2010/11 FINAL REPORT

FSWP File Number*	FSWP 10 LR SIFM 93

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

1. Project Information

1.1. Project Title

Fishwheel, radio-telemetry and catch monitoring components of the "Count on Salmon" Project.

1.2. Proponent's Legal Name

LGL Limited

1.3. Project Location

Tagging in marine test fisheries, lower Fraser River sampling, basin wide radio-telemetry

1.4. Contact for this report

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1.5 Funding Amount

Original Approved Grant Amount:	Total FSWP Expenditures:	Final Invoice Amount:	Final Non-FSWP leveraging, including cash and in-kind:
$345,667	$345,667.41	$65,192.86	$486,555.13

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.

Recently, there have been large discrepancies between the estimates of abundance derived from the Mission hydroacoustic surveys, and those made on the spawning grounds for some Fraser River sockeye stocks. Also recently, large proportions of Late-run Fraser River sockeye salmon have died in fresh water before reaching their spawning grounds. Early river entry has been associated with increased levels of pre-spawn mortality for Late-run sockeye stocks. A large scale radio-telemetry study was conducted to provide estimates of river entry timing, in-river survival, migration rates and the impact of fisheries on the survival of all run-timing groups of Fraser River sockeye salmon. Fishwheels were deployed in the lower Fraser River to provided Early Stuart sockeye for tagging and assess the near-shore species composition needed to convert hydroacoustic counts into species-specific estimates.

In 2010, 728 sockeye were radio-tagged, including 67 at the Crescent Island fishwheels, 303 at the Juan de Fuca reef-nets, and 358 on the Johnstone Strait troll boat near Crescent Island. Each radio-tagged fish was also measured and spaghetti-tagged, and a small adipose tissue sample was taken for microsatellite stock identification. Radio-tagged fish were tracked using 28 fixed-station receivers in 27 locations along the Fraser River and within major tributaries. Fifty-two percent of the radio-tagged sockeye were detected at least once

after release, and 46% were known to pass Mission. In all, 9% of tags were returned from marine and in-river fisheries, and 24% were tracked to the vicinity of stock-specific spawning areas. The majority (43%) of radio-tagged sockeye were identified to Late-run stocks.

'After-harvest' survival to spawning areas was significantly higher for Late-run sockeye than for all other run timing groups. Survival estimates derived from radio-telemetry data were compared with the Difference Between Estimates (DBEs) derived from the Mission and spawning ground estimates. The previous observed pattern, of telemetry based survival estimates being lower than those derived from the DBEs, continued in 2010. The telemetry data indicated that the survival rates were lowest for Early Stuart (53% ±14%) and Early Summer (46% ±12%) while DBEs suggested survival rates of 61% for both of these timing groups. The DBE for Summer-run stocks suggests a rather unbelievable survival rate of 108% compared to the radio-telemetry estimate of 71% ±12%. The DBE for Late-run Shuswap stocks (89%) was reasonable close to the comparable and most precise of the radio-telemetry estimates (84% ±6%). The distribution of the tags relative to the abundance measured at Mission was substantially better for the Early Stuart and Late-run components than for the other two run-timing groups. The poor representation of the latter half of the Early Summer and Summer-run migrations could have contributed to underestimating survival rates for these run-timing groups where in-river survival tends to increase as water temperature decline.

The proportion of Late-run sockeye that delayed river entry increased over time. No Thompson-bound Late-run sockeye that passed Mission before 30 August survived to a spawning location. The highest rate of en-route loss for sockeye was observed in the reach between Hell's Gate and Kelly Creek, and for Thompson-bound stocks between Hell's Gate and Ashcroft.

Two fishwheels were operated from late June to early October in a relatively fast-flowing section of the Fraser River near Crescent Island. All captured fish were identified to species, and species composition was calculated daily. The fishwheels caught 7,346 sockeye, 1,094 steelhead, 1,079 coho, 616 Chinook, 81 chum, and 5 pink salmon along with 14 other species. The 2010 sockeye return to the Fraser River was the largest since the 1913 Hells Gate slide and the total sockeye abundance estimated at Mission was the largest recorded at this site. This large abundance of sockeye dwarfed the numbers of other co-migrating species and thus sockeye usually represented over 85% of the salmon captured by the fishwheels and Whonnock gillnet test fishery. Consequently, these two test fisheries produced very similar stock composition estimates for most of the sockeye migration period.

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

Troll, reef nets and fishwheels were excellent methods for capturing sockeye for bio-telemetry studies. Tracking results for radio-tagged sockeye have consistently identified in-river fishing locations where en-route losses are significant. These en-route losses must be taken into consideration when estimating total returns and exploitation rates for Fraser sockeye.

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
Daily in-season estimates of near-shore species composition that can be applied to the Mission hydroacoustic target counts.	In-season estimates of the near-shore species composition were provided to the PSC and others every 3-4 days throughout the sockeye migration period.
Post-season estimates of the survival from Mission and Qualark to spawning areas for each sockeye run-timing group and the identification of locations and times when substantial enroute losses occur.	The project report provides the survival rates from Mission to spawning areas and identifies the location and timing of en-route losses for each run-timing group.
Estimates of migration rates by river reach and run-timing group required for annual run reconstruction analyses. Analyses could be conducted at the Conservation Unit or population level depending on the allotment of tags.	The project report provides migration rates by river reach and run-timing group in a format suitable for the 2010 run reconstruction analyses. The number of tags was not sufficient to determine CU specific migration rates.
A comprehensive report on the results from the 2010 study and comparison with results from previous studies.	The project report provides a comprehensive description of the field and analytical methods, results and discussion for each project objective.

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.

As in 2009, the project clearly demonstrated that the Crescent Island fishwheel site was an effective location for operating fishwheels from late June through late-September. The combination of a floating shoreline abutment, one regular-size fishwheel and the new large fishwheel deployed at the Crescent Island site provided consistent daily of the near-shore species composition. During periods of lower sockeye abundance the fishwheel species composition was different from that for the Whonnock test fishery but the two test fisheries produced similar estimates of the sockeye percentage when sockeye were abundant.

The deployment of additional receivers, increase catch monitoring and mobile tracking effort provided the data needed to assess the fate of radio-tags entering each fishing area. Most of the tags removed by fishers were returned to the project office, however, several tags last detected in fishing areas that were not return were track to communities away from the river. These increased monitoring, tracking and fisher awareness efforts contributed to the high return rates. We estimate that virtually every tag that was removed by in-river fisheries was accounted for through tag returns and mobile tracking efforts.

'After-harvest' survival to spawning areas was significantly higher for Late-run sockeye than for all other run timing groups. Survival estimates derived from radio-telemetry data were compared with the Difference Between Estimates (DBEs) derived from the Mission and spawning ground estimates. The previous observed pattern, of telemetry based survival estimates being lower than those derived from the DBEs, continued in 2010. The telemetry data indicated that the survival rates were lowest for Early Stuart (53% ±14%) and Early Summer (46% ±12%) while DBEs suggested survival rates of 61% for both of these timing groups. The DBE for Summer-run stocks suggests a rather unbelievable survival rate of 108% compared to the radio-telemetry estimate of 71% ±12%. The DBE for Late-run Shuswap stocks (89%) was reasonable close to the comparable and most precise of the radio-telemetry estimates (84% ±6%). The distribution of the tags relative to the abundance measured at Mission was substantially better for the Early Stuart and Late-run components than for the other two run-timing groups. The poor representation of the latter half of the Early Summer and Summer-run migrations could have contributed to underestimating survival rates for these run-timing groups where in-river survival tends to increase as water temperature decline.

3.4 IF applicable, please describe how your project has achieved one or more of the following supported processes (Section 2.2 of RFP; section 7 of detailed proposal template). If results differ from those originally anticipated, please describe.

Engagement of First Nations. Please specify who, and in what capacity.	First Nations fisheries personnel were engaged in fishwheel operations, tagging, biosampling, catch monitoring, fixed-station receiver maintenance and mobile tracking components of the project.
Active partnerships with one or more organizations.	The Matsqui First Nation has been a major partner throughout the development and implementation of the fishwheel component of the project. In 2010, members of the Northern Shuswap Tribal Council and Bridge River Indian Band assisted with the maintenance and downloading of data from radio-telemetry monitoring stations. DFO and MOE field crews also assisted with the data downloading process for monitoring stations located near their field operations.
Engagement and participation of diverse and under-represented groups.	This project would not have been possible without the engagement and participation of several First Nations in core operations; Canadian and US commercial fishers in the tagging operations; commercial, recreational and First Nation fishers in catch monitoring and tag recovery; and a diverse group of DFO, PSC, PSF, MOE and university biologist who assisted in study design and various field operations.
Relationship building, as a foundation for sustainable, enduring activities.	Matsqui's leadership council has permitted the fishwheels to be operated 24 hours per day, 7 days/week at one of their traditional fishing locations and a portion of the sockeye and Chinook caught by the fishwheel during weekly FSC fishing periods has been provided to Matsqui members to augment their other FSC harvests.
Capacity building, including mentorship models, leadership training and skills development.	The 2010 project continued the process of capacity building with the Matsqui First Nation and initiated the transfer of radio-telemetry skills to Northern Shuswap Tribal Council and Bridge River Indian Band fisheries personnel.
Recognition and support of champions and their initiatives.	This project would not have been possible without the support of champions within the PSC, PSF and Pacific Salmon Endowment Fund Society. Their vision, guidance and leadership are greatly appreciated.
Opportunities to influence policy and decision making,	The consistent observation over 4 years of radio-telemetry studies that few if any of the Late-run sockeye that pass Mission before mid-August will survive to spawn, provides fisheries manager with strong support for allowing in-river fisheries to harvest Late-run stock during this period when co-migrating summer-run stocks are abundant. The fishwheel component of this project has demonstrated that fishwheels can provide a platform that integrates selective harvesting and stock assessment in the lower Fraser River. The consistent observation of higher en-route losses for summer-run stocks in areas and times when warm water, fisheries and river currents combine to stress migrating sockeye must be addressed by fisheries managers and decision makers in planning fisheries during periods when water temperature exceed 19 C.

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 procedures for deploying and operating the fishwheels in the lower Fraser River have been streamlined so they are a cost effective tool for obtaining daily near-shore species composition samples and providing sockeye, Chinook and pink salmon for First Nation FSC or selective commercial in-river fisheries.
The capacity that has been built with commercial fishers, First Nation communities and DFO combined with recent reductions in the costs of radio-tags and fixed-station receivers make future assessment of salmon survival and en-route losses affordable using radio-telemetry technology.

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. expect the unexpected, for example, smoke from forest fires can make solar panel in effective and result in battery failure with fixed-station receivers.
2. the deployment of as many receivers as possible greatly increases the quality and quantity of the information collected when studying diverse salmon runs with long migrations through highly variable habitats and environmental conditions.
3. frequent communication with survey crews is critical to ensure there are no misunderstandings associated with their tasks and responsibilities.

REQUIRED: Attach all DOCUMENTATION of Final Deliverables, and LIST attachments in Section 7. 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.

Daily fishwheel catch data were posted on the PSC web site three times each week. Summaries of the current location of radio-tagged sockeye and Chinook were distributed by email on a weekly basis from 24 Aug. to 4 Nov. 2010. Preliminary in-season results were provided to the PSF in a status report on 3 September 2010. Presentations of study results were provided to the PSC Fraser Panel in Portland on 15 February 2011.