Fraser Salmon & Watersheds Program

2011/12 FINAL REPORT

FSWP File Number*	FSWP 11 35 LR HWRS

* Please use the FSWP File Number provided in previous FSWP project correspondence.

1. Project Information

1.1. Project Title

Groundwater Habitat Interactions for Interior Fraser Coho Salmon

1.2. Proponent's Legal Name

Secwepemc Fisheries Commission

1.3. Project Location

Nicola, Lower Thompson, North Thompson, and South Thompson watersheds

1.4. Contact for this report

Name: Michelle Walsh	Phone: 778-471-8222	Email: mwalsh@shuswapnation.org

1.5 Funding Amount

Original Approved Grant Amount:	Total FSWP Expenditures:	Final Invoice Amount:	Final Non-FSWP leveraging, including cash and in-kind:
$15,000	$14,029.17	$15,000	$15,484.32

2. Project Summary

Please provide a single paragraph describing your project, its objectives, and the results. As this summary may be used in program communications, clearly state the issue(s) that were addressed and avoid overly technical descriptions. Maximum 300 words.

Summer water temperatures in the Southern Interior region of British Columbia frequently approach or exceed the upper thermal limits of salmonids and there is concern for the sustained existence of many populations. As such, First Nations, government, academia and non-profit organizations collaborated to investigate the effects of groundwater upwelling on juvenile Endangered Interior Fraser Coho (*Oncorhynchus kisutch*) summer and winter rearing habitat. Juvenile sampling was undertaken in both summer and winter over several years at paired groundwater and control sites. Mini-piezometers were installed at the groundwater sites to estimate upward groundwater fluxes. Linear and Binomial Mixed Modeling indicates that juvenile coho made preferential use of groundwater upwelling areas during both summer and winter. Temperatures in all of the groundwater areas remained up to 11.5°C cooler than control sites during the summer and slightly warmer at most sites during the winter. The results of this study indicate that groundwater needs to be regulated and protected to reduce potentially harmful temperature effects on coho populations in the Interior of BC.

OPTIONAL: **Please give a short statement (up to 100 words) of the most compelling activity or outcome from your project.**
Juvenile coho made preferential use of groundwater upwelling areas during both summer and winter seasons.

3. Final Project Results and Effectiveness

3.1 Please copy THE EXPECTED DELIVERABLES from your detailed proposal and insert into this table. Add additional rows as needed. Then describe the FINAL DELIVERABLES (the tangible end products resulting from this work) associated with each expected Deliverable.

If FINAL DELIVERABLES differ from the original EXPECTED DELIVERABLES, please describe why, and the implications for the project.

EXPECTED DELIVERABLES	FINAL DELIVERABLES
1. Provide results of statistical analysis between juvenile Coho **summer** habitat use and groundwater upwelling sites in final report	Statistical models relating juvenile coho use of groundwater upwelling areas, while controlling for other habitat factors (see technical report).
2. Groundwater flux magnitudes and direction (i.e. upward or downward) provided for each site in final report	Mini-piezometers were installed at all sites and confirmed upward groundwater fluxes existed at all sites (see technical report).
3. Provide results of statistical analysis between juvenile Coho **winter** habitat use and groundwater upwelling sites in final report	Monthly observations of coho catch per unit effort were collected, in addition to continuous stream temperature records. Statistical models related juvenile coho winter use of groundwater upwelling areas, while controlling for other habitat factors (see technical report).

3.2 Please evaluate the EFFECTIVENESS of your project in achieving Project Objectives. Identify the indicators you have used to measure the effectiveness of your project. Please include any notable successes or challenges.

The objectives were to:

A) Determine if juvenile Coho make preferential use of groundwater upwelling areas during periods of temperature stress;
B) Determine how much groundwater flows into upwelling areas and;
C) Determine if juvenile Coho preferentially use groundwater sites for overwintering.

Objective 'A' was completed since the indicator of success was the completion of robust statistical analysis of Coho observations and habitat indicators. Statistical modeling was successful relating juvenile coho use to groundwater areas while controlling for other habitat parameters. Mixed Modeling was used to accommodate the nested data structure.

Objective 'B' was completed since the indicators of success were installation of mini-piezometer at each groundwater site AND successful calculation of flux value for each site. Piezometer installation was difficult in some areas due to the large substrate of the streambed. The use of mini-piezometers was perfectly suited to the sites.

Objective 'C' was completed since the indicators of success were collection of monthly observations of Coho habitat use and continuous record of stream temperatures AND completion of robust statistical analysis of Coho observations and habitat indicators. A challenge that was encountered was that coho catch per unit effort declined as temperatures dropped. This indicates that other sampling techniques might have been preferred. However, none were considered suitable considering the cold temperatures, ice cover and the conservation status of Interior Fraser Coho.

3.4 IF applicable, please describe how your project has achieved one or more of the following supported processes (Section 2.1 of RFP; section 8 of detailed proposal template). If results differ from those originally anticipated, please describe.

Engagement of First Nations. Please specify who, and in what capacity.	All components of this study were led and conducted by First Nations:Secwepemc Fisheries Commission (Simpcw First Nation and Skeetchestn Indian Band) and the Nicola Tribal Association
Active partnerships with one or more organizations.	Active partnerships are formed with the following organizations: •DFO – provided expertise in study design •UBCO – provided equipment (tools for mini-piezometer installation) and training/expertise in mini-piezometer installation •NTA – conducted a portion of the field data collection in the Nicola River •Watershed Watch Salmon Society – provided aid in study design and will communicate results
Engagement and participation of diverse and under-represented groups.	The study organizations that teamed up for this study represent a diverse range of backgrounds including several First Nations associations, the federal government, academia and a non-profit society. The project is one of few scientific research projects led by First Nations associations.
Relationship building, as a foundation for sustainable, enduring activities.	This project strengthened working relationships between several First Nations groups, DFO, academia and non-profit organizations. It represents a combined effort among these sectors to achieve fisheries management practices based on the best available science.
Capacity building, including mentorship models, leadership training and skills development.	This project built on expertise gained from previous years and created new capacity in hydrogeological methods (piezometer installation), scientific study design and analysis amongst several First Nations groups. This represents the transfer of knowledge from academia, government and non-profits organizations to build capacity amongst First Nations
Recognition and support of champions and their initiatives.	N/A
Opportunities to influence policy and decision making,	The results from this project have the potential to influence a wide range of policy and decisions made at the provincial and federal level regarding fish habitat management and groundwater usage. The project has the potential to provide a direct link between groundwater resources and the habitat needs of an Endangered species, which strengthens the case for groundwater licensing considered under the current modernization of BC's Water Act.

3.5 Please describe how the benefits of this project will be sustained and/or be built upon into the future. What are the planned next steps, or recommendations for further work, if applicable?

The results of this project will be communicated widely. There are no other studies that clearly demonstrate juvenile salmonid use of groundwater upwelling areas in the interior of BC. The results are important for identifying important habitat for the Endangered Interior Fraser Coho. The results will also be communicated to those responsible for modernizing BCs Water Act to ensure protection of groundwater resources for fish. Since this was the final year of the project, no additional work is planned. In the future, the partners are considering writing a science journal article.

3.6. What are the top three lessons learned from this project that could be useful to communicate to others doing similar work in the Basin?

1. Make as much use as possible of suitable study sites identified in other studies. Finding suitable sites was the most resource intensive part of the study.
2. Use mini-piezometers for measuring groundwater-surface water interactions. They are inexpensive, quick easy to install, and require no specialized equipment.
3. Find alternatives to winter juvenile salmonid sampling. Passive sampling gear may not work well given cold temperatures and low activity level of the fish.

REQUIRED: Attach all DOCUMENTATION of Final Deliverables, and LIST attachments in Section 8. These may include technical reports, maps, photos, evidence of communications, lists of meeting participants, etc.

4. Outreach and Communications

Please describe how you have communicated project activities and results within local and basin-wide communities, across organizations and/or to decision makers.

Please list and attach copies of (or links to) any communications materials from these efforts that you have not previously submitted.

The partners are going to communicate the results of the study to the Fraser River Aboriginal Fisheries Secretariat newsletter, Streamline Watershed Management bulletin, and will discuss communications options with Watershed Watch Salmon Society. It is hoped that this multi-year study can be written into a science journal article for publishing.