

Taku River Watershed Nahlin River Chinook Salmon Sonar Enumeration 2019

Final Report
March 2020

PSC NF-2019-I-32
DFO 57907

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Executive Summary

The Northern Endowment Fund provided monies to carry out the 2019 Nahlin River Chinook salmon (*Oncorhynchus tshawytscha*) sonar enumeration project within the Taku River drainage. This permitted the operation of an ARIS sonar unit from 28 May to 27 July with extrapolation to end of run estimated at 05 August 2019. An estimate of 4,403 large (>659 mm mid-eye to fork length) Chinook salmon returned to the Nahlin River portion of the Taku River drainage over this period.

A total of 527 Chinook salmon tissue samples were obtained from the lower Taku River through a separate live capture drift gillnet project and were analyzed for genetic stock identification. Preliminary results show that 37% of these Taku River Chinook salmon samples were from the Nahlin stock group (combined Nahlin River, Dudidontu River, and Tseta Creek stocks).

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1.0 Introduction

The purpose of this project was to enumerate and accurately estimate the 2019 escapement of large (>659 mm mid-eye to fork length (MEF)) Chinook salmon, *Oncorhynchus tshawytscha*, to the Nahlin River using sonar technology. Genetic analysis of tissue samples gathered in the lower Taku River as part of a separate project allowed us to estimate the contribution of Nahlin River Chinook to the entire Taku River drainage Chinook population.

The Nahlin River is located in northwestern British Columbia about 160km south of Atlin, British Columbia, and comprises the headwaters of the Taku River. The Taku River drains to the Pacific Ocean in Southeast Alaska near Juneau (Figure 1; McPherson et al. 1998). The Taku River historically produces the largest run of Chinook salmon in Southeast Alaska, as well as the largest run in British Columbia north of the Skeena River. Based on genetic stock identification (GSI) to date and past aerial survey data, the Nahlin River is the second most important Chinook salmon tributary in the Taku River drainage after the Nakina River, supporting approximately one third of the total annual returns to the Taku River.

Fisheries and Ocean Canada (DFO) retained Metla Environmental Inc (MEI) as a contractor to deliver the sonar field project in 2019, following their successful delivery of the project in 2016 -18.

In 2019, as an additional benefit of this project, the count of large Chinook salmon through the Nahlin River sonar site was used in combination with a concurrent Alaska Department of Fish and Game (ADF&G) Chinook salmon radio telemetry project to provide a mark-recapture estimate of drainage wide Taku River Chinook salmon abundance (PSC 2019).

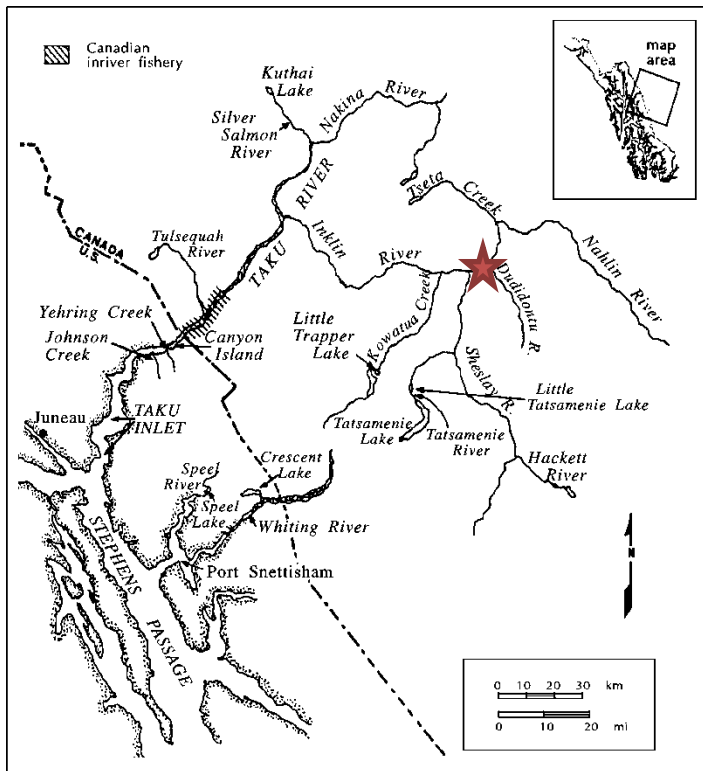


Figure 1. The Taku River drainage with the sonar location identified by the red star.

2.0 Objectives

The objectives of this project were to accurately estimate the escapement of large Chinook salmon to the Nahlin River and accurately estimate the contribution of Nahlin River Chinook salmon stocks to the Taku River drainage wide return in 2019.

3.0 Methods

The sonar project was based out of a DFO field camp located on the Nahlin River approximately three kilometers upstream from its confluence with the Sheslay River (Figure 1). Project supplies and materials were transported by aircraft from Atlin, BC, to a remote airstrip located along the Nahlin River near the confluence of the Nahlin and the Sheslay Rivers. A helicopter, riverboat, and overland walking trail were used to transport staff and materials to the project location. The camp consisted of plywood floor wall tents adjacent to the weir site, and a new kitchen/office cabin was constructed on site over the 2019 season

DFO supplied MEI with an ARIS multi beam sonar unit for the project. The sonar unit was installed in combination with a partial weir on river left and a small deflection weir on river right to direct migrating fish into the approximate 15 meter ensounded portion of the channel (Appendix C). MEI operated and maintained the project from 28 May through 27 July (Appendix 1), the majority of the Chinook salmon migration period. The project began a few days earlier in 2019 than past years to capture the beginning of the run and was operated until daily counts were less than 1% of the total count for three consecutive days. Following removal of the sonar, counts were extrapolated to cover the tail end of the run estimated through 05 Aug 2019 based on the run counts of the last 10 days the sonar was recording.

Sonar files for the entire project duration were read by the contractor on site (no sub-sampling). Species apportionment sampling was not conducted as part of this project. All targets larger than 659 mm mid-eye to fork length were assumed to be large Chinook salmon, with no ability to distinguish between smaller Chinook salmon and co-migrating sockeye salmon. The contractor has invested significant effort into developing relationships between sonar length, true total length, and mid-eye to fork length for this project, as well as developing rationale for size based apportionment (internal DFO files).

Water level, water temperature, and environmental data were collected daily.

Chinook salmon tissue samples for GSI were collected through an ADF&G drift gillnet project on the lower Taku River near Wright River. This project live captured Chinook salmon for application of spaghetti tags and radio transmitters as part of a drainage wide mark-recapture and telemetry project. Samples from 28 April (statistical week 17) to 30 June (statistical week 26) were pooled by statistical week for analysis. Samples were provided to DFO by ADF&G and were processed at the DFO Molecular Genetics Lab in Nanaimo, BC, against the Taku River Chinook salmon SNP baseline.

4.0 Results and Discussion

This year was the fourth successful year of this project which covered the majority of the Chinook salmon migration period. Water levels allowed us to begin a few days earlier than usual in 2019 and we are confident that very few fish had passed by the start date.

The 2019 final total estimate of large Chinook salmon past the Nahlin sonar site is 4,403. The first Chinook salmon passed the sonar on 28 May, consistent with past run timing. The first peak of fish was on 10 June (n=274) and 50% of the run had passed the sonar by 25 June. Two other peaks of fish occurred over the season, one on 26 June (n=254) one on 18 July (n=186). The sonar was removed on 27 July. Counts were extrapolated to 05 August, the estimated date of run completion. We estimate that 91 Chinook salmon passed after sonar removal (Figure 2).

Nahlin River water levels in 2019 were fairly consistent through the first half of the project until June 21 when it started tapering off for the remainder of the project except for an increase in levels on Jul 21 (Figure 3). Nahlin River water levels, similar to the Taku River drainage as a whole, were well below normal in 2019. Comparisons to the Nahlin River 3 year average, also low water years in a historical sense, are presented in Figure 3.

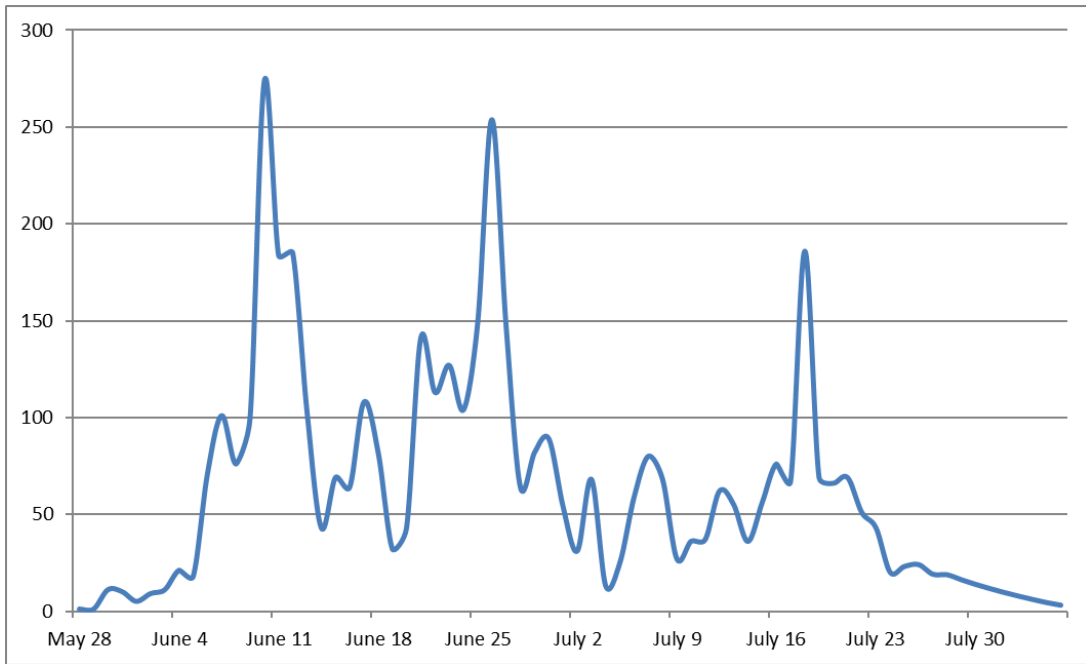


Figure 2. Nahlin River daily sonar count of large Chinook salmon, 2019.

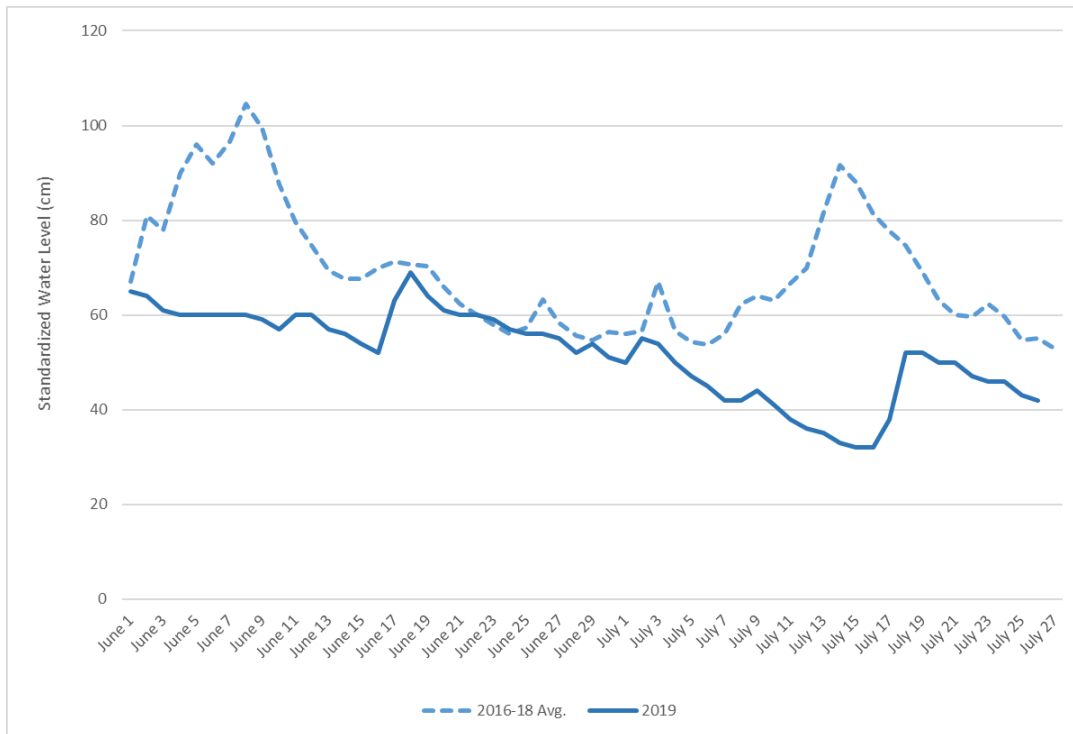


Figure 3. Nahlin River daily water levels at project location, 2019 vs. the 2016-18 average.

The number of Chinook salmon tissue samples obtained for GSI in 2019 from the lower Taku River drift gillnet project, pooled by statistical week, are found in Table 1.

Table 1. Chinook salmon tissue samples collected and analyzed from the lower Taku River drift gillnet project in 2019 by statistical week.

| Statistical Week | Chinook Samples Obtained | Chinook Samples Analyzed |
|------------------|--------------------------|--------------------------|
| 18 | 24 | 24 |
| 19 | 46 | 46 |
| 20 | 82 | 82 |
| 21 | 82 | 82 |
| 22 | 94 | 94 |
| 23 | 71 | 71 |
| 24 | 44 | 44 |
| 25 | 43 | 43 |
| 26 | 37 | 37 |
| 27 | 4 | 4 |
| Total | 527 | 527 |

Based on preliminary GSI results for 2019 samples, the Nahlin Chinook salmon stock grouping (combined Nahlin River, Dudidontu River, and Tseta Creek stocks) comprised a weighted average weekly contribution of 37%, while all other Taku stocks comprised the remaining 63%.

Table 2. Weekly Chinook salmon stock composition of Nahlin stocks in the lower Taku River based on GSI, 2019.

| Statistical Week | Nahlin Group (Nahlin, Dudidontu, Tseta) | Other |
|-------------------------|--|--------------|
| 18 | 57% | 43% |
| 19 | 50% | 50% |
| 20 | 50% | 50% |
| 21 | 48% | 52% |
| 22 | 36% | 64% |
| 23 | 18% | 82% |
| 24 | 32% | 68% |
| 25 | 23% | 77% |
| 26 | 15% | 85% |
| 27 | 12% | 88% |
| Weighted Average | 37% | 63% |

5.0 Budget and Project Operations

The total budget approved to DFO for this project by the Northern Endowment Fund was \$29,000. Total DFO expenditures amounted to \$24,800 which is nearly equivalent to 90% of the approved budget and to monies previously advanced by the PSC. The 10% holdback of \$2,900 is not required from the PSC. We are grateful to the PSC for their administrative assistance in delivering the remainder of the project budget (\$116,500) in a direct award to the project consultant, Metla Environmental. A budget summary of expenditures can be referenced in Appendix B.

6.0 Conclusion

The planned and actual deliverables of the project were as follows:

1. Chinook salmon were enumerated using sonar from 28 May to 27 July on the Nahlin River in the upper Taku River drainage.
2. Lower Taku River Chinook samples were collected and analyzed for genetic stock identification.

The activities supported by this project contribute to accurate estimates of the escapement of large Chinook salmon to the Nahlin River and the stock composition of returns to the entire Taku River drainage. They are also integral in the estimation of drainage wide Chinook salmon runs in the Taku River in combination with radio telemetry projects and mark-recapture methodology.

7.0 Acknowledgements

Metla Environmental Inc., Brian Mercer, David McDonald, Austin Schroeder, Nicholas Starr, and Carolyn Knapper conducted the sonar project supported by this funding under contract directly with PSC. Thanks to Angus MacKay and Victor Keong of the PSC for administrative assistance with this arrangement. Colleen Claggett and Business Management staff of DFO assisted with financial administration and accounting for this project.

8.0 Literature Cited

McPherson, S. A., D. R. Bernard, S. K. Kelley, P. A. Milligan, and P. Timpany. 1998. Abundance of Chinook salmon in the Taku River in 1997. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Data Series Report 98-41, Anchorage.

PSC (Pacific Salmon Commission). 2019. Preliminary estimates of transboundary river salmon production, harvest, and escapement and a review of joint enhancement activities in 2019. Transboundary Technical Committee Report.

9.0 Appendices

Appendix A. Daily Sonar Count of Large Chinook Salmon, 2019.

| Date | Daily | Cumulative | |
|--------|-------|------------|--------------------|
| 28-May | 1 | 1 | |
| 29-May | 1 | 2 | |
| 30-May | 11 | 13 | |
| 31-May | 10 | 23 | |
| 1-Jun | 5 | 28 | |
| 2-Jun | 9 | 37 | |
| 3-Jun | 11 | 48 | |
| 4-Jun | 21 | 69 | |
| 5-Jun | 18 | 87 | |
| 6-Jun | 71 | 158 | |
| 7-Jun | 101 | 259 | |
| 8-Jun | 76 | 335 | |
| 9-Jun | 100 | 435 | |
| 10-Jun | 274 | 709 | |
| 11-Jun | 184 | 893 | |
| 12-Jun | 185 | 1078 | |
| 13-Jun | 103 | 1181 | |
| 14-Jun | 43 | 1224 | |
| 15-Jun | 69 | 1293 | |
| 16-Jun | 64 | 1357 | |
| 17-Jun | 108 | 1465 | |
| 18-Jun | 82 | 1547 | |
| 19-Jun | 32 | 1579 | |
| 20-Jun | 43 | 1622 | |
| 21-Jun | 141 | 1763 | |
| 22-Jun | 113 | 1876 | |
| 23-Jun | 127 | 2003 | |
| 24-Jun | 104 | 2107 | |
| 25-Jun | 149 | 2256 | |
| 26-Jun | 254 | 2510 | |
| 27-Jun | 147 | 2657 | |
| 28-Jun | 64 | 2721 | |
| 29-Jun | 82 | 2803 | |
| 30-Jun | 89 | 2892 | |
| 1-Jul | 54 | 2946 | |
| 2-Jul | 31 | 2977 | |
| 3-Jul | 68 | 3045 | |
| 4-Jul | 13 | 3058 | |
| 5-Jul | 25 | 3083 | |
| 6-Jul | 59 | 3142 | |
| 7-Jul | 80 | 3222 | |
| 8-Jul | 68 | 3290 | |
| 9-Jul | 27 | 3317 | |
| 10-Jul | 36 | 3353 | |
| 11-Jul | 37 | 3390 | |
| 12-Jul | 62 | 3452 | |
| 13-Jul | 55 | 3507 | |
| 14-Jul | 36 | 3543 | |
| 15-Jul | 56 | 3599 | |
| 16-Jul | 76 | 3675 | |
| 17-Jul | 67 | 3742 | |
| 18-Jul | 186 | 3928 | |
| 19-Jul | 69 | 3997 | |
| 20-Jul | 66 | 4063 | |
| 21-Jul | 69 | 4132 | |
| 22-Jul | 51 | 4183 | |
| 23-Jul | 43 | 4226 | |
| 24-Jul | 20 | 4246 | |
| 25-Jul | 23 | 4269 | |
| 26-Jul | 24 | 4293 | |
| 27-Jul | 19 | 4312 | |
| 28-Jul | 19 | 4331 | extrapolated count |
| 29-Jul | 16 | 4347 | extrapolated count |
| 30-Jul | 14 | 4361 | extrapolated count |
| 31-Jul | 12 | 4372 | extrapolated count |
| 1-Aug | 10 | 4382 | extrapolated count |
| 2-Aug | 8 | 4390 | extrapolated count |
| 3-Aug | 6 | 4396 | extrapolated count |
| 4-Aug | 4 | 4400 | extrapolated count |
| 5-Aug | 3 | 4403 | extrapolated count |

Appendix B. Expenditures

| Taku River - Nahlin River Chinook Salmon Enumeration 2019 (NF-2019-I-32) | | | | | | | | | |
|--|-----------------------|---------------------------------|--------------------|------------------------|-------------------------------|------------------------------|--------------------|---------------------|--------------------|
| EXPENDITURES | | | | | | | | | |
| Labour | | | | | | | | | |
| DFO Employee Salaries and Benefits | | | | | | | | | |
| Position | | Expenditures (DFO Inkind + PSC) | DFO-Inkind | PSC funding (expenses) | Approved Budget (PSC Funding) | Total PSC Funded Expenditure | Variance | | |
| Manager | Salary | | | | | | | | |
| | Benefits | \$ - | | | | | | | |
| Biologist BI-03 | Salary | \$ 2,025.00 | \$ 2,025.00 | | | | | | |
| | Benefits | \$ 546.75 | \$ 546.75 | | \$ - | | | | |
| Biologist BI-02 | Salary | \$ 3,375.00 | \$ 3,375.00 | | | | | | |
| | Benefits | \$ 911.25 | \$ 911.25 | | \$ - | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | Total Expended | \$ 6,858.00 | \$ 6,858.00 | \$ - | \$ - | | | \$ - | \$ - |
| Subcontractors & Consultants | | | | | | | | | |
| Contract | | Contract Amount Expended | Inkind | PSC funding (expenses) | Approved Budget | Total PSC Funded Expenditure | Variance | | |
| Air Charter Support | | \$ 12,400.00 | | \$ 12,400.00 | 8,000 | | | | |
| Contract for Cabin Construction | | \$ - | | | 3,500 | | | | |
| | | \$ - | | | | | | | |
| | | \$ - | | | | | | | |
| | | \$ - | | | | | | | |
| | | \$ - | | | | | | | |
| | Total Expended | \$ 12,400.00 | \$ - | \$ 12,400.00 | \$ 11,500.00 | \$ 12,400.00 | \$ (900.00) | | |
| | | | \$ 6,858.00 | | Total \$ 11,500.00 | \$ 12,400.00 | \$ (900.00) | | |
| Site / Project Costs | | | | | | | | | |
| Item | | Amount Expended | Inkind | PSC funding (expenses) | Approved Budget | Total PSC Funded Expenditure | Variance | | |
| Travel | | \$ - | | | | | | | |
| Small Tools & Equipment | | \$ - | | | | | | | |
| Site Supplies & Materials | | \$ 2,400.00 | | \$ 2,400.00 | \$ 4,000.00 | | | | |
| Equipment Rental | | \$ - | | | | | | | |
| Work & Safety Gear | | \$ - | | | | | | | |
| Repairs & Maintenance | | \$ - | | | \$ 3,000.00 | | | | |
| Permits | | \$ - | | | | | | | |
| Other costs - GSI analysis | | \$ 10,000.00 | | \$ 10,000.00 | \$ 10,500.00 | | | | |
| | Total Expended | \$ 12,400.00 | \$ - | \$ 12,400.00 | \$ 17,500.00 | | | \$ 12,400.00 | \$ 5,100.00 |
| | | | \$ - | | \$ 17,500.00 | | | \$ 12,400.00 | \$ 5,100.00 |
| Training Costs | | | | | | | | | |
| Item | | Amount Expended | Inkind | PSC funding (expenses) | Approved Budget | Total PSC Funded Expenditure | Variance | | |
| Name of course | | \$ - | | | | | | | |
| | | \$ - | | | | | | | |
| | | | | | | | | | |
| | Total Expended | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | | |
| | | | \$ - | | \$ - | \$ - | \$ - | | |

| Overhead / Indirect Costs | | | | | | | |
|--|-----------------|-------------|------------------------|-----------------|------------------------------|-------------|-------------|
| Item | Amount Expended | Inkind | PSC funding (expenses) | Approved Budget | Total PSC Funded Expenditure | Variance | |
| Office space; including utilities, etc. | \$ - | | | | | | |
| Insurance | \$ - | | | | | | |
| Office supplies | \$ - | | | | | | |
| Telephone & long Distance | \$ - | | | | | | |
| Photocopies & printing | \$ - | | | | | | |
| Indirect/overhead costs | \$ - | | | | | | |
| Administration and financial management | \$ - | | | | | | |
| (If the PSC contribution to Indirect costs exceeds 20% of the total PSC grant submission of back-up documentation justifying the expense is required). | | | | | | | |
| Total Expended | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| | | \$ - | | \$ - | \$ - | \$ - | \$ - |

| Capital Costs / Assets (Value > \$250.00) | | | | | | | |
|---|-----------------|-------------|------------------------|-----------------|------------------------------|-------------|-------------|
| Item | Amount Expended | Inkind | PSC funding (expenses) | Approved Budget | Total PSC Funded Expenditure | Variance | |
| | \$ - | | | | | | |
| | \$ - | | | | | | |
| | \$ - | | | | | | |
| | \$ - | | | | | | |
| Total Expended | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| | | \$ - | | \$ - | \$ - | \$ - | \$ - |

Financial Report

| Categories | DFO InKind | Approved Budget (PSC Grant) | Project Expenditures (PSC\$) | Variance |
|---------------------------|-------------|-----------------------------|------------------------------|--------------------|
| Labour | \$ 6,858.00 | \$ 11,500.00 | \$ 12,400.00 | \$ (900.00) |
| Site / Project Costs | \$ - | \$ 17,500.00 | \$ 12,400.00 | \$ 5,100.00 |
| Training | \$ - | \$ - | \$ - | \$ - |
| Overhead / Indirect Costs | \$ - | \$ - | \$ - | \$ - |
| Capital Costs / Assets | \$ - | \$ - | \$ - | \$ - |
| TOTAL | | \$ 29,000.00 | \$ 24,800.00 | \$ 4,200.00 |

| | | |
|---|-----------------------|-------------------------------|
| PSC Project Funding Grant Advance Amount Received | \$ (24,773.00) | (funds rec enter as negative) |
| PSC Project Funding Grant Amount Remaining to be Paid | \$ - | (positive refundable to PSC) |
| Difference Between Grant Amount and Project Expenditures | \$ (27.00) | |

Justification if Variance

| |
|--|
| |
|--|

Project Manager Name Aaron Foos

Project Manager Signature

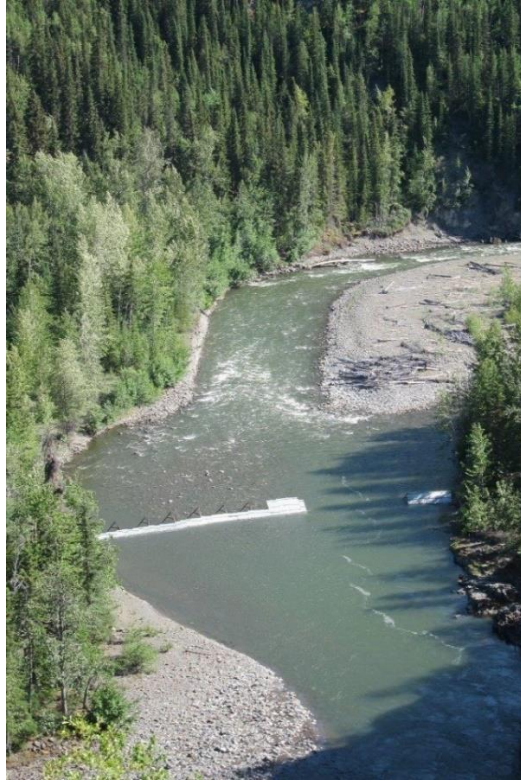
Date

DFO Responsibility Center Manager Name William Waugh

DFO Responsibility Center Manager Signature

Date

Appendix C. Photographs



Photograph 1. Nahlin River partial fence and sonar site.



Photograph 2. Sonar work station.