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**COPPER RIVER HYDROACOUSTIC SALMON ENUMERATION STUDIES,
1993 AND 1994**



by

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ABSTRACT

The Miles Lake sonar project began in 1978 to assess annual salmon escapement into the Copper River. The studies conducted during 1993 and 1994 used side scanning sonar equipment deployed on the north and south banks of the Copper River. Counting sites were located near the outlet of Miles Lake approximately 53 km upstream from the commercial fishing district. Escapement estimates for sockeye salmon (*Oncorhynchus nerka*) were 833,387 in 1993 the largest escapement since the sonar operation began and in 1994 the second largest recorded with 715,181 past the sonar site. Use of riverine sonar units capable of dividing the sonar beam into 16 monitoring sectors, each with adjustable hit criteria for targets, improved the accuracy of escapement estimates and allowed observations of salmon distribution across the counting transect to be obtained.

KEY WORDS: Copper River, hydroacoustics, migration, Miles Lake, *Oncorhynchus nerka*, Pacific salmon, riverine sonar, sockeye salmon, side scanning sonar, spawning escapement enumeration

INTRODUCTION

The Copper River drainage (Figure 1) has supported a commercial fishery since the early 1890's and a subsistence life style for the residents of this drainage for many years before that. Five species of Pacific salmon spawn in the Copper River. The most abundant species is sockeye salmon which makes up more than 90 percent of the total run. Coho salmon (*O. kisutch*) comprise approximately five percent and chinook salmon (*O. tshawytscha*) make up about three percent of the total run. Populations of pink (*O. gorbuscha*) and chum (*O. keta*) salmon are not abundant.

There are three major sockeye salmon spawning components in the Copper River system. The most abundant component, referred to as upper Copper River stocks, spawn in Copper River tributaries above Miles Lake. The second component, derived from upper Copper River stocks, is an artificially propagated Gulkana River hatchery stock. The hatchery, which has operated since the early 1970's, produces approximately 225,000 returning adult sockeye salmon. The third component, referred to as lower delta stocks, spawn in systems below the Chugach Mountains, between Eyak Lake and Katalla River.

Management of Copper River salmon resources is difficult due to several factors. The Copper River is a cold turbid system draining extensive glaciers originating in the Alaska, Chugach, Wrangell, and St. Elias mountain ranges. Enumerating the escapement within this drainage has been difficult since the main stem Copper River is too turbid to allow visual counting of salmon. While it is possible to survey clear tributary streams, sockeye and chinook salmon reach these months after they have passed through the commercial fishery. Such surveys have little value for inseason management decisions and make it impossible to ensure that minimum escapement levels are achieved. However, post season escapement estimates do provide data to forecast subsequent runs and to establish escapement goals.

Inseason escapement estimates first became possible in 1978, with the deployment of a single side scanning sonar salmon counter on the south bank of the Copper River at the outlet of Miles Lake (Mile 49 of the Copper River Highway) approximately 53 km upstream from the commercial fishing zone. In 1979 an additional side scanning unit was installed on the north bank of the river. Information from this project has been used for real time management of both the commercial and personal use fisheries. The Copper River management plan, 5AAC 29.360, specifies minimum escapement goals which are based on data obtained from this sonar project (ADF&G 1993). Emergency order regulation of the multi-million dollar commercial fishery as well as subsistence, personal use, and sport fisheries is based on escapement information collected at the Miles Lake sonar site.

METHODS

To estimate total escapement, the sonar system must be placed in an area of the river where salmon do not mill and all salmon traveling upriver have a high probability of passing through the sounding beam. An area of the river with a single channel, uniform slope, smooth bottom and adequate current velocity is most desirable. The most suitable location, closest to the river mouth, was found just downstream of Miles Lake. This site is 53 km above the upper commercial district boundary. This section of the river is influenced by two glaciers: Childs Glacier, which is below Miles Lake, and Miles Glacier, which is on the eastern shore of Miles Lake (Figure 2). Although the Copper River Highway provides access to the site, deep snow drifts render the highway impassable well into June most years. Since sonar gear is deployed in the river at the earliest date that breakup conditions allow, other means of transportation to the site prior to the road opening have included track vehicles, snow machines, fixed wing aircraft, chartered helicopters, and the Coast Guard helicopter.

Sonar Operations

The basic adult salmon counter system consists of four main elements: an electronic counting unit, a transducer, an artificial bottom substrate, and an oscilloscope for calibration. The system is powered by a 12 volt battery continuously recharged by a solar panel.

Electronic counting units used on this project varied within and between years. Two 16 sector, 1985 Bendix units with adjustable hit criteria by sector are currently used. Two 12 sector 1981, Bendix units with rock inhibiting functions are available to replace 16 sector units which malfunction or are damaged.

Transducers operate at 515 KHz and have alternating beam widths of 2 and 4 degrees. Each transducer is mounted on an underwater stand near the river bank and aimed horizontally across the river so that the beam is perpendicular to the current and slightly off the bottom. This allows monitoring of that portion of river most frequently used by migrating sockeye salmon. Each transducer is aimed over either an artificial bottom substrate with a smooth straight surface or the natural river bottom where the slope is smooth and uniform. A permanent artificial substrate has been constructed at the south bank site by embedding a steel rail in concrete to form a uniform surface along the river bottom. The rail also serves as a guide along which the transducer stand is moved in response to water level fluctuations.

A minimum water level of 40.1 m above mean sea level is needed for use of the permanent substrate. When water levels are lower, a portable substrate is used which consists of an 18 m length of 20.3 cm diameter aluminum tubing . This substrate is held in place against the river current by cables fastened to the shore. However, in 1994 the north bank portable tripod was deployed on the south bank in place of the portable substrate.

Each transducer stand has an adjustment wheel at the top which is manually turned to aim the sonar beam along the river bottom or substrate. To position the beam up- or downriver, the entire tripod must be shifted in the desired direction (Morstad 1992). These manually adjustable stands are less prone to damage by large pieces of ice and debris than remote controlled pan and tilt rotator units.

Calibrations

Each year, frequent adjustments of substrates and transducers have been required on both river banks because of large fluctuations in river level, wave action caused by strong winds, and periods of heavy ice passage. During 1993 and 1994, when the south bank unit was on either the portable or permanent substrate, calibrations were conducted every three hours for 30 min or until 100 salmon were counted. When the south bank transducer was mounted on the tripod, calibrations were usually conducted every hour for 30 min and then expanded to obtain a cumulative hourly count. The north bank sonar unit was calibrated every four hours for 30 min or until 100 salmon were counted (Morstad 1992).

Species Apportionment

Test fishing programs using gill nets and beach seines were attempted in the vicinity of the sonar site from 1985 through 1987, but a lack of good sampling locations and small catches indicated that this was not a viable way to collect data on species composition (Morstad 1992). No species apportionment information was collected at the site in either 1993 or 1994. However, based on information from subsistence, commercial, recreational and personal use harvests, as well as aerial surveys, most salmon migrating up the Copper River are sockeye salmon. Therefore, it was assumed that most sonar counts could be attributed to this species.

RESULTS and DISCUSSION

Escapement Enumeration

In 1993, the sonar project operated from 21 May to 3 August. Estimated escapement during that time period was 883,387 salmon, 62 percent above the escapement goal (Table 1). Daily escapements were above the anticipated daily escapements from the start of operation and remained above the anticipated until the end to the season (Figure 3). The return of sockeye salmon to the Copper River was the largest on record and was 75 percent above the forecast (Donaldson 1994). Water level was also above average from the beginning of operation (Table 2).

In 1994, the sonar project operated from 17 May to 1 August. Estimated escapement during that time period was 715,181 salmon, 38 percent above the escapement goal (Table 3). Daily escapements were within anticipated daily escapements from the start of operation but started lagging behind after the first 10 days. Daily escapement remained behind the anticipated dailies until 7 June when escapement began exceeding the daily anticipated until the sonar projected ended on August 1 (Figure 4).

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TABLES

Table 1. Daily sockeye salmon escapement estimates at Miles Lake sonar, 1993.

Date	Water Level ^a	North Bank	Estimate		Escapement Objective		Actual 0600	Projected Daily
			South Bank	Daily	Cumulative	Daily		
18-May								
19-May						1,307	2,346	
20-May	41.12	65	9,438 ^b	9,503	9,503	1,514	3,860	
21-May	41.26	85	13,592	13,677	23,180	1,657	5,517	2,439
22-May	41.40	269	22,437	22,706	45,886	1,793	7,310	3,707
23-May	41.39	251	28,174	28,425	74,311	2,740	10,050	7,224
24-May	41.38	1,077	30,903	31,980	106,291	3,513	13,563	7,196
25-May	41.54	1,379	37,202	38,581	144,872	4,825	18,388	11,029
26-May	41.68	1,254	22,393	23,647	168,519	5,143	23,531	7,300
27-May	41.67	530	12,355	12,885	181,404	5,363	28,894	3,232
28-May	41.65	457	17,019	17,476	198,880	6,663	35,557	3,334
29-May	41.77	218	12,938	13,156	212,036	8,459	44,016	4,901
30-May	41.93	214	8,264	8,478	220,514	6,784	50,800	2,383
31-May	42.11	180	16,506	16,686	237,200	7,660	58,460	4,670
01-Jun	42.35	120	16,353	16,473	253,673	9,490	67,950	3,560
02-Jun	42.37	240	22,591	22,831	276,504	9,792	77,742	6,778
03-Jun	42.40	260	14,331	14,591	291,095	10,515	88,257	4,280
04-Jun	42.49	268	17,317	17,585	308,680	10,265	98,522	3,154
05-Jun	42.53	552	25,227	25,779	334,459	11,506	110,028	4,928
06-Jun	42.60	477	25,166	25,643	360,102	12,718	122,746	8,113
07-Jun	42.74	391	17,677	18,068	378,170	11,591	134,337	5,538
08-Jun	42.68	1,277	19,485	20,762	398,932	11,208	145,545	4,478
09-Jun	42.35	506	24,491	24,997	423,929	12,702	158,247	4,433
10-Jun	42.03	758	19,036	19,794	443,723	11,963	170,210	4,316
11-Jun	41.84	218	10,901	11,119	454,842	11,666	181,876	2,808
12-Jun	41.84	179	18,143	18,322	473,164	11,276	193,152	3,565
13-Jun	41.86	250	12,622	12,872	486,036	10,601	203,753	4,035
14-Jun	41.94	120	8,237	8,357	494,393	9,464	213,217	2,406
15-Jun	42.08	336	13,015	13,351	507,744	8,915	222,132	2,295
16-Jun	42.35	545	13,702	14,247	521,991	9,277	231,409	3,675
17-Jun	42.58	124	7,497	7,621	529,612	8,171	239,580	2,565
18-Jun	42.61	99	4,822	4,921	534,533	8,094	247,674	1,018
19-Jun	42.57	71	6,253	6,324	540,857	7,060	254,734	1,413
20-Jun	42.60	159	4,741	4,900	545,757	6,480	261,214	1,373
21-Jun	42.46	168	3,368	3,536	549,293	6,597	267,811	805
22-Jun	42.50	225	2,639	2,864	552,157	6,151	273,962	843
23-Jun	42.52	292	4,777	5,069	557,226	6,129	280,091	1,337
24-Jun	42.58	186	5,885	6,071	563,297	6,354	286,445	1,554
25-Jun	42.64	223	4,098	4,321	567,618	6,249	292,694	1,211
26-Jun	43.00	103	2,615	2,718	570,336	6,312	299,006	538
27-Jun	42.75	145	3,225	3,370	573,706	5,894	304,900	695
28-Jun	42.61	117	4,244	4,361	578,067	5,847	310,747	1,030
29-Jun	42.57	486	4,490	4,976	583,043	5,769	316,516	977
30-Jun	42.60	308	8,076	8,384	591,427	5,817	322,333	1,708

-Continued-

Table 1. (page 2 of 2)

Date	Water Level ^a	North Bank	Estimate		Escapement Objective		Actual 0600	Projected Daily	
			South Bank	Daily	Cumulative	Daily			Cumulative
01-Jul	42.65	358	7,281	7,639	599,066	5,337	327,670	1,821	7,284
02-Jul	42.61	212	5,508	5,720	604,786	5,231	332,900	1,608	6,432
03-Jul	42.62	109	5,036	5,145	609,931	5,261	338,161	1,258	5,032
04-Jul	42.55	151	5,376	5,527	615,458	5,452	343,613	1,378	5,512
05-Jul	42.63	227	6,112	6,339	621,797	5,545	349,158	1,436	5,744
06-Jul	42.59	226	6,205	6,431	628,228	5,296	354,454	1,789	7,156
07-Jul	42.53	393	8,836	9,229	637,457	4,938	359,392	1,634	6,536
08-Jul	42.34	320	10,066	10,386	647,843	4,598	363,990	2,343	9,372
09-Jul	42.08	271	10,834	11,105	658,948	4,705	368,695	2,180	8,720
10-Jul	42.50	277	9,289	9,566	668,514	4,958	373,653	2,890	11,560
11-Jul	42.82	404	6,960	7,364	675,878	5,659	379,312	1,449	5,796
12-Jul	43.07	409	6,410	6,819	682,697	5,082	384,394	1,671	6,684
13-Jul	43.16	311	5,304	5,615	688,312	5,351	389,745	1,049	4,196
14-Jul	43.45	186	7,487	7,673	695,985	5,083	394,828	2,009	8,036
15-Jul	43.61	394	5,718	6,112	702,097	5,689	400,517	1,159	4,636
16-Jul	43.76	181	6,699	6,880	708,977	5,568	406,085	1,645	6,580
17-Jul	44.04	227	4,948	5,175	714,152	5,595	411,680	1,404	5,616
18-Jul	44.14	282	5,116	5,398	719,550	6,445	418,125	893	3,572
19-Jul	44.07	217 ^c	6,565	6,782	726,332	7,938	426,063	1,423	5,692
20-Jul	43.82	237	7,180	7,417	733,749	8,125	434,188	1,230	4,920
21-Jul	43.85	251	7,593	7,844	741,593	9,206	443,394	2,406	9,624
22-Jul	43.87	295	8,946	9,241	750,834	8,240	451,634	1,064	4,256
23-Jul	43.44	448	13,564	14,012	764,846	6,029	457,663	2,437	9,748
24-Jul	43.29	406	12,317	12,723	777,569	4,386	462,049	2,926	11,704
25-Jul	43.19	289	8,759	9,048	786,617	6,372	468,421	1,517	6,068
26-Jul	43.21	205	6,201	6,406	793,023	5,464	473,885	1,796	7,184
27-Jul	43.29	238	7,227	7,465	800,488	5,110	478,995	1,696	6,784
28-Jul	43.33	191	5,781	5,972	806,460	5,228	484,223	1,763	7,052
29-Jul	43.43	195	5,921	6,116	812,576	5,329	489,552	1,070	4,280
30-Jul	43.49	208	6,295	6,503	819,079	2,763	492,315	1,383	5,532
31-Jul	43.53	177	5,362	5,539	824,618	2,130	494,445	1,345	5,380
01-Aug	43.60	146	4,414	4,560	829,178	1,863	496,308	1,358	5,432
02-Aug	43.40	134	4,075	4,209	833,387	1,631	497,939	934	3,736
Total		23,757	809,630	833,387					

^a Meters above mean sea level.

^b Move transducer to permanent substrate.

^c North bank counts ended on July 18. Counts after July 18 are interpolated from the average percent of the North bank counts versus the south bank counts of 3.3 percent.

Table 2. Water levels at Miles Lake, elevation in meters above sea level, Miles Lake sonar, Copper River, 1982 - 1994.

Date	Elevation Above Sea Level													1982-1994
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Average
11-May													39.03	
12-May														
13-May													39.12	
14-May													39.18	
15-May						38.99		40.05					39.26	39.43
16-May								40.04					39.33	39.68
17-May						39.09		40.01					39.43	39.51
18-May					39.19	39.10		40.01					39.53	39.46
19-May					39.31	39.05	39.70	40.06					39.76	39.58
20-May			39.05		38.97	39.05	39.62	40.07				41.12	40.17	39.72
21-May			39.08		38.95	39.10	39.65	40.02	40.79	39.42		41.26	40.35	39.85
22-May			39.31		39.19	39.14	39.65	40.14	40.92	39.52	39.62	41.40	40.19	39.91
23-May			39.45		39.29	39.21	39.60	40.23	40.81	39.70	39.68	41.39	40.07	39.94
24-May		39.39	39.48		39.37	39.28	39.61	40.27	40.63	39.96		41.38	40.12	39.95
25-May		39.39	39.57		39.38	39.29	39.64	40.16	40.48	40.17	39.92	41.54	40.17	39.97
26-May		39.36	39.61		39.46	39.36	39.67	40.17	40.48	40.33	40.10	41.68	40.05	40.02
27-May		39.37	39.71		39.54	39.46	39.75	40.27	40.58	40.41	40.30	41.67	40.03	40.10
28-May		39.39	39.75	40.28	39.60	39.46	39.78	40.42	40.77	40.51	40.55	41.65	40.11	40.19
29-May		39.38	39.61	40.34	39.77	39.48	39.82	40.60	41.00	40.55	40.73	41.77	40.08	40.26
30-May	39.62	39.44	39.55	40.31	39.97	39.45	39.87	41.00	41.47	40.56	40.94	41.93	40.22	40.33
31-May		39.58	39.47	40.18	39.96	39.48	40.00	41.49	41.72	40.58	40.97	42.11	40.23	40.48
01-Jun		39.94	39.46	40.03	39.97	39.76	40.12	41.82	41.00	40.51	41.13	42.35	40.21	40.52
02-Jun	40.03	40.64	39.42	39.90	39.96	39.98	40.14	41.87	42.03	40.42	41.22	42.37	40.22	40.63
03-Jun	40.31	41.00	39.39	39.88	39.97	40.33	40.16	41.70	42.18	40.32	41.34	42.40	40.27	40.71
04-Jun	40.60	40.94	39.45	39.95	39.90	40.36	40.26	41.70	42.26	40.31	41.50	42.49	40.30	40.77
05-Jun	40.72	40.94	39.61	40.18	39.88	40.30	40.32	42.02	42.45	40.38	41.56	42.53	40.40	40.87
06-Jun	40.83	40.89	39.75	40.44	39.98	40.43	40.35	42.11	42.67	40.42	41.52	42.60	40.52	40.96
07-Jun	40.71	40.82	40.04	40.36	40.19	40.73	40.61	42.06	42.81	40.47	41.38	42.74	40.75	41.05
08-Jun	40.69	40.82	40.34	40.11	40.43	40.88	40.82	42.00	42.98	40.55	41.53	42.68	40.88	41.13
09-Jun		40.85	40.36	40.03	40.46	40.69	41.15	41.89	42.96	40.60	41.62	42.35	40.97	41.16
10-Jun	41.50	40.84	40.36	40.06	40.36	40.64	41.48	41.92	42.85	40.58	41.73	42.03	41.10	41.19
11-Jun		40.82	40.43	40.01	40.24	40.54	41.80	41.80	42.63	40.71	41.91	41.84	41.38	41.18
12-Jun		40.84	40.56	40.01	40.13	40.38	42.00	41.65	42.47	40.87	42.17	41.84	41.55	41.21
13-Jun		40.81	40.68	40.11	40.22	40.34	42.19	41.73	42.44	41.06	42.48	41.86	41.74	41.31
14-Jun		40.67	40.84	40.13	40.33	40.37	42.36	41.78	42.61	41.31	42.74	41.94	42.00	41.42
15-Jun	41.27	40.71	40.97	40.16	40.62	40.36	42.45	42.03	42.66	41.53	42.89	42.08	42.44	41.55
16-Jun		40.60	41.07	40.13	41.05	40.36	42.64	42.13	42.58	41.77	43.01	42.35	42.82	41.71
17-Jun	41.06	40.75	41.05	40.13	41.58	40.44	42.80	42.02	42.52	42.00	42.97	42.58	43.11	41.77
18-Jun	40.93	40.88	40.89	40.36	41.83	40.57	42.99	41.94	42.39	42.10	42.85	42.61	43.26	41.82
19-Jun		40.97	40.97	40.49	41.88	40.51	42.90	42.02	42.15	42.04	42.63	42.57	43.25	41.87
20-Jun	41.16	41.31	41.15	40.49	41.89	40.43	42.56	42.09	42.03	42.05	42.47	42.60	43.02	41.79
21-Jun	41.50	41.58	41.31	40.51	41.71	40.36	42.32	42.15	41.91	42.53	42.58	42.46	42.89	41.83
22-Jun	41.54	41.85	41.66	40.34	41.54	40.70	42.53	42.22	41.92	43.14	42.91	42.50	42.72	41.97
23-Jun		41.95	41.76	40.39	41.43	41.18	42.25	42.34	41.93	43.69	42.99	42.52	42.85	42.11
24-Jun	41.35	42.01	41.99	40.46	41.29	41.27	41.82	42.48	42.01	44.02	42.90	42.58	43.16	42.10
25-Jun		42.19	42.35	40.74	41.11	41.23	41.73	42.84	42.02	44.03	42.66	42.64	43.34	42.24
26-Jun	41.62	42.43	42.60	40.79	41.00	41.10	41.68	43.13	42.09	43.83	42.42	43.00	43.39	42.24
27-Jun		42.44	42.75	40.77	40.97	40.98	41.68	43.11	42.31	43.64	42.26	42.75	43.06	42.23
28-Jun	42.39	42.43	42.58	40.97	41.17	41.28	41.55	43.01	42.59	43.57	42.44	42.61	42.54	42.24
29-Jun		42.60	42.37	41.20	41.52	41.00	41.79	42.98	42.96	43.66	42.68	42.57	42.20	42.29
30-Jun	42.90	42.55	42.14	41.43	41.62	41.53	41.79	43.03	43.27	43.78	42.99	42.60	42.05	42.44

-Continued-

Table 2. (page 2 of 2).

Date	Elevation Above Sea Level													1982-1994
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Average
01-Jul	42.81	42.43	41.88	41.86	41.96	42.37	41.73	43.10	43.49	43.87	43.28	42.65	42.08	42.58
02-Jul		42.24	41.94	42.32	42.37	42.83	41.82	43.31	43.78	43.90	43.61	42.61	42.34	42.75
03-Jul	42.57	42.33	41.91	42.55	42.61	42.85	41.99	43.49	43.76	43.77	44.15	42.62	42.47	42.85
04-Jul	42.18	42.51	41.91	42.62	42.70	42.91	42.29	43.41	43.71	43.76	44.35	42.55	42.48	42.88
05-Jul		42.60	41.96	42.62	42.85	43.04	42.51	43.43	43.71	43.53	44.53	42.63	42.55	43.00
06-Jul		42.67	41.86	42.67	43.03	43.16	42.66	43.38	43.74	43.24	44.55	42.59	42.55	43.01
07-Jul	41.92	42.70	42.06	42.85	43.11	43.12	42.95	43.42	43.85	43.07	44.38	42.53	42.44	42.95
08-Jul		42.84	42.29	42.93	43.13	42.93	43.08	43.43	43.75	43.08	44.19	42.34	42.23	43.02
09-Jul		42.81	42.52	42.75	43.03	42.33	43.06	43.50	43.51	43.22	43.71	42.08	42.24	42.90
10-Jul		42.82	42.72	42.55	42.70	42.52	42.94	43.63	43.14	43.49	43.39	42.50	42.38	42.90
11-Jul	42.72	42.72	42.62	42.52	42.62	42.49	42.72	43.74	42.81	43.22	43.34	42.82	42.34	42.82
12-Jul		42.55	42.47	42.55	42.76	42.50	42.53	43.95	42.58	43.04	43.48	43.07	42.43	42.82
13-Jul		42.14	42.32	42.62	42.80	42.53	42.72	44.07	42.51	42.94	43.72	43.16	42.52	42.84
14-Jul		41.98	42.19	42.60	42.78	42.41	42.73	44.03	42.42	42.92	43.65	43.45	42.63	42.82
15-Jul		41.80	42.16	42.55	42.51	42.47	42.66	43.82	42.37	42.85	43.42	43.61	42.78	42.75
16-Jul	42.44	41.95	42.06	42.44	42.35	42.43	42.64	43.51	42.28	42.82	43.41	43.76	42.98	42.70
17-Jul		42.10	41.96	42.42		42.47	42.72	43.20	42.12	42.96	43.27	44.04	42.99	42.75
18-Jul	42.35	42.23	41.83	42.49		42.35	43.03	43.14	42.50	42.86	43.19	44.14	42.97	42.76
19-Jul		42.46	41.96	42.49		42.36	43.18	43.30	42.78	42.50	43.16	44.07	43.06	42.85
20-Jul	42.39	42.55	41.99	42.60		42.63	43.18	43.47	43.06	42.17	43.16	43.82	42.68	42.81
21-Jul		42.53	41.76	42.90		42.78	43.24	43.58	43.28	42.11	43.31	43.85	42.73	42.92
22-Jul		42.48	41.63	42.88	43.53	43.36	43.53	43.32	43.57	42.27	43.34	43.87	42.44	43.02
23-Jul	42.09	42.27	41.61	42.62	43.41	43.51	43.40	43.14	43.62	42.41	43.14	43.44	42.21	42.84
24-Jul	42.58	42.30	41.66	42.37	43.34	43.39	43.38	43.00	43.72	42.70	42.92	43.29	42.13	42.83
25-Jul	42.72	42.30	41.86	42.24		43.17	43.04	42.91	43.83	42.87	42.84	43.19	42.26	42.77
26-Jul	42.98	42.20	42.06	42.24	42.77	43.01	42.70	42.86	43.75	42.97	43.11	43.21	42.40	42.79
27-Jul	43.13	42.10	42.19	41.99	42.45	43.02	42.54	42.81	43.25	42.95	43.26	43.29	42.68	42.74
28-Jul	43.09	42.23	42.29	41.99	42.22	43.16	42.58	42.75	42.90	42.90	43.18	43.33	42.76	42.72
29-Jul		42.51	42.29	42.11	42.01	43.23	42.58	42.87	43.15	42.82	42.99	43.43	42.83	42.74
30-Jul		42.68	42.39	42.24	41.94	43.29	42.43	42.96	43.46	42.77	42.88	43.49	42.94	42.79
31-Jul		42.76	42.34	42.39	41.98	43.26	42.38	43.13	43.51	42.65	42.81	43.53	43.28	42.84
01-Aug		42.79	42.39	42.55		43.07	42.31	43.29	43.51			43.60	42.96	42.94
02-Aug	43.90	42.66	42.32	42.98		42.98	42.33	43.37	43.51			43.40	43.17	43.06
03-Aug	43.84	42.61	42.34	44.35		42.92	42.48						43.52	43.15
04-Aug		42.55	42.34	45.09		42.93	42.81							43.14
05-Aug		42.62	42.42			42.88								42.64
06-Aug			42.42											42.42
07-Aug			42.42											42.42
08-Aug			42.42											42.42

Table 3. Daily sockeye salmon escapement estimates at Miles Lake sonar, 1994.

Date	Water Level ^a	North Bank	Estimate		Daily	Cumulative	Escapement Objective		0600 Count	Projected Daily
			South Bank				Daily	Cumulative		
15-May	39.26									
16-May	39.33									
17-May	39.43	21 ^b	427	448	448	448	107	107		
18-May	39.53	33	653	686	686	1,134	931	1,038		
19-May	39.76	45	907	952	952	2,086	1,307	2,345		
20-May	40.17	45	910	955	955	3,041	1,514	3,859		
21-May	40.35	77	1,533	1,610	1,610	4,651	1,657	5,516		
22-May	40.19	115	2,307	2,422	2,422	7,073	1,793	7,309		
23-May	40.07	169	3,389	3,558	3,558	10,631	2,740	10,049		
24-May	40.12	134	2,763	2,897	2,897	13,528	3,513	13,562		
25-May	40.17	182	3,901	4,083	4,083	17,611	4,825	18,387		
26-May	40.05	147	3,135	3,282	3,282	20,893	5,143	23,530		
27-May	40.03	124	2,731	2,855	2,855	23,748	5,363	28,893		
28-May	40.11	145	2,902	3,047	3,047	26,795	6,663	35,556		
29-May	40.08	138	2,750	2,888	2,888	29,683	8,459	44,015		
30-May	40.22	94	1,872	1,966	1,966	31,649	6,784	50,799		
31-May	40.23	220	4,396	4,616	4,616	36,265	7,660	58,459		
01-Jun	40.21	449	8,974	9,423	9,423	45,688	9,490	67,949		
02-Jun	40.22	371	7,396	7,767	7,767	53,455	9,792	77,741		
03-Jun	40.27	149	2,988	3,137	3,137	56,592	10,515	88,256		
04-Jun	40.30	293	5,850	6,143	6,143	62,735	10,265	98,521		
05-Jun	40.40	251	5,014	5,265	5,265	68,000	11,506	110,027		
06-Jun	40.52	576	11,524	12,100	12,100	80,100	12,718	122,745		
07-Jun	40.75	815	15,917	16,732	16,732	96,832	11,591	134,336		
08-Jun	40.88	1,754	16,268 ^c	18,022	18,022	114,854	11,208	145,544	3,640	14,560
09-Jun	40.97	1,720	16,322	18,042	18,042	132,896	12,702	158,246	5,345	21,380
10-Jun	41.10	2,346	15,242	17,588	17,588	150,484	11,963	170,209	5,524	22,096
11-Jun	41.38	1,721	10,551	12,272	12,272	162,756	11,666	181,875	4,673	18,692
12-Jun	41.55	1,230	11,778	13,008	13,008	175,764	11,276	193,151	2,015	8,060
13-Jun	41.74	1,489	7,592	9,081	9,081	184,845	10,601	203,752	3,377	13,508
14-Jun	42.00	2,172	13,467	15,639	15,639	200,484	9,464	213,216	4,776	19,104
15-Jun	42.44	518	11,161	11,679	11,679	212,163	8,915	222,131	2,039	8,156
16-Jun	42.82	500	13,727	14,227	14,227	226,390	9,277	231,408	3,137	12,548
17-Jun	43.11	921	10,524	11,445	11,445	237,835	8,171	239,579	2,082	8,328
18-Jun	43.26	731	16,492	17,223	17,223	255,058	8,094	247,673	2,852	11,408
19-Jun	43.25	691	18,701	19,392	19,392	274,450	7,060	254,733	5,820	23,280
20-Jun	43.02	1,000	10,498	11,498	11,498	285,948	6,480	261,213	3,226	12,904
21-Jun	42.89	876	10,823	11,699	11,699	297,647	6,597	267,810	2,465	9,860
22-Jun	42.72	1,274	12,031	13,305	13,305	310,952	6,151	273,961	2,551	10,204
23-Jun	42.85	1,389	17,297	18,686	18,686	329,638	6,129	280,090	4,565	18,260
24-Jun	43.16	801	23,481	24,282	24,282	353,920	6,354	286,444	4,425	17,700
25-Jun	43.34	419	13,721	14,140	14,140	368,060	6,249	292,693	4,167	16,668
26-Jun	43.39	376	11,828	12,204	12,204	380,264	6,312	299,005	2,398	9,592
27-Jun	43.06	628	13,518	14,146	14,146	394,410	5,894	304,899	4,146	16,584
28-Jun	42.54	498	8,715	9,213	9,213	403,623	5,847	310,746	2,956	11,824
29-Jun	42.20	976	14,883	15,859	15,859	419,482	5,769	316,515	2,740	10,960
30-Jun	42.05	742	10,103	10,845	10,845	430,327	5,817	322,332	1,451	5,804

-Continued-

Table 3. (page 2 of 2)

Date	Water Level ^a	North Bank	Estimate		Daily	Cumulative	Escapement Objective		0600 Count	Projected Daily
			South Bank				Daily	Cumulative		
01-Jul	42.08	385	9,974		10,359	440,686	5,337	327,669	2,314	9,256
02-Jul	42.34	444	9,358		9,802	450,488	5,231	332,900	2,678	10,712
03-Jul	42.47	468	9,497		9,965	460,453	5,261	338,161	2,797	11,188
04-Jul	42.48	441	8,341		8,782	469,235	5,452	343,613	2,589	10,356
05-Jul	42.55	149	6,047		6,196	475,431	5,545	349,158	1,316	5,264
06-Jul	42.55	190	9,354		9,544	484,975	5,296	354,454	2,039	8,156
07-Jul	42.44	408	9,513		9,921	494,896	4,938	359,392	3,043	12,172
08-Jul	42.23	789	7,158		7,947	502,843	4,598	363,990	1,877	7,508
09-Jul	42.24	512	8,879		9,391	512,234	4,705	368,695	1,621	6,484
10-Jul	42.38	695	13,844		14,539	526,773	4,958	373,653	2,271	9,084
11-Jul	42.34	546	13,110		13,656	540,429	5,659	379,312	3,177	12,708
12-Jul	42.43	220	16,003		16,223	556,652	5,082	384,394	4,138	16,552
13-Jul	42.52	242	13,682		13,924	570,576	5,351	389,745	3,893	15,572
14-Jul	42.63	498	12,835		13,333	583,909	5,083	394,828	3,602	14,408
15-Jul	42.78	237	9,924		10,161	594,070	5,689	400,517	2,686	10,744
16-Jul	42.98	232	7,723		7,955	602,025	5,568	406,085	1,988	7,952
17-Jul	42.99	473	7,169		7,642	609,667	5,595	411,680	2,027	8,108
18-Jul	42.97	906	6,157		7,063	616,730	6,445	418,125	1,654	6,616
19-Jul	43.06	248	4,427		4,675	621,405	7,938	426,063	1,654	6,616
20-Jul	42.68	313	3,609		3,922	625,327	8,125	434,188	975	3,900
21-Jul	42.73	184	7,572		7,756	633,083	9,206	443,394	1,228	4,912
22-Jul	42.44	141 ^d	13,335		13,476	646,559	8,240	451,634	3,778	15,112
23-Jul	42.21		14,447		14,447	661,006	6,029	457,663	4,098	16,392
24-Jul	42.13		10,424		10,424	671,430	4,386	462,049	1,787	7,148
25-Jul	42.26		13,043		13,043	684,473	6,372	468,421	5,017	20,068
26-Jul	42.40		5,897		5,897	690,370	5,464	473,885	2,356	9,424
27-Jul	42.68		4,888		4,888	695,258	5,110	478,995	1,927	7,708
28-Jul	42.76		5,467		5,467	700,725	5,228	484,223	2,003	8,012
29-Jul	42.83		3,996		3,996	704,721	5,329	489,552	1,096	4,384
30-Jul	42.94		3,156		3,156	707,877	2,763	492,315	440	1,760
31-Jul	43.28		3,686		3,686	711,563	2,130	494,445	801	3,204
01-Aug	42.96		4,014		4,014	715,577	1,863	496,308	683	2,732
Total		38,086	677,491		715,577					

a Meters above sea level.

b North bank counts are derived from an average of five percent of north versus south bank counts from 1988-93.

c South bank transducer was deployed on the permanent substrate at midnight.

d North banks counter was pulled at 12:00 midnight.

FIGURES

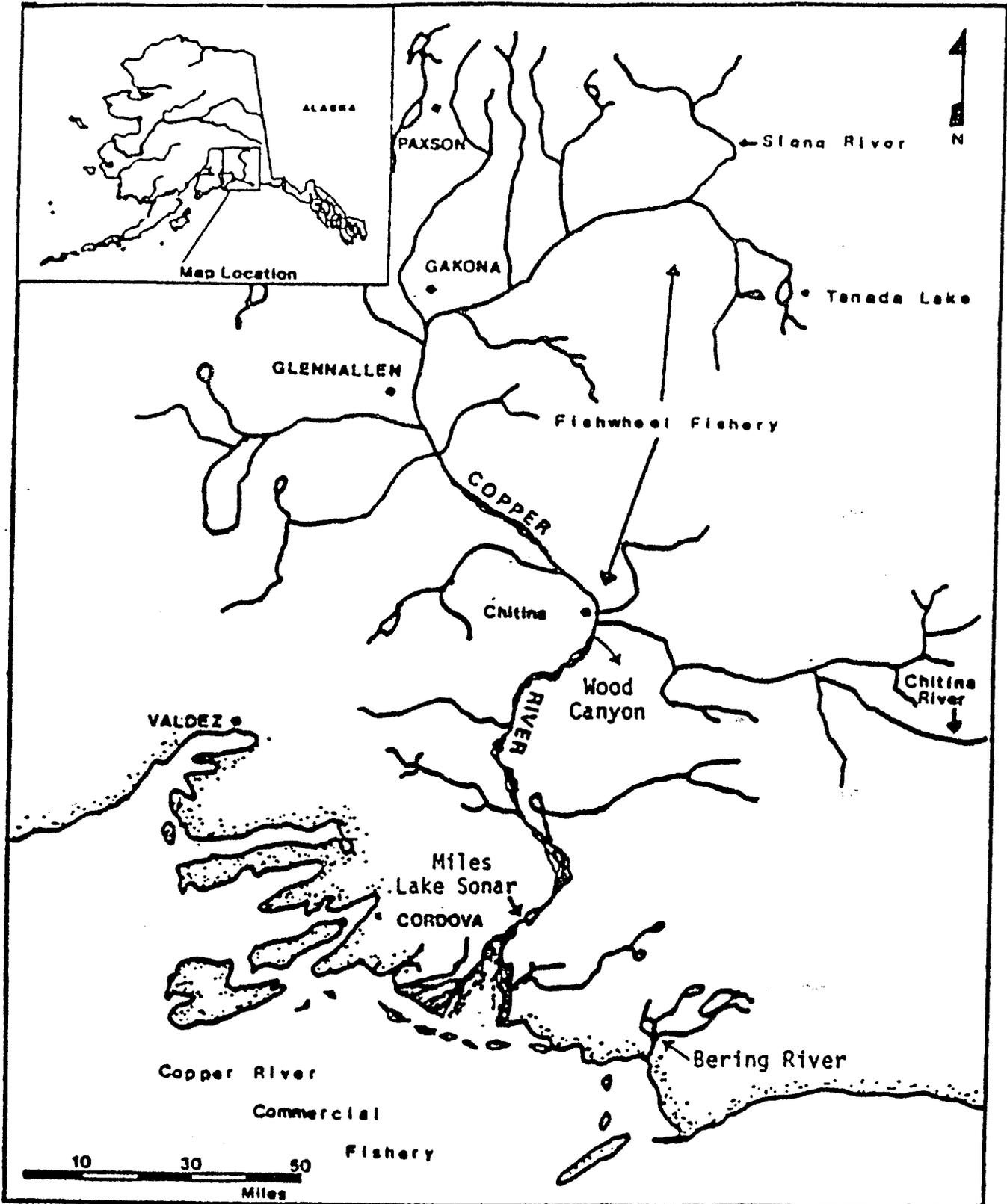


Figure 1. Commercial and subsistence fishing areas, Copper River drainage.

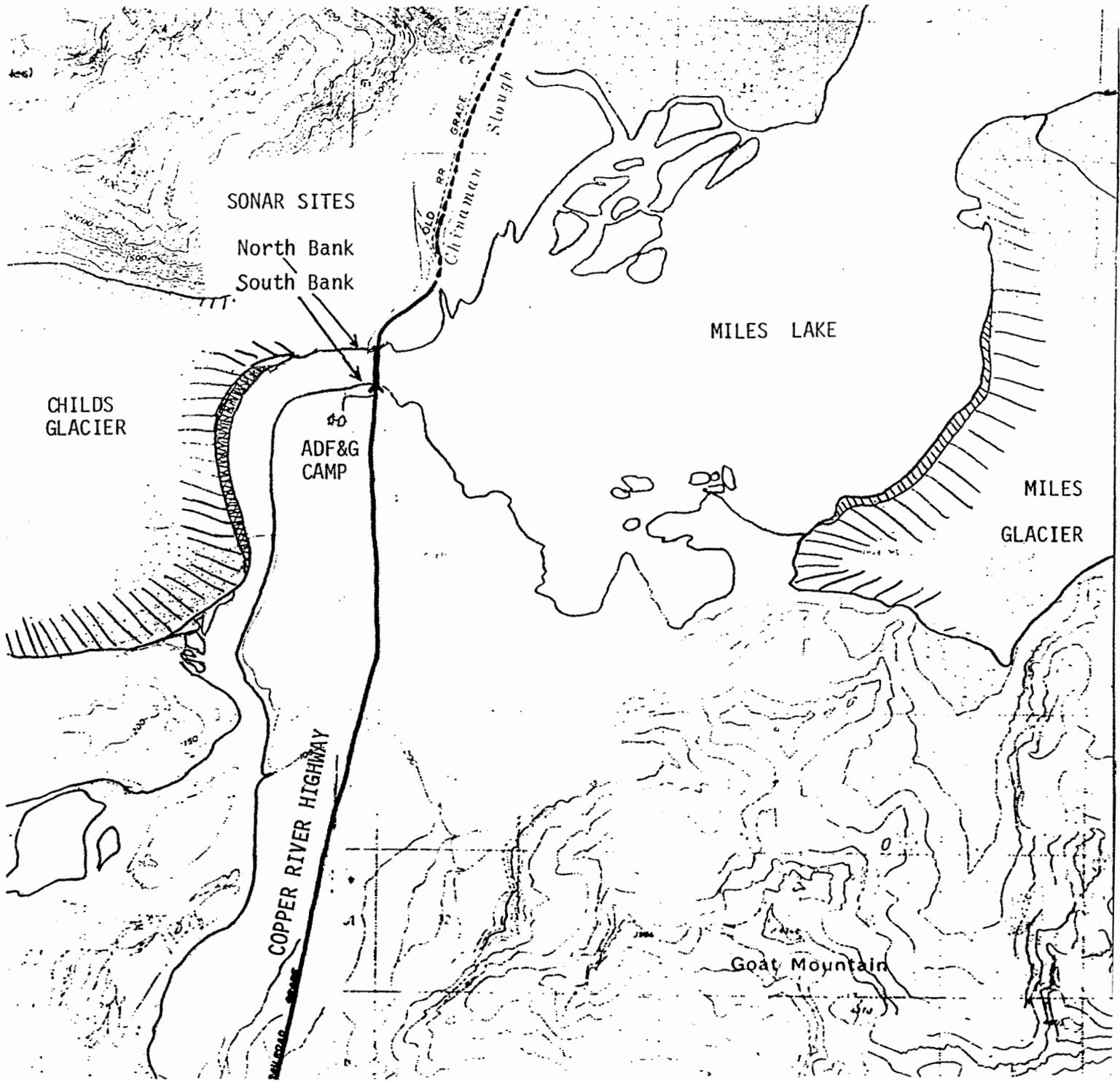


Figure 2. North and south bank sonar sites, Miles Lake area, Copper River.

1993 MILES LAKE SONAR COUNTS

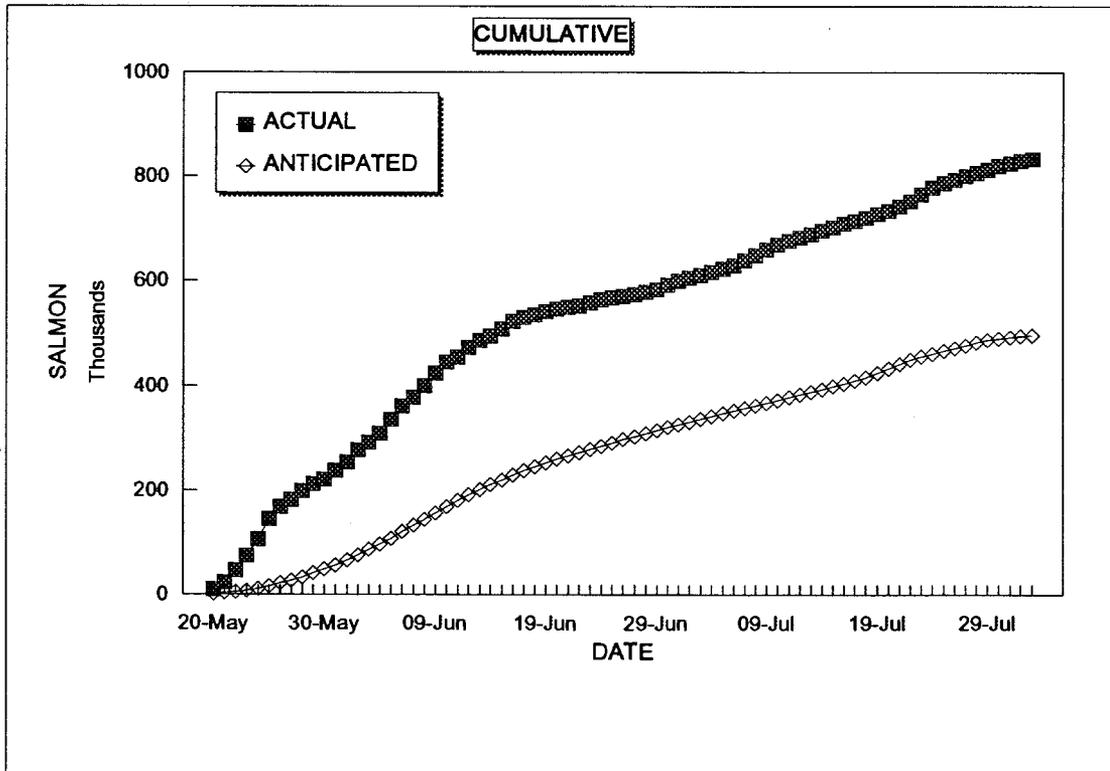
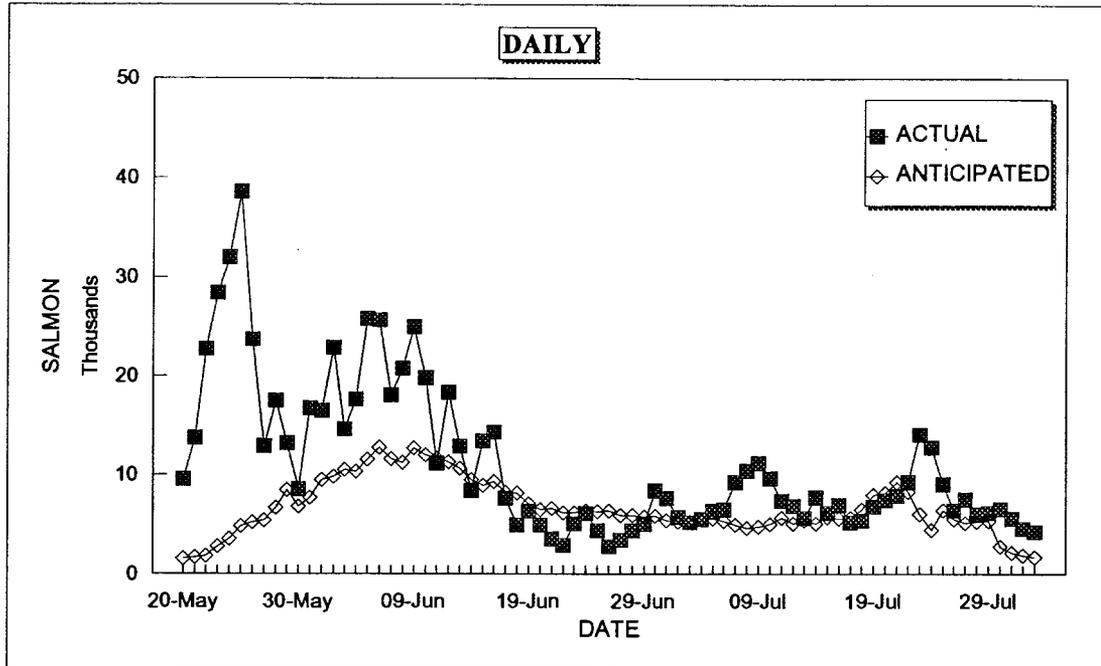


Figure 3. Anticipated and actual daily and cumulative salmon escapement estimates, Miles Lake sonar, 1993.

1994 MILES LAKE SONAR COUNTS

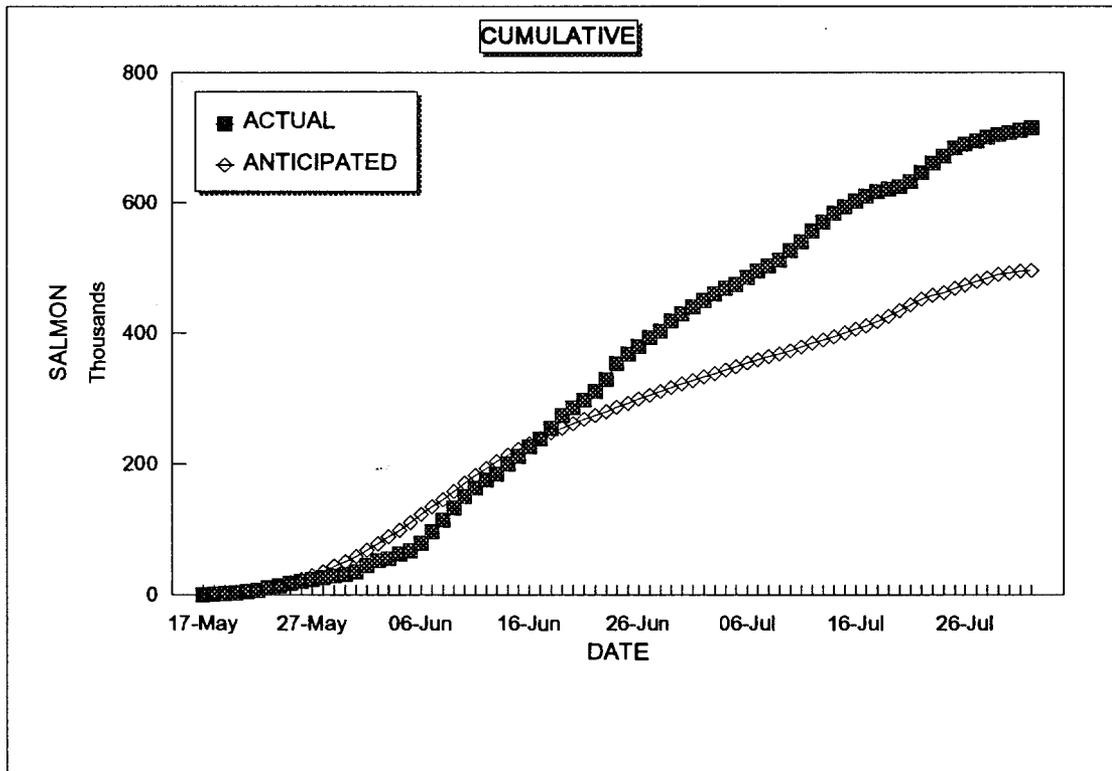
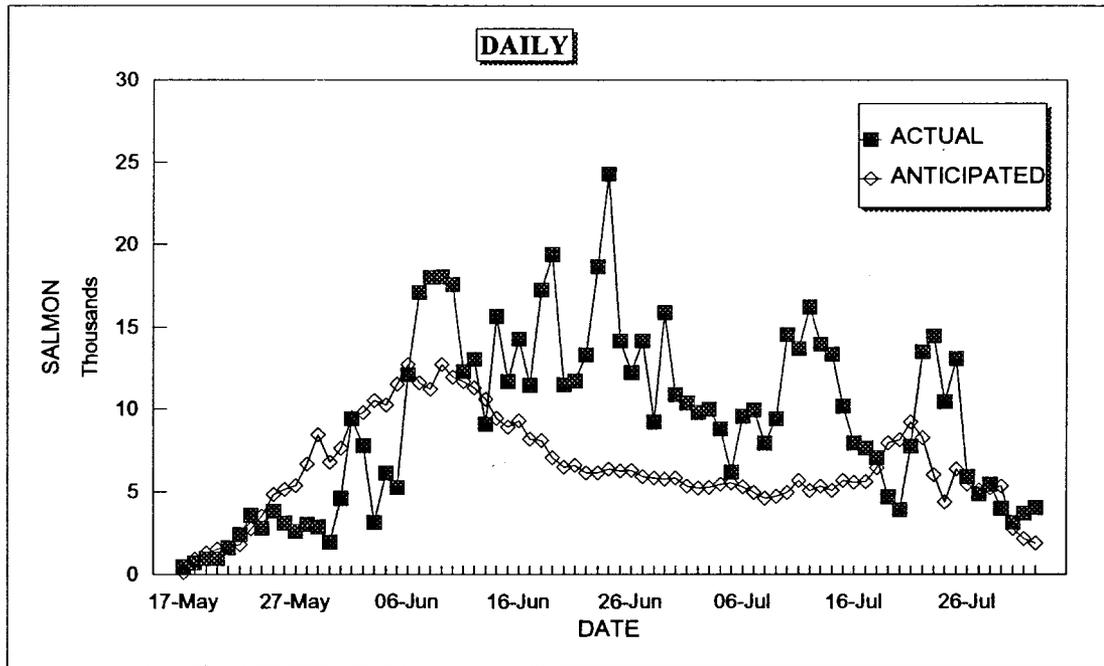


Figure 4. Anticipated and actual daily and cumulative salmon escapement estimates, Miles Lake sonar, 1994.

APPENDIX

Appendix 1. Daily salmon escapement estimates, Miles Lake sonar, Copper River, 1978-1994.

Date	1978	1979	1980	1981	1982	1983	1984	1985	1986
17-May				5,372					
18-May		381	218	9,665					
19-May		487	167	11,409			725		
20-May		847	221	10,733			1,924		
21-May		1,199	88	9,729			1,986		
22-May		1,916	391	7,558			5,124		
23-May		2,901	594	6,214		3,310	5,042		
24-May		3,402	494	12,985	90	8,620	4,486		
25-May		2,397	713	12,816	493	11,587	3,120		534
26-May	502	4,927	1,057	6,383	1,023	10,575	4,645		1,694
27-May	837	6,821	2,115	2,842	12,091	8,661	5,836		2,092
28-May	1,047	2,768	1,693	2,560	47,303	8,456	4,978	1,031	3,384
29-May	661	3,905	1,080	2,160	19,671	6,380	7,126	417	2,393
30-May	3,241	7,482	1,903	11,822	8,781	8,296	4,951	599	3,173
31-May	2,549	8,655	3,620	21,126	11,389	17,123	4,278	1,758	4,150
01-Jun	2,616	4,078	5,257	18,415	15,385	18,428	8,536	3,462	7,001
02-Jun	2,811	3,465	7,061	23,771	17,213	14,414	8,483	6,726	20,638
03-Jun	1,837	3,536	7,437	16,716	13,383	13,137	9,730	10,691	20,237
04-Jun	3,256	2,778	8,996	9,755	12,355	15,357	12,496	24,272	26,626
05-Jun	2,970	4,352	9,746	10,478	14,806	19,110	16,728	30,507	27,934
06-Jun	3,318	6,453	5,407	11,975	15,585	14,069	18,097	32,953	14,527
07-Jun	3,808	7,031	2,093	13,585	12,506	19,309	18,515	27,256	9,658
08-Jun	3,275	11,078	1,349	14,412	8,430	16,094	26,619	30,925	24,938
09-Jun	2,252	7,985	3,543	15,694	7,017	11,415	20,476	29,702	28,242
10-Jun	3,475	5,205	7,301	12,856	7,599	8,009	19,275	12,010	29,952
11-Jun	2,490	4,426	12,032	7,877	7,879	9,563	17,237	11,826	25,418
12-Jun	2,082	2,227	11,584	4,844	8,587	13,292	21,706	8,231	16,494
13-Jun	2,419	3,903	7,600	3,556	9,932	13,444	12,072	6,829	11,453
14-Jun	2,835	2,563	5,661	5,228	12,551	13,831	5,981	6,800	11,393
15-Jun	2,913	3,351	7,308	7,071	12,677	15,915	10,291	8,825	8,747
16-Jun	2,782	3,473	5,655	6,885	13,595	7,938	13,930	9,347	10,099
17-Jun	2,779	4,640	7,189	6,467	12,030	5,671	19,809	6,270	8,772
18-Jun	2,261	3,911	6,741	4,565	6,544	5,689	12,850	3,738	9,050
19-Jun	3,035	3,413	2,391	2,985	4,369	6,461	7,474	3,251	7,910
20-Jun	3,035	1,954	3,597	2,891	3,352	7,382	9,258	2,423	7,240
21-Jun	2,515	2,223	4,142	3,446	3,346	8,124	7,159	2,061	6,741
22-Jun	2,068	2,585	3,954	3,997	4,467	8,005	5,522	2,763	9,026
23-Jun	2,841	2,865	3,896	4,363	7,031	7,528	5,913	3,369	8,010
24-Jun	2,616	1,877	5,217	4,651	6,329	6,009	6,741	2,950	6,968
25-Jun	2,130	3,013	5,104	3,398	4,903	5,226	6,503	1,585	5,731
26-Jun	1,771	1,973	3,595	2,412	4,416	5,638	4,385	2,381	5,410
27-Jun	2,178	1,315	3,421	2,507	2,732	4,738	7,224	3,035	5,153
28-Jun	1,103	1,697	4,324	2,949	2,174	4,771	6,728	2,264	5,022
29-Jun	1,604	1,450	3,845	3,421	2,130	4,304	4,453	2,147	3,578
30-Jun	1,632	1,899	3,465	2,378	2,313	6,146	6,449	2,139	3,771

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Appendix 1. (page 2 of 4)

Date	1978	1979	1980	1981	1982	1983	1984	1985	1986
01-Jul	1,587	2,651	3,559	2,723	2,190	6,106	8,226	2,620	3,584
02-Jul	2,533	2,524	3,365	2,606	4,420	6,113	7,554	2,608	3,152
03-Jul	2,527	2,859	4,104	2,548	5,751	6,026	8,581	1,819	2,311
04-Jul	2,980	3,806	2,934	4,094	5,245	6,943	6,515	3,536	1,805
05-Jul	2,269	3,008	2,879	4,256	4,995	5,347	6,662	3,254	1,499
06-Jul	1,623	1,996	3,025	3,476	6,300	3,973	5,449	4,664	2,809
07-Jul	1,152	892	3,291	3,863	6,171	4,209	4,040	3,627	2,991
08-Jul	831	2,091	2,995	3,774	3,990	4,080	3,906	3,893	2,860
09-Jul	947	3,190	2,817	3,449	2,210	3,353	3,210	6,827	3,077
10-Jul	1,252	4,209	3,642	2,942	2,070	3,644	2,927	10,607	5,435
11-Jul	841	3,684	5,763	2,271	1,980	4,454	3,608	5,457	5,115
12-Jul	341	3,262	4,788	3,468	3,420	4,541	4,280	6,329	5,042
13-Jul	167	3,144	1,725	2,265	4,032	4,543	4,582	5,252	3,696
14-Jul	290	4,124	1,679	2,596	4,339	5,819	6,573	6,113	3,530
15-Jul	275	3,535	1,743	3,691	4,714	6,496	5,521	5,024	4,699
16-Jul	538	5,175	2,515	2,580	3,561	6,970	6,755	5,339	2,227
17-Jul	304	3,555	3,419	780	2,925	6,327	4,955	5,960	4,108
18-Jul	284	3,760	5,878	8,633	3,413	4,326	4,736	5,110	4,993
19-Jul	321	3,344	5,613	20,975	4,296	3,703	3,140	4,560	6,066
20-Jul	238	2,716	5,060	20,511	3,920	3,988	3,389	8,176	5,997
21-Jul	81	2,583	3,826	15,741	4,049	4,463	3,204	4,128	4,746
22-Jul	18	2,012	3,173	6,566	3,871	4,881	3,780	3,158	3,408
23-Jul	15	1,915	2,143	5,787	3,099	3,603	3,205	2,870	2,909
24-Jul	40	2,182	1,353	5,063	3,061	3,903	2,198	2,162	2,633
25-Jul	13	1,112	1,623	3,391	3,374	4,535	1,937	2,449	2,292
26-Jul		771	1,256	2,493	2,596	3,839	1,687	1,974	1,799
27-Jul		318	1,198	2,451	2,247	3,687	1,391	2,191	1,626
28-Jul		387	698	2,785	2,375	5,234	1,004	2,839	1,797
29-Jul		365	400	3,686	1,426	4,138	891	2,813	1,563
30-Jul		491	470	3,814	963	3,512	938	2,790	1,489
31-Jul		703	353	3,802	1,176	1,835	1,093	1,848	1,259
01-Aug		758	825	3,396	511	1,912	1,047	1,070	1,172
02-Aug		379	1,034	2,304	942	2,211	1,088	703	1,045
03-Aug		227	764	1,913	494	2,088	1,213		770
04-Aug		286	708	1,297	581	2,897	1,118		814
05-Aug		173	758	1,181	122		1,009		435
06-Aug		103	877	1,170			533		416
07-Aug		76	615						192
08-Aug			166						33
09-Aug			239						47
Total	107,011	237,173	276,538	535,263	467,306	545,724	536,806	436,313	508,600

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Appendix 1. (page 3 of 4)

Date	1987	1988	1989	1990	1991	1992	1993	1994	Average Daily Count
17-May			732					447	1,638
18-May			3,660					686	2,922
19-May		313	6,588					951	2,949
20-May	167	877	6,935				9,503	954	3,573
21-May	36	1,140	4,834	1,121	1,087		13,677	1,610	3,319
22-May	482	2,256	4,030	4,843	1,717		22,706	2,422	4,859
23-May	1,732	5,078	6,472	7,177	3,161		28,425	3,558	6,139
24-May	2,040	11,033	7,448	11,923	2,465		31,980	2,814	7,675
25-May	4,263	9,979	4,658	14,333	3,046		38,581	3,825	7,882
26-May	7,115	8,946	8,318	11,337	3,274		23,647	3,088	6,435
27-May	12,176	13,247	13,143	12,060	3,893	1,226	12,885	2,602	7,033
28-May	16,392	14,201	13,880	7,434	3,389	1,431	17,476	3,047	8,851
29-May	14,485	10,022	10,677	9,176	3,933	2,362	13,156	2,888	6,500
30-May	18,196	6,806	5,375	9,541	4,417	5,736	8,478	1,966	6,515
31-May	18,540	7,586	7,316	10,343	9,362	7,931	16,686	4,616	9,237
01-Jun	16,395	5,205	7,041	10,026	16,833	6,610	16,473	9,423	10,070
02-Jun	14,385	3,558	5,234	9,909	21,151	7,919	22,831	7,786	11,609
03-Jun	17,666	4,626	6,867	8,576	17,808	11,535	14,591	3,137	10,677
04-Jun	14,632	7,877	8,555	7,572	14,557	7,921	17,585	6,143	11,808
05-Jun	10,962	6,755	7,512	10,173	18,673	9,295	25,779	5,265	13,591
06-Jun	4,322	8,895	7,719	10,410	11,688	14,552	25,643	12,100	12,807
07-Jun	5,755	9,096	12,693	11,137	8,440	16,734	18,068	17,108	12,517
08-Jun	6,366	11,322	14,565	7,637	9,471	17,729	20,762	18,022	14,294
09-Jun	7,922	14,641	9,440	9,905	11,665	20,719	24,997	18,042	14,333
10-Jun	11,553	15,216	12,126	11,660	8,565	23,430	19,794	17,588	13,271
11-Jun	11,194	16,255	9,663	16,181	8,104	18,591	11,119	12,272	11,890
12-Jun	6,506	14,959	8,256	23,929	12,688	14,096	18,322	13,008	11,812
13-Jun	4,053	10,751	10,626	24,448	9,066	18,257	12,872	9,081	10,021
14-Jun	8,053	9,382	13,548	14,302	9,236	20,456	8,357	15,639	9,754
15-Jun	5,485	9,910	9,922	8,390	14,967	23,957	13,351	11,679	10,280
16-Jun	5,516	6,484	8,889	10,112	14,367	13,914	14,247	14,227	9,498
17-Jun	5,406	4,910	10,020	12,695	10,129	14,509	7,621	11,445	8,845
18-Jun	4,815	6,469	11,131	8,052	11,051	14,893	4,921	17,223	7,877
19-Jun	3,983	7,855	8,345	9,763	12,921	12,324	6,324	19,392	7,188
20-Jun	3,933	7,952	7,575	9,315	14,146	19,480	4,900	11,498	7,055
21-Jun	3,924	5,770	7,169	10,292	8,750	16,882	3,536	11,699	6,340
22-Jun	6,379	6,985	8,868	10,157	7,830	9,452	2,864	13,305	6,366
23-Jun	10,111	7,699	5,850	10,166	6,358	7,234	5,069	18,686	6,882
24-Jun	15,708	5,582	3,927	9,340	5,963	6,319	6,071	24,282	7,091
25-Jun	16,517	5,597	2,996	10,010	7,660	6,675	4,321	14,140	6,206
26-Jun	12,500	6,378	3,426	6,812	9,500	7,180	2,718	12,204	5,453
27-Jun	7,010	6,559	3,240	9,234	10,355	6,266	3,370	14,146	5,440
28-Jun	5,644	6,259	6,302	6,881	10,810	8,084	4,361	9,213	5,211
29-Jun	6,836	8,220	6,490	4,499	10,439	9,258	4,976	15,859	5,501
30-Jun	4,636	6,497	7,354	3,975	9,113	7,416	8,384	10,845	5,201

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Appendix 1. (page 4 of 4)

Date	1987	1988	1989	1990	1991	1992	1993	1994	Average Daily Count
01-Jul	2,012	5,602	7,930	4,323	7,303	7,120	7,639	10,359	5,031
02-Jul	3,406	4,680	5,296	5,067	5,109	5,591	5,720	9,802	4,679
03-Jul	4,096	4,222	4,976	4,682	6,335	4,641	5,145	9,965	4,740
04-Jul	7,100	3,532	7,369	5,665	6,680	5,413	5,527	8,782	5,172
05-Jul	4,351	3,304	10,739	7,998	5,845	4,424	6,339	6,196	4,904
06-Jul	3,393	3,510	10,024	7,749	6,213	6,987	6,431	9,544	5,127
07-Jul	5,617	4,324	10,236	5,700	6,222	7,361	9,229	9,921	5,226
08-Jul	6,616	8,499	11,113	5,192	7,069	5,758	10,386	7,947	5,353
09-Jul	6,352	5,167	10,761	5,153	6,453	11,937	11,105	9,391	5,612
10-Jul	8,585	6,347	9,506	6,620	4,610	9,139	9,566	14,539	6,214
11-Jul	5,322	7,620	8,453	5,402	4,477	8,380	7,364	13,656	5,520
12-Jul	5,757	7,881	11,953	9,338	4,818	7,959	6,819	16,223	6,248
13-Jul	6,583	7,087	9,329	11,432	3,969	6,741	5,615	13,924	5,534
14-Jul	6,439	7,012	10,270	8,206	7,498	8,574	7,673	13,333	6,122
15-Jul	5,722	6,924	12,283	8,309	7,550	8,971	6,112	10,161	5,984
16-Jul	6,259	5,457	10,897	6,093	9,671	7,683	6,880	7,955	5,680
17-Jul	4,467	4,877	8,903	6,259	9,668	6,718	5,175	7,642	5,061
18-Jul	4,620	3,857	11,811	5,726	7,340	8,807	5,398	7,063	5,633
19-Jul	4,127	4,583	10,567	5,975	7,513	8,615	6,782	4,675	6,168
20-Jul	3,634	4,483	10,169	4,315	10,681	7,102	7,417	3,922	6,219
21-Jul	2,441	3,964	8,639	2,534	10,268	4,898	7,844	7,756	5,363
22-Jul	1,273	2,797	8,908	2,457	9,702	4,612	9,241	13,476	4,902
23-Jul	1,002	3,429	8,103	3,901	9,017	5,426	14,012	14,447	4,993
24-Jul	625	3,900	6,250	2,883	4,245	3,821	12,723	10,424	3,969
25-Jul	2,014	4,023	5,303	2,050	3,066	2,984	9,048	13,043	3,662
26-Jul	368	4,142	5,706	2,257	4,422	3,412	6,406	5,897	3,064
27-Jul	626	3,920	5,699	2,885	3,884	3,619	7,465	4,888	3,006
28-Jul	2,494	3,452	4,926	1,934	4,793	3,205	5,972	5,467	3,085
29-Jul	2,341	3,476	4,150	2,808	5,354	3,954	6,116	3,996	2,967
30-Jul	2,075	2,423	2,519	2,462	4,711	3,872	6,503	3,156	2,637
31-Jul	2,226	1,920	1,551	2,550	2,901	3,855	5,539	3,686	2,269
01-Aug	2,726	1,438	2,299	3,839			4,560	4,014	2,112
02-Aug	1,299	1,098	1,744	5,249			4,209		1,793
03-Aug	1,702								1,146
04-Aug	1,499								1,150
05-Aug	518								599
06-Aug									620
07-Aug									294
08-Aug									100
09-Aug									143
Total	483,478	488,098	607,797	581,859	579,435	601,952	833,387	715,181	522,515

Appendix 2. Cumulative daily salmon escapement estimates, Miles Lake sonar, Copper River, 1978-1994.

Date	1978	1979	1980	1981	1982	1983	1984	1985	1986
17-May				5,372					
18-May		381	218	15,037					
19-May		868	385	26,446			725		
20-May		1,715	606	37,179			2,649		
21-May		2,914	694	46,908			4,635		
22-May		4,830	1,085	54,466			9,759		
23-May		7,731	1,679	60,680		3,310	14,801		
24-May		11,133	2,173	73,665	90	11,930	19,287		
25-May		13,530	2,886	86,481	583	23,517	22,407		534
26-May	502	18,457	3,943	92,864	1,606	34,092	27,052		2,228
27-May	1,339	25,278	6,058	95,706	13,697	42,753	32,888		4,320
28-May	2,386	28,046	7,751	98,266	61,000	51,209	37,866	1,031	7,704
29-May	3,047	31,951	8,831	100,426	80,671	57,589	44,992	1,448	10,097
30-May	6,288	39,433	10,734	112,248	89,452	65,885	49,943	2,047	13,270
31-May	8,837	48,088	14,354	133,374	100,841	83,008	54,221	3,805	17,420
01-Jun	11,453	52,166	19,611	151,789	116,226	101,436	62,757	7,267	24,421
02-Jun	14,264	55,631	26,672	175,560	133,439	115,850	71,240	13,993	45,059
03-Jun	16,101	59,167	34,109	192,276	146,822	128,987	80,970	24,684	65,296
04-Jun	19,357	61,945	43,105	202,031	159,177	144,344	93,466	48,956	91,922
05-Jun	22,327	66,297	52,851	212,509	173,983	163,454	110,194	79,463	119,856
06-Jun	25,645	72,750	58,258	224,484	189,568	177,523	128,291	112,416	134,383
07-Jun	29,453	79,781	60,351	238,069	202,074	196,832	146,806	139,672	144,041
08-Jun	32,728	90,859	61,700	252,481	210,504	212,926	173,425	170,597	168,979
09-Jun	34,980	98,844	65,243	268,175	217,521	224,341	193,901	200,299	197,221
10-Jun	38,455	104,049	72,544	281,031	225,120	232,350	213,176	212,309	227,173
11-Jun	40,945	108,475	84,576	288,908	232,999	241,913	230,413	224,135	252,591
12-Jun	43,027	110,702	96,160	293,752	241,586	255,205	252,119	232,366	269,085
13-Jun	45,446	114,605	103,760	297,308	251,518	268,649	264,191	239,195	280,538
14-Jun	48,281	117,168	109,421	302,536	264,069	282,480	270,172	245,995	291,931
15-Jun	51,194	120,519	116,729	309,607	276,746	298,395	280,463	254,820	300,678
16-Jun	53,976	123,992	122,384	316,492	290,341	306,333	294,393	264,167	310,777
17-Jun	56,755	128,632	129,573	322,959	302,371	312,004	314,202	270,437	319,549
18-Jun	59,016	132,543	136,314	327,524	308,915	317,693	327,052	274,175	328,599
19-Jun	62,051	135,956	138,705	330,509	313,284	324,154	334,526	277,426	336,509
20-Jun	65,086	137,910	142,302	333,400	316,636	331,536	343,784	279,849	343,749
21-Jun	67,601	140,133	146,444	336,846	319,982	339,660	350,943	281,910	350,490
22-Jun	69,669	142,718	150,398	340,843	324,449	347,665	356,465	284,673	359,516
23-Jun	72,510	145,583	154,294	345,206	331,480	355,193	362,378	288,042	367,526
24-Jun	75,126	147,460	159,511	349,857	337,809	361,202	369,119	290,992	374,494
25-Jun	77,256	150,473	164,615	353,255	342,712	366,428	375,622	292,577	380,225
26-Jun	79,027	152,446	168,210	355,667	347,128	372,066	380,007	294,958	385,635
27-Jun	81,205	153,761	171,631	358,174	349,860	376,804	387,231	297,993	390,788
28-Jun	82,308	155,458	175,955	361,123	352,034	381,575	393,959	300,257	395,810
29-Jun	83,912	156,908	179,800	364,544	354,164	385,879	398,412	302,404	399,388
30-Jun	85,544	158,807	183,265	366,922	356,477	392,025	404,861	304,543	403,159

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Appendix 2. (page 2 of 4)

Date	1978	1979	1980	1981	1982	1983	1984	1985	1986
01-Jul	87,131	161,458	186,824	369,645	358,667	398,131	413,087	307,163	406,743
02-Jul	89,664	163,982	190,189	372,251	363,087	404,244	420,641	309,771	409,895
03-Jul	92,191	166,841	194,293	374,799	368,838	410,270	429,222	311,590	412,206
04-Jul	95,171	170,647	197,227	378,893	374,083	417,213	435,737	315,126	414,011
05-Jul	97,440	173,655	200,106	383,149	379,078	422,560	442,399	318,380	415,510
06-Jul	99,063	175,651	203,131	386,625	385,378	426,533	447,848	323,044	418,319
07-Jul	100,215	176,543	206,422	390,488	391,549	430,742	451,888	326,671	421,310
08-Jul	101,046	178,634	209,417	394,262	395,539	434,822	455,794	330,564	424,170
09-Jul	101,993	181,824	212,234	397,711	397,749	438,175	459,004	337,391	427,247
10-Jul	103,245	186,033	215,876	400,653	399,819	441,819	461,931	347,998	432,682
11-Jul	104,086	189,717	221,639	402,924	401,799	446,273	465,539	353,455	437,797
12-Jul	104,427	192,979	226,427	406,392	405,219	450,814	469,819	359,784	442,839
13-Jul	104,594	196,123	228,152	408,657	409,251	455,357	474,401	365,036	446,535
14-Jul	104,884	200,247	229,831	411,253	413,590	461,176	480,974	371,149	450,065
15-Jul	105,159	203,782	231,574	414,944	418,304	467,672	486,495	376,173	454,764
16-Jul	105,697	208,957	234,089	417,524	421,865	474,642	493,250	381,512	456,991
17-Jul	106,001	212,512	237,508	418,304	424,790	480,969	498,205	387,472	461,099
18-Jul	106,285	216,272	243,386	426,937	428,203	485,295	502,941	392,582	466,092
19-Jul	106,606	219,616	248,999	447,912	432,499	488,998	506,081	397,142	472,158
20-Jul	106,844	222,332	254,059	468,423	436,419	492,986	509,470	405,318	478,155
21-Jul	106,925	224,915	257,885	484,164	440,468	497,449	512,674	409,446	482,901
22-Jul	106,943	226,927	261,058	490,730	444,339	502,330	516,454	412,604	486,309
23-Jul	106,958	228,842	263,201	496,517	447,438	505,933	519,659	415,474	489,218
24-Jul	106,998	231,024	264,554	501,580	450,499	509,836	521,857	417,636	491,851
25-Jul	107,011	232,136	266,177	504,971	453,873	514,371	523,794	420,085	494,143
26-Jul		232,907	267,433	507,464	456,469	518,210	525,481	422,059	495,942
27-Jul		233,225	268,631	509,915	458,716	521,897	526,872	424,250	497,568
28-Jul		233,612	269,329	512,700	461,091	527,131	527,876	427,089	499,365
29-Jul		233,977	269,729	516,386	462,517	531,269	528,767	429,902	500,928
30-Jul		234,468	270,199	520,200	463,480	534,781	529,705	432,692	502,417
31-Jul		235,171	270,552	524,002	464,656	536,616	530,798	434,540	503,676
01-Aug		235,929	271,377	527,398	465,167	538,528	531,845	435,610	504,848
02-Aug		236,308	272,411	529,702	466,109	540,739	532,933	436,313	505,893
03-Aug		236,535	273,175	531,615	466,603	542,827	534,146		506,663
04-Aug		236,821	273,883	532,912	467,184	545,724	535,264		507,477
05-Aug		236,994	274,641	534,093	467,306		536,273		507,912
06-Aug		237,097	275,518	535,263			536,806		508,328
07-Aug		237,173	276,133						508,520
08-Aug			276,299						508,553
09-Aug			276,538						508,600

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Date	1987	1988	1989	1990	1991	1992	1993	1994	Average Cumulative Count
17-May			732					447	1,638
18-May			4,392					1,133	4,560
19-May		313	10,980					2,084	7,508
20-May	167	1,190	17,915				9,503	3,038	11,082
21-May	203	2,330	22,749	1,121	1,087		23,180	4,648	14,401
22-May	685	4,586	26,779	5,964	2,804		45,886	7,070	19,259
23-May	2,417	9,664	33,251	13,141	5,965		74,311	10,628	25,398
24-May	4,457	20,697	40,699	25,064	8,430		106,291	13,442	33,073
25-May	8,720	30,676	45,357	39,397	11,476		144,872	17,267	40,955
26-May	15,835	39,622	53,675	50,734	14,750		168,519	20,355	47,390
27-May	28,011	52,869	66,818	62,794	18,643	1,226	181,404	22,957	54,423
28-May	44,403	67,070	80,698	70,228	22,032	2,657	198,880	26,004	63,275
29-May	58,888	77,092	91,375	79,404	25,965	5,019	212,036	28,892	69,774
30-May	77,084	83,898	96,750	88,945	30,382	10,755	220,514	30,858	76,290
31-May	95,624	91,484	104,066	99,288	39,744	18,686	237,200	35,474	85,527
01-Jun	112,019	96,689	111,107	109,314	56,577	25,296	253,673	44,897	95,596
02-Jun	126,404	100,247	116,341	119,223	77,728	33,215	276,504	52,683	107,205
03-Jun	144,070	104,873	123,208	127,799	95,536	44,750	291,095	55,820	117,882
04-Jun	158,702	112,750	131,763	135,371	110,093	52,671	308,680	61,963	129,690
05-Jun	169,664	119,505	139,275	145,544	128,766	61,966	334,459	67,228	143,281
06-Jun	173,986	128,400	146,994	155,954	140,454	76,518	360,102	79,328	156,088
07-Jun	179,741	137,496	159,687	167,091	148,894	93,252	378,170	96,436	168,605
08-Jun	186,107	148,818	174,252	174,728	158,365	110,981	398,932	114,458	182,899
09-Jun	194,029	163,459	183,692	184,633	170,030	131,700	423,929	132,500	197,231
10-Jun	205,582	178,675	195,818	196,293	178,595	155,130	443,723	150,088	210,503
11-Jun	216,776	194,930	205,481	212,474	186,699	173,721	454,842	162,360	222,393
12-Jun	223,282	209,889	213,737	236,403	199,387	187,817	473,164	175,368	234,205
13-Jun	227,335	220,640	224,363	260,851	208,453	206,074	486,036	184,449	244,226
14-Jun	235,388	230,022	237,911	275,153	217,689	226,530	494,393	200,088	253,980
15-Jun	240,873	239,932	247,833	283,543	232,656	250,487	507,744	211,767	264,260
16-Jun	246,389	246,416	256,722	293,655	247,023	264,401	521,991	225,994	273,758
17-Jun	251,795	251,326	266,742	306,350	257,152	278,910	529,612	237,439	282,603
18-Jun	256,610	257,795	277,873	314,402	268,203	293,803	534,533	254,662	290,479
19-Jun	260,593	265,650	286,218	324,165	281,124	306,127	540,857	274,054	297,667
20-Jun	264,526	273,602	293,793	333,480	295,270	325,607	545,757	285,552	304,722
21-Jun	268,450	279,372	300,962	343,772	304,020	342,489	549,293	297,251	311,062
22-Jun	274,829	286,357	309,830	353,929	311,850	351,941	552,157	310,556	317,428
23-Jun	284,940	294,056	315,680	364,095	318,208	359,175	557,226	329,242	324,310
24-Jun	300,648	299,638	319,607	373,435	324,171	365,494	563,297	353,524	331,401
25-Jun	317,165	305,235	322,603	383,445	331,831	372,169	567,618	367,664	337,608
26-Jun	329,665	311,613	326,029	390,257	341,331	379,349	570,336	379,868	343,061
27-Jun	336,675	318,172	329,269	399,491	351,686	385,615	573,706	394,014	348,501
28-Jun	342,319	324,431	335,571	406,372	362,496	393,699	578,067	403,227	353,712
29-Jun	349,155	332,651	342,061	410,871	372,935	402,957	583,043	419,086	359,212
30-Jun	353,791	339,148	349,415	414,846	382,048	410,373	591,427	429,931	364,413

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Date									Average
	1987	1988	1989	1990	1991	1992	1993	1994	Cumulative Count
01-Jul	355,803	344,750	357,345	419,169	389,351	417,493	599,066	440,290	369,444
02-Jul	359,209	349,430	362,641	424,236	394,460	423,084	604,786	450,092	374,123
03-Jul	363,305	353,652	367,617	428,918	400,795	427,725	609,931	460,057	378,864
04-Jul	370,405	357,184	374,986	434,583	407,475	433,138	615,458	468,839	384,036
05-Jul	374,756	360,488	385,725	442,581	413,320	437,562	621,797	475,035	388,940
06-Jul	378,149	363,998	395,749	450,330	419,533	444,549	628,228	484,579	394,067
07-Jul	383,766	368,322	405,985	456,030	425,755	451,910	637,457	494,500	399,294
08-Jul	390,382	376,821	417,098	461,222	432,824	457,668	647,843	502,447	404,646
09-Jul	396,734	381,988	427,859	466,375	439,277	469,605	658,948	511,838	410,258
10-Jul	405,319	388,335	437,365	472,995	443,887	478,744	668,514	526,377	416,472
11-Jul	410,641	395,955	445,818	478,397	448,364	487,124	675,878	540,033	421,993
12-Jul	416,398	403,836	457,771	487,735	453,182	495,083	682,697	556,256	428,241
13-Jul	422,981	410,923	467,100	499,167	457,151	501,824	688,312	570,180	433,775
14-Jul	429,420	417,935	477,370	507,373	464,649	510,398	695,985	583,513	439,897
15-Jul	435,142	424,859	489,653	515,682	472,199	519,369	702,097	593,674	445,881
16-Jul	441,401	430,316	500,550	521,775	481,870	527,052	708,977	601,629	451,561
17-Jul	445,868	435,193	509,453	528,034	491,538	533,770	714,152	609,271	456,622
18-Jul	450,488	439,050	521,264	533,760	498,878	542,577	719,550	616,334	462,255
19-Jul	454,615	443,633	531,831	539,735	506,391	551,192	726,332	621,009	468,423
20-Jul	458,249	448,116	542,000	544,050	517,072	558,294	733,749	624,931	474,641
21-Jul	460,690	452,080	550,639	546,584	527,340	563,192	741,593	632,687	480,004
22-Jul	461,963	454,877	559,547	549,041	537,042	567,804	750,834	646,163	484,906
23-Jul	462,965	458,306	567,650	552,942	546,059	573,230	764,846	660,610	489,899
24-Jul	463,590	462,206	573,900	555,825	550,304	577,051	777,569	671,034	493,868
25-Jul	465,604	466,229	579,203	557,875	553,370	580,035	786,617	684,077	497,530
26-Jul	465,972	470,371	584,909	560,132	557,792	583,447	793,023	689,974	500,594
27-Jul	466,598	474,291	590,608	563,017	561,676	587,066	800,488	694,862	503,600
28-Jul	469,092	477,743	595,534	564,951	566,469	590,271	806,460	700,329	506,685
29-Jul	471,433	481,219	599,684	567,759	571,823	594,225	812,576	704,325	509,652
30-Jul	473,508	483,642	602,203	570,221	576,534	598,097	819,079	707,481	512,289
31-Jul	475,734	485,562	603,754	572,771	579,435	601,952	824,618	711,167	514,558
01-Aug	478,460	487,000	606,053	576,610			829,178	715,181	516,670
02-Aug	479,759	488,098	607,797	581,859			833,387		518,462
03-Aug	481,461								519,609
04-Aug	482,960								520,759
05-Aug	483,478								521,358
06-Aug									521,978
07-Aug									522,272
08-Aug									522,372
09-Aug									522,515

Appendix Table 3. The number of minutes each hour the oscilloscope was monitored on the south bank tripod, Miles Lake sonar, 1994.

HOUR	17-May	18-May	19-May	20-May	21-May	22-May	23-May	24-May	25-May	26-May	27-May	28-May	29-May	30-May	31-May	01-Jun	02-Jun	03-Jun	04-Jun	05-Jun	06-Jun	07-Jun
0000-0100												30	30	30	30	30	30	30	30	30	30	30
0100-0200												30	30	30	30	30	30	30	30	30	30	30
0200-0300												30	30	30	30	30	30	30	30	30	30	30
0300-0400												30	30	30	30	30	30	30	30	30	30	30
0400-0500												30	30	30	30	30	30	30	30	30	30	30
0500-0600								20	30	30	30	30	30	30	30	30	30	30	30	30	30	30
0600-0700		15				30		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
0700-0800		30	30	30		30	25	25	30	30	30	30	30	30	30	30	30	30	30	30	30	30
0800-0900		30	30			30		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
0900-1000		15	30	8	30	25	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
1000-1100		30	30	30	15	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
1100-1200		30	30	30	10	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
1200-1300		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
1300-1400		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
1400-1500		30	30	30	30	30	30	30	30	30	30	30	30	30	28	30	30	30	30	30	30	30
1500-1600	30	30	30	30	28	30	30	30	30	30	18	30	30	30	30	30	30	30	30	30	30	30
1600-1700	15	25	30	30	30	30	30	30	30	30	23	30	30	30	30	30	30	30	25	30	30	25
1700-1800	35	30	25	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
1800-1900	30	15	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
1900-2000	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
2000-2100	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	25	30
2100-2200	30	30	30	30	30	30	30	30		30	30	30	30	30	30	30	30	30	30	30	30	30
2200-2300	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
2300-2400						30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
TOTAL	230	460	475	428	383	535	475	555	540	570	549	720	720	720	718	720	720	720	715	720	715	685

Appendix Table 4. The number of fish observed passing the south bank tripod during visual monitoring of the oscilloscope, Miles Lake sonar, 1994.

HOUR	17-May	18-May	19-May	20-May	21-May	22-May	23-May	24-May	25-May	26-May	27-May	28-May	29-May	30-May	31-May	01-Jun	02-Jun	03-Jun	04-Jun	05-Jun	06-Jun	07-Jun
0000-0100												24	59	41	54	169	158	72	51	90	38	495
0100-0200												54	57	28	55	127	185	61	152	17	67	491
0200-0300												38	83	16	16	142	289	24	108	58	109	242
0300-0400												70	69	18	14	181	226	53	114	66	96	448
0400-0500												72	123	29	26	377	343	31	272	56	161	92
0500-0600								22	97	77	100	71	170	47	30	211	317	48	102	79	132	391
0600-0700		9				33		52	76	66	46	57	82	20	29	166	207	36	43	98	142	354
0700-0800		22	28	0		36	23	19	93	94	90	50	69	17	106	198	266	35	61	117	162	219
0800-0900		21	9			41		52	96	85	40	64	99	34	85	110	87	67	125	159	146	352
0900-1000		3	21	3	36	31	54	53	73	66	63	52	27	54	40	302	163	54	102	93	110	
1000-1100		13	16	8	12	39	44	36	96	49	56	54	43	87	38	70	112	77	119	111	100	304
1100-1200		27	26	7	12	53	47	92	88	65	58	32	33	78	41	8	150	18	149	131	81	193
1200-1300		19	15	13	20	56	50	83	108	99	71	35	103	68	116	201	125	59	124	128	153	177
1300-1400		17	10	7	43	68	85	85	116	51	89	72	56	63	118	190	151	55	66	103	252	247
1400-1500		12	12	7	12	62	46	95	39	75	102	107	40	54	95	245	130	72	167	77	254	366
1500-1600	1	15	20	9	16	43	55	43	148	74	59	73	23	53	103	196	93	70	75	50	243	243
1600-1700	4	2	24	27	4	46	65	18	108	92	31	85	30	38	99	208	89	56	125	46	293	420
1700-1800	6	16	6	19	47	23	82	46	81	49	38	87	22	31	217	155	91	68	139	47	367	372
1800-1900	9	1	13	40	54	35	125	29	83	55	30	56	27	39	209	206	102	90	143	127	477	459
1900-2000	7	18	32	9	66	83	60	58	35	55	22	61	21	22	84	229	73	53	112	162	757	225
2000-2100	5	9	28	43	26	81	117	98	23	27	22	55	32	29	166	269	99	51	128	195	404	403
2100-2200	15	9	17	40	29	36	148	67		38	29	66	25	18	170	231	85	111	161	186	309	369
2200-2300	21	5	24	44	33	69	73	64	46	44	39	72	43	19	124	182	56	108	128	189	458	381
2300-2400						24	51	67	77	80	35	44	39	33	156	114	101	125	114	122	390	302
TOTAL	68	218	301	276	410	859	1,125	1,079	1,463	1,241	1,020	1,451	1,375	936	2,191	4,487	3,698	1,494	2,900	2,507	5,681	7,543

Appendix Table 5. Expanded hourly and daily counts from the south bank tripod , Miles Lake sonar, 1994.

HOUR	17-May	18-May	19-May	20-May	21-May	22-May	23-May	24-May	25-May	26-May	27-May	28-May	29-May	30-May	31-May	01-Jun	02-Jun	03-Jun	04-Jun	05-Jun	06-Jun	07-Jun
0000-0100												48	118	82	108	338	316	144	102	180	76	990
0100-0200												108	114	56	110	254	370	122	304	34	134	982
0200-0300												76	166	32	32	284	578	48	216	116	218	484
0300-0400												140	138	36	28	362	452	106	228	132	192	892
0400-0500												144	246	58	52	754	686	62	544	112	322	184
0500-0600								66	194	154	200	142	340	94	60	422	634	96	204	158	264	782
0600-0700		36				66		104	152	132	92	114	164	40	58	332	414	72	86	196	284	708
0700-0800		44	56	0		72	55	46	186	188	180	100	138	34	212	396	532	70	162	234	324	438
0800-0900		42	18			82		104	192	170	80	128	198	68	170	220	174	134	250	318	292	704
0900-1000		12	42	23	72	74	108	106	146	132	126	104	54	108	80	604	326	108	204	186	220	
1000-1100		26	32	16	48	78	88	72	192	98	112	108	86	174	76	140	224	154	238	222	200	608
1100-1200		54	52	14	72	106	94	184	136	130	116	64	66	156	82	16	300	36	298	262	122	386
1200-1300		38	30	26	40	112	100	166	216	198	142	70	206	136	232	402	250	118	248	256	306	354
1300-1400		34	20	14	86	136	170	170	232	102	178	144	112	126	236	380	302	110	132	206	504	494
1400-1500		24	24	14	24	124	92	190	78	150	204	214	80	108	204	490	260	144	334	154	508	732
1500-1600	2	30	40	18	34	86	110	86	296	148	221	146	46	106	206	392	188	140	150	100	486	486
1600-1700	16	5	48	54	8	92	130	36	216	184	81	170	60	76	198	416	178	112	300	92	586	1,008
1700-1800	10	32	14	38	94	46	164	92	162	98	76	174	44	62	434	310	182	136	278	94	734	744
1800-1900	18	4	26	80	108	70	250	58	166	110	60	112	54	78	418	412	204	180	286	254	954	918
1900-2000	14	36	64	18	132	166	120	116	70	110	44	122	42	44	168	458	146	106	224	324	1,514	450
2000-2100	10	18	56	86	52	162	234	196	46	54	44	110	64	58	332	538	198	102	256	390	970	806
2100-2200	30	18	34	80	58	72	296	134		76	58	132	50	36	340	462	170	222	322	372	618	738
2200-2300	42	10	48	88	66	138	146	128	92	88	78	144	86	38	248	364	112	216	256	378	916	762
2300-2400					48	102	134	154	160	70	88	78	66	312	228	202	250	228	244	780	604	
Total	142	463	604	569	894	1,730	2,259	2,188	2,926	2,482	2,162	2,902	2,750	1,872	4,396	8,974	7,396	2,988	5,850	5,014	11,524	15,254
Daily	427	653	907	910	1,533	2,307	3,389	2,763	3,901	3,135	2,731	2,902	2,750	1,872	4,396	8,974	7,396	2,988	5,850	5,014	11,524	15,917

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