

## BC Salmon Restoration and Innovation project



NATIONAL INDIGENOUS FISHERIES INSTITUTE  
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## GIS Mapping of BC Riparian Areas to Inform Risk Vulnerability

### Proposed Concept

First Nations mapping riparian areas critical to wild salmon using advanced technology, while developing risk vulnerability capacity and planning related to sensitive waterways.

### Description

First Nations across BC have identified the need to gather data regarding risk vulnerability and the state of the natural environment within their traditional territories critical to wild salmon populations. Multiple factors, including limited resources, capacity and training, have left Indigenous communities in BC without a province-wide mechanism for observing shifts and trends in vulnerable riparian landscapes over time, and thus being unable to connect how these changes may impact the salmon species on which communities rely.

Through the use of geographic information system (GIS) technologies and community mapping techniques, First Nations can overcome this shortcoming by gathering and sharing baseline watershed data, and beginning to identify and mitigate shifts and trends in waterways and landscapes. Using unmanned aerial vehicle (UAV) and Light Detection and Ranging (LiDAR) technologies to collect GIS data is common across a wide range of mapping, land management and planning efforts. LiDAR is a remote sensing method that uses light in the form of an aerially pulsed laser to measure variable distances to the Earth. These light pulses—combined with other data recorded by the airborne system—generate precise, three-dimensional information about the shape of the Earth and its surface characteristics.

This proposed project consists of two to four pilots hosted by Aboriginal Aquatic Resource and Oceans Management (AAROM) groups and/or First Nations communities to gather GIS data and use the information to support the development of community-based watershed mapping and disaster management planning. The project would be developed and implemented in collaboration with the University of Victoria's Map Shop Collaborative over a three- to four-year period. An initial relationship building/coordination exercise between AAROMs and UVic would need to be held prior to the start of this project.



The project has four elements:

***1. Mapping using drones and LiDAR to gather spatial data***

Each pilot project would use a UAV drone to collect LiDAR data in a watershed of significance to map landscape and waterway features of importance to aquatic risk vulnerability planning. Data would be captured at fine temporal resolution for describing landscape and water system dynamics in soil moisture, vegetation, and topography in catchments where there are important downstream effects. An initial flight would gather baseline data for the watershed, and subsequent flights will allow for comparisons to monitor landscape shifts.

Each pilot would require one drone equipped with LiDAR capabilities and GIS station as well as software and hardware, and training to operate the tools and to interpret data.

***2. Developing a BC-wide online platform to enable sharing of interpreted GIS data***

Interpreted drone information would be mapped using ARC GIS and uploaded to an online platform designed to share mapped information broadly. This would contribute to a BC-wide online platform housing interactive watershed maps which will monitor and measure landscape changes over time and support risk vulnerability management. There will need to be collaborative decision-making to establish where a central online platform would exist – and coordination of a broad framework tool.

***3. Developing risk vulnerability management plans using community mapping and GIS***

Concurrent with the gathering of data, methodologies for community-based watershed mapping will be developed to inform the long-term risk vulnerability mitigation and response planning processes and provide valuable information regarding watershed dynamics and trends critical to thriving wild salmon populations.

Community mapping provides a framework and forum for integrating local knowledge about past and current environmental changes, in combination with GIS information, and can provide a platform to develop well-informed strategies on how to manage community responses to significant and severe changes to waterways and critical salmon habitat.

***4. Developing an aquatic-themed GIS and community-planning risk vulnerability framework tool***

After completion of pilots, other watersheds could be mapped using the best practices and methodologies developed during the pilots, which will be outlined in a resulting BC First Nations risk vulnerability framework document.



## Workshop

Following a discussion about the proposed concept and any required changes or input from BC AAROMs and First Nations, the workshop would focus on identifying the parameters and estimated cost of the project over three years. This project could include the following elements:

- How GIS technology can be effectively and more widely used to support salmon management planning and related initiatives
- Address First Nation resilience planning related to access to salmon and stewardship of habitat
- Development of a process to replicate vulnerability planning through use of GIS more broadly in First Nations communities and organizations in BC
- Development of processes to share GIS data in an effort to support broader salmon rebuilding and habitat restoration initiatives

## Why is this Concept Being Considered?

Through the use of community mapping practices coupled with GIS data collection, this initiative will support collection of watershed mapping data while enabling communities to build scientific and research capacity and skills around risk vulnerability. This project will advance Indigenous collection of scientific data, develop capacity to participate in community planning, salmon habitat degradation, while advancing a plan to mitigate identified risks. It will also contribute to the standardization and collection of monitoring and data collection tools and training.

Other expected results include:

- Increased First Nations technical mapping capacity
- First Nations communities in BC are supported in the planning of riparian and water related disaster management – including community-based watershed mapping methodologies and best practices developed
- Socio-economic gaps reduced through creation of jobs in implementation of project

## Alignment with BCSRIF Priorities

The overall objective of this proposed initiative is to support the conservation and sustainability objectives of wild BC salmon stocks, while also providing BC First Nations with tools related to risk vulnerability planning and management in relation to changes in water-levels and impacted critical riparian spaces. It will also help AAROMs invest in technological infrastructure, and participate in the training necessary to operate and interpret related data, that can be used beyond the lifetime of this project.



## **Alignment with Other Initiatives (Potential Partners)**

### ***University of Victoria Map Shop Collaborative***

The Map Shop is an initiative hosted by the Department of Geography at the University of Victoria, and is run by a mix of staff and faculty who help manage projects that focus on the use and development of community mapping and geospatial technologies. Expertise within this collaborative includes:

- Community mapping
- Outreach and engagement
- Graphic design
- Spatial analysis and modelling
- Geospatial technology development

This initiative functions to facilitate processes for community engagement, learning, research, and sustainable community planning through participatory community mapping. This is achieved through engaging students, community members, Indigenous partners and other participants both locally and globally.

