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FLOOD FREQUENCY IN ALASKA

By

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ABSTRACT

Records of peak discharge at 183 sites were used to study flood frequency in Alaska. The vast size of Alaska, its great ranges of physiography, and the lack of data for much of the State precluded a comprehensive analysis of all flood determinants. Peak stream discharges, where gaging-station records were available, were analyzed for 2-year, 5-year, 10-year, 25-year, and 50-year average-recurrence intervals. A regional analysis of the flood characteristics by multiple-regression methods gave a set of equations that can be used to estimate floods of selected recurrence intervals up to 50 years for any site on any stream in Alaska. The equations relate floods to drainage-basin characteristics. The study indicates that in Alaska the 50-year flood can be estimated from 10-year gaging-station records with a standard error of 22 percent whereas the 50-year flood can be estimated from the regression equation with a standard error of 53 percent. Also, maximum known floods at more than 500 gaging stations and miscellaneous sites in Alaska were related to drainage-area size. An envelope curve of 500 cubic feet per second per square mile covered all but 2 floods in the State.

DEFINITIONS

Annual peak discharge: the highest instantaneous peak discharge at a stream site during a year. In this report, a year is the water year, from October 1 to September 30 of the indicated year.

Recurrence interval (return period): the average interval of time within which the given flood will be exceeded once.

Basin physical and climatic characteristics used in this report include:

Area of glaciers (G) in percentage of drainage area.

Area of lakes and ponds (S_+) in percentage of drainage area.

Drainage area (A) in square miles, is the total drainage area upstream from the stream site and for gaging stations is that shown in the latest published U.S. Geological Survey or Canadian Water Survey reports.

Main-channel slope (S) is the average slope between points 10 percent and 85 percent of the distance from the gaging site to the basin divide (stream length).

Mean annual precipitation (P) in inches, as determined from U.S. Weather Bureau publication, "Climate of Alaska."

Mean basin elevation (E) in thousands of feet above sea level.

Precipitation intensity (I), in inches, is the maximum rainfall expected in 24 hours each 2 years as determined from U.S. Weather Bureau Technical Paper 49.

Stream length (L) is the length of the main channel between the gaging station and the basin divide measured along the channel that drains the largest basin.

Channel hydraulics: the mechanics of relation between channel geometry (width, depth, slope, and roughness), stage, and discharge.

Downstream order: gaging stations are listed in the same downstream order used in U.S. Geological Survey Water-Supply Papers. Records are listed in a downstream order along the mainstream, and stations on tributaries are listed between stations on the mainstream in the order in which those tributaries enter the mainstream. Stations on tributaries entering above all mainstream stations are listed before the first mainstream station. Stations on tributaries to tributaries are listed in a similar manner.

Each complete record station and peak record station has been assigned a station number. Numbers increase in the downstream direction. Numbers are not consecutive so that intervening numbers may be assigned to new stations as they are established.

The general arrangement within Alaska is as follows:

Mainland streams between the Alaska-British Columbia border and longitude 141°.

Island streams east of longitude 141°. Listing is south to north and counter-clockwise around each island starting at the western-most point.

Streams tributary to the Pacific Ocean between longitude 141° and the western tip of the Alaska Peninsula.

The Aleutian Islands.

Streams tributary to the Bering Sea and the Arctic Ocean ending at the Alaska-Yukon border.

The maps and tables in this report are keyed to the provisional map of the subregional breakdown of the State by the U.S. Water Resources Council.

Flood: Any streamflow overtopping the natural or artificial banks in any reach of a stream. In this report, the highest discharge each year is the annual flood.

Flood-crest profile: a graph of flood-crest elevations along a river in flood, plotted as ordinate, against distance, measured in the upstream direction, plotted as abscissa.

Flood-discharge rate: the discharge per unit area, in cubic feet per second per square mile (cfs per square mile).

Gaging station: a site on a stream where systematic observations of gage height and discharge are obtained.

Stream discharge: the flow of a stream past a cross section of the stream. In this report, discharge is considered to be a time rate of volume flow and is measured in cubic feet per second (cfs).

Stream icing: the growth of ice in a stream channel during winter. Stream icing is spectacularly large in much of Alaska and often completely fills the channels, creating more of a flood hazard than open-channel, peak-discharge flooding.

Stream stage: the height of the water surface above an established datum plane.

INTRODUCTION

Economic design of structures along streams requires an evaluation of flood hazards. Hazards include overbank inundation, channel erosion and deposition, and destruction from stream velocity or pressure. The hazards can be related to stream stage or discharge. The critical stage or discharge is generally the instantaneous maximum or peak value. Peak discharges are related to peak stages and velocities by channel hydraulics so that flood-crest profiles, inundated areas, and current velocities can be evaluated, except when ice or debris jams and stream icing are present. Thus, the peak discharge is a very useful measure of flood magnitude.

The magnitude and frequency of peak discharges in Alaska and the adjacent area of Canada that drains into Alaska are described in this report. Peak discharges are tabulated for 2-year, 5-year, 10-year, 25-year, and 50-year average-recurrence intervals for those sites where peak-discharge records are long enough to justify such evaluation. Results of a regional frequency analysis are described. A method for estimating flood magnitudes of selected frequencies for most sites in Alaska is presented. Maximum known peak discharges are tabulated for many Alaskan and Canadian locations.

This report was prepared in the Alaska District of the Water Resources Division, U.S. Geological Survey under the direction of Harry Hulsing, district chief. It is based on data collected at Alaskan sites by the Geological Survey in cooperation with several Federal, State, and local agencies, and at Canadian sites by the Water Survey of Canada.

GEOGRAPHY IN RELATION TO FLOODS

The area of Alaska is approximately 586,000 square miles, but the streams flowing from Alaska drain about 730,000 square miles, partly in Canada. The diverse physiography of the State effects great variations in streamflow-flood characteristics. Most of Alaska is mountainous or hilly although lowlands and plains 20 to 100 miles wide abound. The mountains generally receive more precipitation than the lowlands and plains. Also, the rainfall or snowmelt from the mountains runs off faster than that from the lowlands and plains, resulting in higher flood-discharge rates in the mountains..

Along the Pacific Ocean, the Pacific Mountain System (Wahrhaftig, 1965) forms a barrier to the flow of moist air from the ocean. Its rugged coastal slopes receive large volumes of precipitation that run off rapidly, causing Alaska's highest known flood-discharge rates. Temperatures are mild and floods can occur even in winter when combined snowmelt and rainfall occasionally produce exceptionally large floods. The few coastal lowlands or low plateaus along the Pacific Coast have relatively low flood-discharge rates.

North of the Pacific Mountain System are numerous mountain ranges separated by large river-valley lowlands, plateaus, and large coastal lowlands. The precipitation in this area of Alaska is much less than in the Pacific Mountain System, and flood-discharge rates are much lower.

In interior Alaska and throughout the drainage systems that flow into the Arctic Ocean, the long cold winters cause extensive freezing. Rapid warming in the spring (May or June) causes the snowmelt to overflow frozen or ice-jammed channels

in spectacular spring breakup floods. Continuous permafrost in interior Alaska prevents rainfall from infiltrating; therefore, a large percentage of the rainfall during larger storms becomes flood runoff.

Natural glacier-dammed lakes form in many places in Alaska especially in the Pacific Mountain System. These lakes occasionally "break out" causing spectacular floods that have very high peak-discharges.

Man's activities have contributed very little to aggravating flood hazards in Alaska. Some communities occupy flood plains and consequently have a potential for heavy flood damage. Roads and other structures have been built and are being planned along stream channels where flood hazards exist.

FLOOD-FREQUENCY RECORDS

All annual peak-discharge records at least 5 years in duration for stations on unregulated Alaskan streams or on Canadian streams flowing into Alaska were used in the analysis of flood frequency. The records were not adjusted to a common base period. Flood-frequency curves were determined for each gaging station using all the records available as of September 30, 1968. The Log Pearson Type III flood-frequency method (Water Resources Council, 1968) was used in the analysis. Curves defined in this analysis are available for review in the Geological Survey District Office, Water Resources Division, in Anchorage, Alaska. Table 1 shows the flood discharges for 2-year, 5-year, 10-year, 25-year, and 50-year average-recurrence intervals for the gaging-station records analyzed.

Flood discharges for recurrence intervals of up to about twice the length of flood-peak record in years are shown. For example, if a station has 11 years of record, the 25-year flood is shown but not the 50-year flood. Only 24 gaging stations have records as long as the 20 years or more needed for evaluating a 50-year flood magnitude.

Table 1.--Gaging-station characteristics.

Station no.	A	S	L	St	H	G	P	$I_{24,2}$	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}
							SOUTHEAST SUBREGION						
15-0080.00	84	70	4.0	5	3.60	33	80	4	15,500	68,300	160,000	-	-
100.00	80	197	14.5	0	3.40	12	80	5	11,700	16,400	19,500	23,500	-
105.00	8.58	375	5.5	0	2.14	0	80	5	1,970	3,070	3,710	-	-
115.00	45.3	107	10.7	0	1.70	0	90	5	7,930	9,570	10,300	-	-
120.00	15.5	130	7.6	5	1.73	0	95	7	1,140	1,660	2,130	2,800	3,620
140.00	12	12.6	5.7	27	1.31	0	100	7	493	632	723	-	-
180.00	18	315	6.1	11	.17	0	120	5	1,980	2,740	3,230	-	-
190.00	16.5	114	6.2	2	1.07	0	140	4	2,480	3,490	4,090	-	-
201.00	16.1	254	8.4	4	2.62	2	110	5	1,280	1,870	2,320	-	-
220.00	67.4	857	18.8	0	2.40	10	120	7	6,710	9,260	11,200	13,800	-
260.00	23	30.6	9.8	4	3.16	0	100	4	1,620	2,120	2,460	2,900	3,240
300.00	27	59	13.5	7	2.11	1	80	4	2,280	2,670	2,840	-	-
340.00	32.5	161	11.1	9	2.40	23	52	6	3,110	4,170	4,960	6,070	6,980
360.00	226	148	17	0	3.10	26	50	6	18,800	26,500	32,500	41,000	-
380.00	11.4	248	5.0	1	2.59	29	80	4	1,950	2,530	2,910	-	-
400.00	15.2	234	8.5	15	3.10	17	100	5	840	1,170	1,410	1,720	1,970
420.00	22.3	246	7.6	0	2.30	12	100	3	4,530	5,400	6,000	-	-
440.00	24.3	219	8.5	0	2.20	11	100	3	3,810	4,460	4,850	5,290	-
480.00	4.57	232	3.4	0	1.90	2	100	3	464	616	718	848	947
500.00	9.76	541	4.9	0	2.40	9	100	3	1,240	1,680	2,020	2,510	2,910
520.00	12.1	500	5.3	0	3.43	68	100	3	1,520	1,990	2,340	2,820	-
538.00	2.5	555	3.6	0	1.17	0	100	3	671	885	973	-	-
540.00	3.96	536	3.6	0	1.20	0	120	5	170	233	282	-	-
561.00	145	192	19.0	0	3.90	18	60	5	3,520	6,900	11,000	-	-
562.00	43.2	439	12.1	0	3.40	27	40	5	2,010	3,770	6,130	-	-
564.00	190	17.3	23.0	1	4.82	37	120	6	8,150	11,900	16,000	-	-
580.00	6.8	0	4.2	37	.86	0	90	5	480	604	685	-	-
600.00	2.81	540	2.0	11	1.34	0	150	5	439	539	591	645	678
620.00	14.0	276	6.1	7	1.04	0	150	5	1,350	1,950	2,440	-	-
640.00	13.5	164	6.5	9	1.28	0	150	5	2,490	3,490	4,200	-	-
660.00	5.8	312	4.2	9	1.63	0	150	5	1,210	1,770	2,160	-	-
680.00	5.7	770	4.2	9	1.68	0	150	5	1,320	1,790	2,110	2,540	-
700.00	36.5	51	12.3	6	1.80	0	150	5	3,130	3,920	4,410	5,000	5,410
720.00	32.1	40.6	16.3	19	1.30	0	150	5	2,860	3,530	3,960	4,500	4,900
722.00	18.6	35.7	7.4	10	.72	0	150	5	2,910	3,630	3,970	-	-
740.00	19.7	115	8.1	16	.90	0	150	5	1,180	1,410	1,550	1,720	-
760.00	33.9	40	10.1	12	1.30	0	160	5	2,830	3,620	4,040	4,490	4,770
780.00	30.2	133	13	10	1.50	0	160	5	2,810	3,410	3,760	4,150	-
798.00	5.96	345	3.9	0	1.40	0	120	7	791	1,070	1,250	-	-
800.00	59	45.2	19.4	3	1.70	0	120	7	4,690	6,360	7,420	-	-
820.00	5.7	235	5.2	21	1.60	0	120	5	328	416	468	-	-
840.00	3.9	675	2.1	5	.90	0	140	5	205	284	352	-	-
851.00	5.9	351	5.5	8	1.00	0	120	5	629	743	777	796	-
852.00	16.8	195	5.4	1	1.20	0	120	5	1,740	2,460	2,740	-	-
856.00	8.82	292	5.4	0	1.00	0	160	5	1,980	2,920	3,660	4,750	-
857.00	28.7	51	13.1	0	1.40	0	160	5	4,640	6,660	8,120	10,100	-
858.00	15.1	125	6.4	0	1.12	0	160	5	2,200	2,920	3,400	4,020	-
860.00	49.5	23.4	13.6	6	1.00	0	160	5	3,310	4,300	4,970	-	-
865.00	17	115	7.1	11	.50	0	80	4	1,060	1,580	2,020	-	-
866.00	11.2	82.9	5.3	9	6.80	0	80	4	1,200	1,810	2,340	-	-
880.00	39	95.5	11.2	3	2.40	5	120	6	3,980	5,510	6,440	7,520	8,280
920.00	26	25.2	13.4	15	1.50	0	160	6	1,950	2,480	2,830	-	-
940.00	7.41	33.7	5.4	24	1.30	0	160	6	559	753	890	1,070	-
980.00	32	93.8	12.1	9	2.00	13	120	6	2,760	3,380	3,800	4,330	-
1000.00	17.5	446	7.4	7	2.30	20	120	6	2,220	2,450	2,560	2,660	-
1020.00	56.2	21.4	12.5	11	1.20	1	160	4	1,360	1,650	1,870	2,160	-
1080.00	24.3	27.8	9.7	1	.90	0	110	4	1,830	2,300	2,410	2,980	-
1090.00	13.6	239	6.9	0	1.60	0	100	3	1,550	1,920	2,140	2,380	-
							SOUTH-CENTRAL SUBREGION						
2000.00	620	35.9	78	8	3.03	8	12	3	5,040	6,960	8,380	10,300	-
2010.00	11.4	28	14.2	9	1.70	0	12	1.5	100	131	146	-	-
2019.00	7.12	31.2	8.6	35	1.60	0	12	1.5	51.5	102	144	-	-
2020.00	2,670	43.5	84	5	3.45	12	20	3	25,600	39,300	50,300	66,500	-
2060.00	880	16.1	62	4	3.50	12	18	1.5	7,030	7,830	8,270	8,750	-
2080.00	420	71	46	4	3.60	12	19	1.5	5,340	6,690	7,510	8,470	-
2081.00	70.5	119	17.9	4	3.10	0	60	3	439	727	1,020	-	-
2120.00	20,600	14.4	178.4	0	3.62	18	24	2	154,000	174,000	187,000	203,000	-
2125.00	9.8	538	4.7	29	4.30	0	24	2	169	275	385	-	-
2160.00	20.5	219	11	0	2.00	33	100	5	2,870	4,150	4,910	5,760	6,330
2191.00	4.22	381	2.8	0	1.20	0	80	5	387	484	558	-	-
2260.00	19	343	9.5	2	2.40	29	80	5	1,600	2,060	2,360	-	-
2380.00	7.96	246	8.1	2	2.21	0	80	5	271	353	428	-	-
2390.00	54	191	13.3	6	2.80	37	32	5	2,530	3,430	3,950	4,550	-
2400.00	226	51	28	4	.97	0	26	2.5	1,880	2,360	2,680	3,080	-
2416.00	131	12.7	21	6	.67	0	25	2.5	470	565	622	-	-
2420.00	738	68.3	55	17	1.81	29	26	2	8,130	9,550	10,500	11,800	-

Table 1.--Gaging-station characteristics--continued.

Station no.	A	S	L	St	B	G	P	$I_{24,2}$	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}
					SOUTH-CENTRAL SUBREGION--continued								
1S-2439.00	16.8	316	7.4	0	2.30	5	80	5	641	1,030	1,300	-	-
2440.00	32.6	220	14.6	6	2.80	13	80	5	528	706	828	987	-
2460.00	44.2	460	12.8	10	2.90	19	80	5	911	1,300	1,660	2,250	-
2480.00	181	89	28	2	2.47	12	80	6	3,500	4,560	5,400	6,610	7,630
2540.00	31.7	136	14.7	13	2.70	0	80	5	296	442	563	747	-
2580.00	634	268	60	5	2.65	11	40	3	10,300	13,600	16,200	19,900	23,000
2600.00	31.8	194	9.9	16	2.40	6	60	3	293	421	535	-	-
2605.00	8.6	459	4.8	0	[illegible].20	0	60	3	174	236	272	-	-
2610.00	48	74.1	13.5	10	2.50	4	60	3	402	655	816	-	-
2640.00	61.8	116	23.5	8	2.10	13	60	3	460	779	1,050	-	-
2701.00	6.03	409	5.9	0	3.20	0	80	5	78	87	89	-	-
2740.00	30.4	246	11.5	0	2.53	0	13	1.5	207	325	439	640	841
2750.00	20	226	11.4	9	.80	0	13	1.5	64	86	99	114	-
2760.00	90.5	119	19	0	3.10	0	17	2	852	1,120	1,300	1,560	1,760
2765.00	113	121	23	0	2.60	0	17	2	687	823	881	-	-
2800.00	119	265	18	3	3.70	18	12	1.5	1,500	1,930	2,250	2,690	-
2810.00	1,180	183	43	4	4.00	55	12	1.5	236,000	296,000	335,000	381,000	-
2820.00	289	13.6	30	0	4.19	0	12	1.5	4,490	5,750	6,450	7,220	-
2824.00	8.51	679	3.7	0	3.00	0	12	1.5	17	26	34	-	-
2840.00	2,070	79.7	77	0	4.00	13	18	1.5	23,500	28,300	31,900	36,700	40,600
2860.00	28.5	44	11.4	10	.50	0	20	1.5	32	45	54	-	-
2900.00	61.9	187	14.9	0	3.70	5	20	1.5	2,030	2,890	3,540	4,460	5,230
2910.00	950	56.6	51	0	4.51	26	24	2	15,100	18,400	21,600	-	-
2912.00	280	133	23	1	4.52	20	20	.5	5,980	7,290	8,090	9,040	-
2915.00	4,140	10	107	0	3.56	7	24	1.5	35,200	43,700	49,400	-	-
2920.00	6,160	10.2	189	0	3.42	5	25	2	49,300	63,400	73,800	88,100	-
2924.00	2,570	23	87	1	3.76	28	18	1.6	38,700	47,000	55,600	-	-
2928.00	164	114	25	0	1.93	0	28	2.2	3,560	4,180	4,440	-	-
2930.00	19.6	53.8	12.3	21	.40	0	28	1.5	111	146	177	-	-
2943.00	2,250	30.6	98	5	2.81	17	20	2	32,900	37,100	39,800	-	-
2945.00	1,120	49.8	54.5	4	3.90	31	22	2	16,300	19,400	21,500	-	-
2956.00	15	126	8.9	3	2.30	1	60	3	2,230	3,320	4,070	-	-
2960.00	123	31.2	23	3	1.83	0	60	3	5,740	8,700	11,100	14,700	-
2972.00	4.74	105	5.1	0	.70	0	60	3	794	969	1,080	-	-
					SOUTHWEST SUBREGION								
2980.00	200	54	28	4	2.70	6	24	3	2,810	3,690	4,400	-	-
3000.00	3,300	5.7	106	8	2.16	8	23	3	27,200	30,600	32,900	35,800	-
3020.00	1,490	12.5	76	16	1.10	0	26	3	18,300	22,400	24,800	27,500	-
3030.00	1,110	1.35	92	25	.89	0	26	3	13,000	16,300	18,600	21,400	-
3036.00	11,700	2.39	251	4	1.85	0	16	1.5	56,700	69,100	75,100	-	-
3040.00	31,100	1.14	456	3	1.48	1	18	1.5	177,000	240,000	288,000	355,000	-
					YUKON SUBREGION								
3059.00	2.93	187	2.1	0	3.00	0	12	1.5	34	90	149	-	-
3560.00	113,500	2.49	657	1	3.34	3	12	1.0	297,000	396,000	467,000	564,000	-
3895.00	9,330	9.9	208	0	3.[illegible]6	1	8	1.3	30,200	57,700	62,200	-	-
4680.00	199,400	2.31	1,024	5	2.81	2	11	1.0	340,000	702,000	804,000	928,000	-
4700.00	3,280	25.40	121	0	3.73	0	12	1.3	7,720	8,950	9,830	11,000	-
4739.50	37.1	225	12.6	0	4.30	0	12	3	416	825	1,150	-	-
4760.00	8,550	8.93	230	1	3.86	0	11	1.5	28,900	32,400	34,800	37,800	-
4760.50	3.32	828	4.2	0	3.30	0	10	3	113	158	176	-	-
4762.00	11	169	7.1	4	2.00	0	12	3	103	135	147	-	-
4763.00	65.1	223	19.1	1	3.20	5	12	3	774	1,660	2,500	-	-
4764.00	57.6	185	12.9	4	3.10	0	12	3	1,090	1,610	2,030	-	-
4780.00	13,500	2.78	346	2	3.44	6	11	1.5	48,900	55,800	59,800	-	-
4780.10	50.3	74	12.8	1	4.20	10	20	2	839	1,230	1,400	-	-
4785.00	5.32	351	5.7	0	3.30	0	12	1.5	98	136	154	-	-
4840.00	2,170	19.4	124	2	2.52	0	12	1.6	19,700	30,700	41,900	62,100	-
5140.00	1,980	12.6	119	2	1.77	0	12	1.3	10,500	18,100	26,100	41,400	57,900
5155.00	27,500	4.12	489	6	3.92	6	11	1.4	85,000	117,000	149,000	-	-
5158.00	36.2	169	10.2	2	3.40	0	12	1.5	1,130	2,250	3,240	-	-
5160.00	710	48.7	52	0	3.47	2	16	2	6,990	8,550	9,540	10,700	-
5180.00	1,910	21.2	88	0	3.50	4	14	1.5	22,800	29,600	34,800	42,400	-
5190.00	12.6	88	5.9	0	1.00	0	12	1.0	446	903	1,230	-	-
5300.00	61.1	95.2	16.8	0	2.80	0	12	1.8	1,030	1,900	3,070	-	-
5646.00	2,693	2.9	184	5	1.41	0	14	1.3	22,700	25,600	27,300	-	-
5648.00	259,000	2.03	1,212	5	2.64	1	12	1.0	654,000	798,000	872,000	947,000	-
5649.00	18,700	18.8	262	4	2.20	0	13	1.5	162,000	213,000	247,000	-	-
					NORTHWEST SUBREGION								
7120.00	1,720	20.2	68	16	.70	0	14	1.4	17,100	27,800	36,100	-	-

Table 1.--Gaging-station characteristics--concluded.

Station no.	A	S	L	St	E	G	P	$I_{24,2}$	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}
							CANADA						
15-0242.00	1,360	41	72	0	4.80	2	18	1.2	15,600	17,900	19,100	-	-
243.00	7,300	5.6	166	0	4.30	0	16	1.0	55,600	79,900	91,400	102,000	-
244.00	616	63	49	0	3.90	0	16	1.0	4,260	5,500	6,440	-	-
245.00	1,360	28	98	1	3.80	0	13	1.0	15,000	20,400	23,300	-	-
246.00	11,300	15.5	224	0	4.20	0	20	1.3	93,400	112,000	121,000	130,000	-
247.00	3,610	22.7	140	1	3.50	6	32	2.5	72,300	84,200	92,500	-	-
410.00	770	69.4	58	2	4.80	45	20	1.5	2,110	2,870	3,490	4,410	-
411.00	6,000	15.8	155	1	3.80	4	20	1.3	50,800	63,000	70,400	79,200	-
1200.00	1,620	12.6	106	4	4.10	0	12	1.0	2,520	3,530	4,170	4,950	-
1202.00	249	32	27	8	4.20	0	12	1.0	1,620	1,990	2,220	-	-
1205.00	3,200	10.3	130	5	3.90	0	12	1.0	6,270	8,240	9,310	10,400	-
3045.20	650	18	35	4	3.20	0	12	1.0	317	469	564	677	-
3045.50	269	32.3	33	27	4.40	0	16	1.0	559	668	731	803	-
3046.00	2,520	7.5	70	9	3.50	6	16	1.0	7,030	9,060	9,680	10,400	-
3046.50	104	67	24	5	4.40	10	20	1.5	1,230	1,530	1,760	2,080	-
3047.00	289	89	33	5	4.60	16	20	1.5	3,710	4,550	5,270	6,340	-
3047.50	366	38	42	6	4.00	1	12	1.0	2,180	2,680	3,040	3,530	-
3048.00	92	230	16	3	3.90	9	20	1.0	1,750	2,350	2,930	3,910	-
3048.50	337	50	40	0	4.50	0	12	1.0	1,570	2,000	2,240	2,490	-
3049.20	31	140	12.5	0	3.30	0	12	1.0	45	66	78	-	-
3049.50	597	47	36	1	3.50	0	12	1.0	1,950	2,750	3,260	3,910	-
3050.00	7,500	.4	184	7	3.80	5	12	1.0	18,800	20,500	21,600	22,700	23,500
3050.30	1,570	14.3	75	6	4.60	5	12	1.0	7,320	9,040	9,700	10,200	-
3050.50	2,640	10.6	107	4	4.40	3	12	1.0	8,010	10,200	11,900	14,100	16,000
3051.00	12,000	.7	252	6	3.80	4	12	1.0	24,900	27,200	28,400	29,700	-
3051.50	1,280	24.5	61	1	4.30	0	14	1.0	8,120	11,300	13,500	16,500	-
3052.00	737	7.8	49	5	4.00	0	12	1.0	1,880	2,320	2,540	2,770	-
3052.50	11,700	6.3	180	3	3.80	0	13	1.0	37,500	48,000	54,900	63,400	69,800
3052.60	13,700	4.6	276	2	3.80	0	13	1.0	41,700	53,400	60,800	69,900	-
3053.00	2,640	7.5	112	2	4.10	0	14	1.0	9,790	14,900	18,900	24,500	-
3053.50	33,600	1.8	364	4	4.00	1	12	1.0	66,800	87,400	101,000	119,000	-
3053.90	2,800	10.1	144	3	3.80	0	17	1.0	16,700	20,800	23,300	-	-
3054.00	7,670	0.5	162	1	3.90	0	16	1.0	38,200	50,800	59,100	69,500	-
3054.20	19,700	5.9	340	1	3.70	0	17	1.0	71,100	104,000	129,000	165,000	-
3054.50	53,400	2.0	520	3	3.80	1	13	1.0	145,000	199,000	238,000	290,000	-
3055.00	1,500	66	107	7	3.00	12	10	1.0	9,270	10,700	11,500	12,200	-
3055.90	12,100	7.8	276	1	4.10	0	14	1.0	80,700	107,000	121,000	137,000	147,000
3056.20	13,500	6.5	308	1	3.90	0	14	1.0	90,500	119,000	139,000	-	-
3056.50	19,700	4.5	420	1	3.60	0	13	1.0	85,400	128,000	170,000	-	-
3056.70	97,300	2.0	547	2	4.00	2	15	1.2	267,000	358,000	420,000	-	-
3057.00	106,000	2.1	603	2	3.90	2	15	1.1	255,000	331,000	381,000	446,000	495,000
3889.50	20,900	5.3	304	1	1.90	0	9	1.0	171,000	196,000	216,000	-	-

Annual peak-discharges were available for 142 gaging stations in Alaska and 41 gaging stations in Canada as shown in figure 1. Much of the area, particularly in the interior, west, and north, has almost no peak discharge records. Very few records are available for small streams except in southeast Alaska, on the Kenai Peninsula, and around Anchorage.

REGIONAL FLOOD FREQUENCY

The capability for evaluating flood hazards is needed in all areas, not just where gaging-station records have been taken. Usually, the need for flood-frequency information in Alaska is at locations that have few, if any, hydrologic data, and time and cost do not permit collecting the amount of records necessary to make a reliable frequency analysis for the site.

A regional analysis defining the relation between the magnitude and frequency of floods and the drainage-basin physical and climatic variables was based on data for the entire State. The analysis used multiple-regression methods (Benson, 1962; Benson, 1964). The basic regression equation used is of the form:

$$Y = a \cdot A^{b} \cdot S^{c} \cdot P^{d} \ldots$$

where Y is a flood characteristic; A, S, P... are basin variables; and a, b, c... are constants, determined by a standard statistical procedure. The data used in the analysis are shown in table 1.

The basin variables used in the analysis were computed from Geological Survey and Canadian topographic and climatic maps. The climatic maps are shown as figures 2 and 3. The basin variables (physical and climatic characteristics) are described in the section on definitions.

Figure 2.--Mean annual precipitation in inches (1931-1955).

Figure 3.--Two-year 24-hour rainfall in inches.

Results of the analysis are shown in table 2, the equations may be used to estimate the flood characteristics as shown for any location, by substituting values of the basin variables as indicated. The other basin variables in table 1 were not found to be statistically significant.

Table 2.--Regional flood-frequency relations for Alaska.

$$Y = a.A^{b_1}.(St+1)^{b_2}.P^{b_3}.I_{24,2}^{b_4}$$

Dependent variable Y	Regression constant a	Regression coefficients b_1	b_2	b_3	b_4	Standard error of estimate (percent)
Q_2	1.99	.90	-.24	.74	.53	80
Q_5	3.92	.87	-.25	.66	.60	80
Q_{10}	5.57	.86	-.26	.61	.65	81
Q_{25}	9.25	.85	-.35	.53	.81	72
Q_{50}	14.00	.75	-.20	.76	--	53

Example: $Q_2 = 1.99A^{.90}(St+1)^{-.24}P^{.74}I_{24,2}^{.53}$

The principal measure of the accuracy with which a particular streamflow characteristic can be determined is the statistical measure of error, "standard error of estimate," and is expressed in this report as a percentage of the average value of the characteristic. The standard error is the estimated limit above and below the average within which about 67 percent of future values of the characteristics are expected to fall. Conversely, only one chance in three exists that future values will differ from the average by more than one standard error.

The standard error of estimate is shown for each regression equation. This standard error of estimate gives an evaluation of reliability of estimates for the physical and climatic features that were sampled in Alaska and adjacent parts of Canada. The range and distribution of the features may be studied by reference to table 1. Estimates should be considered less reliable for sites having indices of physical and climatic features outside the range of indices sampled.

Stream-gaging records do not define flood-frequency characteristics without error. However, the standard error of estimate of the 50-year flood evaluated from 10-year records for the gaging stations used in this analysis is 22 percent, whereas the standard error of estimate from the 50-year-flood regression equation is 53 percent. This means that a 10-year-flood record at a site car be expected on the average to be considerably more reliable than an estimate using the regression equation.

An analysis of deviations (a deviation is the difference between the flood discharge as estimated from the regression relation and as determined from the flood record) shows that the equations estimate flood magnitudes that are too high in the Kenai River basin. This is attributed partly to inaccuracy in the map of mean annual precipitation. Gaging-station records show that mean annual runoff commonly exceeds the mapped values of mean annual precipitation. In the Kenai River basin exceptionally high mean annual precipitation relative to runoff is mapped. Better regional flood-frequency relations based on regression methods will require better regional maps of precipitation or alternate basin indices and more records of runoff.

Caution is recommended in using the 50-year flood regression equation for the following reasons:

1. Only 24 gaging stations having about 25 years minimum record were available to evaluate the 50-year flood regression equation. This is a very small sample.

2. Of these 24 stations, none outside the Southeast and South-Central subregions sampled drainage basins of less than about 1,500 square miles.

This report supersedes and expands upon an earlier flood-frequency analysis (Berwick, Childers, Kuentzel, 1964). The earlier analysis was for Alaska south of the Yukon River whereas this report covers the entire State.

MAXIMUM KNOWN FLOODS

Flood-hazard evaluation usually requires determination of a "design" flood. This is sometimes a flood of 50-year or some other recurrence interval. In Alaska, flood records are so few and so short that the basis for the 50-year flood is uncertain. Therefore the maximum known floods for nearby or similar sites may help in the evaluation of the flood hazard.

Maximum known peak discharges are listed in table 3 for all gaging stations and miscellaneous-measurement sites in Alaska. Lengths of flood records in water years and periods of records are shown for gaging stations. The flood-discharge rate in cubic feet per second per square mile is shown for comparison of flood rates between sites or areas. The sites are listed in downstream order and are grouped by Water Resources Council subregions. The station numbers shown are the Geological Survey numbers (see definitions). All gaging stations, both current and discontinued having at least one year of record, are shown in figure 1.

The maximum known peak discharges listed in table 3 were plotted in relation to drainage-area size. Along the coast of the Pacific Mountain System, basins are generally less than 100 square miles in area and have high flood-discharge rates. The curve for 500 cfs per square mile encompasses all maximum known floods, except two along the coast of the Pacific Mountain System. In the rest of Alaska, a curve for 100 cfs per square mile encompasses almost all maximum floods known.

Table 3.--Maximum known floods in Alaska

Permanent Sta. No. 15-	Stream & Place of Determination	D.A.	Period of Record years/dates	Maximum Flood Known: Date	Gage Height (ft)	Discharge: Cfs	Discharge: Cfs per sq. mi.	Remarks
			ALASKA REGION					
	SOUTHEAST							
0080.00	Salmon R nr Hyder	84	5(1963-67)	Nov. 40, 1965	28.5	110,000	1,310	Glacier-dammed lake breakout
0100.00	Davis R nr Hyder	80	10(1931-40)	Nov. 12, 1936	13.30	19,500	244	
0105.00	Halibut Bay trib nr Hyder	8.58	6(1962-68)	Oct. 19, 1964	14.40	1,900	[illegible]	
0115.00	Red R nr Metlakatla	45.3	5(1963-68)	Oct. 19, 1964	10.22	10,300	227	
0119.00	Cabin C nr Ketchikan	8.80	4(1964-68)	Sept. 23,1967	11.45	1,450	165	
0120.00	Winstanley C nr Ketchikan	15.5	24(1945-68)	Jan. 30, 1957	6.65	4,120	266	
0140.00	Punchbowl L O nr Ketchikan	12	6(1923-29)	Dec. 7, 1925	--	710	59.1	Maximum daily
0156.00	Klahini R nr Bell Island	58.0	1(1967-68)	Sept. 28,1968	5.26	4,140	71.4	
0160.00	Short C nr Bell Island	20	1(1922-23)	Sept. 5, 1924	--	1,000	50.0	
0180.00	Shelokum L O nr Bell Island	19	6(1915-21)	Dec. 18, 1919	--	3,100	172	
0190.00	Black Bear C nr Meyers Chuck	16.9	5(1963-68)	Mar. 29, 1964	16.76	4,380	265	
0200.00	Tyee C nr Wrangell	14	1(1926-67)	Oct. 5, 1926	--	1,060	75.8	
0201.00	Tyee C at mouth nr Wrangell	16.1	5(1963-68)	Oct. 23, 1967	4.46	2,440	152	
0220.00	Harding R nr Wrangell	67.4	18(1950-68)	Oct. 14, 1961	16.22	15,000	222	
0240.00	Mill C nr Wrangell	37	3(1913-15,24-25,27-28)	Oct. 16, 1919	--	3,310	89.4	
0260.00	Cascade C nr Petersburg	23	30(1917-20, 22-24, 25-28, 40-68)	Sept. 11,1948	10.0	3,280	142	
0280.00	Scenery C nr Petersburg	30.0	4(1948-52)	Sept. 23,1948	5.82	4,400	143	
0300.00	Sweetheart Falls C nr Juneau	27	5(1917-18, 19-20, 22-24, 26-27)	Sept. 26,1918	--	2,880	106	
0310.00	Long R ab Long L nr Juneau	8.20	3(1965-68)	Sept. 28,1968	15.05	2,000	241	Maximum recorded
0320.00	Long L O nr Juneau	30.2	1(1913-14)	Oct. 20, 1913	--	4,250	141	Maximum daily
0340.00	Long R nr Juneau	32.5	28(1915-19, 19-22, 26-32, 51-68)	Sept. 10,1927	--	6,000	184	
0360.00	Speel R nr Juneau	226	10(1916-18, 60-68)	Sept. 27,1919	--	35,600	157	Estimated
0380.00	Cowee C nr Juneau	11.4	9(1914-15, 16-18, 19-20, 26-32)	Sept. 9, 1927	--	3,100	272	
0400.00	Dorothy C nr Juneau	15.2	37(1929-41, 42-67)	Nov. 3, 1949	5.85	1,780	117	
0420.00	Carlson C @ Sunny Cv nr Juneau	22.3	5(1915-20)	Sept. 26,1918	--	6,200	278	
0440.00	Carlson C nr Juneau	24.3	9(1951-61)	Aug. 12 or 13, 1961	10.5	5,100	210	
0460.00	Grindstone C nr Juneau	3.6	3(1916-18, 19-20)	Sept. 26,1918	--	700	194	
0480.00	Sheep C nr Juneau	4.57	25(1917-20, 46-68)	Sept. 8, 1948	3.60	840	183	
0500.00	Gold C at Juneau	9.76	25(1916-20,46-48,49-68)	Aug. 12, 1961	6.57	2,650	274	
0520.00	Lemon C nr Juneau	12.1	18(1950-68)	Aug. 13, 1961	5.31	3,370	278	
0525.00	Mendenhall R nr Auke Bay	85.1	3(1965-68)	Sept. 15,1967	8.43	9,020	106	
0528.00	Montana C nr Auke Bay	15.5	3(1965-68)	Aug. 23, 1966	16.77	1,920	124	
0538.00	Lake C at Auke Bay	2.50	5(1963-68)	Aug. 23, 1966	5.2	980	391	
0540.00	Auke C at Auke Bay	3.75	11(1946-59, 61-68)	Nov. 2, 1949	4.85	348	92.7	Maximum observed
0542.00	Herbert R nr Auke Bay	56.0	2(1966-68)	Sept. 18,1967	22.40	6,280	110	
0545.00	Bemile C nr Auke Bay	1.35	2(1966-68)	Sept. 15,1967	6.08	240	178	
0560.00	Sherman C at Comet	3.65	2(1914-16)	Oct. 15, 1915	--	208	57.0	
0561.00	Skagway R at Skagway	145	5(1963-68)	Sept. 15,1967	8.50	13,600	93.7	
0562.00	Weak C nr Skagway	43.2	7(1961-68)	Sept. 15,1967	7.75	9,800	226	
0564.00	Chilkat R @ Gorge nr Klukwan	190	6(1962-68)	Sept. 15,1967	14.59	22,000	116	
0569.00	Chilkat R nr Klukwan	760	3(1958-61)	Aug. 14, 1961	27.40	20,600	27.1	
0575.00	William Henry C nr Auke Bay	1.58	2(1966-68)	Sept. 15,1967	13.70	663	419	
0580.00	Purple L O nr Metlakatla	6.8	9(1946-52, 53-56)	Apr. 27, 1949	5.15	716	105	
0600.00	Perseverance C nr Wacker	2.81	25(1931-32,37-39,46-68)	Oct. 18, 1964	5.68	656	233	

Table 3.--Maximum known floods in Alaska--continued.

Permanent Sta. No. 15-	Stream & Place of Determination	D.A.	Period of Record years/dates	Maximum Flood Known				Remarks
				Date	Gage Height (ft)	Discharge		
						Cfs	Cfs per sq. mi.	
0620.00	Ward C nr Wacker	14.0	4(1948-52)	Apr. 16, 1957	6.83	2,600	186	
0640.00	Ketchikan C at Ketchikan	13.5	9(1910-12,15-19,64-67)	Nov. 18, 1917	--	4,400	325	
0660.00	Beaver Falls C nr Ketchikan	5.8	5(1927-32)	Nov. 7, 1929	--	2,180	376	
0680.00	Mahoney C nr Ketchikan	5.7	18(1922-23,27-33,47-58)	Feb. 2, 1954	4.66	2,530	444	
0700.00	Falls C nr Ketchikan	36.5	25(1916-20, 22-24, 27-33, 46-59)	Nov. 1, 1917	--	5,500	150	
0720.00	Fish C nr Ketchikan	32.1	47(1915-24, 26-31, 32-35, 38-68)	Oct. 15, 1961	5.85	5,400	168	
0722.00	Sea Level C nr Ketchikan	18.6	6(1962-68)	Oct. 19, 1964	13.32	4,000	215	
0740.00	Ella C nr Ketchikan	19.7	23(1927-38, 46-58)	Dec. 7, 1930	--	1,720	87.3	
0760.00	Manzanita C nr Ketchikan	33.9	31(1927-37, 46-67)	Oct. 14, 1961	10.27	5,820	171	
0780.00	Grace C nr Ketchikan	30.2	15(1927-37, 63-68)	Sept. 4, 1964	6.22	3,990	132	
0800.00	Orchard C nr Bell Island	59	7(1915-21, 22-23)	Nov. 1, 1917	--	7,100	120	
0805.00	Traitors R nr Bell Island	20.8	4(1964-68)	Oct. 18, 1964	6.10	2,280	110	
0815.00	Staney C nr Craig	51.6	4(1964-68)	Oct. 18, 1964	13.1	24,500	474	
0818.00	N B Trocadero C nr Hydaburg	17.4	1(1967-68)	Nov. 21, 1967	6.74	4,450	256	
0820.00	Reynolds C nr Hydaburg	5.7	6(1950-56)	Feb. 2, 1954	3.35	475	83.4	
0840.00	Myrtle C at Niblack	3.9	5(1916-21)	Nov. 14, 1917	--	387	99.2	
0850.00	Saltery C nr Kasaan	5.53	3(1961-64)	Oct. 31, 1963	4.07	1,220	220	
0851.00	Old Tom C nr Kasaan	5.90	20(1948-68)	Apr. 16, 1953	6.96	883	150	
0852.00	Dog Salmon C nr Hollis	16.8	5(1963-68)	Oct. 19, 1964	17.14	2,680	159	
0853.00	Cabin C nr Kasaan	8.81	3(1961-64)	Jan. 6, 1963	5.30	1,530	173	
0854.00	Virginia C nr Kasaan	3.08	4(1961-64)	Sept. 20, 1964	4.90	300	97.5	
0856.00	Indian C nr Hollis	8.52	14(1948-53, 54-64)	Oct. 13, 1961	8.09	6,000	680	
0857.00	Harris R nr Hollis	28.7	16(1948-64)	Dec. 5, 1959	10.03	8,810	307	
0858.00	Maybeso C at Hollis	15.1	14(1948-63)	Oct. 14, 1961	9.39	3,760	249	
0860.00	Karta R nr Kasaan	49.5	5(1915-20)	Nov. 1, 1917	--	5,070	102	
0865.00	Neck C nr Point Baker	17.0	7(1960-67)	Oct. 3, 1961	4.62	2,280	134	
0866.00	Big C nr Point Baker	11.2	5(1963-68)	Sept. 3,1966	5.28	2,390	214	
0872.00	Hammer Slough at Petersburg	1.46	3(1964-67)	Oct. 22, 1965	3.07	602	412	
0875.00	Twin C nr Petersburg	3.82	2(1966-68)	Oct. 18, 1966	10.51	290	75.9	
0880.00	Sawmill C nr Sitka	39.0	20(1928-29, 33-35, 36-41, 45-57)	Sept. 8, 1949	10.20	6,100	156	
0900.00	Green L O nr Sitka	31	4(1915-20)	Sept. 26,1918	--	3,300	106	
0920.00	Mikacutof R nr Port Alexander	26	5(1951-56)	Oct. 22, 1953	8.02	2,820	108	
0934.00	Sashin C nr Big Port Walter	2.68	1(1964-68)	Sept. 28,1964	4.32	742	277	
0936.00	E B Lovers Cv C nr Big Port Walter	--	2(1966-68)	Sept. 24,1966	2.83	158	--	
0940.00	Deer L O nr Port Alexander	7.41	17(1950-67)	Dec. 14, 1962	3.80	1,120	151	
0960.00	Coal C nr Baranof	28.5	3(1922-24, 25-26)	Sept. 30,1923	--	4,800	168	
0980.00	Baranof R at Baranof	32.0	19(1914-22, 25-27, 58-59, 60-68)	Sept. 24,1923	--	4,170	130	
1000.00	Takatz C nr Baranof	17.5	18(1950-68)	Sept. 28,1968	5.84	2,620	150	
1020.00	Hunsinburg C nr Angoon	56.2	17(1951-68)	Oct. 21, 1953	3.78	2,400	42.7	
1040.00	Porcupine R nr Chichagof	7.12	1(1919-20)	Jan. 7, 1920	--	1,180	166	
1060.00	Falls C nr Chichagof	6.48	1(1917-18)	Sept. 25,1918	--	665	103	
1070.00	Kadashan R nr Tenakee	37.7	4(1964-68)	Sept. 28,1964	10.23	5,810	154	
1080.00	Pavlof R nr Tenakee	24.3	12(1956-68)	Jan. 4, 1963	8.37	2,970	122	
1086.00	Hilda C nr Douglas	2.62	2(1966-68)	Nov. 21, 1967	4.60	400	149	
1080.00	Lawson C at Douglas	2.98	2(1966-68)	Sept. 5, 1968	4.30	565	189	
1090.00	Fish C nr Auke Bay	13.6	9(1958-68)	Oct. 2, 1961	5.05	2,120	156	

Table 3.--Maximum known floods in Alaska--continued.

Permanent Sta. No. 15-	Stream & Place of Determination	D.A.	Period of Record years/dates	Maximum Flood Known: Date	Gage Height (ft)	Discharge: Cfs	Discharge: Cfs per sq. mi.	Remarks
	SOUTH-CENTRAL							
1990.00	Copper R trib nr Slana	4.32	5(1962-68)	July, 1964	13.75	173	40.0	
2000.00	Gakona R at Gakona	620	19(1947-48, 49-67)	Aug. 1, 1956	7.92	10,300	16.6	
2010.00	Dry C nr Glennallen	11.4	6(1962-68)	May, 1966	12.62	130	11.4	
2011.00	L Nelchina R trib nr Eureka	7.81	4(1964-68)	May 17, 1967	11.84	115	14.7	
2019.00	Moose C trib at Glennallen	7.12	6(1962-68)	May, 1966	15.11	140	19.7	
2020.00	Tazlina R nr Glennallen	2,670	18(1948-50, 51-67)	Aug. 14, 1962	13.19	60,700	22.7	Glacier-dammed lake breakout
2060.00	Klutina R at Copper Center	880	18(1948-66)	June 29, 1953	9.24	9,040	10.3	
2080.00	Tonsina R at Tonsina	420	17(1949-54, 55-67)	June 17, 1962	4.91	8,490	20.2	
2081.00	Squirrel C at Tonsina	70.5	7(1963-68)	June, 1964	5.64	1,200	17.0	
2082.00	Rock C nr Tonsina	14.3	1(1967-68)	--	10.22	95	6.65	
2085.00	Fivemile C nr Chitina	13.2	3(1963-64,65-66,67-68)	Aug., 1964	11.78	290	22.0	
2100.00	McCarthy C nr McCarthy	71	--	June 24, 1913	--	876	12.3	
2115.00	Tebay R nr Chitina	55.4	4(1961-65)	June 9, 1964	3.84	946	17.1	
2120.00	Copper R nr Chitina	20,600	14(1949-52,55-65,66-68)	July, 1951	28.3	220,000	10.7	
2125.00	Boulder C nr Tiekel	9.80	5(1963-68)	June, 1964	12.28	450	45.9	
2128.00	Ptarmigan C trib nr Valdez	0.44	1(1967-68)	--	9.98	23	52.3	
2140.00	Copper R nr Cordova	21,800		July 16, 1913	41.0	216,000	9.90	
2160.00	Power C nr Cordova	20.5	21(1946-68)	Sept. 25,1949	7.65	5,540	270	
2190.00	W F Olsen Bay C nr Cordova	4.78	4(1963-68)	Aug. 21, 1966	4.79	988	206	
2191.00	Control C nr Cordova	4.22	6(1963-69)	Sept. 6, 1965	12.00	579	137	
2220.00	Millard C nr Ellamar	12		Aug. 27, 1913	3.20	462	38.5	
2260.00	Solomon Gulch nr Valdez	19	7(1949-56)	Sept. 4, 1951	6.50	2,420	127	
2280.00	Gold C nr Valdez	9.5		Sept. 23,1913	5.70	2,000	211	
2300.00	Uno C nr Valdez	5.0		Sept. 24,1913	3.62	85	17.0	
2320.00	Davis C at Golden	7.80		Sept. 23,1913	7.20	664	85.0	
2340.00	Avery R nr Golden	9.53		Sept. 23,1913	7.80	989	105	
2360.00	Hobo C nr Golden	5.1		Aug. 27, 1913	4.70	119	23.3	
2369.00	Wolverine C nr Lawing	9.61	2(1966-68)	Sept. 6, 1967	5.94	960	100	
2370.00	Nellie Juan R nr Hunter	125	5(1960-65)	Sept. 12,1961	11.33	9,820	78.5	
2374.00	Chalmers R nr Cordova	6.32	3(1966-70)	Oct. 11, 1961	12.31	3,040	481	
2377.00	Resurrection R nr Seward	169	3(1964-67)	Aug. 21, 1966	10.68	18,900	112	
2378.00	Bear C trib nr Seward	1.63	2(1966-68)	Sept. 7, 1967	4.11	134	82.2	
2380.00	Lost C nr Seward	7.96	9(1948-49, 62-70)	Oct. 11, 1969	11.68	619	77.7	
2385.00	Lowell C at Seward	4.02	4(1964-68)	Aug. 21, 1966	--	1,200	298	
2386.00	Spruce C nr Seward	9.26	3(1965-69)	Aug. 21, 1966	10.1	3,980	430	
2390.00	Bradley R nr Homer	54.0	14(1954-55, 57-70)	Oct. 14, 1969	9.13	7,690	142	
2395.00	Fritz C nr Homer	10.4	7(1962-70)	Oct. 9, 1969	11.63	181	17.4	
2398.00	Diamond C nr Homer	5.35	7(1962-69)	June, 1966	12.00	80	14.9	
2399.00	Anchor R nr Anchor Point	133	4(1964-70)	Oct. 14, 1969	4.72	1,730	13.0	
2400.00	Anchor R at Anchor Point	226	14(1952-66)	May 8, 1963	6.36	3,030	13.4	
2405.00	Cook Inlet trib nr Ninilchik	1.69	3(1965-68)	1967	14.08	--	--	
2416.00	Ninilchik R at Ninilchik	131	6(1962-68)	June 2, 1964	4.46	650	4.96	
2420.00	Kasilof R nr Kasilof	738	20(1948-68)	Sept. 14,1957	7.90	12,300	16.7	
2435.00	Snow R nr Divide	99.8	5(1960-65)	Sept. 30,1961	10.3	25,000	250	Glacier-dammed lake breakout

Table 3.--Maximum known floods in Alaska--continued.

Permanent Sta. No. 15-	Stream & Place of Determination	D.A.	Period of Record years/dates	Maximum Flood Known				Remarks
				Date	Gage Height (ft)	Discharge		
						Cfs	Cfs per sq. mi.	
2439.50	Porcupine C nr Primrose	16.8	6(1962-70)	Sept. 11, 1969	12.58	1,400	83.3	
2440.00	Ptarmigan C at Lawing	32.6	11(1946-50, 51-58)	June 29, 1953	--	980	30.0	
2460.00	Grant C nr Moose Pass	44.2	11(1946-50, 51-58)	Sept. 3, 1957	4.06	1,700	38.4	
2480.00	Trail R nr Lawing	181	21(1946-50, 51-68)	Sept. 18,1967	11.93	7,480	41.3	
2500.00	Falls C nr Lawing	11.8	8(1912-13, 62-69)	Sept., 1966	13.86	693	58.7	
2518.00	Quartz C at Gilpatricks	9.41	7(1962-70)	Oct. 6, 1969	11.54	633	67.3	
2520.00	Quartz C nr Gilpatricks	30		Sept. 24 and 25, 1913	3.75	135	4.5	
2530.00	Crescent C nr Moose Pass	21.4	4(1956-60)	May 25, 1960	2.81	262	12.2	
2540.00	Crescent C nr Cooper Landing	31.7	20(1949-69)	Oct. 9, 1969	1.73	1,500	47.3	Channel scoured
2580.00	Kenai R at Cooper Landing	634	22(1946-68)	Sept. 1, 1967	16.25	21,500	33.9	Glacier-dammed lake breakout
2600.00	Cooper C nr Cooper Landing	31.8	11(1948-59)	June 29, 1953	4.02	729	22.9	
2605.00	Stetson C nr Cooper Landing	8.6	6(1957-63)	Sept. 17,1961	3.00	291	33.8	
2610.00	Cooper C at mouth nr Cooper Lake	48.0	7(1957-64)	Sept. 21,1961	2.11	841	17.5	
2620.00	Kenai R nr Cooper Landing	728		Sept. 27 thru 29, 1913	--	6,070	8.34	
2640.00	Russian R nr Cooper Landing	61.8	8(1946-54)	Nov. 24, 1952	4.75	1,240	20.7	
2660.00	Russian R at mouth nr Cooper Lake	71.0		Sept. 26,1913	4.30	510	7.19	
2663.00	Kenai R at Soldotna	2,010	4(1964-70)	Oct. 15, 1969	12.20	30,000	14.9	
2665.00	Beaver C nr Kenai	51	1(1967-68)	Apr. 28 thru May 3, 1968	--	70	1.37	Maximum daily
2679.00	Resurrection C nr Hope	149	1(1967-70)	Oct. 6, 1969	8.40	2,700	18.1	
2680.00	Resurrection C at Hope	162	21(1949-51)	June 20, 1950	2.80	2,140	13.2	
2695.00	Granite C nr Portage	28.2	3(1966-70)	Oct. 6, 1969	12.46	2,040	72.3	
2700.00	Mills C nr Gilpatricks	25		Sept. 25,1913	3.90	203	8.12	
2701.00	Fresno C at Shield	6.03	7(1962-69)	June, 1969	10.58	135	22.4	
2704.00	Donaldson C nr Wibel	4.07	4(1962-66)	June, 1966	10.15	42	10.3	
2719.00	Cub C nr Sunrise	1.80	5(1964-69)	Sept., 1967	12.09	54	30.0	
2720.00	Sixmile C nr Sunrise	263		Sept. 25,1913	6.95	6,150	23.4	
2725.30	California C at Girdwood	6.96	1(1966-68)	Sept. 18,1967	20.83	593	85.1	
2725.50	Glacier C at Girdwood	62.0	4(1964-68)	Sept. 18,1967	7.90	7,710	124	
2739.00	N F Campbell C at Canyon Mouth	25.2	2(1966-68)	July 20, 1967	3.73	244	9.69	
2740.00	N F Campbell C nr Anchorage	30.4	22(1946-68)	June 21, 1964	3.30	891	29.3	
2743.00	N F Campbell C nr Anchorage	13.4	2(1966-68)	Sept. 17,1967	11.45	81	6.05	
2746.00	Campbell C nr Spenard	69.1	3(1965-68)	Sept. 6, 1967	2.95	275	3.98	
2748.00	CB of CF Chester C nr Anchorage	10.8	2(1966-68)	Sept. 18,1967	10.94	34	3.14	
2750.00	Chester C at Anchorage	20.0	11(1957-68)	Apr. 27, 1963	2.40	95	4.74	
2751.00	Chester C at Arctic Blvd.	29.3	2(1966-68)	Sept. 4 and 5, 1967	2.52	86.5	2.96	
2760.00	Ship C nr Anchorage	90.5	22(1946-68)	June 21, 1964	3.44	1,900	20.5	
2765.00	Ship C at Elmendorf AFB	113	6(1962-68)	Sept. 18,1967	4.74	875	7.75	
2771.00	Eagle R at Eagle River	192	3(1965-68)	Sept. 18,1967	9.40	6,240	32.5	
2772.00	Meadow C at Eagle River	7.43	1(1964-65)	Sept. 15,1965	9.08	22	2.96	
2776.00	E F Eklutna C nr Palmer	38	3(1959-62)	Sept. 12,1961	3.86	1,320	34.7	
2778.00	W F Eklutna C nr Palmer	26	3(1959-62)	Aug. 29, 1962	3.84	1,470	56.5	
2800.00	Eklutna C nr Palmer	119	11(1946-57)	Sept. 18,1951	6.10	2,530	21.2	
2810.00	Knik R nr Palmer	1,180	34(1934-68)	July 18, 1958	25.30	359,000	300	Glacier-dammed lake breakout
2815.00	Camp C nr Sheep Mountain Inn	1.09	1(1967-68)	May 20, 1968	9.70	11.8	10.8	
2820.00	Caribou C nr Sutton	289	14(1954-68)	June 16, 1962	6.89	7,670	26.5	
2823.00	Pinochle C nr Sutton	7.99	1(1967-68)	May 26, 1968	8.79	16.8	2.10	

Table 3.--Maximum known floods in Alaska--continued.

Permanent Sta. No. 15-	Stream & Place of Determination	D.A.	Period of Record years/dates	Maximum Flood Known				Remarks
				Date	Gage Height (ft)	Discharge		
						Cfs	Cfs per sq. mi.	
2824.00	Furiton C nr Sutton	8.51	6(1962-68)	July, 1964	10.60	35	4.11	
2835.00	Eska C nr Sutton	13.4	1(1965-66)	--	10.46	86	6.41	
2840.00	Matanuska R at Palmer	2,070	20(1948-68)	June 8, 1964	11.45	40,100	19.3	
2860.00	Cottonwood C nr Wasilla	28.5	6(1948-54)	--	--	55	1.93	
2900.00	L Susitna R nr Palmer	61.9	21(1947-68)	Aug. 24, 1959	7.39	5,160	83.4	
2910.00	Susitna R nr Denali	950	9(1957-65, 66-68)	Aug. 14 and 15, 1967	12.70	28,200	29.7	
2911.00	Rafe C nr Denali	4.33	6(1962-68)	July, 1964	11.72	210	48.5	
2912.00	Maclaren R nr Paxson	280	11(1957-68)	Sept. 13,1960	7.14	8,920	31.8	
2915.00	Susitna R nr Cantwell	4,140	7(1960-67)	June 8, 1964	8.35	51,200	12.4	
2920.00	Susitna R at Gold Creek	6,160	20(1948-68)	June 7, 1964	16.58	90,700	14.7	
2924.00	Chulitna R nr Talkeetna	2,570	9(1957-62, 64-68)	July 20, 1967	22.48	75,900	29.5	
2927.00	Talkeetna R nr Talkeetna	2,006	4(1963-68)	July 20, 1967	15.75	59,400	28.8	
2928.00	Montana C nr Montana	164	6(1962-68)	July 19 and 20, 1967	12.23	4,600	28.0	
2929.00	Goose C nr Montana	14.3	4(1962-64, 66-68)	June, 1964	11.04	530	36.5	
2930.00	Caswell C nr Caswell	19.8	6(1962-68)	Aug., 1965	12.80	207	10.5	
2940.00	Craigie C nr Wasilla	2.8		June 15, 1913	1.66	70	25.0	
2943.00	Skwentna R nr Skwentna	2,250	9(1959-68)	Aug. 8, 1966	12.55	42,400	18.8	
2945.00	Chakachatna R nr Tyonek	1,120	7(1958-64, 66-68)	Aug. 18, 1967	29.30	23,400	20.9	
2955.00	L Kitoi C nr Afognak	2.63	1(1960-61)	Jan. 20, 1961	2.64	42	16.0	
2956.00	Terror R nr Kodiak	15.0	7(1961-68)	Aug. 29, 1963	5.92	4,590	306	
2875.00	Terror R at mouth nr Kodiak	46.0	5(1963-68)	Sept. 26,1966	6.48	3,820	83.0	
2960.00	Uganik R nr Kodiak	123	18(1950-68)	Oct. 3, 1952	10.65	13,700	111	
2963.00	Spiridon L O nr Larsen Bay	23.3	4(1961-65)	Mar. 27, 1964	1.72	189	8.11	
2970.00	Dog Salmon C nr Aynkulik	72.9	2(1959-61)	Sept. 24,1961	3.08	777	10.6	
2972.00	Myrtle C nr Kodiak	4.74	6(1962-68)	Aug. 30, 1963	4.94	1,080	228	
2975.00	Red Cloud C trib nr Kodiak	1.51	5(1962-67)	Aug. 30, 1963	12.30	570	337	
	SOUTHWEST							
2976.40	Limpet C on Amchitka Island	1.64	1(1967-68)	Nov. 13, 1967	2.36	43	25.4	
2976.50	Falls C on Amchitka Island	1.0	1(1967-68)	Sept. 25,1968	1.25	12	12.0	April to September only
2976.55	Clevenger C on Amchitka Island	0.5	1(1967-68)	Sept. 25,1968	2.71	7.0	14.0	April to September only
2976.60	Constantine Spring on Amchitka Island	--	1(1967-68)	Dec. 18, 1967	--	0.81	--	
2976.80	Bridge C on Amchitka Island	3.03	1(1967-68)	Jan. 2, 1968	3.67	80	26.4	
2976.90	White Alice C on Amchitka Island	1.0	1(1967-68)	Sept. 25,1968	1.53	14.9	14.9	April to September only
2979.00	Eskimo C nr King Salmon	16.1	3(1964-67)	June, 1967	11.2	227	14.1	
2980.00	Tunalinn R nr Fort Alsworth	200	6(1950-56)	June 28, 1953	5.17	4,720	23.6	
3000.00	Newhalen R nr Iliamna	3,300	17(1950-67)	Aug. 30, 1959	9.19	36,000	10.9	
3001.00	Newhalen R trib nr Iliamna	11.3	3(1965-68)	June, 1968	10.79	56	4.95	
3005.00	Kvichak R at Igiugig	6,500	2(1966-68)	Sept. 21 and 22, 1967	21.3	67,000	10.3	
3015.00	Allen R nr Aleknagik	270.0	4(1962-66)	Sept. 16,1965	15.79	7,930	29.3	
3020.00	Nushagak R nr Dillingham	1,490	16(1952-68)	June 25, 1958	9.65	29,000	19.4	
3028.00	Grant L O nr Aleknagik	47	4(1959-60, 61-63, 64-65)	June 1, 1965	--	965	20.5	
3030.00	Wood R nr Aleknagik	1,110	11(1957-68)	June 10, 1965	13.07	22,000	19.8	
3030.10	Silver Salmon C nr Aleknagik	10.2	3(1964-67)	June 12, 1967	11.85	340	33.3	
3036.00	Kuskokwim R at McGrath	11,700	6(1962-68)	June 6, 1964	--	70,000	5.98	

Table 3.--Maximum known floods in Alaska--continued.

Permanent Sta. No. 15-	Stream & Place of Determination	D.A.	Period of Record years/dates	Maximum Flood Known				Remarks
				Date	Gage Height (ft)	Discharge Cfs	Discharge Cfs per sq. mi.	
3040.00	Kuskokwim R at Crooked Creek	31,100	19(1950-55, 57-58, 59-68)	June 5, 1964	25.74	392,000	12.6	
	YUKON							
3050.00	Dennison Fork nr Tetlin Junction	2.93	5(1963-68)	July, 1964	16.29	128	43.7	
3059.50	Taylor C nr Chicken	38.4	1(1967-68)	June 21, 1968	12.59	170	4.42	
3060.00	Dennison Fork nr Chicken	1,540		June 12, 1912	5.80	6,500	4.22	
3080.00	Kechumstuk C nr Chicken	189		June 16, 1916	6.8	2,200	11.6	
3100.00	Mosquito Fork nr Chicken	824		June 16, 1912	5.3	4,030	4.90	
3140.00	Walker Fork at Poker Creek	7.37		Aug. 12, 1912	2.90	25	3.39	
3160.00	Walker Fork at Boundary	15.8		Aug. 11, 1911	3.08	79	5.00	
3180.00	Walker Fork nr Boundary	70.2		Aug. 9, 1910	3.80	242	3.44	
3200.00	Wade C nr Jack Wade	23.1		Aug. 9, 1910	4.08	125	5.40	
3220.00	Napoleon C nr Franklin	13.3		June 6, 1911	--	15.5	1.16	
3240.00	S F Fortymile R at Franklin	3,180		June 17, 1912	10.5	12,600	3.96	
3280.00	Fortyfive Pup nr Franklin	9.1		Aug. 11, 1912	3.90	118	13.0	
3300.00	N F Fortymile R ab Middle Fork	724		Aug. 9, 1910	4.1	1,420	1.96	
3320.00	Confederate C nr Franklin	9		Aug. 11, 1912	1.50	57	6.34	
3340.00	Hutchinson C bl Conf nr Franklin	16.6		Sept. 11,1911	3.1	172	10.4	
3360.00	Montana C nr Franklin	5.9		June, 1912	2.25	65	11.0	
3380.00	Hutchinson C bl Montana Creek	29		Sept. 12,1911	3.35	270	9.31	
3400.00	N F Fortymile R nr Franklin	2,010		May 19, 1911	--	19,500	9.70	
3419.00	N F King Solomon C nr Eagle	18.5	1(1962-63)	Sept., 1963	10.38	18	0.97	
3420.00	King Solomon C at Liberty	54.2		Aug. 7, 1912	5.20	396	7.30	
3460.00	Dome C nr Dome Creek	24.9		Aug. 11, 1912	4.20	47	1.88	
3480.00	Fortymile R at Steel Creek	5,890		July 11, 1963	--	42,800	7.27	
3500.00	Steel C at Steel Creek	12.5		Aug. 9, 1910	3.48	161	12.9	
3520.00	Squaw Gulch nr Bonanza Bar	24.2		Sept. 18,1912	3.00	175	7.23	
3540.00	Canyon C nr Bonanza Bar	56.5		Aug. 9, 1910	4.00	348	6.16	
3560.00	Yukon R at Eagle	113,500	21(1910-12, 49-68)	May 30, 1957	23.01	561,000	4.94	
3600.00	Mission C nr Eagle	84.8		July 5, 1910	3.62	251	2.96	
3620.00	Wolf C nr Eagle	19.5		July 26, 1911	3.35	45	2.30	
3640.00	American C nr Gravel Gulch	24.1		July 5, 1910	3.92	145	6.01	
3650.00	Discovery Fork American C nr Eagle	5.53	3(1962-63, 64-66)	1966	11.18	8.0	1.44	
3660.00	Discovery Fk Amer C nr Gravel Gulch	14.8		July 12, 1910	3.00	73	4.94	
3680.00	American C at Eagle	67.3		June 17, 1910	3.80	779	11.6	
3700.00	Seventymile R ab Fl C nr Crooked C	129		Aug. 7, 1910	4.65	2,280	17.7	
3720.00	Flume C nr Crooked Creek	36.7		Aug. 7, 1912	4.35	735	20.0	
3740.00	Alder C nr Crooked Creek	11.8		Aug. 7, 1912	4.00	162	13.7	
3760.00	Barney C nr Crooked Creek	--		Aug. 9, 1910	2.40	13.4	--	
3800.00	Sanickson C nr Crooked Creek	12.6		June 17, 1910	3.90	310	24.6	
3820.00	Washington C nr Crooked Creek	15.6		July 21, 1912	2.50	100	6.40	
3840.00	Seventymile R nr Crooked Creek	465		Aug. 7, 1912	10.00	13,000	27.9	
3860.00	Crooked Creek at Crooked Creek	17.2		Aug. 7, 1912	5.80	208	12.1	
3880.00	Fox C nr Crooked Creek	8.3		July 21, 1912	2.30	23	2.77	
3890.00	Porcupine R nr Fort Yukon	29,500	4(1964-68)	June 3, 1968	29.60	217,000	7.35	
3895.00	Chandalar R nr Venetie	9,330	5(1963-68)	June 9, 1968	19.57	62,800	6.73	
3920.00	Birch C ab Twelvemile C, Miller Hse	88		July 1, 1911	5.5	550	6.25	

Table 3.--Maximum known floods in Alaska--continued.

Permanent Sta. No. 15-	Stream & Place of Determination	D.A.	Period of Record years/dates	Maximum Flood Known				Remarks
				Date	Gage Height (ft)	Discharge		
						Cfs	Cfs per sq. mi.	
3939.00	N F Twelvemile C nr Miller House	23.2	2(1965-67)	Aug. 14, 1967	14.4	1,710	73.7	
3940.00	Birch C bl Twelvemile C nr Miller Hse	141		June 23, 1912	6.5	1,410	10.0	
3960.00	Fryingpan C nr Miller House	15.9		June 10, 1910	3.46	17	1.07	
3980.00	Grt Unknown C nr Miller House	41.2		June 19, 1912	4.20	323	7.84	
4000.00	Birch C bl Grt Unkn C nr Miller Hse	376		June 24, 1912	7.6	2,520	6.70	
4020.00	Lawson C nr Chena Hot Springs	21.6		July 10, 1912	3.37	35	1.62	
4040.00	Clums Fork nr Chena Hot Springs	46.4		Sept. 20,1912	3.77	66	1.42	
4060.00	Birch C bl Clums Frk nr Miller House	600		June 1, 1911	--	3,500	5.83	
4080.00	Birch C nr Circle Springs	873		June 24, 1912	9.5	8,100	9.29	
4100.00	Buckley Bar C nr Circle Springs	10.6		Sept. 22,1912	2.64	43	4.06	
4140.00	Porcupine C ab di in nr Miller Hse	17.8		July 30, 1914	1.48	62	3.48	
4180.00	Porcupine C bl di in nr Miller Hse	17.8		June 24, 1912	4.75	295	16.5	
4280.00	Bonanza C bl di in nr Miller House	7.9		June 23, 1912	5.70	90	11.4	
4300.00	Porcupine C nr Bonz C nr Miller Hse	39.9		July 12, 1909	--	335	8.40	
4320.00	Independence C nr Miller House	8.6		July 4, 1911	3.54	170	19.8	
4360.00	Miller C nr Miller House	10.5		June 23, 1912	3.30	87	8.29	
4380.00	Mammoth C at Miller House	37.1		June 4, 1909	--	604	16.3	
4385.00	Bedrock C nr Miller House	9.98	(1963-67)	Aug. 14, 1967	15.73	422	42.5	
4398.00	Boulder C nr Central	31.5	6(1963-68)	Aug. 13, 1968	7.50	1,150	36.5	
4400.00	Crooked C at Central	161		June 24, 1912	3.20	1,160	77.20	
4420.00	Deadwood C nr Central	21.3		June 17, 1909	--	105	4.92	
4440.00	Portage C nr Circle Springs	10.9		June 23, 1912	2.92	55	5.04	
Misc	Big Mosquito C nr Central	3.51		Aug. 13, 1968	--	142	40.5	
Misc	Quartz C nr Central	17.2		Aug. 13, 1968	--	375	23.8	
4460.00	Birch C nr Circle	2,150		Aug. 14, 1964	--	84,000	39.1	
4480.00	Bachelor C nr Miller House	11.4		June 8, 1909	1.82	53	4.64	
4500.00	Nome C nr Chatanika	20		June 25, 1912	3.30	142	7.10	
4520.00	Nome C ab Ophir C nr Chatanika	76		June 23, 1912	4.9	764	10.0	
4540.00	Quail C nr Rampart	8.5		June 24, 1909	2.40	188	22.1	
4560.00	Quail C at mouth nr Rampart	20.2		Aug. 9, 1910	3.00	394	19.5	
4580.00	Troublesome C nr Rampart	43.2		June 3, 1910	4.06	708	16.4	
4600.00	Hoosier C nr Rampart	25.7		May 17 and Aug. 9, 1909	2.40	729	28.3	
4620.00	Minook C nr Rampart	130		May 25, 1909	5.2	4,200	32.3	
4640.00	L Minook C nr Rampart	5.9		May 17, 1909	2.38	167	28.3	
4660.00	Hunter C nr Rampart	33.4		Sept. 4, 1909	1.10	28	0.84	
4680.00	Yukon R at Rampart	199,400	13(1954-67)	June 15 and 16, 1964	40.98	950,000	4.75	
4699.00	Silver C nr Northway Junction	11.7	4(1963-67)	July 11, 1964	16.25	355	30.3	
4700.00	Chisana R at Northway Junction	3,280	20(1948-68)	June 28, 1964	13.18	12,000	3.66	
4710.00	Bitterroot C nr Northway Junction	15.4	2(1963-64, 67-68)	June, 1964	17.54	1,010	65.6	
4715.00	Tanana R trib nr Tetlin Junction	2.43	4(1964-68)	May, 1968	11.94	25	10.3	
4720.00	Tanana R nr Tok Junction	6,800	4(1949-53)	Aug. 7, 1953	9.00	35,700	5.25	
4730.00	Bartell C nr Mentasta	12.0	2(1964-66)	1966	--	88	7.33	
4736.00	Log Cabin C nr Log Cabin Inn	10.7	3(1965-68)	June 27, 1968	11.33	258	24.1	
4739.50	Clearwater C nr Tok	37.1	5(1963-68)	June 27, 1968	18.39	1,040	28.0	
4740.00	Tok R nr Tok Junction	930	3(1951-54)	June 16, 1952	6.83	3,830	4.12	
4760.00	Tanana R nr Tanacross	8,550	16(1952-68)	June 19, 1966	11.65	39,100	4.67	

Table 3.--Maximum known floods in Alaska--continued.

Permanent Sta. No. 15-	Stream & Place of Determination	D.A.	Period of Record years/dates	Maximum Flood Known				Remarks
				Date	Gage Height (ft)	Discharge		
						Cfs	Cfs per sq. mi.	
4760.50	Tanana R trib nr Tanacross	3.32	5(1963-68)	July, 1964	13.2	165	49.7	
4762.00	Tanana R trib nr Dot Lake	11.0	5(1963-68)	July, 1964	12.70	146	13.3	
4763.00	Berry C nr Dot Lake	65.1	5(1963-68)	July 19, 1964	15.11	2,980	45.8	
4764.00	Dry C nr Dot Lake	57.6	5(1963-68)	July 20, 1964	16.20	2,200	38.2	
Misc	Jarvis C nr Delta Junction	247		June 15, 1967	--	784	3.17	
4780.00	Tanana R at Big Delta	13,500	8(1949-57)	July 29, 1949	23.57	62,800	4.65	
4780.10	Rock C nr Paxson	50.3	6(1962-68)	June, 1964 & Aug. 15, 1967	12.24	1,230	24.4	
4780.40	Phelan C nr Paxson	12.3	2(1966-68)	Aug. 13, 1967	11.51	2,320	190	
4780.50	McCallum C nr Paxson	15.5	2(1966-68)	Aug. 13, 1967	12.12	1,010	65.2	
4785.00	Ruby C nr Donnelly	5.32	4(1963-67)	July, 1967	12.46	150	28.2	
4800.00	Banner C at Richardson	20.5	4(1963-67)	1966	13.55	732	35.6	
4820.00	Junction C nr Richardson	23.6		June 24 and 25, 1912	11.0	300	12.7	
4840.00	Salcha R nr Salchaket	2,170	18(1948-50, 60-68)	Aug. 14, 1967	20.50	97,000	44.7	
Misc	L Salcha R nr Salchaket	67.4		Aug. 13, 1967	--	1,900	28.2	
4850.00	Moore C at Eielson AFB	136	2(1963-65)	June 14, 1965	7.88	370	2.72	
4852.00	Garrison Slough at Eielson AFB	6.24	2(1963-65)	Apr. 18, 1965	4.45	51	8.17	
4860.00	Chena R nr Chena Hot Springs	157		Aug. 7, 1912	6.25	772	4.92	
4880.00	N F Chena R nr Chena Hot Springs	93.8		June 28, 1912	2.83	119	1.27	
4900.00	Monument C at Chena Hot Springs	30.1		July 28, 1912	2.75	74	2.46	
4920.00	N F Chena R bl Moma C nr Chena Ht Sp	129		June 23, 1912	4.08	162	1.26	
4930.00	Chena R nr Two Rivers	941	1(1967-68)	May 20, 1968	18.60	6,620	7.03	
Misc	Poldrich C nr Two Rivers	3.49		Aug. 12, 1967	--	40	11.5	
Misc	Chena R ab L Chen R nr Eielson AFB	1,370		Aug. 13 or 14, 1967	--	105,000	76.6	
4940.00	Chena R nr Fairbanks	1,440		June 25, 1912	--	9,050	6.28	
4960.00	L Chena R ab Sor C nr Chatanika	79		May 20, 1908	2.20	405	5.12	
4980.00	Sorrels C nr Chatanika	21		May 20, 1908	2.30	131	6.23	
5000.00	Elliott C nr Chatanika	13.8		May 20, 1908	3.30	111	8.05	
5020.00	Fish C bl Solo C nr Chatanika	21.5		Aug. 15, 1911	5.4	120	5.58	
5040.00	Fish C ab Fairbanks nr Chatanika	39		May 22, 1908	3.60	227	5.81	
5060.00	Miller C nr Chatanika	16.7		May 16, 1908	2.45	122	7.31	
5080.00	Fish C at mouth nr Chatanika	90.2		May 4, 1908	4.35	682	7.54	
5100.00	L Chena R nr Chatanika	228		May 16, 1908	4.85	1,670	7.32	
5110.00	L Chena R nr Fairbanks	356		Aug. 13, 1967	31.7	17,000	47.7	
5120.00	Chena Slough nr Fairbanks	2.[illegible]	5(1947-52)	May 15, 1948	4.86	740	37.0	
Misc	Steele C nr Fairbanks	10.7		Aug. 12, 1967	--	340	31.8	
5140.00	Chena R at Fairbanks	1,980	22(1946-68)	Aug. 15, 1967	18.82	74,400	37.6	
Misc	Isabella C nr Fairbanks	4.56		Aug. 12, 1967	--	160	35.1	
5155.00	Tanana R at Nenana	27,500	2(1961-63)	Aug. 18, 1967	18.90	186,000	6.76	
5158.00	Seattle C nr Cantwell	36.2	6(1962-68)	June, 1964	13.43	3,100	85.6	
5159.00	Lily C nr Cantwell	5.63	2(1966-68)	June, 1966	10.78	130	23.1	
5160.00	Nenana R nr Windy	710	16(1950-68)	June 15, 1962	9.84	11,900	16.8	
5161.00	Nenana R trib nr Cantwell	1.62	2(1966-68)	July 21, 1967	9.14	10	6.18	
5162.00	Slime C nr Cantwell	6.98	2(1966-68)	July, 1967	14.52	685	99.3	
5180.00	Nenana R nr Healy	1,910	18(1950-68)	July 25, 1967	13.40	48,800	24.5	
5181.00	L Panguingue C nr Lignite	3.44	2(1964-65, 66-67)	Aug. 12, 1967	14.13	151	44.2	
5182.00	Rock C nr Ferry	8.17	1(1966-67)	Aug. 12, 1967	17.40	515	63.0	
5182.50	Birch C nr Rex	4.10	3(1964-67)	Aug. 12, 1967	14.74	464	113	

Table 1.--Maximum known floods in Alaska- continued.

Permanent Sta. No. 15-	Stream & Place of Determination	D.A.	Period of Record years/dates	Maximum Flood Known				Remarks
				Date	Gage Height (ft)	Discharge		
						Cfs	Cfs per sq. mi.	
5183.00	Nenana R nr Rex	2,450	3(1964-67)	July 25, 1967	14.85	63,000	25.7	
5183.50	Teklanika R nr Lignite	489	4(1964-68)	July 25, 1967	12.51	33,100	67.7	
5184.00	Tanana L trib nr Nenana	0.58	2(1965-67)	May, 1967	12.01	17.7	30.5	
Misc	Tolovana R nr Livengood	140		Aug. 12 or 13, 1967	--	12,000	85.7	
5190.00	Bridge C nr Livengood	12.6	5(1962-67)	Aug., 1964	17.41	1,070	85.0	
Misc	W F Tolovana R nr Livengood	291		Aug. 13, 1967	--	2,290	7.86	
5192.00	Tolovana R trib nr Livengood	7.81	4(1963-67)	Aug., 1964	12.58	137	17.5	
5200.00	Idaho C nr Miller House	5.31	5(1962-67)	Aug. 12 thru 14, 1967	28.06	626	118	
5220.00	McManus C nr Chena Hot Springs	80		June 10, 1910	4.62	760	9.50	
5230.00	Smith C nr Chena Hot Springs	17.0		Aug. 15, 1911	4.05	50	2.94	
5240.00	Pool C nr Chena Hot Springs	14		Aug. 15, 1911	4.00	77	5.50	
5260.00	Charity C nr Chena Hot Springs	6.9		June 3, 1910	3.75	77	11.1	
5280.00	Homestake C nr Chena Hot Springs	5.6		June 23, 1912	3.50	58	10.4	
5300.00	Faith C nr Chena Hot Springs	61.1	7(1911-12, 62-68)	Aug. 14, 1967	15.15	4,950	81.0	
5320.00	Chatanika R nr Chena Hot Springs	132		Sept. 12, 1907	6.31	2,190	16.6	
Misc	Chatanika R nr Chatanika	244		Aug. 13, 1967	--	19,600	80.3	
5340.00	Kokomo C nr Chatanika	33		Aug. 1, 1907	--	233	7.06	
5340.00	Chatanika R nr Chatanika	456		May 9, 1914	7.30	3,480	7.64	
Misc	Chatanika R nr Olnes	528		Aug. 13 and 14, 1967	--	25,000	47.3	
Misc	Rose C nr Fox	2.00		Aug. 13, 1967	--	104	52.0	
5400.00	Goldstream C nr Fox	28.6		Sept. 16, 1907	1.80	41	1.43	
Misc	Tatalina R nr Livengood	80.8		Aug. 12 thru 14, 1967	--	3,560	44.1	
5416.00	Globe C nr Livengood	26.3	3(1964-66)	July, 1967	12.0	284	10.8	
5416.50	Globe C trib nr Livengood	9.01	4(1963-67)	Aug. 12, 1967	15.35	490	54.3	
5418.00	Washington C nr Fox	46.7	3(1965-68)	Aug. 14, 1967	18.29	2,500	53.5	
5420.00	Washington C ab Aggie C nr Martin	117		June 15, 1909	4.50	557	4.75	
5440.00	Aggie C nr Martin	35.8		May 24, 1909	3.29	136	3.80	
5460.00	Washington C nr Martin	153		May 15, 1909	--	1,400	9.15	
5480.00	New York C nr Eureka	4.7		Aug. 9, 1909	1.20	100	21.3	
5520.00	California C nr Eureka	6.7		Sept. 18 and 19, 1908	1.30	8.7	1.30	
5560.00	Pioneer C nr Eureka	8.1		May 26, 1909	2.35	86	10.6	
5620.00	Hurlinana C nr Eureka	42.7		Aug. 9, 1909	3.5	315	7.37	
5640.00	Sullivan C at Tofty	19.6		Aug. 9, 1909	2.10	198	10.1	
5646.00	Melozitna R nr Ruby	2,693	7(1961-68)	Sept. 3, 1962	9.40	28,200	10.5	
5648.00	Yukon R at Ruby	259,000	11(1956-68)	June 20, 1964	35.40	970,000	3.74	
5649.99	Koyukuk R at Hughes	18,700	8(1960-68)	June 6, 1964	31.89	266,000	14.2	
5652.00	Yukon R at Kaltag	296,000	10(1956-66)	June 27, 1964	26.44	1,030,000	3.48	
	NORTHWEST							
5660.00	Pargon R nr Boston	20		July 6, 1909	1.10	89	4.45	
5780.00	Candepaza R nr Candepaza	47		July 30, 1909	2.8	1,080	23.0	
5840.00	Coleman R at East Fork	66		July 31, 1909	1.55	692	10.5	
5850.00	Goldengate C nr Nome	1.55		Sept. 8, 1965	11.7	59	38.0	
5880.00	Nome R ab Mio di in nr Nome	15		June 15, 1907	2.14	460	30.7	
6000.00	Nome R bl Mio di in nr Nome	15		June 16, 1909	1.80	271	18.1	
6140.00	Nome R nr Nome	37		Sept. 7, 1910	3.4	910	24.6	
6160.00	Hobson C nr Nome	2.6		June 11, 1909	--	60	23.0	
6200.00	Snake R nr Nome	69		June 25 and Sept. 11, 1908	1.00	540	7.83	

Table 3.--Maximum known floods in Alaska--continued.

Permanent Sta. No. 15-	Stream & Place of Determination	D.A.	Period of Record years/dates	Maximum Flood Known: Date	Gage Height (ft)	Discharge: Cfs	Cfs per sq. mi.	Remarks
6210.00	Snake R nr Nome	85.7	4(1964-68)	June 2[illegible], 1966	11.90	4,200	49.0	
6240.00	Penny R nr Oregon	19		July 7, 1907	2.2	152	8.0	
6260.00	Pilgrim R nr Nome	8.2		Sept. 10,1907	--	160	19.5	
6290.00	Windy C nr Nome	12		Sept. 10,1907	--	200	16.7	
6300.00	Marsh C nr C nr Nome	2.3		Sept. 10,1907	--	40	17.4	
6330.00	Washington C nr Nome	6.34	3(1963-65, 67-68)	Sept. 8, 1965	12.50	220	34.7	
6400.00	West Fork Grand Central River	2.0		July 8, 1906	--	200	71.5	Estimated maximum daily
6420.00	W F Grand Central R at di in nr Iron	5.4		July 8, 1906	--	600	111	Estimated maximum daily
6440.00	Center L O nr Iron Creek	1.8		July 8, 1906	--	200	111	Estimated maximum daily
6460.00	W F Grand Central R nr Iron Creek	7.7		Sept. 10,1907	2.70	406	52.7	
6480.00	N F Grand Central R at di in nr Nome	2.3		Sept. 10,1907	--	171	74.4	Estimated maximum daily
6500.00	N F Grand Cen R nr di in nr Iron C	5.5		Sept. 2[illegible],1906	1.5	120	21.8	
6520.00	N F Grand Central R nr Iron Creek	6.9		Sept. 10,1907	2.25	364	52.8	
6540.00	Grand Central R bl Fairbanks nr Iron	14.6		July 8, 1906	--	1,160	79.5	Estimated maximum daily
6560.00	Gold Run nr Iron Creek	10.5		Sept. 11,1907	--	120	11.4	
6580.00	Thompson C nr Iron Creek	2.5		July 8, 1906	--	200	80.0	Maximum daily
6640.00	Grand Central R nr Iron Creek	44		July 8, 1906	--	1,500	34.1	Estimated maximum daily
6660.00	Kruzgamepa R nr Iron Creek	84	2(1908-10)	Sept. 8, 1910	--	4,300	51.2	
6681.00	Bear C nr Nome	3.91	4(1964-65, 66-68)	June, 1965	11.77	144	36.8	
6682.00	Crater C nr Nome	22.1	1(1963-64)	June, 1964	12.59	816	36.9	
6760.00	Iron C nr Iron Creek	50		June 16, 1909	3.30	1,160	23.2	
6782.00	Bear C nr Pilgrim Springs	3.7		Aug. 9, 1909	1.50	41	11.1	
6840.00	Smith C nr Mary Ialoo	6.8		Aug. 9, 1909	1.85	231	34.0	
6920.00	Kuzitrin R nr Taylor	44		Sept. 10,1907	--	351	7.97	
7000.00	Taylor C nr Taylor	73.4		Sept. 10,1907	2.40	430	5.86	
7020.00	Henry C nr Taylor	51		Sept. 6, 1910	1.95	449	8.80	
7120.00	Kuskokwim R nr Nome	1,720	b(1909-12, 61-63, 65-68)	June 2, 1966	11.94	31,900	18.5	
7160.00	Goodhope R nr Cottonwood	194		June 24 and 28, 1909	1.20	91	0.47	
7180.00	Innachuk R at Utica	145		June 26 and 27, 1909	--	93	0.64	
7340.00	Quartz C nr Candle	56		Aug. 10, 1909	2.90	242	4.32	
7360.00	Glacier C nr Candle	10		June 16, 1909	--	108	10.8	
7400.00	Hunter C nr Candle	32		Sept. 18,1908	1.02	26.6	0.83	
7430.00	June C nr Kotzebue	10.9	3(1964-67)	June 6, 1966	6.72	209	19.2	
7440.00	Kobuk R at Ambler	6,570	3(1965-68)	June 13 and 14, 1966	38.2	94,000	14.3	
7460.00	Noatak R at Noatak	12,000	3(1965-68)	June 14, 1968	28.7	242,000	20.2	
7480.00	Ootorpik R nr Point Hope	35	5(1957-62)	Sept. 4, 1961	4.36	1,450	41.4	
	ARCTIC SLOPE							
Misc	Colville R at Mouth	23,300		June 14, 1962	--	216,000	9.26	Arnborg, Walter & Peippe report
9750.00	Chamberlin C nr Barter Island	1.46		July 9, 1958	--	88	60.3	
9760.00	Neruokpukkoonga C nr Barter Island	123		June 23, 1958	--	706	5.74	

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APPENDIX

Surface-water stations in Canada used in this study

Station number	Station name	Drainage area (sq mi)	Daily record length in years*
	STIKINE RIVER BASIN		
15-0242.00	Klappan R nr Telegraph C, B.C.	1,360	7(1961-
0243.00	Stikine R ab Grd Cyn nr Telegraph C, B.C.	7,300	12(1957-
0244.00	Tanzilla R nr Telegraph C, B.C.	616	8(1958-66)
0245.00	Tuya R nr Telegraph C, B.C.	1,360	7(1962-
0246.00	Stikine R at Telegraph C,	11,300	15(1953-
0247.00	Iskut R bl Johnson R, B.C.	3,610	10(1958-
	TAKU RIVER BASIN		
0410.00	Sloko R nr Atlin, B.C.	180	12(1958-
0411.00	Taku R nr Tulsequah, B.C.	6,000	16(1952-
	ALSEK RIVER BASIN		
1200.00	Aishihik R nr Whitehorse, Y.T.	1,620	19(1949-
1202.00	Kathleen R nr Haines Jct., Y.T.	249	6(1958-64)
1205.00	Dezedeash R at Haines Jct., Y.T.	3,200	16(1952-
	YUKON RIVER BASIN		
3045.20	Lubbock R nr Atlin, Y.T	650	14(1954-
3045.50	Pine C nr Atlin, B.C.	269	13(1963-
3046.00	Atlin R nr Atlin, B.C.	2,520	18(1950-
3046.50	Wann R nr Atlin, B.C.	104	12(1956-
3047.00	Fantail R at O of Fantail L nr Atlin, B.C.	289	12(1956-
3047.50	Tutshi R at O of Tutshi L nr Atlin, B.C.	366	12(1956-
3048.00	Lindeman R nr Bennett, B.C.	92	14(1954-
3048.50	Wheaton R nr Carcross, Y.T.	337	13(1955-
3049.20	Tagish C nr Carcross, Y.T.	31	11(1965-

*Dates are last continuous period of record.

APPENDIX--continued

Surface-water stations in Canada used in this study

Station number	Station name	Drainage area (sq mi)	Daily record length in years*
	YUKON RIVER BASIN--cont.		
15-3049.50	MaClintock R nr Whitehorse, Y.T.	597	13(1955-
3050.00	Yukon R at Whitehorse, Y.T.	7,500	25(1943-
3050.30	Takhini R at O of Kusawa L, Y.T.	1,570	16(1951-
3050.50	Takhini R nr Whitehorse, Y.T.	2,640	21(1947-
3051.00	Yukon R ab Frank C, Y.T.	12,000	16(1952-
3051.50	Swift R nr Swift R, B.C.	1,280	13(1955-
3052.00	Gladys R at O of Gladys L nr Atlin, B.C.	737	12(1956-
3052.50	Teslin R nr Teslin, Y.T.	11,700	23(1947-
3052.60	Teslin R nr Whitehorse, Y.T.	13,700	13(1955-
3053.00	Big Salmon R nr Carmacks, Y.T.	2,640	13(1961-
3053.50	Yukon R at Carmacks, Y.T.	33,600	18(1950-
3053.90	Ross R at Ross R, Y.T.	2,800	7(1961-
3054.00	Pelly R at Ross R, Y.T.	7,670	15(1953-
3054.20	Pelly R at Pelly Crossing, Y.T.	19,700	17(1951-
3054.50	Yukon R ab White R nr Dawson, Y.T.	58,400	12(1955-
3055.00	Kluane R at O of Kluane L., Y.T.	1,730	16(1952-
3055.90	Stewart R at Mayo, Y.T.	12,100	20(1948-
3056.20	Stewart R at Stewart Crossing, Y.T.	13,500	8(1960-
3056.50	Stewart R at mouth, Y.T.	19,000	5(1963-
3056.70	Yukon R at Stewart R, Y.T.	97,300	10(1955-65)
3057.00	Yukon R at Dawson, Y.T.	106,000	22(1955-
3889.50	Porcupine R at Old Crow Y.T.	20,900	8(1960-

*Dates are last continuous period of record.