Fraser Salmon & Watersheds Program

2011/12 FINAL REPORT

FSWP File Number*	FSWP 11 76 SIFM LR

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

1. Project Information

1.1. Project Title

Research on ecology and control methods for invasive yellow perch

1.2. Proponent's Legal Name

Thompson Rivers University

1.3. Project Location

Thompson and Shuswap: Shuswap Lake, Adams Lake, Pinaus Lake, Swan Lake, Wood Lake, Ellison Lake, Kalamalka Lake, Little Pinaus Lake and Bear/Lambly Lake.

1.4. Contact for this report

Name: Brian Heise	Phone: 250-371-5530	Email: bheise@tru.ca

1.5 Funding Amount

Original Approved Grant Amount:	Total FSWP Expenditures:	Final Invoice Amount:	Final Non-FSWP leveraging, including cash and in-kind:
$12851.00	$12851.00	$12851.00	$71,848.00

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.

Yellow perch (*Perca flavescens*) threaten native fishes and aquatic ecosystems in British Columbia. Introduced species can rapidly adapt to new environments by exhibiting changes in behavior and life history traits. Although yellow perch general ecology is well documented in other parts of Canada and the United States, we know little about yellow perch diet and their preferred habitat in BC's interior. Determining if there are differences between native and invasive populations may help to show why they are successful invaders and help to predict future impacts. Here we studied feeding ecology and movement of introduced yellow perch in seven lakes in BC's interior. Stomach contents of yellow perch and rainbow trout were analyzed for each season (spring, summer, late summer and fall 2011, winter 2012) to determine if yellow perch are selecting for specific food items and if dietary overlap is occurring with rainbow trout. Food availability was determined through benthic and zooplankton sampling. General movement patterns of yellow perch were recorded in two lakes using 24 hour radio telemetry. Artificial spawning substrates were tested as a possible method to reduce reproductive success by removing egg masses. Preliminary results from study lakes in BC's interior show that yellow perch

introduced into Pinaus and Bear Lakes are predominantly littoral, moving parallel to the shoreline during the day and becoming stationary during the night. The greatest movement occurred at dawn and dusk periods. Yellow perch diet was dominated by littoral macrobenthos, particularly amphipods and immature diptera (larvae and pupae) in Pinaus Lake. Significant seasonal variation in diet was likely linked to resource availability. In late summer, snails were commonly consumed in addition to amphipods and immature diptera and in fall, mysis shrimp were also a main food source.

OPTIONAL: **Please give a short statement (up to 100 words) of the most compelling activity or outcome from your project.**

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 – IN PROGRESS
1. Determine distribution and feeding ecology of yellow perch in Pinaus and Bear Lakes (spring, summer, late summer and fall). Do additional sampling for feeding ecology in Swan Wood, Ellison, Kalamalka and Little Pinaus Lakes in Summer and late summer.	1. All samples have been collected for summer, late summer, fall and winter. Spring data is left to be collected this coming season. Summer telemetry work has been completed in Pinaus and Bear Lakes. Spring telemetry work is left to be completed. Gut content analysis is being completed for yellow perch in Pinaus and Bear Lakes for spring, summer, late summer, fall and winter. Rainbow trout gut contents are also being analyzed for Pinaus and Bear Lakes. Additional summer and late summer data are being analyzed for yellow perch in Swan, Wood, Ellison, Kalamalka and little Pinaus Lakes (spreadsheet attached).
2- Determine food availability in Pinaus and Bear Lakes through sampling zooplankton and benthic inverts. (spring, summer and fall). Complete additional sampling on Swan, Wood, Ellison, Kalamalka and Little Pinaus Lakes.	2. All samples have been collected for summer, late summer, fall and winter. Spring data is left to be collected this coming season. Types of food resources available in the sample lakes are being analyzed.
3- Determine the timing of yellow perch spawning in Pinaus and Swan Lakes in spring 2011 and 2012	3. Snorker surveys and placement of artificial spawning subsrates were done in spring 2011 in Pinaus and Swan lakes, but were unsuccessful. Spawning timing of yellow perch is being examined in Pinaus Lake in the spring of 2012, including a trial of a new design of spawning substrate. In addition spawning timing will be monitored in the other study lakes.

4- Determine if yellow perch in Pinaus and Swan Lakes will spawn on artificial spawning substrates (spring 2011)	4. Trials using artificial spawning substrates were not successful in spring 2011, as the trials were completed too late in the season. New substrates have been designed and will be tried in March-April 2012.
5- Complete trial of artificial spawning substrates in Adams Lake in spring 2012, if perch are detected by DFO sampling program	5. If perch are found in spring 2012, then trials will be completed. As well, trials will be completed in Pinaus Lake.

3.2 Please evaluate the EFFECTIVENESS of your project in achieving Project Objectives, using the specific measures of success identified in your proposal. Please include any notable successes or challenges.

- The project has successfully supplied data on the movement patterns of yellow perch in Bear and Pinaus Lakes. More data is left to be collected this spring. Winter telemetry work is in progress at this time. No data analysis has been completed to date, as this was planned for the second year of the study. Sampling techniques have been effective in tracking the movement of yellow perch in the study lakes.

- Quantitative data on feeding preferences of yellow perch and trout in the study lakes is being collated. Samples were successfully collected for all seasons to date, and stomach contents are successfully being analyzed in the lab where proportions of food items are being determined. Spring field samples are yet to be collected for the upcoming season.

- Data on taxonomic composition and proportion of the benthic invertebrates and zooplankton in the study lakes has been collected and is being analyzed in the lab. These data, in combination with the gut content analysis will allow us to make a quantitative assessment of food preferences (i.e., selectivity).

- Spawning timing in Pinaus Lake has not yet been determined. Observations will be completed this upcoming spring to complete this project objective.

- The use of artificial spawning substrates as a viable method for reducing perch populations is still being investigated. Further trials are yet to be completed this spring in Pinaus Lake.

This is a 2 year study and is not yet complete. Year one field work went very well, and met all objectives. Final field sampling and data analysis will be completed in year 2.

3.4 If applicable, please describe project outcomes that relate to one or more of the following strategic approaches (Section 2.1 of RFP; section 8 of detailed proposal template), and include specific examples.

Engagement of First Nations. Please specify who, and in what capacity.	Surveys for yellow perch were completed by the Secwepemc Fisheries Commission in Adams and Shuswap Lakes.
Active partnerships with one or more organizations.	This is a collaborative project with partners Department of Fisheries and Oceans Canada, CN Rail, the BC Ministry of Natural Resource Operations, the Secwepemc Fisheries Commission, and Thompson Rivers University.
Engagement and participation of diverse and under-represented groups.	
Relationship building, as a foundation for sustainable, enduring activities.	Has increased collaboration amongst university researchers and government biologists (provincial and federal). Regular communications occur with Andrew Klassen and Matthias Herborg of MoE, and Lynda Ritchie of DFO.

Capacity building, including mentorship models, leadership training and skills development.	The project involved the training of a summer research assistant and a Master's student. In addition a part-time research assistant was hired during the winter season and a short term lab assistant was hired and trained in gut content identification for the month of March.
Recognition and support of champions and their initiatives.	
Opportunities to influence policy and decision making.	The project will help with fisheries management in Okanagan/Shuswap lakes (i.e., strategy to deal with an invasive species).

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 project results will contribute to better management decisions that utilize knowledge of yellow perch ecology in non-native habitat, particularly BC's interior lakes. Determining if there are differences between native and invasive populations will help to show why they are successful invaders and help to predict future impacts.

The results of this project will be built upon by future studies including an upcoming study on predation of yellow perch by native species such as northern pikeminnow.

Contact has been made with Dr. Michael Stewart of NIWA, New Zealand, to work on a collaborative project involving the use of sex pheromones as a control method. Further development of this project will begin during winter 2013.

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. Don't allow yellow perch to be introduced into lakes where they are not native, as they can adapt well and are strong competitors for other species and have the ability to adapt to a wide range of conditions.
2. Based on our telemetry movement data on yellow perch, to optimize catches using gillnets, focus on morning and evening sets when the fish are most active. Overnight sets are not useful, as yellow perch do not move during the night.
3. Public education on the potential impacts and value of invasive fish species, specifically yellow perch, is needed. When speaking with sport fishers, we encountered a wide range of opinions and knowledge about the fish and its value in BC lakes.

3.7 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.

New since interim report:

- An article on invasive species was written for BC Outdoors Sport Fishing magazine discussing the dangers of invasive species. This project was mentioned as an example of research that is currently underway. (Heise, B. 2012. Invasive fish species. A threat to BC lakes. BC Outdoors Sport Fishing. March/April 2012, Pg. 8., PDF attached).

- Brian Heise attended three invasive species conferences where he was able to discuss the project with small groups:

  1. Heise, B.A. There's something fishy about our watersheds. Invited talk at the workshop: Stop the spread. Aquatic invasive species workshop. Central Kootenay Invasive Plant Committee. Castlegar, BC. Sept. 16, 2011.

  2. The Invasive Species Strategy for British Columbia. Presentation to the workshop "Invasive Alien Species Strategy Workshop", Invasive Species Council of BC, Jan. 24, 2012. Richmond, BC. (invited).

  3. National Invasive Alien Species Forum, Ottawa, Feb. 28-29 2012.

- Details on the project were presented at a BC Ministry of Environment meeting by Matthias Herborg, the province's Aquatic Invasive Species Coordinator (January 2012).

- An overview presentation about the project was given at the Thompson Rivers University environmental science showcase seminar on March 1, 2012 (PDF attached).

- Brian Heise has discussed the project with students in two of his courses at Thompson Rivers University (Fisheries Management Fall 2011, and Ichthyology Winter 2012).

- We will be attending the American Fisheries Society conference in August 2012, in St.Paul Minnesota to present a poster on the results of this study to the fisheries science/management community (abstract PDF attached).

Previously Reported:

- The Kamloops Daily News published an article on July 27, 2011 discussing invasive perch in BC, and also discussed this research project.
  Reference: July 27, 2011. Robert Coopmans. TRU research looking for new ways to control perch. Daily News (Kamloops), Pg. A5, with photos. (interviewed July 20).

- TRU published a website article on the research program including its purpose, timeline and goals.
  Reference: August 3, 2011. Arathje. M.Sc. researcher tracks fishy invaders.
  Thompson Rivers University "In the News" article on TRU webpage.
  http://newsroom.blog.mytru.ca/2011/08/03/msc-researcher-tracks-fishy-invaders/

- Project information signs have been posted at our two main study lakes. These signs have been successful at informing campers and fishers as to the purpose and type of study underway. We notice that quite a few people are aware of the project, especially return fishers. We have also discussed the project with the owners of the fishing resorts on Pinaus and Lambly Lakes. At Lambly Lake, this person also manages the Forestry Rec Site.

- A significant amount of time each field day was spent talking with people at the boat launches and out fishing, about what we are doing and why. People are always curious about our sampling procedures and yellow perch presence in the lakes.