

GOODNEWS RIVER FISHERIES STUDIES, 1989

By:

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## ABSTRACT

The Goodnews River salmon counting tower operated from 28 June through 31 July 1989. An estimated 1,915 chinook (Oncorhynchus tshawytscha), 21,186 sockeye (O. nerka), 145 coho (O. kisutch), 246 pink (O. gorbuscha) and 10,380 chum (O. keta) salmon migrated past the counting tower during the 1989 operational period. The chinook and chum salmon season passage was below the minimum escapement objective established for the project. Sockeye salmon season passage was at the lower end of the escapement objective range.

Aerial survey counts of the Goodnews River system, in combination with tower estimates of the Middle Fork Goodnews River, provided a 1989 escapement estimate of 2,891 chinook, 35,476 sockeye, 400 pink and 15,495 chum salmon returning to the Goodnews River. The escapement estimates combined with the reported commercial and the estimated subsistence harvest in Goodnews Bay yields a total run estimate of 6,324 chinook, 55,644 sockeye, 482 pink and 29,877 chum salmon.



## INTRODUCTION

### *Description of the Area*

The Goodnews River originates in the Ahklun Mountains and flows southwest approximately 60 miles to Goodnews Bay (Figure 1). The Middle Fork parallels the length of the mainstem (North Fork) Goodnews River before joining near its mouth. The Alaska Department of Fish and Game (ADF&G) operates a salmon counting tower on the Middle Fork approximately 11 river miles from Goodnews Bay village. The Goodnews River system drains an area of roughly 910 square miles and contains many lakes. All five species of Pacific salmon reside in the Goodnews River drainage.

### *Commercial Fishery*

Commercial salmon fishing has occurred annually since 1968 in Goodnews Bay. The prevailing commercial gear employed consists of drift gill nets fished in tidal channels radiating from the Goodnews River (Figure 2). The 1989 Goodnews Bay reported commercial harvest totaled 2,966 chinook (*Oncorhynchus tshawytscha*), 19,299 sockeye (*O. nerka*) 31,849 coho (*O. kisutch*), 82 pink (*O. gorbuscha*) and 13,622 chum (*O. keta*) salmon (Table 1). The 1989 chinook salmon harvest was 42% below the previous (1984-1988) five year average. The commercial harvest of sockeye and coho salmon harvest were slightly below their previous five year average. The pink salmon commercial harvest may not truly reflect abundance as pink salmon is the least commercially valuable species and is not targeted. The even year pink salmon run is historically larger than the odd year run. The chum salmon commercial harvest was 18% below the previous 5 year average of 16,584 fish (Appendix 1).

### *Subsistence Fishery*

Goodnews Bay residents have long depended upon the fishery resources as a source of food. The Department has documented subsistence salmon harvests in Goodnews Bay since 1977 (Appendix 2). Harvest estimates in 1989 were made from interviews with subsistence fishing families in November. In 1989 the Subsistence Division interviewed 62 subsistence fishing families. The estimated subsistence harvest was 467 chinook, 869 sockeye, 897 coho, and 760 chum salmon (Table 2).

### *Escapement Objectives*

Preliminary escapement objectives of 3,000 to 4,000 chinook, 35,000 to 45,000 sockeye and 13,000 to 18,000 chum salmon were established in 1983 (Schultz, 1984). Evaluation of the sockeye salmon exploitation rate in previous years indicated that historic harvest levels could be maintained with a reduced escapement objective (Appendix 3).

The escapement objective for sockeye salmon was lowered to 20,000 to 30,000 in 1989. Total annual harvest of sockeye has averaged 19,989 fish since 1983 while escapement into the Goodnews River drainage has averaged 58,094. The average exploitation rate (subsistence and commercial) has averaged 27% with a range of 16 to 49% (Appendix 3). In the Togiak River drainage, which lies adjacent to the Goodnews River area, sockeye salmon exploitation rates have averaged 60% (ADF&G, 1989). Although the sockeye escapement data base is not extensive enough to estimate spawner/recruit ratios, there is no evidence that Goodnews Bay sockeye productivity is significantly less than that in the Togiak area. Lowering the escapement objective to 20,000 to 30,000 sockeye should allow for an increased exploitation rate while maintaining total sockeye run size at historic levels.

The objectives represent those escapement levels thought to be necessary to maintain returns at current levels, and are based on historical aerial surveys and counting tower information. Escapement objectives are useful in evaluating abundance trends and the success of fishery management strategies. In-season cumulative counting tower escapement estimates can be compared with historic migratory timing to predict whether escapement objectives will be achieved. This information helps managers of the Goodnews Bay commercial fishery determine commercial periods. Continuing assessment of salmon returns may require future adjustments of the escapement objectives to optimize salmon production.

## METHODS

### *Atmospheric and Hydrological Observations*

Project personnel recorded standard environmental factors including relative water level, precipitation, and air and water temperatures daily at the tower site. Changes in water level, usually associated with precipitation, influence the ability to enumerate and identify salmon. Increased water level usually increases turbidity making enumeration and identification more difficult. Air and water temperatures are collected to establish a data base that may provide significant relationships with run timing, survival, or other parts of the life history.

### *Salmon Escapement Estimates*

The sampling scheme used for the 1989 field season was similar to that used since 1985. The hour was the primary sample unit, with three secondary units (3 consecutive 20-minute periods). The observer monitored the first 20-minutes of each hour. To obtain the net number of salmon going upriver during the 20-minute counting period, the recorded number of salmon of each species that went downstream was subtracted from those that traveled upriver. The 20-minute count was multiplied by three to estimate the full hour passage. Six 24 consecutive hour counts (one 20-minute period per hour) were conducted in 1989 to determine daily diel passage rates for salmon.

Historical (1981-1989) average counts by hour for each species, as a percentage of the daily total (Appendices 4-7), were used to expand passage estimates for those hours that the tower was not in operation. With the limited data base available for coho salmon, the average historical sockeye salmon hourly migration percentage was used to determine coho salmon passage during hours the tower was not operating. The historical hourly migration percentages during high pink salmon return years (1982, 1984, 1986 and 1988) has a large enough data base to evaluate the passage of pink salmon during hours the tower was not in operation.

The average of the previous and succeeding daily counts was used to estimated daily counts for scheduled crew days off (Sundays and holidays).

#### *Age, Sex and Size*

The region has established escapement sample objectives for age, length and sex information of 150 each for chinook, sockeye and chum salmon. Fish were collected by beach seining below the tower site on the Middle Fork and on the North Fork Goodnews River .

#### *Aerial Survey*

The Department conducted aerial surveys on 25 July and 15 August 1989 to assess escapement on the Goodnews River system. Aerial surveys count only a percentage of the fish present, which may vary depending on the experience of the surveyor, weather conditions and the spawning stage of the salmon at the time of the survey. The percentage of the salmon observed by the surveyor was calculated by comparing the aerial survey count above the tower site with the tower count through that date. Expanding the aerial survey count of the entire Goodnews River to estimate total escapement based on this relationship assumes the surveyor was observing the same percentage of the fish present throughout the survey.

### **RESULTS**

#### *Atmospheric and Hydrological Observations*

Atmospheric and hydrological observations at the Goodnews River salmon counting tower site are found in Appendix 8. Extremely high water levels delayed the start of the project until 28 June. The scheduled operational date was 15 June. Water levels and visibility did not adversely affect fish counts during tower operation after 28 June (Figure 3).

#### *Salmon Escapement Estimates*

An unexpanded total of 448 chinook, 4,290 sockeye, 33 coho, 64 pink and 2,579 chum salmon were counted during 522 twenty-minute tower counting periods (Tables 3-7). The 20-minute estimates, expanded by a factor of three, and expanding for hours or days not counted, yields total estimates of 1,773 chinook, 18,375 sockeye, 145 coho, 246 pink and 10,058 chum salmon passing the site during the

operational period (Tables 8-11). An estimated 1,915 chinook, 21,186 sockeye, 145 coho, 246 pink and 10,380 chum salmon passed the tower site in 1989 when expanding the counts to include escapement prior to initiation of the tower counting operation (Table 12). Historic estimates of daily and cumulative salmon escapements for the Goodnews River counting tower are shown in Appendices 9-13.

The 1989 expanded escapement estimate of 1,915 chinook salmon was well below the minimum objective of 3,000 chinook salmon. Run timing was very similar to the 1981 to 1989 average (Appendix 14), with 50 percent of the chinook salmon migration passing the tower site by 12 July.

The 1989 expanded escapement estimate of 21,186 sockeye salmon is slightly above the minimum escapement objective of 20,000 sockeye salmon. Run timing was two days later than the average for the nine years the tower has been in operation (Appendix 15). Fifty percent of the run passed by 8 July.

Historic daily cumulative proportions of coho and pink salmon escapement are shown in Appendices 16 and 17. These are incomplete since tower operation is discontinued well before the peak of migration for these species.

The 1989 expanded escapement estimate of 10,380 chum salmon is below the escapement objective of 13,000 to 18,000 chum salmon. Run timing was one day earlier than average with 50 percent of the chum salmon migration passing the tower site by 15 July (Appendix 18).

Average daily diel count distributions for chinook, sockeye and chum salmon were similar (Appendices 19-22 and Figure 4). Peak passage time was between noon and midnight when approximately 75% of the fish were observed. The peak periods for chinook salmon passage were from 9:00 pm and 10:00 pm and 3:00 am and 4:00 am when 10.4% of the fish were counted. Peak hour for sockeye and chum salmon passage was between midnight and 1:00 am when 7.3% of the sockeye and 14.6% of the chum were observed.

#### *Age, Sex and Size*

A total of 32 chinook, 93 sockeye and 193 chum salmon with readable scales was sampled by beach seine in 1989 (Tables 13-16). Chinook salmon were mainly age 6 (63%), sockeye salmon were predominately age 5 (88%) and the majority of chum salmon (65%) were age 4 fish.

#### *Aerial Survey*

Aerial surveys were flown on 25 July and 15 August to enumerate the salmon escapement in the Goodnews River. The surveyor rated the conditions fair with clear skies, low and clear river water levels and before peak chinook and sockeye salmon spawning stage but after the peak of chum salmon spawning. The surveyor counted 1,928 chinook, 21,350 sockeye and 4,362 chum salmon (Table 17). Of this total, 1,277 chinook, 12,750 sockeye and 2,922 chum salmon were counted above the tower site. Based on the tower estimate through the date of the survey the surveyor counted 66.7, 60.2 and 28.2 percent of the chinook, sockeye and chum salmon escapement, respectively.

Assuming the surveyor counted the same percentage throughout the drainage, the total escapement into the Goodnews River on July 31 was estimated to be 2,891 chinook, 35,476 sockeye, 400 pink and 15,495 chum salmon (Table 17). The escapement estimates combined with commercial and estimated subsistence harvest in Goodnews Bay result in a total run size estimate of 6,324 chinook, 55,644 sockeye, 482 pink and 29,877 chum salmon. The commercial fishery exploitation rate was approximately 54, 36, 17 and 48 percent of the estimated run size for chinook, sockeye, pink and chum salmon, respectively (Appendix 3).

## DISCUSSION

Adjustment of the time allowed for commercial fishing is the primary method of controlling the harvest in Goodnews Bay. The apparent lag time between the commercial fishery and the tower project is too large to use the tower estimate for in-season management during the early portion of the chinook salmon migration. This inability to accurately assess the run status of chinook salmon early makes it necessary to take a conservative approach towards chinook salmon management. The tower estimates become more useful as an in-season indicator of the chinook salmon run as the season progresses. The Goodnews Bay commercial fishery opened on 19 June and a "normal" schedule of two 12-hour periods per week was maintained in June. Preliminary 1989 tower count estimates confirmed preseason forecasts of a weak chinook salmon return, and suggested that chinook salmon escapement objectives would not be achieved. To minimize transfer of fishermen from Districts 1 and 4, the openings were scheduled to coincide with commercial fishery openings in these districts.

Historical commercial fishery statistics are the primary tool available to the managers of the Goodnews Bay commercial fishery during the early portion of the chinook salmon migration. However, managers can use tower estimates as early as 1 July since 16 percent of the historical (1981-1989) average migration has passed the tower by that date (Appendix 14). Historically, 60 to 70 percent of the chinook salmon migration has passed through the commercial fishery by 1 July. This is not too late to adjust commercial periods to accommodate the chinook salmon escapement objective. Due to high water levels, the startup date for the tower was delayed 14 days past its normal starting date. This delay greatly reduced the managers ability to assess chinook salmon escapement in time to adjust commercial harvest levels.

The project is an excellent in-season management tool for sockeye salmon which have a short travel time between the commercial fishery and the tower site. After fishing three 12-hour periods in the first week of July, it became apparent that the sockeye salmon escapement was below average. Managers allowed two 12-hour periods in the second and fourth weeks ("normal" schedule is three 12-hour periods per week) and one 12-hour period during the third week of July to allow additional chinook and sockeye salmon escapement. The commercial harvest of 19,299 sockeye salmon was below the previous five year average of 22,282 salmon. The reduction in fishing time allowed the sockeye escapement to reach the low end of the objective range.

The return of chum salmon into the Goodnews Bay fishery coincides with the sockeye salmon migration. There are only limited ways to segregate the harvest of these two species within Goodnews Bay, with sockeye salmon the primary species of management concern. The commercial harvest of 13,622 chum salmon was below the previous five year average (1984-1988) of 16,584 salmon. The tower escapement estimate of 10,380 chum salmon was below the escapement objective of 13,000 to 18,000 salmon.

The district was returned to a three 12-hour per week fishing schedule on 31 July as sockeye and chum harvests dropped and coho salmon dominated the catch. Coho catches were "normal" until the last week of August when harvests fell below historic levels for that time period. The fishery was closed on 1 September and opened for the last time on 8 September but no fish were sold due to lack of buyers.



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**TABLES**

Table 1. Goodnews Bay, District 5, commercial salmon harvest and fishing effort by period, 1989.

Date	Permits	Lodgs	Chinook		Sockeye		Coho		Pink		Chum	
			No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
6/19	18	23	390	1.81	551	2.55	0	0.00	0	0.00	557	2.58
6/23	27	29	583	1.80	1,466	4.52	0	0.00	0	0.00	886	2.73
6/26	30	30	416	1.16	1,909	5.30	0	0.00	0	0.00	1,241	3.45
6/30	33	36	460	1.16	2,037	5.14	0	0.00	0	0.00	1,349	3.41
7/03	38	43	156	0.34	2,589	5.68	0	0.00	0	0.00	1,309	2.87
7/05	26	26	95	0.30	1,254	4.02	0	0.00	0	0.00	976	3.13
7/07	41	42	196	0.40	2,083	4.23	0	0.00	0	0.00	1,809	3.68
7/10	45	50	203	0.30	1,759	3.26	0	0.00	9	0.02	2,085	3.86
7/14	42	45	210	0.42	1,656	3.29	1	0.00	4	0.01	1,963	3.89
7/21	41	45	44	0.09	887	1.80	18	0.04	7	0.01	440	0.89
7/24	37	40	23	0.05	588	1.32	33	0.07	9	0.02	315	0.71
7/27	33	33	26	0.07	419	1.06	68	0.17	6	0.02	162	0.41
7/31	31	31	20	0.05	300	0.81	364	0.98	4	0.01	92	0.25
8/02	34	35	26	0.06	256	0.63	891	2.18	6	0.01	92	0.23
8/04	31	33	17	0.05	208	0.56	878	2.36	0	0.00	36	0.10
8/07	30	32	15	0.04	178	0.49	812	2.26	2	0.01	16	0.04
8/09	31	33	18	0.05	135	0.36	2,163	5.81	2	0.01	45	0.12
8/11	28	29	15	0.04	80	0.24	2,550	7.59	5	0.01	25	0.07
8/14	32	38	11	0.03	122	0.32	2,374	6.18	3	0.01	62	0.16
8/16	37	43	6	0.01	110	0.25	2,557	5.76	3	0.01	14	0.03
8/18	46	51	8	0.01	96	0.17	3,864	7.00	4	0.01	6	0.01
8/21	60	66	7	0.01	239	0.33	3,459	4.80	3	0.00	127	0.18
8/23	53	57	7	0.01	88	0.14	3,417	5.37	2	0.00	6	0.01
8/25	55	62	1	0.00	90	0.14	3,590	5.44	1	0.00	4	0.01
8/28	65	68	8	0.01	74	0.09	2,235	2.87	4	0.01	2	0.00
8/30	57	58	4	0.01	68	0.10	1,483	2.17	7	0.01	2	0.00
9/01	45	51	1	0.00	57	0.11	1,092	2.02	1	0.00	1	0.00
9/08	0	0					----	NO BUYER	----			
Total	88	1,129	2,966	0.31	19,299	1.74	31,849	2.34	82	0.01	13,622	1.22
Average wt. (lbs)			17.7		7.09		8.57		4.06		7.26	

Table 2. Goodnews Bay area subsistence salmon fishery summary, 1989.

Village	Families Surveyed			Reported Harvest					Estimated Total No. Fishing Families	Expanded Harvest Estimates				
	Number	People	Dogs	Chinook	Sockeye	Coho	Pink	Chum		Chinook	Sockeye	Coho	Pink	Chum
Goodnews	31	129	7	264	451	510	0	375	67	423	718	829	0	620
Platinum	12	46	0	32	109	49	0	101	25	44	151	68	0	140
Goodnews Bay														
Total	62	175	7	296	560	559	0	476	92	467	869	897	0	760

Table 3. Chinook salmon escapement counts by 20-minute observation period for the Goodnews River tower, 1989.

Date	No. counts	Chinook salmon counted for 20-minute observation during hour:																					Total No. Chinook Salmon Counted	Percent Daily run Counted			
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20			21	22	23
6/28	19	0	0	1	1	3	1	0					0	2	0	4	3	4	1	1	0	0	0	0	21	90.2	
6/29	18	0	0	0	0	0	0	0					0	0	1	0	2	2	1	0	1	0	0	0	7	89.2	
6/30	6	1	2	4	4	2	4																		17	23.5	
7/1	12												1	0	1	11	5	4	0	0	0	1	0	1	24	65.7	
7/2	16	0	0	1	0								2	1	1	1	2	1	1	0	0	4	0	2	16	84.3	
7/3	16	1	1	0	2								2	2	1	2	0	3	0	0	0	0	0	2	16	84.3	
7/4	0																								0	0.0	
7/5	12												0	0	0	0	0	0	1	8	2	0	1	0	12	65.7	
7/6	16	-2	0	-5	0								0	-1	1	2	0	0	1	2	-1	1	0	0	-2	84.3	
7/7	16	0	0	5	1								0	0	2	1	4	2	3	0	1	2	2	0	23	84.3	
7/8	13	1											0	0	0	0	0	0	0	0	1	2	0	2	6	70.2	
7/9	0																								0	0.0	
7/10	24	0	0	0	1	-1	0	0	0	0	1	0	0	0	1	1	0	4	1	1	0	2	2	0	13	99.7	
7/11	18	1	2	1	2	0	0						1	1	3	0	2	1	3	4	5	2	2	0	30	89.2	
7/12	18	0	3	3	7	4	0						3	4	0	3	1	3	1	0	0	0	1	1	34	89.2	
7/13	18	3	0	2	2	7	0						0	0	8	3	5	0	1	1	5	2	0	0	39	89.2	
7/14	18	0	2	1	1	0	0						0	1	2	4	1	4	1	4	2	0	1	0	24	89.2	
7/15	18	0	2	3	2	3	2						4	0	1	0	1	4	1	0	0	0	1	2	26	89.2	
7/16	0																								0	0.0	
7/17	24	0	3	1	3	3	-1	-1	0	0	1	-1	4	1	0	2	0	7	3	3	0	3	4	0	6	41	99.7
7/18	24	0	1	1	1	0	0	0	0	0	0	1	0	0	0	1	1	2	2	3	-1	1	3	1	2	19	99.7
7/19	18	0	1	2	0	0	0							0	3	0	0	0	0	0	1	0	0	1	2	10	89.2
7/20	18	1	1	0	1	1	-3							0	0	-1	0	0	0	1	0	0	0	-1	0	89.2	
7/21	18	0	0	0	0	0	0							0	2	2	0	-1	0	4	0	4	-1	1	1	12	89.2
7/22	24	0	0	3	3	3	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	3	0	16	99.7
7/23	0																									0	0.0
7/24	24	0	2	1	3	1	1	0	0	1	0	0	0	0	0	-1	0	0	0	1	0	0	2	0	0	11	99.7
7/25	18	0	3	0	0	1	-1							0	-1	0	0	0	1	-1	0	1	1	0	0	4	89.2
7/26	24	3	2	1	1	1	0	0	1	0	0	2	-1	0	2	-1	0	0	0	1	0	0	1	0	2	15	99.7
7/27	18	2	0	2	2	1	1							0	0	3	-2	-1	1	0	0	0	0	1	1	11	89.2
7/28	18	0	0	0	-1	1	0							0	1	0	1	-1	0	1	-1	-1	0	0	1	1	89.2
7/29	18	1	0	0	1	1	1							0	0	0	0	1	-1	-1	-1	0	0	0	1	3	89.2
7/30	0																									0	0.0
7/31	18	0	0	0	-1	0	0							-1	-1	-1	3	0	0	0	0	0	0	0	0	-1	89.2
Total	522	12	25	27	36	31	5	-1	1	1	2	2	3	13	17	26	35	34	39	27	20	25	26	17	25	448	

Table 4. Sockeye salmon escapement counts by 20-minute observation period for the Goodnews River tower, 1989.

Date	No. of counts	Sockeye counted for 20-minute observation during hour:																				Total No. sockeye salmon counted	Percent Daily run counted				
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19			20	21	22	23
6/28	19	0	17	12	1	17	3	0					14	17	20	33	6	60	7	26	9	26	35	8	311	84.3	
6/29	18	5	13	1	1	2	2					3	0	17	2	4	28	33	6	6	4	4	0	131	81.9		
6/30	6	1	0	2	1	1	6																		11	17.4	
7/1	12												8	9	21	1	14	27	2	0	19	34	8	14	157	64.5	
7/2	16	14	2	5	2							2	16	9	15	8	30	2	0	0	0	11	17	4	137	78.5	
7/3	16	9	13	1	13							16	2	9	6	18	4	43	0	6	20	0	11	171	78.5		
7/4	0																								0	0.0	
7/5	12											0	0	0	0	4	29	7	30	4	1	8	6	89	64.5		
7/6	16	10	2	1	5							48	12	5	24	18	1	1	21	22	7	10	2	189	78.5		
7/7	16	4	10	4	5							4	1	0	16	19	44	5	14	23	34	5	25	213	78.5		
7/8	13	9										17	10	5	12	35	39	18	7	11	16	7	8	194	69.5		
7/9	0																								0	0.0	
7/10	24	3	13	8	10	3	2	3	13	4	4	6	35	12	14	35	50	4	28	23	29	21	13	23	10	366	99.8
7/11	18	45	13	8	13	8	3					70	11	17	20	8	24	52	14	20	9	32	33	400	81.9		
7/12	18	36	0	9	2	0	7					7	9	14	19	13	17	30	24	27	48	23	32	317	81.9		
7/13	18	23	10	5	3	0	2					23	0	18	15	7	6	25	7	32	14	4	9	203	81.9		
7/14	18	7	3	10	2	4	5					19	3	6	33	34	9	3	41	22	7	12	6	226	81.9		
7/15	18	14	10	6	4	5	4					7	6	9	5	13	15	2	0	0	0	9	8	117	81.9		
7/16	0																								0	0.0	
7/17	24	27	11	9	5	6	4	2	5	1	0	0	4	20	1	4	0	5	7	0	3	20	10	16	18	178	99.8
7/18	24	22	10	16	17	9	7	13	11	1	1	0	6	2	12	1	0	7	13	24	7	13	2	1	12	207	99.8
7/19	18	20	13	9	4	2	0					5	5	7	5	15	4	1	8	8	11	10	11	138	81.9		
7/20	18	6	5	8	4	3	2					0	4	0	2	18	1	2	12	17	15	17	21	137	81.9		
7/21	18	11	7	4	1	2	2					0	4	0	1	0	6	1	3	4	11	11	8	76	81.9		
7/22	24	7	2	9	5	4	0	1	0	0	0	0	0	0	0	1	4	13	8	6	1	2	4	4	4	75	99.8
7/23	0																								0	0.0	
7/24	24	6	3	10	1	4	0	5	3	0	1	1	1	0	1	2	0	1	3	1	0	7	8	6	5	69	99.8
7/25	18	6	8	4	5	2	2					1	2	0	2	1	2	3	0	2	3	9	2	54	81.9		
7/26	24	2	2	4	2	0	2	2	3	0	0	0	1	0	1	0	0	1	0	0	0	2	6	29	99.8		
7/27	18	9	9	5	0	5	0					0	1	4	-1	0	1	1	0	3	0	6	3	46	81.9		
7/28	18	5	1	3	1	0	0					0	0	0	0	1	0	3	1	2	-1	-1	2	17	81.9		
7/29	18	2	1	-1	0	0	1					1	0	2	1	-1	0	1	1	0	0	2	5	15	81.9		
7/30	0																								0	0.0	
7/31	18	0	1	0	1	0	0					0	2	0	1	0	0	2	1	1	2	4	2	17	81.9		
Total	522	303	179	152	108	77	54	26	35	6	6	7	47	279	143	206	266	266	407	298	256	301	309	284	275	4290	

Table 5. Coho salmon escapement counts by 20-minute observation period for the Goodnews River tower, 1989.

Date	No. counts	Coho salmon counted for 20-minute observation during hour:																							Total No. Coho Salmon Counted	
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
6/28	19	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/29	18	0	0	0	0	0	0						0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/30	6	0	0	0	0	0	0																			
7/1	12												0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/2	16	0	0	0	0								0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/3	16	0	0	0	0								0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/4	0																									
7/5	12												0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/6	16	0	0	0	0								0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/7	16	0	0	0	0								0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/8	13	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/9	0																									
7/10	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/11	18	0	0	0	0	0	0						0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/12	18	0	0	0	0	0	0						0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/13	18	0	0	0	0	0	0						0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/14	18	0	0	0	0	0	0						0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/15	18	0	0	0	0	0	0						0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/16	0																									
7/17	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/18	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/19	18	0	0	0	0	0	0						0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/20	18	0	0	0	0	0	0						0	0	0	0	1	0	0	1	0	0	0	0	1	3
7/21	18	1	0	0	0	0	0						0	0	0	0	0	0	0	0	0	0	0	0	0	1
7/22	24	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
7/23	0																									
7/24	24	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2
7/25	18	0	0	0	0	0	0						0	0	0	0	1	0	0	0	0	0	0	0	0	1
7/26	24	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4
7/27	18	2	1	0	0	0	0						0	0	0	0	0	0	0	0	0	0	0	0	0	3
7/28	18	1	0	0	0	1	0						0	0	0	0	0	0	1	0	0	0	0	0	2	5
7/29	18	0	0	0	0	1	0						0	0	0	0	0	0	0	0	0	0	0	0	0	1
7/30	0																									
7/31	18	0	0	0	0	0	0						0	0	0	1	1	0	2	0	1	3	2	0	0	10
Total	522	7	1	1	0	2	0	0	0	0	1	0	0	0	0	1	1	3	0	3	1	1	3	2	6	33

Table 6. Pink salmon escapement counts by 20-minute observation period for the Goodnews River tower, 1989.

Date	No. counts	Pink salmon counted for 20-minute observation during hour:																					Total No. Pink Salmon Counted			
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20		21	22	23
6/28	19	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0
6/29	18	0	0	0	0	0	0	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0
6/30	6	0	0	0	0	0	0	0																		
7/1	12													0	0	0	0	0	0	0	0	0	0	0	0	0
7/2	16	0	0	0	0									0	0	0	0	0	0	0	0	0	0	0	0	0
7/3	16	0	0	0	0									0	0	0	0	0	0	0	0	0	0	0	0	0
7/4	0																									
7/5	12													0	0	0	0	0	0	0	0	0	0	0	0	0
7/6	16	0	0	0	0									0	0	0	0	0	0	0	0	0	1	0	0	0
7/7	16	0	0	0	0									0	0	0	0	0	0	0	0	0	0	0	0	0
7/8	13	0												0	0	0	0	0	0	0	0	0	0	0	0	0
7/9	0																									
7/10	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/11	18	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0
7/12	18	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0
7/13	18	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	1	1	2
7/14	18	0	1	0	0	0	0							0	0	0	0	0	1	0	0	1	1	0	0	4
7/15	18	0	0	0	0	0	0							0	0	0	0	0	1	0	0	0	0	0	1	2
7/16	0																									0
7/17	24	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4
7/18	24	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	6
7/19	18	1	1	0	0	0	0							0	0	0	0	1	0	0	1	0	1	0	0	5
7/20	18	0	0	0	0	0	0							0	0	0	0	2	0	0	2	0	0	1	2	7
7/21	18	1	0	0	0	0	0							0	0	0	0	0	0	1	0	0	0	1	0	3
7/22	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	1	0	2	9
7/23	0																									0
7/24	24	3	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	6
7/25	18	0	0	0	0	0	0							0	0	0	0	0	0	2	0	0	0	2	2	6
7/26	24	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3
7/27	18	0	0	0	0	0	0							0	0	1	0	0	0	0	0	0	0	0	2	3
7/28	18	0	0	0	0	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0
7/29	18	0	0	0	0	0	0							0	0	1	0	0	0	0	0	1	0	0	0	2
7/30	0																									0
7/31	18	0	0	0	0	0	0							0	0	0	0	0	0	1	0	0	0	0	0	1
Total	522	9	3	0	0	1	0	1	0	0	0	0	0	0	0	2	3	5	4	4	3	6	4	6	13	64

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Table 7. Chum salmon escapement counts by 20-minute observation period, Goodnews River tower, 1989.

Date	No. of counts	Chum salmon counted for 20-minute observation for hour:																							Total N chum salmon counted	Percent Daily run counted	
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22			23
6/28	19	0	0	1	1	1	0	0					0	0	0	4	0	4	0	0	0	0	1	0	12	91.2	
6/29	18	1	1	0	2	0	1						2	0	0	0	1	0	0	0	0	0	1	0	9	88.2	
6/30	6	0	0	0	0	0	0																		0	20.5	
7/1	12												0	1	0	0	3	2	0	0	2	11	3	3	25	67.7	
7/2	16	7	3	1	2								2	0	3	2	2	5	0	0	0	0	15	6	48	84.3	
7/3	16	8	2	7	1								0	3	2	1	3	6	3	1	11	12	9	7	70	84.3	
7/4	0																								0	0.0	
7/5	12												0	0	0	0	0	3	3	1	1	2	1	2	13	67.7	
7/6	16	7	0	1	0								0	0	0	0	5	1	7	20	8	10	15	2	76	84.3	
7/7	16	0	0	0	1								2	-1	0	2	0	4	3	3	1	6	9	15	39	84.3	
7/8	13	1											1	2	1	1	1	0	0	2	7	13	-2	13	40	74.7	
7/9	0																								0	0.0	
7/10	24	2	1	2	1	0	1	0	2	1	0	2	0	2	3	8	5	4	9	4	24	28	11	28	12	150	100.1
7/11	18	7	4	2	1	1	0						14	7	1	7	9	13	18	15	8	14	4	3	128	88.2	
7/12	18	3	14	37	1	4	4						7	7	3	7	4	11	3	2	5	15	10	11	148	88.2	
7/13	18	47	51	15	4	3	1						38	2	3	3	1	3	9	2	10	1	7	25	225	88.2	
7/14	18	16	4	14	9	7	11						4	-2	3	17	13	1	3	16	15	12	21	10	174	88.2	
7/15	18	24	3	2	1	2	1						3	0	0	2	5	13	4	6	4	23	7	14	114	88.2	
7/16	0																								0	0.0	
7/17	24	23	4	6	2	5	2	5	1	-5	1	0	6	-3	5	1	6	8	8	5	1	16	7	12	24	140	100.1
7/18	24	15	5	11	4	3	1	2	2	1	1	8	2	2	5	-1	1	3	30	23	2	10	2	4	9	145	100.1
7/19	18	7	4	3	2	0	0						-2	3	6	3	5	2	2	4	5	9	6	6	65	88.2	
7/20	18	16	4	10	3	2	-2						6	1	1	0	26	7	9	10	9	7	10	7	126	88.2	
7/21	18	12	8	5	1	1	1						2	4	2	2	0	4	8	0	5	1	6	4	66	88.2	
7/22	24	5	1	4	3	1	1	1	0	1	2	3	1	0	-1	2	4	7	21	11	3	4	3	11	18	106	100.1
7/23	0																								0	0.0	
7/24	24	37	14	23	1	4	1	10	4	0	1	2	-1	2	4	9	5	4	8	5	1	11	10	15	10	180	100.1
7/25	18	14	8	0	8	-2	8						1	1	0	1	5	6	16	1	3	9	15	12	106	88.2	
7/26	24	41	7	14	0	2	1	0	1	2	1	3	1	1	1	7	1	0	3	2	1	1	6	8	17	121	100.1
7/27	18	29	5	16	4	9	2						0	-1	7	0	2	2	4	3	8	4	10	7	111	88.2	
7/28	18	7	5	3	0	1	1						0	1	0	5	4	4	6	2	2	1	3	3	48	88.2	
7/29	18	7	3	-2	2	0	6						2	3	3	2	0	0	3	6	3	-1	6	7	50	88.2	
7/30	0																								0	0.0	
7/31	18	-4	1	0	2	1	4						6	3	3	1	0	2	10	1	4	2	3	5	44	88.2	
Total	522	332	152	175	56	45	45	18	10	0	6	18	9	92	51	64	82	115	172	161	127	181	190	226	252	2579	

Table 8. Daily estimated chinook salmon escapement past the Goodnews River counting counting tower, 1989.

<u>Date</u>	<u>Number of twenty minute counts</u>	<u>Salmon counted during twenty minute count (A)</u>	<u>Expanded hour count (A*3)</u>	<u>Estimated percent of daily run counted (C)</u>	<u>Estimated daily count (A*3)/C</u>
6/28	19	21	63	90.2	70
6/29	18	7	21	89.2	24
6/30	6	17	51	23.5	67 <sup>a</sup>
7/1	12	24	72	65.7	110
7/2	16	16	48	84.3	57
7/3	16	16	48	84.3	57
7/4	0	0	0	0.0	56 <sup>a</sup>
7/5	12	12	36	65.7	55
7/6	16	-2	(6)	84.3	(7)
7/7	16	23	69	84.3	82
7/8	13	6	18	70.2	26
7/9	0	0	0	0.0	33 <sup>a</sup>
7/10	24	13	39	100.0	39
7/11	18	30	90	89.2	101
7/12	18	34	102	89.2	114
7/13	18	39	117	89.2	131
7/14	18	24	72	89.2	81
7/15	18	26	78	89.2	87
7/16	0	0	0	0.0	105 <sup>a</sup>
7/17	24	41	123	100.0	123
7/18	24	19	57	100.0	57
7/19	18	10	30	89.2	34
7/20	18	0	0	89.2	0
7/21	18	12	36	89.2	40
7/22	24	16	48	100.0	48
7/23	0	0	0	0.0	41 <sup>a</sup>
7/24	24	11	33	100.0	33
7/25	18	4	12	89.2	13
7/26	24	15	45	100.0	45
7/27	18	11	33	89.2	37
7/28	18	1	3	89.2	3
7/29	18	3	9	89.2	10
7/30	0	0	0	0.0	4 <sup>a</sup>
7/31	18	-1	(3)	89.2	(3)
<b>Total</b>	<b>522</b>	<b>448</b>	<b>1,344</b>		<b>1,773</b>

a average of preceding and following days counts

Table 9. Daily estimated sockeye salmon escapement past the Goodnews River counting counting tower, 1989.

<u>Date</u>	<u>Number of twenty minute counts</u>	<u>Salmon counted during twenty minute count (A)</u>	<u>Expanded hour count (A*3)</u>	<u>Estimated percent of daily run counted (C)</u>	<u>Estimated daily count (A*3)/C</u>
6/28	19	311	933	84.3	1,107
6/29	18	131	393	81.9	480
6/30	6	11	33	17.4	605 <sup>a</sup>
7/1	12	157	471	64.5	730
7/2	16	137	411	78.5	524
7/3	16	171	513	78.5	654
7/4	0	0	0	0.0	534 <sup>a</sup>
7/5	12	89	267	64.5	414
7/6	12	189	567	78.5	722
7/7	16	213	639	78.5	814
7/8	13	194	582	69.5	837
7/9	0	0	0	0.0	968 <sup>a</sup>
7/10	24	366	1,098	100.0	1,098
7/11	18	400	1,200	81.9	1,465
7/12	18	317	951	81.9	1,161
7/13	18	203	609	81.9	744
7/14	18	226	678	81.9	828
7/15	18	117	351	81.9	429
7/16	0	0	0	0.0	482 <sup>a</sup>
7/17	24	178	534	100.0	534
7/18	24	207	621	100.0	621
7/19	18	138	414	81.9	505
7/20	18	137	411	81.9	502
7/21	18	76	228	81.9	278
7/22	24	75	225	100.0	225
7/23	0	0	0	0.0	216 <sup>a</sup>
7/24	24	69	207	100.0	207
7/25	18	54	162	81.9	198
7/26	24	29	87	100.0	87
7/27	18	46	138	81.9	168
7/28	18	17	51	81.9	62
7/29	18	15	45	81.9	55
7/30	0	0	0	0.0	59 <sup>a</sup>
7/31	18	17	51	81.9	62
<b>Total</b>	<b>518</b>	<b>4,290</b>	<b>12,870</b>		<b>18,375</b>

a Average of preceding and following days counts

Table 10. Daily estimated coho and pink salmon escapement past the Goodnews River counting tower, 1989.

<u>Date</u>	<u>Number of twenty minute counts</u>	<u>Salmon counted during twenty minute count (A)</u>	<u>Expanded hour count (A*3)</u>	<u>Estimated percent of daily run counted (C)</u>	<u>Estimated daily count (A*3)/C</u>
<u>Coho</u>					
7/20	18	3	9	82.1	11
7/21	18	1	3	82.1	4
7/22	24	3	9	100.0	9
7/23	0	0	0	0.0	8 <sup>a</sup>
7/24	24	2	6	100.0	6
7/25	18	1	3	82.1	4
7/26	24	4	12	100.0	12
7/27	18	3	9	82.1	11
7/28	18	5	15	82.1	18
7/29	18	1	3	82.1	4
7/30	0	0	0	0.0	21 <sup>a</sup>
7/31	18	10	30	82.1	37
<b>Total</b>	<b>522</b>	<b>33</b>	<b>99</b>		<b>145</b>
<u>Pink</u>					
7/6	16	1	3	83.8	4
7/7	16	0	0	83.8	0
7/8	13	0	0	78.8	0
7/9	0	0	0	0.0	0 <sup>a</sup>
7/10	24	0	0	100.0	0
7/11	18	0	0	86.4	0
7/12	18	0	0	86.4	0
7/13	18	2	6	86.4	7
7/14	18	4	12	86.4	14
7/15	18	2	6	86.4	7
7/16	0	0	0	0.0	10 <sup>a</sup>
7/17	24	4	12	100.0	12
7/18	24	6	18	100.0	18
7/19	18	5	15	86.4	17
7/20	18	7	21	86.4	24
7/21	18	3	9	86.4	10
7/22	24	9	27	100.0	27
7/23	0	0	0	0.0	23 <sup>a</sup>
7/24	24	6	18	100.0	18
7/25	18	6	18	86.4	21
7/26	24	3	9	100.0	9
7/27	18	3	9	86.4	10
7/28	18	0	0	86.4	0
7/29	18	2	6	86.4	7
7/30	0	0	0	0	5 <sup>a</sup>
7/31	18	1	3	86.4	3
<b>Total</b>	<b>522</b>	<b>64</b>	<b>192</b>		<b>246</b>

a average of preceding and following days counts

Table 11. Daily estimated chum salmon escapement past the Goodnews River counting counting tower, 1989.

<u>Date</u>	<u>Number of twenty minute counts</u>	<u>Salmon counted during twenty minute count (A)</u>	<u>Expanded hour count (A*3)</u>	<u>Estimated percent of daily run counted (C)</u>	<u>Estimated daily count (A*3)/C</u>
6/28	19	12	36	91.2	39
6/29	18	9	27	88.2	31
6/30	6	0	0	20.5	71 <sup>a</sup>
7/1	12	25	75	67.7	111
7/2	16	48	144	84.3	171
7/3	16	70	210	84.3	249
7/4	0	0	0	0.0	154 <sup>a</sup>
7/5	12	13	39	67.7	58
7/6	16	76	228	84.3	270
7/7	16	39	117	84.3	139
7/8	13	40	120	74.7	161
7/9	0	0	0	0.0	306 <sup>a</sup>
7/10	24	150	450	100.0	450
7/11	18	128	384	88.2	435
7/12	18	148	444	88.2	503
7/13	18	225	675	88.2	765
7/14	18	174	522	88.2	592
7/15	18	114	342	88.2	388
7/16	0	0	0	0.0	404 <sup>a</sup>
7/17	24	140	420	100.0	420
7/18	24	145	435	100.0	435
7/19	18	65	195	88.2	221
7/20	18	126	378	88.2	429
7/21	18	66	198	88.2	224
7/22	24	106	318	100.0	318
7/23	0	0	0	0.0	429 <sup>a</sup>
7/24	24	180	540	100.0	540
7/25	18	106	318	88.2	361
7/26	24	121	363	100.0	363
7/27	18	111	333	88.2	378
7/28	18	48	144	88.2	163
7/29	18	50	150	88.2	170
7/30	0	0	0	0	160 <sup>a</sup>
7/31	18	44	132	88.2	150
<b>Total</b>	<b>522</b>	<b>2,579</b>	<b>7,737</b>		<b>10,058</b>

a average of preceding and following days counts

Table 12. Daily and cumulative salmon escapement estimates, Goodnews River tower, 1989.

Date	Chinook				Sockeye				Coho				Pink				Chum			
	Daily		Cumulative		Daily		Cumulative		Daily		Cumulative		Daily		Cumulative		Daily		Cumulative	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
6/27 <sup>a</sup>	142	7.42	142	7.42	2811	13.27	2811	13.27									322	3.10	322	3.10
6/28	70	3.66	212	11.07	1107	5.23	3918	18.49									39	0.38	361	3.48
6/29	24	1.25	236	12.32	480	2.27	4398	20.76									31	0.30	392	3.78
6/30	67	3.50	303	15.82	605	2.86	5003	23.61									71	0.68	463	4.46
7/01	110	5.74	413	21.57	730	3.45	5733	27.06									111	1.07	574	5.53
7/02	57	2.98	470	24.54	524	2.47	6257	29.53									171	1.65	745	7.18
7/03	57	2.98	527	27.52	654	3.09	6911	32.62									249	2.40	994	9.58
7/04	56	2.92	583	30.44	534	2.52	7445	35.14									154	1.48	1148	11.06
7/05	55	2.87	638	33.32	414	1.95	7859	37.10									58	0.56	1206	11.62
7/06	-7	-0.37	631	32.95	722	3.41	8581	40.50				4	1.63	4	1.63		270	2.60	1476	14.22
7/07	82	4.28	713	37.23	814	3.84	9395	44.35				0	0.00	4	1.63		139	1.34	1615	15.56
7/08	26	1.36	739	38.59	837	3.95	10232	48.30				0	0.00	4	1.63		161	1.55	1776	17.11
7/09	33	1.72	772	40.31	968	4.57	11200	52.87				0	0.00	4	1.63		306	2.95	2082	20.06
7/10	39	2.04	811	42.35	1098	5.18	12298	58.05				0	0.00	4	1.63		450	4.34	2532	24.39
7/11	101	5.27	912	47.62	1465	6.91	13763	64.96				0	0.00	4	1.63		435	4.19	2967	28.58
7/12	114	5.95	1026	53.58	1161	5.48	14924	70.44				0	0.00	4	1.63		503	4.85	3470	33.43
7/13	131	6.84	1157	60.42	744	3.51	15668	73.95				7	2.85	11	4.47		765	7.37	4235	40.80
7/14	81	4.23	1238	64.65	828	3.91	16496	77.86				14	5.69	25	10.16		592	5.70	4827	46.50
7/15	87	4.54	1325	69.19	429	2.02	16925	79.89				7	2.85	32	13.01		388	3.74	5215	50.24
7/16	105	5.48	1430	74.67	482	2.28	17407	82.16				10	4.07	42	17.07		404	3.89	5619	54.13
7/17	123	6.42	1553	81.10	534	2.52	17941	84.68				12	4.88	54	21.95		420	4.05	6039	58.18
7/18	57	2.98	1610	84.07	621	2.93	18562	87.61				18	7.32	72	29.27		435	4.19	6474	62.37
7/19	34	1.78	1644	85.85	505	2.38	19067	90.00				17	6.91	89	36.18		221	2.13	6695	64.50
7/20	0	0.00	1644	85.85	502	2.37	19569	92.37	11	7.59	11	7.59	24	9.76	113	45.93	429	4.13	7124	68.63
7/21	40	2.09	1684	87.94	278	1.31	19847	93.68	4	2.76	15	10.34	10	4.07	123	50.00	224	2.16	7348	70.79
7/22	48	2.51	1732	90.44	225	1.06	20072	94.74	9	6.21	24	16.55	27	10.98	150	60.98	318	3.06	7666	73.85
7/23	41	2.14	1773	92.58	216	1.02	20288	95.76	8	5.52	32	22.07	23	9.35	173	70.33	429	4.13	8095	77.99
7/24	33	1.72	1806	94.31	207	0.98	20495	96.74	6	4.14	38	26.21	18	7.32	191	77.64	540	5.20	8635	83.19
7/25	13	0.68	1819	94.99	198	0.93	20693	97.67	4	2.76	42	28.97	21	8.54	212	86.18	361	3.48	8996	86.67
7/26	45	2.35	1864	97.34	87	0.41	20780	98.08	12	8.28	54	37.24	9	3.66	221	89.84	363	3.50	9359	90.16
7/27	37	1.93	1901	99.27	168	0.79	20948	98.88	11	7.59	65	44.83	10	4.07	231	93.90	378	3.64	9737	93.81
7/28	3	0.16	1904	99.43	62	0.29	21010	99.17	18	12.41	83	57.24	0	0.00	231	93.90	163	1.57	9900	95.38
7/29	10	0.52	1914	99.95	55	0.26	21065	99.43	4	2.76	87	60.00	7	2.85	238	96.75	170	1.64	10070	97.01
7/30	4	0.21	1918	100.16	59	0.28	21124	99.71	21	14.48	108	74.48	5	2.03	243	98.78	160	1.54	10230	98.55
7/31	-3	-0.16	1915	100.00	62	0.29	21186	100.00	37	25.52	145	100.00	3	1.22	246	100.00	150	1.45	10380	100.00

a Estimate of cumulative passage before counting started on 6/28

Table 13. Age, sex, and size composition of chinook salmon, from the Goodnews Bay commercial harvest and escapement, 1989.

	Age Class <sup>a</sup>						Total
	1.2	1.3	1.4	2.3	1.5	3.3	
<b>Commercial Harvest Sample</b>							
<u>Females</u>							
Mean Length	601.2	694.2	818.9	0.0	921.5	0.0	
Std. Error	41.45	15.65	13.52	0.00	24.38	0.00	
Range	460-750	548-888	531-968	0-0	833-1009	0-0	
Sample Size	6	38	55	0	6	0	105
<u>Males</u>							
Mean Length	576.5	709.0	845.6	0.0	878.0	0.0	
Std. Error	11.78	13.19	11.93	0.00	50.71	0.00	
Range	508-693	511-979	600-1028	0-0	698-922	0-0	
Sample Size	18	61	61	0	5	0	145
<u>Total</u>							
Mean Length	582.7	703.0	833.0	0.0	902.0	0.0	
Std. Error	13.24	10.00	9.00	0.00	26.00	0.00	
Range	460-750	511-979	531-1028	0-0	698-1009	0-0	
Sample Size	24	99	116	0	11	0	250
Total Harvest <sup>b</sup>	285	1,175	1,376	0	131	0	2,966
<b>Escapement Sample</b>							
<u>Females</u>							
Mean Length	0.0	746.5	857.6	0.0	861.0	0.0	
Std. Error	0.00	75.50	13.09	0.00	29.00	0.00	
Range	0-0	671-822	795-922	0-0	832-890	0-0	
Sample Size	0	2	11	0	2	0	15
<u>Males</u>							
Mean Length	412.5	765.4	870.6	636.0	0.0	601.0	
Std. Error	55.50	34.98	26.58	0.00	0.00	0.00	
Range	357-468	688-885	733-1004	636-636	0-0	601-601	
Sample Size	2	5	8	1	0	1	17
<u>Total</u>							
Mean Length	412.5	760.0	863.0	636.0	861.0	601.0	
Std. Error	55.50	29.00	13.00	0.00	29.00	0.00	
Range	357-468	671-885	733-1004	636-636	832-890	601-601	
Sample Size	2	7	19	1	2	1	32
Total Escapement	182	632	1,715	90	182	90	2,891

a European age designation

b Commercial and subsistence harvest

Table 14. Age, sex, and size composition of sockeye salmon from the Goodnews Bay commercial harvest and escapement, 1989.

	Age Class <sup>a</sup>							Total
	1.1	1.2	0.4	1.3	2.2	1.4	2.3	
<u>Commercial Harvest Sample</u>								
<u>Females</u>								
Mean Length	0.0	540.1	603.0	565.0	552.0	582.9	558.3	
Std. Error	0.00	6.81	0.00	2.26	0.00	12.14	28.26	
Range	0-0	485-600	603-603	443-648	552-552	525-641	504-599	
Sample Size	0	22	1	222	1	9	3	258
<u>Males</u>								
Mean Length	557.0	556.2	0.0	597.2	610.8	603.4	602.2	
Std. Error	0.00	6.95	0.00	1.90	13.70	11.22	13.84	
Range	557-557	436-626	0-0	493-665	576-643	560-623	548-623	
Sample Size	1	38	0	267	4	5	5	320
<u>Total</u>								
Mean Length	557.0	550.0	603.0	583.0	599.0	590.0	586.0	
Std. Error	0.00	5.00	0.00	2.00	16.00	9.00	15.00	
Range	557-557	436-626	603-603	443-665	552-643	525-641	504-623	
Sample Size	1	60	1	489	5	14	8	579
Total Harvest <sup>b</sup>	33	2,000	33	16,332	167	467	267	19,299
<u>Escapement Sample</u>								
<u>Females</u>								
Mean Length	0.0	467.3	0.0	544.0	494.0	495.0	548.0	
Std. Error	0.00	12.33	0.00	5.02	0.00	0.00	3.00	
Range	0-0	455-492	0-0	484-596	494-494	495-495	545-551	
Sample Size	0	3	0	29	1	1	2	36
<u>Males</u>								
Mean Length	0.0	549.0	0.0	583.5	630.0	0.0	590.5	
Std. Error	0.00	0.00	0.00	4.53	0.00	0.00	7.24	
Range	0-0	549-549	0-0	484-648	630-630	0-0	576-607	
Sample Size	0	1	0	51	1	0	4	57
<u>Total</u>								
Mean Length	0.0	487.8	0.0	569.0	562.0	495.0	576.0	
Std. Error	0.00	22.20	0.00	4.00	68.00	0.00	10.00	
Range	0-0	455-549	0-0	484-648	494-630	495-495	545-607	
Sample Size	0	4	0	80	2	1	6	93
Total Escapement	0	1,526	0	30,517	763	381	2,289	35,476

a European age designation

b Commercial and subsistence harvest combined



Table 15. Age, sex, and size composition of coho salmon from the Goodnews Bay commercial harvest, 1989.

	Age Class <sup>a</sup>			Total
	1.1	2.1	3.1	
<u>Commercial Harvest Sample</u>				
<u>Females</u>				
Mean Length	563.2	598.6	579.5	
Std. Error	14.68	2.83	22.50	
Range	505-625	485-686	557-602	
Sample Size	9	146	2	157
<u>Males</u>				
Mean Length	592.7	599.1	630.9	
Std. Error	10.75	2.67	18.60	
Range	534-667	465-689	527-668	
Sample Size	12	270	7	289
<u>Total</u>				
Mean Length	580.0	599.0	619.0	
Std. Error	9.16	2.00	17.00	
Range	505-667	465-689	527-668	
Sample Size	21	416	9	447
Total Harvest <sup>b</sup>	1,496	29,711	641	31,849

a European age designation

b Commercial and subsistence harvest combined

Table 16. Age, sex, and size composition of chum salmon from the Goodnews Bay commercial harvest and escapement, 1989.

	Age Class <sup>a</sup>				Total
	0.2	0.3	0.4	0.5	
<u>Commercial Harvest Sample</u>					
<u>Females</u>					
Mean Length	547.0	561.5	590.7	611.7	
Std. Error	0.00	2.68	2.78	0.67	
Range	547-547	430-631	505-680	611-613	
Sample Size	1	113	122	3	239
<u>Males</u>					
Mean Length	515.0	587.8	619.0	632.4	
Std. Error	0.00	2.98	2.67	12.35	
Range	515-515	488-704	521-718	610-703	
Sample Size	1	145	147	7	301
<u>Total</u>					
Mean Length	531.0	576.0	606.0	626.0	
Std. Error	16.00	2.00	2.00	9.00	
Range	515-547	430-704	505-718	610-703	
Sample Size	2	258	269	10	540
Total Harvest <sup>b</sup>	50	6,534	6,786	252	13,622
<u>Escapement Sample</u>					
<u>Females</u>					
Mean Length	0.0	542.5	566.1	593.5	
Std. Error	0.00	3.52	6.29	29.5	
Range	0-0	484-586	514-608	564-623	
Sample Size	0	50	19	2	71
<u>Males</u>					
Mean Length	476.0	562.2	604.9	631.8	
Std. Error	0.00	3.83	4.71	5.75	
Range	476-476	487-651	545-679	618-646	
Sample Size	1	75	42	4	122
<u>Total</u>					
Mean Length	476.0	554.0	593.0	619.0	
Std. Error	0.00	3.00	4.00	12.00	
Range	476-476	484-651	514-679	564-646	
Sample Size	1	125	61	6	193
Total Escapement	80	10,036	4,897	482	15,495

a European age designation

b Commercial and subsistence harvest combined

Table 17. Aerial survey and tower count salmon escapement estimates, Goodnews River, 1989.

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Aerial Survey Estimates

<u>Goodnews River</u>	<u>Chinook</u>	<u>Sockeye</u>	<u>Coho<sup>a</sup></u>	<u>Pink<sup>a</sup></u>	<u>Chum</u>
Middle Fork	1,277	12,750	--	--	2,922
North Fork	651	8,600	--	--	1,440
Total	1,928	21,350	0	0	4,362

Aerial Survey and Counting Tower Comparison

	<u>Chinook</u>	<u>Sockeye</u>	<u>Coho</u>	<u>Pink</u>	<u>Chum</u>
Aerial Survey Estimate Above the Counting Tower Site	1,277	12,750	--	0	2,922
Counting Tower Estimate	1,915	21,186	--	246	10,380
Percentage the Aerial Estimate is of Tower	66.7%	60.2%		0.0%	28.2%

Escapement Estimate as of July 31, 1989

<u>Goodnews River</u>	<u>Chinook</u>	<u>Sockeye</u>	<u>Coho</u>	<u>Pink</u>	<u>Chum</u>
Middle Fork	1,915	21,186		246	10,380
North Fork	976	14,290		154	5,115
Total	2,891	35,476		400	15,495

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a Tower project ends before peak of coho and pink salmon migrations therefore escapement estimates are minimum estimates

**FIGURES**

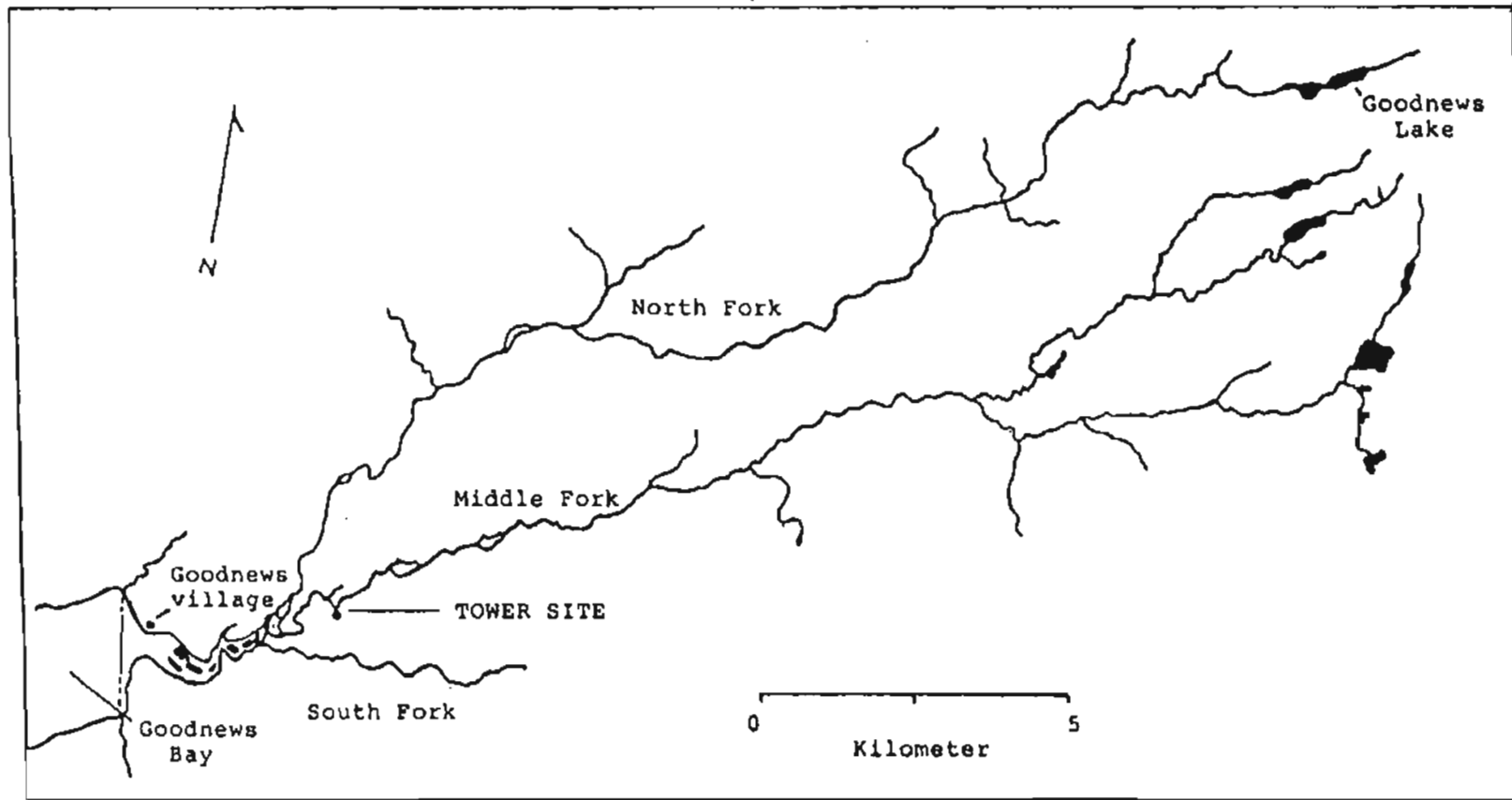


Figure 1. Map of the Goodnews River drainage.

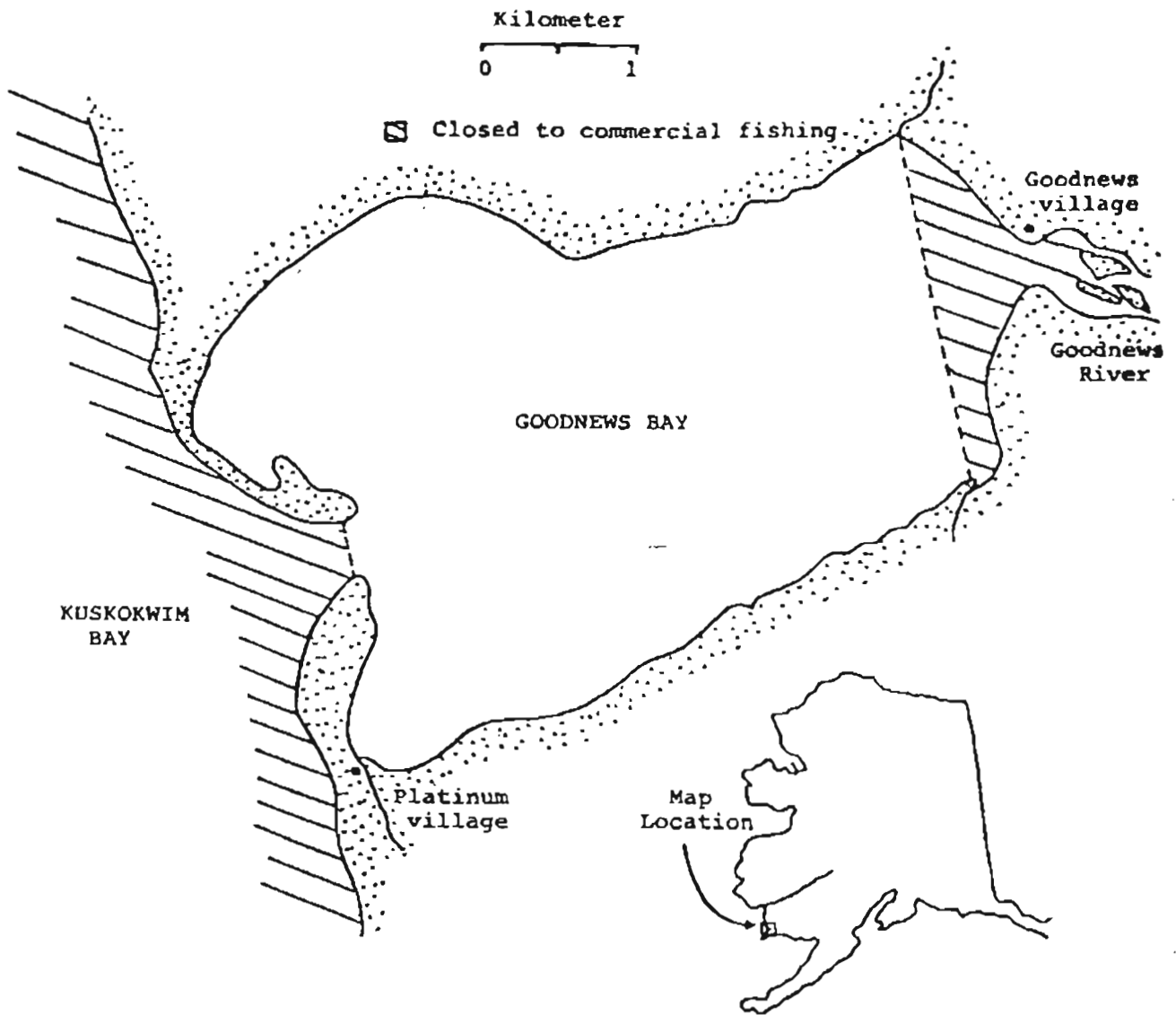
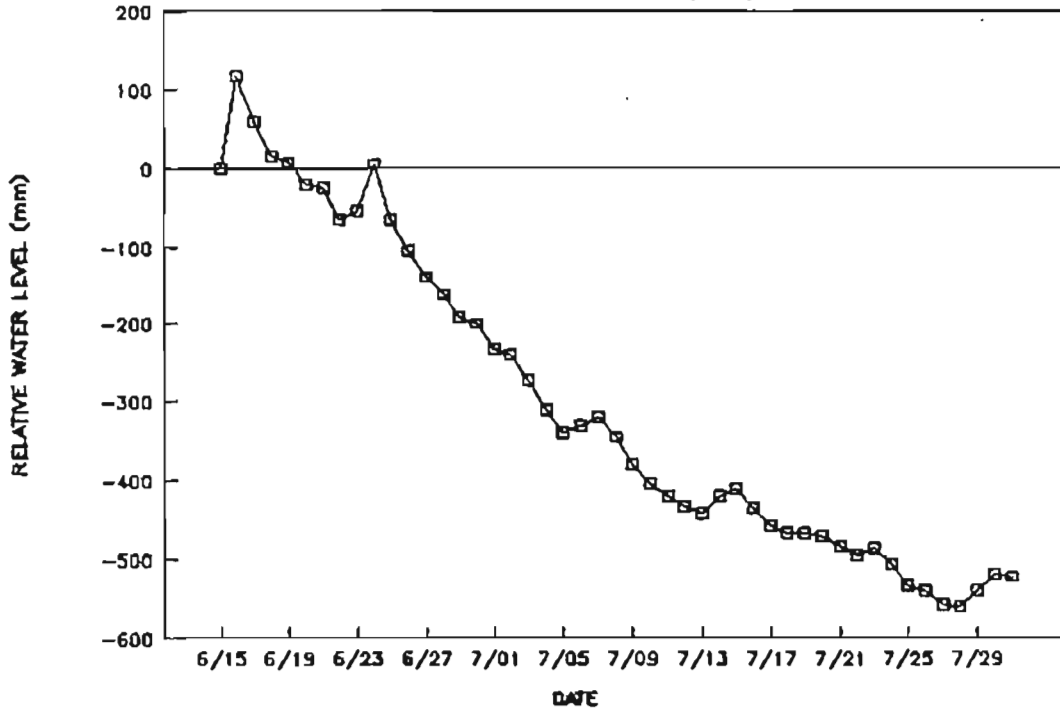


Figure 2. Map of Goodnews Bay, District 5, of the Kuskokwim Management Area.

### GOODNEWS RIVER RELATIVE WATER LEVEL

SALMON COUNTING TOWER SITE, 1989



### GOODNEWS RIVER PRECIPITATION

SALMON COUNTING TOWER SITE, 1989

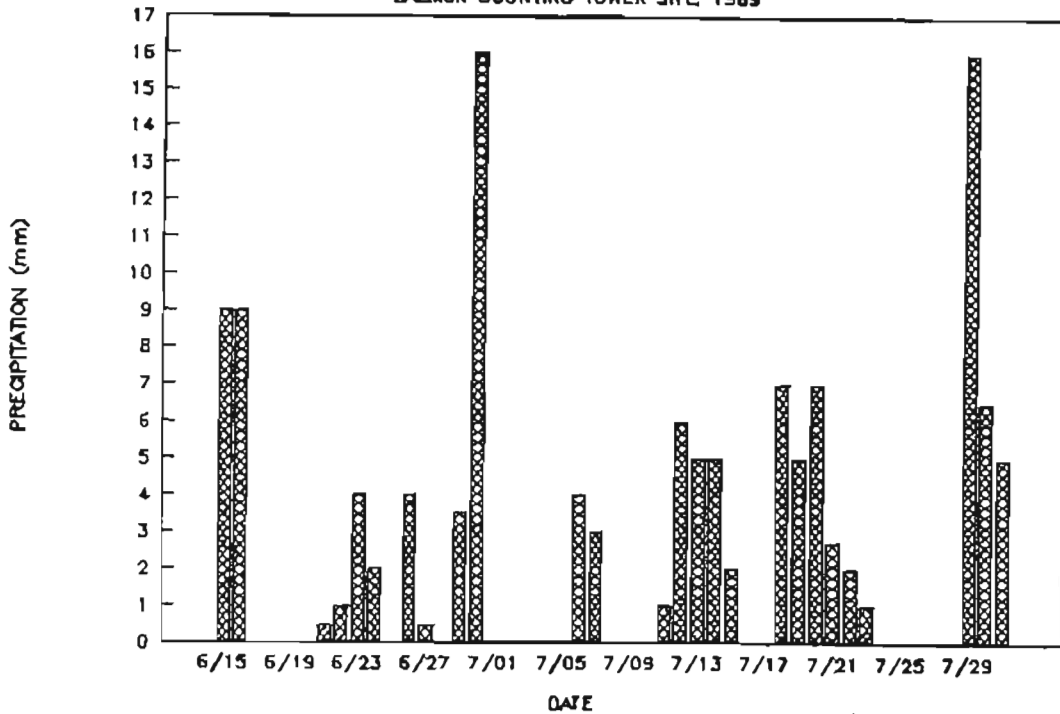


Figure 3. Relative water level and precipitation, Goodnews River counting tower, 1989.

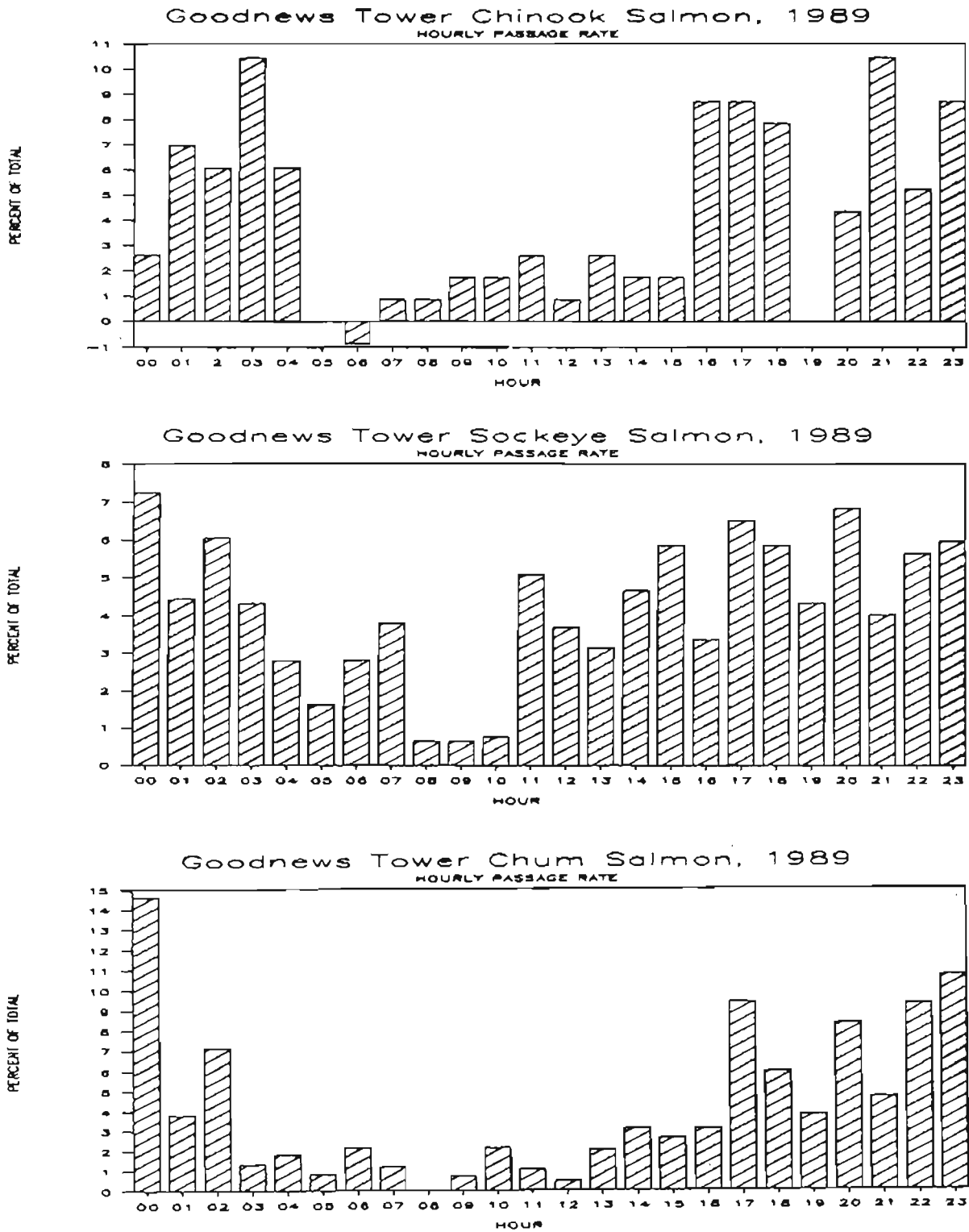


Figure 4. Average daily diel chinook, sockeye and chum salmon count distribution, Goodnews River counting tower, 1989.



**APPENDICES**

Appendix 1. Goodnews Bay, District 5, commercial salmon harvest, 1968-1989.

<u>YEAR</u>	<u>CHINOOK</u>	<u>SOCKEYE</u>	<u>COHO</u>	<u>PINK</u>	<u>CHUM</u>	<u>TOTAL</u>
1968			5,458			5,458
1969	3,978	6,256	11,631	298	5,006	27,169
1970	7,163	7,144	6,794	12,183	12,346	45,630
1971	477	330	1,771	0	301	2,879
1972	264	924	925	66	1,331	3,510
1973	3,543	2,072	5,017	324	15,781	26,737
1974	3,302	9,357	21,340	16,373	8,942	59,314
1975	2,156	9,098	17,889	419	5,904	35,466
1976	4,417	5,575	9,852	8,453	10,354	38,651
1977	3,336	3,723	13,335	29	6,531	26,954
1978	5,218	5,412	13,764	9,103	8,590	42,087
1979	3,204	19,581	42,098	201	9,298	74,382
1980	2,331	28,632	43,256	7,832	11,748	93,799
1981	7,190	40,273	19,749	11	13,642	80,865
1982	9,476	38,877	46,683	4,673	13,829	113,538
1983	14,117	11,716	19,660	0	6,766	52,259
1984	8,612	15,474	71,176	4,711	14,340	114,313
1985	5,793	6,698	16,498	8	4,784	33,781
1986	2,723	25,112	19,378	4,447	10,355	62,015
1987	3,357	27,758	29,057	54	20,381	80,607
1988	4,964	36,368	30,832	5,509	33,059	110,732
1989	2,966	19,299	31,849	82	13,622	67,818
Five year Average (1984-1988)	5,089	22,282	33,388	2,946	16,584	80,289

Appendix 2. Goodnews Bay area subsistence salmon fishery harvest, 1977-1989.

Year	Village	Families Surveyed			Reported Harvest					Est. total No. Fishing Families	Expanded Harvest Estimates				
		Number	People	Dogs	Chinook	Sockeye	Coho	Pink	Chum		Chinook	Sockeye <sup>a</sup>	Coho <sup>b</sup>	Pink	Chum
1977	Goodnews	26	148	64	-	-	-	-	-	-	574	856	184	-	-
	Platinum	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TOTAL	26	148	64	-	-	-	-	-	-	574	856	184	-	-
1978	Goodnews	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Platinum	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1979	Goodnews	15	89	21	-	-	-	-	-	-	228	554	176	-	-
	Platinum	6	36	9	-	-	-	-	-	-	110	528	50	-	-
	TOTAL	21	125	30	-	-	-	-	-	-	338	1,082	226	-	-
1980	Goodnews	44	205	75	-	-	-	-	-	-	498	1,823	4,226	-	-
	Platinum	11	28	16	-	-	-	-	-	-	192	0	248	-	-
	TOTAL	55	233	91	-	-	-	-	-	-	690	1,823	4,474	-	-
1981	Goodnews	13	68	40	-	-	-	-	-	-	1,309	3,178	1,622	-	-
	Platinum	4	17	4	-	-	-	-	-	-	100	333	0	-	-
	TOTAL	17	85	44	-	-	-	-	-	-	1,409	3,511	1,622	-	-
1982	Goodnews	17	91	37	-	-	-	-	-	39	1,185	2,210	2,518	-	-
	Platinum	5	24	4	-	-	-	-	-	9	51	544	174	-	-
	TOTAL	22	115	41	-	-	-	-	-	48	1,236	2,754	2,692	-	-
1983	Goodnews	24	170	88	709	702	2	0	221	34	1,004	1,308	3	-	-
	Platinum	6	48	14	53	180	1	0	0	7	62	210	2	-	-
	TOTAL	30	218	102	762	882	3	0	221	41	1,066	1,518	5	-	-
1984	Goodnews	18	138	25	307	474	28	34	97	35	597	922	54	66	189
	Platinum	4	21	20	18	24	57	0	0	7	32	42	100	0	0
	TOTAL	22	159	45	325	498	85	34	97	42	629	964	154	66	189
1985	Goodnews	13	72	27	179	252	94	1	152	29	399	562	210	2	339
	Platinum	3	17	4	20	107	8	0	7	4	27	142	11	0	9
	TOTAL	16	89	31	199	359	102	1	159	33	426	704	221	2	348
1986	Goodnews	20	121	29	311	521	0	0	114	33	513	860	0	0	188
	Platinum	4	21	5	28	55	5	0	2	6	42	83	8	0	3
	TOTAL	24	142	34	339	576	5	0	116	39	555	942	8	0	191
1987	Goodnews	17	-	-	311	405	0	0	180	35	640	834	0	0	371
	Platinum	7	-	-	123	85	30	0	145	10	176	121	43	0	207
	TOTAL	24	-	-	434	490	30	0	325	45	816	955	43	0	578
1988	Goodnews	20	85	35	289	898	1,072	0	405	20	289	898	1,072	0	405
	Platinum	6	23	9	21	167	90	0	43	6	21	167	90	0	43
	TOTAL	26	108	44	310	1,065	1,162	0	448	26	310	1,065	1,162	0	448
1989 <sup>c</sup>	Goodnews	44	129	7	264	451	510	0	375	67	423	718	829	0	620
	Platinum	18	46	0	32	109	49	0	101	25	44	151	68	0	140
	TOTAL	62	175	7	296	560	559	0	476	92	467	869	897	0	760

a 1977 through 1983 some small chinook, pink and chum salmon were reported as sockeye salmon.  
 b In most years, surveys were completed prior to the majority of the coho salmon subsistence harvest.  
 c Preliminary data.

Appendix J. Historical estimated run size and commercial exploitation rate, Goodnews River, 1981 - 1989.

Year	Species	Middle Fork Tower Estimate	Middle Fork Aerial Survey Count as a Percentage of Tower Estimate	Goodnews River Escapement Estimate	Goodnews Bay Subsistence Harvest Estimate	Goodnews Bay Commercial Harvest	Goodnews Bay Total Run Size Estimate	Exploitation <sup>a</sup> Percentage of Run Size
1981 <sup>b</sup>	Chinook	3,688	-	-	1,409	7,190	-	-
	Sockeye	49,108	-	-	3,511 <sup>c</sup>	40,273	-	-
	Chum	21,827	-	-	-	13,642	-	-
1982 <sup>b</sup>	Chinook	1,395	-	-	1,236	9,476	-	-
	Sockeye	56,255	-	-	2,754 <sup>c</sup>	38,877	-	-
	Chum	6,767	-	-	-	13,829	-	-
1983	Chinook	6,027	36%	14,398	1,066	14,117	29,581	51%
	Sockeye	25,816	22%	69,955	1,518 <sup>c</sup>	11,716	83,189	16%
	Chum	15,548	-	-	-	6,766	-	-
1984	Chinook	3,260	35%	8,743	629	8,612	17,984	51%
	Sockeye	32,059	27%	67,213	964	15,474	83,651	20%
	Chum	19,003	35%	117,739	189	14,340	132,268	11%
1985	Chinook	2,831	70%	7,979	426	5,793	14,198	44%
	Sockeye	24,131	11%	50,481	704	6,698	57,883	13%
	Chum	10,367	32%	25,025	340	4,784	30,157	17%
1986	Chinook	2,083	57%	4,094	553	2,723	7,372	44%
	Sockeye	51,069	28%	93,228	942	22,608	116,778	20%
	Chum	14,765	38%	51,910	191	10,355	62,456	17%
1987	Chinook	2,274	100%	4,490	816	3,357	8,663	48%
	Sockeye	28,871	85%	51,989	955	27,758	80,702	36%
	Chum	17,519	58%	37,802	578	20,381	58,761	36%
1988	Chinook	2,712	39%	5,419	310	4,964	10,699	49%
	Sockeye	15,799	30%	38,319	1,065	36,368	75,752	49%
	Chum	20,799	21%	39,501	448	33,059	73,008	46%
1989 <sup>d</sup>	Chinook	1,915	67%	2,891	467	2,966	6,324	54%
	Sockeye	21,186	60%	35,476	869	19,299	55,644	36%
	Chum	10,380	28%	15,495	760	13,622	29,877	48%

a Commercial and subsistence harvest

b Incomplete aerial survey results.

c Subsistence caught chum salmon is included in subsistence sockeye salmon harvest.

d Preliminary figures.

Appendix 4. Historical hourly passage rate for chinook salmon, Goodnews River tower, 1981 - 1989.

Year	No. of Counts	Full hour counts																							Total No. Chinook Salmon Counted	
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1981	6	6.0	6.6	5.7	1.3	0.0	3.8	0.0	1.1	0.7	1.9	6.4	5.1	6.2	6.8	3.8	3.6	6.6	3.8	7.0	7.4	3.4	4.7	5.5	2.6	531
1982	2	3.6	3.0	1.5	1.0	0.0	2.6	1.5	1.0	0.0	2.0	0.5	1.5	2.6	3.1	4.1	1.0	3.1	2.0	11.7	14.4	9.8	12.2	6.6	11.2	196
Year	No. of Counts	Twenty minute counts																							Total No. Chinook Salmon Counted	
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1983	24	3.3	3.9	4.3	1.6	1.2	1.8	1.3	1.6	2.2	1.4	3.0	6.1	6.8	7.5	5.2	5.8	6.9	7.0	4.2	5.5	7.2	6.3	2.7	3.2	1,020
1984	21	3.8	2.9	1.4	0.3	0.0	0.6	1.8	0.9	0.9	0.8	1.3	4.2	3.2	2.8	5.5	6.7	7.2	5.9	10.4	8.1	7.0	8.1	9.7	6.5	781
1985	12	4.8	5.1	8.2	7.4	6.7	2.7	3.8	2.7	1.5	1.5	2.4	1.7	3.6	4.8	3.2	2.5	7.4	5.0	4.4	5.0	4.2	4.6	3.2	3.6	525
1986	6	1.1	6.5	8.6	14.6	7.0	3.8	0.5	0.0	3.2	-1.1	4.9	4.9	2.2	1.6	4.9	1.6	7.0	-0.5	0.0	7.0	1.1	3.2	13.0	4.9	185
1987	6	5.6	1.6	6.4	2.4	3.2	1.6	1.2	1.2	2.8	0.8	0.8	0.0	2.8	6.8	3.2	6.8	10.0	6.0	2.8	6.0	5.6	5.6	11.2	5.6	250
1988	6	9.9	0.9	3.6	4.5	1.8	0.9	0.0	1.8	0.9	1.8	3.6	0.0	2.7	2.7	2.7	0.0	4.5	7.2	6.3	8.1	10.8	8.1	7.2	9.9	111
1989	6	2.6	7.0	6.1	10.4	6.1	0.0	-0.9	0.9	0.9	1.7	1.7	2.6	0.9	2.6	1.7	1.7	8.7	8.7	7.8	0.0	4.3	10.4	5.2	8.7	115
Average		4.5	4.2	5.1	4.8	2.9	2.0	1.0	1.2	1.5	1.2	2.7	2.9	3.4	4.3	3.8	3.3	6.8	5.0	6.1	6.8	5.9	7.0	7.1	6.2	

Appendix 5. Historical hourly passage rate for sockeye salmon, Goodnews River tower, 1981- 1989.

Year	No. of Counts	Full Hour Counts																							Total No. Sockeye Salmon Counted	
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1981	6	1.6	1.4	0.7	0.8	2.8	2.3	2.8	3.6	4.6	4.9	8.3	11.0	5.6	6.1	3.9	4.6	6.4	5.3	5.4	6.9	3.5	2.9	2.2	2.4	10,571
1982	2	2.4	3.6	1.8	1.1	1.6	3.2	2.7	2.3	3.2	3.8	3.2	5.9	5.8	4.6	3.5	4.7	6.3	6.0	6.7	6.6	5.3	5.0	4.2	6.5	2,610
Year	No. of Counts	Twenty Minute Counts																								
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1983	24	2.9	2.1	1.4	2.4	1.9	1.9	2.2	2.8	3.7	4.8	5.4	8.5	6.1	5.9	4.7	6.7	4.3	6.2	4.1	5.0	4.2	5.6	4.3	2.9	5,372
1984	21	6.9	3.7	1.7	1.0	0.5	0.6	3.4	1.0	1.2	1.4	3.1	4.4	4.3	2.8	7.3	4.5	7.1	4.4	8.1	8.0	4.9	6.8	5.8	7.1	7,131
1985	12	7.3	3.5	1.6	2.6	1.4	1.3	2.4	2.4	6.0	2.9	1.8	2.7	4.6	6.4	5.4	7.4	4.2	4.7	7.1	3.8	4.5	6.0	4.9	5.1	4,214
1986	6	4.2	5.8	3.5	2.6	2.1	1.2	2.1	1.5	3.3	0.4	0.6	5.9	2.5	2.7	6.0	9.3	6.0	6.8	6.4	5.3	4.0	4.7	7.8	5.2	3,662
1987	6	4.8	4.2	5.0	3.0	1.3	0.8	1.6	2.0	2.2	0.6	0.4	1.1	4.4	2.7	5.8	4.6	6.9	7.0	5.9	5.8	5.4	8.1	10.6	5.7	1,918
1988	6	7.8	4.8	3.3	4.7	1.8	1.1	1.8	2.4	2.1	0.8	0.9	2.3	1.5	2.0	1.4	6.3	3.5	10.7	4.8	10.7	6.6	5.0	9.3	4.7	665
1989	6	7.3	4.4	6.1	4.3	2.8	1.6	2.8	3.8	0.6	0.6	0.8	5.1	3.7	3.1	4.7	5.8	3.4	6.5	5.8	4.3	6.8	4.0	5.6	6.0	924
Average		5.0	3.7	2.8	2.5	1.8	1.6	2.4	2.4	3.0	2.2	2.7	5.2	4.3	4.0	4.7	6.0	5.3	6.4	6.0	6.3	5.0	5.3	6.1	5.1	

Appendix 6. Historical hourly passage rate for pink salmon, Goodnews River tower, 1981 - 1989.

Year	No. of Counts	Full Hour Counts																							Total No. Pink Salmon Counted	
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1981	6	0.8	1.6	0.0	2.4	3.1	3.9	0.8	2.4	3.1	1.6	1.6	7.1	5.5	3.1	6.3	4.7	6.4	12.6	7.9	7.1	5.5	5.5	3.9	3.1	127
1982	2	0.7	1.5	0.0	3.8	3.0	3.7	0.7	2.2	3.0	3.0	1.5	6.8	5.3	3.0	6.8	4.5	6.1	12.1	7.6	6.8	5.3	5.3	3.8	3.0	132
Year	No. of Counts	Twenty Minute Counts																							Total No. Pink Salmon Counted	
Year	No. of Counts	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1983	24	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	7.7	7.7	15.4	0.0	7.7	3.8	15.4	0.0	7.7	11.5	15.4	0.0	26
1984	21	5.9	1.8	1.0	0.7	0.8	0.4	1.9	1.5	0.5	0.4	0.4	3.3	0.2	0.8	2.4	2.7	3.0	4.5	6.2	6.7	13.0	10.2	17.9	13.8	2,270
1985	12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	3	
1986	6	9.4	2.7	1.7	0.8	0.4	1.7	4.6	6.9	4.6	1.0	2.5	3.8	2.1	3.6	7.3	7.1	4.8	5.0	6.5	4.8	4.0	8.4	3.3	2.9	478
1987	6	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	33.3	0.0	0.0	0.0	0.0	3
1988	6	12.1	4.9	0.7	0.5	0.2	0.3	1.5	2.1	0.3	0.2	0.3	0.7	2.9	2.9	2.0	1.8	2.8	5.5	5.1	8.6	6.9	8.2	10.9	18.8	613
1989	6	25.0	3.6	0.0	0.0	3.6	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7	7.1	7.1	0.0	0.0	14.3	3.6	3.6	17.9	28
Average		6.0	5.5	0.8	0.9	1.2	1.1	1.5	1.7	1.3	4.4	0.7	2.8	5.3	2.3	4.5	3.5	4.2	5.6	9.1	7.5	6.3	5.9	10.2	6.6	
Even Year Average		7.0	2.7	0.9	1.4	1.1	1.5	2.2	3.2	2.1	1.2	1.2	3.7	2.6	2.6	4.6	4.0	4.2	6.8	6.4	6.7	7.3	8.0	9.0	9.6	

Appendix 7. Historical hourly passage rate for chum salmon, Goodnews River tower, 1981 - 1989.

Year	No. of Counts	Full Hour Counts																							Total No. Chum Salmon Counted	
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1981	6	3.0	3.9	2.1	1.1	1.4	5.5	1.2	0.9	1.7	1.2	6.5	10.5	4.2	5.4	2.4	7.4	10.8	5.1	5.6	6.6	4.0	3.8	3.2	2.5	4,813
1982	2	1.8	3.2	3.6	0.5	3.2	1.9	4.1	1.1	2.4	0.8	1.2	1.1	2.9	0.9	2.5	4.9	3.2	5.0	7.7	9.0	12.5	11.7	7.0	7.8	754
Year	No. of Counts	Twenty Minute Counts																								
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1983	24	3.8	2.5	1.6	3.5	2.0	1.5	1.7	1.7	3.7	3.6	4.4	5.2	4.8	4.8	4.3	5.4	4.8	5.9	6.5	5.5	5.6	6.2	5.5	6.1	3,784
1984	21	5.9	3.0	1.1	0.7	0.2	0.4	3.4	0.5	0.4	0.4	1.2	7.7	0.6	0.7	1.9	2.0	3.3	3.2	8.7	5.9	11.1	10.1	14.5	13.1	5,418
1985	12	4.6	6.3	4.3	4.1	2.1	1.3	5.6	2.0	0.5	0.6	1.1	1.2	0.5	1.9	2.0	5.5	4.1	4.6	6.9	5.5	7.4	9.0	9.3	9.6	2,150
1986	6	6.3	4.7	6.3	3.7	1.6	3.0	3.1	1.3	1.5	0.5	0.9	0.7	2.1	1.2	3.7	4.3	2.0	5.2	8.2	5.6	4.7	10.6	10.2	8.8	1,279
1987	6	11.0	3.4	3.2	3.9	4.0	3.0	3.9	1.3	1.6	0.7	0.8	0.7	1.0	16.6	3.4	1.1	3.0	3.7	2.2	3.6	5.5	5.2	8.8	8.2	1,069
1988	6	12.4	3.1	2.6	2.1	0.6	0.4	1.6	1.3	0.6	0.2	0.4	0.1	5.6	2.4	3.0	1.5	2.4	4.9	5.1	8.9	10.2	7.3	11.8	11.8	1,634
1989	6	14.6	3.8	7.1	1.3	1.8	0.8	2.1	1.2	0.0	0.7	2.1	1.1	0.5	2.0	3.1	2.6	3.1	9.4	5.9	3.8	8.3	4.6	9.3	10.7	842
Average		7.0	3.8	3.5	2.3	1.9	2.0	3.0	1.3	1.4	1.0	2.1	3.1	2.5	4.0	2.9	3.9	4.1	5.2	6.3	6.0	7.7	7.6	8.8	8.7	



Appendix 8. Goodnews River tower meteorologic and hydrologic observations, 1989

Date	Time	Cloud	Percip.	Wind	Temp. (C)		Water
		Cover (%)	(mm)	(mph)	Air	Water	Level (mm)
6/14	1720	75	0.0	5	22	3.0	730
6/15	1245	100	9.0	<5	22	1.5	730
6/16	1150	40	9.0	20	16	0.6	848
6/17	1156	40	0.0	10	23	1.5	790
6/18	0820	85	0.0	3	19	2.0	745
6/19	1210	75	0.0	8	19	2.0	737
6/20	1235	100	0.0	12	26	2.0	710
6/21	1115	100	0.5	5	16	1.5	705
6/22	1230	50	1.0	<5	18	1.5	665
6/23	1240	100	4.0	<5	13	1.5	675
6/24	1140	50	2.0	5	11	1.7	735
6/25	1535	100	0.0	<5	18	2.5	665
6/26	1150	35	4.0	<5	19	3.0	625
6/27	1250	25	0.5	10	19	4.0	590
6/28	1228	35	0.0	<5	21	4.5	568
6/29	1250	100	3.5	<5	19	4.5	537
6/30	1315	50	16.0	5	17	5.0	530
7/01	1450	10	0.0	10	21	7.0	498
7/02	1230	35	0.0	7	26	7.0	490
7/03	1205	35	0.0	<5	24	7.0	457
7/04	1710	60	0.0	<5	23	7.0	420
7/05	1400	100	0.0	12	13	6.0	390
7/06	1503	100	4.0	10	16	5.0	400
7/07	1235	85	3.0	7	14	5.0	410
7/08	1250	100	0.0	<5	14	4.5	385
7/09	1528	100	0.0	6	12	4.5	351
7/10	1222	100	0.0	<5	13	4.5	327
7/11	1425	100	1.0	10	18	5.0	310
7/12	1328	100	6.0	<5	20	5.0	298
7/13	1737	100	5.0	<5	17	5.0	289
7/14	1215	100	5.0	5	15	5.0	310
7/15	1230	100	2.0	7	17	5.0	320
7/16	1610	80	0.0	20	18	5.0	295
7/17	1245	75	0.0	10	13	5.0	273
7/18	1215	100	7.0	<5	12	5.0	264
7/19	1320	100	5.0	5	11	4.5	264
7/20	1231	40	7.0	8	14	4.5	260
7/21	1332	100	2.7	5	12	4.5	245
7/22	1210	40	2.0	<5	11	4.0	235
7/23	1200	75	1.0	6	18	4.5	243
7/24	1220	65	0.0	5	18	5.0	224
7/25	1232	25	0.0	5	23	6.0	198
7/26	1231	10	0.0	6	23	6.0	190
7/27	1252	85	0.0	5	25	7.0	173
7/28	1355	100	0.0	8	26	6.5	170
7/29	1430	100	16.0	<5	17	6.5	190
7/30	1314	100	6.5	<5	12	5.5	210
7/31	1227	100	5.0	<5	13	5.5	207

Appendix 9. Estimated daily and cumulative chinook salmon escapement, Goodnews River tower, 1981-1989.

Date	1981		1982		1983		1984		1985		1986		1987		1988		1989	
	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.
6/11					5	5												
6/12					0	5												
6/13	0	0			0	5												
6/14	0	0			-5	0												
6/15	0	0			0	0	0	0										
6/16	0	0			0	0	0	0			0	0						
6/17	2	2			0	0	0	0			6	6						
6/18	0	2			0	0	0	0			0	6						
6/19	4	6			0	0	4	4			6	12						
6/20	9	15			5	5	4	8			0	12						
6/21	11	26			16	21	12	20			0	12						
6/22	10	36			64	85	9	29			0	12	0	0				
6/23	16	52	0	0	186	271	6	35			0	12	0	0	50	50		
6/24	21	73	22	22	118	389	26	61			0	12	0	0	22	72		
6/25	41	114	28	50	106	495	46	107			26	38	0	0	109	181		
6/26	30	144	4	54	55	550	15	122			0	38	4	4	155	336		
6/27	82	226	2	56	21	571	11	133	4	4	79	117	0	4	200	536	142 <sup>A</sup>	142
6/28	92	318	0	56	171	742	51	184	0	4	45	162	8	12	56	592	70	212
6/29	166	484	0	56	341	1083	11	195	11	15	50	212	16	28	49	641	24	236
6/30	54	538	0	56	520	1603	8	203	10	25	55	267	36	64	176	817	67	303
7/1	86	624	0	56	273	1876	57	260	8	33	129	396	56	120	251	1068	110	413
7/2	186	810	3	59	263	2139	105	365	38	71	41	437	67	187	102	1170	57	470
7/3	90	900	2	61	113	2252	57	422	32	103	90	527	59	246	93	1263	57	527
7/4	134	1034	23	84	172	2424	58	480	60	163	65	592	51	297	89	1352	56	583
7/5	252	1286	44	128	231	2655	59	539	87	250	40	632	91	388	84	1436	55	638
7/6	237	1523	11	139	61	2716	105	644	132	382	53	685	190	518	68	1504	-7	631
7/7	192	1715	24	163	656	3372	145	789	99	481	67	752	43	561	95	1599	82	713
7/8	206	1921	44	207	147	3519	158	947	66	547	57	809	37	598	70	1669	26	739
7/9	102	2023	50	257	102	3621	170	1117	126	673	38	847	71	669	126	1795	33	772
7/10	133	2156	26	283	198	3819	135	1252	132	805	87	934	141	810	120	1915	39	811
7/11	110	2266	66	349	205	4024	188	1440	192	997	78	1012	61	871	114	2029	101	912
7/12	78	2344	106	455	282	4306	105	1545	186	1183	64	1076	58	929	81	2110	114	1026
7/13	92	2436	104	559	263	4569	159	1704	45	1228	86	1162	55	984	59	2169	131	1157
7/14	61	2497	49	608	67	4636	202	1906	45	1273	109	1271	213	1197	24	2193	81	1238
7/15	142	2639	85	693	157	4793	124	2030	45	1318	139	1410	132	1329	48	2241	87	1325
7/16	67	2706	117	810	130	4923	46	2076	108	1426	79	1489	107	1436	65	2306	105	1430
7/17	68	2774	96	906	116	5039	223	2299	141	1567	26	1515	114	1550	49	2355	123	1553
7/18	69	2843	59	965	92	5131	70	2369	189	1756	84	1599	120	1670	33	2388	57	1610
7/19	76	2919	22	987	106	5237	40	2409	183	1939	76	1675	85	1755	30	2418	34	1644
7/20	81	3000	39	1026	160	5397	100	2509	162	2101	79	1754	49	1804	21	2439	0	1644
7/21	26	3026	55	1081	187	5584	113	2622	96	2197	83	1837	48	1852	11	2450	40	1684
7/22	48	3074	34	1115	67	5651	136	2758	30	2227	147	1984	69	1921	67	2517	48	1732
7/23	68	3142	33	1148	58	5709	159	2917	96	2323	64	2048	45	1966	45	2562	41	1773
7/24	85	3227	32	1180	89	5798	43	2960	97	2420	44	2092	73	2039	41	2603	33	1806
7/25	50	3277	31	1211	79	5877	62	3022	101	2521			58	2097	37	2640	13	1819

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Date	1981		1982		1983		1984		1985		1986		1987		1988		1989	
	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.
7/26	43	3320	31	1242	96	5973	54	3076	115	2636			47	2144	14	2654	45	1864
7/27	23	3343	19	1261	38	6011	59	3135	20	2656			35	2179	3	2657	37	1901
7/28	23	3366	36	1297	16	6027	59	3194	40	2696			22	2201	17	2674	3	1904
7/29	39	3405	16	1313			39	3233	60	2756			26	2227	17	2691	10	1914
7/30	18	3423	13	1326			19	3252	57	2813			45	2272	21	2712	4	1918
7/31	34	3457	29	1355			8	3260	18	2831							-3	1915
8/1	33	3490	17	1372														
8/2	46	3536	5	1377														
8/3	28	3564	18	1395														
8/4	36	3600																
8/5	36	3636																
8/6	20	3656																
8/7	13	3669																
8/8	12	3681																
8/9	7	3688																

a estimated cumulative escapement before counting started on 6/28

Appendix 10. Estimated daily and cumulative sockeye salmon escapement, Goodnews River tower, 1981-1989.

Date	1981		1982		1983		1984		1985		1986		1987		1988		1989	
	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.
6/11					3	3												
6/12					0	3												
6/13	0	0			0	3												
6/14	1	1			0	3												
6/15	0	1			0	3	92	92										
6/16	0	1			3	6	8	100			0	0						
6/17	32	33			0	6	11	111			0	0						
6/18	107	140			0	6	13	124			0	0						
6/19	259	399			0	6	143	267			0	0						
6/20	104	503			3	9	100	367			0	0						
6/21	291	794			0	9	452	819			292	292						
6/22	571	1365			0	9	289	1108			276	568	222	222				
6/23	669	2034	1822	1822	0	9	203	1311			261	829	193	415	358	358		
6/24	633	2667	4201	6023	799	808	379	1690			59	888	121	536	269	627		
6/25	868	3535	6010	12033	527	1335	554	2244			697	1585	427	963	695	1322		
6/26	690	4225	5019	17052	404	1739	630	2874			431	2016	697	1660	783	2105		
6/27	3108	7333	2559	19611	410	2149	1005	3879	125	125	1299	3315	818	2478	870	2975	2811 <sup>A</sup>	2811
6/28	2039	9372	98	19709	262	2411	1461	5340	235	360	1657	4972	794	3272	703	3678	1107	3918
6/29	1877	11249	268	19977	462	2873	1141	6481	616	976	1505	6477	771	4043	746	4424	480	4398
6/30	1511	12760	438	20415	315	3188	1236	7717	825	1801	1353	7830	805	4848	818	5242	605	5003
7/1	1798	14558	608	21023	481	3669	1546	9263	1033	2834	2514	10344	840	5688	983	6225	730	5733
7/2	1861	16419	675	21698	1053	4722	1855	11118	883	3717	2487	12831	1104	6792	556	6781	524	6257
7/3	1438	17857	966	22664	647	5369	1484	12602	565	4282	2442	15273	1333	8125	609	7390	654	6911
7/4	1865	19722	2328	24992	1177	6546	1733	14335	1044	5326	2587	17860	1562	9687	635	8025	534	7445
7/5	2970	22692	3690	28682	1708	8254	1981	16316	1523	6849	2732	20592	1595	11282	661	8686	414	7859
7/6	2487	25179	2755	31437	1150	9404	1474	17790	1016	7865	3192	23784	1627	12909	959	9645	722	8581
7/7	1511	26690	1578	33015	1483	10887	1931	19721	1087	8952	3651	27435	1761	14670	609	10254	814	9395
7/8	2176	28866	2912	35927	1131	12018	2419	22140	1158	10110	3158	30593	1436	16106	698	10952	837	10232
7/9	2195	31061	4382	40309	1166	13184	2907	25047	1680	11790	2700	33293	1044	17150	652	11604	968	11200
7/10	2169	33230	2364	42673	1179	14363	1417	26464	1212	13002	3075	36368	1292	18442	586	12190	1098	12298
7/11	2778	36008	2194	44867	1961	16324	1018	27482	1362	14364	1896	38264	873	19315	519	12709	1465	13763
7/12	1476	37484	2023	46890	1617	17941	992	28474	777	15141	2098	40362	1012	20327	537	13246	1161	14924
7/13	1889	39373	1319	48209	1091	19032	862	29336	780	15921	1953	42315	1151	21478	365	13611	744	15668
7/14	1223	40596	1567	49776	701	19733	774	30110	774	16695	1809	44124	1125	22603	459	14070	828	16496
7/15	1450	42046	1097	50873	992	20725	549	30659	768	17463	1553	45677	1412	24015	246	14316	429	16925
7/16	1439	43485	1513	52386	1002	21727	323	30982	753	18216	1243	46920	762	24777	269	14585	482	17407
7/17	946	44431	785	53171	763	22490	260	31242	963	19179	799	47719	438	25215	210	14795	534	17941
7/18	476	44907	534	53705	866	23356	121	31363	1077	20256	1104	48823	447	25662	151	14946	621	18562
7/19	758	45665	282	53987	549	23905	117	31480	1038	21294	660	49483	449	26111	157	15103	505	19067
7/20	753	46418	385	54372	439	24344	124	31604	1074	22368	486	49969	450	26561	111	15214	502	19569
7/21	351	46769	238	54610	607	24951	124	31728	771	23139	311	50280	284	26845	101	15315	278	19847
7/22	447	47216	202	54812	336	25287	97	31825	468	23607	331	50611	478	27323	137	15452	225	20072
7/23	386	47602	187	54999	87	25374	70	31895	121	23728	307	50918	391	27714	123	15575	216	20288
7/24	212	47814	172	55171	129	25503	22	31917	221	23949	151	51069	239	27953	80	15655	207	20495
7/25	183	47997	157	55328	91	25594	19	31936	102	24051			382	28335	36	15691	198	20693

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Date	1981		1982		1983		1984		1985		1986		1987		1988		1989	
	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.
7/26	144	48141	142	55470	65	25659	37	31973	37	24088			235	28570	31	15722	87	20780
7/27	116	48257	120	55590	91	25750	34	32007	18	24106			87	28657	24	15746	168	20948
7/28	197	48454	90	55680	66	25816	26	32033	11	24117			107	28764	17	15763	62	21010
7/29	228	48682	73	55753			17	32050	4	24121			48	28812	13	15776	55	21065
7/30	127	48809	83	55836			7	32057	0	24121			59	28871	23	15799	59	21124
7/31	44	48853	92	55928			-4	32053	10	24131							62	21186
8/1	57	48910	109	56037														
8/2	47	48957	126	56163														
8/3	39	48996	92	56255														
8/4	53	49049																
8/5	39	49088																
8/6	7	49095																
8/7	1	49096																
8/8	7	49103																
8/9	2	49105																
8/10	0	49105																
8/11	11	49116																
8/12	-6	49110																
8/13	0	49110																
8/14	-2	49108																
8/15	0	49108																

a Estimate of cumulative escapement before counting started on 6/28

Appendix 11. Estimated daily and cumulative coho salmon escapement, Goodnews River tower, 1981-1989.

Date	1981		1982		1983		1984		1985		1986		1987		1988		1989	
	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.
7/1	0	0	2	2	0	0	0	0	0	0	3	3	0	0	0	0	0	0
7/18	0	0	1	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0
7/19	2	2	1	4	0	0	0	0	0	0	0	3	0	0	0	0	0	0
7/20	4	6	1	5	0	0	0	0	0	0	2	5	0	0	0	0	11	11
7/21	6	12	0	5	0	0	3	3	0	0	4	9	0	0	0	0	4	15
7/22	3	15	0	5	0	0	4	7	0	0	134	143	0	0	0	0	9	24
7/23	1	16	0	5	0	0	4	11	0	0	17	160	0	0	0	0	8	32
7/24	2	18	0	5	0	0	25	36	0	0	3	163	0	0	0	0	6	38
7/25	2	20	1	6	0	0	7	43	7	7			0	0	0	0	4	42
7/26	1	21	3	9	0	0	35	78	78	85			0	0	0	0	12	54
7/27	1	22	5	14	0	0	21	99	51	136			0	0	3	3	11	65
7/28	1	23	9	23	0	0	39	138	45	181			0	0	0	3	18	83
7/29	9	32	10	33			30	168	38	219			0	0	3	6	4	87
7/30	4	36	6	39			21	189	29	248			62	62	0	6	21	108
7/31	4	40	4	43			60	249	34	282							37	145
8/1	24	64	5	48														
8/2	14	78	6	54														
8/3	22	100	37	91														
8/4	15	115																
8/5	50	165																
8/6	22	187																
8/7	13	200																
8/8	22	222																
8/9	33	255																
8/10	16	271																
8/11	29	300																
8/12	25	325																
8/13	28	353																
8/14	3	356																
8/15	0	356																

Appendix 12. Estimated daily and cumulative pink salmon escapement, Goodnews River tower, 1981-1989.

Date	1981		1982		1983		1984		1985		1986		1987		1988		1989	
	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.
7/1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	13	0	0
7/2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	36	0	0
7/3	0	0	0	0	0	0	11	11	0	0	0	0	0	0	23	59	0	0
7/4	0	0	0	0	0	0	10	21	0	0	4	4	0	0	23	82	0	0
7/5	0	0	3	3	0	0	8	29	0	0	7	11	0	0	23	105	0	0
7/6	2	2	1	4	0	0	18	47	0	0	16	27	0	0	13	118	4	4
7/7	2	4	4	8	0	0	18	65	0	0	25	52	0	0	32	150	0	4
7/8	9	13	10	18	9	9	42	107	0	0	60	112	0	0	23	173	0	4
7/9	9	22	42	60	0	9	84	191	0	0	20	132	0	0	96	269	0	4
7/10	17	39	17	77	12	21	61	252	0	0	93	225	0	0	102	371	0	4
7/11	10	49	61	138	9	30	431	683	0	0	63	288	0	0	108	479	0	4
7/12	13	62	105	243	3	33	266	949	0	0	117	405	0	0	234	713	0	4
7/13	16	78	225	468	0	33	176	1125	0	0	175	580	0	0	321	1034	7	11
7/14	15	93	227	695	0	33	276	1401	0	0	232	812	0	0	450	1484	14	25
7/15	26	119	183	878	9	42	459	1860	0	0	644	1456	4	4	330	1814	7	32
7/16	47	166	413	1291	0	42	642	2502	0	0	346	1802	0	4	399	2213	10	42
7/17	64	230	255	1546	0	42	1457	3959	0	0	329	2131	6	10	425	2638	12	54
7/18	48	278	183	1729	3	45	973	4932	0	0	532	2663	3	13	451	3089	18	72
7/19	81	359	110	1839	18	63	510	5442	0	0	481	3144	5	18	163	3252	17	89
7/20	101	460	223	2062	3	66	363	5805	9	9	924	4068	8	26	279	3531	24	113
7/21	58	518	484	2546	9	75	676	6481	5	14	1366	5434	17	43	304	3835	10	123
7/22	123	641	858	3404	0	75	702	7183	0	14	1376	6810	3	46	688	4523	27	150
7/23	161	802	848	4252	0	75	727	7910	0	14	987	7797	3	49	438	4961	23	173
7/24	76	878	837	5089	21	96	597	8507	3	17	337	8134	7	56	283	5244	18	191
7/25	41	919	827	5916	0	96	491	8998	27	44			4	60	127	5371	21	212
7/26	48	967	817	6733	0	96	753	9751	58	102			0	60	186	5557	9	221
7/27	55	1022	994	7727	0	96	789	10540	7	109			-4	56	302	5859	10	231
7/28	63	1085	680	8407	6	102	1071	11611	6	115			0	56	390	6249	0	231
7/29	12	1097	520	8927			871	12482	4	119			0	56	348	6597	7	238
7/30	18	1115	525	9452			671	13153	18	137			7	63	184	6781	5	243
7/31	26	1141	1144	10596			591	13744	7	144							3	246
8/1	25	1166	1083	11679														
8/2	37	1203	1022	12701														
8/3	17	1220	1154	13855														
8/4	22	1242																
8/5	18	1260																
8/6	7	1267																
8/7	16	1283																
8/8	19	1302																
8/9	4	1306																
8/10	6	1312																
8/11	11	1323																
8/12	2	1325																
8/13	1	1326																
8/14	1	1327																
8/15	0	1327																

Appendix 13. Estimated daily and cumulative chin salmon escapement, Goodnews River tower, 1981-1989.

Date	1981		1982		1983		1984		1985		1986		1987		1988		1989	
	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.
6/11					0	0												
6/12					0	0												
6/13	0	0			0	0												
6/14	0	0			0	0												
6/15	0	0			0	0	0	0										
6/16	1	1			0	0	0	0			0	0						
6/17	0	1			0	0	0	0			0	0						
6/18	0	1			0	0	0	0			0	0						
6/19	0	1			0	0	0	0			0	0						
6/20	4	5			0	0	0	0			0	0						
6/21	5	10			0	0	0	0			0	0						
6/22	35	45			0	0	0	0			0	0	0	0				
6/23	16	61	0	0	0	0	0	0			0	0	0	0	0	0		
6/24	16	77	42	42	3	3	23	23			0	0	0	0	18	18		
6/25	217	294	141	183	0	3	45	68			0	0	0	0	178	196		
6/26	147	441	163	346	30	33	15	83			0	0	7	7	225	421		
6/27	411	852	82	428	17	50	37	120	0	0	0	0	0	7	271	692	322 <sup>a</sup>	322
6/28	372	1224	0	428	0	50	107	227	0	0	0	0	9	16	223	915	39	361
6/29	293	1517	4	432	148	198	55	282	0	0	15	15	17	33	317	1232	31	392
6/30	166	1683	8	440	82	280	55	337	0	0	30	45	61	94	961	2199	71	463
7/1	339	2022	12	452	560	840	145	482	0	0	125	170	105	199	1281	3474	111	574
7/2	556	2578	6	458	613	1453	234	716	11	11	68	238	58	257	291	3765	171	745
7/3	189	2767	30	488	445	1898	491	1207	4	15	326	564	89	346	246	4011	249	994
7/4	387	3154	65	553	545	2443	404	1611	78	93	404	968	121	467	224	4235	154	1148
7/5	353	3507	100	653	646	3089	316	1927	152	245	482	1450	141	608	201	4436	58	1206
7/6	552	4059	47	700	409	3498	264	2191	88	333	447	1897	162	770	654	5090	270	1476
7/7	443	4502	27	727	682	4180	232	2423	55	388	411	2308	168	938	1149	6239	139	1615
7/8	653	5155	126	853	459	4639	433	2856	21	409	268	2576	91	1029	935	7174	161	1776
7/9	659	5814	326	1179	892	5531	633	3489	81	490	422	2998	183	1212	1785	8959	306	2082
7/10	960	6774	224	1403	572	6103	680	4169	228	718	1478	4476	343	1555	1353	10312	450	2532
7/11	803	7577	308	1711	642	6745	1507	5676	570	1288	699	5175	281	1836	921	11233	435	2967
7/12	1058	8635	391	2102	1079	7824	906	6582	708	1996	412	5587	330	2166	1536	12769	503	3470
7/13	658	9293	339	2441	588	8412	1108	7690	288	2284	570	6157	379	2545	634	13403	765	4235
7/14	439	9732	490	2931	157	8569	1295	8985	450	2734	729	6886	408	2953	912	14315	592	4827
7/15	643	10375	371	3302	433	9002	1310	10295	612	3346	1457	8343	289	3242	984	15299	388	5215
7/16	727	11102	380	3682	407	9409	1325	11620	972	4318	934	9277	1216	4458	805	16104	404	5619
7/17	664	11766	212	3894	372	9781	2286	13906	777	5095	709	9986	990	5448	573	16677	420	6039
7/18	455	12221	167	4061	398	10179	396	14302	690	5785	755	10741	1011	6459	341	17018	435	6474
7/19	790	13011	122	4183	401	10580	159	14461	873	6658	433	11174	695	7154	384	17402	221	6695
7/20	1186	14197	193	4376	784	11364	466	14927	630	7288	512	11686	378	7532	282	17684	429	7124
7/21	711	14908	175	4551	1034	12398	964	15891	358	7646	592	12278	722	8254	300	17984	224	7348
7/22	1179	16087	197	4748	671	13069	630	16521	85	7731	1181	13459	1071	9325	834	18818	318	7666
7/23	1168	17255	219	4967	215	13284	284	16805	444	8175	981	14440	1479	10804	267	19085	429	8093
7/24	628	17883	242	5209	447	13731	201	17006	440	8615	324	14764	1130	11934	236	19321	540	8615
7/25	605	18488	264	5473	433	14164	256	17262	323	8938			1717	13651	205	19526	361	8996

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-Continued-



Date	1981		1982		1983		1984		1985		1986		1987		1988		1989	
	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.	Daily	Cumm.
7/26	545	19033	286	5759	409	14573	441	17703	404	9342			1069	14720	154	19680	363	9359
7/27	326	19359	204	5963	381	14954	514	18217	261	9603			422	15142	232	19912	378	9737
7/28	717	20076	116	6079	594	15548	300	18517	230	9833			1552	16694	328	20240	163	9900
7/29	406	20482	132	6211			211	18728	198	10031			508	17202	343	20583	170	10070
7/30	270	20752	83	6294			121	18849	113	10144			315	17517	216	20799	160	10230
7/31	177	20929	74	6368			154	19003	223	10367							150	10380
8/1	135	21064	104	6472														
8/2	104	21168	134	6606														
8/3	103	21271	161	6767														
8/4	107	21378																
8/5	119	21497																
8/6	75	21572																
8/7	34	21606																
8/8	37	21643																
8/9	43	21686																
8/10	20	21706																
8/11	30	21736																
8/12	25	21761																
8/13	18	21779																
8/14	10	21789																
8/15	38	21827																

a Estimated cumulative escapement before counting began on 6/28

Appendix 14. Historic daily cumulative proportion of chinook salmon escapement at the Goodnews River counting tower, 1981-1989.

Date	1981	1982	1983	1984	1985	1986	1987	1988	1989	Ave.
6/11			0.0008							0.0001
6/12			0.0008							0.0001
6/13	0.0000		0.0008							0.0001
6/14	0.0000		0.0008							0.0000
6/15	0.0000		0.0008	0.0000						0.0000
6/16	0.0000		0.0008	0.0000		0.0000				0.0000
6/17	0.0005		0.0008	0.0000		0.0029				0.0004
6/18	0.0005		0.0008	0.0000		0.0029				0.0004
6/19	0.0016		0.0008	0.0012		0.0057				0.0010
6/20	0.0041		0.0008	0.0025		0.0057				0.0015
6/21	0.0070		0.0035	0.0061		0.0057				0.0025
6/22	0.0098		0.0141	0.0089		0.0057	0.0000			0.0043
6/23	0.0141	0.0000	0.0450	0.0107		0.0057	0.0000	0.0184		0.0104
6/24	0.0198	0.0158	0.0645	0.0187		0.0057	0.0000	0.0265		0.0168
6/25	0.0309	0.0358	0.0821	0.0328		0.0182	0.0000	0.0667		0.0296
6/26	0.0390	0.0387	0.0913	0.0374		0.0182	0.0018	0.1239		0.0389
6/27	0.0613	0.0401	0.0947	0.0408	0.0014	0.0559	0.0018	0.1976	0.0742	0.0631
6/28	0.0862	0.0401	0.1231	0.0564	0.0014	0.0774	0.0053	0.2183	0.1107	0.0799
6/29	0.1312	0.0401	0.1797	0.0598	0.0053	0.1013	0.0123	0.2364	0.1232	0.0988
6/30	0.1459	0.0401	0.2660	0.0623	0.0088	0.1276	0.0282	0.3013	0.1582	0.1265
7/1	0.1692	0.0401	0.3113	0.0798	0.0117	0.1893	0.0528	0.3938	0.2157	0.1626
7/2	0.2196	0.0423	0.3549	0.1120	0.0251	0.2089	0.0823	0.4314	0.2454	0.1913
7/3	0.2440	0.0437	0.3737	0.1294	0.0364	0.2519	0.1083	0.4657	0.2752	0.2143
7/4	0.2804	0.0602	0.4022	0.1472	0.0576	0.2830	0.1307	0.4985	0.3044	0.2405
7/5	0.3487	0.0918	0.4405	0.1653	0.0883	0.3021	0.1708	0.5295	0.3332	0.2745
7/6	0.4130	0.0996	0.4506	0.1975	0.1349	0.3274	0.2280	0.5546	0.3295	0.3039
7/7	0.4650	0.1168	0.5595	0.2420	0.1699	0.3595	0.2469	0.5896	0.3723	0.3468
7/8	0.5209	0.1484	0.5839	0.2905	0.1932	0.3867	0.2632	0.6154	0.3859	0.3765
7/9	0.5485	0.1842	0.6008	0.3426	0.2377	0.4049	0.2945	0.6619	0.4031	0.4087
7/10	0.5846	0.2029	0.6336	0.3840	0.2844	0.4465	0.3565	0.7061	0.4235	0.4469
7/11	0.6144	0.2502	0.6677	0.4417	0.3522	0.4837	0.3834	0.7482	0.4762	0.4909
7/12	0.6356	0.3262	0.7145	0.4739	0.4179	0.5143	0.4089	0.7780	0.5358	0.5339
7/13	0.6605	0.4007	0.7581	0.5227	0.4338	0.5554	0.4331	0.7998	0.6042	0.5743
7/14	0.6771	0.4358	0.7692	0.5847	0.4497	0.6076	0.5268	0.8086	0.6465	0.6118
7/15	0.7156	0.4968	0.7953	0.6227	0.4656	0.6740	0.5849	0.8263	0.6919	0.6526
7/16	0.7337	0.5806	0.8168	0.6368	0.5037	0.7118	0.6320	0.8503	0.7467	0.6903
7/17	0.7522	0.6495	0.8361	0.7052	0.5535	0.7242	0.6822	0.8684	0.8110	0.7314
7/18	0.7709	0.6918	0.8513	0.7267	0.6203	0.7643	0.7350	0.8805	0.8407	0.7646
7/19	0.7915	0.7075	0.8689	0.7390	0.6849	0.8007	0.7724	0.8916	0.8585	0.7906
7/20	0.8134	0.7355	0.8955	0.7696	0.7421	0.8384	0.7940	0.8993	0.8585	0.8163
7/21	0.8205	0.7749	0.9265	0.8043	0.7761	0.8781	0.8151	0.9034	0.8794	0.8420
7/22	0.8335	0.7993	0.9376	0.8460	0.7866	0.9484	0.8455	0.9281	0.9044	0.8699
7/23	0.8520	0.8229	0.9472	0.8948	0.8206	0.9790	0.8653	0.9447	0.9258	0.8947
7/24	0.8750	0.8459	0.9620	0.9080	0.8548	1.0000	0.8974	0.9598	0.9431	0.9162
7/25	0.8886	0.8681	0.9751	0.9270	0.8905	1.0000	0.9230	0.9735	0.9499	0.9328
7/26	0.9002	0.8903	0.9910	0.9436	0.9311	1.0000	0.9437	0.9786	0.9734	0.9502
7/27	0.9065	0.9039	0.9973	0.9617	0.9382	1.0000	0.9591	0.9797	0.9927	0.9599
7/28	0.9127	0.9297	1.0000	0.9798	0.9523	1.0000	0.9688	0.9860	0.9943	0.9693
7/29	0.9233	0.9412	1.0000	0.9917	0.9735	1.0000	0.9802	0.9923	0.9995	0.9780
7/30	0.9281	0.9505	1.0000	0.9975	0.9936	1.0000	1.0000	1.0000	1.0016	0.9857
7/31	0.9374	0.9713	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9899
8/1	0.9463	0.9835	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9922
8/2	0.9588	0.9871	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9940
8/3	0.9664	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9963
8/4	0.9761	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9973
8/5	0.9859	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9984
8/6	0.9913	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9990
8/7	0.9948	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9994
8/8	0.9981	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998
8/9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Appendix 15. Historic daily cumulative proportion of sockeye salmon escapement at the Goodnews River counting tower, 1981-1989.

Date	1981	1982	1983	1984	1985	1986	1987	1988	1989	Ave.
6/11			0.0001							0.0000
6/12			0.0001							0.0000
6/13	0.0000		0.0001							0.0000
6/14	0.0000		0.0001							0.0000
6/15	0.0000		0.0001	0.0029						0.0004
6/16	0.0000		0.0002	0.0031		0.0000				0.0004
6/17	0.0007		0.0002	0.0035		0.0000				0.0005
6/18	0.0029		0.0002	0.0039		0.0000				0.0009
6/19	0.0081		0.0002	0.0083		0.0000				0.0021
6/20	0.0102		0.0003	0.0114		0.0000				0.0028
6/21	0.0162		0.0003	0.0256		0.0057				0.0060
6/22	0.0278		0.0003	0.0346		0.0111	0.0077			0.0102
6/23	0.0414	0.0324	0.0003	0.0409		0.0162	0.0144	0.0227		0.0210
6/24	0.0543	0.1071	0.0313	0.0527		0.0174	0.0186	0.0397		0.0401
6/25	0.0720	0.2139	0.0517	0.0700		0.0310	0.0334	0.0837		0.0695
6/26	0.0860	0.3031	0.0674	0.0897		0.0395	0.0575	0.1332		0.0970
6/27	0.1493	0.3486	0.0832	0.1210	0.0052	0.0649	0.0858	0.1883	0.1327	0.1308
6/28	0.1908	0.3504	0.0934	0.1666	0.0149	0.0974	0.1133	0.2328	0.1849	0.1574
6/29	0.2291	0.3551	0.1113	0.2022	0.0404	0.1268	0.1400	0.2800	0.2076	0.1856
6/30	0.2598	0.3629	0.1235	0.2408	0.0746	0.1533	0.1679	0.3318	0.2361	0.2143
7/1	0.2964	0.3737	0.1421	0.2890	0.1174	0.2025	0.1970	0.3940	0.2706	0.2515
7/2	0.3343	0.3857	0.1829	0.3469	0.1540	0.2512	0.2353	0.4292	0.2953	0.2899
7/3	0.3636	0.4029	0.2080	0.3932	0.1774	0.2991	0.2814	0.4678	0.3262	0.3242
7/4	0.4016	0.4443	0.2536	0.4472	0.2207	0.3497	0.3355	0.5079	0.3514	0.3701
7/5	0.4621	0.5099	0.3197	0.5090	0.2838	0.4032	0.3908	0.3498	0.3710	0.4285
7/6	0.5127	0.5588	0.3643	0.5550	0.3259	0.4657	0.4471	0.6105	0.4050	0.4800
7/7	0.5435	0.5869	0.4217	0.6153	0.3710	0.5372	0.5081	0.6490	0.4435	0.5291
7/8	0.5878	0.6386	0.4655	0.6907	0.4190	0.5991	0.5579	0.6932	0.4830	0.5815
7/9	0.6325	0.7165	0.5107	0.7814	0.4886	0.6519	0.5940	0.7345	0.5287	0.6388
7/10	0.6767	0.7586	0.5564	0.8256	0.5388	0.7121	0.6388	0.7716	0.5805	0.6848
7/11	0.7332	0.7976	0.6323	0.8574	0.5953	0.7493	0.6690	0.8044	0.6496	0.7298
7/12	0.7633	0.8335	0.6950	0.8883	0.6275	0.7903	0.7041	0.8384	0.7044	0.7675
7/13	0.8018	0.8570	0.7372	0.9152	0.6598	0.8286	0.7439	0.8615	0.7395	0.8006
7/14	0.8267	0.8848	0.7644	0.9394	0.6918	0.8640	0.7829	0.8906	0.7786	0.8306
7/15	0.8562	0.9043	0.8028	0.9565	0.7237	0.8944	0.8318	0.9061	0.7989	0.8595
7/16	0.8855	0.9312	0.8416	0.9666	0.7549	0.9188	0.8582	0.9232	0.8216	0.8850
7/17	0.9048	0.9452	0.8712	0.9747	0.7948	0.9344	0.8734	0.9365	0.8468	0.9044
7/18	0.9145	0.9547	0.9047	0.9785	0.8394	0.9560	0.8889	0.9460	0.8761	0.9228
7/19	0.9299	0.9597	0.9260	0.9821	0.8824	0.9689	0.9044	0.9559	0.9000	0.9387
7/20	0.9452	0.9665	0.9430	0.9860	0.9269	0.9785	0.9200	0.9630	0.9237	0.9536
7/21	0.9524	0.9708	0.9665	0.9899	0.9589	0.9846	0.9298	0.9694	0.9368	0.9653
7/22	0.9615	0.9743	0.9795	0.9929	0.9783	0.9910	0.9464	0.9780	0.9474	0.9752
7/23	0.9693	0.9777	0.9829	0.9951	0.9833	0.9970	0.9599	0.9858	0.9576	0.9814
7/24	0.9736	0.9807	0.9879	0.9958	0.9925	1.0000	0.9682	0.9909	0.9674	0.9862
7/25	0.9774	0.9835	0.9914	0.9963	0.9967	1.0000	0.9814	0.9932	0.9767	0.9900
7/26	0.9803	0.9860	0.9939	0.9975	0.9982	1.0000	0.9896	0.9951	0.9808	0.9926
7/27	0.9827	0.9882	0.9974	0.9986	0.9990	1.0000	0.9926	0.9966	0.9888	0.9944
7/28	0.9867	0.9898	1.0000	0.9994	0.9994	1.0000	0.9963	0.9977	0.9917	0.9962
7/29	0.9913	0.9911	1.0000	0.9999	0.9996	1.0000	0.9980	0.9985	0.9943	0.9973
7/30	0.9939	0.9926	1.0000	1.0001	0.9996	1.0000	1.0000	1.0000	0.9971	0.9983
7/31	0.9948	0.9942	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9986
8/1	0.9960	0.9961	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9990
8/2	0.9969	0.9984	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9994
8/3	0.9977	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997
8/4	0.9988	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998
8/5	0.9996	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999
8/6	0.9997	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8/7	0.9998	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8/8	0.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8/9	0.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8/10	0.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8/11	1.0002	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8/12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8/13	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8/14	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8/15	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Appendix 16. Historic daily cumulative proportion of coho salmon escapement at the Goodnews River counting tower, 1981-1989.

Date	1981	1982	1983	1984	1985	1986	1987	1988	1989	Ave.
7/17	0.0000	0.0220		0.0000	0.0000	0.0184	0.0000	0.0000	0.0000	0.0050
7/18	0.0000	0.0330		0.0000	0.0000	0.0184	0.0000	0.0000	0.0000	0.0064
7/19	0.0056	0.0440		0.0000	0.0000	0.0184	0.0000	0.0000	0.0000	0.0085
7/20	0.0169	0.0549		0.0000	0.0000	0.0307	0.0000	0.0000	0.0759	0.0223
7/21	0.0337	0.0549		0.0120	0.0000	0.0552	0.0000	0.0000	0.1034	0.0324
7/22	0.0421	0.0549		0.0281	0.0000	0.8773	0.0000	0.0000	0.1655	0.1460
7/23	0.0449	0.0549		0.0442	0.0000	0.9816	0.0000	0.0000	0.2207	0.1683
7/24	0.0506	0.0549		0.1446	0.0000	1.0000	0.0000	0.0000	0.2621	0.1890
7/25	0.0562	0.0659		0.1727	0.0248	1.0000	0.0000	0.0000	0.2897	0.2012
7/26	0.0590	0.0989		0.3133	0.3014	1.0000	0.0000	0.0000	0.3724	0.2681
7/27	0.0618	0.1538		0.3976	0.4823	1.0000	0.0000	0.5000	0.4483	0.3805
7/28	0.0646	0.2527		0.5542	0.6418	1.0000	0.0000	0.5000	0.5724	0.4482
7/29	0.0899	0.3626		0.6747	0.7766	1.0000	0.0000	1.0000	0.6000	0.5630
7/30	0.1011	0.4286		0.7590	0.8794	1.0000	1.0000	1.0000	0.7448	0.7391
7/31	0.1124	0.4723		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8231
8/1	0.1798	0.5275		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8384
8/2	0.2191	0.5934		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8516
8/3	0.2809	1.0000		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9101
8/4	0.3230	1.0000		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9154
8/5	0.4635	1.0000		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9329
8/6	0.5253	1.0000		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9407
8/7	0.5618	1.0000		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9452
8/8	0.6236	1.0000		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9529
8/9	0.7163	1.0000		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9645
8/10	0.7612	1.0000		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9702
8/11	0.8427	1.0000		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9803
8/12	0.9129	1.0000		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9891
8/13	0.9916	1.0000		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9989
8/14	1.0000	1.0000		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8/15	1.0000	1.0000		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Appendix 17. Historic daily cumulative proportion of pink salmon escapement at the Goodnews River counting tower, 1981-1989.

Date	1981	1982	1983	1984	1985	1986	1987	1988	1989	Ave.
7/1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0019	0.0000	0.0002
7/2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0053	0.0000	0.0006
7/3	0.0000	0.0000	0.0000	0.0008	0.0000	0.0000	0.0000	0.0087	0.0000	0.0011
7/4	0.0000	0.0000	0.0000	0.0015	0.0000	0.0005	0.0000	0.0121	0.0000	0.0016
7/5	0.0000	0.0002	0.0000	0.0021	0.0000	0.0014	0.0000	0.0155	0.0000	0.0021
7/6	0.0015	0.0003	0.0000	0.0034	0.0000	0.0033	0.0000	0.0174	0.0163	0.0047
7/7	0.0030	0.0006	0.0000	0.0047	0.0000	0.0064	0.0000	0.0221	0.0163	0.0059
7/8	0.0098	0.0013	0.0882	0.0078	0.0000	0.0138	0.0000	0.0255	0.0163	0.0181
7/9	0.0166	0.0043	0.0882	0.0139	0.0000	0.0162	0.0000	0.0397	0.0163	0.0217
7/10	0.0294	0.0056	0.2059	0.0183	0.0000	0.0277	0.0000	0.0547	0.0163	0.0398
7/11	0.0369	0.0100	0.2941	0.0497	0.0000	0.0354	0.0000	0.0706	0.0163	0.0570
7/12	0.0467	0.0175	0.3235	0.0690	0.0000	0.0498	0.0000	0.1051	0.0163	0.0698
7/13	0.0588	0.0338	0.3235	0.0819	0.0000	0.0713	0.0000	0.1525	0.0447	0.0852
7/14	0.0701	0.0502	0.3235	0.1019	0.0000	0.0998	0.0000	0.2188	0.1016	0.1073
7/15	0.0897	0.0634	0.4118	0.1353	0.0000	0.1790	0.0635	0.2675	0.1301	0.1489
7/16	0.1251	0.0932	0.4118	0.1820	0.0000	0.2215	0.0635	0.3264	0.1707	0.1771
7/17	0.1733	0.1116	0.4118	0.2881	0.0000	0.2620	0.1587	0.3890	0.2195	0.2238
7/18	0.2095	0.1248	0.4412	0.3588	0.0000	0.3274	0.2063	0.4555	0.2927	0.2685
7/19	0.2705	0.1327	0.6176	0.3960	0.0000	0.3865	0.2857	0.4796	0.3618	0.3256
7/20	0.3466	0.1488	0.6471	0.4224	0.0625	0.5001	0.4127	0.5207	0.4593	0.3911
7/21	0.3904	0.1838	0.7353	0.4716	0.0972	0.6681	0.6825	0.5656	0.5000	0.4771
7/22	0.4830	0.2457	0.7353	0.5226	0.0972	0.8372	0.7302	0.6670	0.6098	0.5476
7/23	0.6044	0.3069	0.7353	0.5755	0.0972	0.9586	0.7778	0.7316	0.7033	0.6101
7/24	0.6616	0.3673	0.9412	0.6190	0.1181	1.0000	0.8889	0.7733	0.7764	0.6829
7/25	0.6925	0.4270	0.9412	0.6547	0.3056	1.0000	0.9524	0.7921	0.8618	0.7364
7/26	0.7287	0.4860	0.9412	0.7095	0.7083	1.0000	0.9524	0.8195	0.8984	0.8049
7/27	0.7702	0.5377	0.9412	0.7669	0.7569	1.0000	0.8889	0.8540	0.9390	0.8316
7/28	0.8176	0.6068	1.0000	0.8448	0.7986	1.0000	0.8889	0.9215	0.9390	0.8686
7/29	0.8267	0.6443	1.0000	0.9082	0.8264	1.0000	0.8889	0.9729	0.9675	0.8928
7/30	0.8402	0.6822	1.0000	0.9570	0.9514	1.0000	1.0000	1.0000	0.9878	0.9354
7/31	0.8598	0.7648	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9583
8/1	0.8787	0.8429	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9691
8/2	0.9066	0.9167	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9804
8/3	0.9194	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9910
8/4	0.9359	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9929
8/5	0.9495	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9944
8/6	0.9548	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9950
8/7	0.9668	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9963
8/8	0.9812	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9979
8/9	0.9842	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9982
8/10	0.9887	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9987
8/11	0.9970	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997
8/12	0.9985	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998
8/13	0.9992	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999
8/14	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8/15	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Appendix 18. Historic daily cumulative proportion of chin salmon escapement at the Goodnews River counting tower, 1981-1989.

Date	1981	1982	1983	1984	1985	1986	1987	1988	1989	Ave.
6/11			0.0000							0.0000
6/12			0.0000							0.0000
6/13	0.0000		0.0000							0.0000
6/14	0.0000		0.0000							0.0000
6/15	0.0000		0.0000	0.0000						0.0000
6/16	0.0000		0.0000	0.0000		0.0000				0.0000
6/17	0.0000		0.0000	0.0000		0.0000				0.0000
6/18	0.0000		0.0000	0.0000		0.0000				0.0000
6/19	0.0000		0.0000	0.0000		0.0000				0.0000
6/20	0.0002		0.0000	0.0000		0.0000				0.0000
6/21	0.0005		0.0000	0.0000		0.0000				0.0001
6/22	0.0021		0.0000	0.0000		0.0000	0.0000			0.0002
6/23	0.0028	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0003
6/24	0.0035	0.0062	0.0002	0.0012		0.0000	0.0000	0.0009		0.0013
6/25	0.0135	0.0270	0.0002	0.0036		0.0000	0.0000	0.0094		0.0060
6/26	0.0202	0.0511	0.0021	0.0044		0.0000	0.0004	0.0202		0.0109
6/27	0.0390	0.0632	0.0032	0.0063	0.0000	0.0000	0.0004	0.0333	0.0310	0.0196
6/28	0.0561	0.0632	0.0032	0.0119	0.0000	0.0000	0.0009	0.0440	0.0348	0.0238
6/29	0.0695	0.0698	0.0127	0.0148	0.0000	0.0010	0.0019	0.0592	0.0378	0.0290
6/30	0.0771	0.0650	0.0180	0.0177	0.0000	0.0030	0.0054	0.1054	0.0446	0.0374
7/1	0.0926	0.0668	0.0540	0.0254	0.0000	0.0115	0.0114	0.1670	0.0553	0.0538
7/2	0.1181	0.0677	0.0935	0.0377	0.0011	0.0161	0.0147	0.1810	0.0718	0.0668
7/3	0.1268	0.0721	0.1221	0.0633	0.0014	0.0382	0.0198	0.1928	0.0958	0.0814
7/4	0.1445	0.0817	0.1571	0.0848	0.0090	0.0656	0.0267	0.2036	0.1106	0.0982
7/5	0.1607	0.0965	0.1987	0.1014	0.0236	0.0982	0.0347	0.2133	0.1162	0.1159
7/6	0.1860	0.1034	0.2250	0.1153	0.0321	0.1285	0.0440	0.2447	0.1422	0.1357
7/7	0.2063	0.1074	0.2688	0.1275	0.0374	0.1563	0.0535	0.3000	0.1556	0.1570
7/8	0.2362	0.1261	0.2984	0.1503	0.0395	0.1745	0.0587	0.3449	0.1711	0.1777
7/9	0.2664	0.1742	0.3557	0.1836	0.0473	0.2031	0.0692	0.4307	0.2006	0.2145
7/10	0.3103	0.2073	0.3925	0.2194	0.0693	0.3032	0.0888	0.4958	0.2439	0.2589
7/11	0.3471	0.2528	0.4338	0.2987	0.1242	0.3505	0.1048	0.5401	0.2858	0.3042
7/12	0.3956	0.3106	0.5032	0.3464	0.1925	0.3784	0.1237	0.6139	0.3343	0.3554
7/13	0.4258	0.3607	0.5410	0.4047	0.2203	0.4170	0.1453	0.6444	0.4080	0.3964
7/14	0.4459	0.4331	0.5511	0.4728	0.2637	0.4664	0.1686	0.6883	0.4650	0.4394
7/15	0.4753	0.4880	0.5790	0.5418	0.3228	0.5651	0.1851	0.7356	0.5024	0.4883
7/16	0.5086	0.5441	0.6052	0.6115	0.4165	0.6284	0.2545	0.7743	0.5413	0.5427
7/17	0.5391	0.5754	0.6291	0.7318	0.4915	0.6764	0.3110	0.8018	0.5818	0.5931
7/18	0.5599	0.6001	0.6547	0.7526	0.5580	0.7275	0.3687	0.8182	0.6237	0.6293
7/19	0.5961	0.6181	0.6805	0.7610	0.6422	0.7568	0.4084	0.8367	0.6450	0.6603
7/20	0.6304	0.6467	0.7309	0.7855	0.7030	0.7915	0.4300	0.8502	0.6863	0.6972
7/21	0.6830	0.6725	0.7974	0.8362	0.7375	0.8316	0.4712	0.8647	0.7079	0.7336
7/22	0.7370	0.7016	0.8406	0.8694	0.7457	0.9116	0.5323	0.9048	0.7385	0.7757
7/23	0.7905	0.7340	0.8544	0.8843	0.7886	0.9781	0.6168	0.9176	0.7799	0.8160
7/24	0.8193	0.7698	0.8831	0.8949	0.8310	1.0000	0.6813	0.9289	0.8319	0.8489
7/25	0.8470	0.8088	0.9110	0.9084	0.8622	1.0000	0.7793	0.9388	0.8667	0.8802
7/26	0.8720	0.8310	0.9373	0.9316	0.9011	1.0000	0.8403	0.9462	0.9016	0.9090
7/27	0.8869	0.8812	0.9618	0.9586	0.9263	1.0000	0.8644	0.9574	0.9381	0.9305
7/28	0.9198	0.8983	1.0000	0.9744	0.9485	1.0000	0.9530	0.9731	0.9538	0.9579
7/29	0.9384	0.9178	1.0000	0.9855	0.9676	1.0000	0.9820	0.9896	0.9701	0.9723
7/30	0.9507	0.9301	1.0000	0.9919	0.9785	1.0000	1.0000	1.0000	0.9855	0.9819
7/31	0.9589	0.9410	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9889
8/1	0.9650	0.9564	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9913
8/2	0.9698	0.9762	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9940
8/3	0.9745	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9972
8/4	0.9794	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9977
8/5	0.9849	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9983
8/6	0.9883	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9987
8/7	0.9899	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9989
8/8	0.9916	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9991
8/9	0.9935	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9993
8/10	0.9945	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9994
8/11	0.9958	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9995
8/12	0.9970	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997
8/13	0.9978	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998
8/14	0.9983	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998
8/15	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Appendix 19. Chinook salmon counts obtained during periods of 24 consecutive hourly observation, Goodnews River tower, 1989.

Date	Total hour count																							Total No. Chinook Salmon Counted	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
7/10	0	0	0	1	-1	0	0	0	0	1	0	0	0	0	1	1	0	4	1	1	0	2	2	0	13
7/17	0	3	1	3	3	-1	-1	0	0	1	-1	4	1	0	2	0	7	3	3	0	3	4	0	6	41
7/18	0	1	1	1	0	0	0	0	0	0	1	0	0	0	1	1	2	2	3	-1	1	3	1	2	19
7/22	0	0	3	3	3	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	3	0	16
7/24	0	2	1	3	1	1	0	0	1	0	0	0	0	0	-1	0	0	0	1	0	0	2	0	0	11
7/26	3	2	1	1	1	0	0	1	0	0	2	-1	0	2	-1	0	0	0	1	0	0	1	0	2	15
Total	3	8	7	12	7	0	-1	1	1	2	2	3	1	3	2	2	10	10	9	0	5	12	6	10	115
(X)	2.6	7.0	6.1	10.4	6.1	0.0	-0.9	0.9	0.9	1.7	1.7	2.6	0.9	2.6	1.7	1.7	8.7	8.7	7.8	0.0	4.3	10.4	5.2	8.7	

Appendix 20. Sockeye salmon counts obtained during periods of 24 consecutive hourly observation, Goodnews River tower, 1989.

Date	Sockeye counted for 20-minute observation during hour:																							Total No. sockeye salmon counted	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
7/10	3	13	8	10	3	2	3	13	4	4	6	35	12	14	35	50	4	28	23	29	21	13	23	10	366
7/17	27	11	9	5	6	4	2	5	1	0	0	4	20	1	4	0	5	7	0	3	20	10	16	18	178
7/18	22	10	16	17	9	7	13	11	1	1	0	6	2	12	1	0	7	13	24	7	13	2	1	12	207
7/22	7	2	9	5	4	0	1	0	0	0	0	0	0	1	4	13	8	6	1	2	4	4	4	75	
7/24	6	3	10	1	4	0	5	3	0	1	1	1	0	1	2	0	1	3	1	0	7	8	6	5	69
7/26	2	2	4	2	0	2	2	3	0	0	0	1	0	1	0	1	1	0	0	0	0	0	2	6	29
Total	67	41	56	40	26	15	26	35	6	6	7	47	34	29	43	54	31	60	54	40	63	37	52	55	924
(%)	7.3	4.4	6.1	4.3	2.8	1.6	2.8	3.8	0.6	0.6	0.8	5.1	3.7	3.1	4.7	5.8	3.4	6.5	5.8	4.3	6.8	4.0	5.6	6.0	



Appendix 21. Pink salmon counts obtained during periods of 24 consecutive hourly observation, Goodnews River tower, 1989.

Date	Pink salmon counted for 20-minute observation during hour:																							Total No. Pink Salmon Counted	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
7/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/17	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4
7/18	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	6
7/22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	1	0	2	2	9
7/24	3	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	6
7/26	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	3
Total	7	1	0	0	1	0	1	0	0	0	0	0	0	0	3	2	2	0	0	4	1	1	5	28	
(X)	25.0	9.6	0.0	0.0	3.6	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7	7.1	7.1	0.0	0.0	14.3	3.6	3.6	17.9		

Appendix 22. Chum salmon counts obtained during periods of 24 consecutive hourly observation, Goodnews River tower, 1989.

Date	Chum salmon counted for 20-minute observation for hour:																							Total No. chum salmon counted	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
7/10	2	1	2	1	0	1	0	2	1	0	2	0	2	3	8	5	4	9	4	24	28	11	28	12	150
7/17	23	4	6	2	5	2	5	1	-5	1	0	6	-3	5	1	6	8	8	5	1	16	7	12	24	140
7/18	15	5	11	4	3	1	2	2	1	1	8	2	2	5	-1	1	3	30	23	2	10	2	4	9	145
7/22	5	1	4	3	1	1	1	0	1	2	3	1	0	-1	2	4	7	21	11	3	4	3	11	18	106
7/24	37	14	23	1	4	1	10	4	0	1	2	-1	2	4	9	5	4	8	5	1	11	10	15	10	180
7/26	41	7	14	0	2	1	0	1	2	1	3	1	1	1	7	1	0	3	2	1	1	6	8	17	121
Total	123	32	60	11	15	7	18	10	0	6	18	9	4	17	26	22	26	79	50	32	70	39	78	90	842
(X)	14.6	3.8	7.1	1.3	1.8	0.8	2.1	1.2	0.0	0.7	2.1	1.1	0.5	2.0	3.1	2.6	3.1	9.4	5.9	3.8	8.3	4.6	9.3	10.7	