

BLIND CREEK CHINOOK SALMON ENUMERATION WEIR, 2017

Prepared for: The Yukon River Panel  
Restoration and Enhancement Fund  
CRE-37-17

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March, 2018

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## **ABSTRACT**

A Chinook salmon enumeration and sampling weir has been operated annually in Blind Creek from 2003 through 2016. The weir site is located approximately 1 km upstream of the confluence with the Pelly River. In 2017, the weir project was initiated on July 14, but high flows delayed installation of the weir until July 24. From July 24 to July 27, 17 Chinook salmon were sampled for age-sex-length data. Heavy rainfall in the drainage led to extreme flood conditions beginning July 28. With rising water levels and increased turbidity weir operations were suspended and un-impeded fish passage was provided by the removal of the pen gates and weir panels next to each bank. Water levels continued to rise with the eventual collapse of the weir structure on July 29. The 2017 weir project was terminated at this time and the camp was dismantled August 1. The remaining weir material was removed from the creek on August 11 after water levels had receded. The 2017 project was the first time in 14 years of operation that the weir project has failed due to high water.

## **INTRODUCTION**

Blind Creek is an important contributor to Chinook salmon (*Onchorynchus tshawytscha*) production in the Pelly River drainage. Radio telemetry studies conducted in 2003 and 2004 indicated that Blind Creek represented 11% (2003) and 9% (2004) of the run in the Pelly River drainage (Mercer 2005, Mercer and Eiler 2004). Blind Creek is accessible by road and its typically moderate flows allow for effective operation of a fish counting and sampling weir; thereby making it a useful Chinook escapement index for the Pelly River drainage.

Chinook escapements in Blind Creek were monitored periodically between 1989 and 2000 through aerial surveys or enumeration weirs (Appendix 1). Since 2003 annual weir operations have been conducted (Appendix 2). The 2003 – 2016 average weir count is 555 with annual returns ranging from 157 (2012) to 1,155 (2003). Aerial survey results have shown that Chinook salmon spawning occurs throughout the lower 40 km of the creek with highest concentrations found between 12 and 35 km upstream of the confluence with the Pelly River (Harder 1996; Wilson 2001, 2002).

Chinook salmon have been live sampled at the Blind Creek weir project for age, sex and length (ASL) data since 2003. This information provides biological baseline data on the quality and health of the stock as well as information used by fishery managers to construct sibling based pre-season run forecasts. Whole population ASL data collected over a long term (several brood year cycles) assists in assessing biological trends of Yukon River Chinook.

The weir site is located approximately 10 km southeast of the town of Faro and is accessed from a maintained mining road (Blind Creek Road). The proximity of the weir operation to the town of Faro has created an opportunity for public viewing of migrating Chinook salmon, facilitating public awareness of the salmon resource, management programs and the role of the Yukon River Panel (YRP).

## **STUDY AREA**

Blind Creek flows in a southwesterly direction from its headwaters in the Anvil Range into the Pelly River, approximately 10 km southeast of the Town of Faro (Figure 1). The creek and its tributaries drain an area of approximately 618 km<sup>2</sup>. Major lake systems in the drainage basin include the Blind Lake and Swim Lake chains. A mining access road from the Town of Faro crosses the creek at two locations, approximately 2 km (lower bridge) and 3 km (upper bridge) upstream of its confluence with the Pelly River. The weir site is located approximately 1 km upstream of the creek mouth and 30 m downstream of the lower bridge crossing.

## **OBJECTIVES**

The specific objectives of this project are as follows:

- 1) Install and operate a weir to obtain a count of the total 2017 Chinook escapement in Blind Creek above the weir;
- 2) Conduct live sampling at the weir to obtain age-sex-length (ASL) data from a representative sample of migrating Chinook with a minimum goal of 25% of the run;

- 3) Provide information about the Chinook weir operation to the Town of Faro Interpretive Centre and on-site interpretation to facilitate public awareness of the salmon resource, management programs and the role of the YRP.

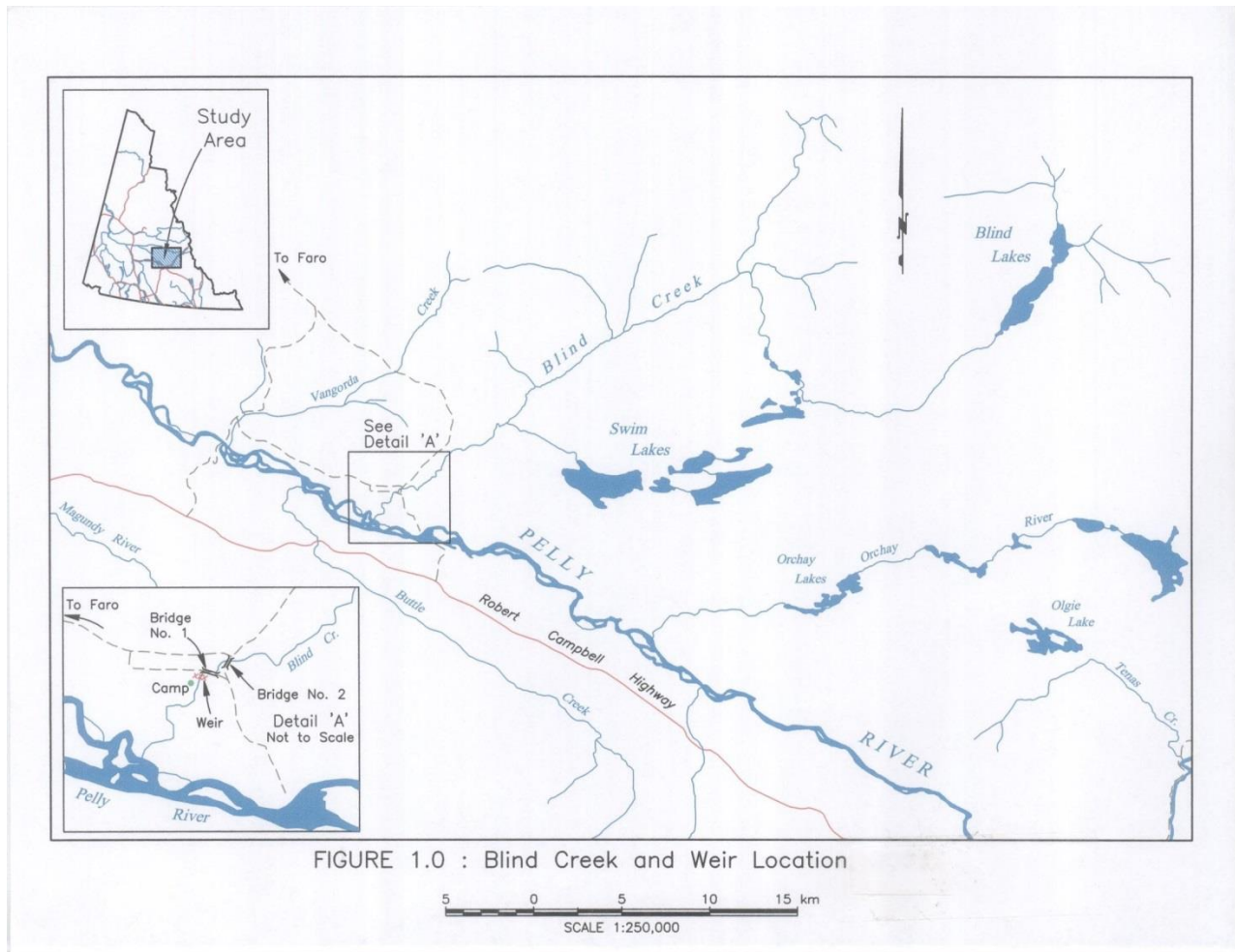


FIGURE 1.0 : Blind Creek and Weir Location

Figure 1. Blind Creek and Weir Location

## METHODS

### *Camp Set-up*

In order to monitor the weir and salmon passage continually it is necessary to construct a temporary camp near the weir location. Materials for the camp were transported to the weir site from storage in Whitehorse and Faro on July 14. As in previous years, the camp was set up on the west side of Blind Creek approximately 80 metres from the weir site. The camp was comprised of three wall tents: one to house a kitchen/eating area and two for sleeping quarters.

### *Weir Construction*

Weir construction was initiated on July 14 with the placement of a segment of the fence next to the right bank. Because of rising water conditions and strong midstream flows the entire

structure could not be completed at this time. Complete installation of the weir was delayed until July 24, after the water level had subsided. The weir was placed in the same area used for the past 14 years, approximately 1 km upstream of the creek mouth and 30 m downstream of the first bridge crossing.

Materials used for construction of the weir were stored on site from the previous season's operation. The fence was constructed of conduit panels supported by tripods placed in a 'V' configuration to direct fish moving close to the bank towards the holding pen (Figure's 2 & 3). The holding pen was placed in the main current and at the upstream apex of the fence location. This pen consisted of conduit panels connected together to form an enclosure measuring 2m (L) X 0.7 m (W) X 1.0 m (H). Two triangular shaped conduit panels, each 2 metres long, were used to connect the pen to the fence and create a staging area for fish moving into the pen. Sand bags were placed along the bottom upstream side of the weir to prevent scouring of the creek substrate and undermining of the structure. A platform was placed alongside the holding pen to facilitate enumeration and biological sampling.



Figure 2. Weir under construction, July 24.

### ***Weir Operation & Biological Sampling***

Commencing July 25, the weir was monitored daily from first light until dark and kept closed at night. As a result of persistent murky water conditions and zero visibility, the weir was monitored continuously by weir staff throughout the day on a rotating basis.

Chinook moving upstream to the weir were allowed access to the holding pen by raising a vertical gate secured to the downstream opening. After Chinook moved into the pen, the gate was closed and the fish were immediately sampled.

Chinook held for sampling were removed from the holding pen by dip net and placed in a v-shaped trough filled with water. Sex and length measurements (fork length (FL) and mid-eye fork (MEF)) were recorded to the nearest 0.5 cm. Five scales were taken from each fish and placed on standard scale cards for age determination. Daily and cumulative counts as well as sampling data were recorded on field notes and transcribed daily to spreadsheets. Scale cards and an electronic copy of ASL data were submitted to DFO, Whitehorse at the completion of field operations. Scales were analyzed for age by the DFO sclerochronology lab at the Pacific Biological Station, Nanaimo, B.C.

Subjective observations of the condition of sampled Chinook were recorded. The overall condition of each fish was rated as good, fair or poor as determined by the presence of fungus and vitality of the fish. The presence of gillnet marks on sampled fish was recorded.

The weir was checked at least twice a day for scouring and areas of possible escape. Debris collecting on the weir was removed as required.



Figure 3. Weir in place, July 25.

### ***Water Conditions***

Stream and air temperatures were measured each morning by weir attendants using a hand-held thermometer. Water depth readings were recorded from a staff gauge maintained by Environment Yukon and located about 25 m downstream of the lower bridge along the west bank. Stream discharge data was obtained from Environment Yukon (Water Resources Branch, Whitehorse). Data logger water temperature measurements were obtained from the Yukon Waters Temperature database web site: [yukonwatertemperatures.info](http://yukonwatertemperatures.info)<sup>1</sup>.

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<sup>1</sup> Baseline water temperatures of select Yukon River Chinook Salmon spawning & migration habitats in Canada. R&E Fund project CRE-20, submitted by Al von Finster.



## ***Public Awareness***

Copies of the salmon brochure produced by the project manager were provided to the Town of Faro Interpretive Centre at the start of the project. This brochure contains information about the salmon resource and weir operation for visitors to the Faro area.

## **RESULTS**

### ***Weir operation***

The weir was operational from July 24 to July 27. After heavy rainfall in the drainage the water level increased steadily reaching extreme flood conditions beginning July 28 (Figure 4). With rising water levels and increased turbidity weir operations were suspended and un-impeded fish passage was provided by the removal of the pen gates and weir panels next to each bank. Debris was removed from the fence structure until it became unsafe to do so. Water levels continued to rise with the eventual collapse of the weir structure on July 29 (Figure 5). The 2017 weir project was terminated at this time and the camp was dismantled August 1. The remaining weir material was removed from the creek on August 11 after water levels had receded.



Figure 3. Flood conditions, July 28.

### ***Chinook Counts***

A total of 17 Chinook salmon was counted through the weir from July 24 to July 27. The first fish was observed on July 26, two days after the weir was completely installed.



Figure 4. Collapse of fence structure, July 29.

### ***Biological Sampling***

All 17 Chinook salmon captured were sampled for ASL data (Appendix 3). The sampled fish were comprised of 6 females and 11 males. Complete age data was determined from 12 of the Chinook sampled; partial ages were determined for the remaining 5 fish. The age composition of fish that were successfully aged was 50% age-6 (1.4, 2.3)<sup>2</sup>, 41.7% age-5 (1.3), and 8.3% age-7 (2.4).

The fish sampled in 2017 appeared in good condition with few showing physiological deterioration such as fin abrasion and fungus. Gillnet marks were observed on one of the fish sampled.

### ***Water Conditions***

Daily discharge in Blind Creek during the Chinook run was above the average observed in previous years of weir operation (2003 – 2016) (Figure 5). Heavy rainfall in the drainage before and during the Chinook run in Blind Creek resulted in very high water levels and extremely murky water conditions. The mean, maximum and minimum discharge in July and August for the period 1992 to 2017 is presented in Appendix 4. Daily weather and water conditions recorded by weir attendants in July are presented in Appendix 5.

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<sup>2</sup> European age format e.g. 1.1 denotes a 3 year old fish with 1+ years freshwater residence and 1 year marine.

A maximum water temperature of 13.7°C was reached on July 7. Mean water temperatures in July and August were 10.8° C and 9.8° C, respectively (data from the Yukon Waters Temperature database).

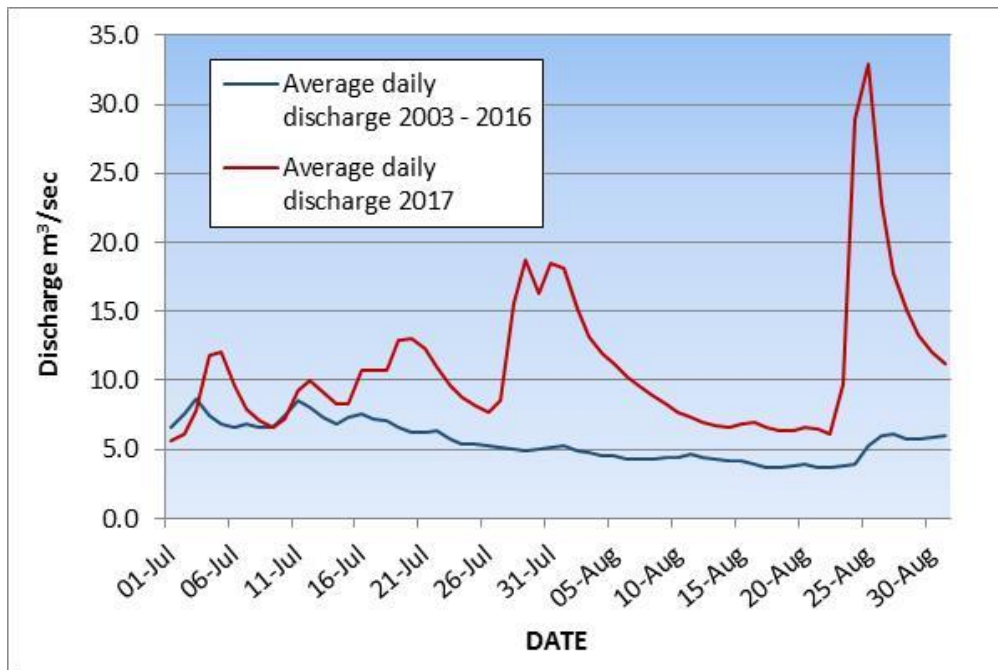


Figure 5. Mean daily discharge in Blind Creek, 2017 and 2003 – 2016. (data from: Environment Yukon, Water Resources Branch).

### ***Public Awareness***

The 2017 season provided little opportunity for public visitation of the weir operation. After failure of the weir structure, personnel at the Faro Interpretive Centre were notified and remaining brochures retrieved by weir staff.

### **DISCUSSION**

The 2017 Blind Creek weir project objectives were not met due to the early collapse of the weir structure during extreme flood conditions. The majority of the weir panels are reusable; however several of the tripods were destroyed and will need to be replaced in the 2018 season. The 2017 project was the first time in 14 years of operation that the weir project has failed due to high water.

The high water conditions that persisted in Blind Creek during the Chinook migration and spawning period may have affected the reproductive success of Chinook spawners in Blind Creek. During attempts to capture broodstock for classroom incubation programs in local schools, seven unspawned female carcasses were found in the section of the creek between the upper and lower bridges (Nicholas de Graff, personal communication). Between the weir and major spawning area is a canyon which, under high water conditions, may present a velocity

barrier to migrating Chinook salmon. It is possible that this canyon below the area that is heavily used by Chinook spawners became inaccessible or was hard for fish to ascend.

## **ACKNOWLEDGEMENTS**

Thank you to the following individuals for providing assistance during camp set-up, weir construction and operation: Robyn Uiterwaal, Melina Tessier, Elijah Bekk and Jan McKenzie. The assistance of Jonah Pilch and Willis Bolton during removal of weir components from the creek was greatly appreciated. Streamflow data included in this report was provided by Jonathan Kolot of Environment Yukon, Water Resources Branch. Thanks to Brian Mercer for providing editorial comments.

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Appendix 1. Blind Creek Chinook Counts from aerial surveys and weir operations, 1989, 1990, 1995-2017.

YEAR	METHOD	CHINOOK COUNTS	START DATE	ARRIVAL OF FIRST FISH	END DATE	50% of Run	90% of Run
1989	Aerial survey <sup>a</sup>	400	Aug 7		Aug 7		
1990	Aerial survey <sup>a</sup>	443	Aug 14		Aug 14		
1995	Weir	826	NR		NR		
1996	Aerial survey <sup>a</sup>	422	Aug ?		Aug ?		
1996	Weir	NR	July 28		Aug 17		
1997	Weir	957	July 24	July 25	Aug 22	July 30	Aug 8
1998	Weir	373	July 19	July 27	Aug 19	Aug 4	Aug 15
1999	Weir	892	July 28	Aug 1	Aug 22	Aug 6	Aug 10
2000	Weir	NR	NR		NR		
2001	Aerial survey <sup>b</sup>	226	Aug 21		Aug 21		
2002	Aerial survey <sup>b</sup>	107	Aug 15		Aug 15		
2003	Weir	1,155	July 16	July 17	Aug 18	July 29	Aug 5
2004	Weir	792	July 11	July 19	Aug 15	July 30	Aug 5
2005	Weir	525	July 15	July 20	Aug 15	Aug 4	Aug 10
2006	Weir	677	July 16	July 28	Aug 17	Aug 5	Aug 12
2007	Weir	304	July 17	July 24	Aug 17	Aug 6	Aug 12
2008	Weir	276	July 25	July 28	Aug 19	Aug 12	Aug 17
2009	Weir	716	July 20	July 27	Aug 19	Aug 6	Aug 10
2010	Weir	270	July 19	July 28	Aug 19	Aug 11	Aug 16
2011	Weir	360	July 15	July 24	Aug 18	Aug 10	Aug 13
2012	Weir	157	July 25	July 28	Aug 20	Aug 8	Aug 15
2013	Weir	312	July 24	July 29	Aug 19	Aug 9	Aug 14
2014	Weir	602	July 13	July 17	Aug 17	July 30	Aug 5
2015	Weir	964	July 17	July 22	Aug 19	Aug 1	Aug 11
2016	Weir	664	July 15	July 17	Aug 16	July 31	Aug 9
2017*	Weir	(17)	July 24	July 26	July 28	-	-

<sup>a</sup> aerial survey conducted by P.A. Harder and Associates Ltd.

<sup>b</sup> aerial survey conducted by RRDC and Jane Wilson & Associates

NR - not reported

\* Weir installation delayed due to high water. Weir operation was suspended on July 28 due to flood conditions.

Note: weir operations in 1997, 1998 and 1999 involved enumeration of Chinook salmon only. Sampling conducted in later years resulted in delays in the normal migration timing.

Appendix 2. Daily and average daily Chinook salmon counts in Blind Creek, 1997-1999, 2003-2017

DATE	Daily Count 2017 *	Daily Count 2016	Daily Count 2015	Daily Count 2014	Daily Count 2013	Daily Count 2012	Daily Count 2011	Daily Count 2010	Daily Count 2009	Daily Count 2008	Daily Count 2007	Daily Count 2006	Daily Count 2005	Daily Count 2004	Daily Count 2003	Daily Count 1999	Daily Count 1998	Daily Count 1997	Daily Average
11-Jul														0					0
12-Jul														0					0
13-Jul				0										0					0
14-Jul				0										0					0
15-Jul		0		0		0							0	0					0
16-Jul		0		0		0						0	0	0	0				0
17-Jul		3	0	5		0					0	0	0	0	1				1
18-Jul		0	0	2		0					0	0	0	0	1				0
19-Jul		5	0	3		0	0				0	0	0	1	2		0		1
20-Jul		1	0	9		0	0	0			0	0	1	32	0		0		4
21-Jul		0	0	0		0	0	0			0	0	0	5	2		0		1
22-Jul		4	2	5		0	0	0			0	0	1	2	4		0		2
23-Jul		1	2	23		0	0	0			0	0	0	2	2		0		3
24-Jul	0	25	9	16	0		3	0	0		1	0	0	140	1		0		15
25-Jul	0	9	0	7	0	0	0	0	0	0	0	0	0	24	10	0	0	122	10
26-Jul	9	9	0	0	0	0	1	0	0	0	0	0	2	10	17	0	0	85	7
27-Jul	8	9	21	24	0	0	1	0	2	0	7	0	10	20	495	0	1	66	37
28-Jul		65	13	116	0	2	2	1	8	1	3	2	8	60	2	0	0	73	21
29-Jul		130	9	89	1	2	5	1	27	1	3	9	13	33	68	0	0	64	27
30-Jul		31	29	6	0	0	4	1	12	2	10	27	105	225	95	0	0	70	36
31-Jul		48	45	4	2	3	1	17	106	1	9	26	18	36	7	0	0	44	22
01-Aug		45	366	21	0	3	11	0	84	4	8	67	15	60	45	15	0	49	47
02-Aug		50	48	32	2	4	7	0	25	1	27	8	15	34	0	65	6	77	24
03-Aug		55	19	32	6	7	6	0	24	6	6	109	35	7	7	133	34	38	31
04-Aug		12	29	116	19	6	11	1	0	3	13	25	45	15	201	50	169	60	46
05-Aug		23	102	35	35	2	7	33	22	5	8	131	46	15	75	116	16	22	41
06-Aug		21	64	2	28	8	13	23	106	11	63	19	53	27	50	73	4	33	35
07-Aug		7	41	16	48	10	7	19	67	17	59	47	54	19	12	25	5	20	28
08-Aug		26	26	1	4	33	35	5	30	26	6	63	31	4	18	129	5	43	29
09-Aug		20	20	8	25	17	30	9	110	18	20	44	18	8	1	128	1	19	29
10-Aug		24	17	4	36	13	86	4	28	11	9	14	15	2	0	139	31	21	27
11-Aug		12	28	3	52	2	45	27	20	15	4	16	14	10	8	1	25	5	17
12-Aug		7	22	9	12	6	31	23	9	19	16	28	11	1	4	0	15	16	13
13-Aug		12	9	4	5	9	29	19	7	27	14	19	7	0	18	0	9	5	11
14-Aug		4	5	5	19	7	6	40	6	20	8	11	3	0	2	0	11	1	9
15-Aug		6	15	3	7	8	13	14	13	26	6	6	5	0	2	0	18	13	9
16-Aug		0	4	2	6	9	1	6	3	23	4	5			5	0	7	8	6
17-Aug			11	0	5	4	5	12	4	23		1			0	0	9	3	6
18-Aug			7		0	2	0	12	3	12					0	14	3		5
19-Aug			1		0	0		3	0	4						4	4		2
20-Aug						0										0			0
21-Aug																0			0
<b>TOTAL</b>	<b>(17)*</b>	<b>664</b>	<b>964</b>	<b>602</b>	<b>312</b>	<b>157</b>	<b>360</b>	<b>270</b>	<b>716</b>	<b>276</b>	<b>304</b>	<b>677</b>	<b>525</b>	<b>792</b>	<b>1155</b>	<b>892</b>	<b>373</b>	<b>957</b>	

\* Weir installation delayed due to high water. Weir operation was suspended on July 28 due to flood conditions.

Note: shaded areas denote start and end date of weir operations

Appendix 3. Blind Creek Chinook salmon live sampling results, 2017.

DATE	FISH #	SEX	MEF (mm)	FL (mm)	AGE*	CONDITION (Good/Fair/Poor)	COMMENTS
26-Jul	1	F	820	870	M4	G	
26-Jul	2	M	755	845	1.3	G	wound on side
26-Jul	3	F	815	875	1.4	G	
26-Jul	4	M	670	730	1.3	G	
26-Jul	5	M	780	860	1.4	G	
26-Jul	6	M	690	770	2.3	G	
26-Jul	7	F	860	940	M4	G	ripe, expelled a few eggs, some scars
26-Jul	8	M	775	855	M4	G	
26-Jul	9	F	835	895	2.4	G	
27-Jul	10	M	NM	885	2.3	G	
27-Jul	11	M	810	880	1.3	G	
27-Jul	12	M	750	830	M4	G	
27-Jul	13	F	745	805	2.3	G	
27-Jul	14	F	735	815	1.4	G	
27-Jul	15	M	670	710	M4	G	
27-Jul	16	M	705	765	1.3	G	
27-Jul	17	M	710	770	1.3	G	gill net marks

\* European age format

**Partial Ages:** F=freshwater stage M=Marine stage



Appendix 4. Mean, Maximum and Minimum discharge in cubic metres per second for July and August, Blind Creek, 1992-2017.

	JULY Daily Discharge (m <sup>3</sup> /sec)					AUGUST Daily Discharge (m <sup>3</sup> /sec)				
	Mean	Max.	Max. Day	Min.	Min. Day	Mean	Max.	Max. Day	Min.	Min. Day
1992	9.87	13.06	14/07	6.59	31/07	4.47	6.24	01/08	3.30	27/08
1993	8.93	12.0	11/07	7.41	30/07	7.41	9.18	12/08	6.55	30/08
1994	3.92	5.50	01/07	2.52	27/07	1.48	2.61	01/08	0.94	21/08
1995	4.71	8.09	06/07	2.60	01/07	4.91	5.79	29/08	3.88	15/08
1996	4.80	8.87	12/07	2.67	31/07	3.92	7.62	30/08	2.24	03/08
1997*	4.96	9.66	25/07	2.53	04/07	9.11	10.3	01/08	7.71	03/08
1998	-	-	-	-	-	-	-	-	-	-
1999	4.49	12.5	02/07	2.12	25/07	2.25	3.20	01/08	1.93	27/08
2000	-	-	-	-	-	-	-	-	-	-
2001	8.49	16.2	17/07	5.20	31/07	3.33	5.00	01/08	2.28	18/08
2002	2.85	4.95	06/07	2.25	28/07	2.71	5.81	30/08	1.82	11/08
2003	5.25	14.6	07/07	3.26	29/07	2.49	4.27	01/08	1.37	21/08
2004	3.41	4.56	01/07	3.02	17/07	2.51	3.41	01/08	2.28	26/08
2005	4.28	5.57	19/07	3.23	12/07	2.31	4.48	01/08	1.47	18/08
2006	5.92	10.8	11/07	2.76	31/07	3.46	5.08	15/08	2.50	01/08
2007	5.60	10.8	03/07	3.36	27/07	3.03	4.93	08/08	1.43	31/08
2008	12.55	29.2	16/07	6.26	04/07	9.66	31.10	26/08	4.81	17/08
2009 <sup>a</sup>	3.62	6.49	11/07	1.79	31/07	2.24	4.44	27/08	0.81	07/08
2010	-	-	-	-	-	-	-	-	-	-
2011 <sup>b</sup>	-	-	-	-	-	-	-	-	-	-
2012	14.81	37.54	03/07	6.97	31/07	7.15	14.60	11/08	5.00	08/08
2013	5.72	13.12	22/07	3.12	16/07	4.53	7.76	28/08	2.59	13/08
2014	4.81	7.92	31/07	3.12	28/07	4.06	7.87	01/08	2.99	24/08
2015	4.1	5.74	04/07	3.13	20/07	4.27	14.59	31/08	2.77	17/08
2016	5.39	7.27	31/07	4.01	07/07	6.35	8.20	04/08	5.23	24/08
2017	10.33	20.35	31/07	5.46	02/07	11.54	36.71	25/08	5.92	23/08

\* no data available for period between July 14-July 24 and after August 3.

<sup>a</sup> Preliminary data – February 10, 2009. Discharge data was not available for the period July 3-July 10.

<sup>b</sup> No data available due to equipment malfunction

Note: 1998, 2000 and 2010 data not available

(Source: Environment Yukon, Water Resources Branch).

Appendix 5. Blind Creek weather and water conditions, 2017.

<b>DATE</b>	<b>TIME</b>	<b>AIR TEMP (°C)</b>	<b>WATER TEMP (°C)</b>	<b>WATER LEVEL (cm)</b>	<b>WATER CLARITY</b>	<b>WEATHER</b>
July 14	-	-	-		Very murky	sunny & hot
July 15	-	-	-	82	Very murky	rain overnight & periodically throughout the day
July 16	10:00	-	10.6	90	Very murky	overcast
July 17	9:30	14	10.5	90.5	Very murky	rain overnight & morning. Cloudy afternoon
July 18	9:30	15	11	90	Very murky	cloudy
July 19	9:30	15	11	100	Very murky	rain overnight. Cloudy during day
July 20	9:15	19	10.7	106	Very murky	sunny a.m. rain shower in evening
July 21	9:30	14	11	100	Very murky	sunny a.m. storm clouds move around camp
July 22	9:00	16.5	11.5	93	Very murky	mostly sunny. Light rain shower in afternoon
July 23	9:00	16	10.5	85	Very murky	mostly sunny
July 24	8:30	16	11	81	Very murky	sunny
July 25	8:30	17	11	82	Very murky	sunny & hot
July 26	9:30	17	13	79	Very murky	mix of sun & cloud, hot
July 27	8:30	12	13	79	Very murky	steady rain overnight and during day
July 28	8:00	12	10.2	125	Very murky	overcast
July 29	8:00	-	-	154	Very murky	mix sun & cloud
July 30	8:00	-	-	124	Very murky	rain