Mechanistic modelling to link hydrology to juvenile salmon habitat quality and productivity

Conservation and Stewardship

Fraser

Habitat Monitoring

Modelling

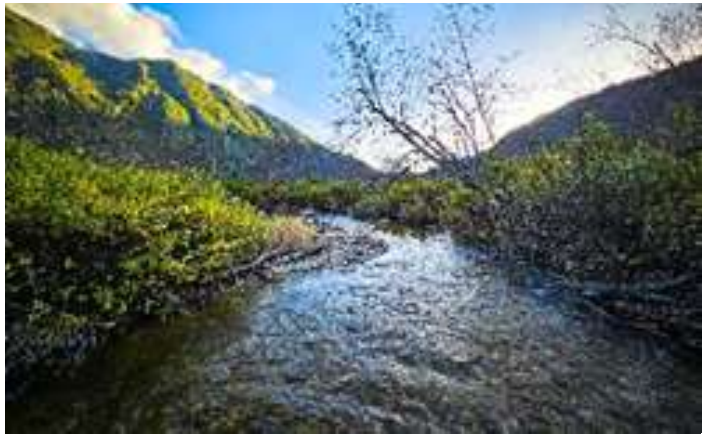

Photo of freshwater rearing habitat for juvenile coho salmon. Credit: Julian Gan

Flow is a key habitat attribute for salmon in freshwater and is rapidly changing in many areas due to human activities and climate warming. In particular, low summer flows are seen as a key threat to salmon. Yet, it remains challenging to make explicit predictions about how much water salmon actually need and how these needs may change with shifting environmental conditions in the future. This project advances a simple yet mechanistic modelling framework to establish flow-habitat relationships for stream-rearing salmon across scenarios of changing temperature and physical habitat structure.

This approach integrates well-established theories of geomorphology and fish energetics, but strives for tractability. It also leverages a larger watershed- scale research program in the North Thompson that has established an extensive field monitoring network of flow, temperature, and habitat conditions that are direct model inputs.

Three main outcomes from the work:
1) Technical reports describing the modelling framework and associated software.

Take-aways

- Predicting how much water fish need is a key management challenge in the face of climate change and increased water demand.
- Hydraulic habitat models are widely used for instream flow management, but do not currently account for dynamic water temperature.
- This project leverages large-scale flow and temperature monitoring across the North Thompson to develop flow-habitat models for juvenile coho, which incorporate dynamic temperatures and habitat structure.

2) Flow-habitat relationships for juvenile coho rearing across tributaries of the North Thompson under different temperature scenarios.
3) Advice to internal and external clients for setting environmental flow guidelines under dynamic hydrologic conditions.

Photo of a juvenile coho salmon. Credit: Morgan Bond.

Timeline

✓ to March 2024: Presentation and work-planning to IPSE hydrology committee

🔄 to March 2025:Field data collection. Model implementation and sensitivity analysis. Ongoing engagement with project collaborators

🔄 to March 2026: Publication of technical reports and journal publications

DFO Science Division
Ecosystem Sciences

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Project Leads
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Locations
North Thompson

Collaborations
Secwepemc Fisheries Commission

Species
Coho

Project ID
2424

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