

## Summer 2024 Sustainability Scholars Program Internship Opportunity

The UBC Sustainability Hub is pleased to offer current UBC graduate students the opportunity to work on sustainability internship projects. Successful candidates work under the guidance of a mentor from the partner organization, and are immersed in real world learning where they can apply their research skills and contribute to advancing sustainability across the region. These opportunities are paid. The pay rate for the summer 2024 program is \$27.50/hour or \$6,875 for a 250-hour project.

- Visit the [Sustainability Scholars Program website](#) to learn [how the program works](#) and to [apply](#).
- Be sure to review the application guide on the Apply page to confirm your eligibility before applying.

**Applications close at midnight on Sunday January 28, 2024.**

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### > This is a Fraser Estuary Research Collaborative Project <

The [Fraser Estuary Research Collaborative](#) (FERC) is focussed on advancing efforts to protect the Fraser River estuary in collaboration with key NGO and Indigenous partners. If you are interested in producing new knowledge and supporting Fraser estuary protection through scientific, technical, governance and policy innovations, the following project might be for you.

**Successful candidates are expected to attend workshops and other events in the lower mainland in person.**

**Project title: Using a landscape analysis approach to identifying opportunities for salmon habitat restoration projects in the Lower Fraser River**

#### **Project Background & Overview:**

The Lower Fraser River is a migratory corridor for all salmon populations that spawn in the Fraser River watershed, which comprises one-third of British Columbia. Historically, the Lower Fraser River had many sloughs, pools, and side channels that acted as important stopover sites and habitat refugia for outmigrating juvenile salmon as they made their way to the estuary. However, with European colonization and industrial development, these habitats have been significantly reduced or completely removed due to shoreline armoring, a practice that uses riprap<sup>1</sup> retaining walls to reinforce riverbanks to prevent erosion. The extensive development of natural shoreline in the Lower Fraser River has transformed the North, Middle, and South Arms into homogenous, fast-flowing aquatic environments that subject juvenile salmon to increased predation rates and higher physiological stress.

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<sup>1</sup> Riprap is often used to stabilize construction site areas and facilitates industrial development of the riverbank and shoreline. Hard armoured shorelines can also introduce toxic contaminants and pollutants into the aquatic environment (e.g., heavy metals from rip rap), that can impact water quality.

## **Key overarching issues**

Considering that many populations of Fraser River salmon are assessed as at-risk of extinction, increasing available rearing habitat and the connectivity between habitats is vital to their recovery. Further, it has been demonstrated that juvenile salmon found along riverine shorelines that feature natural cover (e.g., overhanging vegetation, large woody debris) are better fed and more abundant than those along engineered shorelines (Garland et al. 2002; Tabor et al. 2011). In the Duwamish River estuary, located in the industrialized Puget Sound, Washington, the density of epibenthic invertebrates measured along unarmoured shorelines was 10-fold greater than along armoured shorelines (Morley et al. 2012), indicating higher prey density and availability for juvenile salmon. There is a clear opportunity to identify shoreline restoration sites in the Lower Fraser River that could provide transitional habitats for juvenile salmon, allowing the gradual physiological adjustments to saline water and providing increased foraging opportunities for these young fish. Over the long-term, providing habitat refugia and connectivity could increase the likelihood of survival for salmon during this vulnerable life stage and support the overall recovery of Fraser River salmon populations.

## **Sustainability problem and proposed solution**

This project contributes to the larger sustainability issue of the rapid development, urbanization, and ongoing industrialization of the Lower Fraser River and estuary. There are numerous industrial projects currently proposed to be built in or adjacent to the North Arm of the Lower Fraser River, including: a replacement of the George Massey Tunnel, the FortisBC Tilbury Phase 2 LNG Expansion Project, and an upgrade and rebuild of the Iona Wastewater Treatment Plant LNG, among others. This project will address the ongoing loss and degradation of shoreline and in-river habitat in the Lower Fraser River by identifying locations to support a 'greenway' of connected habitats for juvenile salmon.

## **Project description**

This project proposes to use a landscape framework to identify key locations where developed shoreline, or remaining natural shoreline, could be restored/enhanced to provide tidal transition areas and refugia for outmigrating juvenile salmon. The landscape framework used in this project will be modeled after the framework implemented in the Columbia River Estuary (see Hood et al. 2021), which uses a 'stepping-stone model' to provide site-specific evaluation for each restoration site. The goal of the stepping-stone model is to create shoreline habitat 'patches', which when spaced less than 5 km apart, provide habitat connectivity and a corridor for juvenile salmon.

The stepping-stone model could include the following factors to help identify candidate locations:

- 1) Landscape priorities
  - a. Temporal and spatial use of shoreline habitat by different salmon life histories (to determine project benefits)
- 2) Individual project criteria
  - a. Travel distances between patches
  - b. Access of habitat patches and opportunities for feeding and residency

- c. State of shorelines (armoured or natural?)
- 3) Ecological factors
  - a. water flow (mean annual discharge in m<sup>3</sup>)
  - b. riparian/vegetation habitat present (in m<sup>2</sup>)
  - c. water quality
- 4) Jurisdiction/zoning and project feasibility
  - a. Identify the landowner/jurisdiction responsible for the shoreline, and any permitting/permission steps needed to conduct restoration

Importantly, the details of the stepping-stone model can be adapted to the financial and physical restraints of each location while advancing ecological objectives for juvenile salmon. Thus, a stepping-stone model of appropriate size and location can benefit juvenile salmon growth and survival throughout their estuary residency and migration in geographies where urban development constrains the size of habitat restoration projects, such as in the Lower Fraser River.

### **Climate action and sustainability elements**

In addition to benefitting juvenile salmon, habitat restoration patches identified in this project could also provide greenspace in an otherwise industrial and developed shoreline. These locations could potentially be turned into publicly-accessible greenspaces that provide wildlife habitat and educational opportunities for local communities and schools. Further, it has been demonstrated that restored shorelines improve local water quality by reducing stormwater runoff through the filtration and retention of water from native vegetation, thus contributing to a cleaner environment in the Lower Mainland.

### **Action**

The stepping-stone approach taken in this project operationalizes landscape ecology-based decisions within Lower Fraser River for migratory salmon and is applicable to other salmon-bearing rivers – particularly those that are in urbanized environments. With the identification of patch locations, these restoration projects could be realized over the coming decade with collaboration from Indigenous Nations, adequate funding, and appropriate permitting.

### **Project scope**

- Conduct a literature review on the role of estuarine habitat in salmon life histories and provide an overview of habitat restoration that has occurred to date in the Fraser River Estuary. Identify current knowledge gaps or uncertainties.
- Scope a landscape framework (with stepping-stone model) to the Lower Fraser, and identify:
  - Landscape priorities
  - Project criteria
  - Ecological factors
  - Jurisdiction/permitting requirements
- Scope restoration goals and limitations

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- Goal: provide refugia habitat for outmigrating juvenile salmon in the North Arm of the Lower Fraser River to increase habitat connectivity.
- Limitations: geographic scale of potential habitats to restore; jurisdictional barriers, permitting, funding for restoration efforts, etc.
- Create a map of the Fraser River Estuary and identify the percent of natural shoreline remaining versus armoured shoreline.
- Identify locations on map where habitat restoration could create restored habitat patches.
- Summarize the habitat type, size of restoration site, habitat function for juvenile salmon, and the area (in m<sup>2</sup>) that could be restored in research report.
- Summarize landscape framework and candidate restoration sites in a summary report

## Deliverables

- A final map of the North Arm of the Lower Fraser River that identifies potential shoreline restoration projects.
- A final report containing a summary of the work completed.
- An article summarizing the project for Raincoast's website.
- A final report for the online public-facing [Scholars Project Library](#).

## Time Commitment

- This project will take 250 hours to complete
- This project must be completed between May 1 to August 15, 2024
- The Scholars is to complete their hours between 9 am and 5 pm, Monday to Friday, approximately 17 to 20 hours per week.
- We would like the student to attend weekly meetings with Raincoast's Salmon Team (3-4:30 pm), which occur every Thursday. This will provide the student with an opportunity to share their weekly learnings, discuss questions, and identify next steps for project completion.

## Required/preferred Skills and Background

- Excellent research and writing skills
- Demonstrated interest in sustainability
- Familiarity with research methodologies and survey techniques
- Strong analytical skills
- Ability to work independently
- Deadline oriented
- Project management and organizational skills
- GIS training or experience.
- Design and layout skills
- We are ideally looking for a student that has GIS/mapping expertise and also some understanding of salmon ecology (but it is not required as Raincoast staff can supply this knowledge).

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Applications close **midnight Sunday January 28, 2024**

Apply here: [Click here to apply](#)

Contact Karen Taylor at [sustainability.scholars@ubc.ca](mailto:sustainability.scholars@ubc.ca) if you have questions

## Useful Resources

We are holding a special **resume preparation workshop for prospective Scholars** on January 23, 2024.  
[Click here for details and to register.](#)

Below are some links to useful resources to help you with your resume and cover letter (there are many more online). Some of these resources also provide information on preparing for your interview.

<https://students.ubc.ca/career/career-resources/resumes-cover-letters-curricula-vitae>

<https://www.grad.ubc.ca/current-students/graduate-pathways-success>

<https://www.grad.ubc.ca/cover-letter-cv-resume-templates-ubc-career-services>