

2018 LATE RUN SOCKEYE

Preliminary Escapement Estimates

Preliminary escapement estimates are based on in-season data that have not been fully verified. Changes in preliminary estimates are likely.

Background

The Late Run consists of a diverse group of populations that predominately spawn in four areas of the southern and east-central portion of the Fraser River system (Lower Fraser, Harrison-Lillooet, Seton-Anderson and South Thompson) and includes 6 of the 24 current Conservation Units (CU) that have been identified for Fraser Sockeye (Grant et al. 2011). Populations within the Late Run timing group enter the lower Fraser River from August to October, after delaying off the mouth of the Fraser River for a period of time, and migrate immediately upstream to terminal spawning areas. Spawners begin arriving on spawning grounds in early September with peak of spawning for most populations occurring from early October to mid-November. The die-off is generally complete by late November.

Of the 6 current CUs in the Late Run aggregate, three have been designated as RED status (Cultus-L, Harrison (U/S)-L and Seton-L), one as AMBER status (Lillooet-Harrison-L) and two as AMBER/GREEN status (Harrison (D/S)-L and Shuswap Complex-L) in the 2017 Wild Salmon Policy biological status evaluations (DFO 2018). These status designations align closely with the recent COSEWIC (Committee on the Status of Endangered Wildlife in Canada) status assessment conducted on Fraser Sockeye (COSEWIC 2017).

The 2014 brood year escapement for the Late Run totalled 2,303,384 spawners. The largest spawning escapements in 2014 were observed in the Lower Shuswap River (832,810), Lower Adams River (707,087), Little River (213,315), Middle Shuswap River (194,780) and the Eagle River (191,334). Spawning success for the aggregate in 2014 was 95.4% (4.6% pre-spawn mortality), well above the long term average of 85.8%.

Escapement Estimation

The 2018 escapement estimation plan was based on a pre-season spawning escapement target of 2,959,200 (at the 50% probability forecast) using standard enumeration methodology based on the number of spawners expected to return by population (Andrew and Webb, 1987). Typically, low precision visual surveys are used to enumerate populations with expected escapements of less than 75,000 spawners and high precision methods (hydroacoustics, enumeration fence or mark-recapture) are used for populations with expected escapements of greater than 75,000 spawners.

The 2018 escapement estimation plan had five components:

1. Visual Surveys

Most Late Run populations had expected escapements of less than 75,000 spawners; consequently, they were assessed visually on foot, by boat or by helicopter. Survey frequency ranged from weekly coverage on most systems, to single surveys for remote or difficult to access systems. Where single surveys were used, the survey was timed to coincide with expected peak abundance using temporal patterns in nearby populations.

On each visual survey the entire spawning area is assessed with counts of live and dead Sockeye. For ground surveys, the sex and spawning success (females only) is recorded for all carcasses recovered. After enumeration, all recovered carcasses are chopped in half with a machete to avoid re-counting on subsequent surveys.

For each stream the total escapement is the sum of the maximum count of live spawners and the cumulative count of recovered carcasses through the date of the peak live count multiplied by an index expansion factor. The total escapement for a stream is reported by males, females and jacks in three steps:

- The total jack recovery is adjusted by applying an expansion factor of 1.26 (Andrew and Webb, 1987). The adjusted carcass recovery totals are then used to calculate the proportion of adult males, females and jacks for each stream;
- If the adult carcass recovery sample (excluding unsexed carcasses) is both temporally and spatially representative throughout the die-off period, then the estimate is stratified by adult males, females and jacks on the basis of the proportions calculated above;
- If the total adult carcass recovery is not temporally and spatially representative throughout the die-off period, then the adult sex ratio, jack composition and female spawning success is estimated from a nearby stream or population aggregate. Jacks are excluded from this calculation if none were observed during surveys of the stream in question.

The average female spawning success is calculated from the weighted daily estimates of female egg retention (0%, 50% or 100%) in the female carcass recovery sample. The effective female escapement is the product of the total female escapement and the average female spawning success (excluding Sockeye killed for biological samples).

Visual surveys were conducted by DFO Fraser River Stock Assessment and Lil'wat First Nations (Harrison-Lillooet system). Instream Fisheries Research Inc. provided visual survey data for Bridge River.

2. Carcass Census

Escapement to the Weaver Creek spawning channel was assessed after loading was complete by conducting a complete census of all carcasses within the channel. The channel is managed and operated by DFO, Salmonid Enhancement Program (SEP).

3. Enumeration Fences

Escapements to Cultus Lake and Salmon River were assessed using counting fences. The total escapement in fenced streams is estimated from the sum of the daily fence counts. With the exception of Cultus, the sex specific escapement (including jacks) and female spawning success for fenced streams are estimated from carcasses recovered during foot surveys using the methods as described for visual surveys. Due to the low number of carcass recovery samples at Cultus, the sex-specific escapement (excluding jacks) is estimated by applying a correction factor to the male and female counts through the fence based on the sex identification error in the brood stock sample.

4. Hydroacoustics

Escapements to the Birkenhead River, Eagle River and Lower Shuswap River were assessed using hydroacoustic imaging systems (DIDSON or ARIS). The Birkenhead project was conducted jointly by DFO Fraser River Stock Assessment and Lil'wat First Nation. The procedures used to analyse the hydroacoustic data to estimate total escapement are similar to those described in Cronkite et. al (2006). The sex specific escapement (including jacks) and female spawning success are estimated from carcasses recovered during foot surveys using the methods as described for visual surveys.

5. Mark-Recapture

Escapements to the Adams and Little rivers were assessed using mark-recapture methods. The procedures used to analyse the mark-recapture data and estimate the sex specific escapements (including jacks) and female spawning success are similar to those described in Schubert 2007.

Escapements

The preliminary 2018 Late Run Sockeye spawning escapement estimate totals 1,584,850 of which 735,119 are adult males, 849,721 are adult females and 10 are jacks (Table 1). It is 69% of the 2014 brood year escapement of 2,303,384 and 64% of the cycle average (excluding 2002 due to incomplete assessment) of 2,468,905 (Figure 1). It is 81% of the Pacific Salmon Commission (PSC) estimate of potential spawning escapement¹ of 1,950,188, 84% of the spawning escapement target of 1,880,000 and 82% of the projected spawning escapement² of 1,933,800 based on the Fraser River panel final in-season adopted Late Run size of 4,700,000.

The largest Late Run escapements in 2018 were observed in the Lower Adams River (535,564), Lower Shuswap River (452,500), Eagle River (179,796), Middle Shuswap River (178,344) and Little River (127,386). Preliminary estimates of escapement and spawning success by spawning site are reported in Table 1.

Late Run Sockeye experienced above average water temperatures in early August and below average discharge levels for the entire migration period in the Fraser River. Fraser River water temperatures at Hope were as high as 2.7°C above average in early August before returning to near normal temperatures in late August (DFO Fraser River Environmental Watch 2019). Water discharge levels at Hope were as much as 40% below average from early August through September, reaching historic minima levels in mid-September (Environment Canada 2019a). Despite these conditions, Late Run Sockeye were reported to be in good condition on the spawning grounds with little evidence of migratory difficulties. Spawning success for the aggregate is an estimated 98.9% in 2018, well above the long term average of 85.8%.

Water levels on the spawning grounds were variable, but within normal ranges in most areas of the watershed with the exception of the eastern portion of the South Thompson system which experienced record high water levels in October. With the exception of Cultus, water temperatures on the spawning grounds were favourable throughout the Late Run spawning period, ranging from 3.0°C to 17.0°C. The period of arrival and spawning timing was slightly delayed in the South Thompson system but within normal ranges in all areas with the exception of Cultus where the peak migration was notably later (19 days) than average.

- **Lower Fraser** – This area has one Late Run CU (Cultus-L).
 - **Cultus-L:** The preliminary 2018 escapement to this CU totals 504 including 168 Sockeye retained for broodstock (Figure 2a). This escapement is the lowest on record for this cycle line and is the 6th lowest escapement on record for all years. It is 11% of the 2014 brood year escapement (4,636) and 3% of the long term cycle average (15,245). Although water temperatures in Sweltzer Creek were high during the front end of the migration period (ranging from 20-27°C from August 1st through September 13th), Sockeye were reported to be in generally good condition. Peak migration through the fence was almost 3 weeks later than normal in 2018 with a 50% migration date of October 8th (average since 2002 is September 19th). Spawning success was the highest observed in recent years at an estimated 75.0% in 2018, (average of 27.2% since 2006), but is based on a very limited number (4) of female carcasses. As most spawning in Cultus Lake occurs at depths below the visual range (>7m), it is expected that standard carcass recovery surveys on Cultus

¹ The potential spawning escapement is the number of Sockeye estimated past the PSC hydroacoustic site in the Lower Fraser River at Mission minus estimates of catch above Mission.

² The projected spawning escapement is the potential spawning escapement adjusted to account for historic differences between the Mission hydroacoustic estimates of fish passage and the spawning grounds estimates.

Lake are biased towards unsuccessful spawners as they are more easily accessible to crews. Therefore, the reported estimate of spawning success is expected to be biased low and not representative of the total population.

- **Harrison-Lillooet** – This area includes several Late Run Sockeye populations in three CUs (Lillooet-Harrison-L, Harrison (D/S)-L, and Harrison (U/S)-L.).
 - **Lillooet-Harrison-L:** Escapement to this CU is dominated by the Birkenhead River population. The preliminary 2018 escapement to this CU totals 15,430 spawners. Excluding 2002 which was only partially assessed, this escapement represents the fourth consecutive decline relative the brood year, decreasing by 95% since 1998 (Figure 2b). It is the 2nd lowest on record for this cycle year and the 3rd lowest on record for all years. It is 42% of the 2014 brood year of 36,534 and 13% of the cycle average (excluding 2002) of 117,988. (Figure 2b). Spawning success is an estimated 91.9% in 2018, above the long term average of 90.3%.
 - **Harrison (D/S)-L:** Escapement to this CU is dominated by the Big Silver Creek population. The preliminary 2018 escapement to this CU totals 1,140 spawners. This escapement represents the fourth consecutive decline relative to the brood year, decreasing by 96% since the record cycle year escapement in 2002 (Figure 2c). It is 22% of the 2014 brood escapement of 5,273 and 25% of the cycle average of 4,591 (Figure 2c). Due to limited carcass availability the reported estimates of sex ratio and spawning success are based on the Birkenhead River.
 - **Harrison (U/S)-L:** The preliminary 2018 escapement to the Weaver Creek system totals 15,095 spawners. This escapement is the second lowest on this cycle since the spawning channel has been in operation (Figure 2d). It is 61% of the 2014 brood year of 24,646 and 21% of the post-spawning channel cycle average (72,804) (Figure 2d). Spawning success in the system is the highest observed in over 25 years at an estimated 97.4%, well above the long term average of 89.5%.
- **Mid-Fraser** – This area has one un-validated Late Run CU (Mid-Fraser-River Type)³ with one spawning site (Bridge River).
 - **Middle Fraser (River-Type)³:** Late Run Sockeye were first reported spawning in Bridge River in 2013 and again on the 2014 brood year (68). Prior to 2013, this area had not been consistently surveyed during the Late Run spawning period. No Late Run Sockeye were observed in Bridge River in 2018. Further research is required to determine if this is a persistent late run spawning population.
- **Seton-Anderson** – This area has one Late Run CU (Seton-L) with one consistent Sockeye spawning population (Portage Creek).
 - **Seton-L:** The preliminary 2018 escapement to this CU totals 35,548 spawners (Table 1). This is the second largest escapement on record for all cycle years. It is nearly 1.5 times the 2014 brood year escapement of 24,275 and almost double the cycle year average of 20,178 since the population was re-established with hatchery transplants in mid-1960s (Figure 2e). Spawning success is an estimated 99.7% in 2018, above the long term average of 95.6%.
- **South Thompson** – This area has one Late Run CU (Shuswap Complex-L) with many spawning sites distributed among five nursery lakes including Adams, Big Shuswap, Little

³ Un-validated CU; further research is required to determine if the CU meets the criteria as defined under the Wild Salmon Policy (Grant et. al, 2011).

Shuswap, Mabel and Mara lakes. This CU is typically dominated by the Adams and Shuswap river populations on this dominant cycle year.

- **Shuswap Complex-L:** The preliminary 2018 escapement to this CU totals 1,517,301 spawners (Table 1). This escapement is 69% of the 2014 brood escapement of 2,208,177 and 63% of the cycle average of 2,426,860 (Figure 2f). The 2018 escapement to the Adams River (535,564) is the lowest on record for this cycle year. It is 76% of the 2014 brood year escapement (707,087) and 34% of the cycle year average (1,582,831). Escapement to the Shuswap River system (635,209) is 61% of the 2014 brood year (1,042,076) and 31% above the cycle year average (484, 649).

The period of sockeye arrival timing to the South Thompson system was slightly later and more protracted than normal in 2018. Water levels in the eastern portion of the watershed were above average throughout the Late Run arrival and spawning period, most notably in the Shuswap River, where they reached record high levels in October (Environment Canada 2019b). Spawning success is an estimated 99.0% in 2018, well above the long term average of 94.2%.

References

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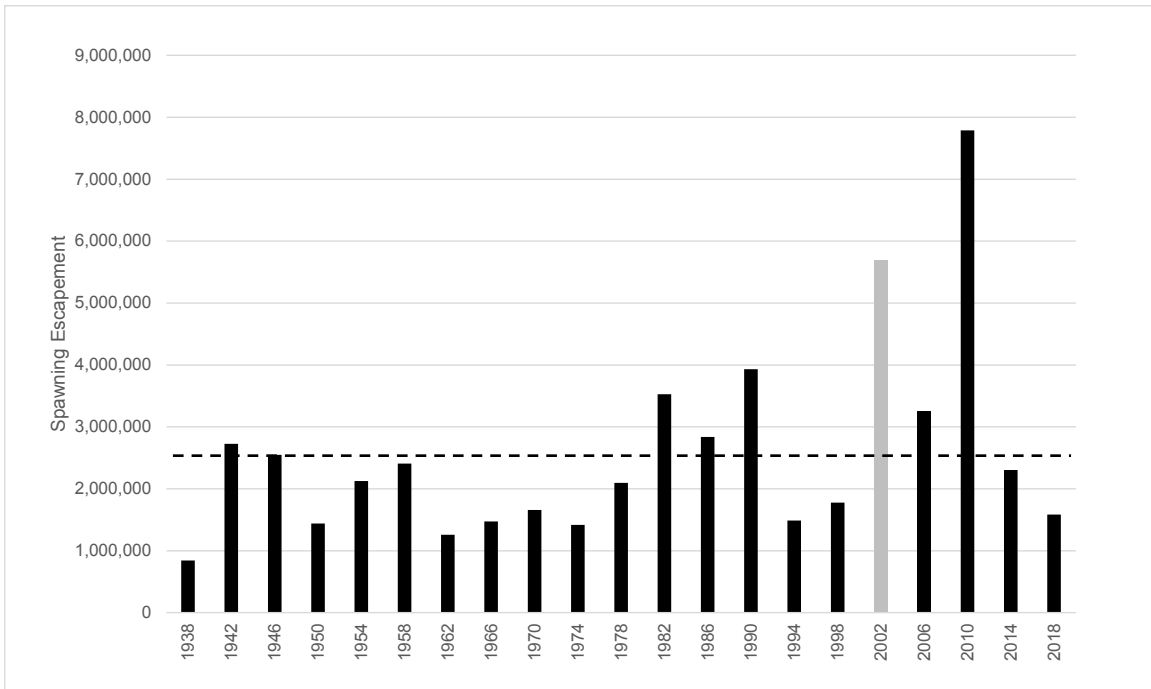
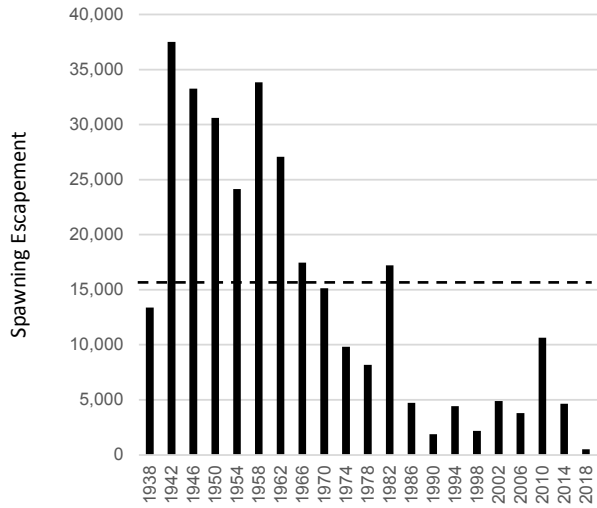
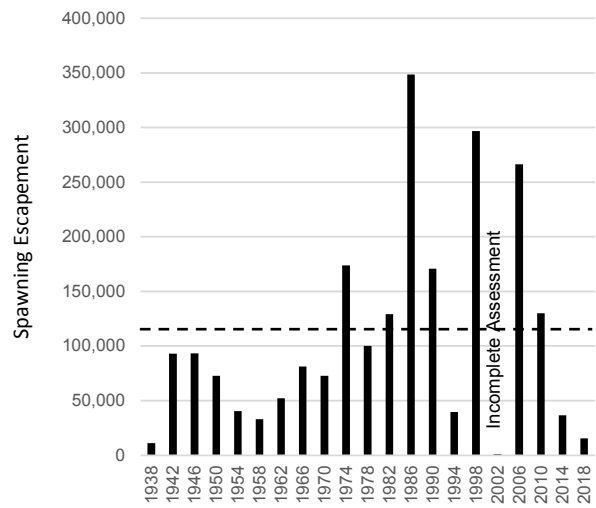


Figure 1. Historical Late Run Sockeye spawning escapements on the 2018 cycle line. The grey bar indicates incomplete assessment. Dashed line indicates the cycle average (excluding 2002).

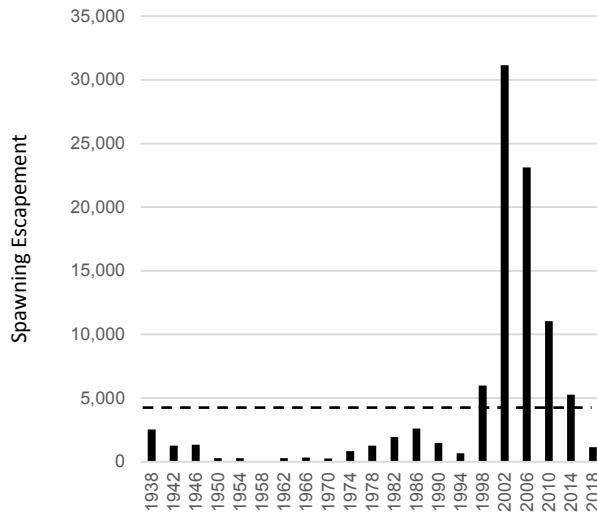
a. Cultus-L



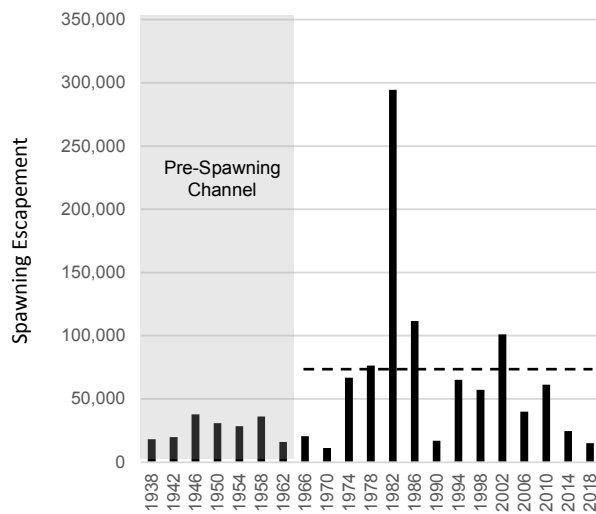
b. Lillooet-Harrison-L



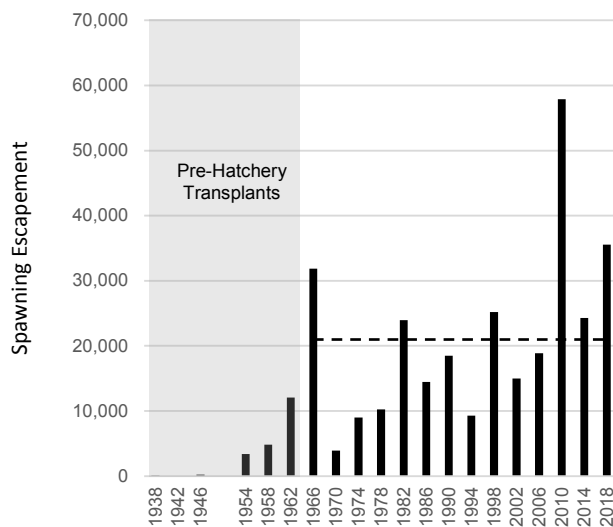
c. Harrison (D/S)-L



d. Harrison (U/S)-L



e. Seton-L



f. Shuswap Complex-L

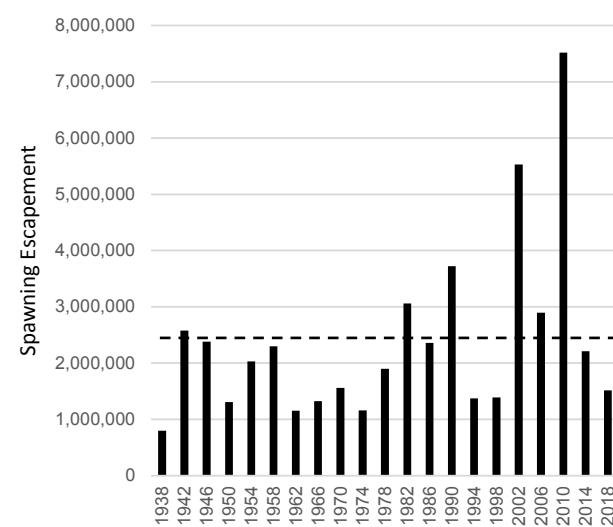


Figure 2 (a-f). Historical Late Run Sockeye spawning escapement by CU on the 2018 cycle line; Cultus-L (a), Lillooet-Harrison-L (b), Harrison (D/S)-L (c), Harrison (U/S)-L (d), Seton-L (e) and Shuswap Complex-L (f). Dashed line indicates the cycle average. Missing years indicate no assessments were conducted.

TABLE 1. 2018 PRELIMINARY LATE RUN SOCKEYE SALMON ESCAPEMENT SUMMARY

WATERSHED AREA / CONSERVATION UNIT	PEAK SPAWNING	TOTAL POPULATION	ADULTS	JACKS	MALES	FEMALES	% SPAWN	EFFECTIVE FEMALES*	REMARKS
LOWER FRASER RIVER									
<u>Cultus-L</u>									
Cultus Lake	Nov. 26-Dec. 2, 2018.	336	336	0	132	204	75.0%	153	Estimate does not include 168 Sockeye taken for broodstock.
AREA TOTAL:		336	336	0	132	204	75.0%	153	
HARRISON-LILLOOET									
<u>Lillooet-Harrison-L</u>									
Birkenhead River	Sep. 18-24, 2018.	15,066	15,056	10	7,181	7,875	91.9%	7,240	
Green River	Sep. 21-27, 2018.	279	279	0	133	146	91.9%	134	Birkenhead R. adult sex ratio & % spawn applied.
Miller Creek		0	0	0	0	0	0.0%	0	
Pemberton Creek		0	0	0	0	0	0.0%	0	
Poole Creek		0	0	0	0	0	0.0%	0	
Railroad Creek		0	0	0	0	0	0.0%	0	
Sampson Creek	Sep. 20-26, 2018.	85	85	0	40	45	91.9%	41	Birkenhead R. adult sex ratio & % spawn applied.
Taillefer Creek		0	0	0	0	0	0.0%	0	
Sub-total:		15,430	15,420	10	7,354	8,066	91.9%	7,415	
<u>Harrison (D/S)-L</u>									
Big Silver Creek	Sep. 17-24, 2018.	1,030	1,030	0	491	539	91.9%	496	Birkenhead R. adult sex ratio & % spawn applied.
Cogburn Creek		13	13	0	6	7	91.9%	6	Birkenhead R. adult sex ratio & % spawn applied.
Crazy Creek		0	0	0	0	0	0.0%	0	
Douglas Creek	Sep. 15-20, 2018.	92	92	0	44	48	91.9%	44	Birkenhead R. adult sex ratio & % spawn applied.
Sloquet Creek	Sep. 15-20, 2018.	5	5	0	2	3	91.9%	3	Birkenhead R. adult sex ratio & % spawn applied.
Tipella Creek		0	0	0	0	0	0.0%	0	
Sub-total:		1,140	1,140	0	543	597	91.9%	549	
<u>Harrison (U/S)-L</u>									
Weaver Channel	Oct. 18-26, 2018.	13,756	13,756	0	5,667	8,089	97.4%	7,780	
Weaver Creek	Oct. 18-26, 2018.	1,339	1,339	0	552	787	97.4%	767	Weaver Cr. Channel sex ratio & % spawn applied.
Sub-total:		15,095	15,095	0	6,219	8,876	97.4%	8,547	
AREA TOTAL:		31,665	31,655	10	14,116	17,539	94.2%	16,511	
MID-FRASER RIVER									
<u>Middle Fraser (River-Type)¹</u>									
Bridge River		0	0	0	0	0	0.0%	0	
AREA TOTAL:		0	0	0	0	0	0.0%	0	

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<u>SETON-ANDERSON</u>									
<u>Seton-L</u>									
Portage Creek	Oct. 23-30, 2018.	35,548	35,548	0	13,096	22,452	99.7%	22,395	
AREA TOTAL:		35,548	35,548	0	13,096	22,452	99.7%	22,395	
<u>LATE SOUTH THOMPSON</u>									
<u>Shuswap Complex-L</u>									
<u>Adams Lake</u>									
Adams Lake South - Shore ²	Oct. 14-29, 2018.	2,876	2,876	0	1,414	1,462	99.1%	1,449	Adams Lk. comp. sex ratio & % spawn applied.
Adams Lake East - Shore	Oct. 16-29, 2018.	2,494	2,494	0	1,226	1,268	99.1%	1,257	Adams Lk. comp. sex ratio & % spawn applied.
Adams Lake North - Shore ³	Oct. 18-24, 2018.	24	24	0	11	13	99.1%	13	Adams Lk. comp. sex ratio & % spawn applied.
Adams River, upper	Oct. 15-22, 2018.	400	400	0	197	203	99.1%	201	Adams Lk. comp. sex ratio & % spawn applied.
Bush Creek	Oct. 20-25, 2018.	115	115	0	56	59	99.1%	58	Adams Lk. comp. sex ratio & % spawn applied.
Momich River, lower	Oct. 15-22, 2018.	68	68	0	33	35	99.1%	35	Adams Lk. comp. sex ratio & % spawn applied.
Sinmax Creek (Pass Creek)	Oct. 13-24, 2018.	5,125	5,125	0	2,500	2,625	99.6%	2,613	
Sub-total:		11,102	11,102	0	5,437	5,665	99.3%	5,626	
Little River	Oct. 16-25, 2018.	127,386	127,386	0	43,871	83,515	99.7%	83,304	
<u>Mara Lake</u>									
Mara Lake - Shore	Oct. 10-20, 2018.	49	49	0	23	26	99.0%	26	L. Shuswap R. sex ratio and % spawn applied.
Sub-total:		49	49	0	23	26	99.0%	26	
<u>Shuswap Lake - Anstey Arm</u>									
Misc. Anstey Arm - Shore ⁴	Oct. 12-18, 2018.	5,348	5,348	0	2,723	2,625	98.9%	2,595	Adams R. sex ratio & % spawn applied.
Anstey River	Oct. 15-21, 2018.	2,300	2,300	0	1,171	1,129	98.9%	1,116	Adams R. sex ratio & % spawn applied.
Hunakwa Creek	Oct. 13-21, 2018.	814	814	0	414	400	98.9%	395	Adams R. sex ratio & % spawn applied.
Sub-total:		8,462	8,462	0	4,308	4,154	98.8%	4,106	
<u>Shuswap Lake - Main Arm</u>									
Adams Channel	Oct. 17-20, 2018.	9	9	0	5	4	98.9%	4	Adams R. sex ratio & % spawn applied.
Adams River, lower	Oct. 10-25, 2018.	535,564	535,564	0	272,671	262,893	98.9%	259,855	
Huihill Creek	Oct. 10-24, 2018.	596	596	0	303	293	98.9%	290	Adams R. sex ratio & % spawn applied.
Misc. Main Arm - Shore ⁵	Oct. 16-25, 2018.	7,102	7,102	0	3,620	3,482	98.8%	3,441	
Nikw ikw aia Creek	Oct. 5-10, 2018.	407	407	0	207	200	98.9%	198	Adams R. sex ratio & % spawn applied.
Onyx Creek		0	0	0	0	0	0.0%	0	
Ross Creek		0	0	0	0	0	0.0%	0	
Scotch Creek	Oct. 10-20, 2018.	1,912	1,912	0	973	939	98.9%	928	Adams R. sex ratio & % spawn applied.
Sub-total:		545,590	545,590	0	277,779	267,811	98.9%	264,716	

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<u>Shuswap Lake - Salmon Arm</u>									
Misc. Salmon Arm - Shore ⁶	Oct. 18-28, 2018.	4,623	4,623	0	1,831	2,792	98.5%	2,749	Shuswap Lk. - Salmon Arm comp. sex ratio & % spawn applied.
Canoe Creek		7	7	0	3	4	98.5%	4	Shuswap Lk. - Salmon Arm comp. sex ratio & % spawn applied.
Crazy Creek	Oct. 10-20, 2018.	1,008	1,008	0	399	609	98.5%	600	Eagle R. sex ratio & % spawn applied.
Eagle River	Oct. 10-20, 2018.	179,796	179,796	0	71,190	108,606	98.5%	106,947	
Perry River	Oct. 10-20, 2018.	1,566	1,566	0	620	946	98.5%	932	Eagle R. sex ratio & % spawn applied.
Reinecker Creek		0	0	0	0	0	0.0%	0	
Salmon River		274	274	0	109	165	98.5%	162	Shuswap Lk. - Salmon Arm comp. sex ratio & % spawn applied.
Tappen Creek	Oct. 10-20, 2018.	90	90	0	36	54	98.5%	53	Shuswap Lk. - Salmon Arm comp. sex ratio & % spawn applied.
Yard Creek	Oct. 10-20, 2018.	18	18	0	7	11	98.5%	11	Eagle R. sex ratio and % spawn applied.
Sub-total:		187,382	187,382	0	74,195	113,187	98.5%	111,458	
<u>Shuswap Lake - Seymour Arm</u>									
Misc. Seymour Arm - Shore	Oct. 14-20, 2018.	629	629	0	320	309	98.9%	305	Adams R. sex ratio & % spawn applied.
Celista Creek	Oct. 18-22, 2018.	200	200	0	102	98	98.9%	97	Adams R. sex ratio & % spawn applied.
McNomee Creek	Oct. 14-19, 2018.	49	49	0	25	24	98.9%	24	Adams R. sex ratio & % spawn applied.
Seymour River	Oct. 12-19, 2018.	799	799	0	407	392	98.9%	388	Adams R. sex ratio & % spawn applied.
Sub-total:		1,677	1,677	0	854	823	98.9%	814	
<u>Shuswap River</u>									
Bessette Creek		695	695	0	345	350	99.2%	347	Middle Shuswap R. sex ratio & % spawn applied.
Blurton Creek		0	0	0	0	0	0.0%	0	
Cooke Creek		0	0	0	0	0	0.0%	0	
Johnson Creek		0	0	0	0	0	0.0%	0	
Kingfisher Creek		0	0	0	0	0	0.0%	0	
Lower Shuswap River	Oct. 12-22, 2018.	452,500	452,500	0	210,331	242,169	99.0%	239,634	
Middle Shuswap River	Oct. 10-20, 2018.	178,344	178,344	0	88,655	89,689	99.2%	88,944	
Noisy Creek	Oct. 10-20, 2018.	23	23	0	11	12	99.2%	12	Middle Shuswap R. sex ratio & % spawn applied.
Trinity Creek		0	0	0	0	0	0.0%	0	
Tsuius Creek		0	0	0	0	0	0.0%	0	
Tsuius Creek - Shore		0	0	0	0	0	0.0%	0	
Wap Creek	Oct. 8-18, 2018.	3,647	3,647	0	1,813	1,834	99.2%	1,819	Middle Shuswap R. sex ratio & % spawn applied.
Sub-total:		635,209	635,209	0	301,155	334,054	99.0%	330,756	

TABLE 1. 2018 PRELIMINARY LATE RUN SOCKEYE SALMON ESCAPEMENT SUMMARY

WATERSHED AREA / CONSERVATION UNIT	PEAK SPAWNING	TOTAL POPULATION	ADULTS	JACKS	MALES	FEMALES	% SPAWN	EFFECTIVE FEMALES*	REMARKS
South Thompson River	Oct. 22-29, 2018.	445	445	0	153	292	99.7%	291	Little R. sex ratio & % spawn n applied.
AREA TOTAL:		1,517,301	1,517,301	0	707,774	809,527	99.0%	801,097	
TOTALS:		1,584,850	1,584,840	10	735,119	849,721	98.9%	840,156	

* Effective female totals do not include fish killed for biological samples.

¹ Un-validated CU; further research is required (Grant et. al. 2011.)

² Area includes Bush Cr. Shore and Sinmax Cr. Shore (previously reported separately).

³ Area includes Momich River Shore and Boat Basin (previously reported separately).

⁴ Area includes several shore spawning areas previously reported separately (4 Mile Cr. Shore, Queest Cr. Shore, Vanishing Cr. Shore and Anstey R. Shore).

⁵ Area includes several shore spawning areas previously reported separately (Adams R. Shore, Cruikshank Pt. W. Shore, Hlina Cr. Shore, Lee Cr. Shore, Misc. North Shore, Misc. South Shore, Onyx Cr. Shore, Ross Cr. Shore and Scotch Cr. Shore).

⁶ Area includes Knight Cr. Shore and Reinecker Cr. Shore (previously reported separately).