

King Salmon Lake sockeye smolt survey

- 2014 -



- Final Report -

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For the: Northern Fund of the Pacific Salmon Commission

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TABLE OF CONTENTS

INTRODUCTION	1
Background:	1
Objectives and scope:	1
Site description:	2
METHODS	2
RESULTS	3
General:	3
Ages:	3
Lengths and weights:	4
DISCUSSION	7
Data limitations:	7
Average smolt weights:	8
Recommendations:	9
 LIST OF FIGURES:	
Figure 1: General location of the project site	2
Figure 2: 2014 smolt age classes by percentage (n=277).....	4
Figure 3: 2014 smolt length frequencies (n=281).....	5
Figure 4: 2014 smolt length / weight relationship (n=281).....	6
Figure 5: 2014 smolt thermal marks by percentage (n=280).....	6
Figure 6: Average weights of enhanced vs. wild KSL 1+ smolts	7
Figure 7: Average weights of age 1+ smolts from KSL.....	8
Figure 8: 2014 comparison of average weights for age 1+ smolts from Tahltan and King Salmon lakes.....	9
 LIST OF TABLES:	
Table 1: 2014 smolt age classes.....	3
Table 2: 2014 smolt length and weight summary by age class	4
 LIST OF PHOTOS:	
Photo 1: Fyke net installed at lake outlet.....	3

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 is being 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. 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. With the majority of enhanced smolts from the 2012 brood year expected to be out-migrating during the spring of 2014, it was considered prudent that some monitoring of such be undertaken.

Objectives and scope:

The overall goal of this project was to capture out-migrating King Salmon Lake sockeye smolts for subsequent biological sampling.

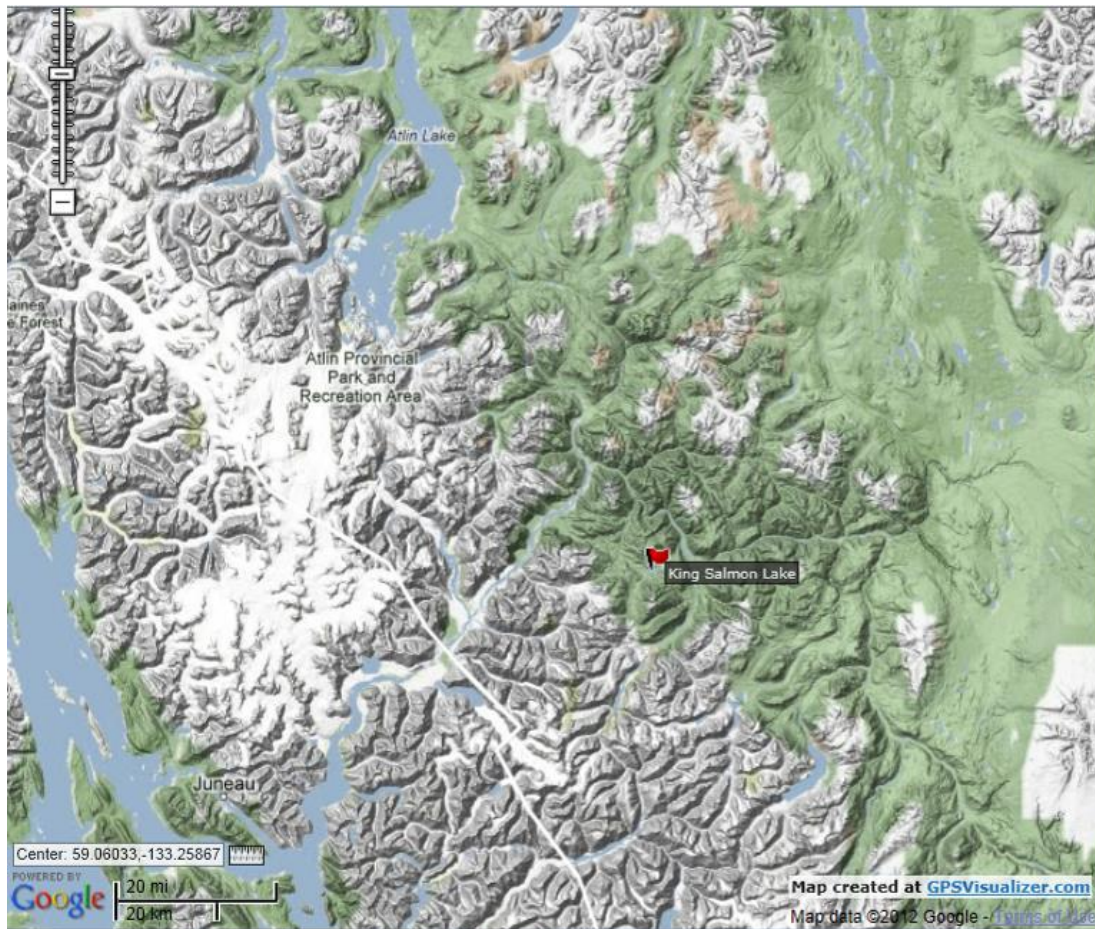
The main objectives for the project included:

- 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 of 100-400 out-migrating sockeye smolts.
- Providing indicator information regarding sockeye smolt condition, lake productivity and enhanced / wild proportions.
- Submission of a written report of project methods and results, inclusive of appropriate comparisons with previous data.
- Continued 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. It supports a lake 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 May 21, 2014 a TRTFN Biologist and Technician proceeded to the site by helicopter. Out-migrating sockeye smolts were captured by fyke net at the outlet of the lake. The revised sampling target (suggested by the TBR Enhancement Sub-Committee) was 300. Smolts were sampled for: fork length (nearest mm); weight (nearest 0.1 g); age (scales); and otoliths. The crew returned from the site on 24, 2014. Smolt heads were preserved in ethanol and delivered to the DFO-Whitehorse Lab for otolith extraction and analysis.

Photo 1: Fyke net installed at lake outlet

RESULTS

General:

A total of 281 sockeye smolts were sampled during the project. Of these 277 were successfully aged and 280 of the otoliths were effectively read.

It should be noted that given the small sample size, detailed interpretation of results is limited. The project is only a reconnaissance level initiative where samples are obtained over a short period. However, the reduced cost and project duration does allow for the collection of useful indicator information and serves as some means of monitoring.

Ages:

Smolt age results are presented in Table 1 and Figure 2 below by number and percentage. Almost all of the smolts were age 1+ fish, with only 1 sample being age 2+.

Table 1: 2014 smolt age classes

N	Age			
	# 1+	# 2+	% 1+	% 2+
277	276	1	98.4	1.6

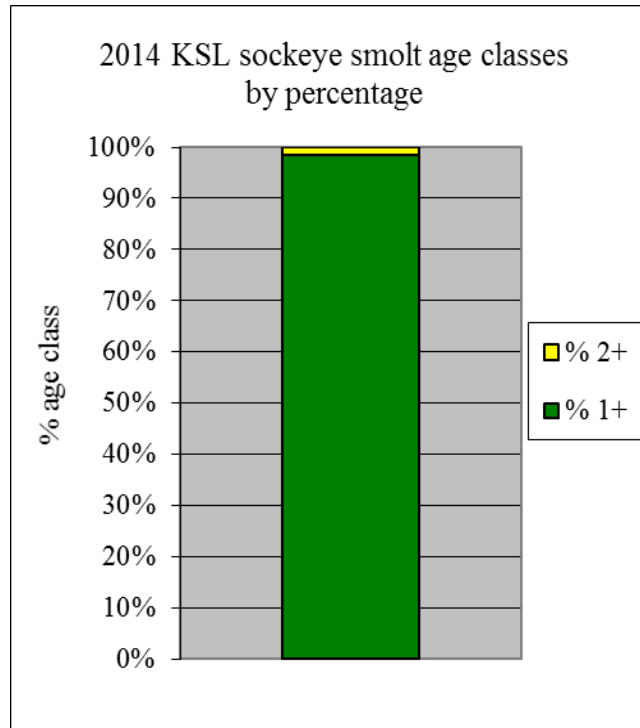


Figure 2: 2014 smolt age classes by percentage (n=277)

Lengths and weights:

Table 2 below provides a summary of lengths and weights by age class.

Table 2: 2014 smolt length and weight summary by age class

		Age		
		1+	2+	*Combined
	N	276	1	281
Weight (grams)	Average	5.44	13.20	5.47
	Std. Dev.	1.5	N/A	1.6
	Min.	1.4	13.2	1.4
	Max.	10.9	13.2	13.2
Fork Length (mm)	Average	84.4	114.0	84.6
	Std. Dev.	8.0	N/A	8.1
	Min.	56.0	114.0	56.0
	Max.	105.0	114.0	114.0

* includes non-aged specimens

Smolt fork lengths for age 1+ fish ranged from 56 - 105 mm with an average of 84.4 mm. The one age 2+ fish captured and sampled had a length of 114 mm. The resulting length frequencies (for all samples) are depicted in Figure 3 below.

Smolt weights for age 1+ fish ranged from 1.4 – 10.9 g with an average of 5.4 g (n=276). Only one age 2+ fish was captured and sampled at a weight of 13.2 g. The resulting length/weight relationship (for all samples) is plotted in Figure 4.

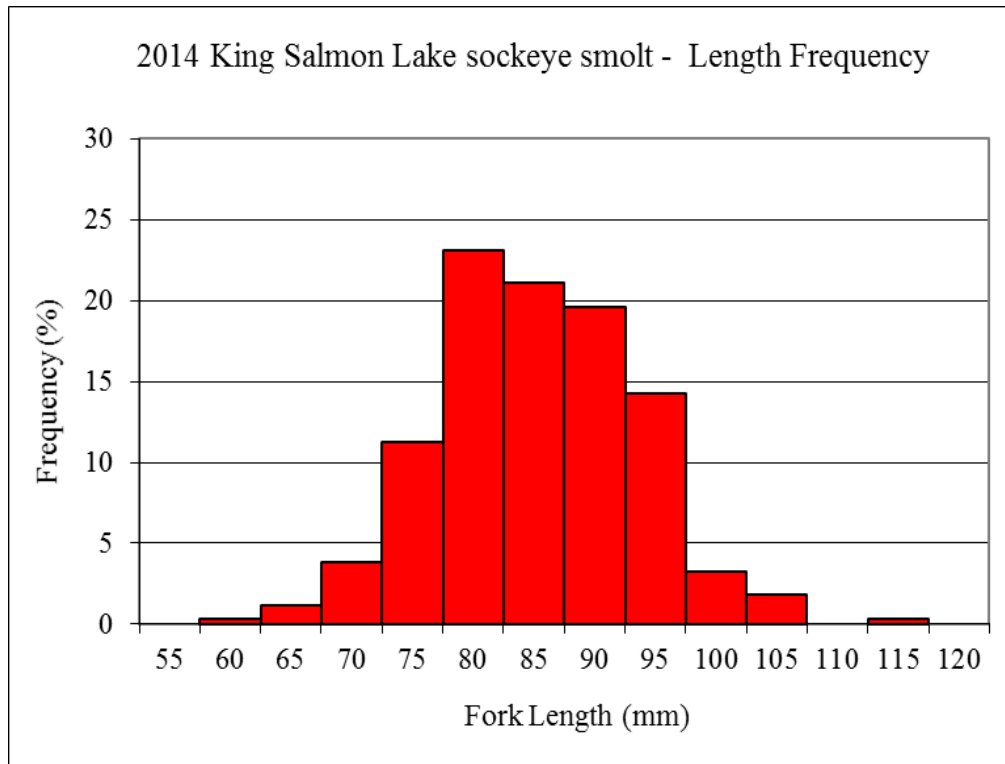


Figure 3: 2014 smolt length frequencies (n=281)

Results of otolith analysis for thermal marks are shown in Table 3 and Figure 5 below. Of the total sample, 11.8% displayed the hatchery thermal mark.

Table 3: 2014 smolt otolith / thermal marks

	#	%
Marked	33	11.8%
Not Marked	247	88.2%
Total	280	100.0%

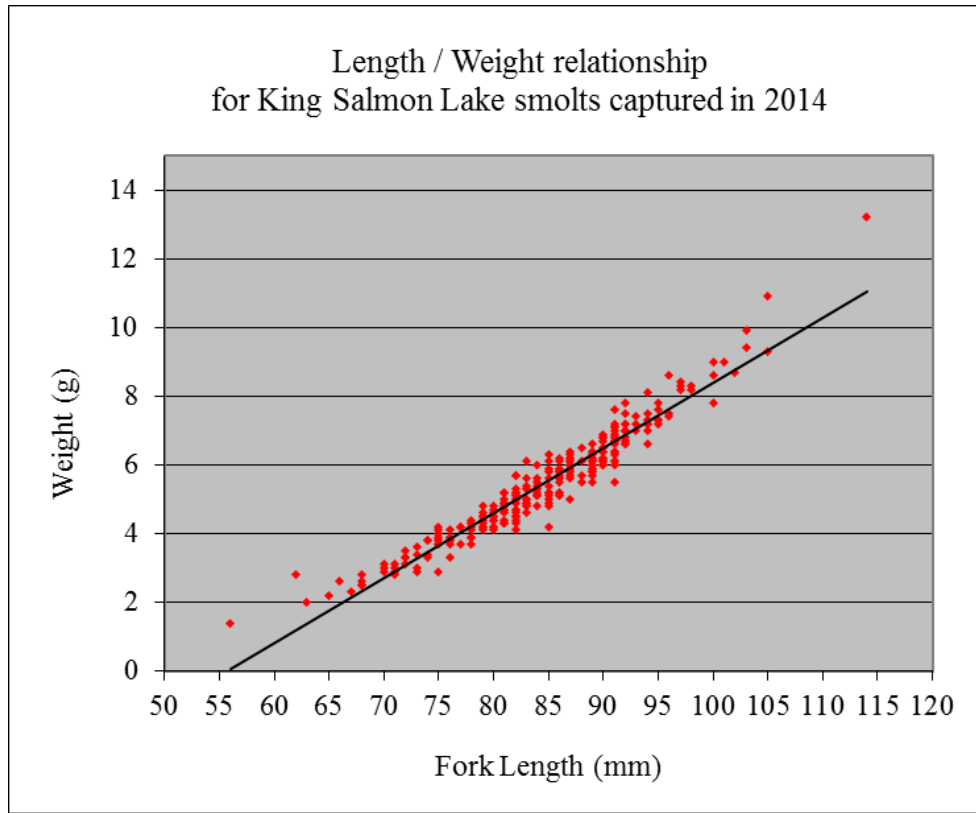


Figure 4: 2014 smolt length / weight relationship (n=281)

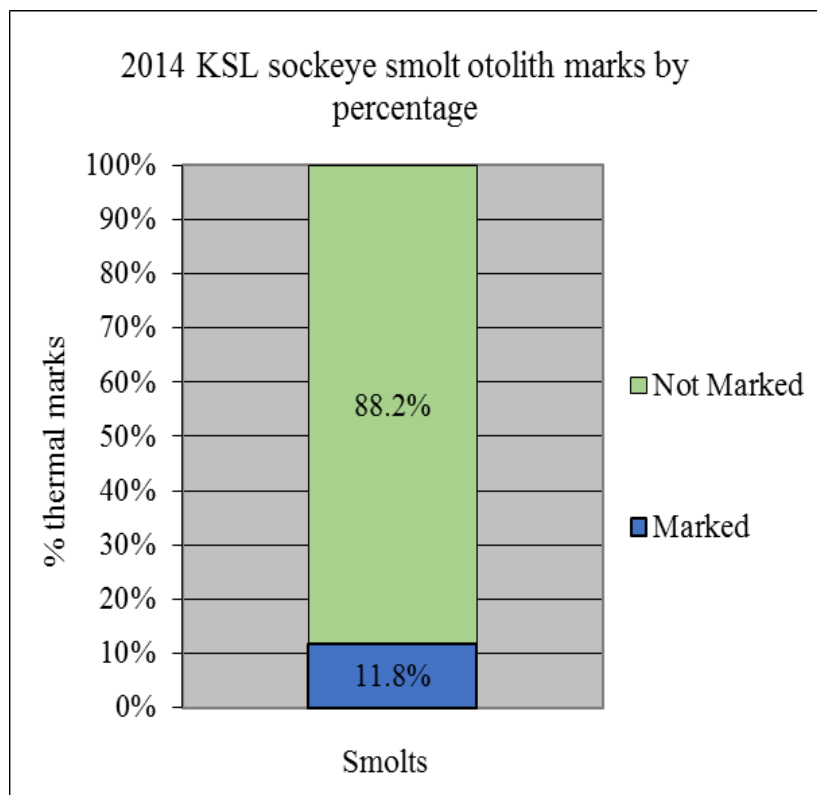


Figure 5: 2014 smolt thermal marks by percentage (n=280)

The average weight (and length) of enhanced and wild age 1+ smolts are displayed in Table 4 and Figure 6 below. (Only samples which were effectively read for both age and otolith marks are included.)

Table 4: Average weight and length of enhanced vs. wild 1+ smolts

	# of samples	Ave. weight (g)	Ave. length (mm)
Enhanced	32	7.0	92.2
Wild	243	5.3	83.6

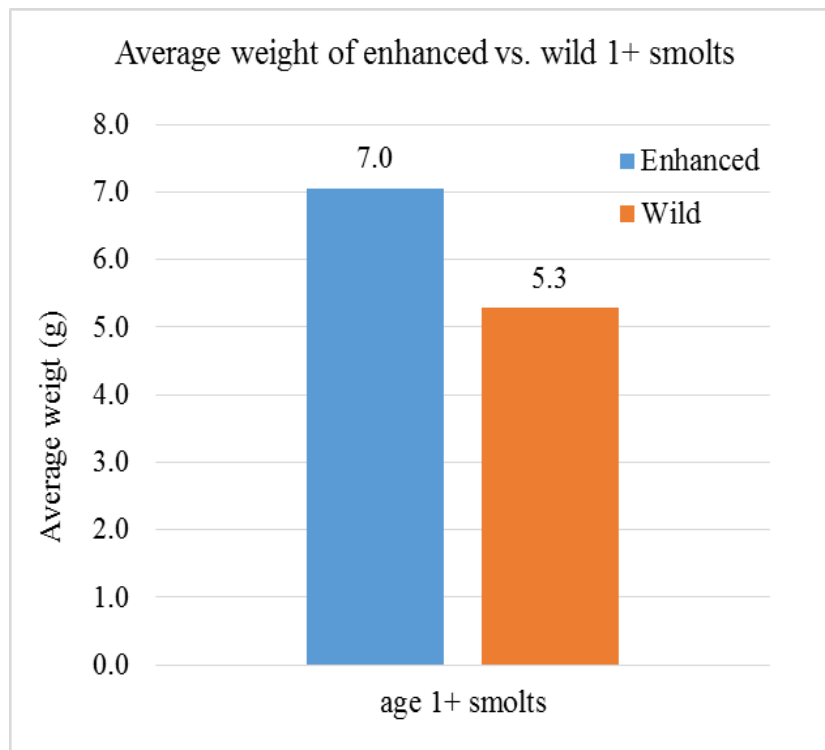


Figure 6: Average weights of enhanced vs. wild KSL 1+ smolts

DISCUSSION

Data limitations:

As noted previously, the relatively small sample size restricts the level at which data can be analysed. With merely a small fraction of the overall smolt population being sampled, only general interpretation of results can be made.

Average smolt weights:

A comparison of the yearly average weights of age 1+ smolts (wild and enhanced combined) from King Salmon Lake is portrayed in Figure 7 below. The average weight observed in 2008 at King Salmon Lake was 8.2g vs. 5.4g in 2014.

A comparison between 2014 average weights of age 1+ smolts (separated by wild and enhanced) from King Salmon Lake and Tahltan Lake is portrayed in Figure 8 below. Enhanced smolts from King Salmon Lake show a larger degree of size difference.

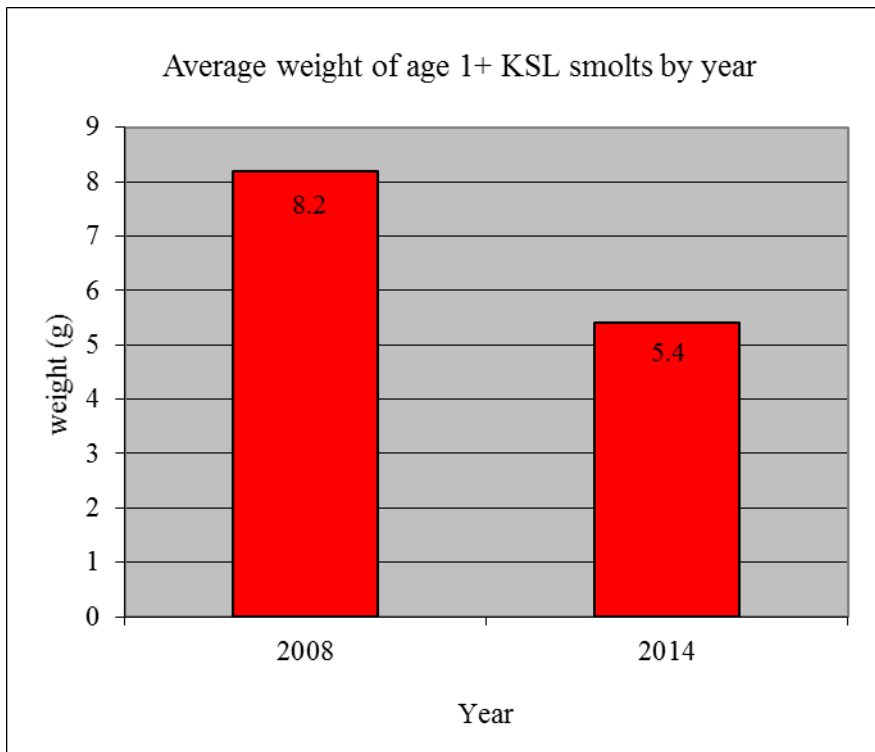


Figure 7: Average weights of age 1+ smolts from KSL

The PSC TBR Enhancement Sub-Committee discussed the outcomes of this project during their March 2015 meeting. In general the 2014 smolt results were found to be quite favourable, in particular the relative ratio of enhanced smolts in the sample and the size difference between wild fish.

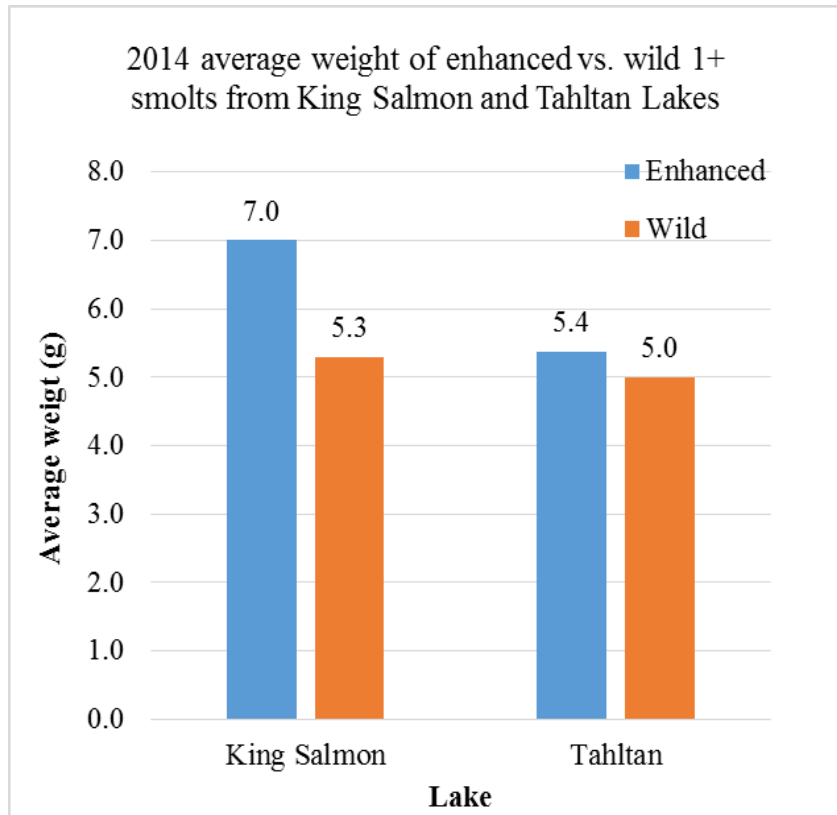


Figure 8: 2014 comparison of average weights for age 1+ smolts from Tahltan and King Salmon lakes

Recommendations:

Although this smolt sampling project remains limited in scope, it does provide some general indication of average smolt sizes and thermal mark presence/absence. It is recommended that this project be continued as a basic means of monitoring smolt characteristics and lake productivity in relation to enhancement activities.

Since an egg take at the lake was conducted in 2014, it is anticipated that smolt assessment (similar to herein) would be proposed for 2016. Although further discussion is required, it is anticipated that the monitoring of enhanced adults returning in 2016 can largely be done through existing projects such as fishery sampling for thermal marks and/or the adult enumeration weir at the lake. This project is still considered experimental, therefore assessment results will further steer potential enhancement activities in the future.