Building Climate Resilience: Salmon Sampling

Background Information on the Fraser River:

The Fraser River starts as a trickle of melted snow at the top of Mount Robson, which is in the Rocky Mountains, sitting on the border of British Columbia and Alberta. The river travels 1,375 kilometres through BC and empties into the Pacific Ocean. There are many tributaries (a river or stream that flows into a larger river or lake) that add water to the Fraser as it travels through BC. The Fraser River is the longest in BC, and one of the largest in all of Canada.

The landscapes of the Fraser River change from the beginning of its journey to its end. As you exit the headwaters on Mount Robson, the water is crystal clear, shallow, and extremely cold. The middle portion of the river is called the Fraser Canyon, where the river is squeezed between mountain ranges, increasing the speed and creating many impressive rapids. The point at which the fresh water of the Fraser River meets the salty water of the Pacific Ocean is called the estuary (also sometimes called "between land" by the First Nations people because, as the tides ebb and flow, the estuary changes from land that is covered with water to dry land). Because estuaries have access to both riparian (river) and marine nutrients, they are home to an incredible diversity of life. The Lower Mainland is located in the estuary portion of the Fraser River.

The Fraser River Estuary is as rich in its biodiversity as it is an ideal habitat for many organisms, such as salmon. Salmon are a keystone species because their life cycle contributes greatly to the health and biodiversity of numerous ecosystems. They transport nutrients found in the ocean to freshwater environments as they migrate inland to spawn. These nutrients can also reach land as their odies wash upon shore, feeding hundreds of other species, from bears and eagles to towering forests and microorganisms. Their populations are an important way for scientists to gauge the health of a watershed, and their decline signals broader ecosystem imbalances.

Indigenous people have been living in what we now call Canada for time immemorial, meaning that Indigenous communities have no stories of arriving here. They have always been here. There are many different First Nations along the River; each group is unique, with its own language or dialect, specific traditions, particular relationships with the landscape, stories, etc. The river has been used by Indigenous communities for thousands of years, and they have specialized technologies, traditions and celebrations related to the river, nature, and biodiversity. Hul'q'umi'num', Halq'eméylem, and hənqəmin̓əm are Indigenous language dialects spoken in the lower portion of the Fraser River. In Halqeméylem, the language dialect spoken in the upper portion of the lower Fraser, the word for river is Stolo. In hənqəmin̓əm, a language dialect spoken in the lower portion of the lower Fraser, the word for river is stalə w. Indigenous communities throughout BC speak other languages and dialects, and will have other names for the river. The Fraser River Discovery Centre is located on the traditional and unceded territory of the hənqəmin̓əm and Halqeméylem speaking peoples. Territory acknowledgement is one small part of Reconciliation. We ask you to take a moment to think of other ways you can participate in Reconciliation with Indigenous communities.

Program Overview:

In this program, students will be introduced to the importance of salmon in everyday lives and how samples are taken and used to assess salmon health and the health of the river. They will delve into Indigenous Peoples' connection to salmon and how they measure the health of the salmon population using cultural technologies. Scientists can figure out important information regarding salmon, including age, feeding habitats, and seasonal changes, by looking at otolith and scale samples.

The 70-minute program begins with an introductory presentation and is split into three activities:

1. Guess the sampling technique
2. Otolith age determination
3. Sampling board game

Program Objectives

- How sampling informs conservation decisions
- Benefits and drawbacks of different sampling techniques
- Environmental conditions affect salmon growth
- How to protect salmonid habitat in streams

Helpful Vocabulary

- **Hatchery**: a place where the hatching of fish or poultry eggs is artificially controlled for commercial purposes.
- **Interconnectedness**: a holistic worldview where everything in the universe is seen as linked and interdependent, including people, animals, plants, the land, the spirit world, and the Great Spirit.
- **Keystone Species:** species with significant influence in their natural environment – so much so that they are critical to maintaining the diversity and stability of an ecosystem
- **Otolith**: calcium carbonate ear bone that grows with the fish, creating daily and annual rings, similar to tree rings, that reveal the fish's age
- **Reciprocity**: a fundamental principle based on mutual exchange, respect, and a deep understanding of interconnectedness with all living things, including the land, community, and spirit

- **River Basin:** the area of land from which all surface water—including precipitation, runoff, and groundwater—drains into a particular river and eventually flows to a single outlet, such as the sea or a large lake.
- **Sample:** a selected group of people or things from a larger population used to gather information about the whole group
- **Sustainability**: the practice of meeting present needs without compromising the ability of future generations to meet their own needs, balancing environmental, economic, and social factors to ensure long-term health for both people and the planet.
- **Traditional Knowledge**: a living system of knowledge, know-how, skills, practices, and cultural expressions that are passed down from generation to generation within a community
- **Urban Development:** the process of building, changing, and improving towns and cities through the creation of new buildings, infrastructure, and public spaces
- **Water Contamination:** Water contamination occurs when substances pollute the water and make it unusable for cooking, drinking and other uses. Contamination can occur from agriculture, industrial chemicals, overflowing sewers and more.

In- class activities:

Here are some ideas to help prepare your class for the program, and to continue the learning back in the classroom.

Pre-visit:

1. Have students become familiar with the route of the Fraser River. Show on a map where the river begins, the different ecosystems it passes through, and where it ends. Map out the journey of salmon starting at the side streams, all the way to the ocean.
2. Review the salmon life cycle
    a. https://www.youtube.com/watch?v=gFswGt7o_08
        i. Watch this beautiful video that illustrates the life cycle of salmon, told from the salmon's perspective. This video shows how salmon affects all aspects of life inside and outside the ater. It outlines Indignoeus' importance as well.
    b. https://www.scienceworld.ca/resource/salmon-life-cycle-mix-match/
        i. A hands-on activity created by Science World that has students become familiar with not only the life cycle of salmon, but their changing environments as well.
3. Introduce salmonid sampling techniques, such as studying otolith and scale samples
    a. https://www.youtube.com/watch?v=f1-Hx3iKepY

i. Introduction to what Otoliths are and why they are used to study salmon

b. https://www.youtube.com/watch?v=7vkWwNXh7LA&t=5s
   i. How otoliths and scales are studied

Post visit:

1. Have students reflect on the board game activity from the program. Have students think back on the different scenarios from the game.
   a. What were some of the threats to salmon and their habitat?
   b. How are Indigenous Ways of Knowing important to salmon and their survival?
   c. Why is salmon sampling important? What are the risks?
   d. What external events affect the growth of salmon?
   e. Who relies on the return of salmon?
   f. How does climate change affect salmon and their habitat?
2. Review current Indigenous led management of salmon populations
   a. https://www.dfo-mpo.gc.ca/campaign-campagne/pss-ssp/stories-articles/2025-indig-harvest-peches-auto-eng.html
   b. https://psf.ca/blog/the-mamalilikullas-game-plan-to-recover-salmon-populations/#:~:text=Indigenous%2Dled%20conservation%20has%20existed,advisor%20to%20Mamalilikulla%20First%20Nation.
3. A final review of why we sample salmon, what it represents and why it's important.
   a. https://www.dfo-mpo.gc.ca/videos/eval-assess-eng.html