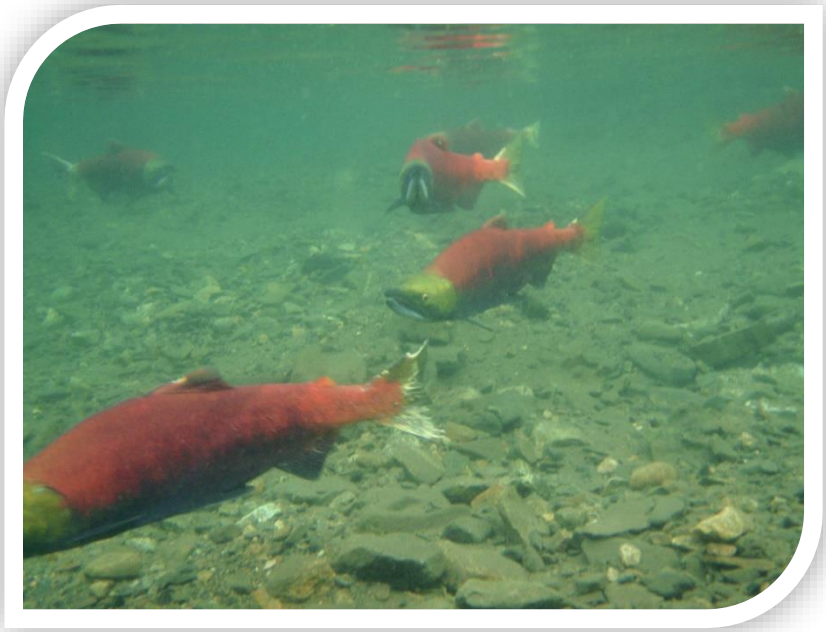
# King Salmon Lake sockeye enhancement - 2018 -



## Final Report

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Prepared by:

Taku River Tlingit Fisheries

## ACKNOWLEDGEMENTS

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# INTRODUCTION

## Background:

The Taku River enhancement program started in 1989 and remains an important aspect within the Transboundary chapter of the Pacific Salmon Treaty (PST). An interest in diversifying or expanding the existing Taku enhancement program was reflected in the updated 2009 Transboundary PST arrangements. The impetus for conducting a new sockeye enhancement project at King Salmon Lake also came from previous recommendations within the following projects or processes: the Taku sockeye enhancement feasibility study (2008-2010), the Transboundary Panel Strategic Salmon Plan (2009), and the Taku Enhancement Production Plan (2009-2014).

This enhancement initiative was utilized within a relatively short-term to restore sockeye production to higher levels while taking advantage of underutilized rearing capacity in the lake. The first sockeye egg-take was implemented at King Salmon Lake in September of 2012 and the second in 2014. Eggs were incubated at the Port Snettisham Hatchery (in Alaska) and the enhanced fry were planted back into the lake of origin in spring of 2013 and 2015. With the majority of enhanced adults from the 2014 brood year expected to be returning during the 2018 season, it was considered prudent that some sampling of such be undertaken.

## Objectives and scope:

The overall goal of this project was to obtain otolith samples from post-spawn sockeye salmon at King Salmon Lake (KSL) to determine the relative proportion of enhanced adult escapement.

The main objectives for the project included:

To follow-up on related PST obligations, inform the Taku Enhancement Production Plan and further pursue recommendations of the Transboundary Panel Strategic Salmon Plan;

The capture and biological sampling post-spawn sockeye adults;

Provide indicator information regarding enhanced / wild proportions and project success;

Prepare and submit a written report of project methods and results;

To continue collaboration and communications with the TBR Enhancement Sub-Committee regarding this enhancement initiative.

## Site description:

King Salmon Lake is located approximately 100km SSE from the community of Atlin, BC. (See the map in Figure 1 below.) The lake is situated at the headwaters of King Salmon Creek which flows into the main-stem Taku River. This remote location is only accessible by float plane or helicopter. The lake supports a spawning / rearing sockeye salmon stock, the adults of which have been enumerated by TRT Fisheries since 2004.

Figure 1: General location of the project site


## METHODS

On Sept. 23, 2018 the TRT Fisheries Manager/Crew Leader and two Technicians proceeded to the site by helicopter. Adult sockeye were captured by snorkelling with a dry suit and using a spear gun. Virtually all sampled fish were post spawn. There were some limited observations of fish still exhibiting spawning behavior, which were selectively avoided. The fish were then dispatched, gender was recorded, MEF and POH lengths were taken, and otoliths were extracted. The informal sampling target was 200 to 300. The crew left the site on Sept. 27, 2018 and otolith samples were subsequently delivered to the DFO-Whitehorse Lab for analysis.

## RESULTS

### Otolith sampling:

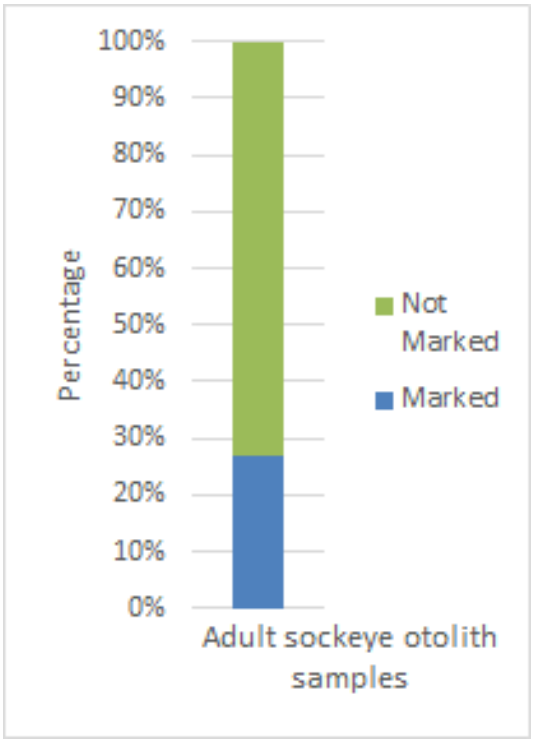
A total of 228 adult sockeye were sampled during the project. Of these, all otoliths were successfully read. As portrayed in Table 1 and Figure 2 below, a total of 61 otoliths were

marked as enhanced fish, resulting in a percentage of 26.8% enhanced fish. All enhanced adults were from the 2014 brood year, i.e. released back into the lake in 2015.

**Table 1: 2018 adult sockeye otolith / thermal marks**

| | # | % |
|---|---|---|
| Marked | 61 | 26.8% |
| Not Marked | 167 | 73.2% |
| Total | 228 | 100.0% |

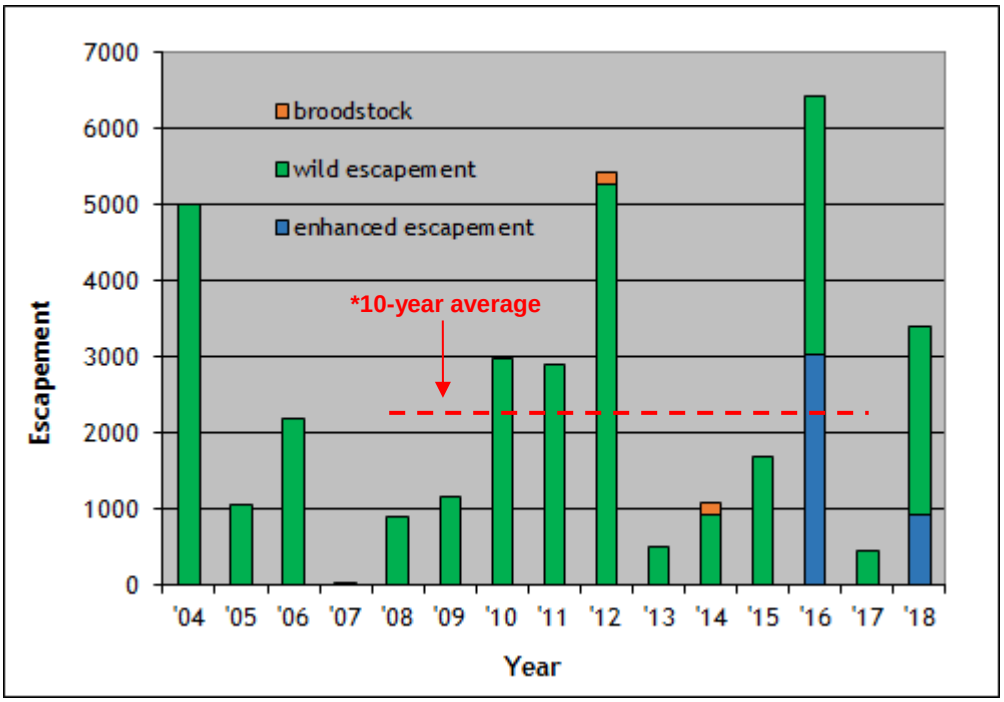
Figure 2: 2018 adult sockeye otolith / thermal marks




## Escapement:

Adult sockeye escapements into King Salmon Lake from 2004 – 2018 are portrayed in Figure 3 below. The total escapement in 2018 was 3,375. The 10 year average escapement is 2,339. Applying the percentages from sampled thermal marked fish, the 2018 escapement works out to approximately 905 enhanced and 2,470 wild sockeye.

Figure 3: King Salmon Lake adult sockeye escapement 2004-2018




*The 10-year average uses 2009 and 2011 escapement estimates which are based upon aerial survey expansions.

## DISCUSSION

The estimated enhanced egg to adult survival from the 2014 brood year is shown in Table 2 below, with calculation process.

Table 2: Estimated enhanced sockeye survivals – 2014 BY

| Lake | Brood year | Source of estimate | Calculation | Comments | **Est. egg to adult survival** |
|---|---|---|---|---|---|
| King Salmon | 2014 | 2018 enhanced harvests and escapement | CAN & US enhanced harvests of 416 and 307 + 905 enhanced lake escapement + 189 age 1.3's expected in 2019 / 203,989 eggs taken | Expected enhanced siblings (5 year olds) in 2019 roughly estimated using the 2015-16 KSL average of 11.6% for age 1.3's at the lake. | **0.9%** |
| King Salmon | 2014 | 2014 TEPP | 80% green egg-fry x 20% fry-smolt x 8% smolt-adult | Optimistically estimated prior to enhancement results. | **1.3%** |

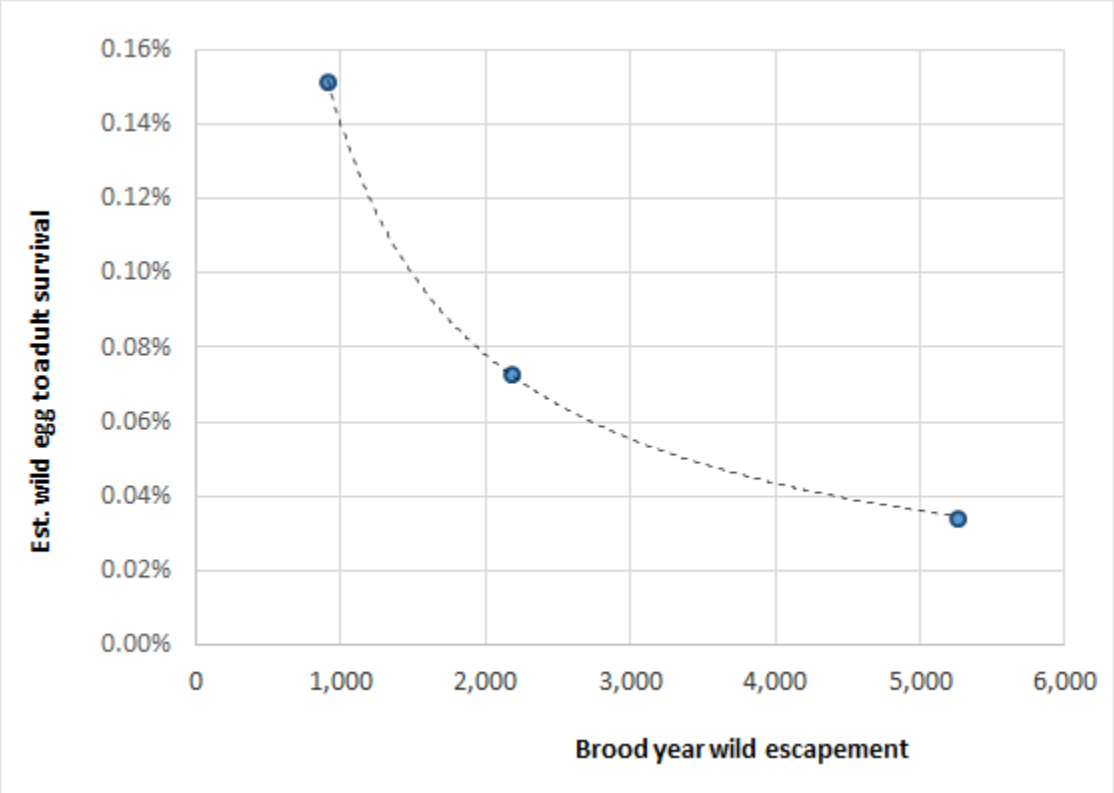
The survival of 0.9% was slightly lower than that previously estimated in the Taku Enhancement Production Plan (TEPP). It was also lower than the 2.1% egg to adult survival estimated for the 2012 brood year egg take. (To note, that 2012 estimate was quite course, i.e.

given the adult escapement was not sampled in the predominate return year of 2016.) However, the 0.9% egg to adult survival should still be considered fairly successful. For perspective, average enhanced survivals for Tahltan Lake have been 1.6% and for planted fry at Tatsamenie Lake 0.3%. Also in comparison, the 2014 brood year egg to adult survival for wild KSL sockeye is roughly estimated to be 0.151%. Course estimates of wild egg to adult survivals for brood years 2006, 2012 and 2014 are shown in Table 3, and in comparison to BY escapement in Figure 4.

Table 3: Estimated wild KSL sockeye egg to adult survivals – 2006, 2012 and 2014 BYs

| Brood year | Ave. Fucunidty | BY escap. | eggs deposited | Return year | CAN harvest | US harvest | escap. | Total run | 1.3's | egg to adult |
|---|---|---|---|---|---|---|---|---|---|---|
| 2006 | 2,888 | **2,177** | 6,287,176 | 2010 | 676 | 450 | 2,977 | 4,103 | 476 | **0.073%** |
| 2012 | 2,888 | **5,257** | 15,182,216 | 2016 | 646 | 671 | 3,378 | 4,695 | 545 | **0.035%** |
| 2014 | 2,888 | **911** | 2,630,968 | 2018 | 630 | 466 | 2,470 | 3,566 | 414 | **0.151%** |

Figure 4: Estimated wild KSL sockeye egg to adult survivals vs. brood year escapement

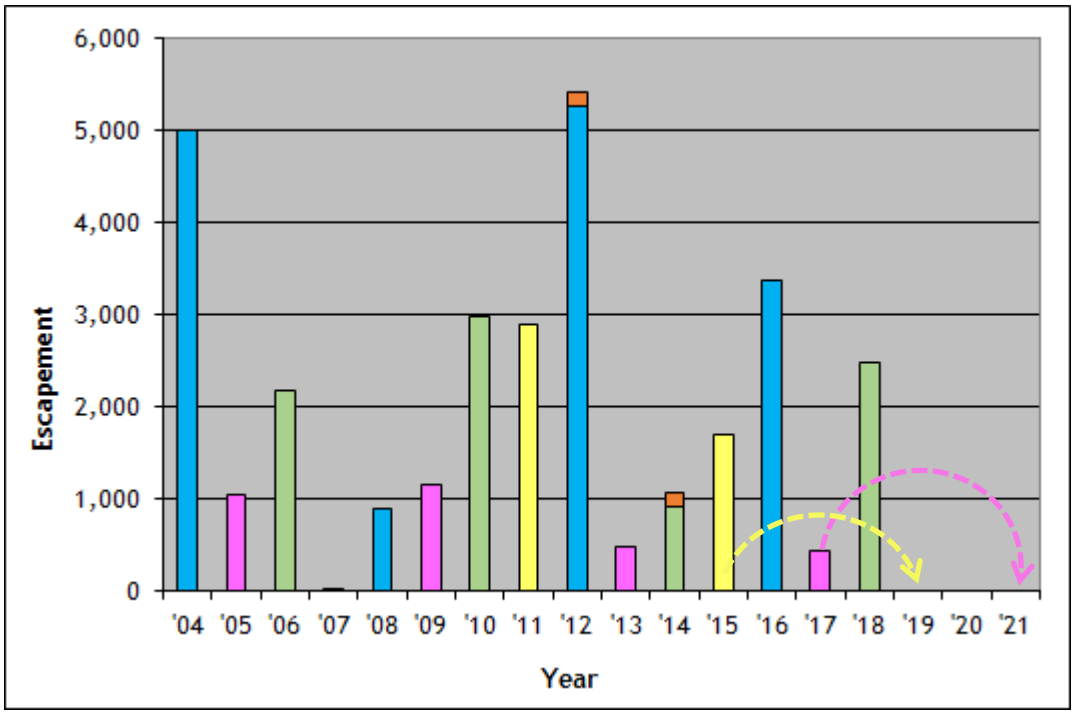



## Recommendations:

The original goal of this enhancement initiative was to use short term, small scale enhancement methods to restore the production of this stock to higher levels. TRT Fisheries

still considers the original goal as valid, and would suggest that supplementing the production level of low brood years is still the best approach. In this regard, and with KSL sockeye being predominately 4 year olds, Figure 5 below shows two remaining brood years for proposed enhancement, that being egg takes for 2019 and 2021.

Figure 5: King Salmon Lake sockeye brood years pending enhancement




In Table 4 below, proposed King Salmon Lake sockeye enhancement and associated monitoring projects are shown. (Such are colour coded to brood year and the predominate age classes of enhanced migrants are bolded in larger font.) Continued sampling of enhanced age 1.2 adults is recommended, using similar methods and timing as this 2018 project.

Table 4: Proposed KSL Enhancement Plan (based on BY cycles)

| Broodyear | Enhanced Migrants (by age) | | Proposed enhancement project(s) or related monitoring | |
|---|---|---|---|---|
| | Smolts out | Adults in | | |
| 2018 | - | 1.2 | Sampling for enhanced adults completed | |
| 2019 | - | 1.3 | Conduct egg take #3 | |
| 2020 | | | | |
| 2021 | 1+ | | Smolt enumeration and/or sampling | Conduct egg take #4 |
| 2022 | 2+ | | | |
| 2023 | 1+ | 1.2 | Sample for enhanced adults | Smolt enumeration and/or sampling |
| 2024 | 2+ | 1.3 | | |
| 2025 | - | 1.2 | Sample for enhanced adults | |

In the longer term, and in particular if this enhancement initiative is to continue, improved smolt assessment is recommended. At this point it has been assumed that the lake is spawning limited, with underutilized rearing capacity. However, these assumptions are currently based on course fishery data, simple observation of spawning habitats, along with some preliminary limnology samples. In order to accurately estimate egg to smolt survivals, a smolt enumeration project would need to be initiated. This would serve to provide better information regarding early stage wild and enhanced survivals, rearing capacity or potential, and wild spawning production limitations. From this, future consideration could also be given to the potential improvement or addition to spawning habitats.

## PROJECT PERFORMANCE REVIEW

Below is a list of the measures for project success from the original proposal. After each is a brief review of post-project performance.

Obtaining an adequate number of samples: The sampling target of 200-300 fish was achieved with a total sample of 228.

Effective reporting of results: Preliminary project results were provided to the TBR Technical Committee and Enhancement Sub-Committee during their post season meeting in November of 2018. This report will be made available to the TBR agencies and further discussion is expected at both the technical and political levels regarding the future of this enhancement initiative.

Not exceeding the original budget: Initially the project came in over budget, however this was offset in order to keep it within the original budget. The initial overage was due to planned fixed wing transport not being available during the time sensitive field work timeline. Rotor wing transport had to be utilized, which significantly increased the cost.