Salmon Lake Subsistence Sockeye Salmon Project: 2004 – 2006 Summary Report

Prepared for the Sitka Tribe of Alaska by

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ABSTRACT

Salmon Lake is a small salmon-producing system located at the head of Silver Bay, near Sitka, Alaska. Because of this lake's easy access from the nearby city of Sitka, and because of the closure to subsistence fishing in nearby Redoubt Lake, the Alaska Department of Fish and Game, in cooperation with Sitka Tribe of Alaska and the U.S. Forest Service, launched an assessment project for this system in 2001. The Sitka Tribe of Alaska took over the sockeye portion of this project in 2004, and here we report on the last two years of study: 2005 and 2006. Over the six years of study the estimated sockeye escapement ranged from about 1,000 to 2,500 sockeye salmon, with estimates in 2005 and 2006 of 2,500 and 1,900, respectively. In all years, spawning stock size (escapement) was measured with a counting weir validated by a mark-recapture study. As in previous years, in 2005 and 2006 an analysis of the mark rate in the recapture samples showed that a substantial number of fish had passed though the weir unobserved and uncounted—emphasizing the importance of the mark-recapture portion of the study. Interestingly, this system produced a large number of jacks, or 3-year-old male sockeye salmon, with this age class making up over 25% of the escapement sample in the last two years of the study (34% in 2005 and 25% in 2006). Although measures of the exact number of fishery removals is unavailable, it appears that fishery removals were a small part of the total run in the years 2001 to 2006, and the run appears stable and sustained at the present time.

INTRODUCTION

Redoubt and Salmon lakes are the two major salmon-producing systems in Sitka Sound, and subsistence fishers from the Southeastern Alaskan city of Sitka have easy access to these lakes. Starting in the 1990s, fishery managers took actions to restrict commercial and subsistence fisheries in some years due to low returns to Redoubt Lake. Biologists from the Alaska Department of Fish and Game (ADF&G), the Sitka Tribe of Alaska, and the U.S. Forest Service were concerned that fishing effort would be redirected to Salmon Lake sockeye (*Oncorhynchus nerka*) and coho (*O. kisutch*) salmon. In March of 2000, the Southeast Alaska Regional Advisory Council identified sockeye and coho salmon in Salmon Lake as a priority for subsistence fisheries monitoring. Although subsistence harvests of sockeye salmon at Salmon Lake were relatively small in number, the Regional Advisory Council was concerned that harvests at these systems may remove a large percentage of the total return. In response, in 2001 the Alaska Department of Fish and Game, the Sitka Tribe of Alaska, and the U.S. Forest Service established a weir at the outlet of Salmon Lake to count the incoming sockeye and coho salmon (Tydingco et al. 2006) and conducted associated sonar studies of juvenile salmon and water quality measurements. This successful project provided the first reliable estimates of sockeye escapement magnitude for this lake, and this project built upon a limited escapement history and information base for coho salmon (Schmidt 1996).

Before this weir was installed, in 1998, ADF&G and the Northern Southeast Regional Aquaculture Association conducted foot and snorkel surveys of Salmon Lake inlet streams to provide a low-cost indication of sockeye abundance in that system. However, observer counts from foot surveys or airplanes generally have failed to capture the magnitude of the

total escapement across a season, and these aerial and foot counts have tended to under-represent the actual escapement on any given day (e.g., Bevan 1961 or Bue et al. 1998). Furthermore, the detectability of spawning salmon depends on many factors, such as water clarity; stream morphology; and the ecology, behavior, size, and color of salmon. After several years of comparisons between snorkel surveys and total estimates of escapement, Tydingco et al. (2006) concluded that snorkel survey counts over time did not adequately reflect trends in escapements. Subsequently, these surveys were discontinued.

Sitka Tribe of Alaska biologists assumed responsibility for the assessment of sockeye escapement in Salmon Lake for the 2004 to 2006 period, and ADF&G continued the research on coho salmon. The sockeye project during this time focused specifically on estimating sockeye escapement and on a corresponding picture of demographic features of the spawning stock, such as the age-class distribution. The Sitka Tribe of Alaska continued to use the weir designed and originally installed by ADF&G as the main stock-assessment tool (Woody 2008).

In all years of the study, the statistical population under consideration was the collection of fish that moved past the weir, and the population size, age-class distribution, and other statistics all relate to this collection of fish. In other words, the statistical population was defined as the fish past the weir before any fish died in the lake, and this is not exactly the same population of fish that actually spawned. Although weir counts are often assumed to be an accurate assessment of sockeye escapement, many studies in Southeast Alaska have shown that weirs often leak, leading to an underestimate of the fish that escape the fishery and enter the lake environment (e.g. Geiger et al. 2006, see p. 70). For that reason, the Sitka Tribe of Alaska chose to follow the example set by Tydingco et al. (2006) and validate the weir count with a mark-recapture study, as has been the custom for most weir studies in Southeast Alaska since the 1990s. The larger purpose of this study was to contribute to a record of escapement sizes (and associated demographic statistics) for the purpose of assessing the capacity of the Salmon Lake stock to meet subsistence needs in the Sitka area. Here we document 2005 and 2006 project years, and compare results from these two years to the entire six years of study, with special emphasis on the 2004 to 2005 period.

OBJECTIVES

1. Estimate the magnitude of sockeye salmon escapement into Salmon Lake.
2. Estimate the age, length, and sex composition of the sockeye salmon in the Salmon Lake escapement.

STUDY AREA

Salmon Lake is located 14.4 km southeast of Sitka at the head of Silver Bay (Figure 1). The lake lies at 15.2 m elevation and is fed primarily by two main inlet streams and several smaller tributaries opposite the 1.1 km outlet stream. The U.S. Forest Service maintains a recreational use cabin on the lake. A foot trail provides access to Salmon Lake and to Redoubt Lake (the latter being the other sockeye stock important for subsistence use in the Sitka area). Tydingco et al. (2006) reported that the lake supports populations of sockeye, pink (*O. gorbuscha*), chum (*O. keta*), and coho salmon; Dolly Varden (*Salvelinus malma*);

cutthroat (*O. clarki*) and steelhead (*O. mykiss*) trout; stickleback (*Gasterosteus aculeatus*); and sculpin (*Cottus sp*.).

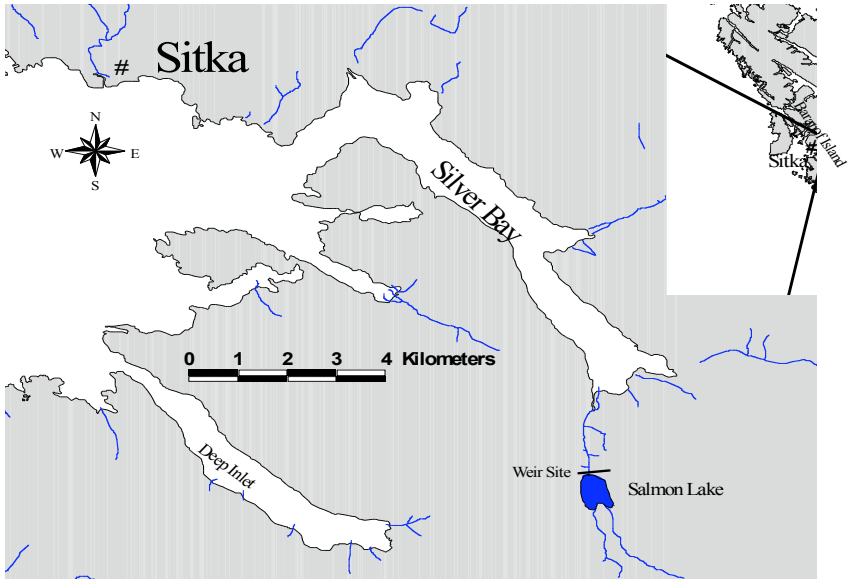

Figure 1. Study area showing Salmon Lake, weir site and major tributaries.

METHODS

WEIR OPERATIONS AND FISH COUNTING

In 2005 and 2006, a floating weir was installed at the outlet of Salmon Lake. This was the same weir described by Tydingco et al. (2006). It consisted of hollow PVC panels attached to an anchored cable laid across the stream channel, with a fixed live box attached on the upstream side. One-inch diameter schedule 30 PVC was used as the weir pickets. The picket spacing was 19 pickets per 4-ft by 20-ft panel on the floating portion of the weir. A rigid weir was on either side of the 40-foot long floating weir. The rigid weir was supported by bipods and consisted of 3-in aluminum channel with a hole spacing of 49 per 8 ft. The pickets used for the rigid weir were 3/4-in galvanized conduit. Fish were allowed to move upstream though the weir by entering a holding trap. When passage rates were low, the trap was cleared of fish two or three times per day. At high passage rates the trap was cleared approximately every two hours.

FISH MARKING

Both adult and jack sockeye salmon were captured and sampled at the weir. In both years, the preseason plan was for all sockeye salmon that entered the weir to be captured in the live box, counted, marked and tagged, and measured. However, a small number of fish were counted and passed through unmarked and untagged in the 2005 season. In 2005, sockeye salmon were tagged, both adults and jacks, with an individually numbered Floy™ tag, used to identify fish during the recapture portion of the study. In 2006, the fish were tagged with

color-coded tags, without an individual number. Tags were inserted immediately below the middle of the dorsal fin on the left side. Tagged fish received an additional mark, usually an adipose fin clip, for identification of fish that lost their tags. Each fish was allowed to safely recover in a holding box before release on the upstream side of the weir.

FISH MEASUREMENTS FOR AGE AND LENGTH CHARACTERISTICS AND SEX RATIOS

Nearly all of the adult sockeye salmon that passed through the live box were also sampled for length, sex, and scales (for age determination) at the Salmon Lake weir. Each sampled fish was anesthetized with a mixture of clove oil and Everclear™ alcohol (12 ml clove oil to 108 ml alcohol) in 15 gal of water before the sampling procedure. The length of each of these fish was measured from mid eye to tail fork, to the nearest millimeter. Sex of the fish was determined by length and shape of the kype or jaw. Three scales were taken from the preferred area of each fish (INPFC 1963), and prepared for analysis as described by Clutter and Whitesel (1956). Scale samples were analyzed by ADF&G's Scale Aging Laboratory in Douglas, Alaska, in 2005 and the University of Alaska at the Advanced Instrumentation Laboratory in Fairbanks, Alaska in 2006. Age classes were designated by the European aging system where freshwater and saltwater years are separated by a period (e.g. 1.3 denotes a five-year-old fish with one freshwater and three ocean years; Koo 1962).

We assumed that if any fish passed through the weir undetected, the actual sample we obtained at the weir could be treated as a random sample from a finite population. Therefore, the approximate standard errors were estimated using standard statistical techniques for finite population sampling (e.g. Cochran 1977). The finite population correction factors were calculated based on the mark-recapture estimate of population size and sex ratios taken as fixed (non-random) quantities, ignoring the negligible error this introduced.

MARK RECAPTURES

The recapture sampling took place within the lake, near the eastern inlet stream, which is where a large aggregation of lake-spawning salmon had previously been observed. The recapture sampling occurred only when there were sufficient personnel. Fish were recaptured with a seine, approximately 90 m by 7 m, deployed from a skiff. Each fish was examined for primarily and secondary marks. The length of untagged and unmarked fish was measured at the recapture stage in 2005, and these fish were given an additional mark and colored tag for identification in subsequent recapture sampling.

ESCAPEMENT ESTIMATION WITH MARK-RECAPTURE METHODS

In 2005, because each fish was tagged with a uniquely numbered tag there was a range of statistical options, beginning with the simple two-sample Petersen-type estimator (Seber 1982). Alternatively, a more complicated time-stratified Darroch (1961) estimator could also be considered, with further options for the graininess of the marking stratification—grouping sequentially numbered tags into multiple release strata (again, Seber 1982). Stratified models are widely used for estimating escapement of salmon as they migrate into their spawning streams (Arnason et al. 1996). In 2006, because there were only two color codes on tags and only two recovery events, the options were either to stratify into two strata or else to pool into one stratum, for both marking and recovery, respectively.

Before considering the assumptions that underlie the Petersen estimator, it is important to understand that our statistical population was made up of exactly that group of fish that actually moved through or past the weir—irrespective of the timing of that movement within

the study period. Briefly stated, the most important assumptions underlying the Petersen approach for estimating the number of salmon passing through a weir are that 1) all fish have an equal probability of capture in the first sample (marking), 2) all fish have an equal probability of capture in the second sample (mark-recovery), and 3) all fish mix completely between the first and second sample. Note that these assumptions allow for death before the recapture sample, say by bear predation, but we require that both tagged and untagged fish have the same probability of death between marking and recapture sampling. Arnason et al. (1996) advises that if one or more of these assumptions is met, the marking and recovery strata should be pooled, essentially resulting in a simple Petersen model, thereby providing the most precise estimate. However, if none of the assumptions are met, the pooled estimate will be more precise, but it will be inaccurate. Following the recommendation of Arnason et al., we chose to use a simple pooled Petersen-type estimate if one of two diagnostic chi-squared tests (for complete mixing of animals across recovery strata independent of their initial marking stratum and for an equal proportion of marks in the recovery strata) produced a P-value > 0.05. Otherwise, we planned to use a Darroch estimator, with marking and recovery strata developed so that assumption failure could not be detected with the usual chi-squared tests.

Confidence intervals for the pooled Petersen estimator were generated by assuming that the number of recaptures approximately followed a Poisson distribution (ignoring the fact that the recovery sample occurred with some level of replacement) and noting that the multiplicative inverse of the Petersen estimate is a Poisson random variable times a fixed constant. We estimated the sample variance of the number of recaptures with itself, based on the Poisson assumption, and then developed an upper and lower 95% confidence interval for one over the Petersen estimate using the normal approximation. Finally, the confidence interval was then inverted to produce a non-symmetric interval for the Petersen estimate.

RESULTS

WEIR OPERATION AND FISH COUNTS

In 2005, the field crew operated a floating weir at the outlet of Salmon Lake from 12 June to 26 October 2005. The crew passed the first sockeye salmon through the weir on 12 June and last sockeye salmon through the weir on 26 September. The crew counted a total of 751 sockeye, 737 coho, 517 chum, and 37,542 pink salmon through the weir during this period (Appendix A). The majority of the sockeye salmon entered the lake between the end of June and the end of August (Figure 2; Appendix A). The water breached the top of the weir at least once during the season in 2005 (R. Didrickson, Sitka Tribe of Alaska weir foreman, personal communication 2008).

In 2006, the field crew operated the weir from 23 June to 18 September. The crew passed 11 sockeye salmon through the weir on the first day the weir operated (23 June) and the last sockeye salmon was passed through the weir on 12 September. The crew counted a total of 1,379 sockeye, 102 coho, 217 chum, and 7,803 pink salmon through the weir during this period (Appendix B). Similar to 2004 and 2005, the majority of sockeye salmon entered the lake in July and August, but a large number of sockeye spawners entered the lake in July of 2006. This resulted in the weir count being almost twice as large in 2006 compared to the two previous years (Figure 2). The water breached the top of the weir at least once during the

season in 2006 (R. Didrickson Sitka Tribe of Alaska weir foreman, personal communication 2008).

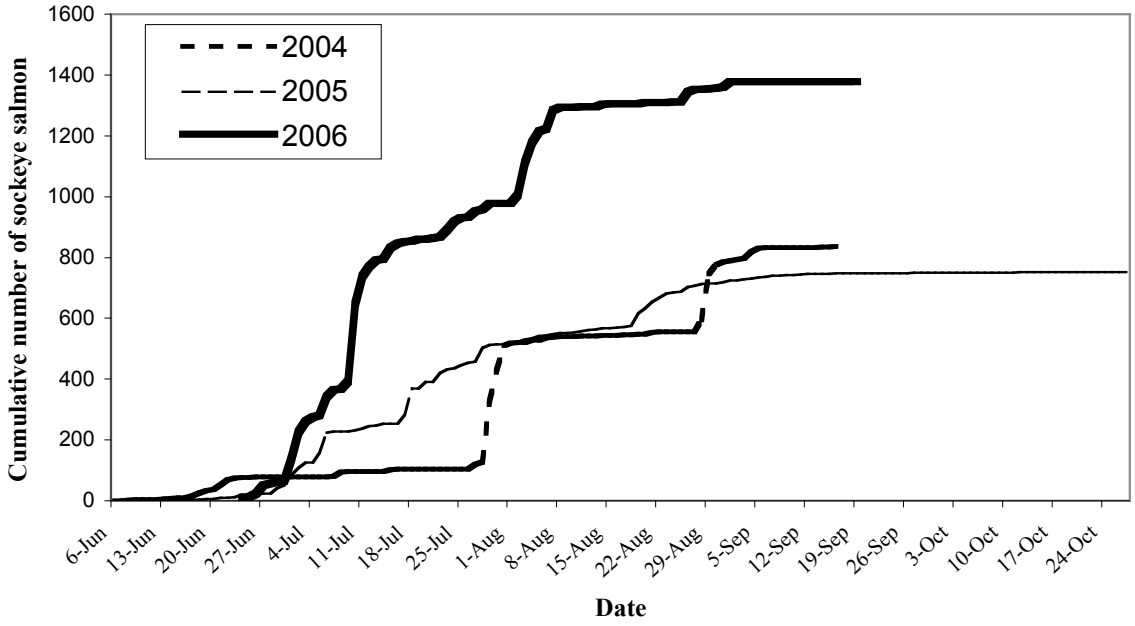

Figure 2. Cumulative sockeye salmon counts through the Salmon Lake weir, 2004 – 2006.

SOCKEYE ESCAPEMENT ESTIMATES

In 2005, the crew marked 716 of 751 sockeye salmon passing through the weir during the marking phase of the mark-recapture study (Table 1). These fish were grouped into three marking strata. The first two marking strata consisted of fish entering during a period of about one month each. The third marking stratum contained fish marked in the last two months of the weir operation (Table 1). Of the 154 sockeye salmon examined on the spawning grounds, only 43 (28%) fish had a mark. Three of the 43 marked fish had an adipose clip but no tag. We assigned these three fish without tags to the first marking stratum because 33 fish in this stratum were released at the weir with an adipose clip but no tag. We considered both the chi-square test for "complete mixing" (X^2=3.28, *P*-value=0.19, df=2) and "equal proportions" (X^2=2.46, *P*-value=0.12, df=2) as non-significant, and subsequently we followed the advice of Arnason et al. (1996) and pooled the marking and recovery strata. Because a substantial number of fish passed through the weir undetected, and were therefore unmarked on the spawning ground (about 70%), we recommend the pooled Petersen mark-recapture estimate as the official sockeye escapement estimate in 2005: 2,500 sockeye salmon (CV=13%; 95% confidence interval: 2,000 to 3,500 fish).

In 2006, the crew marked 100% of the sockeye salmon (1,379 fish) passing through the weir (Table 2). Of the 111 sockeye spawners recaptured on the spawning grounds, 81 fish or 73% were marked—suggesting that about one-quarter of the sockeye salmon passed through the weir undetected in 2006 (Table 2). Despite the fact that the statistical population was not grouped into temporally even marking strata, and the fact that both recapture events occurred before marking was completed at the weir, the tests for "complete mixing" (X^2=3.17, *P*-

value=0.07, df=1) and "equal proportions" (X^2=1.70, P-value=0.19, df=1) were not considered statistically significant. Again, we followed the advice of Arnason et al. (1996) and pooled the marking and recovery strata. Because a substantial number of fish once again entered the lake without being counted at the weir, we recommend the pooled Petersen estimate as the official sockeye salmon escapement estimate for 2006. The pooled Petersen estimate was 1,900 sockeye salmon (CV=6%; 95% CI 1,700 to 2,100 fish).

Table 1. The number of sockeye salmon marked at the Salmon Lake weir in 2005 with the number of recaptures on the spawning grounds, by respective stratum.

Marking at weir						Marks recaptured on spawning grounds		
Marking strata	Marking dates	Tag number sequences released by marking stratum	Number of sockeye salmon through weir	Number of sockeye salmon marked	Percent of sockeye salmon marked	First recapture event 1 (Sept. 2)	Second recapture event 2 (Sept. 16)	Total recapture event 1 and 2
1	6/12-7/15	4953-4996 9301-8500 4201-4230	253	226[a]	89.3%	4	8	12
2	7/16-8/15	4231-4553	317	311[b]	98.1%	9	15	24
3	8/16-10/11	4554-4737	181	179	98.9%	2	5	7
Total marks			751	716	95.3%	15	28	43
Total examined						40	114	154
Percent marked fish in recapture sample						38%	25%	28%

[a]Includes 33 fish marked with an adipose clip (no tag). On spawning grounds, three fish with no tag but clipped were assigned to this group.

[b]Five marked fish were removed from this mark group because they were dead fish on weir.

Table 2. The number of sockeye salmon marked at the Salmon Lake weir in 2006 with the number of recaptures on the spawning grounds, by respective stratum.

Marking at weir						Marks recaptured on spawning grounds		
Marking strata	Marking dates	Tag coding	Number of sockeye salmon through weir	Number of sockeye salmon marked	Percent of passed fish marked	First recapture event 1 (Aug. 10)	Second recapture event (Sep. 15)	Total recaptures event 1 and 2
1	6/23-8/1	ad + yellow	1,006	1,006	100%	50	16	66
2	8/2-9/18	ad + blue	373	373	100%	9	6	15
Total number of marks			1,379	1,379		59	22	81
Total examined						77	34	111
Percent marked fish in recapture sample						77%	65%	73%

FISH MEASUREMENTS FOR AGE AND LENGTH CHARACTERISTICS AND SEX RATIOS

In 2005, 707 readable scales were used to compile age and gender information on sockeye salmon returning to Salmon Lake. The largest age class in the 2005 sockeye escapement was sockeye jacks (age 1.1) comprising 34% of the total (Table 3). The second largest age class was age 1.2, representing about 27% of escapement, followed by age 1.3, representing about 18% of the sockeye escapement (Table 3). Examining the age composition by brood year showed a spawning population composed of about 34% 3-year olds, 37% 4-year olds, 28% 5-year olds, and less than 1% 6-year olds (Figure 3). About 80% of sockeye salmon in the 2005 escapement resided in Salmon Lake for one year before leaving as smolt (age 1.1, 1.2, and 1.3; Table 3).

Table 3. Age composition of sockeye spawners with standard errors, by sex, sampled at the Salmon Lake weir in 2005.

Brood Year	**2002**	**2001**	**2000**	**2001**	**2000**	**1999**	**Total**
Age	**1.1**	**1.2**	**1.3**	**2.1**	**2.2**	**2.3**	
Male							
No. of Fish	244	83	31	54	43	4	459
Percent	53%	18%	7%	12%	9%	1%	65%
SE(%)	2.0%	1.5%	1.0%	1.3%	1.2%	<1%	
Female							
No. of Fish		111	99	16	23	1	250
Percent		44%	40%	6%	9%	0%	35%
SE(%)		2.7%	2.6%	1.3%	1.5%	<1%	
All Fish							
No. of Fish	244	194	130	70	66	5	709
Percent	34%	27%	18%	10%	9%	1%	100%
SE(%)	1.5%	1.4%	1.2%	<1%	<1%	<1%	

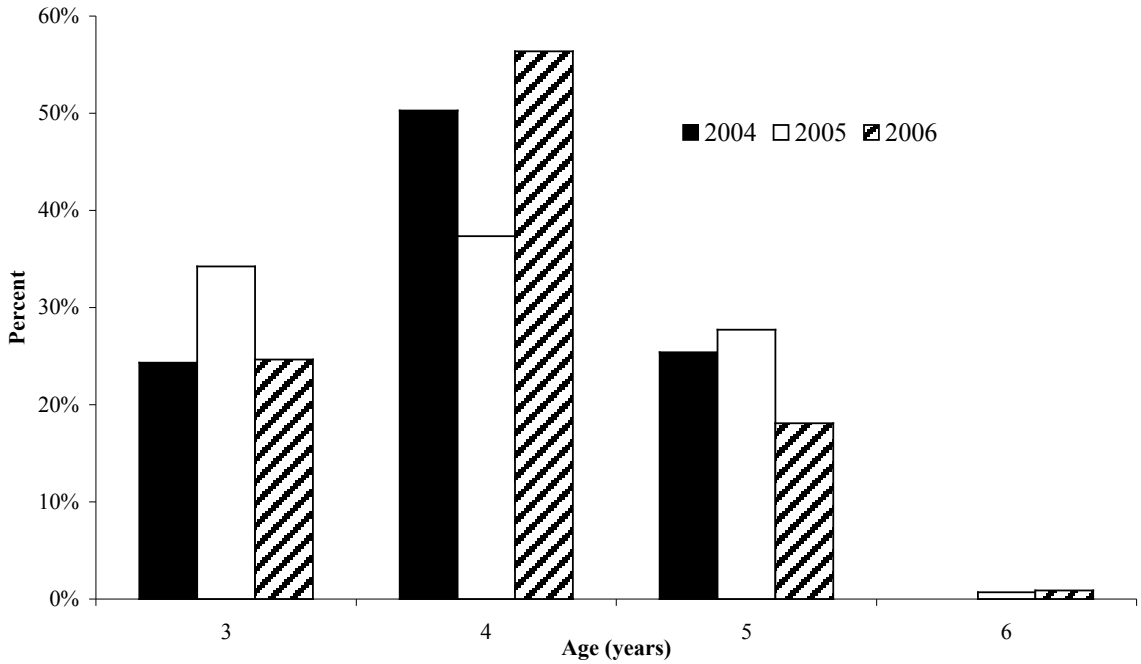

Figure 3. Age category of sockeye salmon returning to Salmon Lake, 2004 – 2006.

In 2005, the average mideye-fork length was 549.4 mm for age-1.3 fish and 507.9 mm for age-1.2 fish (Table 4). Sockeye salmon returning with three ocean years were about 48 mm longer, on average, than their counterparts with only two ocean years, across both freshwater age classes. The length distribution across all ages displayed a distinct bimodal pattern between fish less than about 440 mm and those larger than 440 mm (Figure 4). Because 95% of the fish captured at the weir were marked in 2005, we assumed that most of the unmarked fish observed on the spawning grounds passed through the weir undetected. A comparison of the fish lengths measured at the weir and on the spawning grounds shows that the majority (78%) of the unmarked fish on the spawning grounds were less than 400 mm (Figure 5).

Table 4. Mean age-specific fork length (mm) of sockeye salmon and standard errors, by sex, measured at the Salmon Lake weir in 2005.

Brood Year	**2002**	**2001**	**2000**	**2001**	**2000**	**1999**	**Total**
Age	**1.1**	**1.2**	**1.3**	**2.1**	**2.2**	**2.3**	
Male							
Av. Length	384.8	505.7	561.5	523.4	567.1	606.5	
SE	0.12	0.47	1.12	0.96	0.91	17.30	
No. of Fish	242	83	31	54	43	4	457
Female							
Av. Length		509.6	545.6	510.9	547.0	565.0	
SE		0.26	0.17	2.3	1.14		
No. of Fish		111	99	16	23	1	250
All Fish							
Av. Length	384.8	507.9	549.4	520.5	560.1	598.2	
SE	0.12	0.17	0.18	0.7	0.55	12.52	
No. of Fish	242	194	130	70	66	5	707

In 2005, stratifying age classes by week showed a greater portion of the age-3 sockeye salmon (age class 1.1) entered the lake at the beginning of the season compared to end of the season (Table 5). Age-4 fish (age class 1.2 and 2.1) and age-5 fish (age class 1.3 and 2.2) entered the lake steadily over the season and all age-6 fish entered the lake at the beginning of the season (Table 5).

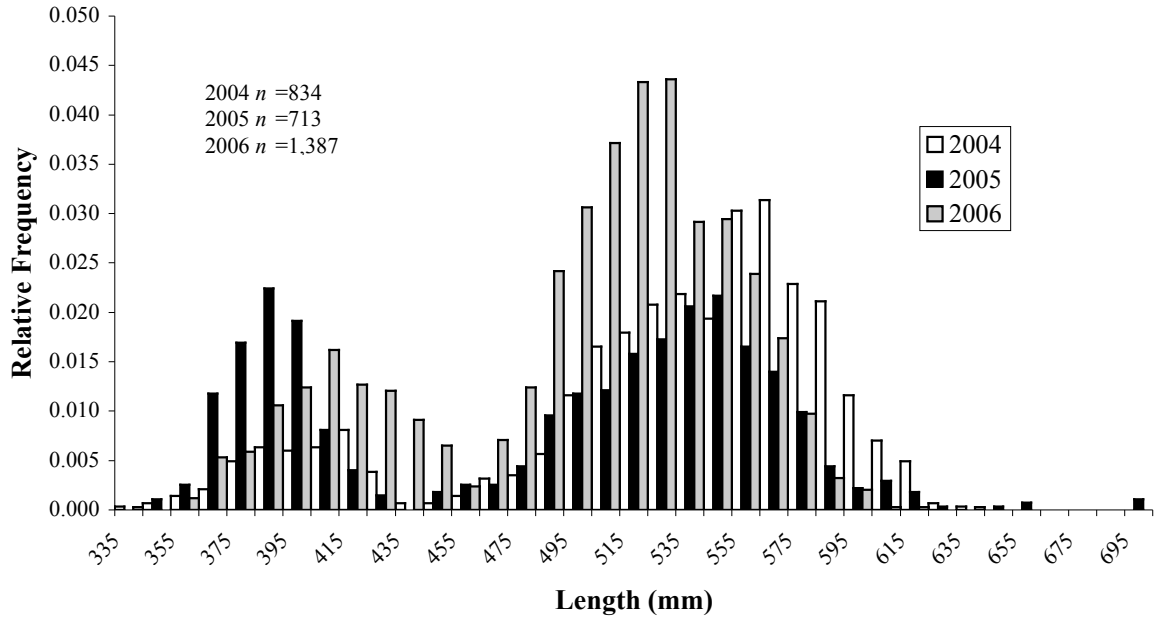

Figure 4. Estimated length distribution of sockeye salmon escapement measured at the Salmon Lake weir, 2004 – 2006.

Table 5. The percent of each sockeye salmon age class passing by the Salmon Lake weir, by week, in 2005.

Week beginning	Age 3	Age 4	Age 5	Age 6
12-Jun			100%	
19-Jun		36%	57%	7%
26-Jun	51%	19%	30%	
3-Jul	36%	32%	28%	3%
10-Jul	22%	31%	45%	2%
17-Jul	51%	36%	13%	
24-Jul	48%	33%	19%	
31-Jul	22%	59%	19%	
7-Aug	39%	39%	22%	
14-Aug	20%	36%	44%	
21-Aug	10%	58%	32%	
28-Aug	6%	77%	18%	
4-Sep	13%	53%	33%	
11-Sep		100%		
18-Sep				
25-Sep		100%		

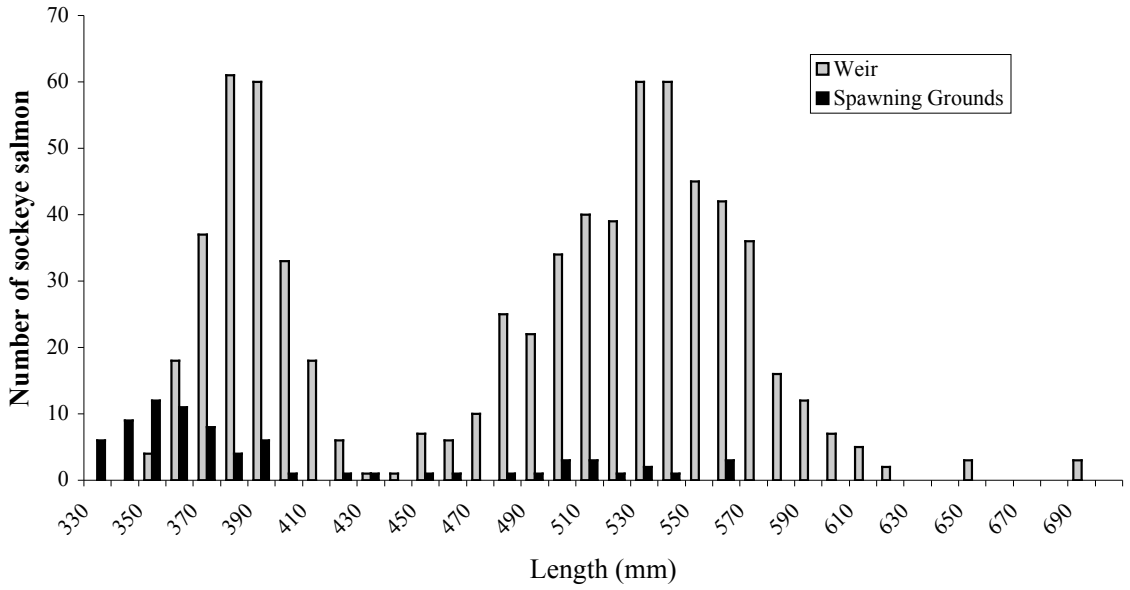

Figure 5. Length distribution of sockeye salmon measured at the Salmon Lake weir in 2005 and the unmarked sockeye salmon measured on the spawning grounds in 2005.

Of the 1,360 sockeye scale samples aged in 2006, several samples were omitted from some analysis because either the sex or length was missing. The largest age class in the 2006 sockeye escapement was the 1.2-age fish, which comprised 56% of the total (Table 6). The second largest age class was age 1.1, representing about 25% of escapement, followed by age 1.3, representing about 16% of the sockeye escapement (Table 6). Examining the age composition by brood year showed a spawning population composed of about 25% 3-year olds, 56% 4-year olds, 18% 5-year olds, and less than 1% 6-year olds (Figure 3). About 98% of sockeye salmon in the 2006 escapement had one freshwater year before leaving the lake as a smolt. In 2006, the timing of sockeye salmon entering the lake system among all ages was fairly evenly distributed throughout the season except the one age-6 fish that entered the system the second week of the season (Table 7).

In 2006, the average fork length was 548.9 mm for age-1.3 fish and 505.7 mm for age-1.2 fish (Table 8). Sockeye salmon returning with three ocean years were about the same size as their counterparts with only two ocean years, across both freshwater age classes. Similar to 2004 and 2005, the length distribution in 2006 across all ages displayed a distinct bimodal pattern between fish less than about 455 mm and those larger than 470 mm (Figure 4).

Table 6. Age composition of sockeye spawners with standard errors, by sex, sampled at the Salmon Lake weir in 2006.

Brood Year	**2003**	**2002**	**2001**	**2000**	**2001**	**2000**	**Total**
Age	**1.1**	**1.2**	**1.3**	**1.4**	**2.2**	**2.3**	
Male							
No. of Fish	339	411	49	4	15	1	819
Percent	41%	50%	6%	0%	2%	0%	61%
SE(%)	<1%	<1%	<1%	<1%	<1%	<1%	
Female							
No. of Fish		350	173	2	7	0	532
Percent		66%	33%	0%	1%	0%	39%
SE(%)		1%	1%	<1%	<1%	<1%	
All Fish							
No. of Fish	339	761	222	6	22	1	1,351
Percent	25%	56%	16%	0%	2%	<1%	100%
SE (%)	<1%	<1%	<1%	<1%	<1%	<1%	

Table 7. The percentage of each sockeye salmon age class passing by the Salmon Lake weir in 2006.

Week beginning	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Weekly totals**
18-Jun		64%	36%		11
25-Jun	21%	60%	19%	>1%	208
2-Jul	25%	58%	16%		165
9-Jul	25%	58%	16%		451
16-Jul	27%	56%	18%		45
23-Jul	8%	64%	28%		87
30-Jul	30%	53%	17%		236
6-Aug	22%	52%	26%		69
13-Aug	18%	65%	18%		17
20-Aug	43%	33%	24%		46
27-Aug	56%	44%			25
Total					1,360

Table 8. Mean age-specific fork length (mm) of sockeye salmon and standard errors, by sex, measured at the Salmon Lake weir in 2006.

Brood Year	2003	2002	2001	2000	2001	2000	Total
Age	1.1	1.2	1.3	1.4	2.2	2.3	
Male							
Av. Length	423.0	507.9	554.1	485.0	568.3	525.0	476.8
SE	0.2	0.1	0.7	14.5	0.8	N.A.	0.1
No. of Fish	334	411	49	4	15	1	814
Female							
Av. Length		503.5	543.8	545.0	566.4		517.6
SE		0.1	0.12	3.5	1.1		0.07
No. of Fish	0	350	173	2	7	0	532
All Fish							
Av. Length	423.0	505.7	548.9	515.0	567.4	525.0	493.0
SE	0.15	0.04	0.11	9.09	0.46	N.A.	0.04
No. of Fish	334	761	222	6	22	1	1,346

DISCUSSION

The sockeye escapement estimates in 2005 and 2006 were almost twice as high as the three previous years (2002, 2003, and 2004) and about the same as 2001 (Figure 6). In all six years of operating a weir at Salmon Lake, the mark-recapture estimate of sockeye spawners was used as the official sockeye escapement estimate because this weir was not fish tight. The fact that sockeye salmon passed through the weir undetected is not surprising, given that water breached the weir in some years. However, the large number of small, unmarked sockeye salmon on the spawning grounds (Figure 5) supports the conclusion that the 38 pickets/20 ft. picket spacing was too wide for this system, and that this spacing allowed some of the smaller fish to pass through the weir. The naturally occurring high levels of small age-3 male fish returning to Salmon Lake in most years further aggravated the leaky weir problem: The large number of small unmarked fish on the spawning grounds means that age-1 fish were under-sampled at the weir, and the age and size estimates were probably biased slightly high, to some extent, over the life of the project.

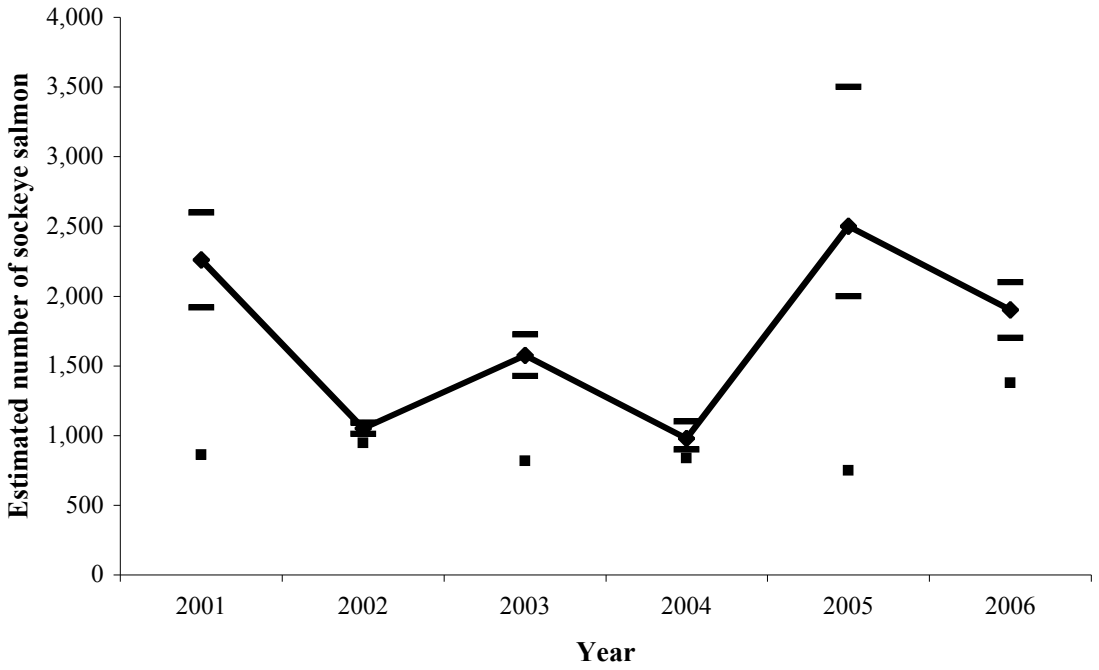

Figure 6. The estimated the number of sockeye salmon returning to Salmon Lake, 2001 – 2006 based on mark-recapture methods (shown with diamond symbols attached with thick line; the upper and lower 95 % CI are shown horizontal dashes) together with the number of fish counted through the weir (shown with square symbols).

The quality of the mark-recapture estimate of sockeye salmon returning to Salmon Lake could be improved by changing the study design in both the marking and recapturing sampling phases. The project, if it is continued, should return to the use of individually numbered tags. The obvious advantage of numbered t-bar tags is that this allows flexibility in defining the stratum boundaries in the marking phase of the study. Then if these numbered tags are considered the secondary mark, the primary mark can be defined as a fin clip or operculum punch. The primary mark should be changed throughout the season to be able to assign fish without tags to marking strata and to define periods of time that the weir is not fish-tight. This scheme eliminates the problems of tag loss, provided it is accomplished with minimal handling and injury to the fish. The numbered tags can then be used to gain additional information about mark-recapture assumptions, and tag numbers can be imputed for fish with a mark and lost tag, allowing the full range stratification options.

More importantly, the mark-recapture estimate could be substantially improved by more effort on the recovery phase. Soon after fish begin arriving on the spawning grounds, the recapture sampling should begin and should continue, with sampling perhaps every other week, until the majority of the spawners have died. Extending the recapture sampling until the last fish through the weir have reached the spawning grounds is very important to ensure marks applied at the end of the season have an equal probability of being recaptured.

The percent of each age group of sockeye salmon returning to the Salmon Lake weir varied considerably in the six years scales were collected and aged (Table 9). In 2001 and 2002, the dominant age group was 5-year olds followed by 4-year olds (Tydingco et al. 2006). In 2003,

age-5 fish also dominated the age groups returning, but 6-year-old fish were the second highest (Tydingco et al. 2006). Sockeye scales aged in 2004, 2005, and 2006 indicated that age-4 fish dominated the age composition returning to the lake (Table 9; Tydingco et al. 2006; Woody 2008; Sitka Tribe of Alaska 2004 unpublished data).

Perhaps the most unusual characteristic of the age and size structure of the sockeye salmon in this system is the large percent of age-3 fish returning in most years (Table 9). The small percentages of age-3 fish that were observed in 2002 and 2003 are more typical of sockeye populations in nearby lakes. For example, the sockeye population returning to Klag Lake was comprised of 1% to 4% age-3 fish from 2003 to 2005 (Conitz et al. 2005). Similarly, the sockeye population in Tumakof Lake (Redfish Bay) was comprised of 2% age-3 fish in 2003 and 2004 (Stahl et al. 2008). In addition, Salmon Lake had a high percent of sockeye smolt leaving the lake after one year (except 2002 and 2003). This latter observation is suggestive of a rich in-lake rearing environment (Koenings and Burkett 1987).

Obviously, commercial harvest of sockeye salmon in Sitka Sound could also affect the strength of the sockeye returns to Salmon Lake. Although most of the sockeye harvest takes place in the eastern channel of Sitka Sound, and is designed to target Redoubt Lake returns, sockeye salmon returning to Salmon Lake are probably intercepted in these fisheries (Bill Davidson, ADF&G Southeast Salmon Management Coordinator, personal communication, 2008). However, the commercial harvest of sockeye salmon in Sitka Sound does not appear to be directly related to sockeye escapement magnitude into Salmon Lake from 2001 to 2006 (Table 10). Also, subsistence users reported harvesting very few sockeye salmon from the Salmon Lake system from 2001 to 2006 (ADF&G Alexander Database), relative to the size of the measured escapements. ADF&G views harvest reports as confidential when only a very few fishers report harvests, and they will only release harvest statistics when aggregating over what they consider a large number of fishers. Too few fishers reported harvests in some years for ADF&G to release a time series of reported subsistence harvests from 2001 to 2006.

Table 9. Annual age-class distribution in Salmon Lake, 2001 – 2006 (note columns approximately add to 100%).

Age (years)	2001	2002	2003	2004	2005	2006
3	21.5	2.1	4.0	25.1	34.4	24.6
4	29.5	23.4	24.2	49.4	37.4	56.4
5	43.8	52.7	44.2	25.5	27.7	18.1
6	5.2	21.2	27.5	0	0.5	0.9

Table 10. The estimated sockeye escapement into Salmon Lake together with the commercial sockeye harvest in Sitka Sound by year (the latter from the Alaska Department of Fish and Game, Douglas Regional Office, December 2008).

Year	Salmon Lake sockeye escapement estimate	Estimated number of sockeye salmon harvested in the Sitka Sound commercial fisheries
2001	2,258	1,800
2002	1,051	800
2003	1,576	1,400
2004	980	3,900
2005	2,500	2,700
2006	1,900	12,000

In summary, this six-year study provided a reassuring picture of the sockeye resource at Salmon Lake. This system does seem to be on track to produce sustainable runs in the near future, and concerns that this system was over-fished to the point of stock decline seem to have been put to rest. However, this stock's small size and the easy access to it from Sitka are obvious reasons for continued vigilance.

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APPENDIX

Appendix Table A. Daily weir counts, by species, for the Salmon Lake weir in 2005.

	Sockeye salmon		Coho salmon		Chum salmon		Pink salmon		Physical data	
Date	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Water depth (mm)	Water Temp (°C)
12-Jun	1	1	0	0	0	0	0	0	N.A.	N.A.
13-Jun	0	1	0	0	0	0	0	0	N.A.	N.A.
14-Jun	0	1	0	0	0	0	0	0	396	14
15-Jun	1	2	0	0	0	0	0	0	454	14
16-Jun	2	4	0	0	0	0	0	0	433	14
17-Jun	0	4	0	0	0	0	0	0	454	14
18-Jun	1	5	0	0	0	0	0	0	433	14
19-Jun	0	5	0	0	0	0	0	0	396	14
20-Jun	4	9	0	0	0	0	0	0	396	13
21-Jun	0	9	0	0	0	0	0	0	442	16
22-Jun	3	12	0	0	0	0	0	0	457	15
23-Jun	7	19	0	0	0	0	0	0	448	14
24-Jun	2	21	0	0	0	0	0	0	433	14
25-Jun	1	22	0	0	0	0	0	0	433	15
26-Jun	1	23	0	0	0	0	0	0	396	15
27-Jun	1	24	0	0	0	0	0	0	396	15
28-Jun	18	42	0	0	0	0	0	0	396	15
29-Jun	10	52	0	0	0	0	0	0	396	15
30-Jun	33	85	0	0	0	0	0	0	381	15
1-Jul	22	107	0	0	0	0	0	0	381	16
2-Jul	18	125	0	0	0	0	0	0	457	16
3-Jul	0	125	0	0	0	0	0	0	585	16
4-Jul	33	158	0	0	0	0	0	0	558	15
5-Jul	65	223	0	0	0	0	0	0	488	15
6-Jul	5	228	0	0	0	0	0	0	457	15
7-Jul	0	228	0	0	0	0	0	0	433	15
8-Jul	0	228	0	0	0	0	0	0	433	15
9-Jul	4	232	0	0	0	0	0	0	433	15
10-Jul	6	238	0	0	0	0	0	0	396	15
11-Jul	7	245	0	0	0	0	0	0	396	16
12-Jul	3	248	0	0	0	0	0	0	396	15
13-Jul	5	253	0	0	0	0	0	0	396	15
14-Jul	0	253	0	0	0	0	0	0	433	14
15-Jul	0	253	0	0	0	0	0	0	482	14
16-Jul	30	283	0	0	0	0	0	0	482	15
17-Jul	87	370	0	0	0	0	0	0	658	15
18-Jul	0	370	0	0	0	0	0	0	701	15
19-Jul	20	390	0	0	0	0	0	0	658	15
20-Jul	0	390	0	0	0	0	22	22	558	15
21-Jul	30	420	0	0	0	0	0	22	558	15
22-Jul	11	431	0	0	0	0	49	71	558	14

Appendix Table A. Daily weir counts, by species, for the Salmon Lake weir in 2005 (cont.).

	Sockeye salmon		Coho salmon		Chum salmon		Pink salmon		Physical data	
Date	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Water depth (mm)	Water Temp (°C)
23-Jul	5	436	0	0	1	1	37	108	546	14
24-Jul	10	446	0	0	0	1	71	179	482	13
25-Jul	8	454	0	0	0	1	35	214	469	13
26-Jul	3	457	0	0	0	1	30	244	457	13
27-Jul	46	503	0	0	2	3	5	249	533	13
28-Jul	10	513	0	0	43	46	355	604	610	13
29-Jul	2	515	0	0	1	47	297	901	558	13
30-Jul	0	515	0	0	0	47	78	979	509	13
31-Jul	0	515	0	0	3	50	157	1,136	457	13
1-Aug	7	522	0	0	3	53	279	1,415	457	14
2-Aug	8	530	0	0	2	55	320	1,735	457	13
3-Aug	4	534	0	0	2	57	207	1,942	433	13
4-Aug	8	542	0	0	6	63	139	2,081	433	13
5-Aug	1	543	0	0	2	65	136	2,217	497	13
6-Aug	5	548	0	0	1	66	96	2,313	686	13
7-Aug	4	552	0	0	4	70	408	2,721	585	13
8-Aug	0	552	1	1	3	73	660	3,381	509	12
9-Aug	2	554	0	1	6	79	303	3,684	457	14
10-Aug	3	557	2	3	1	80	77	3,761	433	14
11-Aug	4	561	2	5	3	83	326	4,087	421	14
12-Aug	2	563	0	5	3	86	133	4,220	405	15
13-Aug	5	568	0	5	2	88	111	4,331	381	14
14-Aug	0	568	2	7	0	88	64	4,395	369	14
15-Aug	2	570	0	7	0	88	0	4,395	357	14
16-Aug	2	572	0	7	0	88	162	4,557	355	12
17-Aug	4	576	0	7	0	88	443	5,000	381	12
18-Aug	41	617	0	7	0	88	870	5,870	N.A.	N.A.
19-Aug	16	633	3	10	6	94	2,642	8,512	N.A.	N.A.
20-Aug	20	653	5	15	9	103	1,455	9,967	N.A.	N.A.
21-Aug	15	668	15	30	13	116	1,954	11,921	482	14
22-Aug	13	681	10	40	18	134	1,288	13,209	914	N.A.
23-Aug	5	686	3	43	61	195	1,860	15,069	736	13
24-Aug	2	688	1	44	17	212	2,157	17,226	572	13
25-Aug	14	702	15	59	21	233	1,122	18,348	559	13
26-Aug	5	707	24	83	51	284	1,963	20,311	800	12
27-Aug	6	713	28	111	25	309	1,695	22,006	635	12
28-Aug	2	715	15	126	19	328	810	22,816	546	11
29-Aug	0	715	2	128	9	337	280	23,096	508	12

Appendix Table A. Daily weir counts, by species, for the Salmon Lake weir in 2005 (cont.).

	Sockeye salmon		Coho salmon		Chum salmon		Pink salmon		Physical data	
Date	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Water depth (mm)	Water Temp (°C)
30-Aug	4	719	1	129	4	341	233	23,329	787	11
31-Aug	5	724	3	132	23	364	789	24,118	953	11
1-Sep	1	725	12	144	31	395	1,605	25,723	787	11
2-Sep	3	728	3	147	17	412	859	26,582	622	12
3-Sep	2	730	4	151	14	426	344	26,926	572	10
4-Sep	5	735	4	155	3	429	396	27,322	533	11
5-Sep	1	736	3	158	5	434	338	27,660	N.A.	11
6-Sep	5	741	1	159	3	437	375	28,035	572	10
7-Sep	0	741	5	164	8	445	965	29,000	1,448	11
8-Sep	1	742	0	164	0	445	0	29,000	N.A.	10
9-Sep	1	743	4	168	15	460	1,274	30,274	813	11
10-Sep	1	744	2	170	0	460	1,181	31,455	610	11
11-Sep	2	746	0	170	9	469	1,074	32,529	N.A.	11
12-Sep	0	746	0	170	8	477	394	32,923	533	12
13-Sep	0	746	0	170	2	479	159	33,082	813	10
14-Sep	0	746	2	172	8	487	925	34,007	711	12
15-Sep	1	747	0	172	3	490	152	34,159	584	11
16-Sep	0	747	0	172	5	495	335	34,494	533	10
17-Sep	0	747	0	172	1	496	170	34,664	533	N.A.
18-Sep	0	747	23	195	6	502	961	35,625	1,270	9
19-Sep	0	747	0	195	0	502	0	35,625	1,524	10
20-Sep	0	747	0	195	0	502	0	35,625	1,143	9
21-Sep	0	747	24	219	0	502	652	36,277	889	10
22-Sep	0	747	26	245	8	510	714	36,991	660	10
23-Sep	0	747	0	245	3	513	142	37,133	673	9
24-Sep	0	747	1	246	0	513	54	37,187	965	10
25-Sep	1	748	5	251	1	514	13	37,200	965	9
26-Sep	1	749	109	360	0	514	144	37,344	711	10
27-Sep	0	749	22	382	0	514	56	37,400	610	9
28-Sep	0	749	6	388	2	516	23	37,423	1,117	9
29-Sep	0	749	50	438	2	518	58	37,481	1,372	9
30-Sep	0	749	17	455	0	518	21	37,502	991	8
1-Oct	0	749	41	496	0	518	9	37,511	927	9
2-Oct	0	749	32	528	0	518	13	37,524	660	9
3-Oct	0	749	25	553	0	518	3	37,527	559	8
4-Oct	0	749	11	564	0	518	3	37,530	521	N.A.
5-Oct	0	749	9	573	0	518	3	37,533	508	9
6-Oct	0	749	22	595	0	518	4	37,537	863	9

Appendix Table A. Daily weir counts, by species, for the Salmon Lake weir in 2005 (cont.).

	Sockeye salmon		Coho salmon		Chum salmon		Pink salmon		Physical data	
Date	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Water depth (mm)	Water Temp (°C)
7-Oct	0	749	16	611	1	519	3	37,540	698	8
8-Oct	0	749	19	630	0	519	1	37,541	572	8
9-Oct	1	750	7	637	0	519	0	37,541	N.A.	N.A.
10-Oct	0	750	5	642	0	519	0	37,541	1,168	8
11-Oct	1	751	2	644	0	519	0	37,541	787	7
12-Oct	0	751	7	651	0	519	0	37,541	1,219	8
13-Nov	0	751	15	666	0	519	0	37,541	965	7
14-Nov	0	751	9	675	0	519	0	37,541	711	7
15-Oct	0	751	10	685	0	519	0	37,541	584	8
16-Oct	0	751	3	688	0	519	0	37,541	546	7
17-Oct	0	751	4	692	0	519	0	37,541	533	7
18-Oct	0	751	5	697	0	519	1	37,542	559	7
19-Oct	0	751	4	701	0	519	0	37,542	749	7
20-Oct	0	751	8	709	0	519	0	37,542	610	7
21-Oct	0	751	2	711	0	519	0	37,542	559	7
22-Oct	0	751	0	711	0	519	0	37,542	889	6
23-Oct	0	751	18	729	0	519	0	37,542	889	5
24-Oct	0	751	6	735	0	519	0	37,542	813	5
25-Oct	0	751	2	737	0	519	0	37,542	762	6
26-Oct	0	751	0	737	0	519	0	37,542	622	6

Appendix Table B. Daily weir counts, by species, for the Salmon Lake weir in 2006.

	Sockeye salmon		Coho salmon		Chum salmon		Pink salmon		Physical data		
Date	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Water depth (mm)	Water Temp (°C)	Rain Gauge (mm)
23-Jun	11	11	0	0	0	0	0	0	344	13	8
24-Jun	0	11	0	0	0	0	0	0	305	13	3
25-Jun	13	24	0	0	0	0	0	0	317	11	10
26-Jun	27	51	0	0	0	0	0	0	433	12	16
27-Jun	6	57	0	0	0	0	0	0	352	11	6
28-Jun	3	60	0	0	0	0	0	0	381	12	23
29-Jun	4	64	0	0	0	0	0	0	457	11	17
30-Jun	73	137	0	0	0	0	0	0	405	11	1
1-Jul	88	225	0	0	0	0	1	1	267	11	0
2-Jul	37	262	0	0	0	0	0	1	305	12	0
3-Jul	13	275	0	0	0	0	0	1	277	12	0
4-Jul	6	281	0	0	0	0	0	1	254	14	0
5-Jul	60	341	0	0	0	0	0	1	241	13	0
6-Jul	25	366	0	0	0	0	0	1	229	12	0
7-Jul	1	367	0	0	0	0	0	1	238	14	14
8-Jul	26	393	0	0	0	0	0	1	279	11	9
9-Jul	254	647	0	0	3	3	7	8	603	12	36
10-Jul	92	739	0	0	0	3	4	12	438	12	6
11-Jul	31	770	0	0	0	3	0	12	330	12	1
12-Jul	21	791	0	0	0	3	0	12	279	13	0
13-Jul	4	795	0	0	0	3	0	12	254	12	0
14-Jul	37	832	0	0	0	3	0	12	241	12	2
15-Jul	14	846	0	0	0	3	0	12	223	13	0
16-Jul	7	853	0	0	0	3	0	12	209	13	2
17-Jul	1	854	0	0	0	3	0	12	203	12	0
18-Jul	5	859	0	0	0	3	1	13	195	13	5
19-Jul	1	860	0	0	0	3	0	13	192	13	1
20-Jul	3	863	0	0	0	3	0	13	178	13	1
21-Jul	4	867	0	0	0	3	0	13	198	13	10
22-Jul	25	892	0	0	1	4	1	14	317	12	16
23-Jul	26	918	0	0	1	5	2	16	289	14	3
24-Jul	12	930	0	0	0	5	0	16	257	13	1
25-Jul	2	932	0	0	0	5	0	16	229	14	0
26-Jul	21	953	0	0	3	8	0	16	225	13	6
27-Jul	6	959	1	1	9	17	1	17	438	14	24
28-Jul	18	977	0	1	3	20	3	20	343	12	
29-Jul	0	977	0	1	3	23	1	21	279	15	0
30-Jul	0	977	0	1	0	23	0	21	247	15	0
31-Jul	0	977	0	1	0	23	0	21	222	15	9
1-Aug	29	1,006	0	1	4	27	6	27	317	16	10
2-Aug	105	1,111	3	4	24	51	260	287	508	11	22

Appendix Table B. Daily weir counts, by species, for the Salmon Lake weir in 2006 (cont.).

	Sockeye salmon		Coho salmon		Chum salmon		Pink salmon		Physical data		
Date	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Water depth (mm)	Water Temp (°C)	Rain Gauge (mm)
3-Aug	66	1,177	4	8	4	55	299	586	578	11	20
4-Aug	39	1,216	8	16	2	57	219	805	413	13	2
5-Aug	7	1,223	2	18	3	60	40	845	330	12	8
6-Aug	61	1,284	14	32	17	77	214	1,059	660	11	23
7-Aug	9	1,293	7	39	13	90	44	1,103	432	11	2
8-Aug	0	1,293	2	41	0	90	6	1,109	336	11	4
9-Aug	1	1,294	1	42	0	90	12	1,121	305	12	2
10-Aug	2	1,296	0	42	0	90	16	1,137	273	12	2
11-Aug	0	1,296	1	43	0	90	28	1,165	251	12	1
12-Aug	0	1,296	1	44	0	90	16	1,181	260	12	13
13-Aug	7	1,303	0	44	0	90	61	1,242	279	12	10
14-Aug	3	1,306	0	44	0	90	50	1,292	343	11	12
15-Aug	0	1,306	0	44	0	90	3	1,295	323	11	2
16-Aug	0	1,306	0	44	0	90	31	1,326	293	11	2
17-Aug	0	1,306	2	46	0	90	67	1,393	305	11	4
18-Aug	0	1,306	0	46	0	90	0	1,393	393	12	0
19-Aug	4	1,310	3	49	1	91	397	1,790	444	12	6
20-Aug	0	1,310	0	49	0	91	52	1,842	375	14	0
21-Aug	0	1,310	0	49	0	91	44	1,886	311	14	1
22-Aug	0	1,310	0	49		91	37	1,923	279	13	6
23-Aug	1	1,311	0	49	0	91	89	2,012	267	13	6
24-Aug	0	1,311	0	49	1	92	115	2,127	280	12	6
25-Aug	33	1,344	4	53	16	108	666	2,793	280	12	8
26-Aug	9	1,353	1	54	10	118	1,034	3,827	508	11	20
27-Aug	0	1,353	5	59	8	126	910	4,737	355	12	4
28-Aug	2	1,355	7	66	18	144	601	5,338	413	11	16
29-Aug	2	1,357	6	72	6	150	177	5,515	432	10	18
30-Aug	4	1,361	5	77	8	158	277	5,792	432	11	8
31-Aug	17	1,378	16	93	27	185	1,100	6,892	635	10	32
1-Sep	0	1,378	0	93	0	185	0	6,892	1,372	11	112
2-Sep	0	1,378	4	97	0	185	81	6,973	838	11	86
3-Sep	0	1,378	4	101	15	200	241	7,214	476	10	2
4-Sep	0	1,378	0	101	4	204	118	7,332	393	10	3
5-Sep	0	1,378	0	101	0	204	54	7,386	317	11	2
6-Sep	0	1,378	0	101	0	204	0	7,386	324	10	2
7-Sep	0	1,378	0	101	0	204	0	7,386	267	11	6
8-Sep	0	1,378	0	101	1	205	55	7,441	393	11	10
9-Sep	0	1,378	0	101	0	205	31	7,472	343	11	5
10-Sep	0	1,378	1	102	3	208	123	7,595	355	11	16
11-Sep	0	1,378	0	102	0	208	0	7,595	393	11	6

Appendix Table B. Daily weir counts, by species, for the Salmon Lake weir in 2006 (cont.).

	Sockeye salmon		Coho salmon		Chum salmon		Pink salmon		Physical data		
Date	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Water depth (mm)	Water Temp (^{o}C)	Rain Gauge (mm)
12-Sep	1	1,379	0	102	4	212	84	7,679	355	11	8
13-Sep	0	1,379	0	102	5	217	72	7,751	330	12	2
14-Sep	0	1,379	0	102	0	217	0	7,751	292	10	0
15-Sep	0	1,379	0	102	0	217	0	7,751	279	10	0
16-Sep	0	1,379	0	102	0	217	0	7,751	254	10	0
17-Sep	0	1,379	0	102	0	217	0	7,751	229	11	0
18-Sep	0	1,379	0	102	0	217	52	7,803	229	11	6