Gitanyow Fisheries Authority

Kitwanga River Salmon Enumeration Facility (KSEF) – 2015 Annual Report

Submitted to: Gitanyow Hereditary Chiefs,
Pacific Salmon Foundation,
Fisheries and Oceans, Canada,
Pacific Salmon Commission

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Abstract

In 2015, the Gitanyow Fisheries Authority (GFA) operated the Kitwanga River Salmon Enumeration Facility (KSEF) for the 13th consecutive year to count and biologically sample Pacific salmon returning to the Kitwanga River. The fence stayed operational from July 10th to October 9th, 2015 under higher than normal water conditions for most of the year. On October 9th the KSEF was breached due to extremely high water levels which forced the closure of the project approximately three week earlier than anticipated. A total of 4,636 sockeye, 897 chinook, 45 jack chinook, 95,101 pink, 312 chum, and 1,094 coho salmon were enumerated through the facility. The 2015 sockeye return of 4,636 fish was well below the highest recorded of 20,804 in 2010, above the lowest return of 240 fish in 2007, and slightly below the running average of 4,865 fish per year (2003-2014). The 2015 chinook return of 897 fish was 42 percent below the running average of 1,542 fish (2003 – 2014) and marked the 7th consecutive year of counts below 1,000 fish compared to the range of 1,450 to 3,225 fish observed from 2003 to 2008. The 2015 pink run of 95,101 fish was well below the running odd-year average of 229,417 fish (2003 – 2013). The 2015 pink return originated from the 2013 brood year, which had an escapement of 120,172 fish, indicating the 2015 return was 21% below replacement. The 2015 chum salmon return of 312 fish was 41% below the average escapement recorded from 2003-2014 (754 fish), and marked the 10th consecutive year of low escapements; there is no sign of recovery to the 1,000+ chum returns encountered in years 2003 to 2005. The 2015 coho return of 1,094 fish was well below the highest return of 12,080 coho in 2009 and slightly above the 690 fish return in 2004. The 2015 coho return is 73% below the running average from 2003 to 2014 of 4,089 fish per year and the low return is likely at least partially attributed to the fence closing earlier than in other years. Based on average run timing through the KSEF (2003-2014) GFA is confident that all chinook, pink and chum would have moved through the KSEF prior to project ending early and we estimate that 92% of the sockeye and 82% of the coho should have moved passed the site by October 9, 2015.

Acknowledgements

Gitanyow Fisheries Authority (GFA) would like to thank the Gitanyow Hereditary Chiefs (GHC) for their continued leadership and support for the GFA program. In 2015 the project funders were: Fisheries and Oceans Canada (Prince Rupert Stock Assessment), the Pacific Salmon Foundation (PSF), Pacific Salmon Commission (PSC) and the Gitanyow Huwilp Sustainability Fund. GFA gratefully acknowledges the field staff that make the project possible. GFA staff are often required to work long shifts under short notice in adverse weather conditions and for this we are very grateful for their continued commitment to the project. In 2015 GFA technicians included: Les McLean, Earl McLean, Vernon Russell, Phillip Johnson, Owen Russel, Johnny Martin, Morgan Douse, Brenton Williams, James Morgan and Dustin Gray and GFA lead staff included: Derek Kingston, Mark Cleveland, Gregory Rush and Kevin Koch.

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1. INTRODUCTION AND BACKGROUND

Historically, the Gitanyow fished salmon in the Kitwanga River for food, social and ceremonial purposes with sockeye being the main salmon species of choice. In the early 1900's sockeye stocks were thriving and Gitanyow Elders spoke of the lakeshores of Gitanyow Lake turning red every fall as the sockeye congregated to spawn on their respective spawning grounds. However, by the 1960's the Elders talked of the noticeable declines in the returns of the Kitwanga sockeye and by the 1970's most fishing sites along the Kitwanga River were voluntarily abandoned by the Gitanyow due to conservation concerns for the stock (Cleveland 2005, Kingston 2013).

Over fishing in mixed stock fisheries in the ocean was one of the main reasons the stocks collapsed. Past fishery re-constructions for the last 50 years show an average exploitation on Kitwanga sockeye of over 50% and reaching as high as 70% in some years (Cox-Rogers, DFO, Pers. comm., 2010). Other factors likely contributed to the decline. They include the degradation of spawning and rearing habitat in and around Gitanyow Lake due to poor forest harvesting practices (Cleveland 2006, Kingston 2013).

Historical DFO Salmon Escapement Data (SEDS) records for Kitwanga sockeye are very limited. In most years, stream escapement counts were not completed and even when they were, the results were likely inaccurate. Kitwanga sockeye are exclusively lakeshore spawners and GFA observations over the last 15 plus years have found that conducting lakeshore counts is very difficult and almost always under estimated true annual escapements by a large margin.

In 1999, GFA initiated studies on Kitwanga sockeye to conserve, protect and recover the stock. One of the highest priority projects has included the accurate annual assessment of adult and smolt production. Adult escapement data has been collected continuously since 2003 when the Kitwanga River Salmon Enumeration Facility (KSEF) was constructed. Smolt production from Gitanyow Lake has been accurately assessed continuously since 2008, when the Kitwanga River Smolt Facility (KsF) was constructed.

In conjunction with counting fences, GFA has conducted spawning habitat assessment and rehabilitation works and small pilot hatchery programs to try and boost egg to fry survival (Cleveland 2007 & 2009, Kingston 2008 & 2009, McCarthy and Cleveland 2012). In addition, an

overall reduction in the exploitation rate on Kitwanga sockeye has been implemented in the last 5 years where averages have been about 20-25%. These compare positively to the more historical exploitation rates which were double and triple these values. All of these works have had a positive effect on Kitwanga sockeye and we have seen some modest rebuilding of the stock in reason years.

The KSEF not only provides benefits for the Kitwanga sockeye rebuilding program, but it is also used as a middle Skeena salmon index because it also collects annual escapement data on chinook, pink, chum and coho salmon. The information collected at the KSEF is relied upon in-season and post-season by fisheries managers that use this index tool to help manage all Skeena salmon fisheries.

The 2015 season marks the 13th year that the KSEF has been in operation. Kitwanga salmon escapement data from 2000 to 2002 obtained from the temporary weir, stream walks and aerial flights prior to the construction of the KSEF and presented in previous reports are not included in this report.

In 2015, the KSEF was operated with funding contributions from Fisheries and Oceans Canada (Prince Rupert Stock Assessment), Pacific Salmon Foundation, Pacific Salmon Commission, Gitanyow Hereditary Chiefs - AFS program and the Gitanyow Huwilp Sustainability Fund. This report summarizes the sampling results and findings for the KSEF program in 2015.

2. DESCRIPTION OF THE STUDY AREA

The Kitwanga River (BC Watershed Code 400-364900) is a fifth order stream that drains into the Skeena River about 250 km northeast of Prince Rupert, B.C. It supports all six species of Pacific salmon including pink salmon (*Oncorhynchus gorbuscha*), chum salmon (*O. keta*), chinook salmon (*O. tshawytscha*), coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), and steelhead trout (*O. mykiss*). The Kitwanga River supports populations of resident rainbow trout (*O. mykiss*), cutthroat trout (*O. clarki*), Dolly Varden char (*Salvelinus malma*), bull trout char (*S. confluentus*), mountain whitefish (*Prosopium williamsoni*) and various other species of coarse fish (BC Fisheries Information Summary System, or FISS).

The drainage encompasses an area of about 83,000 hectares and has a total mainstem length of approximately 59 kilometers (Cleveland 2000). Gitanyow Lake (gazetted name Kitwanga Lake) separates the Upper and the Lower Kitwanga River. The Upper Kitwanga is located directly north of Gitanyow Lake and has a main stem length of about 23 km. The Lower Kitwanga River flows south for about 36 km between Gitanyow Lake and the Skeena River. The Lower Kitwanga River has four major gazetted tributaries: Tea Creek, Deuce Creek, Kitwancool Creek and Moonlit Creek. The Upper Kitwanga River has no major tributaries and exhibits a multi-channel meandering configuration with intensive beaver activity along its lower reaches.

The KSEF is located on the Kitwanga River about 4 km upstream from its confluence with the Skeena River (Figure 1). It is situated on private property and a Statutory Right of Way permit has been granted for the site to the Gitanyow Fisheries for salmon research until 2036. Because the KSEF site is on the traditional territory of the Gitxsan (Gitwangak), fishery personnel from Gitwangak house groups are trained and employed annually by GFA to help operate the facility.

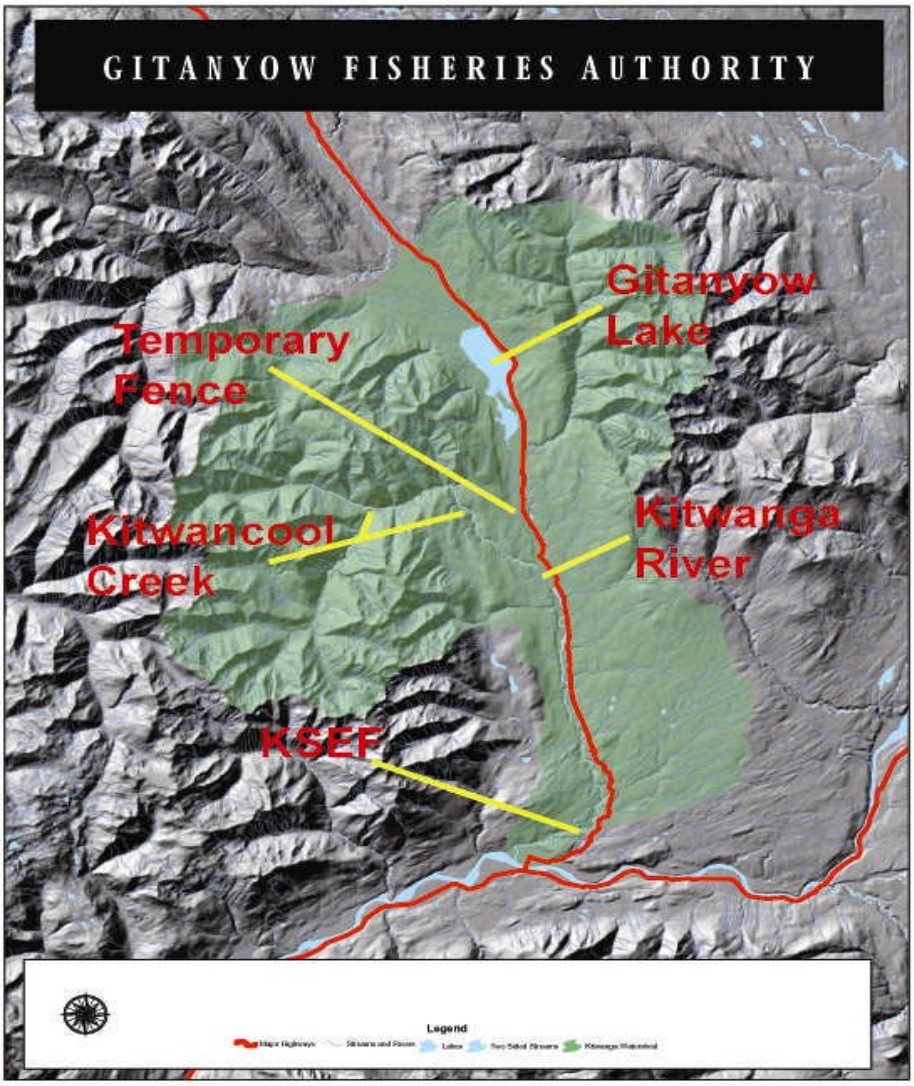

Figure 1: Map of the Kitwanga Watershed including the KSEF (operating from 2003-2015) and the temporary fence sites (operating from 2000-2002).

3. KSEF DESIGN AND OPERATING METHODS

The counting fence is located about 4 Km upstream of the mouth to the Skeena River and downstream of most salmon spawning areas (Cleveland, 2004). The KSEF operates during the summer and fall months and uses aluminum panels that funnel fish into one of two counting stations located on the left and right banks of the river (Figure 2; photo series of KSEF design). From late fall through to the following summer, fence panels and counting boxes are removed allowing fish unimpeded movement past the site. The KSEF is about 30m wide and spans perpendicular to the rivers flow.

Based on a temporary test panel design that was used during the regular fence operations in 2013 and 2014, the GFA upgraded the entire fence section to a fully functioning rotating panel design for the 2015 salmon counting season. GFA acquired financial assistance from the Pacific Salmon Commission (PSC) in 2015 to complete the new fence design (Kingston, 2015). The new rotating panel design provides a much safer platform for the staff working at the facility, allowing them to safely and efficiently remove debris buildup during the fall floods.

The new rotating panel design consists of a series of 9 aluminum transoms that support the aluminum rotating panels. Nine steel base plates were also bolted onto the existing cement crump weir to secure the aluminum transoms that spanned the entire width of the river. The steel base plates were fastened with Hilti bolts at 2m intervals across the width of the river and parallel to the rivers flow. Two rotating fence panels were placed in between each transom. There are a total of 21 rotating panels that span the entire river and block fish passage. Each rotating panel is made from 3/4" schedule 40 aluminum bars that are welded to ¼" – 4" X 4" aluminum square tubing at each end. The panel spacing between each aluminum bar is 1" to block adult salmon from swimming upstream through the panels. The rotating panels are 40" wide and 72" tall. Each aluminum fence panel rotates on 2" trailer balls that are permanently secured in the river onto a continuous steel base plate. A lower nylon bushing was fastened to the base of each rotating panel and the bushing was machined to fit a 2" steel trailer ball. At the top of each rotating panel a steel bracket was welded with an upright 1 ½" steel shaft and a nylon bearing that could be fastened to a cross brace between each transom. Each steel bracket had a 1 ¼" Hex head bolt machined into the top of the bracket to aid in turning each panel with a large T-bar to remove leaf litter and woody debris from the fence panels.

An aluminum walkway was installed on top of the transoms that allowed the workers to access each rotating panel from above and rotate the panel to clear off the debris that has been held up by the fence. Three rows of 12" X 12" X 72" HDPE floats were placed along the back of the entire fence to prevent salmon from jumping on the fence prior to swimming through the counting chutes. The rotating panels and transoms are designed to be taken out after the adult salmon migration so that the only portion remaining in the river is the concrete slabs thereby allowing other fish to migrate past the survey site at all other times of the year (Figure 2; photo series of KSEF design).

Figure 2: Photo series of the KSEF structure including new rotating fence panels, right and left bank counting stations, overhead walkway, and HDPE floats secured to the back of the panels to prevent salmon from jumping.

Once the aluminum rotating panels and walkways were secured into the middle section of the river, the left and right bank counting stations are installed so that all fish can be recorded as they migrate past the fence. Fisheries technicians stationed at each trap box visually identify and tally each fish by species. Each trap box has two counting chutes to direct fish into one of two large holding pens where they can be examined more closely, and sampled as necessary. A white Teflon reflective background is used on the bottom of the trap boxes to make the visual

identification of fish easier. A plexiglass-bottomed viewing box floats on the water to reduce glare and improve the fish visibility. Trap boxes are equipped with hand winches, which are raised or lowered to allow adequate water levels in the chutes.

In 2015, a portion of the salmon migrating through the KSEF was randomly sampled to acquire a full range of fish sizes and scales for length/age analysis. When sampled fish were placed in a "V" trough equipped with a hose and electric pump which provided a constant supply of fresh river water during sampling (Figure 3; Photo series showing sampling stations and sockeye and chinook specimens). Samples were taken from all species except from pink salmon. Fish were also visually inspected to identify the presence of marks (e.g. adipose fin clip), measured for fork length and inspected for sex, ripeness and overall condition. Scale samples were collected for aging and the results are presented in this report using the European method. This method presents ages using a two-number sequence with the first number representing the fresh water occupation period and the second number representing the salt-water occupation period.

GFA fisheries staff was instructed on proper fish handling techniques to reduce the stress on the fish. Crews of two fisheries technicians visually enumerated and tallied salmon as they swam through each trap box. One GFA technician would work on the right bank counting station and the other on the left bank counting station during each shift. The hours of operation were during daylight hours only. The KSEF is closed nightly preventing upstream migration between dusk and dawn.

A manual stage gauge was used to measure river levels throughout the operating period. GFA staff recorded river levels four times daily. The manual stage gauge was established at the KSEF in 2004 and is used to compare water levels and flood events from year to year. Daily water temperatures, rain gauge measurements and air temperature are also recorded throughout the operating period in 2015. GFA has also established a Solinst levelogger, attached to the stream substrate, approximately 75m downstream of the KSEF as well as a Solinst barologger on land. Together these loggers provide accurate water stage and temperature data every half hour, allowing the development of a stream hydrograph over time.

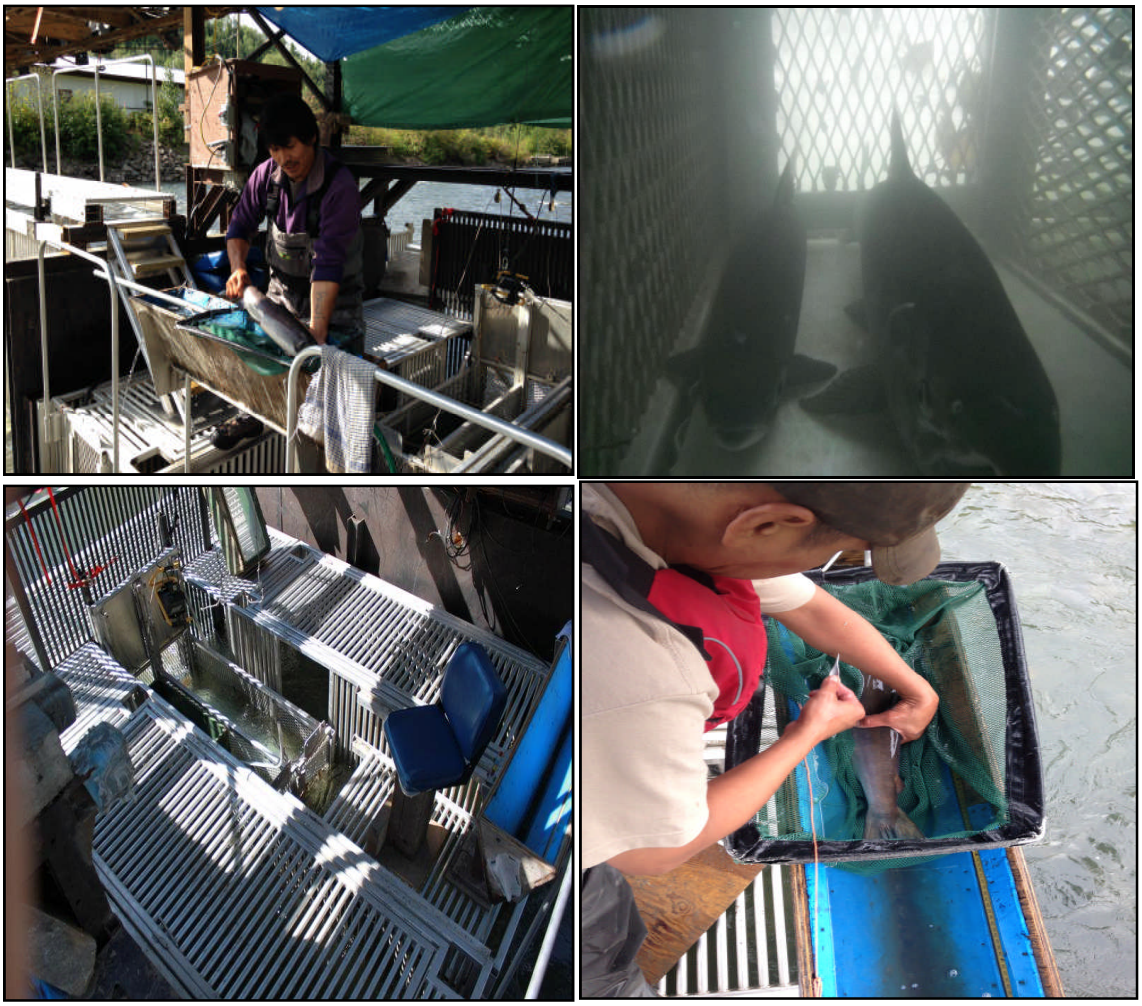

Figure 3: Photo series of counting and sampling stations used at the KSEF.

4. RESULTS

The operation of the KSEF in 2015 marked the 13th consecutive year. The project was operated for a total of 92 days in 2015, from July 10th to October 9th. On October 9th the KSEF was breached due to extremely high water levels which forced the closure of the project approximately three weeks earlier than planned. This extreme high water event breached the fence when water levels reached 1.75m. During the flooding, portions of both the left and right bank counting boxes were blown out which rendered the fence unusable to enumerate salmon for the remainder of the season (Figure 4.).

Figure 4: Photo series of the high water event and breaching of the fence on October 9th, 2015 that disabled both the left and right bank counting boxes.

The average water levels recorded in July 2015 were lower than the previous overall average seen from 2004-2014. However, from late August to early October water levels were considerably higher than normal. The highest water level occurred on September 19th peaking at 1.95m, which was a significant rise from the previous day's level of 1.23m. October 9th marked the end of the 2015 sampling season where water levels rose to 1.75m causing major damage and breaching of the fence (Figure 5).

Water temperatures began at 14° Celsius when the fence opened on July 10th, peaked at 16°C on July 19th and ended at 7°C on October 9th. Water temperatures were considered favorable for salmon during the entire fence operations.

Table 1: Run timing and total escapement for all species counted through the KSEF in 2015.

Species	Run Start	Mid Run	Run end	Peak Run Range	Total Escapement
Sockeye	July 14th	August 27th	October 9th	August 5th – October 2nd	4,636
Chinook	July 10th	August 10th	September 10th	July 17th - August 28th	897
Pink	July 22nd	August 26th	September 30th	August 5th – September 15th	95,101
Chum	August 10th	September 7th	October 5th	August 25th – September 17th	312
Coho	August 9th	September 9th	October 9th	September 3rd to October 2nd	1,094

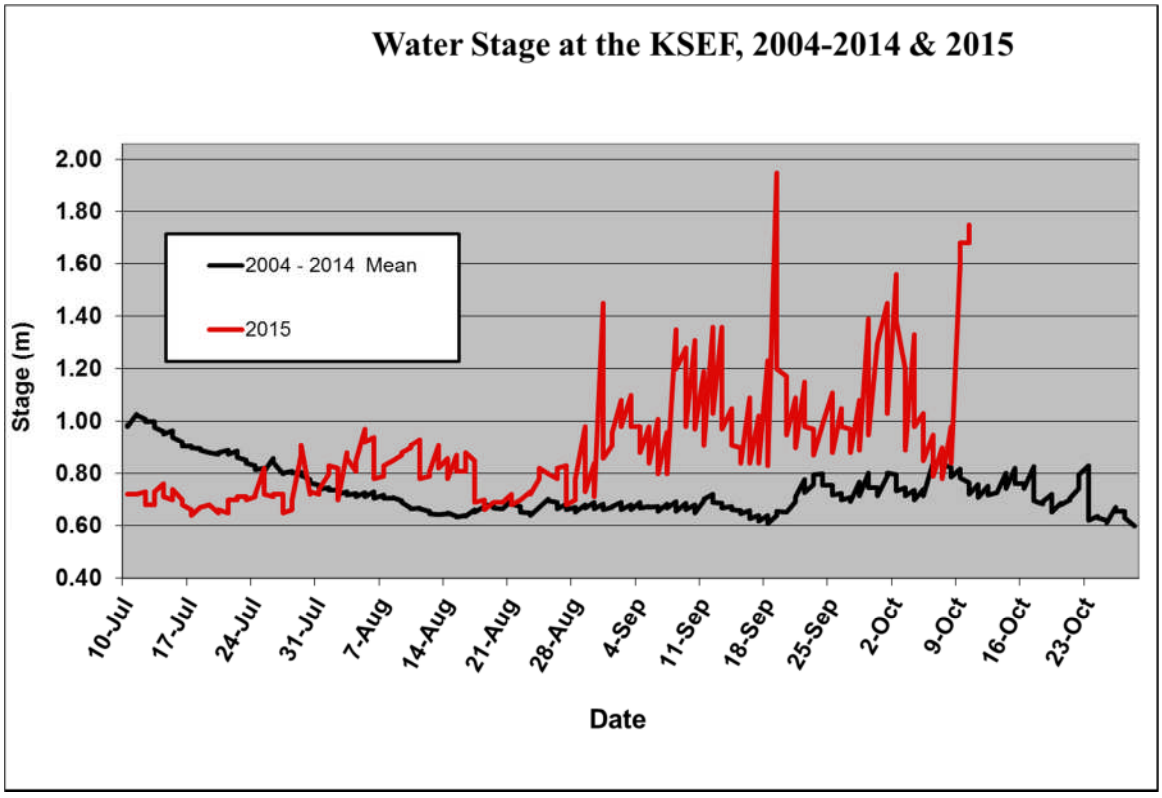

Figure 5: Water Stage at the KSEF, 2004-2014 average and 2015 recordings.

Salmon species-specific breakdowns, including total counts, run timing, historical run numbers, size, age and sex structure are as follows:

4.1 Sockeye

A total of 4,636 sockeye were counted at the KSEF in 2015. Sockeye escapement in 2015 were the fourth highest recorded at the KSEF since the year 2003 (highest was 20,804 in 2010), and showed improvement when compared to the 2011 and 2012 brood years (Figure 6). The current running average escapement from 2003 to 2015 now stands at 4,865 sockeye, which is a notable increase from the 4,062 sockeye per year average calculated for years 2003 to 2014.

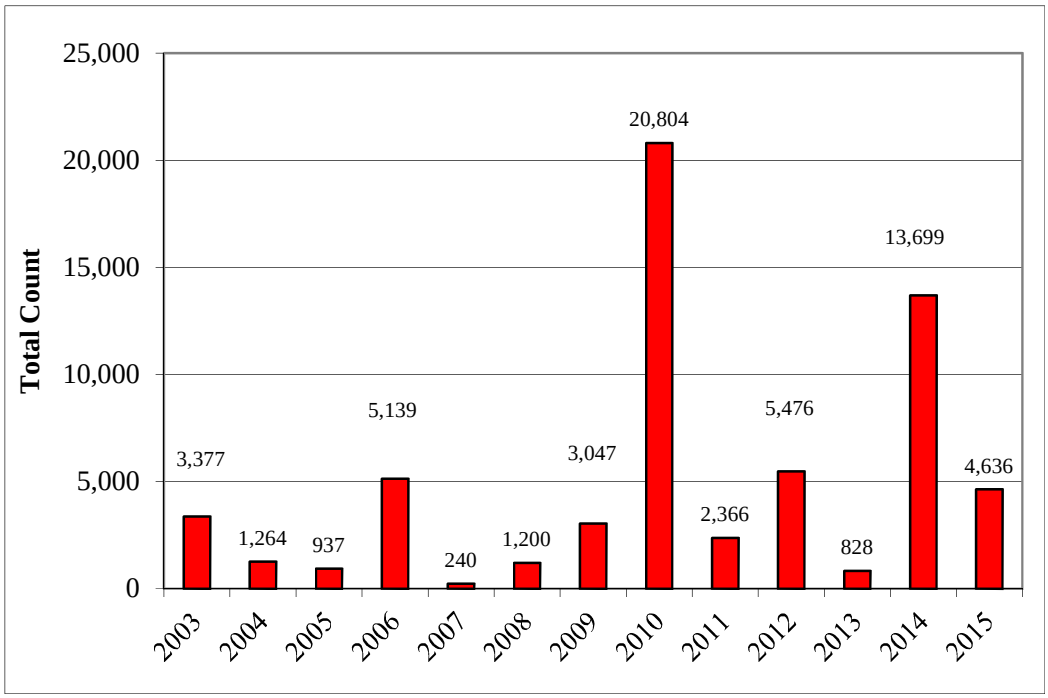

Figure 6: Annual Sockeye escapement into the Kitwanga River through the KSEF from 2003 to 2015.

In 2015, the first sockeye passed through the KSEF on July 14th, which matched normal historical timing of first entry. Sockeye were still migrating through the fence in low numbers immediately prior to the unintended fence closure on October 9th (Figure 7). No distinct trend was observed in the run data. Most of the sockeye run was spread out over an 8-week period from August 7th to October 2nd. Significantly high counts were observed on August 19th (199 fish), August 31th (429 fish) and September 8th (386 fish), and when combined accounted for 22% of the total run.

Preliminary exploitation rates for 2015 were estimated at 20 percent (15% Alaskan Marine, 2% Canadian Marine, and 3% In-river FSC) (pers. comm. Steve Cox-Rogers, 2015; Table 2).

Without exploitation (estimated 1,159 sockeye removed), the estimated total return for would have been approximately 5,795 sockeye.

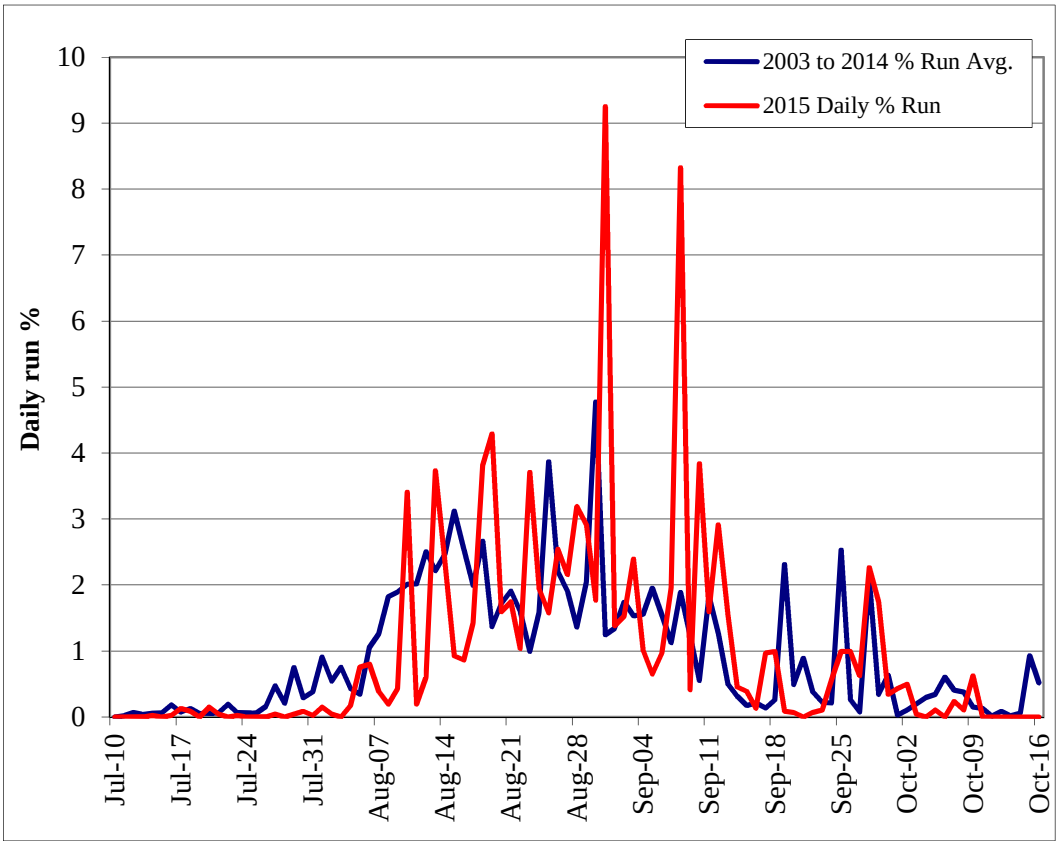

Figure 7: Kitwanga River sockeye salmon average run timing (daily run percent) for 2003-2014 vs. run timing for 2015 at the KSEF.

Table 2: Kitwanga sockeye salmon escapements from 2000 – 2015 with estimated Exploitation Rates from the Alaskan/Canadian Marine and In-River fisheries. Total exploitation rate estimates were provided by the Prince Rupert – DFO.

Return Year	Escapement	Exploitation Rate				Total Return
		Alaska	Can Marine	In-River FSC	Total	
2003	3,377	0.07	0.28	0.03	0.38	5,447
2004	1,264	0.11	0.22	0.05	0.38	2,047
2005	937	0.16	0.05	0.07	0.28	1,300
2006	5,139	0.06	0.42	0.06	0.54	11,208
2007	240	0.18	0.40	0.03	0.61	619
2008	1,200	0.05	0.40	0.05	0.50	2,400
2009	3047	0.08	0.02	0.05	0.15	3,585
2010	20,804	0.043	0.068	0.020	0.13	23,940
2011	2,366	0.073	0.170	0.050	0.29	3,347
2012	5,476	0.027	0.217	0.050	0.29	7,756
2013	828	0.080	0.000	0.050	0.13	952
2014	13,699	0.135	0.236	0.050	0.42	23,660
***2015**	4,636	0.150	0.020	0.030	0.20	5,795
Average	**4,847**	**0.091**	**0.192**	**0.046**	**0.329**	**7,067**

***- 2015 Exploitation rates for the Alaskan/Canadian Marine and In-River fisheries are preliminary estimates**

Complete fork length measurements, age and sex data were collected from 303 sockeye (6.5% of the run). Of these samples, female composition was similar to males at 163 females (53.7%) and 140 males (46.3%). Average fork lengths were slightly greater for males and females showed a wider range in size than males (Table 3). Size class (5 cm) histogram for combined sexes showed a uni-modal distribution, dominated by fish in the 51 to 55 cm size class (53%) followed by fish in the 56 to 60 cm size class (32%; Figure 8). When male and female average length was compared to previous years, the 2015 results fell within the historical range (Table 4). Average length recorded since 2003 were similar and within a narrow 5 cm size range for males (55 to 59 cm), and females (52 to 57 cm) (Table 4).

Table 3. Sockeye salmon fork length (cm) statistics at the KSEF in 2015.

	Female	Male	Combined
Mean	53.7	56.3	55.0
Min	43	49.5	43
Max	62	66	66
Count	163	140	303

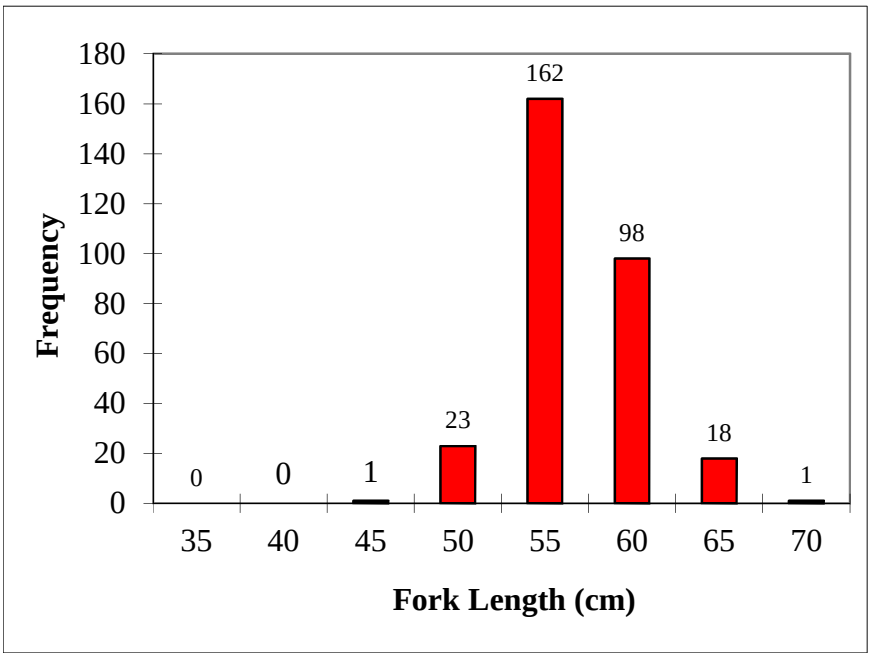

Figure 8: Fork length distribution for sockeye salmon in 2015 (n=303); X axis labels are 5 cm length class upper boundaries.

Table 4: Average length (cm) for sockeye female, male and combined sexes from 2003 to 2015.

Year	Female	Male	Total
2003	55.3	58.8	56.6
2004	56.4	58.3	57.1
2005	57.2	57.5	57.4
2006	52.6	55.3	53.8
2007	53.5	52.2	53.3
2008	54.9	58.3	56.3
2009	54.3	57.4	55.8
2010	53.9	56.5	55.3
2011	56.0	59.0	57.5
2012	55.0	58.0	56.0
2013	54.0	58.0	57.0
2014	52.6	55.9	54.2
2015	53.7	56.3	55.0

In 2015, scale samples were collected from adult sockeye complete with sex and length data and submitted to Carol Lidstone of Birkenhead Scales Analysis for age determination. A total of 303 samples were confidently readable providing a 6.5% sample of the total run (163 females and 140 males; Table 5). Age 4 fish (aged 1.2; or 1 year in fresh water post hatch and 2 years in salt water post-hatch), originating from the 2011 broodyear, were the dominant age class for both females (75%) and males (59%). Mean size for age 4 fish differed slightly for females and males at 53 and 55 cm respectively. The remaining sockeye were all 5-year old fish (n=99; 33%; 57 cm average length) originating from the 2010 broodyear.

Table 5. Sockeye salmon age, sex and fork length statistics at the KSEF in 2015 (CL = mean variance at 95% confidence).

All Years					
Sex	**Count**	**Mean (cm)**	**CL (95%)**	**Min (cm)**	**Max (cm)**
Male	140	56	0.5	50	66
Female	163	54	0.5	43	62
Total	303	55	0.5	43	66
1.2 (4- Year Old Returning Sockeye; 2011 broodyear)					
Sex	**Count**	**Mean (cm)**	**CL (95%)**	**Min (cm)**	**Max (cm)**
Male	82	55	0.6	50	66
Female	122	53	0.5	43	62
Total	204	54	0.55	43	66
1.3 (5- Year Old Returning Sockeye; 2010 broodyear)					
Sex	**Count**	**Mean (cm)**	**CL (95%)**	**Min (cm)**	**Max (cm)**
Male	58	58	0.7	53	65
Female	41	56	0.8	52	62
Total	99	57	0.75	52	65

4.2 Chinook Salmon

A total of 897 adult chinook salmon and 45 jack chinook salmon returned to the KSEF in 2015. The 2015 return is well below the highest return of 3,225 chinook in 2007 and marks the seventh consecutive year of chinook counts below 1000 fish (Figure 9). The 2015 chinook return is 42% below the running average from 2003 to 2014 of 1,542 fish/year.

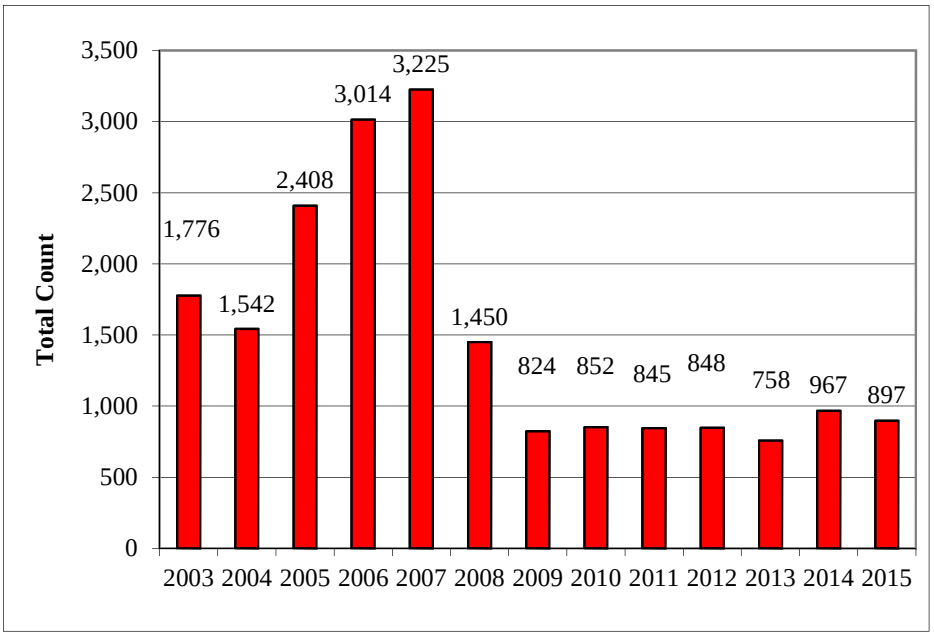

Figure 9: Annual escapement for chinook salmon from 2003 to 2015.

In 2015, the first chinook salmon was counted at the KSEF on July 10th and the last on September 10th (Table 1). The 2015 main run timing range was sporadically spread out from July 17th to August 30th (95% of the total run). Relatively high counts were observed on three dates: July 17th (98 fish), August 10th (125 fish), and August 18th (97 fish). When combined these three dates represented 36% of the total run (Figure 10.)

Length, age, and sex data was collected from 128 chinook salmon (14.2 % of the total run) in 2015. Male and female sex ratios were 55 and 45 percent respectively. Fork length histogram (5cm intervals) showed a bimodal distribution, dominated by fish in 86-90 cm class (20%) and followed by the 81-85cm class (19%; Figure 11). Average fork length of the total sample was 79.9 cm and males and females were 74.9 and 86.2 centimeters respectively (Table 6). The 2015 length results fell within the normal range of results observed since 2008 (Table 7). Age results for the 2015 chinook samples were not available for inclusion in this report but will be presented in the 2016 KSEF Annual Report.

Age results for 2014 are presented below (Table 8). Of the readable scales from the 2014 (21 samples out of a run total of 967 fish, or 2.2% of the 2014 run), the majority of fish (47.6%) were 4-year olds originating from the 2010 broodyear followed by 5-year olds (38.1%) originating from the 2009 broodyear.

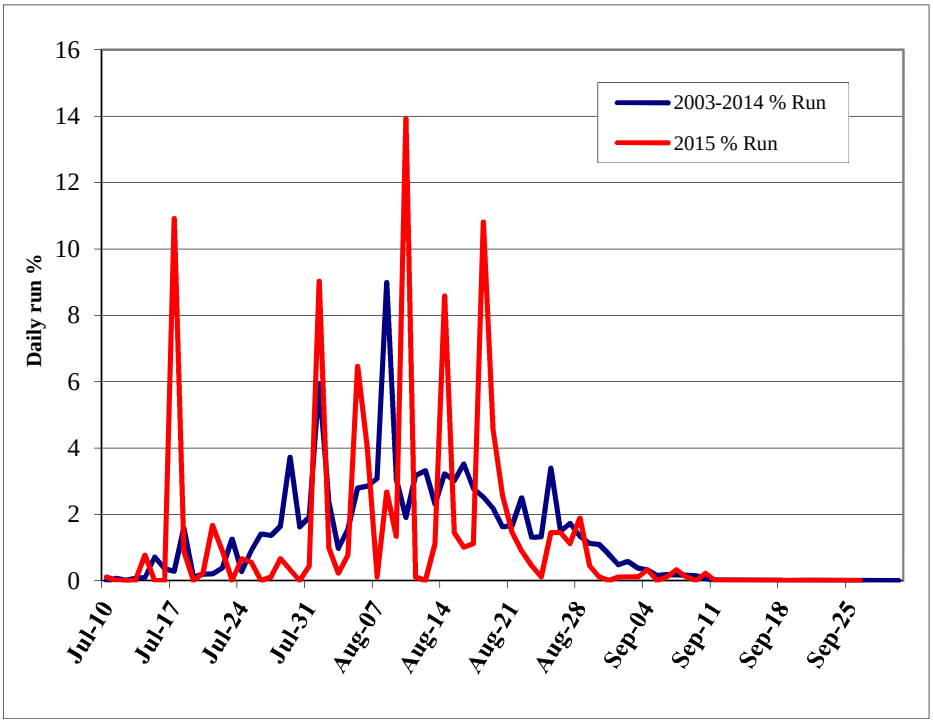

Figure 10: Kitwanga Chinook % Run past KSEF by day for 2003-14 vs. 2015.

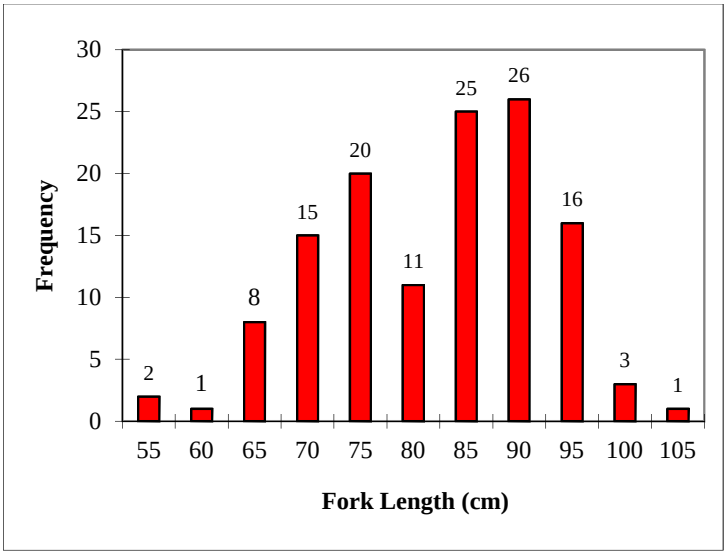

Figure 11: Fork length distribution for chinook salmon in 2015 (n=128); X axis is 5 cm length class upper boundaries.

Table 6: Average, minimum and maximum fork lengths (cm) for chinook salmon sampled in 2015 at the KSEF (n=128).

	Male	Female	Combined
Mean	74.9	86.2	79.9
Minimum	39	55	39
Maximum	94	102	102
Count	71	57	128

Table 7: Average length (cm) for chinook male, female and combined sexes from 2008 to 2015.

Year	Male	Female	Combined
2008	87.8	92.3	89.2
2009	83.6	88.6	85.6
2010	74.6	87.5	80.7
2011	76.0	86.0	80.1
2012	77.0	84.0	80.0
2013	79.0	84.8	81.3
2014	79.6	84.8	81.3
2015	74.9	86.2	79.9

Table 8: Age distribution for Chinook salmon sampled in 2014 at the KSEF.

Age Distribution:						
	Species	**European**	**Gilbert-Rich**	**Brood Yr.**	**Frequency**	**Percent**
	Chinook	14	62	2008	3	14.3%
	Chinook	13	52	2009	8	38.1%
	Chinook	12	42	2010	10	47.6%
Total:					21	100.0%

4.3 Pink Salmon

A total of 95,101 adult pink salmon migrated past the KSEF in 2015. This return was well below the running odd-year average of 229,417 fish (2003 – 2013). The 2015 pink return originated from the 2013 brood year, which had an escapement of 120,172 fish, indicating the 2015 return was 21% below replacement.

The majority of the pinks migrated through the KSEF over a 4-week period between August 7th and September 10th (97% of the run; Figure 13). Peak counts occurred on August 13th (6,567 fish), August 14th (9952 fish) and August 26th (5,833 fish), which when combined represented

24% of the total run. The run timing in 2015 was similar to what has been observed in other odd year returns.

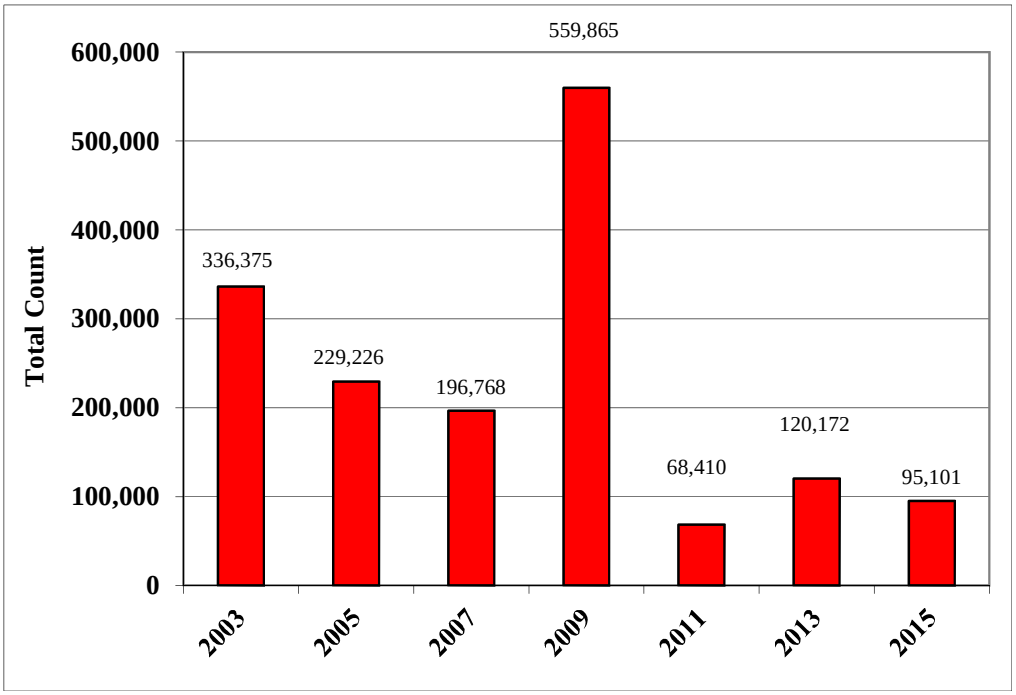

Figure 12: Annual escapement for odd year pink runs at the KSEF from 2003 to 2015.

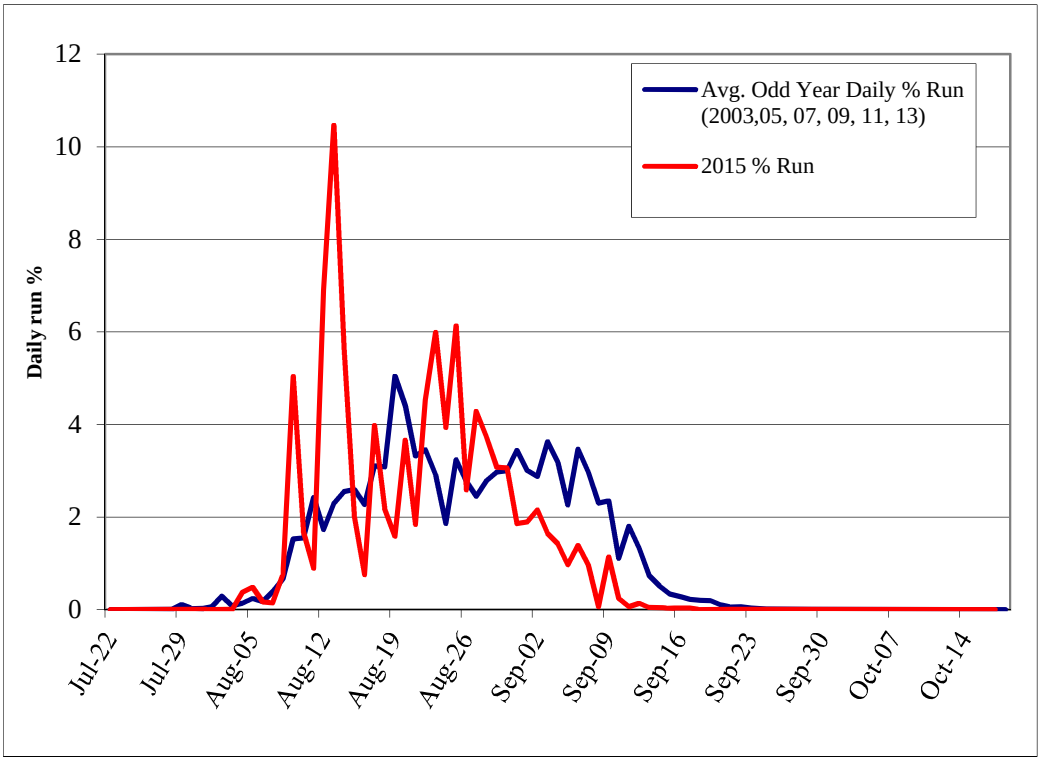

Figure 13: Run timing for pink salmon (daily run %) in 2015 vs. average odd year run from 2003 to 2013.

4.4 Chum Salmon

A total of 312 adult chum salmon migrated past the KSEF in 2015. The 2015 run compares to a maximum return of 1,862 fish in 2005 and a minimum return of 150 fish in 2008 (Figure 14). The 2015 chum escapement was 41% below the average escapement of 754 fish recorded from 2003-2014 and there is no sign of recovery to the 1,000+ returns encountered between years 2003 and 2005.

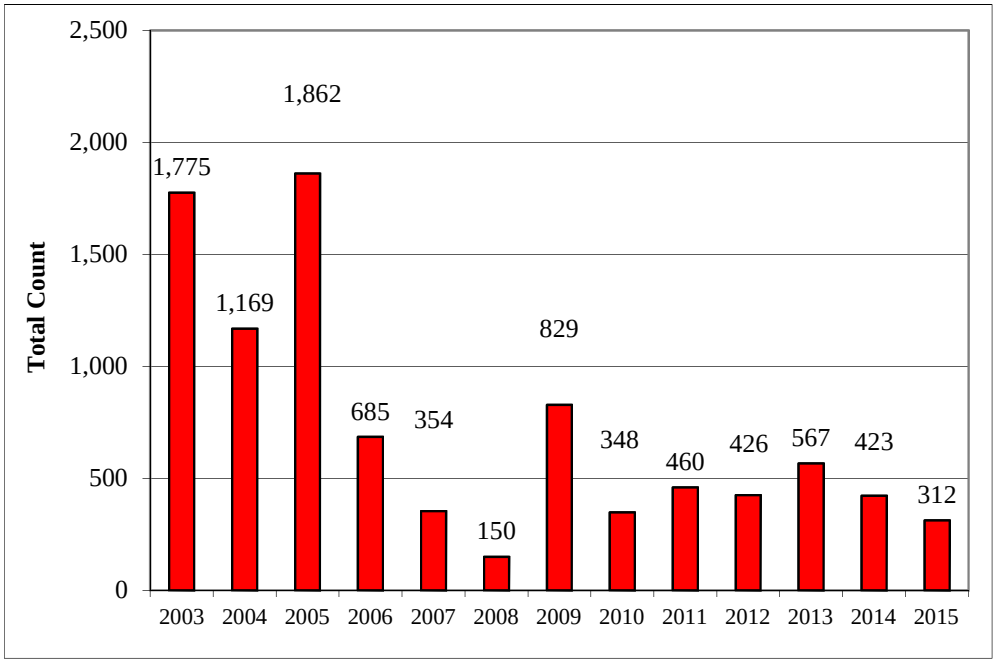

Figure 14: Annual escapement for chum salmon at the KSEF from 2003 to 2015.

In 2015, the first chum salmon was counted at the KSEF on August 10th and the last on October 5th. The bulk of the run occurred over a 3-week period between August 26th and September 18th (88% of the run). Two distinct run pulses of chum were observed from August 24th to September 1st (85 fish) and from September 3rd to 12th (147 fish; Figure 15).

Fork length, sex and age data was collected from 49 chum salmon in 2015 (16% of the run). Male and female sex ratios were 39% and 61% respectively. On average, males were only slightly larger than females (75.9 and 75.3cm respectively; Table 9). Compared to length data collected since 2008, the 2015 mean lengths were consistently within the 70 to 80 cm range (Table 10).

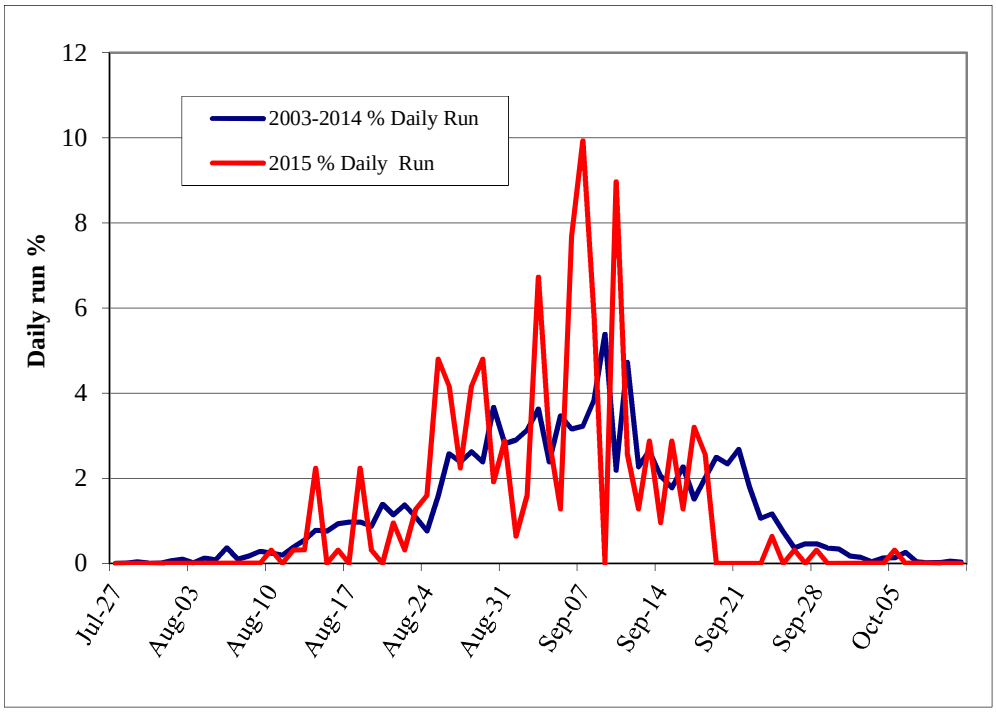

Figure 15: Kitwanga River chum salmon average run timing (daily run %) for 2003-2014 vs. run timing for 2015 at the KSEF.

Table 9: Mean, minimum and maximum fork lengths (cm) for chum salmon sampled in 2015 at the KSEF.

	Male	Female	Combined
Mean	75.9	75.3	75.5
Minimum	61	66	61
Maximum	87	94	94
Count	19	30	49

Table 10: Average length (cm) for chum male, female and combined sexes from 2008 to 2015.

Year	Male	Female	Combined
2008	77.0	70.3	75.0
2009	76.1	72.0	73.7
2010	76.5	73.9	75.1
2011	71.0	70.0	70.7
2012	80.0	77.0	78.0
2013	76.8	74.3	75.4
2014	72.1	72.0	72.1
2015	75.9	75.3	75.5

Age results for 2015 chum salmon returns were not available at the time of this report but will be included in the 2016 KSEF Annual Report.

Age results for 2014 are presented below (Table 11). Of the readable scales from the 2014 aging sample (39 samples out of a run total of 423 fish, or 9.2% of the 2014 run), the majority of fish (92.3%) were 4 year olds originating from the 2010 broodyear.

Table 11: Age distribution for chum salmon sampled in 2014 at the KSEF.

Age Distribution:						
	Species	**European**	**Gilbert-Rich**	**Brood Yr.**	**Frequency**	**Percent**
	Chum	04	51	2009	1	2.6%
	Chum	03	41	2010	36	92.3%
	Chum	02	31	2011	2	5.1%
Total:					39	100.0%

4.5 Coho Salmon

A total of 1,094 adult coho salmon migrated past the KSEF in 2015. The 2015 return is well below the highest return of 12,080 coho in 2009 and slightly above the 690 fish return in 2004 (Figure 16). The 2015 coho return was 73% below the running average from 2003 to 2014, which was 4,089 fish/year.

In 2015, the first coho salmon was counted at the KSEF on August 9th and the last on October 9th, the last day of counting salmon before the fence was breached due to an extreme high water event. The bulk of the run occurred in two large spikes between September 5th and 19th (407 fish) and September 23rd and October 3rd (458 fish; Figure 17). When combined these two pulses represented 80% of the total run. Coho runs could have continued well after the KSEF was closed on October 9th as coho were still arriving in double-digit numbers on the last day of sampling before the KSEF was forced to shut down. For the purpose of this report, the run of 1,094 should be considered a minimum escapement. Logistical difficulties due to high water prevented a full enumeration of the coho run at the KSEF which can potentially continue to the end of October or early November. Based on average run timing through the KSEF (2003-2014)

GFA predicts that 82% of the coho would have moved through the KSEF prior to the end of the sampling for 2015.

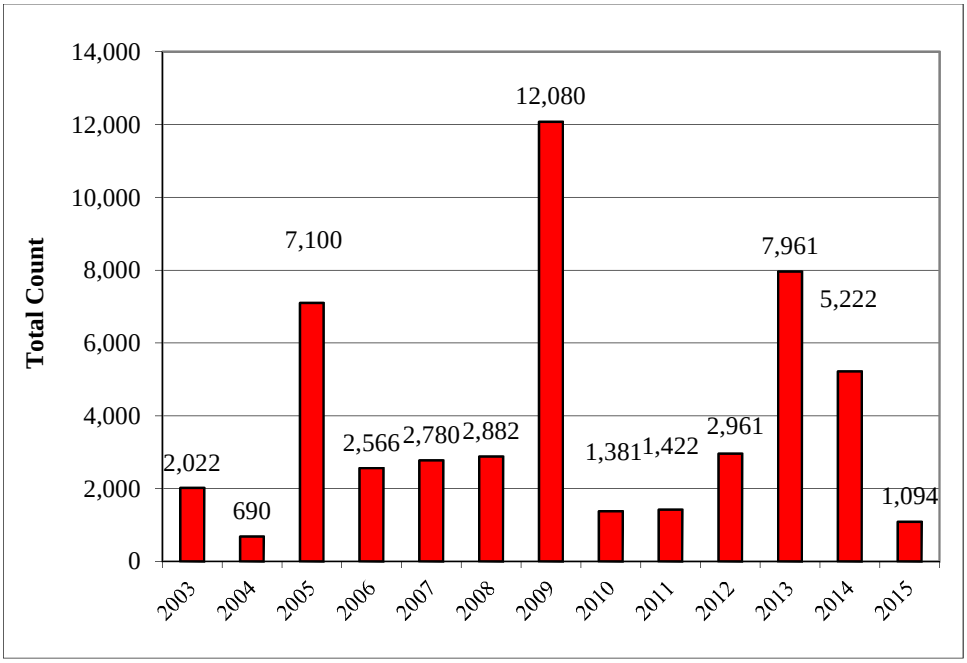

Figure 16: Annual escapement for coho salmon from 2003 to 2015 at the KSEF.

Length, age, and sex data was collected from 20 coho salmon in 2015 (1.8% of the total run). Male and female sex ratios from the samples were 70% and 30% respectively. Average fork length for males and females were similar at 56.8 and 61.0 cm respectively (Table 12). Fork length histogram (5cm intervals) showed a tri-modal distribution, dominated by fish in the 51- 65 cm length interval (75% of the sample; Figure 18). Compared to length data collected since 2010, the 2015 mean length of 58.1 cm was slightly below the 60 to 65 cm range (Table 11).

Age results for 2015 coho salmon returns were not available at the time of this report but will be included in the 2016 KSEF Annual Report.

Age distribution for coho salmon sampled in 2014 is presented below (Table 14). Of the 55 readable scales from the 2014 aging samples (2.8% of the 2014 run of 5,222 fish), the majority of fish were 3-year old returns (89.1%) followed by 4-year old returns (10.9%). Each age class differed by the time coho spent in freshwater, but all spent one year in salt water.

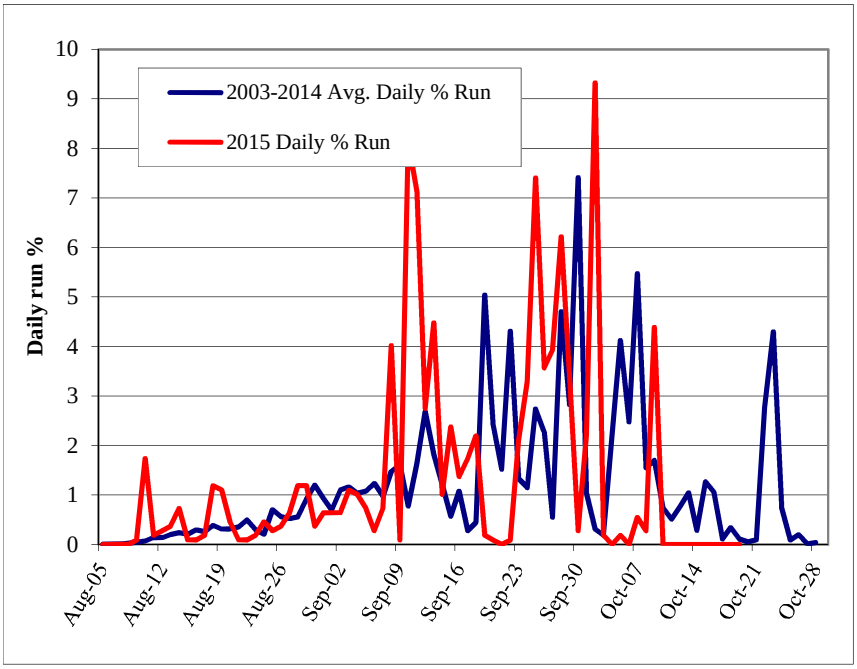

Figure 17: Kitwanga River coho salmon average run timing (daily run %) for 2003-2014 vs. run timing for 2015 at the KSEF.

Table 12: Mean, minimum, and maximum fork lengths (cm) for coho salmon sampled in 2015 at the KSEF.

	Male	Female	Combined
Mean	56.8	61.0	58.1
Minimum	40	48	40
Maximum	73	66	66
Count	14	6	20

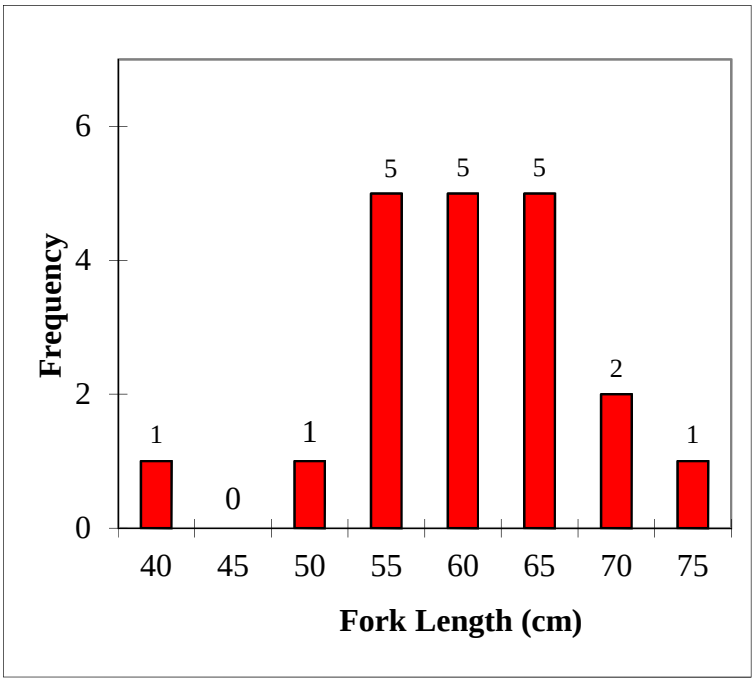

Figure 18: Fork length distribution for coho salmon in 2015 (n=20); X-axis labels are 5 cm length class upper boundaries).

Table 13: Mean length (cm) for coho male, female and combined sexes from 2010 to 2015.

Year	Male	Female	Combined
2010	65.3	64.2	64.8
2011	60.8	62.5	61.4
2012	62.3	60.7	61.2
2013	63.7	60.4	62.7
2014	63.6	62.9	63.4
2015	56.8	61.0	58.1

Table 14: Age distribution for coho salmon sampled in 2014 at the KSEF

Age Distribution:						
	Species	**European**	**Gilbert-Rich**	**Brood Yr.**	**Frequency**	**Percent**
	Coho	21	43	2010	6	10.9%
	Coho	11	32	2011	49	89.1%
Total:					55	100.0%

In the spring of 2014, GFA applied 6,966 CWT's to coho smolts at the Kitwanga Smolt Facility, which is located at the outlet of Gitanyow Lake. Most coho smolts (including CWT implanted

fish) generally return to the KSEF 18 months afterwards. The majority of 2014 CWT smolts were expected to return as adults in the fall of 2015. A total of 70 CWT fish out of 998 examined fish were counted through the KSEF in 2015. Extrapolating to the total run, an estimated 77 tagged fish passed through the fence in 2015 (7.0% recovery).

5. DISCUSSION AND RECOMMENDATIONS

Since the KSEF became operational in 2003, GFA has collected accurate and invaluable information on Kitwanga River salmon stocks where now the information is used annually to gauge the health of other Skeena River salmon stocks. In 2015, under higher than normal water levels for much of August, September and the beginning of October, GFA operated the KSEF to enumerate and collect biological information for sockeye, chinook, chum, pink and coho salmon returning to the Kitwanga River. GFA estimates that all of the chinook, pink and chum and 92% of the sockeye and 82% of the coho would have moved through the KSEF prior to the project end date. The KSEF project closed 3 weeks earlier than normal because of extreme high flows which breached the fence forcing the closure for the year.

In 2015, GFA upgraded the entire middle fence section to a rotating panel design. GFA acquired financial assistance from the Pacific Salmon Commissions Northern Fund and the Gitanyow Hereditary Chiefs to complete the new design. This rotating panel design worked well and provided a much safer platform for the staff working at the facility, allowing them to safely and efficiently remove debris buildup during flooding events. Unfortunately in 2016, the GFA will need to upgrade the left and right bank counting boxes because both were damaged beyond repair during flooding in the fall of 2015.

Most of the 2015 sockeye run of 4,636 fish were 4-year olds originating from the return of 2,366 fish in 2011. This shows that positive rebuilding is occurring in the Kitwanga sockeye population. Since 2010, there has been a slow but positive increase in Kitwanga sockeye numbers with 2014 being the exception. This illustrates the importance of continuing the KSEF program to 1: acquire long-term accurate escapement numbers which can be highly variable from year to year, 2: to obtain exploitation rates on the sockeye stock and 3: to provide in-season salmon forecasts to DFO Fisheries managers so the information can help them implement more sustainable fisheries.

The 2015 chinook salmon run of 897 fish is considered low compared to relatively high returns observed from 2003 to 2008 (1,450-3,225 fish). Chinook salmon numbers in 2015 were 42% below the running average (2003-2014) and marks the 7th consecutive year of counts below 1,000 fish. If escapements do not improve substantially in future years, recovery options may need to be explored.

A total of 95,101 adult pink salmon migrated past the KSEF in 2015 which is well below the running odd-year average of 229,417 fish (2003 – 2013). In the Kitwanga watershed odd year runs normally dominate over even year runs. The 2015 pink return originated from the 2013 brood year, which had an escapement of 120,172 fish, indicating the 2015 return was 21% below replacement.

A total of 312 adult chum salmon migrated past the KSEF in 2015, which was 41% below the average escapement recorded from 2003-2014, and marks the 10th consecutive year of numbers well below the running average since 1000+ fish were counted from 2003 to 2005. If escapements do not improve substantially in future years, recovery options may need to be explored.

A total of 1,094 coho were enumerated at the KSEF in 2015, which was 73% below the average escapement recorded from 2003-2014. Age data was not available for 2015 coho counted through the KSEF, but in most years coho have been found to be mostly 3-year old fish. Given this the 2015 return likely originated from a return of 2,961 fish in 2012, suggesting a decrease in the stock. Although the 2015 return was low it could have been considerably larger if the fence would have remained operational for the entire coho migration. Results of the coded wire tag program were incomplete as capture results from the Canadian and Alaska fisheries were not available in time for this report and the KSEF closed early due to high water before the run was complete.

6. REFERENCES

Cleveland, M.C. 2000. Limnology of Kitwanga Lake: an attempt to identify limiting factors affecting sockeye salmon (Oncorhynchus nerka) production. Gitanyow Fisheries Authority, Kitwanga, B.C. 97 pp.

Cleveland, M.C. 2003. Final Reporting on the Implementation of the Permanent Kitwanga River Salmonid Enumeration Facility and Selective Fisheries Fence. Gitanyow Fisheries Authority, Kitwanga, B.C. 51 pp.

Cleveland, M.C. 2004. The Kitwanga River Adult Salmon Enumeration Initiative, 2003. Gitanyow Fisheries Authority, Kitwanga, B.C. 39 pp.

Cleveland, M.C., S. Cox-Rogers and K. Rabnett. 2006. Kitwanga Sockeye Salmon Recovery Plan (KSRP). Gitanyow Fisheries Authority, Kitwanga, BC. Fisheries and Oceans Canada, Prince Rupert, BC. Skeena Fisheries Commission, Hazelton, BC. 52 pp.

Cleveland, M.C. 2007. Kitwanga Sockeye Enhancement Program 2006/2007. Gitanyow Fisheries Authority, Kitwanga, B.C. 56 pp.

Cleveland, M.C. 2009. Kitwanga Sockeye Enhancement Program 2007/2008 – Year 2. Gitanyow Fisheries Authority, Kitwanga, B.C. 37 pp.

Cox-Rogers, S., Hume, J.M.B., Shortreed, K.S., and Spilsted, B. 2010. A risk assessment model for Skeena River sockeye salmon. Can. Manuscr. Rep. Fish. Aquat. Sci. 2920: viii + 60 p.

Cox-Rogers, S. 2014. Personal Communication. Fisheries and Oceans, Canada – Prince Rupert, BC.

Fisheries and Oceans Canada. 2008b. NuSEDS. V2.0. Regional adult salmon escapement database 1950-2005. Fisheries and Oceans Canada, Pacific Biological Station, Nanaimo, B.C.

Kingston, D. 2008. Kitwanga Sockeye Salmon Spawning Habitat Improvement Initiative 2006/2007. Gitanyow Fisheries Authority, B.C. 38 pp.

Kingston, D. 2009. Kitwanga Sockeye Salmon Spawning Habitat Improvement Initiative 2007/2008. Gitanyow Fisheries Authority, B.C. 38 pp.

Kingston, D. 2010. The 2009 Kitwanga River Salmon Smolt Assessment. Gitanyow Fisheries Authority, Kitwanga, B.C. 22 pp.

Kingston, Derek. 2011. Kitwanga River Salmon Enumeration Facility – 2010 Annual Report. Gitanyow Fisheries Authority, Kitwanga, B.C. 31 pp.

Kingston, D. 2011a. The 2010 Kitwanga River Salmon Smolt Assessment. Gitanyow Fisheries Authority, Kitwanga, B.C. 28 pp.

Kingston, Derek. 2015. Kitwanga River Salmon Enumeration Facility (KSEF) Upgrades. Gitanyow Fisheries Authority, Kitwanga, B.C. 14 pp.

Koch, K. and M.C. Cleveland. 2009. Kitwanga River Salmon Enumeration Facility – 2008 Annual Report. Gitanyow Fisheries Authority, Kitwanga, B.C. 41 pp.

Koch, K. and M. McCarthy. 2010. Kitwanga River Salmon Enumeration Facility – 2009 Annual Report. Gitanyow Fisheries Authority, Kitwanga, B.C. 41 pp.

McCarthy, M. 2012. Kitwanga River Salmon Enumeration Facility – 2011 Annual Report. Gitanyow Fisheries Authority, Kitwanga, B.C. 30 pp.

McCarthy, M. 2013. Kitwanga River Salmon Enumeration Facility – 2012 Annual Report. Gitanyow Fisheries Authority, Kitwanga, B.C. 32 pp.

McCarthy, M. 2014. Kitwanga River Salmon Enumeration Facility – 2013 Annual Report. Gitanyow Fisheries Authority, Kitwanga, B.C. 32 pp.

McCarthy, M. and D. Kingston. 2015. Kitwanga River Salmon Enumeration Facility – 2014 Annual Report. Gitanyow Fisheries Authority, Kitwanga, B.C. 32 pp.