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Abundance and Run Timing of Adult Pacific Salmon in the East Fork Andreafsky River, Yukon Delta National Wildlife Refuge, Alaska, 2008

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Abstract

A resistance board weir was used to collect abundance, run timing, and biological data from salmon returning to the East Fork Andreafsky River, a tributary to the lower Yukon River, between June 21 and July 30, 2008. An estimated 4,242 Chinook salmon *Oncorhynchus tshawytscha* migrated through the weir. Six age groups were identified from 536 Chinook salmon sampled, with age 1.3 (74%) dominating. The sex composition was 37% female. An estimated 57,259 summer chum salmon *O. keta* migrated through the weir. Three age groups were identified from 887 summer chum salmon sampled, with age 0.4 (81%) dominating. The sex composition was 46% female. An estimated 189,908 pink salmon *O. gorbuscha*, 272 sockeye salmon *O. nerka*, and two coho salmon *O. kisutch* were counted through the weir. Other species counted through the weir during 2008 included 1,426 whitefish (Coregoninae), four Arctic grayling *Thymallus arcticus*, and 41 northern pike *Esox lucius*.

Introduction

The Alaska National Interest Lands Conservation Act (ANILCA), signed into law December 2, 1980, mandates that salmon populations and their habitats be conserved within National Wildlife Refuge lands, international treaty obligations be fulfilled, and a subsistence priority for rural residents be maintained (USFWS 1991). Compliance with ANILCA mandates cannot be ensured without reliable data on salmon stocks originating from and returning to refuge lands. The Andreafsky River is one of several lower Yukon River tributaries on the Yukon Delta National Wildlife Refuge (Refuge). The Andreafsky River and its primary tributary, the East Fork Andreafsky River, provide important spawning and rearing habitat for Chinook salmon *Oncorhynchus tshawytscha*, summer chum salmon *O. keta*, coho salmon *O. kisutch*, pink salmon *O. gorbuscha*, and sockeye salmon *O. nerka* (USFWS 1991). The Andreafsky River supports one of the largest returns of Chinook salmon, has the second largest return of summer chum salmon (Bergstrom et al. 1998), and is believed to have the largest return of pink salmon in the Yukon River drainage (USFWS 1991). These Andreafsky River salmon stocks contribute to a large subsistence fishery in the lower Yukon River. The need to collect accurate escapement estimates is required to maintain genetic diversity, determine exploitation rates, and spawner recruit relationships (Labelle 1994). Data on escapement counts, which are necessary for effective management, are lacking for many individual stocks in the Yukon River drainage. Individual salmon stocks that are returning in low numbers or having early and late run timing may be incidentally over-harvested in the subsistence, commercial, or sport fisheries. Federal

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and State fishery managers attempt to distribute salmon harvest over time to avoid over-harvesting an individual salmon stock (Mundy 1982).

Escapement monitoring on the East Fork Andreafsky River started with aerial surveys by the U.S. Fish and Wildlife Service (USFWS) from 1954-1960, and continued by the Alaska Department of Fish and Game (ADF&G) from 1961 to the present. Sonar and tower count methods were added by ADF&G from 1981 through 1988 (Appendix 1). The present weir project (operated by the USFWS Kenai Fish and Wildlife Field Office from 1994-2002 and the USFWS Fairbanks Fish and Wildlife Field Office from 2003-present) provides accurate escapement and biological data dating back to 1994 for Chinook salmon, summer chum salmon, and pink salmon, and from 1995 to 2005 for coho salmon. The Andreafsky River weir is one of the longest running escapement projects in the Yukon River drainage.

Poor salmon returns from 1998 – 2001 in the Yukon River resulted in harvest restrictions, complete fishery closures, and spawning escapements below management goals on many tributaries in the Yukon River drainage (Vania et al. 2002; Kruse 1998). Chinook salmon and summer chum salmon runs improved with harvestable surpluses from 2002 – 2006 (JTC 2007). However, Chinook salmon runs again showed a decline in 2007 and 2008. This project provides necessary enumeration information for management, especially during poor run years.

Specific objectives of the 2008 project were to: (1) enumerate adult salmon escapement; (2) describe run timing of Chinook salmon and summer chum salmon returns; (3) estimate age, sex, and length composition of adult Chinook salmon and summer chum salmon populations; and (4) identify and count other fish species passing through the weir.

Study Area

The Andreafsky River is located in the lower Yukon River drainage in western Alaska (Figure 1). The regional climate is subarctic with extreme temperatures reaching 28˚ C in summer and – 42˚C in winter at St. Mary's, Alaska (Leslie 1989). Mean July high and February low temperatures between 1976 and 2000 were 18˚ and – 22˚C, respectively. Average yearly precipitation is approximately 48 cm of rain and 172 cm of snow. The Andreafsky River ice breakup typically occurs in May or early June, and usually begins to freeze in late October (USFWS 1991). Maximum discharge typically follows breakup. Sporadic high discharge periods generated by heavy rains occur between late July and early September.

The Andreafsky River is one of the three largest Yukon River tributaries within Refuge boundaries (USFWS 1991) and drains a watershed of approximately 5,450 km^2. The main-stem and the East Fork Andreafsky River parallel each other flowing in a southwesterly direction for more than 200 river-kilometers (rkm) and converge 7 rkm above its confluence with the Yukon River. The mouth of the Andreafsky River is approximately 160 rkm upstream from the mouth of the Yukon River. The mainstem and East Fork Andreafsky River flow through the Andreafsky Wilderness and the portions of each river within Refuge boundaries are designated as Wild and Scenic Rivers.

The East Fork Andreafsky River originates in the Nulato Hills at approximately 700 m elevation and drains an area of about 1,950 km^2 (USFWS 1991). The river cuts through alpine tundra at an average gradient of 7.6 m per km for 48 rkm. It then flows for 130 rkm through a forested river valley bordered by hills that rarely exceed 400 m elevation. Willow, spruce, alder, and birch dominate the riparian zone and much of the hillsides. This forested river section drops at an average rate of 1.4 m/km and is characterized by glides and riffles with a gravel and rubble substrate. The river widens in the lowermost 38 rkm and the gradient changes to 0.14 m/km. The valley here is a wetland, interspersed with forest and tundra, and bordered by hills that are typically less than 230 m elevation. Aquatic vegetation grows in the slower flowing stream channels. Water level fluctuations on the Yukon River also affect the stage height in the lower sections of the East Fork and main-stem Andreafsky Rivers.

Methods

Weir Operation

A modified resistance board weir (Tobin 1994; Tobin and Harper 1995; Zabkar and Harper 2003) spanning 105 m was installed in the East Fork Andreafsky River (62^{o} 07'N, 162^{o} 48.4'W) approximately 43 rkm upstream from the Yukon-Andreafsky River confluence and 26 air-km northeast of St. Mary's, Alaska (Figure 1). The weir site is located approximately 2.4 rkm downstream from the 1994 weir site described by Tobin and Harper (1995) and 2.1 rkm downstream from the 1981-1988 sonar and counting tower site described by Sandone (1989). Weir panel picket spacing (4.8 cm edge to edge) was designed to remain functional during higher water flow, but allowed some small pink salmon and resident fish to pass through the weir undetected (Zabkar and Harper 2003). Beginning in 1995, weir operation was extended into September (fall season) to collect coho salmon data. In 2006-2008, funding was unavailable for weir operation during the fall season.

A staff gauge was installed upstream of the weir to measure daily water levels. Staff gauge measurements were calibrated to correspond with the average water depth across the river channel at the upstream edge of the weir. Water temperatures were collected once daily between 0730 and 0830 hours and two automatic temperature loggers collected water temperatures throughout the season.

Two passage chutes were installed, one approximately one-third of the way across from the left bank and the other centered between the banks, in water deep enough to allow fish passage in the event of low water. The thalwag was not used for a fish passage chute because the water was too deep. A fish trap was installed on the right passage chute to facilitate biological sampling. The left passage chute was used when large numbers of pink salmon began building up below the weir. All fish were enumerated and identified to species as they passed through the live trap, except whitefish spp., which were grouped together under the subfamily Coregoninae. Fish were counted 24 hours per day and the numbers were recorded hourly.

The weir was cleaned and its integrity visually checked daily. Cleaning consisted of raking debris from the upstream surface of the weir or walking across each panel to submerge it enough to allow the current to wash debris downstream. Repairs were made when necessary.

Biological Data

Adult salmon were identified and counted daily as they migrated through the weir live trap to determine run timing and escapement. A stratified random sampling design (Cochran 1977) was used to collect age, length, and sex ratio information for Chinook salmon and summer chum salmon. Biological sampling commenced at the beginning of each week, and the weekly sampling goal was 160 Chinook salmon and 160 summer chum salmon spread over a minimum four-day period. All target species within the trap were sampled to prevent bias. Non-target species were identified and counted but not sampled.

Fish sampling consisted of identifying salmon species, determining sex, measuring length, collecting scales, and then releasing the fish upstream of the weir. Secondary sex characteristics were used to determine sex. Length was measured from mid-eye to the fork of the caudal fin and rounded to the nearest 5 mm. Scales were removed from the area above the lateral line and posterior to the dorsal fin following the methods outlined by Koo (1962) and Devries and Frie (1996). Three scales were collected from each Chinook salmon sampled, and one scale was collected from each summer chum salmon sampled. Scales were sent to the Alaska Department of Fish and Game (ADF&G) post season for age determination, and impressions were made on cellulose acetate cards using a heated scale press and examined with a microfiche reader (Zabkar and Harper 2003). Age was determined by an ADF&G biologist and reported according to the European method (Koo 1962). Daily sex ratios were collected by visually sexing each fish when sampling for age and length. The daily escapement counts and sex ratios were reported daily to the USFWS Fairbanks Fish and Wildlife Field Office.

Data Analysis

Calculations for age and sex information were treated as a stratified random sample (Cochran 1977), with sampling weeks as the strata. Age 1.2 Chinook salmon were assumed to be males (Brady 1983; Bales 2007; Karpovich and DuBois 2007) regardless of their field determination. Each statistical week was defined as beginning on Sunday and ending the following Saturday. Incomplete weeks were combined with the week after the beginning of weir operation or with the week before the end of weir operation. Within a stratum, the proportion of the samples composed of a given sex or age, $\hat{p}_{ij}$, was calculated as

$$\hat{p}_{ij} = \frac{n_{ij}}{n_j},$$

where n_{ij} is the number of fish by sex i or age i sampled in week j, and n_j is the total number of fish sampled in week j. The variance of $\hat{p}_{ij}$ was calculated as

$$\hat{v}(\hat{p}_{ij}) = \frac{\hat{p}_{ij}(1-\hat{p}_{ij})}{n_j - 1}.$$

Sex and age compositions for the total run of Chinook and summer chum salmon of a given sex or age, $\hat{p}_i$ were calculated as

$$\hat{p}_i = \sum_{j-1} \hat{W}_j \hat{p}_{ij},$$

where the stratum weight $\hat{W}_j$ was calculated as

$$\hat{W}_j = \frac{N_j}{N},$$

and N_j equals the total number of fish of a given species passing through the weir during week j, and N is the total number of fish of a given species passing through the weir during the run. Variance, $\hat{v}(\hat{p}_i)$ of sex and age compositions for the run was calculated as

$$\hat{v}(\hat{p}_i) = \sum_{j-1} \hat{W}_j^2 \hat{v}(\hat{p}_{ij}).$$

Substantial numbers of coho salmon in 1998 and all salmon species in 2001 were missed due to high water; therefore the counts for these years were not included in any annual comparative analyses.

Age, sex, and length data for sockeye salmon were collected in 2008 (n = 50 fish). Fin-clip samples for genetic analysis were also obtained. These data are planned for presentation in a future report specific to Yukon River sockeye salmon populations.

Results and Discussion

Weir Operation

The weir was operational from June 21 through July 30, 2008. No high or low water events hindered the weir operation in 2008. The average river stage height during weir operations was 75.2 cm with a range between 57.3 and 92.7 cm (Figure 2). Water temperature during weir operations averaged 11°C and ranged between 7 and 17°C (Figure 2).

Biological Data

An estimated 4,242 Chinook salmon, 57,259 summer chum salmon, two coho salmon, 189,908 pink salmon, and 272 sockeye salmon migrated through the weir in 2008 (Table 1). Passage estimates for Chinook salmon and summer chum salmon were conservative due to an unknown number of fish passing before and after the weir was operational. Non-salmon species recorded moving through the weir include 1,426 whitefish, four Arctic grayling, and 41 northern pike.

The East Fork Andreafsky River weir recorded a near average Chinook salmon count (Figure 3), however, overall the 2008 Chinook salmon run was assessed to be poor with the escapement goal into Canada not being met (Hayes et al. 2009). The summer chum salmon run recorded at the weir was slightly below average (Figure 3) with the overall 2008 summer chum salmon run approximately 20% below the recent five-year average but well above the drainage wide escapement goal (Hayes and Newland 2008).

Chinook Salmon

The 2008 Chinook salmon escapement estimate (4,242 fish) was near the 1994-2007 historical average of 4,506 fish (Figure 3; Appendix 2). Peak passage (1,839 fish) occurred during the stratum of July 6 through July 12 (Table 1; Figure 4). The 2008 run timing was slightly later than average. The first quartile passed on July 7 (historical average July 5), the mid-point of the run at the weir was July 11 (historical average July 10), and the third quartile passage date was July 18 (historical average July 15) (Table 2).

Female Chinook salmon lengths ranged from 545 to 940 mm, and male Chinook salmon ranged from 460 to 915 mm (Table 3). A total of 536 Chinook salmon were sampled for age composition, with 68 (13%) classified as unreadable, primarily due to scale regeneration. The age composition of sampled Chinook salmon included six age groups: age 1.2 (3%), age 1.3 (74%), age 1.4 (21%), age 2.3 (<1%), age 1.5 (1%), and age 2.4 (<1%) (Table 4). Females composed an estimated 37% of the overall escapement (Table 4). The age distributions of female and male Chinook salmon were different, with age 1.3 and 1.4 dominating at 52% and 44% respectively for females, and age 1.3 dominating at 87% for males.

The 2008 ADF&G aerial survey conducted on the Andreafsky River estimated 262 Chinook salmon for the main stem and 278 Chinook salmon for the east fork (Appendix 1), however survey conditions were poor. The main stem count was below the Sustainable Escapement Goal (SEG) of 640 to 1,600 Chinook salmon, and the east fork was below the SEG of 960-1,700 Chinook salmon (Hayes and Newland, 2008).

Summer Chum Salmon

The 2008 summer chum salmon escapement estimate of 57,259 fish was 76% of the 1994-2007 historical average of 75,491 fish (Figure 3; Appendix 3), and fell below the Biological Escapement Goal (BEG) of 65,000 to 130,000 fish (Appendix 1; JTC 2009). Peak passage (22,760 fish) occurred during the stratum of June 29 through July 5 (Table 1; Figure 4). The 2008 run timing was later than average. The first quartile passed on July 4 (historical average July 2), the mid-point of the run at the weir was July 6 (historical average July 5), and the third quartile passage date was July 14 (historical average July 11) (Table 2).

Female summer chum salmon lengths ranged from 465 to 660 mm and male summer chum salmon ranged from 490 to 700 mm (Table 3). A total of 887 summer chum salmon was sampled for age composition, with 141 (16%) classified as unreadable, primarily due to scale regeneration, or the scale was missing. The age composition of sampled summer chum salmon included three age groups: age 0.3 (15%), age 0.4 (81%), and age 0.5 (3%) (Table 5). Females comprised an estimated 46% of the overall escapement (Table 5). The age distributions of female and male summer chum salmon were similar with age 0.4 dominating, 76% for females and 86% for males.

Coho Salmon

Coho salmon enumeration was discontinued after the 2005 season due to insufficient funding for continuing weir operations into August and September. There were 2 coho salmon that passed through the weir prior to closure. The first coho salmon passed through the weir on July 29 (Appendix 4).

Pink Salmon

Pink salmon have strong returns to the East Fork Andreafsky River during even-numbered years and relatively weak returns during odd-numbered years (Appendix 5). The 2008 escapement through the weir (189,908 fish) was near the even-year 1994-2006 historical average of 198,558 fish. Pink salmon counts on the Andreafsky River are a measure of relative year to year abundance due to small pink salmon being able to pass uncounted between the weir pickets. Additionally, the 2008 pink salmon escapement estimate was incomplete since weir operation ceased before the end of the run. Peak passage (66,686 fish) occurred during the stratum of July 6 to 12 (Table 1).

Sockeye Salmon

The 2008 sockeye salmon escapement estimate of 272 fish was above the 1995-2007 historical average of 217 fish (Appendix 6). However, the 2008 sockeye salmon escapement estimate was incomplete since weir operation ceased before the end of the run. Large populations of sockeye salmon are absent in the Yukon River drainage (Bergstrom et al. 1995), but small populations have been identified in several Yukon River tributaries (Alt 1983; O'Brien 2006), including the Andreafsky River.

Conclusion

The East Fork Andreafsky River weir has been an important tool for monitoring salmon stocks originating in the Refuge, assisting both ADF&G and USFWS inseason managers with management of Yukon River fisheries. Due to the complexity of the Yukon River mixed-stock salmon fishery and the difficulty in managing specific stocks, it is vital to continue collecting information from individual salmon populations, including stocks in the Andreafsky River drainage. The East Fork Andreafsky weir is unique in that it is the only enumeration project in the lower river downstream of the Pilot Station sonar. The numerical, biological, and run timing information collected from the East Fork Andreafsky weir project is assumed to be representative of other Lower Yukon River systems experiencing lower salmon exploitation due to their location in the lower portion of the Yukon River drainage. This project allows managers to evaluate escapement goals, analyze trends in population size, length, age, and gender, formulate run projections, determine harvest allocations, and monitor long-term changes associated with climate change, harvest fluctuations, diseases, and other stressors.

If commercial interest in Yukon River coho salmon continues to grow, it is recommended that coho salmon enumeration be reinstated on the East Fork Andreafsky River to monitor the status of this stock. Investigations into spawning and rearing locations for sockeye salmon are recommended to assure long-term viability of this small unique population.

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Table 1. Salmon escapement estimates, by stratum, recorded at the East Fork Andreafsky River weir, Alaska, 2008.

Stratum dates	Chinook salmon	Chum salmon	Coho salmon	Pink salmon	Sockeye salmon
June 21 - 28	7	3,122	0	1,061	0
June 29 - July 5	299	22,760	0	31,375	83
July 6 - 12	1,839	13,853	0	66,686	70
July 13 - 19	1,439	13,659	0	34,432	41
July 20 - 30	658	3,865	2	56,354	78
Total	4,242	57,259	2	189,908	272

Table 2. Daily and cumulative estimates of Chinook salmon, summer chum salmon, and pink salmon, and daily and total estimates coho salmon, sockeye salmon, whitefish spp., northern pike, and Arctic grayling escapement through the East Fork Andreafsky River weir, Alaska, 2008.

	Chinook salmon		Chum salmon		Pink salmon		Coho salmon	Sockeye salmon	Whitefish spp.	Northern Pike	Arctic grayling
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Daily	Daily	Daily	Daily
21-Jun	0	0	1	1	0	0	0	0	43	5	1
22-Jun	0	0	57	58	10	10	0	0	52	3	0
23-Jun	0	0	30	88	13	23	0	0	46	3	0
24-Jun	0	0	73	161	5	28	0	0	36	0	0
25-Jun	1	1	34	195	83	111	0	0	34	0	0
26-Jun	0	1	1,160	1,355	214	325	0	0	42	3	0
27-Jun	5	6	902	2,257	343	668	0	0	33	0	0
28-Jun	1	7	865	3,122	393	1,061	0	0	21	2	0
29-Jun	10	17	1,920	5,042	964	2,025	0	0	15	0	2
30-Jun	7	24	1,095	6,137	580	2,605	0	0	21	0	0
1-Jul	14	38	1,718	7,855	883	3,488	0	1	27	0	0
2-Jul	44	82	2,963	10,818	2,197	5,685	0	16	27	1	1
3-Jul	41	123	2,367	13,185	1,969	7,654	0	10	45	2	0
4-Jul	50	173	4,572	17,757	4,814	12,468	0	29	26	1	0
5-Jul	133	306	8,125	25,882	19,968	32,436	0	27	196	3	0
6-Jul	301	607	5,285	31,167	19,672	52,108	0	15	47	2	0
7-Jul	610	1,217	2,598	33,765	24,204	76,312	0	18	67	2	0
8-Jul	777	1,994	2,763	36,528	16,687	92,999	0	25	69	1	0
9-Jul	110	2,104	1,438	37,966	4,900	97,899	0	3	29	3	0
10-Jul	7	2,111	193	38,159	331	98,230	0	2	10	1	0
11-Jul	11	2,122	300	38,459	247	98,477	0	2	22	0	0
12-Jul	23	2,145	1,276	39,735	645	99,122	0	5	14	0	0
13-Jul	53	2,198	1,955	41,690	1,351	100,473	0	5	43	0	0
14-Jul	76	2,274	2,019	43,709	1,559	102,032	0	3	26	2	0
15-Jul	265	2,539	2,322	46,031	3,432	105,464	0	15	31	0	0
16-Jul	355	2,894	3,646	49,677	6,532	111,996	0	6	52	1	0
17-Jul	277	3,171	1,497	51,174	6,793	118,789	0	5	15	1	0
18-Jul	283	3,454	1,324	52,498	7,304	126,093	0	2	41	2	0
19-Jul	130	3,584	896	53,394	7,461	133,554	0	5	75	0	0
20-Jul	57	3,641	691	54,085	5,356	138,910	0	6	34	0	0
21-Jul	58	3,699	594	54,679	6,588	145,498	0	5	31	0	0
22-Jul	130	3,829	572	55,251	2,759	148,257	0	2	48	0	0
23-Jul	104	3,933	535	55,786	2,995	151,252	0	9	19	0	0
24-Jul	75	4,008	383	56,169	5,388	156,640	0	3	28	1	0
25-Jul	49	4,057	335	56,504	2,986	159,626	0	5	17	1	0
26-Jul	35	4,092	142	56,646	2,450	162,076	0	12	9	1	0
27-Jul	26	4,118	191	56,837	4,106	166,182	0	12	10	0	0
28-Jul	61	4,179	149	56,986	7,982	174,164	0	7	9	0	0
29-Jul	39	4,218	168	57,154	8,201	182,365	2	7	7	0	0
30-Jul	24	4,242	105	57,259	7,543	189,908	0	10	10	0	0
Total	4,242		57,259		189,908**		2**	272**	1,427	41	4

[shaded box] indicates dates at which 25, 50, and 75 percent of the run had passed the weir.
** incomplete counts, weir removed

Table 3. Mid-eye to fork length (mm) at age of female and male Chinook salmon and summer chum salmon sampled at East Fork Andreafsky River weir, Alaska, 2008.

	Female					Male				
Age	N	Mean	Median	SE	Range	N	Mean	Median	SE	Range
Chinook salmon										
1.2	0	0	0	0.0	-	15	543	525	12.1	460-635
1.3	88	711	700	7.5	545-890	245	696	690	3.5	570-830
1.4	85	822	830	5.1	740-910	25	779	780	9.9	680-875
2.3	1	745	745	0.0	745-745	0	0	0	0.0	-
1.5	7	856	830	21.5	800-940	1	915	915	0.0	915-915
2.4	0	0	0	0.0	-	1	825	825	0.0	825-825
UNK	23	742	750	15.4	620-910	45	695	695	10.7	460-825
All Ages	204	766	775	5.7	545-940	332	696	695	3.8	460-915
Chum salmon										
0.2	0	0	0	0.0	-	0	0	0	0.0	-
0.3	80	526	520	3.2	470-600	42	557	555	3.9	515-630
0.4	271	539	540	1.7	465-660	330	579	580	1.8	490-690
0.5	10	547	552.5	9.2	505-600	13	604	620	8.7	545-645
UNK	54	536	535	4.1	470-600	86	585	585	3.9	490-700
All Ages	415	537	535	1.4	465-660	471	579	580	1.6	490-700

* One male chum salmon did not have a length measurement.

Table 4. Age and sex ratio estimates by stratum of Chinook salmon sampled at East Fork Andreafsky River weir, Alaska, 2008. Standard errors are in parentheses. Season totals are calculated from weighted weekly strata totals. Unknown age data are from unreadable scale samples and are listed for informational purposes. They were not included in age calculations.

					Brood year and age					
					2004	2003	2002	2002	2001	2001
Strata	Run size (N)	Sample size (n)	Unknown age	Percent female	1.2	1.3	1.4	2.3	1.5	2.4
June 21 - 28	7	6	0	67% (21.1)	17% (16.7)	67% (21.1)	17% (16.7)	0% (10.0)	0% (0.0)	0% (0.0)
June 29 - July 5	299	97	14	24% (4.3)	7% (2.9)	87% (3.7)	5% (2.4)	0% (0.0)	1% (1.2)	0% (0.0)
July 6 - 12	1,839	114	10	37% (4.5)	3% (1.6)	76% (4.2)	20% (4.0)	0% (0.0)	1% (1.0)	0% (0.0)
July 13 - 19	1,439	160	25	31% (3.7)	2% (1.3)	80% (3.5)	16% (3.1)	1% (0.7)	1% (1.0)	0% (0.0)
July 20 - 30	658	159	19	54% (4.0)	1% (1.0)	50% (4.2)	45% (4.2)	0% (0.0)	3% (1.4)	1% (0.7)
Total	4,224	536	68	37% (2.4)	3% (0.9)	74% (2.3)	21% (2.1)	<1% (0.3)	1% (0.6)	<1% (0.1)
Female	1,550	204	23		0% (0.0)	52% (4.3)	44% (4.3)	1% (0.7)	3% (1.1)	0% (0.0)
Male	2,692	332	45		4% (1.4)	87% (2.2)	8% (1.7)	0% (0.0)	1% (0.7)	<1% (0.2)

Table 5. Age and sex ratio estimates by stratum of summer chum salmon sampled at East Fork Andreafsky River weir, Alaska, 2008. Standard errors are in parentheses. Season totals are calculated from weighted weekly strata totals. Unknown age data are from unreadable scale samples and are listed for informational purposes. They were not included in age calculations.

					Brood year and age			
					2005	2004	2003	2002
Strata	Run size (N)	Sample size (n)	Unknown age	Percent female	0.2	0.3	0.4	0.5
June 21 - June 28	3,122	173	31	39% (3.7)	0% (0.0)	13% (2.8)	85% (3.0)	3% (1.4)
June 29 - July 5	22,760	168	20	43% (3.8)	0% (0.0)	14% (2.9)	82% (3.2)	4% (1.6)
July 6 - July 12	13,853	166	22	44% (3.9)	0% (0.0)	12% (2.7)	88% (2.7)	0% (0.0)
July 13 - July 19	13,659	169	29	49% (3.9)	0% (0.0)	20% (3.4)	76% (3.6)	4% (1.7)
July 20 - July 30	3,865	211	39	56% (3.4)	0% (0.0)	22% (3.2)	74% (3.4)	4% (1.7)
Total	57,259	887	141	46% (2.0)	0% (0.0)	15% (1.6)	81% (1.7)	3% (0.8)
Female	26,079	415	54		0% (0.0)	21% (2.6)	76% (2.7)	3% (1.1)
Male	31,180	472	87		0% (0.0)	11% (1.8)	86% (2.1)	3% (1.1)

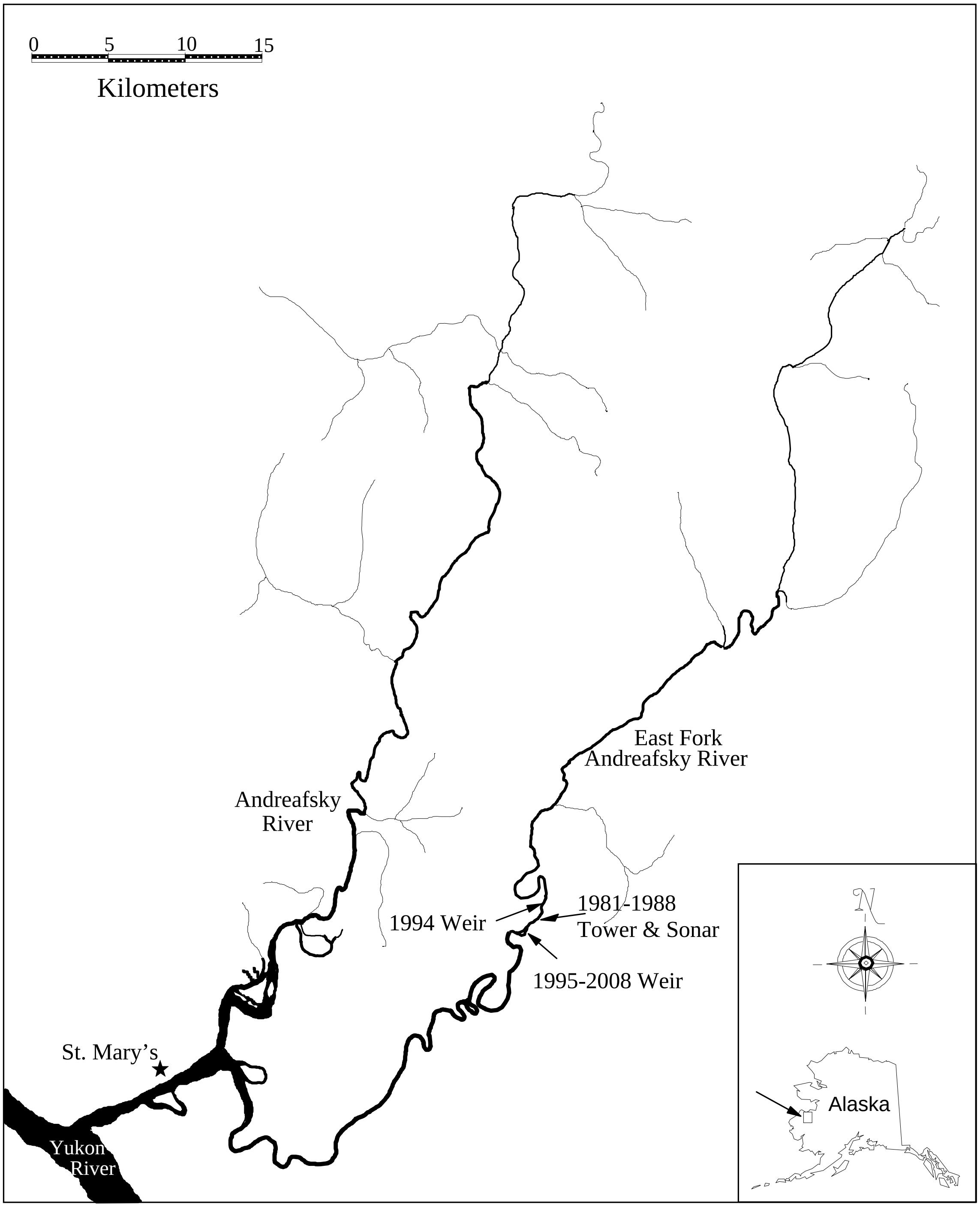

Figure 1. Weir locations in the East Fork Andreafsky River, Alaska, 1994-2008.

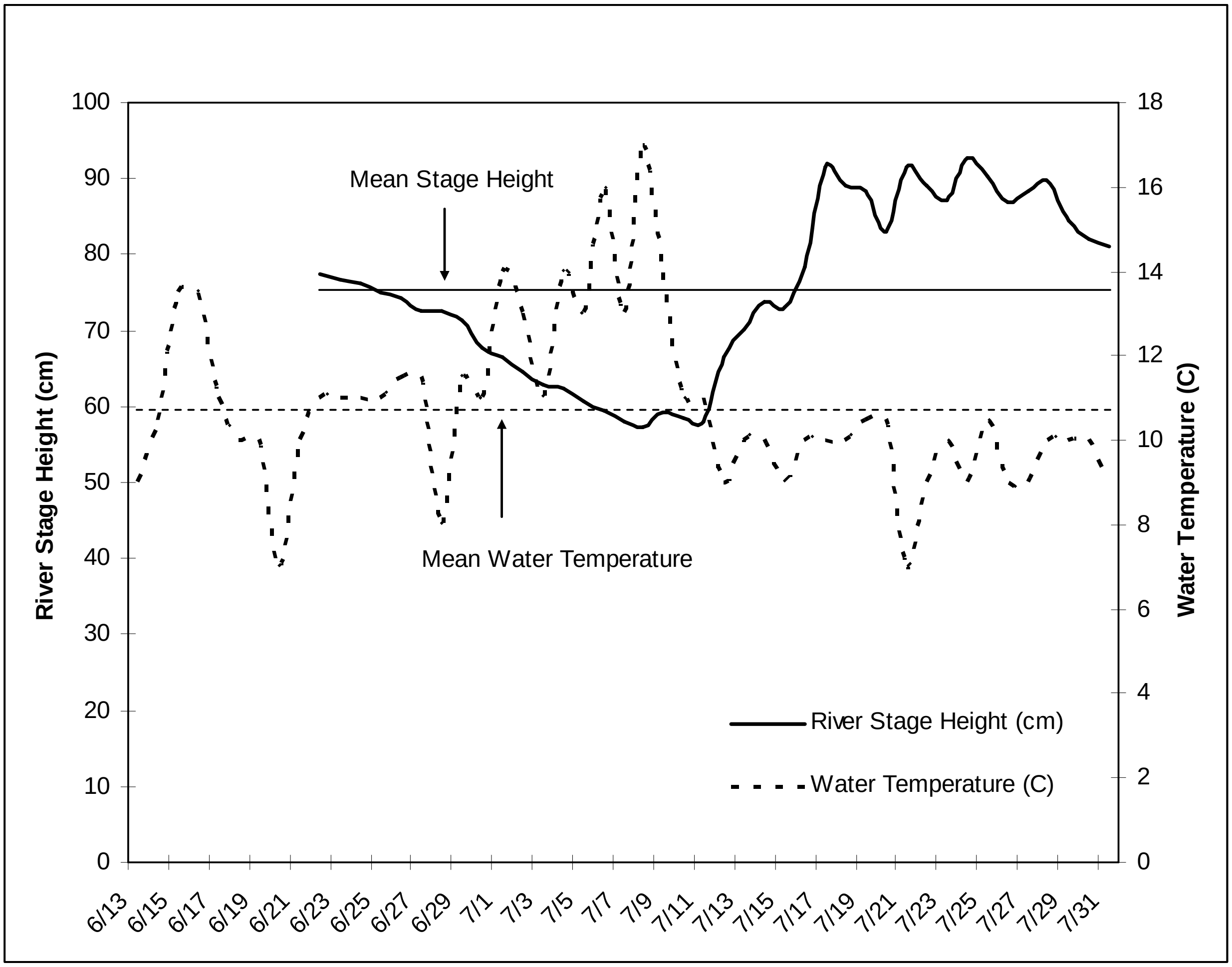

Figure 2. River stage heights and water temperatures at the East Fork Andreafsky River weir, 2008.

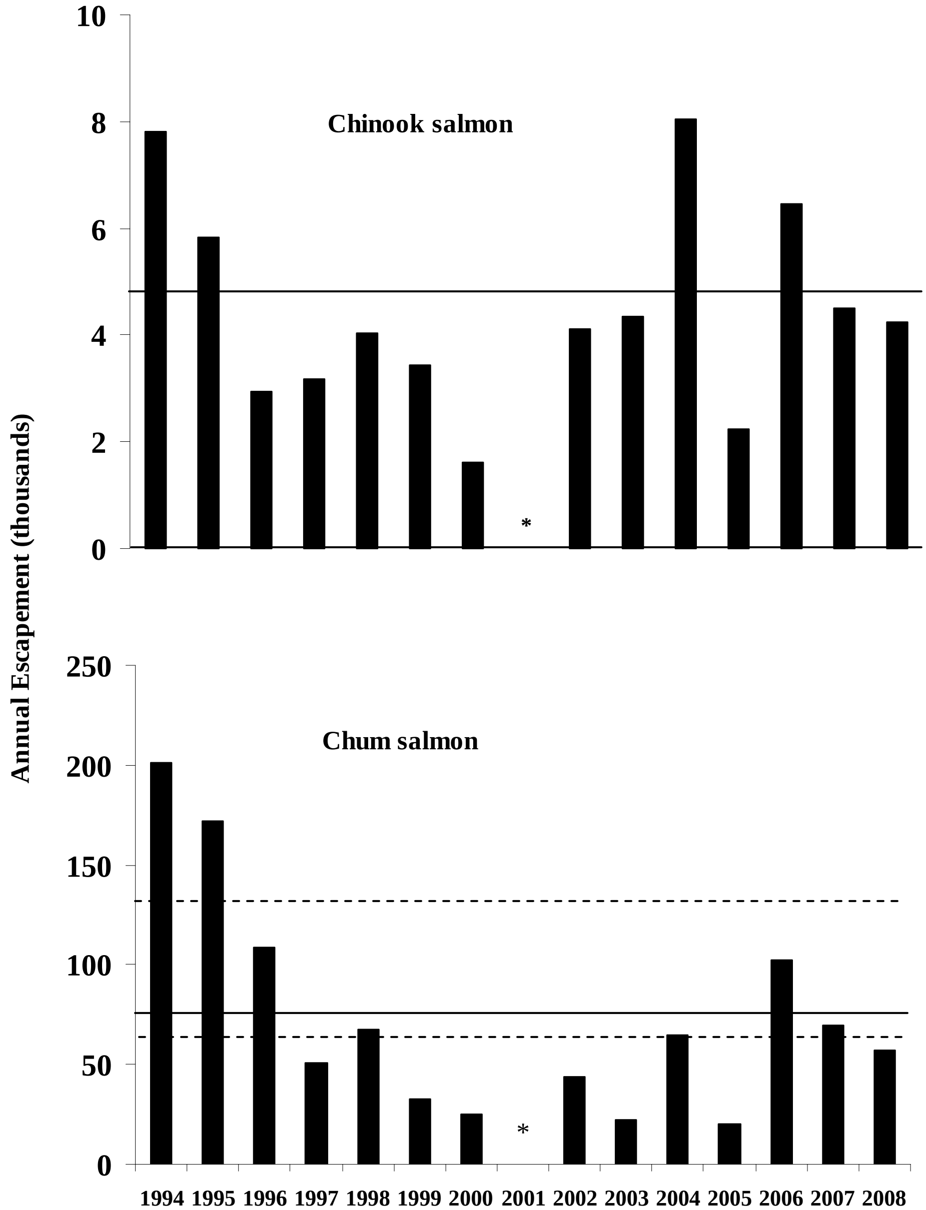

Figure 3. Annual escapement estimates of Chinook salmon and summer chum salmon migrating through the East Fork Andreafsky River weir, Alaska, 1994 to 2008. Historical average represented by the solid, horizontal line. The dotted lines in the summer chum salmon chart represent the maximum and minimum BEG. Asterisk denotes missing annual count due to high water.

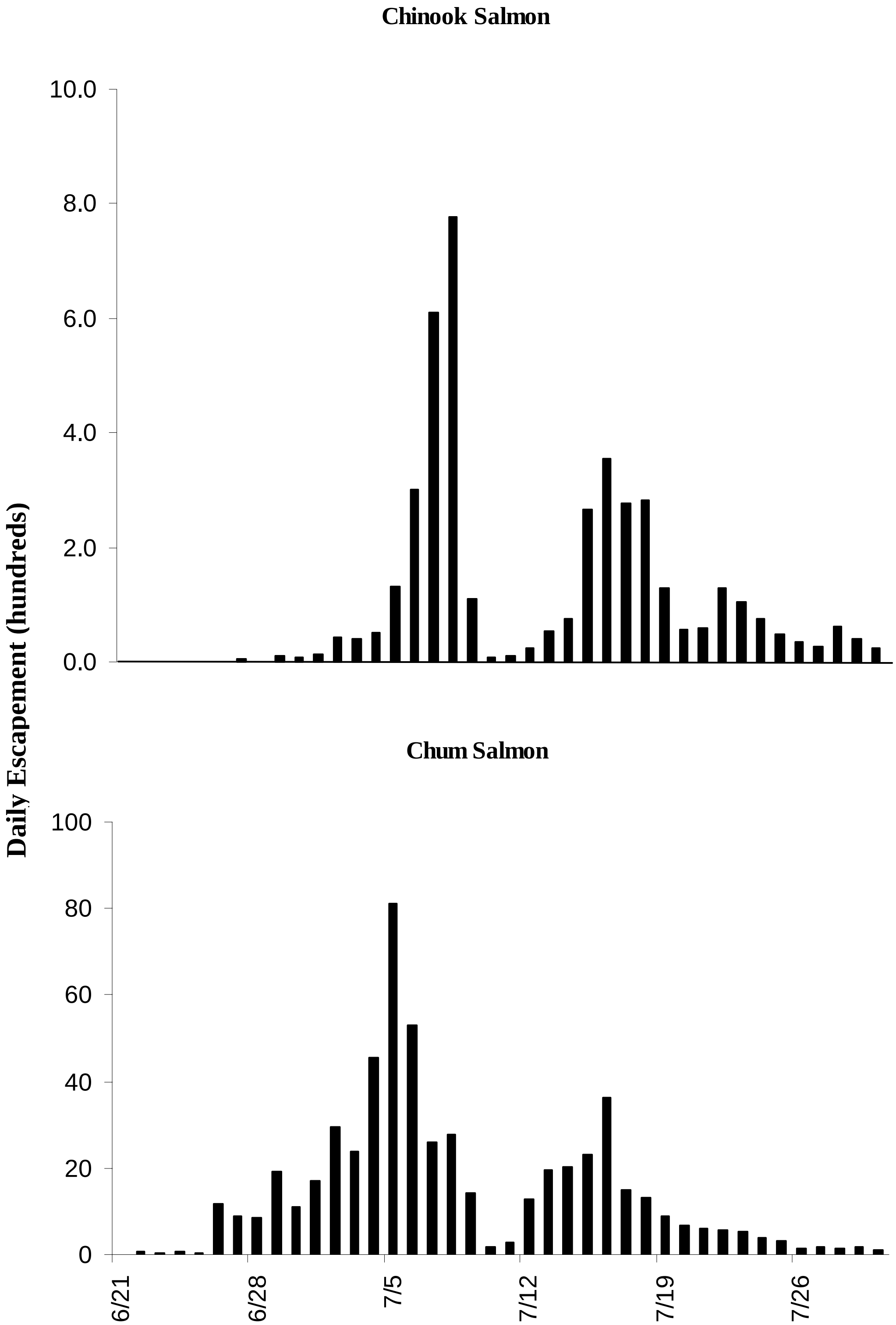

Figure 4.—Daily Chinook salmon and summer chum salmon escapement estimates through the East Fork Andreafsky River weir, Alaska, June 21 to July 30, 2008.

Appendix 1. Historical Chinook, summer chum, and coho salmon escapement estimates recorded for the Andreafsky River, Alaska, 1954-2008. Data provided by ADF&G from JTC (2009).

	East Fork Andreafsky River						Main-stem Andreafsky River		
	Aerial Index Estimates			Sonar, Tower, or Weir			Aerial Index Estimates		
Year	Chinook salmon	Chum salmon	Coho salmon	Chinook salmon	Chum salmon	Coho salmon	Chinook salmon	Chum salmon	Coho salmon
1954	*a*	*a*					2,000 *a*	7,000 *a*	
1955									
1956	336 *b*	15,356 *b*							
1957									
1958	50 *b*	3,500 *b*					150 *b*	30,000 *b*	
1959	150 *b*	4,000 *b*					300 *b*	7,000 *b*	
1960	1,020	10,530					1,220	6,016	
1961	1,003	8,110							
1962	675 *b*	18,040					762 *b*	19,530	
1963									
1964	867	8,863					705	12,810	
1965							355 *b*	14,670 *b*	
1966	361	25,619 *b*					303	18,145	
1967							276 *b*	14,495 *b*	
1968	380	17,600					383 *b*	74,600 *b*	
1969	231 *b*	119,000					374 *b*	159,500 *b*	
1970	665	84,090					574 *b*	91,710 *b*	
1971	1,904	98,095					1,682	71,745	
1972	798 *b*	41,460 *b*					582 *b*	25,573	
1973	825	10,149 *b*					788	51,835	
1974		3,215 *b*					285	33,578	
1975	993	223,485					301	235,954	
1976	818	105,347					643	118,420	
1977	2,008	112,722					1,499	63,120	
1978	2,487	127,050					1,062	57,321	
1979	1,180	66,471					1,134	43,391	
1980	958 *b*	36,823 *b*					1,500	115,457	
1981	2,146 *b*	81,555	1,657 *b*	5,343 *c*	147,312 *c*		231 *b*		
1982	1,274	7,501 *b*			180,078 *c*		851	7,267 *b*	
1983				2,720 *c*	110,608 *c*				
1984	1,573 *b*	95,200 *b*			70,125 *c*		1,993	238,565	
1985	1,617	66,146					2,248	52,750	
1986	1,954	83,931		1,530 *d*	167,614 *d*		3,158	99,373	
1987	1,608	6,687 *b*		2,011 *d*	45,221 *d*		3,281	35,535	
1988	1,020	43,056	1,913	1,339 *d*	68,937 *d*		1,448	45,432	830
1989	1,399	21,460 *b*					1,089		
1990	2,503	11,519 *b*					1,545	20,426 *b*	
1991	1,938	31,886					2,544	46,657	
1992	1,030 *b*	11,308 *b*					2,002 *b*	37,808 *b*	
1993	5,855	10,935 *b*					2,765	9,111 *b*	
1994	300 *b*			7,801	200,981 *f*		213 *b*		
1995	1,635			5,841	172,148	10,901	1,108		
1996				2,955	108,450	8,037	624		
1997	1,140			3,186	51,139	9,472	1,510		
1998	1,027			4,034	67,720	5,417 *e*	1,249 *b*		
1999	*b*			3,444	32,587	2,963	870 *b*		

Appendix 1. Continued.

	East Fork Andreafsky River						Main-stem Andreafsky River		
	Aerial Index Estimates			Sonar, Tower, or Weir			Aerial Index Estimates		
Year	Chinook salmon	Chum salmon	Coho salmon	Chinook salmon	Chum salmon	Coho salmon	Chinook salmon	Chum salmon	Coho salmon
2000	1,018			1,609	24,785	8,451	427		
2001	1,065			1,148 *f*	2,134 *f*	15,896 *e*	570		
2002	1,447			4,123	44,194	3,577	977		
2003	1,116 *b*			4,336	22,461	8,231	1,578 *b*		
2004	2,879			8,045	64,883	11,146	1,317		
2005	1,715			2,239	20,127	5,303	1,492		
2006	590 *b*			6,463	102,260	23 *g*	824		
2007	1,758			4,504	69,642	9 *g*	976		
2008	278 *b*			4,242	57,259	2 *g*	262 *b*		
SEG *h*	960 - 1,900						640 - 1,600		
BEG *i*					65,000 - 130,000				

a Counts for both forks were combined into Andreafsky River count.
b Incomplete survey and/or poor survey timing or conditions resulting in minimal or inaccurate count.
c Sonar count.
d Tower count.
e Incomplete count, missing data not estimated
f Weir installed too late for an accurate count
g Incomplete count, weir removed
h Sustainable Escapement Goals.
i Biological Escapement Goals.

Appendix 2. Historical daily Chinook salmon escapements recorded at the East Fork Andreafsky River weir 1994-2008. Data for 2001 were not used in calculations and are shown for informational purposes only.

Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
15-Jun				0											
16-Jun		0		0											
17-Jun		0		0		0									
18-Jun		0		0		0									
19-Jun		0	0	0		0			0	0				0	
20-Jun		1	0	0		0			0	0				0	
21-Jun		0	10	0		0			1	0				0	0
22-Jun		1	0	0		0			20	0				0	0
23-Jun		0	33	14	0	0			0	4	67			0	0
24-Jun		2	6	21	0	0			0	2	26			0	0
25-Jun		0	0	59	0	0			3	7	15			7	1
26-Jun		0	59	0	0	0			1	3	55	16		2	0
27-Jun		41	42	101	1	0			26	12	181	2		0	5
28-Jun		48	19	11	0	0			314	19	534	42	0	0	1
29-Jun	1	67	6	1	10	0			119	4	290	88	6	4	10
30-Jun	188	104	8	0	34	47	9		27	0	461	238	51	7	7
1-Jul	141	81	72	75	93	19	16		319	176	582	11	40	134	14
2-Jul	54	71	21	24	17	9	39		105	295	25	89	13	197	44
3-Jul	222	17	205	29	36	0	89		230	22	375	135	51	75	41
4-Jul	156	55	124	49	75	12	74		5	6	353	114	128	277	50
5-Jul	651	107	309	98	336	97	38		20	83	263	111	276	141	133
6-Jul	225	678	258	356	373	42	407		356	136	1,187	154	437	476	301
7-Jul	1,156	433	280	227	386	114	18		307	336	878	271	574	442	610
8-Jul	108	155	244	123	204	197	71		130	469	463	169	392	157	777
9-Jul	351	260	186	49	129	216	17		178	823	503	46	86	299	110
10-Jul	375	250	111	64	167	256	30		191	48	368	7	165	255	7
11-Jul	288	382	72	69	255	507	57		264	107	122	15	449	86	11
12-Jul	581	1,022	52	88	138	214	35		166	345	315	9	1,108	653	23
13-Jul	779	697	100	15	62	331	55		191	311	106	58	201	103	53
14-Jul	433	375	96	16	61	97	18		158	340	105	108	67	96	76
15-Jul	352	292	62	124	91	22	90	169	140	2	53	49	117	28	265
16-Jul	389	97	95	274	197	33	76	87	210	7	58	55	262	25	355
17-Jul	144	46	110	91	263	75	62	41	119	25	54	30	714	34	277
18-Jul	285	38	55	25	184	63	48	196	94	235	29	14	371	132	283
19-Jul	161	25	42	70	240	65	34	71	75	158	40	22	264	78	130
20-Jul	53	37	69	264	67	302	22	107	50	28	57	17	164	35	57
21-Jul	66	74	51	148	129	55	12	175	29	10	40	50	161	95	58
22-Jul	62	33	26	35	117	67	21	66	12	2	13	51	166	249	130
23-Jul	209	24	2	103	57	15	6	15	32	23	17	15	117	59	104
24-Jul	149	7	4	57	66	54	11	5	16	58	12	22	48	63	75
25-Jul	25	78	6	0	12	24	10	17	7	31	19	46	25	102	49
26-Jul	51	21	3	11	8	5	9	7	3	4	5	4	8	33	35
27-Jul	92	12	6	3	8	34	7	17	6	22	14	4	2	149	26
28-Jul	20	15	16	29	11	6	3	10	3	108	23	4		4	61
29-Jul	10	9	13	58	23	159	57	41	4	28	19	0		4	39
30-Jul	13	5	7	144	31	80	4	16	2	4	7	4		3	24
31-Jul	10	1	10	2	17	59	20	11	46	0	15	3			
1-Aug	1	8	4	8	20	38	12	8	55	2	13	2			
2-Aug		2	2	4	4	18	4	12	48	5	4	2			
3-Aug		13	2	128	11	42	24	4	10	1	3	8			
4-Aug		5	5	2	1	11	19	8	3	1	6	4			

Appendix 2. Continued.

Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
5-Aug		6	6	1	7	5	14	6	3	4	5	8			
6-Aug		6	2	0	9	2	9	1	4	0	10	4			
7-Aug		19	7	1	10	1	4	11	4	1	8	3			
8-Aug		20	3	2	3	4	7	0	0	3	6	2			
9-Aug		25	2	2	5	0	10	4	0	1	13	9			
10-Aug		25	5	1	7	1	3	2	0	0	39	35			
11-Aug		7	2	1	1	2	8	1	4	1	17	14			
12-Aug		4	3	7	8	5	4	1	0	1	23	2			
13-Aug		11	0	14	7	3	1	10	1	2	21	2			
14-Aug		2	0	18	1	9	3	0	1	3	19	5			
15-Aug		2	0	26	0	2	6	11	0	3	17	7			
16-Aug		3	3	2	12	4	2	8	0	2	16	3			
17-Aug		3	0	4	9	7	1	2	3	1	14	1			
18-Aug		3	2	3	5	3	2	2	0	1	10	3			
19-Aug		2	2	3	2	0	2	2	1	2	9	3			
20-Aug		1	3	2	2	6	3	1	0	2	6	2			
21-Aug		2	3	1	2	0	1	0	0	0	8	2			
22-Aug		0	0	4	1	1	1	1	5	0	5	0			
23-Aug		1	2	2	1	0	0	0	0	0	1	5			
24-Aug		1	0	1	1	0	1	1	1	2	3	0			
25-Aug		0	0	4	1	0	0	0	0	2	1	1			
26-Aug		0	1	0	1	1	2	0	0	1	0	3			
27-Aug		0	0	0	0	1	0	0	0	0	1	3			
28-Aug		3	0	1	0	0	0	0	0	0	0	7			
29-Aug		1	2	2	0	0	0	0	0	0	0	6			
30-Aug		0	1	3	1	0	0	0	1	0	4	5			
31-Aug		0	2	1	1	0	0	0	0	0	2	2			
1-Sep		1	0	0	0	0	0	0	0	0	2	3			
2-Sep		0	0	0	0	1	1	0	0	0	0	3			
3-Sep		0	0	4	0	0	0	0	0	0	0	2			
4-Sep		0	0	0	0	0	0	0	0	0	1	3			
5-Sep		1	0	1	0	1	0	0	0	0	1	1			
6-Sep		0	1	1	0	0	0	0	0	0	2	0			
7-Sep		0	0	0	1	0	0	0	0	0	0	0			
8-Sep		3	0	2	0	0	0	0	0	0	1	1			
9-Sep		0	0	1	1	0	0	0	0	1	1	0			
10-Sep		0	0	0	0	0	0	0	0	0	0	0			
11-Sep		0	0	0	1	0	0	0	0	0	2	0			
12-Sep		0	0	2	0		0	0	0	0	0				
13-Sep			0	0	0		0	0	0	0	0				
14-Sep			0				0	0	0	0	0				
15-Sep			0				0	1		1	0				
16-Sep			0				0				0				
17-Sep			0				0				1				
18-Sep							0				0				
19-Sep							0				1				
20-Sep							0								
21-Sep							0								
22-Sep							0								
23-Sep							0								
Total	7,801	5,841	2,955	3,186	4,034	3,444	1,609	**	4,123	4,336	8,045	2,239	6,463	4,504	4,242

= estimated escapement counts
= adjusted escapement counts
** = incomplete count, missing data not estimated

Appendix 3. Historical daily summer chum salmon estimates recorded at the East Fork Andreafsky River weir 1994-2008. Data for 2001 were not used in calculations and are shown for informational purposes only.

Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2,005	2006	2007	2008
15-Jun				0											
16-Jun		52		1											
17-Jun		332		4		0									
18-Jun		191		71		0									
19-Jun		423	62	539		0			0	0				0	
20-Jun		2,198	424	981		0			0	0				0	
21-Jun		861	3,315	192		0			117	2				0	1
22-Jun		1,170	1,036	53		0			1,782	87				2	57
23-Jun		228	11,195	3,141	13	1			0	564	3,045			0	30
24-Jun		1,951	798	1,620	18	1			6	182	1,062			29	73
25-Jun		364	303	1,422	264	0			522	484	985			1166	34
26-Jun		504	7,306	208	175	7			694	183	2,467	256		348	1160
27-Jun		12,620	3,435	1,691	535	8			2,448	396	4,638	9		70	902
28-Jun		11,201	1,463	1,196	65	0			6,754	546	8,461	424	1,272	362	865
29-Jun	609	9,256	2,335	61	3,153	331			1,765	219	3,807	473	2,822	1644	1920
30-Jun	19,254	10,938	314	80	4,585	4,459	837		836	271	7,081	432	14,912	1785	1095
1-Jul	12,435	8,654	9,164	1,537	4,003	765	1,725		4,403	928	1,590	239	10,229	3581	1718
2-Jul	2,840	5,553	3,326	619	652	459	1,460		2,467	339	153	1,081	2,395	3463	2963
3-Jul	4,973	2,710	8,973	756	1,687	24	1,750		2,291	713	5,689	1,063	7,291	2694	2367
4-Jul	13,321	10,678	10,018	1,264	3,561	3,000	2,070		28	175	3,940	1,238	14,018	4834	4572
5-Jul	12,552	10,026	7,355	831	7,996	4,605	2,300		347	484	2,011	993	9,389	4725	8125
6-Jul	4,043	23,584	3,351	3,428	6,030	1,185	3,717		4,423	1,051	1,791	1,218	7,738	3852	5285
7-Jul	27,527	8,514	3,124	2,980	4,696	1,619	72		2,254	1,376	2,474	1,839	4,225	1980	2598
8-Jul	5,251	732	4,771	2,440	3,088	1,569	1,548		845	2,476	2,096	1,270	3,614	1919	2763
9-Jul	3,883	4,808	3,500	1,799	845	1,754	942		2,265	2,025	1,990	1,112	2,351	4559	1438
10-Jul	12,416	6,473	2,303	3,195	1,003	2,135	727		1,732	244	2,069	1,370	3,478	6021	193
11-Jul	6,896	6,072	1,275	1,792	4,003	1,897	855		1,221	412	1,609	195	2,631	1455	300
12-Jul	8,424	3,973	1,497	1,738	4,401	501	477		1,099	1,762	1,815	197	1,609	2362	1276
13-Jul	14,628	4,552	1,680	1,062	829	710	911		1,055	586	1,071	1,458	725	1219	1955
14-Jul	11,611	2,990	1,038	1,302	1,248	1,223	352		544	254	896	1,242	330	1394	2019
15-Jul	8,275	2,874	935	3,222	2,160	412	638	196	1,014	33	605	557	1,127	860	2322
16-Jul	4,690	3,449	1,280	2,441	2,747	507	551	133	581	123	569	449	1,441	1867	3646
17-Jul	4,886	2,739	774	1,150	3,038	547	464	95	420	445	465	196	2,564	3294	1497
18-Jul	4,532	1,495	852	715	1,580	494	377	229	492	1,078	326	246	1,637	3834	1324
19-Jul	2,977	651	1,848	624	1,365	666	290	102	392	708	217	141	1,294	1349	896
20-Jul	1,091	1,150	1,721	1,220	370	816	206	74	192	681	276	523	924	468	691
21-Jul	1,351	807	1,116	800	335	242	424	228	153	283	142	493	944	700	594
22-Jul	2,228	591	605	668	304	240	280	72	61	47	59	182	921	1895	572
23-Jul	1,320	742	246	405	248	201	116	29	201	306	77	167	715	1417	535
24-Jul	868	290	291	313	200	173	84	32	98	222	116	54	548	1208	383
25-Jul	1,349	1,214	196	121	220	131	159	155	26	348	171	80	452	1784	335
26-Jul	1,977	521	365	339	166	73	130	116	22	218	85	28	334	645	142
27-Jul	2,196	605	278	400	130	132	64	110	60	220	69	32	330	444	191
28-Jul	841	265	738	219	202	92	43	88	123	389	73	100		95	149
29-Jul	564	211	334	234	145	245	173	78	17	220	52	112		179	168
30-Jul	524	248	272	131	115	242	70	37	36	61	37	74		139	105
31-Jul	410	94	260	86	140	200	172	10	119	80	34	79			
1-Aug	239	160	93	134	191	158	89	24	81	104	17	50			
2-Aug		81	158	81	91	118	125	40	33	111	21	25			
3-Aug		147	91	182	76	124	109	28	36	40	28	23			
4-Aug		59	192	48	56	117	83	17	40	91	22	5			

Appendix 3. Continued.

Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
5-Aug		77	132	101	73	45	57	13	3	182	25	24			
6-Aug		115	215	77	71	17	31	2	7	52	31	30			
7-Aug		76	163	29	104	11	5	7	13	85	33	14			
8-Aug		78	54	31	77	16	12	7	5	44	16	19			
9-Aug		70	110	44	34	10	10	7	5	21	36	9			
10-Aug		61	137	17	57	32	13	4	13	21	26	8			
11-Aug		35	63	14	39	14	10	4	11	27	34	18			
12-Aug		60	65	65	77	29	9	3	2	40	26	10			
13-Aug		73	26	36	100	16	22	15	0	21	30	3			
14-Aug		62	35	33	58	6	13	9	0	52	35	7			
15-Aug		49	59	31	34	10	4	9	1	43	39	9			
16-Aug		95	80	46	32	13	4	11	6	35	44	8			
17-Aug		64	35	37	27	10	5	6	1	27	48	5			
18-Aug		83	33	58	21	6	13	6	2	19	18	11			
19-Aug		41	110	43	16	3	5	10	0	32	7	0			
20-Aug		45	33	95	15	3	3	7	2	22	12	1			
21-Aug		47	64	54	13	19	0	7	0	21	5	3			
22-Aug		43	27	37	12	2	1	3	2	10	4	2			
23-Aug		35	37	31	10	6	2	10	3	12	3	25			
24-Aug		35	26	41	9	5	4	5	3	11	14	4			
25-Aug		56	103	41	8	5	6	4	3	24	5	6			
26-Aug		53	35	18	6	2	19	2	1	13	2	3			
27-Aug		57	26	20	5	9	17	3	0	11	2	3			
28-Aug		31	39	38	3	7	13	3	1	5	10	20			
29-Aug		53	78	57	2	5	10	1	0	14	8	22			
30-Aug		34	66	73	4	11	9	4	0	6	19	24			
31-Aug		63	31	21	11	13	2	11	0	2	20	12			
1-Sep		48	38	14	8	18	6	10	0	1	22	7			
2-Sep		75	40	13	4	19	5	9	0	1	14	10			
3-Sep		36	49	53	5	15	4	8	0	5	5	28			
4-Sep		25	48	28	8	5	2	7	0	0	5	9			
5-Sep		30	37	38	1	4	1	6	0	0	16	4			
6-Sep		50	29	31	8	4	1	6	0	2	8	13			
7-Sep		60	50	51	6	3	1	5	1	4	11	7			
8-Sep		96	39	28	4	2	0	4	0	2	12	6			
9-Sep		42	32	22	3	2	0	3	0	3	4	3			
10-Sep		42	32	24	9	3	9	2	2	1	3	8			
11-Sep		37	24	48	10	4	3	0	1	0	6	7			
12-Sep		15	16	42	3		5	1	8	16	2				
13-Sep			18	23	4		1	1	2	3	6				
14-Sep			39				2	3	1	1	3				
15-Sep			33				5	3		3	3				
16-Sep			38				18				2				
17-Sep							3				5				
18-Sep							6				0				
19-Sep							4				3				
20-Sep							8								
21-Sep							10								
22-Sep							1								
23-Sep							1								
Total	200,981	172,148	108,450	51,139	67,720	32,587	24,785	**	44,194	22,461	64,883	20,127	102,260	69,642	57,259

= estimated escapement counts
= adjusted escapement counts
** = incomplete count, missing data not estimated

Appendix 4. Historical daily coho salmon estimates recorded at the East Fork Andreafsky River weir, 1995-2008. Data for 1998 and 2001 were not used in calculations and are shown for informational purposes only.

Date	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2,005	2006	2007	2008
15-Jun			0											
16-Jun	0		0											
17-Jun	0		0		0									
18-Jun	0		0		0									
19-Jun	0	0	0		0			0	0				0	
20-Jun	0	0	0		0			0	0				0	
21-Jun	0	0	0		0			0	0				0	0
22-Jun	0	0	0		0			0	0				0	0
23-Jun	0	0	0	0	0			0	0	0			0	0
24-Jun	0	0	0	0	0			0	0	0			0	0
25-Jun	0	0	0	0	0			0	0	0			0	0
26-Jun	0	0	0	0	0			0	0	0	0		0	0
27-Jun	0	0	0	0	0			0	0	0	0		0	0
28-Jun	0	0	0	0	0			0	0	0	0	0	0	0
29-Jun	0	0	0	0	0			0	0	0	0	0	0	0
30-Jun	0	0	0	0	0	0		0	0	0	0	0	0	0
1-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0
2-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0
3-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0
4-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0
5-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0
6-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0
7-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0
8-Jul	0	0	0	0	0	0		0	1	0	0	0	0	0
9-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0
10-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0
11-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0
12-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0
13-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0
14-Jul	0	0	0	0	0	0		0	0	0	0	0	0	0
15-Jul	0	0	0	0	0	0	0	0	2	0	0	0	0	0
16-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Jul	0	0	0	0	0	0	0	0	0	1	0	0	0	0
20-Jul	0	0	0	0	0	0	0	0	1	0	0	0	0	0
21-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Jul	0	11	0	0	0	0	0	0	0	0	0	2	0	0
24-Jul	0	2	0	0	0	0	0	0	2	0	0	5	0	0
25-Jul	0	1	0	0	0	0	0	0	0	0	0	7	3	0
26-Jul	0	4	0	0	0	0	0	0	0	0	0	4	2	0
27-Jul	0	0	0	0	0	0	0	0	0	0	0	5	0	0
28-Jul	0	3	0	1	0	0	0	0	0	2	0	0	1	0
29-Jul	0	3	0	0	0	0	0	0	0	0	0		0	2
30-Jul	0	9	0	1	0	1	0	0	1	1	0		3	0
31-Jul	0	25	0	0	0	1	0	0	2	2	0			
1-Aug	0	1	0	0	0	7	0	0	0	1	1			
2-Aug	0	7	0	1	0	9	0	0	1	4	0			
3-Aug	1	4	0	5	0	18	0	0	1	0	0			
4-Aug	0	15	0	8	9	16	0	1	1	0	1			

Appendix 4. Continued.

Date	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
5-Aug	0	20	0	8	4	14	0	0	2	8	0			
6-Aug	0	10	0	5	4	13	0	0	4	10	0			
7-Aug	1	26	1	16	0	12	0	0	28	14	1			
8-Aug	1	20	0	9	0	35	0	0	25	16	4			
9-Aug	3	26	0	5	1	79	0	0	27	98	2			
10-Aug	8	138	0	8	2	125	0	1	5	62	2			
11-Aug	12	105	0	3	2	89	0	0	9	115	0			
12-Aug	5	50	10	4	5	51	0	0	19	86	0			
13-Aug	3	16	47	111	1	211	0	0	40	78	0			
14-Aug	3	11	35	71	1	137	1	0	194	71	4			
15-Aug	9	19	6	9	0	64	22	0	146	63	9			
16-Aug	5	276	8	61	5	34	33	0	98	56	37			
17-Aug	11	92	7		2	23	5	0	50	48	6			
18-Aug	24	179	12		0	137	5	0	2	163	173			
19-Aug	41	1,052	13	8	0	108	51	1	7	384	24			
20-Aug	24	100	50		1	333	532	0	21	170	4			
21-Aug	95	149	414		42	303	270	0	11	185	2			
22-Aug	246	9	222		48	59	312	3	3	150	2			
23-Aug	305	32	22		0	10	343	6	24	80	21			
24-Aug	414	12	16		26	44	583	3	263	185	101			
25-Aug	245	1,539	577		8	533	217	7	1,744	243	19			
26-Aug	692	449	150		4	1,401	857	0	634	453	102			
27-Aug	1,436	5	10		4	1,643	382	0	288	17	128			
28-Aug	368	1	24		3	279	403	2	197	4	1,084			
29-Aug	938	179	2,335	371	0	626	103	0	243	38	475			
30-Aug	335	1,489	2,714	618	2	278	1,078	0	552	178	647			
31-Aug	265	374	122	568	1	192	2,264	0	729	490	218			
1-Sep	444	374	73	336	411	358	1,576	0	172	505	23			
2-Sep	863	147	53	17	162	238		14	107	897	23			
3-Sep	14	100	421	80	1,255	162		29	9	234	476			
4-Sep	29	250	355	490	704	160		43	646	167	483			
5-Sep	6	337	219	228	122	39		640	275	609	77			
6-Sep	21	78	514	591	40	46		738	14	1,550	128			
7-Sep	164	84	435	12	0	52		413	42	1,011	207			
8-Sep	2,403	24	169	0	14	48		345	459	578	80			
9-Sep	854	16	223	94	19	55		103	268	337	194			
10-Sep	391	1	52	555	41	94	85	237	9	535	343			
11-Sep	127	0	83	1,104	20	31	30	117	211	259	202			
12-Sep	95	0	64	6		79	20	726	231	13				
13-Sep		0	16	13		30	43	113	399	57				
14-Sep		0				22	21	35	8	37				
15-Sep		3				16	16		4	201				
16-Sep		160				28				240				
17-Sep						19				241				
18-Sep						3				42				
19-Sep						5				157				
20-Sep						5								
21-Sep						34								
22-Sep						32								
23-Sep						10								
Total	10,901	8,037	9,472	5,417**	2,963	8,451	9,252**	3,577	8,231	11,146	5,303	23*	9*	2*

Appendix 5. Historical daily pink salmon escapement estimates recorded at the East Fork Andreafsky River weir, 1994-2008. Data for 2001 were not used in calculations and are shown for informational purposes only.

Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
15-Jun				0											
16-Jun		0		0											
17-Jun		0		0		0									
18-Jun		0		0		0									
19-Jun		0	12	0		0			0	0				0	
20-Jun		0	4	0		0			0	0				0	
21-Jun		0	40	0		0			52	0				0	0
22-Jun		0	42	0		0			462	0				0	10
23-Jun		0	157	0	0	0			0	0	19			0	13
24-Jun		0	67	0	0	0			22	0	15			0	5
25-Jun		0	24	0	8	0			148	3	24			0	83
26-Jun		0	153	0	3	0			338	0	102	0		0	214
27-Jun		1	218	1	22	0			431	6	189	2		0	343
28-Jun		0	80	0	2	0			7,808	4	341	10	43	0	393
29-Jun	8	2	78	0	112	0			5,076	3	374	27	54	3	964
30-Jun	451	3	41	0	258	0	18		1,509	0	1,671	97	314	2	580
1-Jul	409	13	184	2	750	0	5		6,192	16	1,049	15	281	5	883
2-Jul	194	4	107	0	65	0	383		3,345	12	140	89	134	38	2,197
3-Jul	305	4	347	0	704	0	52		6,876	13	1,186	453	326	36	1,969
4-Jul	780	5	1,254	1	1,008	0	224		257	13	2,327	652	1,431	143	4,814
5-Jul	1,027	9	6,678	0	3,595	0	162		1,626	16	5,175	985	1,325	184	19,968
6-Jul	772	98	4,676	2	4,136	2	1,228		13,433	24	4,203	2,334	3,092	251	19,672
7-Jul	4,026	77	3,834	0	4,292	2	354		10,268	94	17,994	3,071	8,096	164	24,204
8-Jul	1,736	4	7,472	1	2,968	1	972		4,815	172	13,079	2,443	13,219	125	16,687
9-Jul	4,263	18	8,905	2	1,382	2	1,680		8,765	259	16,044	1,692	7,941	278	4,900
10-Jul	4,744	33	10,290	1	1,169	10	897		12,942	16	22,171	1,266	11,605	461	331
11-Jul	3,313	23	5,822	2	9,872	20	7,849		10,764	43	15,664	1,453	13,327	112	247
12-Jul	8,447	100	4,662	4	21,285	17	2,726		9,207	185	15,661	385	14,844	315	645
13-Jul	13,568	109	9,484	6	11,399	18	7,044		9,161	173	15,313	2,865	7,204	74	1,351
14-Jul	24,842	94	11,760	1	5,846	7	1,468		7,819	189	25,780	5,106	1,117	129	1,559
15-Jul	22,460	81	9,754	35	21,785	2	966	10	6,958	28	16,578	2,489	2,858	103	3,432
16-Jul	20,612	64	13,476	31	11,087	2	1,206	4	8,224	13	22,322	1,992	2,816	367	6,532
17-Jul	27,053	60	12,222	13	23,930	4	1,446	5	6,724	96	16,143	678	8,969	518	6,793
18-Jul	18,277	31	12,682	5	31,639	4	1,686	26	8,701	702	14,713	945	17,205	843	7,304
19-Jul	20,792	15	14,282	6	27,014	14	1,926	15	6,058	459	15,635	450	18,690	524	7,461
20-Jul	23,511	30	17,477	4	7,204	69	2,170	47	1,983	288	28,631	1,140	18,357	642	5,356
21-Jul	10,872	40	18,780	4	4,672	38	2,549	61	1,239	98	19,851	1,852	13,319	342	6,588
22-Jul	8,975	48	13,018	4	2,460	41	1,143	19	564	18	12,446	814	16,186	1,040	2,759
23-Jul	17,692	77	4,744	5	3,512	25	454	18	1,060	107	9,880	723	11,435	393	2,995
24-Jul	15,120	25	3,778	2	7,181	23	609	38	1,092	107	9,973	256	9,612	306	5,388
25-Jul	3,566	216	2,473	0	5,278	22	1,055	124	385	124	12,352	158	6,890	1,231	2,986
26-Jul	10,225	88	3,365	6	3,496	11	335	53	429	43	12,184	425	4,746	475	2,450
27-Jul	13,821	37	3,768	13	1,186	24	731	68	232	47	10,978	307	5,299	403	4,106
28-Jul	15,302	20	5,036	9	1,496	11	612	94	305	130	9,686	889		143	7,982
29-Jul	9,736	14	1,035	20	1,134	26	415	56	49	140	7,911	744		206	8,201
30-Jul	6,159	29	205	26	982	13	202	22	62	29	5,421	687		236	7,543
31-Jul	2,476	11	706	2	1,315	10	244	10	232	65	4,258	341			
1-Aug	996	22	169	7	962	8	145	17	131	69	2,669	430			
2-Aug		23	107	2	474	5	129	19	61	54	2,342	140			
3-Aug		44	127	8	440	48	81	17	73	33	1,206	79			
4-Aug		20	300	3	303	60	65	12	34	34	843	55			

Appendix 5. Continued.

Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
5-Aug		17	237	3	127	28	49	5	11	35	890	91			
6-Aug		22	61	1	73	14	33	10	13	17	729	114			
7-Aug		37	109	1	104	13	17	10	7	20	789	41			
8-Aug		20	61	5	140	19	17	0	4	9	513	68			
9-Aug		29	55	1	68	7	35	3	5	8	439	39			
10-Aug		46	77	4	36	16	15	6	9	9	384	17			
11-Aug		18	44	7	40	15	11	10	2	6	205	23			
12-Aug		11	51	6	43	17	8	3	4	10	152	10			
13-Aug		12	25	4	52	8	14	8	1	14	140	3			
14-Aug		32	16	3	40	5	11	6	4	21	128	11			
15-Aug		20	7	0	11	3	9	2	1	16	116	10			
16-Aug		19	25	3	18	17	2	1	0	11	104	12			
17-Aug		17	8	5	0	1	1	1	1	6	96	5			
18-Aug		6	17	4	0	6	1	1	0	1	34	3			
19-Aug		7	40	2	2	0	3	6	0	14	35	1			
20-Aug		4	4	4	0	1	3	1	0	18	17	0			
21-Aug		7	2	1	0	1	1	0	1	10	17	3			
22-Aug		6	3	2	0	3	2	1	1	8	7	0			
23-Aug		4	8	2	0	2	1	3	2	12	5	0			
24-Aug		8	7	8	0	7	4	1	3	13	6	2			
25-Aug		3	16	10	0	1	5	0	1	10	7	2			
26-Aug		5	28	3	0	4	0	1	0	9	12	1			
27-Aug		9	1	1	0	1	0	0	0	2	4	2			
28-Aug		0	1	9	0	6	2	0	0	4	4	7			
29-Aug		7	1	15	2	6	1	0	0	3	5	3			
30-Aug		5	6	16	1	2	9	3	1	1	11	1			
31-Aug		0	4	1	2	3	2	0	0	0	18	2			
1-Sep		0	7	1	2	1	1	0	1	10	13	3			
2-Sep		2	4	0	0	1	0	0	1	2	35	2			
3-Sep		1	7	20	4	8	0	0	0	6	6	1			
4-Sep		0	1	13	5	2	0	0	0	8	11	0			
5-Sep		1	3	5	0	4	0	0	2	5	34	2			
6-Sep		1	0	2	2	2	0	0	0	4	47	0			
7-Sep		1	1	3	3	3	0	0	0	8	30	1			
8-Sep		1	0	3	0	0	0	0	0	12	24	0			
9-Sep		0	1	5	2	0	0	0	1	7	22	2			
10-Sep		1	0	4	2	0	1	0	0	5	13	3			
11-Sep		0	0	12	1	3	0	0	1	6	6	6			
12-Sep		1	0	6	2		0	0	2	4	4				
13-Sep			3	6	0		0	2	0	7	1				
14-Sep			0				1	0	0	3	3				
15-Sep			0				1	1		4	3				
16-Sep			1				0				3				
17-Sep							0				2				
18-Sep							0				3				
19-Sep							0				0				
20-Sep							0								
21-Sep							0								
22-Sep							0								
23-Sep							0								
Total	316,530	1,972	214,837	429	227,208	769	43,491	820**	165,991	4,303	399,670	39,030	220,735*	10,092*	189,908*

= estimated escapement count (yellow)
= partial day's count adjusted to 24 hours (grey)
** = incomplete count, missing data not estimated.
* = incomplete count, weir removed

Appendix 6. Historical daily sockeye salmon estimates recorded at the East Fork Andreafsky River weir, 1994-2008. Data for 2001 were not used in calculations and are shown for informational purposes only.

Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
15-Jun				0											
16-Jun		0		0											
17-Jun		0		0		0									
18-Jun		0		0		0				0					
19-Jun		0	0	0		0			0	0				0	
20-Jun		0	0	0		0			0	0				0	
21-Jun		0	0	0		0			0	0				0	0
22-Jun		0	0	0		0			0	0				0	0
23-Jun		0	0	0	0	0			0	0	0			0	0
24-Jun		0	0	0	0	0			0	0	0			0	0
25-Jun		0	0	0	0	0			0	0	0			0	0
26-Jun		0	0	0	0	0			0	0	0	0		0	0
27-Jun		0	0	0	0	0			0	0	1	0		1	0
28-Jun		0	0	0	0	0			0	0	2	0	0	0	0
29-Jun	0	0	0	1	3	1			0	1	5	0	0	0	0
30-Jun	0	0	0	0	0	0	0		0	0	2	1	0	0	0
1-Jul	0	2	0	1	0	0	0		0	0	0	1	0	6	1
2-Jul	0	0	6	0	0	0	0		0	0	3	0	0	8	16
3-Jul	0	1	9	0	0	0	0		0	0	5	0	9	2	10
4-Jul	0	0	16	0	0	1	0		0	1	3	0	50	17	29
5-Jul	0	1	6	0	0	8	0		0	4	9	0	15	5	27
6-Jul	0	4	1	0	0	1	0		1	4	7	0	27	0	15
7-Jul	2	0	7	1	0	2	0		0	4	22	0	16	6	18
8-Jul	1	0	0	0	3	6	0		0	2	18	0	12	6	25
9-Jul	0	0	10	0	0	2	0		0	2	14	0	13	9	3
10-Jul	0	1	6	1	0	0	0		0	13	15	0	12	6	2
11-Jul	1	1	6	0	4	7	1		0	14	18	0	16	2	2
12-Jul	0	0	8	0	8	0	0		1	4	16	1	20	6	5
13-Jul	0	0	7	0	3	0	0		0	4	19	0	4	2	5
14-Jul	0	0	9	2	0	0	1		0	1	10	15	3	1	3
15-Jul	1	0	4	1	10	0	0	0	0	8	3	0	7	1	15
16-Jul	2	0	5	2	7	1	0	0	3	13	6	1	5	2	6
17-Jul	0	0	4	1	5	5	0	0	1	23	9	0	18	4	5
18-Jul	2	3	8	1	13	2	0	1	2	0	7	0	21	5	2
19-Jul	0	0	7	0	17	0	0	0	3	9	12	0	26	5	5
20-Jul	3	1	6	1	3	2	0	0	1	3	12	0	21	3	6
21-Jul	2	2	3	0	1	0	0	0	1	1	7	2	32	1	5
22-Jul	0	0	4	2	6	0	0	4	1	8	2	0	12	4	2
23-Jul	0	0	4	1	3	0	0	1	2	11	7	0	31	4	9
24-Jul	1	0	1	0	1	0	0	2	4	11	10	5	19	4	3
25-Jul	1	8	1	0	9	1	0	1	0	2	16	5	15	8	5
26-Jul	1	2	3	0	0	0	0	0	0	15	9	2	13	8	12
27-Jul	5	1	3	0	0	0	0	2	1	25	16	5	9	4	12
28-Jul	4	0	2	3	6	0	0	0	2	19	6	4		5	7
29-Jul	3	1	0	3	5	0	0	0	0	9	5	7		5	7
30-Jul	2	3	0	2	5	1	1	0	0	18	6	1		1	10
31-Jul	0	0	5	0	4	1	1	0	4	7	7	1			
1-Aug	2	4	1	3	5	0	0	0	3	16	8	0			
2-Aug		0	1	2	1	0	0	0	3	4	9	0			
3-Aug		3	1	1	6	0	1	1	0	11	3	0			
4-Aug		0	4	0	4	1	1	0	0	40	7	0			

Appendix 6. Continued.

Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
5-Aug		0	1	0	3	0	1	0	0	5	2	2			
6-Aug		0	4	0	2	2	0	0	1	11	8	4			
7-Aug		1	3	0	5	0	0	0	0	9	9	0			
8-Aug		1	1	0	2	0	2	0	0	4	8	8			
9-Aug		0	5	0	2	0	1	0	1	2	6	1			
10-Aug		0	3	0	1	0	0	0	1	6	3	1			
11-Aug		0	2	0	4	1	1	0	0	6	5	2			
12-Aug		0	0	0	2	1	0	0	2	3	5	1			
13-Aug		3	0	2	12	1	0	1	0	12	4	3			
14-Aug		3	1	0	2	0	0	0	0	8	3	3			
15-Aug		3	1	0	1	0	0	0	0	7	2	0			
16-Aug		5	5	0	3	0	0	0	0	6	1	4			
17-Aug		5	0	0	2	0	1	0	0	5	0	0			
18-Aug		1	1	1	1	0	1	0	0	8	6	13			
19-Aug		1	5	2	0	2	1	0	0	8	4	0			
20-Aug		3	1	5	0	3	0	1	0	17	5	0			
21-Aug		1	3	5	0	2	0	0	0	0	6	1			
22-Aug		13	1	1	0	0	0	0	0	6	3	0			
23-Aug		9	0	1	0	1	0	0	0	11	0	0			
24-Aug		4	3	1	0	0	2	0	1	10	5	7			
25-Aug		0	16	8	0	0	3	0	0	5	15	1			
26-Aug		1	6	2	0	2	0	0	1	1	4	2			
27-Aug		0	2	1	0	0	11	0	0	6	2	0			
28-Aug		4	2	2	0	2	3	0	0	6	2	15			
29-Aug		1	4	5	0	0	4	0	1	4	2	5			
30-Aug		1	5	6	3	2	3	1	0	2	4	5			
31-Aug		2	0	0	0	0	5	0	0	2	1	1			
1-Sep		3	2	0	1	4	13	0	0	2	6	2			
2-Sep		0	1	4	1	2	5	0	0	1	6	2			
3-Sep		0	3	2	0	9	2	0	0	1	2	8			
4-Sep		2	3	1	0	13	2	0	0	5	5	1			
5-Sep		0	3	1	0	15	0	0	0	4	15	3			
6-Sep		3	2	2	0	2	0	0	0	0	6	3			
7-Sep		1	1	3	0	0	0	0	1	0	1	0			
8-Sep		2	0	1	1	1	0	0	0	1	2	0			
9-Sep		0	0	4	6	2	1	0	1	0	4	0			
10-Sep		1	0	4	0	0	2	0	0	0	1	2			
11-Sep		1	0	2	2	4	0	0	0	1	1	0			
12-Sep		0	0	3	0		0	0	0	0	1				
13-Sep			0	2	0		2	0	0	1	0				
14-Sep			0				1	0	0	1	0				
15-Sep			0				0			0	0				
16-Sep			0				0				1				
17-Sep							1				3				
18-Sep							0				2				
19-Sep							0				1				
20-Sep							1								
21-Sep							3								
22-Sep							1								
23-Sep							0								
Total	33**	113	248	100	188	113	79	15**	43	494	508	151	426*	141*	272*

= estimated escapement counts
* * = incomplete count, missing data not estimated.
* = incomplete count, weir removed