

Session 4

Watersheds In Distress

Educator's Guide



Learn more about practices that are causing serious damage to our watersheds, and threatening the health of our fish populations and drinking water.



The Big Question: How is our watershed being harmed?

In this session, your group will learn more about practices that are causing serious damage to our watersheds, and threatening the health of our fish populations and drinking water.

Indigenous Knowledge Element

Reciprocity: the idea of balanced and mutual exchange within natural, economic, and social systems that humans are one part of with all other life.

Share or, ideally, have an Elder or Knowledge/Culture-Keeper share, a story from the local tradition that reflects this concept (see *Best Water Ways* website for resource links).

Preparation

Look at the regional resources on the *Best Water Ways* site at cowichanlandtrust.ca/best-water-ways. Check if there is a watershed education group in your area that can provide a presentation on this topic. Grade-level appropriate Ecology textbooks, articles, and research papers can add depth to topics that interest your group.

Introducing the Concept

To introduce this session, take a few minutes to review your group's previous learning regarding features, flow, and dynamics of the local watershed, both in the rural and urban areas. Share with them that, in this session, they will begin to explore how different human actions and practices impact the water flow, and water quality, within the watershed. For example, deforestation and development involve removing key elements (trees and other vegetation) that help slow down and filter water flow.

Ask the group what they may have already noticed about impacts to the water flow and quality when they were detectives in the local watershed. This conversation will help your students draw connections between what they have already discovered and the new information they are about to learn.

Learning the Content

Activity 1: Identifying Impacts on the Watershed

Break the learners into small, even-numbered groups. Follow the directions for Activity 1 in the Session Activity Plan (page AP4-2). Learners will work in groups to research the words and terms and share the information with each other.

Words and Terms

Contaminants a polluting or poisonous substance that makes something impure or alters it from its healthy, natural state.

Deforestation the action of clearing a wide area of trees.

- Invasive species** a plant, animal, or insect species that is not native to a specific location (an introduced species), spreads to a degree believed to cause damage to the environment, human economy, and/or human health.
- Nitrates (NO₃)** a chemical compound of Nitrogen and Oxygen. These are essential chemical elements for life. However, in excess, and when in this form, they are harmful. When nitrogen fertilizers are used to enrich soils, excess nitrates are carried by rain, irrigation, and other surface waters through the soil into groundwater. Human and animal wastes can also contribute to nitrate contamination of water.
- Phosphorus** a very reactive chemical element required in small amounts by both plants and animals. Excess phosphorus from fertilizer and other human use (soaps) is carried through the watershed and is very disruptive of balance in aquatic and riparian ecosystems.
- Reciprocity** the concept of mutual exchange and shared benefit within relationships between people and between people and nature. One way of putting it is the fair balance of giving and taking in a relationship.
- Surface run-off (also known as overland flow)** the flow of water that occurs when excess stormwater, meltwater, or other sources flows exceed the capacity of the natural waterways and flow over the lands surface. Repeated surface run-off impacts vegetation, causes flooding and soil and land erosion.

Evaluating the Learning

Watershed Wiz Quiz Game

This is an optional activity. For instructions, see Session Activity Plan (page AP4-3)

Watershed Reflection

The “Watershed Reflection” activity gives learners the opportunity to process what they have learned and make connections to their own life and experience. It is also a valuable way to help you assess the level of learning and comprehension in your group, and to provide some guidance towards ideas you may want to revisit through the rest of the projects and beyond.

Learning outcomes embodied in this session include the learner’s ability to:

- › Name two threats to our watersheds
- › Explain how threats to the watershed impact our drinking water
- › Describe how a damaged watershed harms fish species such as salmon

Sharing Circle

Take a few moments to sit in a circle and invite participants to share something from their “Watershed Reflection”.

Watersheds In Distress: Grade Curriculum and Competency Connections

For detailed information visit <https://curriculum.gov.bc.ca/curriculum/science>

Grade Level and Subject	Content Connections	Curricular Competencies
Grade 9 Science	<ul style="list-style-type: none"> • Sustainability of systems • First Peoples knowledge of interconnectedness and sustainability 	<ul style="list-style-type: none"> • Questioning and predicting • Planning and conducting • Processing and analyzing data and information • Evaluating • Applying and innovating • Communicating
Grade 11 Earth Science	<ul style="list-style-type: none"> • Evidence of climate change • First Peoples knowledge of climate change and interconnectedness as related to environmental systems • Effects of climate change on water sources • First Peoples knowledge and perspectives of water resources and processes 	<ul style="list-style-type: none"> • Questioning and predicting • Planning and conducting • Processing and analyzing data and information • Evaluating • Applying and innovating • Communicating
Grade 11 Environmental Science	<ul style="list-style-type: none"> • First Peoples ways of knowing and doing • First Peoples knowledge and other traditional ecological knowledge in sustaining biodiversity • Ecosystem complexity • Human actions and their impact on ecosystem integrity 	<ul style="list-style-type: none"> • Questioning and predicting • Planning and conducting • Processing and analyzing data and information • Evaluating • Applying and innovating • Communicating
Grade 11 Science for Citizens	<ul style="list-style-type: none"> • Impact of technologies • Actions and decisions affecting the local and global environment, including those of First Peoples • Human impact on Earth's systems • Actions and decisions affecting the local and global environment, including those of First Peoples 	<ul style="list-style-type: none"> • Questioning and predicting • Planning and conducting • Processing and analyzing data and information • Evaluating • Applying and innovating • Communicating

Grade Level and Subject	Content Connections	Curricular Competencies
Grade 12 Environmental Science	<ul style="list-style-type: none"> • Water quality parameters and bioindicators • Availability and water use impacts • Changes to climate systems • Global water security: conservation of water • Impacts of global warming • Land use and degradation 	<ul style="list-style-type: none"> • Questioning and predicting • Planning and conducting • Processing and analyzing data and information • Evaluating • Applying and innovating • Communicating
Grade 12 Specialized Science	<ul style="list-style-type: none"> • Biodiversity is dependent on the complex interactions and processes between biotic and abiotic factors • Climate change impacts biodiversity and ecosystem health 	<ul style="list-style-type: none"> • Questioning and predicting • Planning and conducting • Processing and analyzing data and information • Evaluating • Applying and innovating • Communicating

Notes

[illegible]

Activity Plan

Session 4: Watersheds In Distress



Big Idea/Inquiry

How is our watershed being harmed?



Time

Approximately 2.5 hours

Indigenous Knowledge Element: Reciprocity

Reciprocity: the idea of balanced and mutual exchange within natural, economic, and social systems that humans are one part of with all other life.

Share (or ideally have an elder/culture keeper share) a story from the local tradition that reflects this concept (see *Best Water Ways* website at cowichanlandtrust.ca/best-water-ways for links).



Purpose

The purpose of the session is for students to learn about practices that are causing serious damage to our watersheds, and threatening the health of our drinking water and fish stocks



Handouts/Materials

- *Learner's Guide—Session 4: Watersheds In Distress*
- Grade-level appropriate articles and research papers about impacts on watershed ecosystems
- Earth Science/Ecology reference books



Equipment Needed

- Internet access



Learning Goals

To become aware of threats to the watersheds, water health, and fish health.

Learning Outcomes

Students will be able to:

- › Name two threats to our watersheds
- › Explain how threats to the watershed impact our drinking water and quality of life. Removal of wetlands is one of the root causes of major flooding all around the world
- › Describe how a damaged watershed harms fish species such as salmon

Key Learning Points

- › Industrial deforestation and clearing of riparian areas during development removes primary filtration and/or slows water flow into the watershed.
- › Exposed soils runoff into the watershed, causing sediment damage in fish habitat, and potential contaminants to our drinking water
- › Other contaminants, such as nitrates, phosphorus, and chemical pesticides, enter the watershed from agriculture and other industry
- › Residential areas impact the watershed through phosphorus and other chemical runoff into storm drains and house drains
- › Invasive plant and animal species gain a foothold in damaged ecosystems both in riparian (e.g., blackberry/ivy) and aquatic zones (e.g., parrots feather/reed canary grass), impacting the natural flow of the system
- › Reciprocity: when harm is done to natural systems, eventually harm comes to all beings living in those systems, including humans. Taking good care of Earth's ecosystems with active reciprocity helps maintain balance and reduce harm

Introducing the Topic

To introduce this session, engage in conversation by asking learners what watershed impacts they are already aware of.



Activity 1: Identifying Impacts on the Watershed

Divide into six groups. Using the inquiry questions in their Learner's Guides, each group will research one watershed threat in the vocabulary list and share what they learn. Assign each group one of the vocabulary words to research and share about. Follow the method in their Learner's Guides (20 min).

*There is a table in the Learner's Guide (page LG4-3) where learners can draw and record what they learned about other groups' "Words and Terms" as they share. One side is for the image, and one side for the bullet notes.

Closing the Session

Summarizing and Reflecting: Have learners complete the following activities.



Activity 2: Watershed Wiz Quiz (optional)

Put notebooks away and let the quiz begin! Learners will draw a word or term from a container and match it with a corresponding example on one of the maps, explaining what it is using the example.

When they get it right (maybe with a little help from their friends), they get to pick who goes next!



Activity 3: Watershed Reflection

To transition into this reflective activity, share a bit about what has stood out for you in this session. Direct learners to work on their “Watershed Reflection” independently in their Learner’s Guide.



Activity 4: Sharing Circle

Take a few moments to sit in a circle and invite participants to share something from their “Watershed Reflection”.

Watershed Wiz Quiz

"Watersheds In Distress" Words and Terms

Reciprocity	Eutrophication
Deforestation	Runoff
Phosphorus	Contaminants
Invasive Species	Nitrates