

**Salcha River Chinook and Chum Salmon Counting Tower,  
2013.**

**R&M# 12-13**

by

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## **1. Introduction:**

### *Summary:*

The Salcha River operation monitors and characterizes the largest escapement of Chinook salmon in the Yukon River drainage, as well as a significant chum salmon run. Salcha River tower counts and spawning grounds carcass collections continue to be successful in estimating and characterizing Salcha River Chinook salmon escapement. Salcha River salmon escapement estimates by tower count methods date to 1993, mark-recapture (M-R) methods from 1987–1992, and aerial surveys have been conducted, in most years, since 1973 by the Alaska Department of Fish and Game (ADFG). The Bering Sea Fishermen's Association (BSFA) has successfully operated the Salcha River tower since 1999.

In 2013, the Salcha salmon counting tower became operational July 9, the first Chinook salmon was counted 24 hours later on July 10. Operations ran until August 14, 24 hours after the last Chinook salmon was counted passing the tower (Table 1). Using the tower count data, the ADFG generated an escapement estimate of 5,465 Chinook salmon. The total escapement of 110,000 chum salmon assumes that the Salcha River chum salmon escapement peaked on the historic peak date of August 10-11. High water had an effect on operations on July 11, 12, 13 and again, but less so, on July 21 and 22. Carcass surveys collected age, sex and length (ASL) from 200 Chinook and 160 chum salmon. Chinook salmon ASL samples were collected August 7, 9, 10, 15 and 18. Surveys prior to and after those dates found no Chinook salmon to sample. Chum salmon surveys occurred on August 9, 19, 20, and 30. Extremely low water levels in late July and August greatly impacted the Chinook salmon carcass sampling access. Many Salcha River cabin owners were unable to use jet boats to reach their cabins (normally easily done) due to the extremely low water levels and some main channel erosion changing thalweg location that was caused by an intense and later than normal spring flood. The 2013 Tanana Valley spring season was, in general, very late and cold.

The 2013 counting tower operations ran smoothly due the generally lower than average Salcha River flow volume. The 2013 Chinook salmon run was days later than historic run timing average thus allowing the counting of most of the Chinook salmon run with only minor river flooding issues once the operations began.

For many river systems, the ADFG (via the Alaska Board of Fisheries) sets a Chinook salmon biological escapement goal (BEG), which is the number of adults reaching the spawning grounds believed to be sustainable to produce harvestable returns. For the Salcha River, the Chinook salmon BEG is a range of 3,300 – 6,500. No goal has been established for chum salmon due lack of appropriate data.

### *Objectives:*

- estimate the total escapement of Chinook salmon in the Salcha River using tower counting techniques such that the estimates are within 15% of the actual value 95% of the time;
- estimate age, sex, and length compositions of the escapement of Chinook salmon in the Salcha River such that all estimated proportions are within 5 percentage points of the actual proportions 95% of the time;

- estimate the escapement of Chum salmon through the Salcha River using tower counting techniques through August 15.

**2. Study Area:** Salcha River, 45 miles east of Fairbanks, AK (Figure 1).

**3. Licenses and Permits:** Permits were issued by ADFG to BSFA for carcass survey collections and by the Department of Natural Resources (DNR) divisions of Lands and Parks for the tower site permits.

#### **4. Methods:**

##### *Operation:*

The Salcha River counting tower operation is located 1km upstream of the Richardson Highway Bridge, within the Salcha River State Park (Figure 1). Technicians count Chinook and chum salmon as they swim upstream over a white flash panel that spans the river from one bank directly across (diagonal to stream flow) to the other bank. The flash panel is made up of nine 21-foot-long and 10-foot-wide fabric panels held on the stream bottom by 21 foot long (3-inch diameter) steel pipes that are linked together end to end. Technicians count 20 minutes per hour, 24 hours a day from July through mid-August (24 counts per day every day). Total hourly escapement is calculated by multiplying each hourly 20-minute count by three, resulting in an expanded count estimate. The sum of each day's expanded hourly counts yields an estimated daily escapement total for Chinook and Chum salmon. Results are phoned to ADFG daily. Aerial surveys are at times done when tower counting operations are compromised (e.g. flooding).

Carcass surveys are spread out over time (15-30 days) and space (each covers all 65 miles (75km) of stream of the historic index area) so as to account for the potential collection bias associated with different mortality periods (related to multiple issues such as fish, condition, size (large/small), sex (male/female), spawning date, and environmental (floods, water temperature)). Carcass survey data yields the ASL information used to characterize the Chinook and chum salmon escapement compositions. A minimum of three carcass surveys are done each year, weather permitting. Escapement and ASL analysis and summary estimates are then generated and reported by ADFG.

##### *Data Analysis:*

All data analysis is performed by ADFG.

#### **5. Results:**

The Salcha salmon counting tower became operational July 9, the first Chinook salmon was counted 24 hours later on July 10. Operations ran until August 14, 24 hours after last Chinook salmon was counted passing the tower (Table 1). The preliminary escapement estimates are 5,465 Chinook salmon and 110,000 chum salmon. The chum salmon estimate assumes that the Salcha River chum salmon escapement peaked on the historic peak date of August 10-11. High water effected operations July 11, 12, 13 and again but less so July 21 and 22. Carcass surveys collected ASL from 200 Chinook and 160 chum salmon. Chinook salmon ASL samples were collected August 7, 9, 10, 15 and 18, surveys prior to and after those dates found no Chinook salmon to sample. Chum salmon surveys occurred on August 9, 19, 20, and 30. Extremely low

water levels in late July and August summer greatly impacted the Chinook salmon carcass sampling access.

The 2013 counting tower operations ran smoothly due the generally lower than average Salcha river flow volume. The 2013 Chinook salmon run was days later than historic run timing average thus allowing the counting of most of the Chinook salmon run with only minor river flooding issues once the operations began.

The 2013 Yukon River Chinook salmon return was well below the long-term average and nearer the worst return on record. The Salcha Chinook salmon escapement (5,465) met the Biological Escapement Goal, but was also well below the long-term (27-year) average of 9,080 (Table 2).

The 2013 female portion (50%) of the Salcha Chinook salmon escapement was higher than the 25 year average (42%) and makes sense due to the much higher than average age-6 portion (69%) in 2013 escapement, whereas the 25 year average is 46%. Female Chinook salmon commonly return at an older age than male Chinook salmon, rarely before age-5, and predominately at ages 5 and 6. Female Chinook salmon lengths ranged from 735 to 940 mm, and male Chinook salmon ranged from 350 to 985 mm (Table 3).

## **6. Discussion:**

The 2013 Salcha tower operations ran relatively smoothly and were generally successful in meeting objectives. Although high water stalled early operation deployment, fortunately the Chinook salmon run was believed to be days later than historic averages thus allowing the tower to count most all the Chinook salmon escapement with only minor flooding once the operations began. We were able to work with in-season requests from managers on special genetic collections for both Chinook and chum salmon. Due extreme low water levels during August, lower than desired numbers of Chinook salmon carcasses were recovered during ASL collections.

The Salcha River Chinook and chum salmon escapements seem to be holding relatively steady during recent years of Yukon River drainage-wide Chinook salmon declines and chum salmon increases. One might speculate that, perhaps due to its more remote nature, the Salcha River spawning and rearing habitat remains in better condition than the nearby Chena River; where segments in the lower river were recently listed on the Alaska Department of Environmental Conservation's impaired waters list; and, in the upper reaches, there are issues with spawning and rearing habitat due to the Chena Hot Springs Road. There are however some spawning and rearing habitat problems arising in the Salcha River, but these are beyond the scope of this project; although these issues have been brought to ADFG and DNR staff's attention.

It should be noted that while harvest levels (which have varied but more recently declined greatly) affect escapement numbers and composition, no harvest data is accounted for relative to escapement estimates presented in this report, thus are not comparable to production of Salcha River salmon stocks. Those harvests are accounted for when the BEG is estimated by ADFG. An example of the effects of harvest on escapement can be found in the Yukon River: when Yukon salmon fishing net restrictions (reduced size of mesh) were in effect as in 2012 and 2013, it is likely that action resulted in a larger portion of larger fish and females reaching the spawning grounds and being recorded in escapement surveys, although that larger number may be in part due to a stronger year class survival. The Salcha River Chinook salmon that spawned

in 2006 yielded large returns in both the 2011 and 2012 escapements. The last large number of Chinook salmon females to spawn and reach maturity (return) was in 2006.

### 7. Acknowledgements

Funding for this project was provided by the U.S. Fish and Wildlife Service's Yukon River Salmon Research and Management Fund.

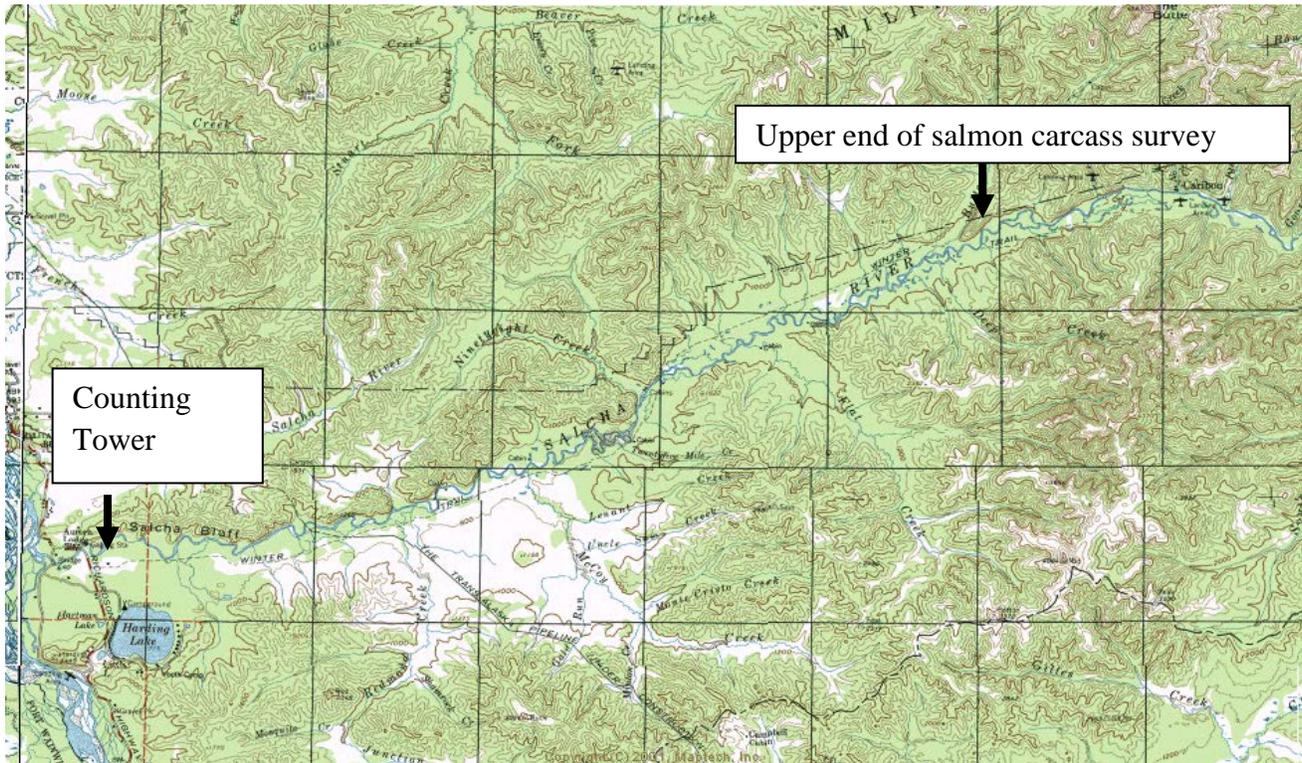


Figure 1. Location of the Salcha River counting tower and carcass survey areas in 2013 .

**Table 1.** Daily estimated passage (escapement) and cumulative count for Chinook and chum salmon past the Salcha River counting tower, 2013.

Date	Chinook Daily	Chinook Cumulative	Chum Daily	Chum Cumulative	Stream clarity
<b>9-Jul</b>	0	0	0	0	100
<b>10-Jul</b>	9	9	0	0	100
<b>11-Jul</b>	6	15	0	0	50
<b>12-Jul</b>	0	15	0	0	20
<b>13-Jul</b>	27	42	3	3	40
<b>14-Jul</b>	54	96	6	9	80
<b>15-Jul</b>	282	378	15	24	90
<b>16-Jul</b>	336	714	60	84	100
<b>17-Jul</b>	348	1062	126	210	100
<b>18-Jul</b>	336	1398	321	531	100
<b>19-Jul</b>	528	1926	528	1059	100
<b>20-Jul</b>	135	2061	1167	2226	100
<b>21-Jul</b>	207	2268	756	2982	50
<b>22-Jul</b>	63	2331	237	3219	30
<b>23-Jul</b>	420	2751	702	3921	90
<b>24-Jul</b>	246	2997	1494	5415	100
<b>25-Jul</b>	291	3288	1749	7164	100
<b>26-Jul</b>	330	3618	2427	9591	100
<b>27-Jul</b>	408	4026	2100	11691	100
<b>28-Jul</b>	381	4407	2526	14217	100
<b>29-Jul</b>	120	4527	2967	17184	100
<b>30-Jul</b>	57	4584	3300	20484	100
<b>31-Jul</b>	51	4635	3186	23670	100
<b>1-Aug</b>	54	4689	2934	26604	100
<b>2-Aug</b>	33	4722	3243	29847	100
<b>3-Aug</b>	96	4818	3492	33339	100
<b>4-Aug</b>	87	4905	2760	36099	100
<b>5-Aug</b>	21	4926	3162	39261	100
<b>6-Aug</b>	6	4932	3396	42657	100
<b>7-Aug</b>	3	4935	3540	46197	100
<b>8-Aug</b>	12	4947	2892	49089	100
<b>9-Aug</b>	3	4950	2658	51747	100
<b>10-Aug</b>	6	4956	2154	53901	100
<b>11-Aug</b>	0	4956	1671	55572	100
<b>12-Aug</b>	6	4962	1557	57129	100
<b>13-Aug</b>	3	4965	1341	58470	100
<b>14-Aug</b>	0	4965	1404	59874	100

**Table 2.** Historic Chinook salmon Salcha River escapement estimates, number of females, proportion of females and proportion of escapement age-6 estimates. These summary estimates are adjusted by ADFG staff to account for high water (poor visibility) during tower counts and possible carcass survey collections bias.

<b>Year</b>	<b>Chinook Total Escapement</b>	<b>Female Escapement</b>	<b>Females Percent</b>	<b>Age 6 Percent</b>
1987	4,771	2,481	52	74
1988	4,322	1,959	45	36
1989	3,294	1,441	44	58
1990	10,728	3,883	36	49
1991	5,608	2,283	41	48
1992	7,862	2,831	36	28
1993	10,007	2,643	26	31
1994	18,399	8,574	47	53
1995	13,643	7,609	56	63
1996	7,570	1,982	26	23
1997	18,514	8,917	48	69
1998	5,027	1,495	30	18
1999	9,198	4,727	51	66
2000	4,595	1,819	40	24
2001	13,328	4,933	37	52
2002	9,000	3,093	34	39
2003	15,500	6,536	42	44
2004	15,761	9,851	63	82
2005	5,988	3,279	55	46
2006	10,679	4,690	44	43
2007	6,425	2,295	36	50
2008	5,447	2,124	39	36
2009	12,774	4,982	39	47
2010	6,900	2,070	30	14
2011	7,200	3,024	42	48
2012	7,165	4,299	60	59
2013	5,465	2,760	50	69
Average	9,080	3,947	43	47

**Table 3.** Salcha River carcass survey, Chinook salmon escapement age and sex composition and mean length (mm) 2013.

Sample Dates	Sample Size		Brood Year (Age)												Total											
			2010		2009		2008		2007		2006		2005													
			1.1	1.2	2.1	1.3	2.2	1.4	2.3	1.5	2.4	1.6	2.5	N	%											
8/06-8/17	179	Male	2	1.1	20	11.2	0	0.0	18	10.1	0	0.0	48	26.8	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	89	49.7
		Female	0	0.0	0	0.0	0	0.0	10	5.6	0	0.0	76	42.5	0	0.0	4	2.2	0	0.0	0	0.0	0	0.0	90	50.3
		Subtotal	2	1.1	20	11.2	0	0.0	28	15.6	0	0.0	124	69.3	0	0.0	5	2.8	0	0.0	0	0.0	0	0.0	179	100.0
		Male Mean Length	363		550			713				845				965										
		SE	12.50		13.54			13.75				8.70				-										
		Range	350-375		440-625			605-810				745-985				965-965										
		n	2		20			18				48			1											
		Female Mean Length	-		-			779				840			868											
		SE	-		-			11.40				4.63			17.85											
		Range	-		-			735-845				760-940			815-895											
		n	-		-			10				76			4											

**Table 4.** Chum salmon carcass survey collection mean and range lengths (mm) at age, age and sex percentages from Salcha River escapement project, collected in 2013.

Brood year	2009		2008		2007		2006		Total		
	Age	3	4	5	6	N	%	N	%	N	%
Males		0	0	34	21.3	41	25.6	7	4.4	82	52
	Mean	0		550		580		580			
	Range	0		500-590		540-640		540-610			
Females		0	0	37	23.1	37	23.1	3	1.9	77	48
	Mean	0		520		550		590			
	Range	0		490-560		520-580		580-610			
Total		0	0	71	44.4	78	48.7	10	6.3	159	100