu.be/dYpCpqbsjk>
- Using copies of *CRD - Look Inside a Watershed*, have students work in partners to identify and discuss the positive and negative impacts humans have on urban streams.
- Give time to explore case studies of urban streams and watersheds including:
 - » Use this story map from Engage with Nature-Based Solutions to explore the urban impacts and restoration efforts on Bowker Creek (Victoria, BC):
<https://engagewithnbs.ca/community-story/bowker-creek/>
 - » Explore the Fraser River Watershed CPR website:
<https://watershedcpr.canadiangeographic.ca/>
 - » Find local case studies in your area or have students research articles in the news about urban streams.

Activity, Part 2

- Continue with the *ENBS - Introduction to Watersheds & Biodiversity presentation* slides to introduce biodiversity by prompting students to view the “Water is Life” artwork (on slide 15). Ask students to discuss with a partner some living things depicted in this artwork.





- Inform students that, in the past 50 years, 73% of all wildlife has been lost. (This figure comes from the 2024 Living Planet Index.) Ask students: *Why might this have happened? What might this statistic mean for people and the planet?*
- Have students define “biodiversity” and continue by watching the following videos:
 - » Watch the TED-Ed video *Why is biodiversity so important?* by Kim Preshoff.
https://youtu.be/GK_vRtHJZu4
 (TED-Ed url is <https://ed.ted.com/lessons/why-is-biodiversity-so-important-kim-preshoff>)
 - » Watch the video *Our planet – What is biodiversity?* by David Attenborough.
<https://youtu.be/US58f-SwO0k>
 Stop the video at 1:40 minutes, just after David Attenborough says “*Our planet’s biodiversity provides all the things we need for free. But it will only do so if there are lots of it, and at the moment it is under attack.*” Discuss this quotation from David Attenborough. Ask students to think about what he might mean when he says that “*biodiversity is under attack*”. Continue with the rest of the video.
- Ask students: *What human behaviours and activities are increasing biodiversity loss?*
- Share United Nations Environment Programme article *Five Drivers of the Nature Crisis*. If more discussion is needed: <https://www.unep.org/news-and-stories/story/five-drivers-nature-crisis>

Evaluation / Assessment

- EXIT CARD: Students can choose and respond to 2–3 questions to confirm their understanding of the lesson:
 - » What conclusions can you make about the importance of watersheds?
 - » Which human actions affect the quality of water in our watersheds or urban streams?
 - » What biodiversity can be found in our watershed?
 - » Which of the United Nations’ Sustainable Development Goals can you connect to watersheds and biodiversity?
 - » What is your connection to your watershed?

Extensions

- Bring in a watershed model or borrow one from a local organization to demonstrate the water cycle and systems. For example, in Greater Victoria: <https://www.crd.ca/environment/education-outreach/field-trips-presentations/harbours-and-watersheds>
- Integrate the SUPPLIED SUPPLEMENT *CRD - Watershed Web of Life* (PDF)
- Participate in a biodiversity scavenger hunt using the SUPPLIED SUPPLEMENT *CRD - Wetland Birds Scavenger Hunt* (PDF)
- Have students create their own watershed model, urban stream case study, or map.
- Take more time to explore the United Nations’ Sustainable Development Goals and the connections to global water systems: <https://sdgs.un.org/goals>

Additional Resources

- SUPPLIED SUPPLEMENTS
 - » *CRD - Rainwater & Watersheds* (PDF)
- Capital Regional District (CRD) Local Watershed Maps: <https://www.crd.ca/environment/stormwater-watersheds-harbours/watersheds/watershed-maps-diagrams>
- Capital Regional District (CRD) Biodiversity Protection: <https://www.crd.ca/environment/biodiversity-flora-wildlife/biodiversity-protection>

LESSON 2

Indigenous Relationships to Freshwater & Nature Journaling

Through this lesson, students explore the Indigenous relationships and interconnectedness with freshwater and the land. They will develop an understanding of Traditional Ecological Knowledge, while interacting with their natural world and nature journaling. For more background knowledge use the *FNESC/FNSA Secondary Science First Peoples Teacher Resource* (Unit 3 Relationship to Freshwater, pages 85–95). This lesson can be divided into parts:

- learning about Indigenous perspectives and their relationship with watersheds,
- scaffolding nature journaling techniques, and
- going outdoors to nature journal and reflect.

Essential Question

How can water resources be understood from the perspective of Indigenous Peoples and Traditional Ecological Knowledge (TEK)?

Objective

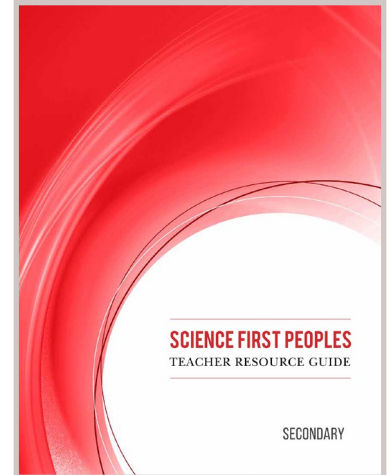
Students will be able to:

- Observe, think, wonder, and reflect through immersive experiences with freshwater ecosystems.
- Identify the Indigenous lands in which they live.
- Describe key principles of Indigenous Knowledge and how it relates to watersheds.
- Apply nature journaling techniques to record scientific and cultural observations

Materials & Preparation

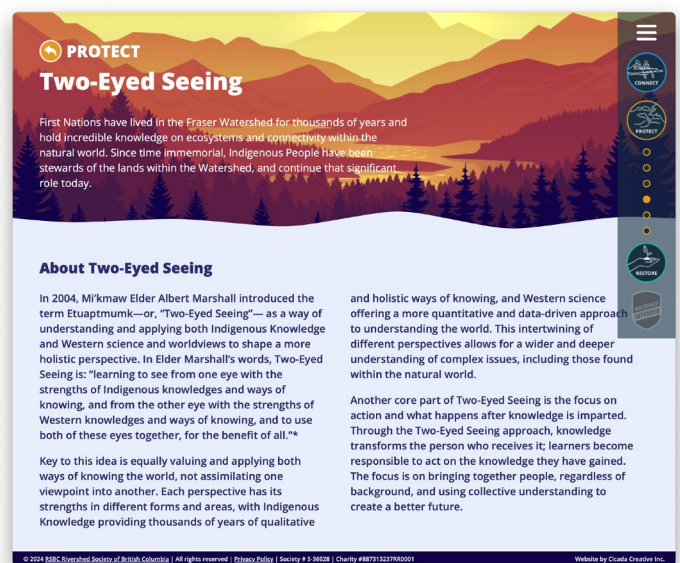
- SUPPLIED SUPPLEMENTS:
 - » *ENBS - Nature Journaling guidelines* (RTF · DOCX · PDF)
 - » *ENBS - Nature Journaling evaluation* (RTF · DOCX · PDF)

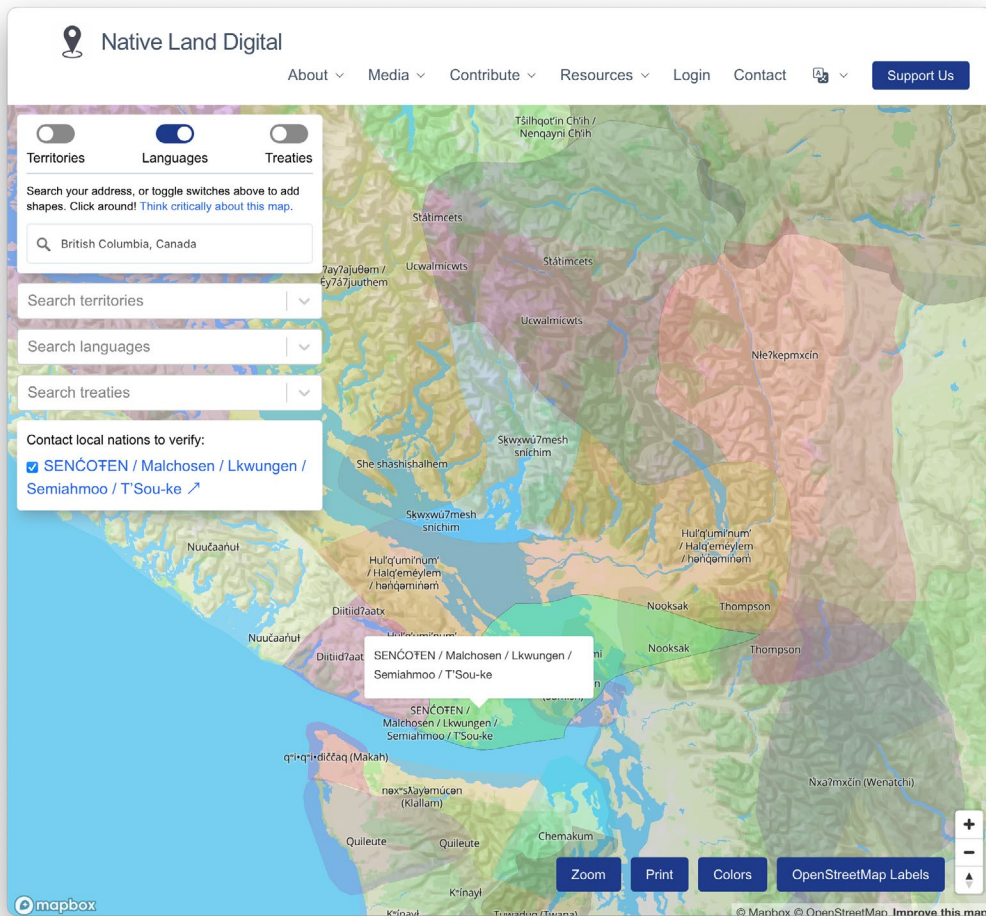
- Internet access, computer, projector, speakers
- Science notebooks or blank paper and clipboards
- Writing tool, coloured pencils
- *FNESC/FNSA Secondary Science First Peoples Teacher Resource*, available to download at <https://www.fnesc.ca/sciencetrg/>



Introduction

- Discuss the Indigenous concept of **place**: “Place is any environment, locality, or context with which people interact to learn, create memory, reflect on history, connect with culture, and establish identity” (Indigenous Knowledge and Perspectives: Science K–12). The connection between people and place is foundational to First Peoples perspectives and Indigenous Knowledge.
- Discuss Traditional Ecological Knowledge as it understands the relationships between all aspects of the local environment including plant species, animal species, habitat, landforms, weather, and seasonal changes. Use the handout to guide the discussion from the *FNESC/FNSA Secondary Science First Peoples Teacher Resource* (page 50).
- Provide examples of connecting Traditional Knowledge and Western Science with the story from Mi'kmaw Elder Albert Marshall and the term **Etuaptmunk** or “Two-Eyed Seeing”: <https://watershedcpr.canadiangeographic.ca/salmon/protect/exploring-conservation-issues/>
- Take time to explore the Indigenous teachings on Canadian Geographic Education’s *Our Water Connection* and why we need to protect it using this visual story map: <https://arcg.is/0iGHa81>
- Explore and watch the video at *We are the Keepers of the Water*: <https://www.keepersofthewater.ca/>
- Ask students to discuss in partners or small groups how they think their local watershed has changed due to colonization.





Activity

- Determine the traditional Indigenous lands of your watershed using Native Land Digital: <https://native-land.ca> or Whose Land: <https://www.whose.land/en/>
- Go for a walk outdoors or to a nearby body of water, and ask students to think about the following guiding questions:
 - » *What are the names of some water bodies near where you live and learn?*
 - » *Do you know of any Indigenous names of places in your community?*
 - » *How do you think these bodies of water are connected?*
 - » *What are your connections to water?*

- Introduce elements of nature journaling with your students using the *ENBS - Nature Journaling guidelines*.
- Have students take time to sit by themselves within a given boundary and nature journal to observe their land, stream, pond, or lake engaging all of their senses.
- Encourage students to use the **SEE-THINK-WONDER** strategy:
 - » What do you **SEE**?
 - » What do you **THINK** about that?
 - » What does it make you **WONDER**?



Assessment

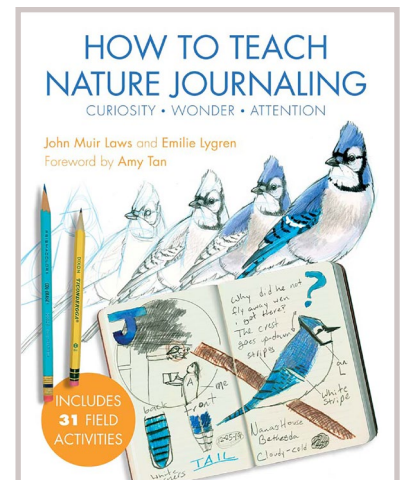
- Students can share their nature journals with a peer and discuss: *How can water resources be understood from the perspective of First Peoples and Traditional Ecological Knowledge?*
- Collect students' nature journals and share written feedback.

Extension

- Invite an Elder or Indigenous knowledge holder to discuss their relationship to water and Traditional Ecological Knowledge.

Additional Resources

- SUPPLIED SUPPLEMENT:
 - » *BC Curric - Indigenous Knowledge and Perspectives* (PDF)
- John Muir Laws: *How to Teach Nature Journaling*:
<https://johnmuirlaws.com/product/how-to-teach-nature-journaling/>



LESSON 3

Urban Stream Mapping

In this lesson, classes are encouraged to visit a local stream or water body in their neighbourhood. Students will draw an aerial sketch of the urban stream and make notes on the characteristics of the riparian zone.

Essential Question

How does the physical structure of a riparian zone affect the health of an urban stream ecosystem?

Objectives

Students will be able to:

- Observe and identify key physical features of a riparian zone, including natural structures (for example, logs, riffles, pools) and human-made features.
- Draw a stream map and aerial sketch showing vegetation, animals, water features, and signs of human impact using symbols and key.

Materials & Preparation

- SUPPLIED SUPPLEMENT:
 - » *ENBS - Urban Stream Design Sketching* (PDF)
- Clipboards
- Coloured pencils

Introduction

- Watch *What is a Riparian Zone?* by Ecosystem Essentials: https://youtu.be/_rZNeGZlfgU
- Explain stream or park etiquette and safety, Leave No Trace, and boundaries for their aerial sketch.
- Remind students about their nature journaling guidelines.

Activity

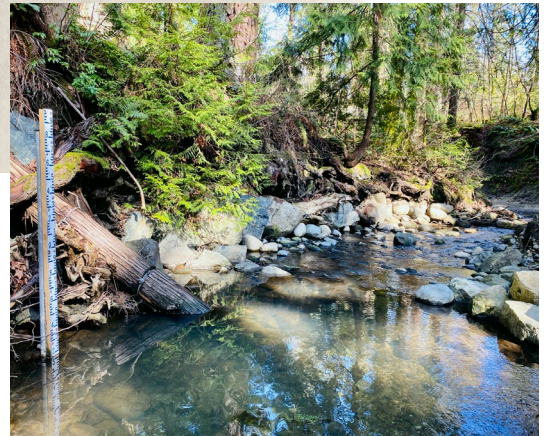
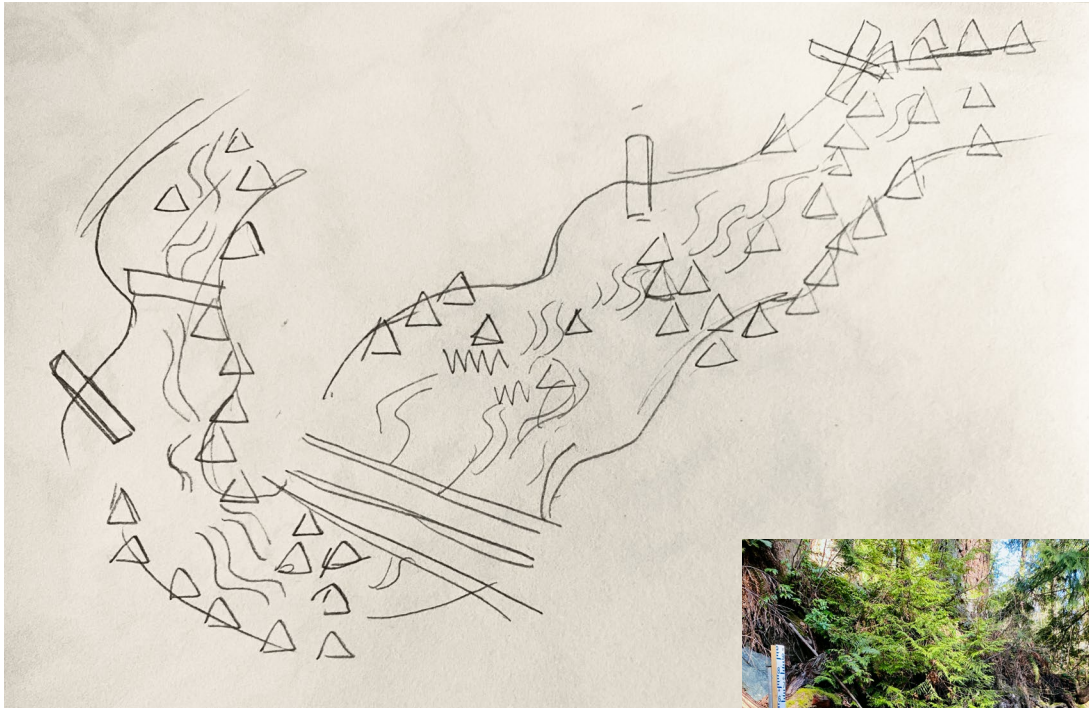
- Students will draw an aerial sketch of the stream location and note the following features at the location: logs, riffles, rapids, pools, overhanging banks or cutbacks (evidence of erosion), rocks along shoreline, plants, and garbage or litter. They can reference *ENBS - Urban Stream Design Sketching*.
- Have students create a key of shapes and lines to identify features and characteristics of the stream, record the location, date, weather, etc.








Assessment

- Have each student write a short paragraph explaining if they think this stream location is ideal for salmon in the early/end stages of their life cycle or a good release site for salmonids in the classroom and include any other information they need to know.

Extensions

- Conduct an entire stream survey investigation including water quality parameters such as measuring temperature, dissolved oxygen, and turbidity, and identifying plants and invertebrates. Adapt Activity 3.4 Water Sampling Investigation from FNESC's *Science First Peoples Teacher Resource Guide (SECONDARY) (2019)* on pages 95–96 and 105–110. This guide is available for free from <https://www.fnesc.ca/sciencetrg/>
- Integrate a salmon study and adapt Engage with Nature-Based Solutions' Urban Streams & Watersheds **Intermediate** unit plans: <https://engagewithnbs.ca/for-schools/>
- Visit Pacific Salmon Foundation's Salmon Spotting map to locate spawning salmon run in rivers and streams of British Columbia: <https://psf.ca/salmonspotting/#map>



- KEY:
-  log
 -  riffle
 -  rapid
 -  rocks along shoreline
 -  overhanging banks or cutbacks
(evidence of erosion)
 -  plants
 -  garbage or litter



Urban stream design sketching at Douglas Creek at PKOLS (Mount Douglas Park) in Victoria, BC (by student Kelly Li)

LESSON 4

Field Study: Watershed Biodiversity Survey

A “**biohoop**” gives us a window into the rich biodiversity of a watershed, especially along the **riparian zone** – the area where land and water meet. By focusing on just one cubic foot of space near a stream, creek, or wetland, you can discover how different organisms interact and how healthy or stressed the ecosystem might be. This hands-on field study connects directly to biodiversity, ecosystems, and human impacts in urban watersheds. (This lesson is adapted from the National Museum of Natural History’s *Biocube at Home* lesson.)

Essential Question

What can a small area of riparian habitat tell us about the health of the whole watershed?

Objectives

Students will be able to:

- Identify key features of a riparian zone and explain its roles in maintaining watershed health.
- Investigate, record, analyze, and communicate findings of observed species in the riparian zone.

Materials & Preparation

- SUPPLIED SUPPLEMENTS:
 - » *ENBS - Biohoops Biodiversity Survey* (RTF · DOCX · PDF)
 - » *CRD - Riparian Zone Ecosystem* (PDF)
 - » *CRD - Native Species* (PDF)
- Clipboards
- Pencils
- Species identification books or plant/animal ID apps (for example, Seek by iNaturalist)

- Hula hoops to serve as “Biohoops”
- Optional: magnifying glass, small containers to temporarily observe insects or aquatic invertebrates
- Pre-visit: choose a safe riparian site with varied vegetation and visible signs of biodiversity

Introduction

- Review prior learning about riparian zones.
- Distribute the *CRD - Riparian Zone Ecosystem* infosheet. Ask students to read the guide with a partner and highlight key points in their own words by choosing a few of the guiding questions: *What are riparian zones? Why are riparian zones important? What are some human impacts on riparian zones? What can we do to support the biodiversity and ecosystem in a riparian zone?*
- Regroup as a class and discuss why riparian zones are critical for water quality, habitat, and ecosystem health.

Activity

- Introduce the biohoop method for the watershed biodiversity survey and explain how a small sampling area can act as a “window” into the ecosystem.
- Discuss safe movement near water and respectful handling of living things. Emphasize the “leave no trace” and “observe and return” principles for any collected organisms.
- Make predictions of the biodiversity they would expect to see at the survey site.
- Using the *ENBS - Biohoops Biodiversity Survey* document, follow the step-by-step instructions and record habitat details (such as location, soil conditions, water, vegetation type, sunlight/shade, human impacts like litter or trampling)
- Students can work in groups of 2–3 to identify as many species as possible within the biohoop (such as plants, insects, fungi, aquatic life) using ID guides/apps to assist with classification.
- Sketch the hoop’s contents from a “bird’s-eye” view, labeling key species.
- Take photos.
- At the end of the biodiversity survey, have the groups share their notes of the abundance (how many individuals of each species) and diversity (how many different species). Discuss any evidence of species interactions (such as predation, competition, pollination, decomposition).
- Repeat biohoop survey (trials) in another location if time allows.

Assessment

- Back at the school, review completed field notes and have each student write their individual responses to at least three of the summary questions on the *ENBS - Biohoops Biodiversity Survey* document.
- Highlight possible sources of error. Have students suggest improvements in your biohoop investigation method.
- Use a short EXIT CARD:
 - » One new species you learned about
 - » One sign of watershed health observed
 - » One human action that could protect the riparian zone

Extension

- Compile class data by having each group enter biodiversity data (such as species type observed, abundance, habitat notes, evidence of human impacts) into a shared Google Sheets, Excel, or poster board. Data can be sorted by categories. Determine total species and frequency of occurrence across all biohoops. Use a spreadsheet tool to create table summaries with totals, averages, and diversity indexes or graphs (such as a bar graph to represent number of species per biohoop location, pie chart showing distribution of plant and animal species, line graph if activity is repeated over time).
- Repeat biohoop biodiversity surveys in the same location during another season to observe changes for long-term monitoring.
- Research and propose one realistic action to reduce human impacts on riparian habitats as a part of an Urban Watershed Action Plan.

Additional Resources

- Smithsonian National Museum of Natural History's Biocube at Home activity:
<https://naturalhistory.si.edu/education/teaching-resources/life-science/biocubes-exploring-biodiversity/biocube-home>
- CRD Biodiversity Protection educational material and information sheets:
<https://www.crd.ca/environment/biodiversity-flora-wildlife/biodiversity-protection>
- Seek by iNaturalist: https://www.inaturalist.org/pages/seek_app

LESSON 5

Protect Biodiversity in Watersheds through Environmental Activism

Use the United Nations' Sustainable Development Goals (SDGs) and specifically **Goal #14 Life Below Water** to bring awareness to protecting our oceans, rivers, lakes, and streams to encourage your students to be environmental stewards and advocates. The World's Largest Lesson resources provides an overview for students who are new to learning about the SDGs. Students will read a superhero comic about protecting life below water and watch films about raising awareness and taking action in aquatic and marine plastic pollution.



Students work in small groups to create their own comic book or film to foster action and awareness to protect biodiversity in watersheds. This lesson plan will take 3-5 blocks to complete: beginning with a review of the SDGs and biodiversity in watersheds; reflecting on examples of comics and campaign films, planning their story map, creating and editing, and presenting.

Essential Question

How can we use our understanding of aquatic and marine biodiversity to tell a story, take action, and protect life below water in our local ecosystems?

Objective

Students will be able to:

- Understand the importance of the SDGs and protecting life below water from threats of biodiversity loss.
- Conduct research related to environmental issues of an urban stream and use existing skills and new skills to take action in environmental stewardship.
- Address an actual environmental issue in the community and coordinate action through collaboration with the community.

Materials & Preparation

- SUPPLIED SUPPLEMENTS:
 - » *ENBS - Biodiversity Campaign presentation* (PPTX · PDF)
 - » *ENBS - Biodiversity Campaign student handout* (RTF · DOCX · PDF)
 - » *ENBS - Biodiversity Campaign comic rubric* (RTF · DOCX · PDF)
 - » *ENBS - Biodiversity Campaign film rubric* (RTF · DOCX · PDF)
 - » *Global Goals - Annie Sunbeam 1* (PPTX · PDF)
- Internet access, computer, projector, speakers
- Students computers or paper

Introduction

- Review the United Nations' Sustainable Development Goals using the World's Largest Lesson resources and focus on **Goal #14 Life Below Water** (30 minutes).
- Guide students through the *ENBS - Biodiversity Campaign presentation* slides.
- Read *Global Goals - Annie Sunbeam 1*.

Activity — COMIC BOOK OPTION

- Remind students about the parts of a comic and have students break down the *Global Goals - Annie Sunbeam 1* or other samples.
- Use a story map template for students to:
 - » Plan a beginning, middle, and end of their comic story or campaign film.
 - » Make connections to **Goal #14 Life Below Water**.
 - » Bring awareness to specific environmental issues in urban streams or salmon habitat.
 - » Select a scene to portray an urban stream.
 - » Develop characters like a superhero, interplanetary being, animal, or themselves!
 - » Solve a problem and work towards protecting or restoring urban streams.
- Encourage students to share their comic story with family, friends, peers, and school community to raise awareness.



Activity — FILM OPTION

- Using the campaign video, *Imaginary Friend ...* (<https://youtu.be/cOY2PbkAww>), guide students through the criteria of the *ENBS - Biodiversity Campaign student handout* and mind map on page 11 of the presentation slides.
- Have students use the Plan, Action, Change template page to brainstorm their ideas.
- Give students time to create their film.
- Encourage students to share their campaign film with family, friends, peers, and school community to raise awareness.

Assessment

- Use the *ENBS - Biodiversity Campaign comic rubric* to evaluate the students' comics, and the *ENBS - Biodiversity Campaign film rubric* to evaluate the students' films.

Extension

- Connect the class with a local organization that protects and restores urban streams.
- Volunteer to help pull invasive species, clean up litter on beaches, restore riparian zones, and learn more about how to help clean your local watersheds.
- Explore and reflect on climate emotions using helpful resources such as Climate Mental Health Network's Climate Emotions Toolkit and Wheel: <https://www.climatementalhealth.net/resources>

LESSON 6

Evidence of Climate Change in Watersheds

This lesson is adapted from the *Citizen's Cool Kit on Climate Change & Urban Forestry* from UBC (<https://calp.forestry.ubc.ca/urban-forestry-toolkit/>). This adaptation has more focus on observing signs and identifying impacts of climate change in a watershed or near local urban streams by exploring your school's neighbourhood. Students will use the Claim-Evidence-Reasoning (CER) model to guide their thinking and investigation. This lesson can be used as an introduction to your unit in climate change or after learning about the causes and climate science.

Essential Question

How might our school grounds and neighbourhood contribute to climate change and impact our watershed?

Objective

Students will be able to:

- Identify common local features that contribute to the causes and show evidence of the impacts of climate change in urban watersheds.
- Apply the Claim-Evidence-Reasoning model to guide their investigation and analysis.

Materials & Preparation

- Internet access, computer, projector
- Class set of clipboards
- Pencils
- Highlighters or coloured pencils
- Printed aerial maps (such as Google Maps) of your school grounds and neighbourhood
- Extra blank paper to record quantitative and qualitative data (or use page 17 of the SUPPLIED SUPPLEMENT *CALP - Coolkit Climate Change Urban Forestry* (PDF))

Introduction

- Play “climate change caterpillar” as an ice-breaker game where each student takes a turn saying one word they associate with climate change. If words are repeated, begin the round again. Consider making a climate change word wall for students.
- Review the causes of climate change and brainstorm a list of local features that could enhance global warming and lead to climate change. For example:
 - » Burning fossil fuels and carbon emissions from transportation and heating buildings;
 - » Dark impervious surfaces (such as concrete, roads, sidewalks, driveways, and parking lots) absorb a higher amount of solar radiation;
 - » Urban Heat Island Effect (UHIE) results in temperature differences between urban and surrounding rural areas; and
 - » Buildings, development, and construction reduces the amount of green space available and contributes to burning fossil fuels.
- Make connections to your watershed and discuss impacts that climate change has on the area or a local urban stream. For example:
 - » Impervious surfaces increases surface runoff and poor drainage, and contributes to flooding;
 - » Urban Heat Island Effect (UHIE) impacts the vulnerability of local waterways by increasing in water temperature; and
 - » Limited trees and basic green lawns increase temperature and risk of drought.
- Create a chart on the board or individually to highlight points from this discussion, and use the following questions to further guide your students:
 - » *What are the main causes of climate change?*
 - » *What are some local features that emit carbon emissions? How do greenhouse gas emissions enhance global warming and contribute to climate change?*
 - » *What are the risks and impacts associated with climate change in our watershed? How is the local watershed vulnerable to climate change? (For example, coastal areas are at risk of sea levels rising, flooding can harm an aquatic ecosystem or infrastructure, and droughts can lead to loss in biodiversity.)*

Activity

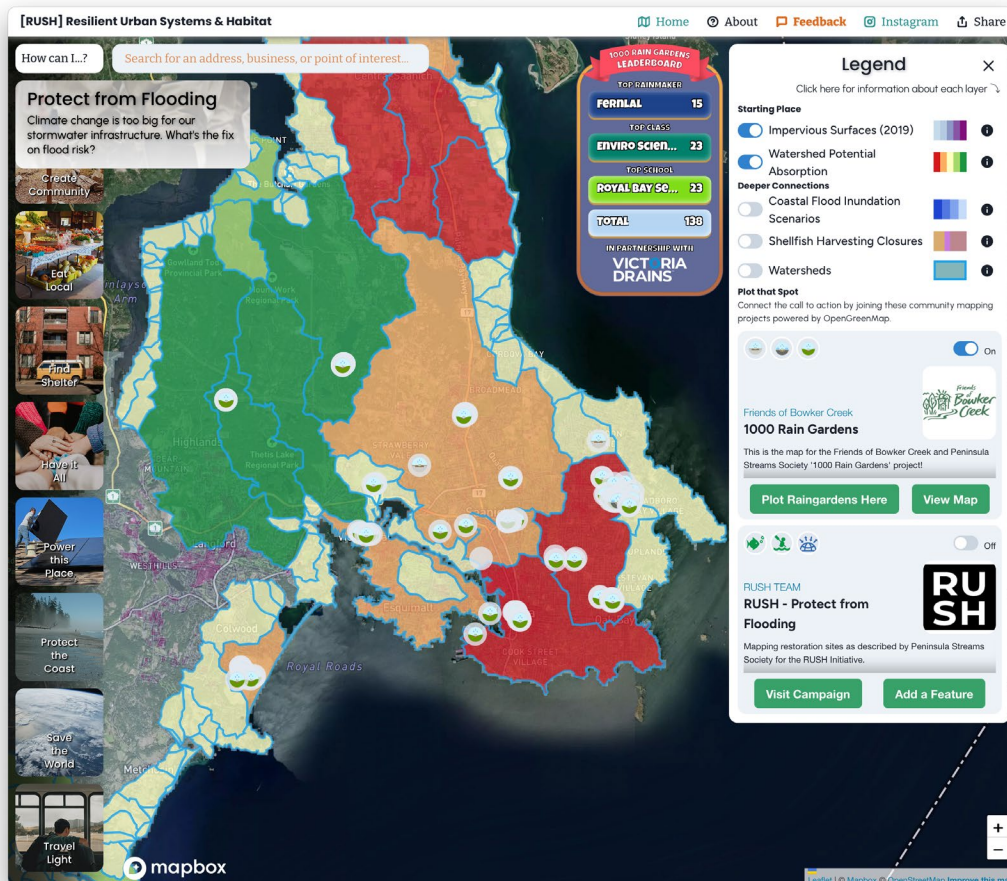
- Introduce the Claim-Evidence-Reasoning (CER) model in relation to this activity with the research question: *How might our school grounds and neighbourhood contribute to climate change and impact our watershed?*
- Distribute printed maps of your school grounds and neighbourhood to students, working in pairs.
- Instruct students to make a claim or hypothesis about their mapping investigation in one sentence that answers the research question. Encourage students to be specific. For example, *“Impervious surfaces absorb more heat.”*
- Take students outdoors and walk around the school grounds and neighbourhood to make annotations on their maps identifying local features that contribute to causes of climate change.
- Have students consider transportation use and record the number of vehicles – as well as how many of these are electric, hybrid, and car share vehicles – and determine the percentage of more sustainable cars. Count and record the number of bicycles they see.
- Have students use coloured pencils or highlighters to annotate areas that are more vulnerable to the impacts of climate change.
- Calculate percent coverage of impervious surfaces using the map.
- Alternatively, have some groups of students map trees, biodiversity, food gardens, or solar panels.

Assessment

- Regroup and give time for students to share their findings.
- Instruct students to write a reflection paragraph using the CER model. Students reiterate their claim about the outcome of their investigation. Then have students present examples and evidence from the data they collected through the school and neighbourhood mapping investigation. Have students explain *why* and *how* the evidence supports their claim. They should conclude the paragraph with any *questions* or *wonders* they have, and identify further experimentation that is required.

Extension

- Have students design an experiment question, determine variables, and create a methodology to explore their claim further.
- Conduct an inquiry project and research the impact of climate change on urban streams or watersheds.
- Consider exploring climate solutions such as low carbon features, activities, and innovations that help reduce watershed vulnerability, and that either mitigate or adapt to climate change.
- If living in Greater Victoria, have students explore the RUSH (Resilient Urban Systems & Habitat) Initiative web map at <https://whatstherush.ca>. Students can use this reference to help them map evidence of climate change. Explain the 3-30-300 rule: tree equity standard in Canada states that you can see at least 3 trees from your home, communities should have 30% tree canopy in neighbourhoods, and you can walk to a green space within 300 metres. Have each student map trees in your neighbourhood using the SUPPLIED SUPPLEMENT RUSH - Tree Equity brochure (PDF).



LESSON 7

Design Challenge: Climate-Resilient Housing & Watershed Protection

This lesson can be a 45-minute design challenge using Lego or Play-Doh, or a multi-day project that explores the design thinking process in more depth and allows students time to build a digital prototype or by using wood, recyclables, or other materials. Students will have built background knowledge on design thinking through classroom discussions, activities, and STEM challenges prior to this lesson. Use current events to introduce local examples of how communities are facing flooding, heatwaves, rising sea levels, and extreme weather events that can damage or destroy homes and infrastructure. Connect how in many places, especially near creeks and rivers, these problems are made worse by how we've built our cities, such as covering land with impervious surfaces (like concrete or asphalt), removing natural buffers, and interrupting the water cycle. When water can't soak into the ground, it rushes into urban streams and watersheds, causing pollution, erosion, and flash floods that hurt both people and ecosystems.

Essential Question

How can we design affordable, climate-resilient housing that protects both people and the health of local watersheds?

Objective

Students will be able to:

- Explain how climate change affects people, homes, and watersheds.
- Use the design thinking process to create a climate-resilient housing prototype.
- Collaborate to plan, build, and reflect on a model that addresses flood mitigation, runoff, and sustainable design.
- Communicate how their prototype supports environmental and social resilience.

Materials & Preparation

- SUPPLIED SUPPLEMENTS:
 - » *Canadian Press - protect homes from rising threats article* (PDF)
 - » *ENBS - Climate-Resilient Housing Design Challenge presentation* (PPTX · PDF)
 - » *ENBS - Climate-Resilient Housing Design Challenge brief* (RTF · DOCX · PDF)
 - » *ENBS - Climate-Resilient Housing Design Challenge map* (RTF · DOCX · PDF)
 - » *ENBS - Climate-Resilient Housing Design Challenge evaluation* (RTF · DOCX · PDF)
- Internet access, computer, projector
- Access to materials for building prototypes such Play-Doh, LEGO, wood pieces, tools, recyclables, hot glue, etc.

Introduction

- Provide background information regarding the environmental concerns of extreme weather events in your local area including images, short video clips, or articles about flooding, heatwaves, and urban streams impacted by climate change (for example, see *Canadian Press - protect homes from rising threats article*)
- Discuss as a class: *what problems do these communities face? How is water moving through these cities? What happens when water has nowhere to go? Why does it matter where and how we build in our watersheds?*
- Introduce the Design Challenge: *“You will work in teams to design and build a small prototype home or shelter that protects people and their environment from the impacts of climate change – especially flooding and runoff that affect local streams and watersheds.”*

Activity

- Introduce the *ENBS - Climate-Resilient Housing Design Challenge brief* to address a threat to a salmon stream habitat and collaborative design project. Specify that students should focus on addressing one of the concerns in their innovation (such as run-off filtration system, litter catcher, habitat restoration system, flooding prevention, or salmon egg protective box).
- Have students begin by filling out their own *ENBS - Climate-Resilient Housing Design Challenge map* before collaborating on ideas and sketching their prototype with labels.
- Provide access to materials based on their planning sheets and time to build prototypes.

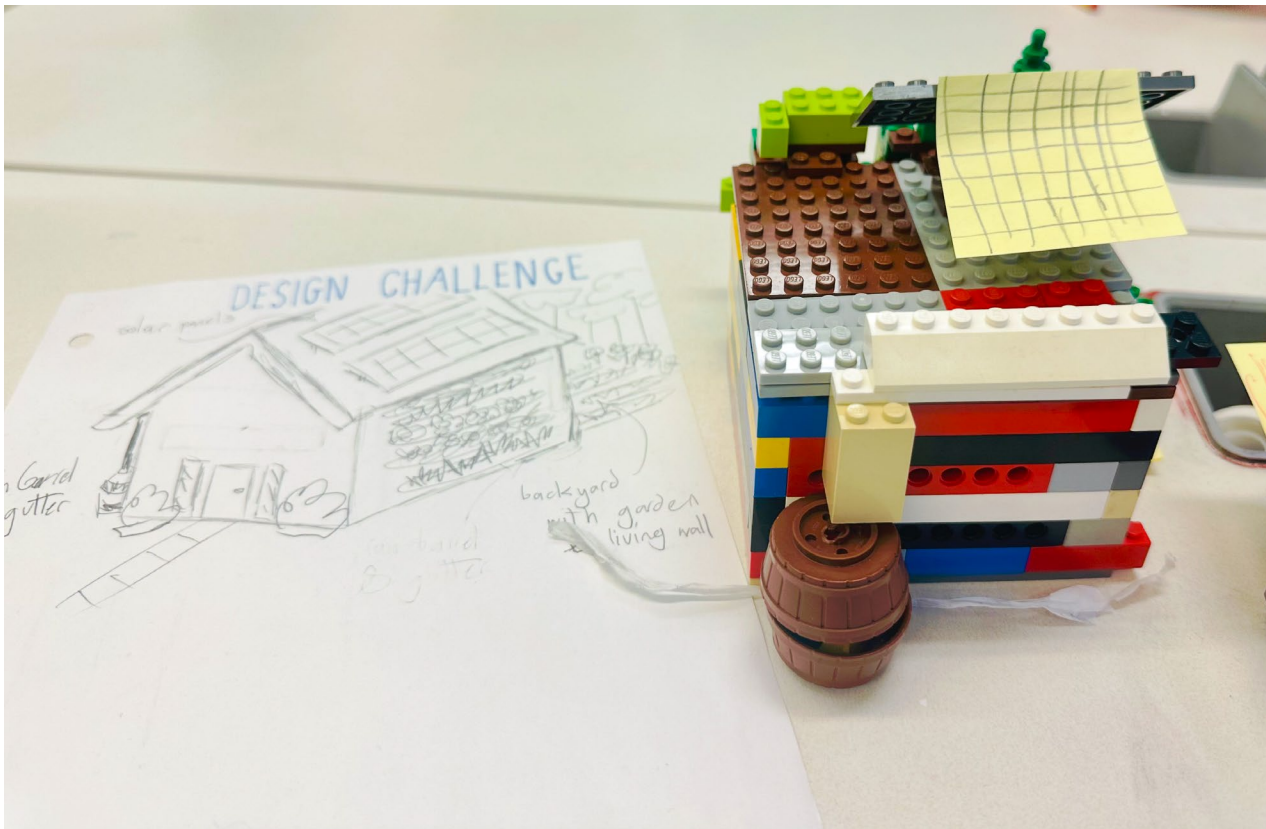
Assessment

- Conduct a gallery walk to share prototypes and present innovations with the whole class.
- Have students complete the *ENBS - Climate-Resilient Housing Design Challenge* evaluation.

Extensions

- Calculate the volume of stormwater the prototype can manage or the footprint area of impervious surface reduced.
- Test how water flows around the model using spray bottles or simulate rainfall.
- Share prototypes with local watershed stewards or invite a planner/engineer to provide feedback.
- Explore **biomimicry** (nature-inspired innovation) to address an environmental issue related to a local stream or watershed. Use Lesson 9 from Engage with Nature-Based Solutions' Urban Streams & Watersheds **Environmental Science 12** unit plans:

<https://engagewithnbs.ca/for-schools/>



LESSON 8

Watershed, Climate Change & Biodiversity Summit

In this culminating project, students will write and present profiles of interested parties, and engage in a summit modelled from the United Nations' Conference of the Parties (COP) to address issues of climate change, biodiversity loss, and watershed protection. Students will have learned about the causes, impacts, and solutions of climate change before preparing for the summit and will need 3-5 classes to prepare for the summit.

Essential Questions

To what extent are human beings responsible for the changes in Earth's climate and the biodiversity loss within our watershed?

How do fossil fuels affect the climate and our water systems? Should we keep using them? Why or why not?

How can people protect watersheds and slow climate change so that both humans and nature can stay healthy? How can we work with nature instead of against it?

Objective

Students will be able to:

- Explain how human activities contribute to climate change, biodiversity loss, and watershed degradation.
- Describe different perspectives of interested parties affected by climate and watershed issues.
- Engage in a collaborative summit to propose solutions that balance environmental, social, and economic needs of our watersheds.
- Reflect on their learning and identify personal actions that support watershed protection and climate action.

Materials & Preparation

- SUPPLIED SUPPLEMENTS:
 - » *CALP - Intro to Climate Change* (PDF)
Print climate profile cards and “meet and greet” questions from pages 15–31.
 - » *ENBS - Watershed, Climate Change & Biodiversity presentation* (PPTX · PDF)
 - » *ENBS - Watershed, Climate Change & Biodiversity inquiry questions* (RTF · DOCX · PDF)
 - » *ENBS - Watershed, Climate Change & Biodiversity profile* (RTF · DOCX · PDF)
 - » *ENBS - Watershed, Climate Change & Biodiversity summit reflection rubric* (RTF · DOCX · PDF)
- Internet access, computer, projector
- List of interested parties (such as Indigenous community member, farmer, city planner, energy company representative, youth activist, government leader, marine biologist, or conservationist)
- Background information sheets on climate change, biodiversity, watersheds, and fossil fuels and printed or shared copies of the *ENBS - Watershed, Climate Change & Biodiversity inquiry questions*
- Chart paper, markers, sticky notes
- Reflection materials as needed (such as art supplies, paper, devices for video/audio if available)

Introduction

- Share David Attenborough’s video *A Life on Our Planet Trailer*, where he comments “We need to learn how to work *with* nature, instead of *against* it.”
<https://www.ourplanet.com/en/video/david-attenborough-a-life-on-our-planet-trailer/>
(also available at <https://youtu.be/64R2MYUt394>)
- Display an image or short video of a global and local watershed or a before-and-after example of environmental change (for example, flooding, pollution, drought, or habitat loss) such as:
 - » NASA’s images of change:
<https://science.nasa.gov/earth/multimedia/interactives/images-of-change/>





- » Pacific Salmon Foundation's *The state of salmon in Canada's largest salmon-bearing river*: <https://youtu.be/9-lrt7z091Y>
- » Global News' Record low snowpack levels raise summer drought concerns: <https://globalnews.ca/video/10284066/record-low-snowpack-levels-raise-summer-drought-concerns>
- » The Tyee's *How The Big Melt Will Change Life for People and Nature*: <https://thetyee.ca/News/2021/05/12/How-Big-Melt-Will-Change-Life-People-Nature/>
- Have students Think-Pair-Share: *How do people use water from our watershed? What problems might climate change cause for water and living things here?*
- Introduce the idea of a Watershed, Climate Change & Biodiversity Summit, explaining that students will represent different groups to work together on solutions just like world leaders do at the United Nations' COP (Conference of the Parties).

Activity — PART 1: Climate Profile and Summit Preparation

- Introduce the *ENBS - Watershed, Climate Change & Biodiversity inquiry questions*.
- Provide examples of climate profiles using *CALP - Intro to Climate Change* (pages 2–4, 15–31)
- Have students move around the classroom to “meet and greet” with their peers representing different characters and using the guiding questions to prompt discussions.

- Debrief the activity prompting students to consider the positive and negative impacts of climate change and how the profiles might connect to watersheds.
- Use *ENBS - Watershed, Climate Change & Biodiversity profile* to have students research their assigned role and prepare a short written profile to share during the summit.

Activity — PART 2: Watershed, Climate Change & Biodiversity Summit

- Invite community members that work in watersheds, climate change, or biodiversity to participate in the summit.
- Update a copy of the *ENBS - Watershed, Climate Change & Biodiversity presentation* and follow or adapt this outline for the summit:
 - » Welcome & Land Acknowledgment
 - » Keynote Speaker
 - » Guest Introductions
 - » Climate Profiles
 - » 3 Discussion Questions (10 minutes each)
 - » Q & A with Guests
 - » Taking Action
 - » Closing Remarks & Gratitude
- Have students make notes on chart paper and sticky notes to compile their discussion ideas.
- Guide students to share their work in their table groups.

Activity — PART 3: Taking Action

- Use the Climate Action Venn Diagram to help students identify their personal climate action: <https://www.ayanaelizabeth.com/climatevenn>
- Take action using the following guiding questions:
 - » *As citizens of the world, what choices can we make to reduce the effects of climate change and biodiversity loss?*
 - » *What are the most pressing actions that we should take (as individuals, as a school, as a community)?*
 - » *What action are you going to take to make our watersheds a better place?*

Assessment

- Have students create a representation of their learning on watersheds, climate change, and biodiversity (such as painting, collage, poem, video, or interpretive dance) and respond to the following prompts in a written statement:
 - » I used to think ___, but now I think ___.
 - » Revisit the *ENBS - Watershed, Climate Change & Biodiversity inquiry questions* and David Attenborough’s comment “We need to learn how to work with nature, instead of against it.
 - » Connect your thinking to at least one of the United Nations’ Sustainable Development Goals.
 - » Why is it important that we address these together: people (social), planet (environmental), prosperity (economic), partnerships, and peace?
 - » What is one action that you can take that can make a positive change towards lessening your impact on our watershed?
 - » Where is your hope?

Extension

- Play cooperative games such as predator/prey with extreme weather events and species from your local watershed, or climate change dodgeball (SUPPLIED SUPPLEMENT *Learning Thorough Landscapes - Climate Change Dodgeball* (PDF)) to demonstrate how increased GHG increases global warming.
- Give students time to implement their action projects based on solutions identified by the class or personal climate action venn diagrams. For example:
 - » Write a letter to a local decision-maker about protecting the watershed
 - » Create a class action plan for reducing water use or pollution at school
 - » Compare your local watershed to another watershed affected by climate change and inquiry into more nature-based solutions
 - » Connect the summit outcomes to current global climate agreements





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