WATER-POWER INVESTIGATIONS IN SOUTHEASTERN ALASKA.

By GEORGE H. CANFIELD.

INTRODUCTION.

Systematic investigation of the water resources of Alaska was begun by the United States Geological Survey in 1906 and has been carried on in different parts of the Territory to the present time. This investigation was undertaken in response to the need for definite information in regard to water available for many uses, among which the most important are hydraulicking, dredging, and supplying power for mines, canneries, and sawmills.

The investigation of the water resources of southeastern Alaska was begun by the Geological Survey in cooperation with the Forest Service in 1915 and was designed to determine both the location and the possibilities of water-power sites. The results of previous years' work have already been published. A table showing water-power possibilities in southeastern Alaska is given on page 184, Bulletin 714–B.

The Geological Survey maintained a number of gaging stations in southeastern Alaska throughout the year, and other stations were installed in cooperation with individuals and corporations. The records obtained at these stations are contained in this paper. Acknowledgment is made to those who have assisted in this work, particularly to Mr. W. G. Weigle and Mr. Charles H. Flory, supervisors of the Forest Service at Ketchikan, and to Mr. Philip H. Dater, district engineer at Portland, Oreg.

The following list shows the stations which have been maintained in southeastern Alaska and the date of establishment. A dash after the date indicates that the station was in operation after December 31, 1920. The location of the stations is shown on Plate I (p. 76).

1. Myrtle Creek at Niblack, Prince of Wales Island, 1917—
2. Karta River at Karta Bay, Prince of Wales Island, 1915—
3. Ketchikan Creek at Ketchikan 1909–1912; 1915–1919.
4. Beaver Falls Creek at George Inlet, Revillagigedo Island, 1917—
5. Mahoney Creek at George Inlet, Revillagigedo Island, 1920—
6. Fish Creek near Sea Level, Revillagigedo Island, 1915—
7. Swan Lake outlet at Carroll Inlet, Revillagigedo Island, 1916—

8. Orchard Lake outlet at Shrimp Bay, Revillagigedo Island, 1915—
9. Shelockum Lake outlet at Bailey Bay, 1915—
10. Mill Creek on mainland near Wrangell, 1915–1917.
11. Cascade Creek at Thomas Bay, near Petersburg, 1917—
12. Green Lake outlet at Silver Bay, near Sitka, 1915—
13. Baranof Lake outlet at Baranof, Baranof Island, 1915—
14. Falls Creek at Nickel, near Chichagof, 1918–1920.
15. Porcupine Creek near Nickel, 1918–1920.
16. Sweetheart Falls Creek near Snettisham, 1915—
17. Crater Lake outlet at Speel River, Port Snettisham, 1913—
18. Long Lake outlet at Port Snettisham, 1913–1915.
19. Long River below Second Lake, at Port Snettisham, 1915—
20. Speel River at Port Snettisham, 1916–1918.
21. Grindstone Creek at Taku Inlet, 1916—
22. Carlson Creek at Sunny Cove, Taku Inlet, 1916—
23. Sheep Creek near Thane, 1916—
24. Gold Creek at Juneau, 1916—
25. Sherman Creek at Kensington mine, 1914–1916.

STATION RECORDS.

MYRTLE CREEK AT NIBLACK, PRINCE OF WALES ISLAND.

LOCATION.—Halfway between beach and Myrtle Lake outlet, which is one-third mile from tidewater, 1 mile from Niblack, in north arm of Moira Sound, Prince of Wales Island, and 35 miles by water from Ketchikan.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—July 30, 1917, to December 31, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank; reached by a trail which leaves beach near the mouth of the creek.

DISCHARGE MEASUREMENTS.—At medium and high stages made from a cable across creek at outlet of lake; at low stages made by wading.

CHANNEL AND CONTROL.—The gage is in a pool 10 feet upstream from a contracted portion of the channel, at a rocky riffle that forms a well-defined and permanent control. At the cable section the bed is smooth, the water deep, and the current uniform and sluggish.

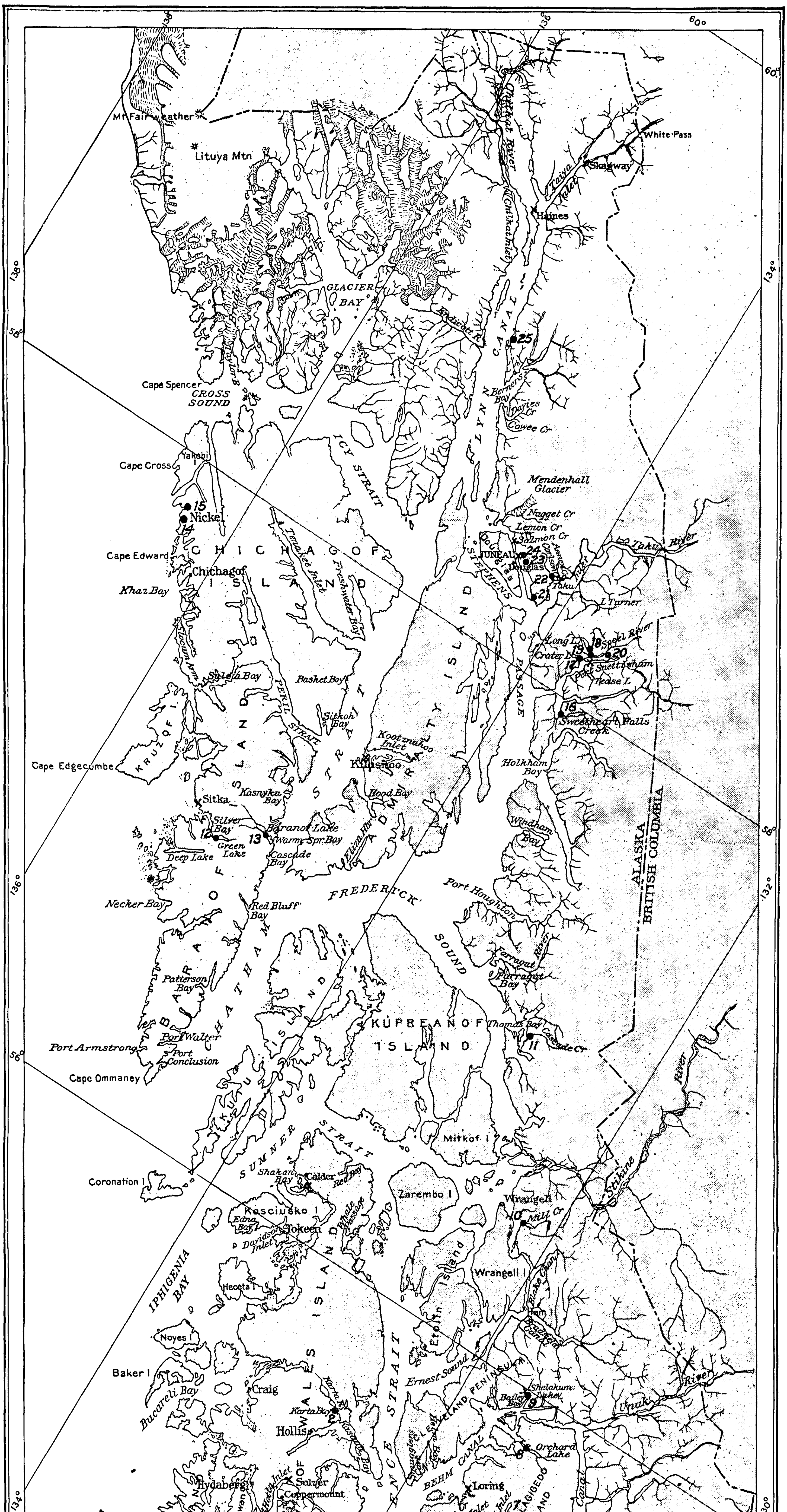
EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.85 feet, at 1 a. m. August 6 (discharge, 169 second-feet); minimum stage, 0.95 foot, at 4 p. m. July 29 (discharge, 24 second-feet).

1917–1920: Maximum stage recorded, 4.4 feet at 5 p. m. November 18, 1917 (discharge from extension of rating curve, 387 second-feet); minimum stage, 0.95 foot, at 4 p. m. July 29, 1920 (discharge, 24 second-feet).

ICE.—Stage-discharge relation not affected by ice.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 25 and 220 second-feet. Operation of water-stage recorder satisfactory, except for periods indicated in footnote to daily discharge table. Daily discharge ascertained by applying to rating table mean gage heights determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging results obtained by applying to rating table gage heights for regular intervals of day. Records excellent, except for periods of break in record, for which they are fair.

Myrtle Lake, the outlet of which is 800 feet from Niblack Anchorage, is 95 feet above high tide and covers 122 acres. Niblack Lake, the outlet of which is 5,700 feet from Niblack Anchorage, is 450 feet above high tide and covers 383 acres. Mary Lake,



SCALE ON 56TH PARALLEL

10 0 10 20 30 40 50 60 70 MILES

● Stream-gaging station

x Precipitation station

MAP OF SOUTHEASTERN ALASKA SHOWING LOCATION OF GAGING STATIONS.

unsurveyed, is about 600 feet above sea level and is a mile long and one-fourth to one-half mile wide. The large lake area in this small drainage basin is the cause of the well-maintained flow during the winter and periods of little rainfall.

A tunnel about 200 feet long through the low ridge separating the outlet of Myrtle Lake from the Niblack Anchorage was practically completed in 1920 by the G. M. Wakefield Mineral Lands Co. At the lake end, the upper 2 feet only of the tunnel section was broken through, because the bottom of the tunnel is at about the same elevation as Myrtle Lake.

No discharge measurements were made at this station during the year.

Daily discharge, in second-feet, of Myrtle Creek at Niblack, for 1920.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	34	44	46	43	31	67	83	157	76
2	.....	.....	32	42	46	40	43	64	95	175	70
3	.....	.....	32	41	46	38	46	56	93	157	88
4	.....	.....	32	40	46	36	102	53	90	140	100
5	.....	.....	32	47	46	35	157	50	88	121	118
6	.....	.....	32	53	46	34	157	46	79	111	140
7	.....	.....	31	54	44	33	100	52	72	103	134
8	.....	.....	31	54	44	31	73	82	67	96	114
9	.....	.....	30	52	46	31	58	67	86	89	99
10	.....	.....	30	48	46	30	54	56	100	84	92
11	.....	50	54	46	44	29	102	65	86	77	86
12	.....	50	71	46	42	29	109	70	80	73	84
13	53	47	57	45	40	28	91	62	105	68	88
14	50	.....	48	42	40	27	77	56	95	63	89
15	48	.....	41	50	42	27	68	71	86	60	80
16	48	.....	37	54	40	27	64	71	79	60	73
17	60	.....	37	55	40	26	59	64	73	62	89
18	80	.....	47	54	42	26	56	57	68	61	92
19	60	34	44	50	40	25	52	54	67	63	81
20	52	34	40	47	40	25	50	68	94	65	75
21	48	33	37	44	40	25	48	80	89	73	70
22	46	33	36	44	42	25	47	98	92	71	67
23	.....	32	35	44	43	25	46	83	106	73	63
24	.....	32	35	43	44	25	44	70	114	84	58
25	.....	31	42	50	44	25	41	63	104	111	56
26	.....	31	60	61	47	25	52	61	92	101	63
27	.....	32	60	56	46	25	61	64	96	96	134
28	.....	37	55	51	47	24	55	106	87	98	124
29	.....	40	50	48	48	24	50	92	78	89	99
30	.....	40	46	48	45	24	46	77	83	81	91
31	.....	36	.....	46	.....	25	56	.....	114	.....	103

NOTE.—Water-stage recorder not operating; discharge estimated from maximum and minimum stages indicated by recorder and comparison with climatic data for Ketchikan and hydrographs for Fish Creek and Karta River: Jan. 1–31, 100 second-feet; Feb. 1–12, 85 second-feet; Feb. 17–19, daily discharge; Feb. 23–29, 40 second-feet; Mar. 1–10, 35 second-feet; Mar. 14–18, 40 second-feet; Apr. 19 and 20, as shown in table.

Monthly discharge of Myrtle Creek at Niblack, for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	.....	.....	100	6,150	August	157	31	67.6	4,160
February	.....	.....	63.6	3,660	September	106	46	67.5	4,020
March	.....	.....	36.8	2,260	October	114	67	88.4	5,430
April	60	30	41.6	2,480	November	175	60	92.1	5,480
May	61	40	48.4	2,980	December	140	56	90.2	5,550
June	48	40	43.7	2,600					
July	43	24	28.8	1,770	The year	.....	24	64.1	46,500

KARTA RIVER AT KARTA BAY, PRINCE OF WALES ISLAND.

LOCATION.—In latitude 55° 34′ N., longitude 132° 37′ W., at head of Karta Bay, an arm of Kasaan Bay, on east coast of Prince of Wales Island, 42 miles by water across Clarence Strait from Ketchikan.

DRAINAGE AREA.—49.5 square miles (U. S. Forest Service reconnaissance map of Prince of Wales Island, 1914).

RECORDS AVAILABLE.—July 1, 1915, to December 31, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank, half a mile above tidewater, at head of Karta Bay and 1¼ miles below outlet of Little Salmon Lake. Two per cent of total drainage of Karta River enters between outlet of lake and gage.

DISCHARGE MEASUREMENTS.—At medium and high stages made from cable across river 50 feet upstream from gage; at low stages by wading at cable section.

CHANNEL AND CONTROL.—From Little Salmon Lake, 1½ miles from tidewater, the river descends 105 feet in a series of rapids in a wide, shallow channel, the banks of which are low but do not overflow. The bed is of coarse gravel and boulders; rock crops out only at outlet of lake. Gage and cable are at a pool of still water formed by a riffle of coarse gravel that makes a well-defined and permanent control.

EXTREMES OF DISCHARGE.—1915–1920: Maximum stage, 5.5 feet November 1, 1917 (discharge, 5,070 second-feet); minimum flow, 21 second-feet, February 11, 1916.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 80 and 1,500 second-feet; extended below 80 second-feet to the point of zero flow and above 1,500 second-feet by estimation. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging results obtained by applying gage heights for regular intervals to rating table. Records excellent, except for periods of breaks in record and for discharge above 1,500 second-feet, for which they are fair.

The combined area of Little Salmon Lake at an elevation of 105 feet and Salmon Lake at an elevation of 110 feet is 1,600 acres. The slopes along the right shore of lakes and at head of Salmon Lake are gentle, and the area included by the 250-foot contour above outlet of lake is 5,500 acres. The drainage area below an elevation of 2,000 feet is heavily covered with timber and dense undergrowth of ferns, brush, and alders. The upper parts of the mountains are covered with thin soil and brush. Only a few peaks at an elevation of 3,500 feet are bare. This large lake and flat area and thick vegetal cover afford considerable natural storage, which, after heavy precipitation, maintains a good run-off. The snow usually melts by the end of June, and the run-off becomes very low during a dry, hot summer.

The Forest Service in the summer of 1916 constructed a pack trail from tidewater to outlet of Little Salmon Lake and ran a line of levels to outlet of Little Salmon Lake, the elevation of which was found to be 105 feet above high tide.

No discharge measurements were made at this station during the year.

Daily discharge, in second-feet, of Karta River at Karta Bay, for 1920.

Day.	Jan.	Feb.	Mar.	Apr.	May.	Aug.	Oct.	Nov.	Dec.
1	454	.....	106	180	.....	.....	.....	1,000	448
2	1,110	.....	97	160	.....	.....	.....	1,940	350
3	2,430	.....	88	142	.....	.....	.....	1,820	364
4	1,570	.....	83	132	.....	.....	.....	1,250	468
5	980	.....	78	128	.....	.....	.....	860	705
6	714	.....	78	128	.....	.....	.....	625	835
7	860	.....	81	125	.....	.....	.....	501	748
8	2,060	.....	88	118	.....	.....	.....	396	588
9	1,390	.....	100	109	.....	.....	.....	326	460
10	916	.....	106	103	.....	.....	.....	269	362
11	609	.....	142	152	.....	.....	.....	233	302
12	536	.....	180	238	.....	.....	565	192	264
13	494	.....	180	254	.....	.....	705	172	274
14	681	238	172	238	.....	.....	880	152	280
15	681	224	160	215	.....	.....	748	132	254
16	543	228	142	192	.....	.....	588	121	192
17	454	565	142	.....	.....	.....	467	118	248
18	356	765	132	.....	.....	.....	382	118	382
19	296	684	118	.....	.....	238	308	135	396
20	243	515	109	.....	.....	.....	350	160	350
21	201	402	100	.....	.....	.....	422	238	308
22	.....	320	88	.....	.....	.....	460	302	262
23	.....	264	83	.....	.....	.....	572	356	229
24	.....	220	83	.....	.....	.....	588	501	199
25	.....	188	81	.....	.....	.....	665	748	172
26	.....	160	78	.....	550	.....	550	722	192
27	.....	145	78	.....	.....	.....	501	588	950
28	.....	128	118	.....	.....	.....	480	705	1,420
29	.....	115	164	.....	.....	.....	415	665	970
30	.....	.....	206	.....	.....	.....	338	550	665
31	.....	.....	201	.....	.....	.....	764	.....	665

NOTE.—Water-stage recorder not operating; discharge for following periods estimated from maximum and minimum stages indicated by recorder and by comparison with hydrographs of other stations: Jan. 22–31, 110 second-feet; and Feb. 1–13, 420 second-feet.

Monthly discharge of Karta River at Karta Bay, for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	2,430	.....	603	37,100	October 12–31	880	308	537	21,300
February	.....	.....	366	21,100	November	1,940	118	530	31,500
March	206	78	118	7,260	December	1,420	172	461	28,300
April 1–16	254	103	163	5,170					

BEAVER FALLS CREEK AT GEORGE INLET, REVILLAGIGEDO ISLAND.

LOCATION.—About 200 feet above diversion dam and flume for shingle mill and salmon cannery; 800 feet from beach on west shore of George Inlet; 10 miles by water from Ketchikan.

DRAINAGE AREA.—5.9 square miles (United States Forest Service survey made in 1917).

RECORDS AVAILABLE.—August 3 to October 10, 1917; September 5 to December 31, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank, a quarter of a mile from tidewater; reached by a corduroy trail which leaves beach back of cannery buildings. The gage was washed out by high water in November, 1917. A new recorder was installed on September 5, 1920, at a point 8 feet downstream from site of first recorder at datum of August 3, 1917.

DISCHARGE MEASUREMENTS.—At medium and high stages, made from log gaging bridge across stream a quarter of a mile upstream from gage; at low stages made by wading under bridge.

CHANNEL AND CONTROL.—The gage is in a partly sheltered pool in a narrow, deep, rocky canyon, 15 feet upstream from a small rocky fall, which forms a well-defined and permanent control.

DIVERSION.—A small quantity of water is diverted about 200 yards below station into a flume for use of shingle mill and cannery.

ACCURACY.—Stage-discharge relation permanent, but gage well was disturbed by logs and settled probably during high water on August 20, 1917. Rating curve used August 3–19, 1917, and September 5 to December 31, 1920, determined by four discharge measurements and point of zero flow, is well defined below 500 second-feet; curve used August 20 to October 10, 1917, based on two discharge measurements which indicate the amount of change in gage datum caused by settlement of gage well. Operation of water-stage recorder satisfactory except for periods indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging results obtained by applying to rating table mean gage heights for intervals of the day. Records good, except those for periods when gage did not operate satisfactorily, which are fair.

Lower Silvis Lake, whose elevation is 790 feet above high tide, is 1½ miles from the beach, and its area is 62 acres. The elevation of upper Silvis Lake, whose outlet is only 1,100 feet from the upper end of the lower lake, is 1,100 feet above high tide and its area is 234 acres. Drainage area above outlet of lower lake is 4.9 square miles; above outlet of upper lake, 3.6 square miles.

Discharge measurements of Beaver Falls Creek at George Inlet during 1920.

[Made by G. H. Canfield.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.ft.*
Sept. 6	0.76	28
Sept. 8	3.54	366

Daily discharge, in second-feet, of Beaver Falls Creek at George Inlet for the periods Aug. 1 to Oct. 10, 1917, and Sept. 6 to Dec. 31, 1920.

Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.
1917.											
1	75	34	142	11	64	14	.....	21	247	175	.....
2	80	28	283	12	59	48	.....	22	371	132	.....
3	88	26	223	13	51	97	.....	23	224	86	.....
4	69	21	352	14	59	193	.....	24	175	168	.....
5	58	18	183	15	182	234	.....	25	140	244	.....
6	49	16	97	16	298	164	.....	26	100	144	.....
7	46	15	69	17	304	97	.....	27	265	323	.....
8	42	14	52	18	437	152	.....	28	276	305	.....
9	38	12	76	19	525	90	.....	29	158	212	.....
10	42	11	152	20	386	97	.....	30	78	107	.....
								31	47	.....	.....

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1920.					1920.					1920.				
1	.....	232	300	85	11	194	152	13	19	21	325	.....	.....	11
2	.....	188	500	40	12	176	185	11	20	22	200	.....	.....	9
3	.....	162	300	40	13	100	246	10	25	23	134	.....	.....	8
4	.....	105	200	70	14	105	146	9	25	24	78	.....	.....	7
5	.....	75	100	72	15	170	72	8	19	25	56	.....	.....	7
6	30	51	50	61	16	105	46	8	14	26	56	.....	.....	7
7	140	33	32	56	17	64	32	7	15	27	63	.....	.....	266
8	336	119	26	38	18	45	26	6	18	28	292	.....	.....	278
9	170	432	21	24	19	38	33	7	15	29	164	.....	.....	152
10	92	291	16	20	20	178	.....	.....	13	30	107	.....	.....	94
										31	.....	.....	.....	100

NOTE.—Discharge for following periods estimated, because of unsatisfactory operation of water-stage recorder, by comparison with records of flow for other stations: Aug. 1, 2, and 24–26, 1917, as shown in table; Oct. 20–31, 1920, 180 second-feet; Nov. 1–7, 13–19, and Dec. 1–4, 1920, as shown in table; Nov. 20–30, 1920, 80 second-feet.

Monthly discharge of Beaver Falls at George Inlet for the periods Aug. 1 to Oct. 10, 1917, and Sept. 6 to Dec. 31, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
1917.					1920.				
August	525	38	162	9,960	September 6–30	336	30	137	6,790
September	323	11	109	6,490	October	.....	26	154	9,470
October 1–10	352	52	163	3,230	November	500	.....	83.5	4,970
					December	278	7	52.5	3,230
					The period	.....	.....	.....	24,500

MAHONEY CREEK AT GEORGE INLET, REVILLAGIGEDO ISLAND.

LOCATION.—One-fourth mile below outlet of Surprise Lake and one-fourth mile above tidewater on west shore of George Inlet, Revillagigedo Island, 3 miles north of Beaver Falls Creek, and 13 miles by water from Ketchikan.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—September 10 to December 31, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank of stream one-fourth mile above beach.

DISCHARGE MEASUREMENTS.—At high stages, made from cable across creek 100 yards above gage; at medium and low stages, by wading at cable section or at channel on beach exposed at low tide.

CHANNEL AND CONTROL.—The gage is at edge of pool between two riffles the lower of which forms a well-defined and permanent control.

ICE.—Stage-discharge relation not affected by ice.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below but poorly defined above 150 second-feet. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting gage-height graph or, for days of considerable fluctuation, by averaging results obtained by applying to rating table mean gage heights for intervals of the day. Records good, except for periods of break in record and discharge above 150 second-feet, for which they are poor.

The Forest Service topographic map of Beaver Falls drainage basin shows the approximate location, outline, and elevation of two important lakes in the Mahoney Creek basin. They are Lower Mahoney Lake, the outlet of which is half a mile from the beach at an elevation of 75 feet above high tide, and Upper Mahoney Lake, the outlet of which is three-fourths mile above head of Lower Mahoney Lake. This lake is about 2,000 feet above high tide and has area of about 180 acres. The discharge at outlet of Upper Mahoney Lake is roughly estimated as 65 per cent of the flow at the gaging station.

Discharge measurements of Mahoney Creek at George Inlet during 1920.

[Made by G. H. Canfield.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Sept. 10	1.42	84
Dec. 3	.95	35
4	1.18	56

Daily discharge, in second-feet, of Mahoney Creek at George Inlet, for the period Sept. 10 to Dec. 31, 1920.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	.....	182	250	70	11	152	127	18	21	21	212	122	.....	14
2	.....	173	400	30	12	157	94	17	22	22	159	104	.....	16
3	.....	127	250	33	13	94	192	16	22	23	105	146	.....	15
4	.....	92	150	55	14	80	130	15	24	24	68	.....	.....	15
5	.....	68	75	58	15	152	82	14	22	25	50	.....	.....	14
6	.....	50	40	54	16	104	53	13	22	26	42	.....	.....	21
7	.....	37	28	56	17	62	37	12	19	27	48	.....	.....	184
8	.....	30	24	47	18	43	28	12	20	28	181	.....	.....	202
9	.....	224	21	35	19	33	26	15	18	29	143	.....	.....	115
10	82	260	19	25	20	76	33	.....	17	30	94	.....	.....	82
										31	.....	.....	.....	88

NOTE.—Discharge for following periods estimated, because of unsatisfactory operation of water-stage recorder, from maximum and minimum stages indicated by recorder and by comparison with records of flow for other stations: Oct. 25–31, 140 second-feet; Nov. 1–6 and 10–19, as shown in table; Nov. 20–30, 70 second-feet; Dec. 1–2, as shown in table.

Monthly discharge of Mahoney Creek at George Inlet for the period Sept. 10 to Dec. 31, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
September 10–30	212	33	102	4,250	December	202	14	46.3	2,850
October	.....	26	114	7,010					
November	400	12	72.0	4,280	The period	.....	.....	.....	18,400

FISH CREEK NEAR SEA LEVEL, REVILLAGIGEDO ISLAND.

LOCATION.—In latitude 55° 24′ W., near outlet of Lower Lake on Fish Creek, 600 feet from tidewater at head of Thorne Arm, 2 miles northwest of mine at Sea Level, and 25 miles by water from Ketchikan.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 19, 1915, to December 31, 1920.

GAGE.—Stevens water-stage recorder on right shore of Lower Lake, 200 feet above outlet.

DISCHARGE MEASUREMENTS.—At medium and high stages made from cable across creek, 1 mile upstream from gage and 500 feet above head of Lower Lake; at low stages made by wading at cable. Only one small creek enters Lower Lake, at point opposite gage, between the cable site and control.

CHANNEL AND CONTROL.—The lake is about 500 feet wide opposite the gage. Outlet consists of two channels, each about 60 feet wide, separated by an island 40 feet wide. From the lake to tidewater, 200 feet, the creek falls about 20 feet. Bedrock exposed at the outlet of the lake forms a well-defined and permanent control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.9 feet about August 6 (discharge computed from extension of rating curve, 4,110 second-feet); minimum stage, 0.63 foot, March 5 (discharge, 40 second-feet).

1915–1920: Maximum stage recorded, 5.33 feet November 1, 1917 (discharge, 4,600 second-feet); minimum stage, 0.50 foot, February 11, 1916 (discharge, 22 second-feet).

ICE.—Lower Lake freezes over, but as gage is set back in the bank ice does not form in well, and the relatively warm water from the lake and the swift current keep the control open.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below and extended above 1,500 second-feet. Operation of water-stage recorder satisfactory except for periods shown in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage heights determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging results obtained by applying to rating table mean gage heights for regular intervals of day. Records good, except for periods of break in record for which they are fair.

A map of the lakes on the drainage basin of this stream was made by the United States Geological Survey in April, 1921. Lower Lake is at an elevation of 15 feet above high tide and has an area of 55 acres; Big Lake is at an elevation of 277 feet and has an area (including lagoon at approximately same elevation) of 358 acres; Third Lake is at an elevation of 324 feet and has an area of 180 acres; Mirror Lake is at an elevation of 377 feet and has an area of about 250 acres; Basin Lake (draining into Big Lake from the east) is at an elevation of 456 feet and has an area of 240 acres.

The following discharge measurement was made by G. H. Canfield:

December 5, 1920: Gage height, 1.32 feet; discharge, 290 second-feet.

Daily discharge, in second-feet, of Fish Creek near Sea Level for 1920.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Dec.
1	285	64	74	130	429	.....	605	120	.....	250
2	368	60	67	114	368	.....	562	.....	.....	225
3	750	78	64	102	346	.....	500	.....	.....	200
4	750	225	60	94	346	.....	436	.....	.....	200
5	506	455	57	89	335	.....	390	.....	.....	291
6	378	756	62	87	680	.....	379	.....	.....	302
7	324	665	74	85	937	.....	379	.....	.....	302
8	581	455	85	80	796	.....	368	.....	.....	265
9	694	357	85	76	650	.....	374	.....	390	220
10	532	275	89	74	488	.....	379	.....	362	193
11	414	225	109	130	379	403	374	.....	320	176
12	318	200	127	225	335	390	357	.....	280	165
13	296	175	130	216	324	379	340	.....	260	169
14	553	150	120	170	308	374	324	.....	240	172
15	686	120	109	176	291	390	302	569	254	157
16	525	150	96	154	346	403	291	422	.....	140
17	395	225	94	140	436	390	275	324	.....	140
18	312	297	94	184	.....	422	264	264	.....	146
19	259	296	92	229	.....	436	234	206	.....	140
20	217	260	130	234	.....	403	220	165	.....	133
21	184	216	165	220	.....	374	184	154	.....	124
22	153	176	140	198	.....	379	173	146	.....	109
23	136	150	120	184	.....	422	157	.....	.....	96
24	123	130	114	176	.....	462	146	.....	.....	94
25	104	112	107	180	.....	436	130	.....	.....	87
26	97	96	96	335	.....	442	120	.....	.....	99
27	90	89	94	660	.....	455	120	.....	.....	335
28	83	85	109	725	.....	483	109	.....	.....	665
29	76	80	124	628	.....	598	102	.....	.....	628
30	65	.....	140	520	.....	658	102	.....	.....	488
31	65	.....	140	.....	.....	.....	106	.....	.....	520

NOTE.—Discharge for following periods estimated, because of unsatisfactory operation of water-stage recorder, from records of flow for other stations: Jan. 26–28, discharge interpolated; Feb. 11–17, daily discharge as given in table (maximum and minimum stages indicated by recorder); May 18–31, 375 second-feet; and June 1–10, 600 second-feet (maximum and minimum stages for the period indicated by the recorder); Aug. 2–14, 1,100 second-feet; Aug. 23–31, 150 second-feet; Sept. 1–8, 240 second-feet; Sept. 11–14, daily discharge Sept. 16–30, 310 second-feet; Oct. 1–31, 460 second-feet; Nov. 1–30, 400 second-feet; Dec. 1–4, daily discharge

Monthly discharge of Fish Creek near Sea Level for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	750	65	333	20,500	August	.....	.....	581	35,700
February	756	60	228	13,100	September	.....	.....	289	17,200
March	165	57	102	6,270	October	.....	.....	460	28,300
April	725	74	220	13,100	November	.....	.....	400	23,800
May	937	.....	421	25,900	December	665	87	233	14,300
June	.....	.....	490	29,200					
July	605	102	284	17,500	The year	.....	.....	337	245,000

SWAN LAKE OUTLET AT CARROLL INLET, REVILLAGIGEDO ISLAND.

LOCATION.—Halfway between Swan Lake and tidewater, on east shore of Carroll Inlet 1 mile from its head, 30 miles by water from Ketchikan.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 24, 1916, to December 31, 1920.

GAGE.—Stevens water-stage recorder on left bank, half a mile from tidewater; reached by a trail which leaves beach back of old cabin one-fourth mile south of mouth of creek. Gage was washed out by extreme high water in November, 1917. New gage installed 10 feet farther back in bank at old datum, but with a new control, on May 5, 1918.

DISCHARGE MEASUREMENTS.—At medium and high stages, made from a cable across stream 100 feet downstream from gage; at low stages, made by wading.

CHANNEL AND CONTROL.—The gage well is in a deep pool 25 feet upstream from a contracted portion of the channel, where a fall of 1 foot over bedrock forms a permanent control. The effect of the violent fluctuation of the water surface outside of the gage well is decreased in the inner float well, because the intake holes at the bottom are very small. At the cable section the bed is rough, the water shallow, and the current very swift. Point of zero flow is at gage height —1.0 foot.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 5.50 feet at noon, August 6 (discharge, computed from extension of rating curve, 2,800 second-feet); minimum stage, 0.23 foot April 10 (discharge, 62 second-feet).

1915–1920: Maximum stage occurred probably on November 1, 1917 (discharge, estimated by comparison with Fish Creek, 5,500 second-feet); minimum discharge, 36 second-feet, March 19–20, 1919.

ICE.—Stage-discharge relation not affected by ice.

ACCURACY.—Stage-discharge relation permanent. Rating curve, determined by six discharge measurements and point of zero flow, is fairly well defined below 2,000 second-feet. Water-stage recorder operated satisfactorily except for periods indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage heights determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging discharges obtained by applying to rating table mean gage heights for regular intervals of day. Records good, except for periods of break in record, for which they are fair.

No maps of the entire drainage basin of this stream are available. The United States Forest Service in the fall of 1920 made a survey consisting of stadia traverse between the beach and Swan Lake, by which the elevation was determined as 220 feet above high tide; triangulation of lake, by which area of lake was determined as 1,325 acres; topography of lake shore below an elevation of 350 feet and of stream between lake and proposed dam site, two-thirds mile below outlet of lake, where elevation of bed of stream is 170 feet; cross section at dam site; and topography along proposed conduit about 300 feet long on south side of creek. Blue-print copies of the map of this survey may be obtained from the offices of the United States Forest Service at Portland, Oreg., or Ketchikan, Alaska.

No discharge measurements were made at this station during the year.

Daily discharge, in second-feet, of Swan Lake outlet at Carroll Inlet for 1920.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	69	89	94	433	585	701	188	331	820	.....	303
2	.....	66	85	85	397	693	639	288	325	1,050	.....	271
3	.....	78	80	79	380	820	513	277	280	1,020	.....	254
4	.....	196	76	74	352	902	469	962	251	770	.....	277
5	.....	425	73	72	368	875	469	2,170	216	608	.....	277
6	.....	644	72	72	593	795	425	2,600	186	485	.....	271
7	337	608	89	69	765	698	390	1,890	218	.....	.....	265
8	565	445	94	68	657	650	371	1,140	585	.....	.....	260
9	537	343	92	63	501	575	361	688	567	.....	.....	248
10	404	277	99	64	400	525	401	450	425	.....	.....	229
11	331	246	158	122	343	500	457	1,200	384	.....	.....	208
12	282	224	152	165	328	485	441	1,800	364	.....	.....	190
13	303	193	135	151	315	470	425	1,300	331	.....	.....	176
14	497	170	116	137	297	460	401	990	303	.....	.....	170
15	505	152	105	126	315	485	394	648	340	.....	.....	161
16	380	161	94	118	390	500	374	461	358	.....	.....	150
17	300	240	90	109	418	525	352	343	340	.....	.....	141
18	254	262	87	213	485	626	307	274	300	.....	.....	139
19	213	254	84	213	473	603	280	210	271	.....	.....	132
20	176	226	99	193	384	485	235	172	282	.....	.....	128
21	156	193	105	181	328	449	213	156	565	.....	183	124
22	139	172	94	170	303	422	193	145	585	.....	181	116
23	122	154	89	165	291	453	170	145	485	.....	218	111
24	111	137	89	170	297	437	150	143	390	.....	243	103
25	101	122	85	226	322	418	135	139	328	.....	309	96
26	94	111	80	448	343	505	126	145	282	.....	343	130
27	85	103	82	790	364	545	122	174	254	.....	337	141
28	79	98	145	745	346	648	112	172	374	.....	331	621
29	76	94	122	630	358	765	111	165	489	.....	328	541
30	73	.....	120	513	445	795	128	154	461	.....	322	422
31	72	.....	103	.....	537	.....	161	246	.....	.....	.....	368

NOTE.—Discharge for following periods estimated, because of unsatisfactory operation of water-stage recorder, from maximum and minimum stages indicated by recorder and by comparison with hydrographs and records of flow for other stations: Jan. 1–6, 450 second-feet; Apr. 13, June 8–16, and Aug. 10–13, as given in table; Oct. 7–31, 550 second-feet; Nov. 1–20, 500 second-feet.

Monthly discharge of Swan Lake outlet at Carroll Inlet for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	.....	72	287	17,600	August	2,600	139	640	39,400
February	644	66	223	12,800	September	585	186	362	21,500
March	158	72	99.5	6,120	October	.....	.....	597	36,700
April	790	63	211	12,600	November	.....	.....	426	25,300
May	765	291	404	24,800	December	621	96	227	14,000
June	902	422	590	35,100					
July	701	111	323	19,900	The year	2,600	63	366	266,000

ORCHARD LAKE OUTLET AT SHRIMP BAY, REVILLAGIGEDO ISLAND.

LOCATION.—In latitude 55° 50′ N., longitude 131° 27′ W., at outlet of Orchard Lake one-third mile from tidewater at head of Shrimp Bay, an arm of Behm canal, 46 miles by water from Ketchikan.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 28, 1915, to December 31, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank 300 feet below Orchard Lake and 100 feet above site of timber-crib dam, which was built in 1914 for proposed pulp mill and washed out by high water August 10, 1915. Datum of gage lowered 2 feet September 15, 1915. Gage heights May 29 to August 10

referred to first datum; August 11, 1915, to August 17, 1916, to second datum. Datum of gage lowered 1 foot August 17, 1916. Gage heights August 18 to December 31, 1916, referred to this datum. Gage washed out probably during high water on November 1, 1917. New gage installed on April 28, 1918, at old site at the datum of August 17, 1916.

DISCHARGE MEASUREMENTS.—At medium and high stages made from cable 5 feet upstream from gage; at low stages by wading one-fourth mile below gage.

CHANNEL AND CONTROL.—From Orchard Lake, at elevation 134 feet above high tide, the stream descends in a series of rapids for 1,000 feet through a narrow gorge, then divides into two channels and enters the bay in two cascades of 100-foot vertical fall. Opposite the gage the water is deep and the current sluggish. At the site of the old dam bedrock is exposed, but for 30 feet upstream the channel is filled in with loose rock and brush placed during construction of dam. This material forms a riffle, which acts as a control for water surface at gage at low and medium stages and is scoured down when ice goes out of lake; the rock outcrop at site of old dam acts as a control at high stages and is permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 8.0 feet at 2 p. m. August 6 (discharge 4,780 second-feet); minimum stage, 0.31 foot March 9 (discharge, 67 second-feet).

1915–1920: Maximum stage probably occurred on November 1, 1917 (discharge estimated by multiplying maximum discharge at Fish Creek on that date by 1.55, which is the ratio between the maximum discharges of Orchard Lake outlet and Fish Creek on October 15 and 16, 1915, 7,100 second-feet); minimum discharge, estimated, 20 second-feet, February 11, 1916.

ICE.—Stage-discharge relation not affected by ice.

ACCURACY.—Stage-discharge relation changes occasionally during high water. Rating curve, determined by seven discharge measurements made since new gage was installed, point of zero flow, and form of upper portion of old rating curve, is well defined below 4,000 second-feet. Operation of water-stage recorder satisfactory except for periods indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage heights determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging discharges obtained by applying to rating table mean gage heights for regular intervals of day. Records good, except for period of break in record, for which they are fair.

The highest mountains on this drainage basin are only 3,500 feet above sea level and are covered to an elevation of 2,500 feet by a heavy stand of timber and a thick undergrowth of brush, ferns, alders, and devil's club. The topography is not so rugged as that of the area surrounding Shelockum Lake, and the proportion of vegetation, soil cover, and lake area is greater, so that more water is stored in the Orchard Lake drainage basin and the flow is better sustained.

A survey of Orchard Lake was made by an engineering company in September, 1920. From this survey the area of the lake was determined as 965 acres and the elevation of lake above high tide as 128 feet. A dam at the outlet of the lake would flood part of the valley, at the head of the lake, which extends upstream a few miles at a small gradient.

Discharge measurements of Orchard Lake outlet at Shrimp Bay during 1920.

[Made by G. H. Canfield.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Feb. 16	0.72	135
Dec. 8	1.48	285

Daily discharge, in second-feet of Orchard Lake outlet at Shrimp Bay, for 1920.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Dec.
1	259	.....	85	.....	680	1,080	1,030	314	400	350
2	422	.....	81	.....	640	1,250	880	447	410	275
3	700	.....	79	.....	624	1,430	740	560	368	300
4	514	.....	74	.....	560	1,460	708	1,210	338	300
5	362	.....	75	.....	572	1,400	724	3,290	280	290
6	270	.....	75	.....	870	1,220	762	4,560	242	285
7	394	.....	72	.....	1,060	1,030	808	2,900	242	280
8	808	.....	68	.....	905	905	808	1,370	680	275
9	616	.....	67	.....	700	855	785	785	762	225
10	430	.....	.....	.....	572	808	785	522	560	190
11	320	.....	.....	.....	492	740	762	1,240	450	162
12	252	.....	.....	.....	485	740	700	2,410	390	140
13	335	.....	.....	.....	485	740	660	2,100	308	134
14	640	.....	.....	.....	467	785	620	1,160	275	130
15	533	.....	.....	.....	510	855	592	700	332	120
16	387	119	.....	.....	680	785	572	474	362	109
17	288	166	.....	.....	700	808	511	350	338	105
18	218	275	.....	.....	740	930	450	272	280	119
19	186	286	.....	.....	740	720	487	225	280	134
20	176	254	.....	.....	612	612	326	196	384	138
21	.....	199	.....	.....	507	596	297	176	600	136
22	.....	166	.....	.....	481	680	270	209	540	125
23	.....	141	.....	.....	500	680	232	314	407	110
24	.....	119	.....	267	588	640	212	297	286	102
25	.....	109	.....	329	640	640	190	247	230	92
26	.....	100	.....	955	640	785	190	267	190	105
27	.....	93	.....	1,280	660	855	190	350	170	810
28	.....	89	.....	1,160	640	930	184	329	340	1,000
29	.....	87	.....	980	680	1,110	186	262	650	660
30	.....	.....	.....	785	920	1,160	192	218	500	457
31	.....	.....	.....	.....	1,000	.....	280	280	.....	433

NOTE.—Discharge estimated for following periods, because water-stage recorder was run down or not operating satisfactorily: Jan. 21–31, 105 second-feet; Feb. 1–15, 350 second-feet; Mar. 10–31, 100 second-feet; Apr. 1–23, 160 second-feet. Discharge for following periods estimated from maximum and minimum stages indicated by recorder and comparison with hydrographs for streams in near-by drainage basins and climatic data for Ketchikan; May 27–28, June 18–22, and Sept. 26–30, daily discharge as shown in table; Oct. 1–31, 630 second-feet; Nov. 1–30, 520 second-feet; Dec. 1–8 by comparison with record of flow for the outlet of Shelockum Lake.

Monthly discharge of Orchard Lake outlet at Shrimp Bay, for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	.....	.....	299	18,400	August	4,560	176	904	55,600
February	.....	87	257	14,800	September	762	170	386	23,000
March	.....	.....	92.8	5,710	October	.....	.....	630	38,700
April	1,280	.....	315	18,700	November	.....	.....	520	30,900
May	1,060	467	656	40,300	December	1,000	92	261	16,000
June	1,460	596	908	54,000					
July	1,030	184	520	32,000	The year	4,560	.....	480	348,000

SHELOCKUM LAKE OUTLET AT BAILEY BAY.

LOCATION.—In latitude 56° 00′ N., longitude 131° 36′ W., on mainland near outlet of Shelockum Lake, three-fourths mile by Forest Service trail from tidewater at north end of Bailey Bay and 52 miles by water north of Ketchikan.

DRAINAGE AREA.—18 square miles (measured on sheets Nos. 5 and 8 of the Alaska Boundary Tribunal, edition of 1895).

RECORDS AVAILABLE.—June 1, 1915, to December 31, 1920.

GAGE.—Stevens continuous water-stage recorder on right shore of lake, 250 feet above outlet.

DISCHARGE MEASUREMENTS.—Made from cable across outlet of lake, 200 feet below gage and 50 feet upstream from crest of falls.

CHANNEL AND CONTROL.—Opposite the gage the lake is 600 feet wide; at the outlet bedrock is exposed and the water makes a nearly perpendicular fall of 150 feet. This fall forms an excellent and permanent control for the gage. At extremely high stages the lake has another outlet about 200 feet to left of main outlet. Point of zero flow is at gage height 0.6 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.65 feet, at 9 a. m. August 6 (discharge, 2,580 second-feet); minimum discharge (estimated from hydrograph for Fish Creek to have occurred March 9), 15 second-feet.

1915–1920: Maximum stage, 6.84 feet at 8 a. m. November 1, 1917 (discharge, 2,780 second-feet); minimum discharge, estimated from climatic records, 2.5 second-feet.

ICE.—Stage-discharge relation not affected by ice.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Operation of water-stage recorder satisfactory except for periods of break in record, as shown in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage heights determined by inspection of gage-height graph, or, for days of considerable fluctuation, by averaging discharges obtained by applying to rating table mean gage heights for regular intervals of day. Records excellent, except for periods of break in record, for which they are fair.

An outline survey of Shelockum Lake was made in 1914 by the United States Forest Service, and blue-print copies of the survey can be obtained from their district office at Ketchikan. This survey ascertained the lake to be 344 feet above high tide and 350 acres in area. The drainage basin above the lake is rough, precipitous, and covered with little soil or vegetation. There are no glaciers or ice fields at the source of the tributary streams. Therefore, because of little natural storage, the run-off after a heavy rainfall is rapid and not well sustained, and during a dry summer or winter the flow becomes very low. The large amount of snow that accumulates on the drainage basin during the winter maintains a good flow in May and June.

No discharge measurements were made at this station during the year.

Daily discharge, in second-feet, of Shelockum Lake outlet at Bailey Bay for 1920.

Day.	Jan.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	106	.....	230	472	422	273	363	263	761	94
2	134	.....	224	525	336	321	304	314	1,320	76
3	206	.....	226	600	292	282	233	336	660	82
4	170	.....	216	600	297	748	214	243	350	82
5	127	.....	204	580	350	1,640	166	172	241	80
6	111	.....	230	508	392	2,300	128	125	164	76
7	164	.....	230	438	407	950	150	92	123	76
8	316	.....	210	405	407	392	525	72	97	75
9	252	.....	174	377	407	237	392	280	78	69
10	190	.....	154	377	392	166	241	525	67	59
11	150	.....	147	358	363	736	182	324	58	55
12	123	.....	196	377	350	1,250	160	210	50	50
13	134	.....	204	350	318	660	128	210	43	53
14	289	.....	194	363	309	336	112	239	38	55
15	297	.....	220	392	292	214	117	210	34	52
16	208	.....	331	392	275	145	104	156	31	47
17	158	.....	306	363	252	112	94	120	30	43
18	121	.....	336	472	220	84	91	94	29	43
19	92	.....	306	363	190	71	115	78	31	44
20	76	.....	241	311	164	60	141	170	59	44
21	58	.....	200	287	149	71	252	275	88	43
22	53	.....	192	324	136	123	235	263	100	41
23	48	.....	210	336	120	145	174	270	98	37
24	43	85	241	297	110	123	127	275	109	35
25	40	123	273	292	98	98	94	268	123	31
26	38	342	270	336	98	154	80	230	152	33
27	35	422	268	363	96	299	72	378	132	194
28	33	378	245	490	92	241	143	363	127	392
29	31	311	280	580	94	170	265	252	136	268
30	30	263	378	542	115	123	212	186	117	184
31	28	.....	455	.....	230	210	.....	275	.....	145

NOTE.—Record traced by recording pencil Jan. 22, 23, 25–27, 30, and 31, too faint to be seen; discharge estimated. No record Feb. 1 to Apr. 23, except maximum stage; discharge estimated from records of flow for streams in near-by drainage basins: Feb. 1–28, 65 second-feet; Mar. 1–31, 30 second-feet; Apr. 1–23, 40 second-feet.

Monthly discharge of Shelockum Lake outlet at Bailey Bay for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	316	28	125	7,690	August	2,300	60	411	25,300
February	.....	.....	65	3,740	September	525	72	187	11,100
March	.....	.....	30	1,840	October	525	72	234	14,400
April	422	.....	94.8	5,640	November	1,320	29	182	10,800
May	455	147	245	15,100	December	392	31	85.7	5,270
June	600	287	416	24,800					
July	422	92	251	15,400	The year	2,300	.....	194	141,000

CASCADE CREEK AT THOMAS BAY, NEAR PETERSBURG.

LOCATION.—One-fourth mile above tidewater on east shore of south arm of Thomas Bay, 22 miles by water from Petersburg. One small tributary enters the river from the left half a mile above gage and 2 miles below outlet of lake.

DRAINAGE AREA.—21.4 square miles (measured on the United States Geological Survey geologic reconnaissance map of the Wrangell mining district, edition of 1907).

RECORDS AVAILABLE.—October 27, 1917, to December 31, 1920.

GAGE.—Stevens water-stage recorder on left bank, one-fourth mile from tidewater; reached by trail which leaves beach back of old cabin at mouth of creek.

DISCHARGE MEASUREMENTS.—At medium and high stages, made from log footbridge across stream one-fourth mile upstream from gage; at low stages, made by wading

CHANNEL AND CONTROL.—Gage is in a protected eddy above a natural rock weir, which forms a well-defined and permanent control. The bed of river under the footbridge is rough and the current swift and irregular, but this section is the only place on the whole river where even at low and medium stages there are no boils and eddies.

EXTREMES OF STAGE.—Maximum stage recorded during period of records, 8.4 feet at 6 a. m. August 6, 1920 (discharge computed from extension of rating curve, 2,540 second-feet); minimum stage, 0.80 foot about April 6, 1918 (discharge, 17 second-feet).

ICE.—Stage-discharge relation not affected by ice.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 1,200 second-feet. Operation of water-stage recorder satisfactory except for periods indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage heights determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging discharge for equal intervals of day. Records good, except for periods when recorder did not operate satisfactorily, for which they are fair.

The first site on this stream for a storage reservoir is at a small lake 3 miles from tidewater, at an elevation of 1,200 feet above sea level. The drainage area above the gaging station is 21 square miles and above the outlet of the lake 17 square miles. Flow during summer is augmented by melting ice from glaciers on upper part of drainage area.

The only maps available, showing the drainage basin of this stream, are sheet 10 (scale, 1: 160,000) of the Alaska Boundary Tribunal, edition of 1895; topographic map of the Wrangell mining district (scale, 1: 250,000) of the United States Geological Survey, edition of 1907 (topography compiled from sheets of the Alaska Boundary Tribunal). A rough map, made for J. T. Martin who has mining claims near the mouth of the stream, shows a very small lake, 1.7 miles upstream from beach at an elevation of 1,250 feet; a small flat, 2.1 miles upstream from beach, at an elevation of 1,600 feet; and a lake (not surveyed but estimated to be 2 miles long by three-fourths mile wide) 2.5 miles upstream from beach, at an elevation of 1,950 feet.

The first lake and the flat are too small for storage reservoirs. A storage reservoir having a capacity sufficient to equalize the flow could probably be created by a tunnel or dam at the outlet of the large lake. The drainage area between the outlet of this lake and the gaging station is 4.5 square miles.

No discharge measurements were made at this station during the year.

Daily discharge, in second-feet, of Cascade Creek at Thomas Bay for 1920.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	70	.....	.....	24	48	365	640	518	380	160	455	40
2	99	.....	.....	25	52	440	552	500	395	153	622	39
3	131	.....	.....	24	55	518	470	470	500	144	425	38
4	107	.....	.....	24	48	570	485	775	570	129	292	37
5	93	.....	.....	24	48	600	535	1,720	535	119	210	37
6	86	.....	.....	24	52	600	570	2,460	440	144	192	36
7	130	.....	.....	24	51	550	622	1,370	305	124	153	35
8	192	.....	.....	24	48	530	675	870	210	119	129	33
9	134	.....	.....	24	48	500	675	570	160	200	114	32
10	117	.....	.....	23	49	470	675	425	150	160	104	31
11	103	.....	.....	25	57	450	675	1,160	150	134	92	30
12	88	.....	.....	39	76	420	675	1,810	119	119	79	29
13	93	.....	.....	31	65	395	622	1,370	111	129	70	28
14	109	.....	.....	27	65	404	605	932	109	124	65	27
15	90	.....	.....	26	86	455	622	622	111	111	62	26
16	77	.....	.....	26	113	440	675	440	250	94	56	26
17	67	.....	.....	25	112	425	658	342	455	81	53	26
18	.....	.....	.....	27	119	425	605	280	368	70	52	29
19	.....	.....	.....	26	108	355	570	260	368	72	50	29
20	.....	.....	.....	26	100	305	535	280	500	122	55	27
21	.....	.....	.....	28	95	280	500	395	470	119	70	26
22	.....	.....	.....	29	99	318	470	410	380	114	54	26
23	.....	.....	.....	29	105	292	425	342	342	206	52	25
24	.....	.....	.....	32	112	250	368	250	355	153	53	26
25	.....	.....	25	80	114	250	355	220	440	127	54	24
26	.....	.....	25	86	121	318	395	440	588	167	48	30
27	.....	.....	25	68	136	395	440	535	470	355	45	114
28	.....	.....	25	56	153	518	440	410	318	260	48	53
29	.....	.....	25	50	192	675	470	292	230	192	47	46
30	.....	.....	25	48	250	710	470	230	183	318	42	44
31	.....	.....	25	.....	305	.....	552	270	.....	368	.....	31

NOTE.—Discharge estimated for following periods, because of unsatisfactory operation of water-stage recorder, by comparison with hydrograph and record of flow for Sweetheart Falls Creek: Jan. 1, 70 second-feet; Jan. 18–31, 45 second-feet; Feb. 1–29, 60 second-feet; Mar. 1–24, 35 second-feet; and June 5–12, as shown in table.

Monthly discharge of Cascade Creek at Thomas Bay for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	192	.....	77.9	4,790	August	2,460	220	676	41,600
February	.....	.....	60	3,450	September	588	109	332	19,800
March	.....	.....	32.7	2,010	October	368	70	158	9,720
April	86	23	34.1	2,030	November	622	42	128	7,620
May	305	48	99.4	6,110	December	114	24	34.8	2,140
June	710	250	441	26,200					
July	675	355	549	33,800	The year	2,460	23	219	159,000

GREEN LAKE OUTLET AT SILVER BAY, NEAR SITKA.

LOCATION.—In latitude 56° 59′ N., longitude 135° 5′ W., at outlet of Green Lake, head of Silver Bay, 10½ miles by water south of Sitka.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 22, 1915, to December 31, 1920.

GAGE.—Stevens water-stage recorder on right bank, at outlet of lake, reached by trail which leaves the beach one-fourth mile north of mouth of stream, ascends a 600-foot ridge, and then drops down to the outlet of the lake. Gage datum lowered 1 foot December 27, 1916.

DISCHARGE MEASUREMENTS.—Made from cable across outlet 30 feet below gage.

CHANNEL AND CONTROL.—From Green Lake, 240 feet above sea level and 1,800 feet from tidewater, the stream descends in a series of falls and rapids through a narrow canyon whose exposed rock walls rise vertically more than 100 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 10.0 feet, at 11 a. m. August 5 (discharge, computed from extension of rating curve, 1,900 second-feet); minimum stage recorded, −0.05 foot, estimated from hydrographs for other stations to have occurred April 10 (discharge, 10 second-feet).

1915–1920: Maximum stage recorded, 13.0 feet, September 26, 1918 (discharge, estimated from extension of rating curve, 3,300 second-feet); minimum stage recorded, −0.05 foot, estimated from hydrographs for other stations to have occurred April 10, 1920 (discharge, 10 second-feet).

ICE.—Ice forms on lake and at gage, but because of current and flow of relatively warm weather from the lake the control remains open.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 10 and 1,300 second-feet. Operation of water-stage recorder satisfactory except for periods indicated by breaks in record, as shown in the footnote to the daily-discharge table. Daily discharge ascertained by applying to the rating table mean daily gage height, determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging results obtained by applying to rating table gage heights for regular intervals of day. Records good, except those for periods when gage was not operating satisfactorily, which are fair.

No maps have been made of the drainage basin. The elevation of Green Lake above high tide, measured by aneroid barometer, is 240 feet; the area of the lake is 175 acres, according to the best available estimates. At the upper end of lake is a low flat, reported to be 2 or 3 miles long, which would be flooded by a dam at outlet of lake.

The following discharge measurement was made by G. H. Canfield:

June 18, 1920: Gage height, 4.36 feet; discharge, 466 second-feet.

Daily discharge, in second-feet, of Green Lake outlet at Silver Bay, for 1920.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Oct.	Nov.	Dec.
1	.....	.....	38	16	.....	406	547	452	.....	820	100
2	.....	.....	30	14	.....	499	452	442	.....	1,480	90
3	.....	.....	26	12	.....	695	397	397	.....	751	90
4	.....	.....	20	16	.....	889	397	470	.....	380	90
5	.....	.....	20	.....	.....	706	424	1,640	.....	320	80
6	212	.....	20	.....	.....	518	461	1,220	.....	774	73
7	1,590	.....	26	.....	.....	442	547	672	.....	461	70
8	1,350	.....	26	.....	.....	490	588	442	.....	278	65
9	464	.....	26	.....	.....	528	568	320	.....	200	60
10	254	.....	30	.....	.....	461	537	328	.....	161	55
11	206	.....	40	.....	.....	397	518	706	.....	134	50
12	147	.....	42	.....	.....	406	557	599	.....	116	50
13	118	.....	40	.....	.....	388	518	673	.....	106	50
14	118	.....	36	.....	.....	424	490	518	.....	93	50
15	107	.....	30	.....	.....	518	499	354	.....	86	40
16	90	.....	30	.....	303	461	461	270	.....	76	40
17	72	.....	33	.....	247	433	424	240	.....	75	40
18	60	.....	28	.....	206	461	406	210	.....	71	40
19	54	.....	26	.....	166	397	406	200	.....	72	35
20	53	.....	20	.....	134	328	415	215	.....	82	35
21	48	.....	18	.....	118	294	406	260	240	90	30
22	46	72	16	.....	114	461	371	294	200	80	30
23	.....	60	16	.....	122	499	320	.....	337	80	30
24	.....	54	16	.....	126	371	270	.....	270	90	25
25	.....	49	16	.....	161	328	270	.....	188	80	25
26	.....	48	16	.....	303	433	320	.....	303	70	50
27	.....	44	23	.....	262	499	354	.....	424	65	150
28	.....	42	40	.....	262	537	415	.....	286	175	275
29	.....	40	38	.....	328	547	499	.....	194	200	212
30	.....	.....	30	.....	380	568	490	.....	885	140	134
31	.....	.....	20	.....	371	.....	480	.....	620	.....	118

NOTE.—Discharge for following periods when water-stage recorder was run down or not operating satisfactorily estimated by comparison with hydrographs of streams in near-by drainage basins and climatic data for Juneau: Jan. 1-5, 280 second-feet; Jan. 23-31, 38 second-feet; Apr. 5-30, 45 second-feet; May 1-15, 115 second-feet. Discharge for following periods estimated by comparison with record of flow for Sweetheart Falls Creek near Snettisham: Aug. 18-21, daily discharge; Aug. 23-31, 290 second-feet; Sept. 1-30 330 second-feet; Oct. 1-20, 240 second-feet; Nov. 21-30, Dec. 1-5, and 7-28, daily discharge.

Monthly discharge of Green Lake outlet at Silver Bay for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	1,590	.....	217	13,300	August	1,640	.....	437	26,900
February	.....	.....	82.9	4,770	September	.....	.....	330	19,600
March	42	16	27.0	1,660	October	885	188	282	17,300
April	.....	.....	40.9	2,430	November	1,480	65	254	15,100
May	380	.....	172	10,600	December	275	25	73.6	4,530
June	889	294	479	28,500					
July	588	270	445	27,400	The year	1,640	.....	237	172,000

BARANOF LAKE OUTLET AT BARANOF, BARANOF ISLAND.

LOCATION.—In latitude 57° 5′ N., longitude 134° 54′ W., at townsite of Baranof, at head of Warm Spring Bay, east coast of Baranof Island, 18 miles east of Sitka across island, but 96 miles from Sitka by water through Peril Strait.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 28, 1915, to December 31, 1920.

GAGE.—Stevens water-stage recorder on right bank 700 feet below Baranof Lake and 800 feet above tidewater at head of Warm Spring Bay.

DISCHARGE MEASUREMENTS.—At medium and high stages, from cable across stream 100 feet below lake and 600 feet above gage; at low stages, by wading 100 feet below cable.

CHANNEL AND CONTROL.—From Baranof Lake, at elevation 130 feet above sea level and 1,500 feet from tidewater, the stream descends in a series of rapids and small falls and enters the bay in a cascade of about 100-foot concentrated fall. The bed is of glacial drift, boulders, and rock outcrop. The gage is in an eddy 50 feet downstream from the foot of a small fall and 100 feet upstream from a riffle which forms a well-defined control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.3 feet at noon, November 2 (discharge, 2,000 second-feet); minimum discharge, estimated, 32 second-feet, April 14.

1915–1920: Maximum stage recorded during period, 5.3 feet August 10, 1915 (discharge, computed from extension of rating curve, 3,350 second-feet); minimum discharge, estimated by discharge measurement and climatic data, 28 second-feet, February 13, 1915.

ICE.—Because of the swift current and flow of relatively warm water from the lake, the stream remains open except during extremely cold periods.

DIVERSIONS.—The flume to Olsen's sawmill diverts from the stream 200 feet below gage only sufficient water to operate a 25-horsepower Pelton water wheel.

ACCURACY.—Stage-discharge relation permanent; slightly affected by ice March 29 to April 19. Rating curve well defined below 2,000 second-feet. Operation of water-stage recorder satisfactory except for periods indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage heights determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging discharge for equal intervals of day. Records good, except for periods when recorder did not operate satisfactorily and for periods when water was frozen in well, for which they are fair.

The drainage area is rough and precipitous, and the vegetable and soil cover is thin, even on the foothills of the mountains. The run-off is rapid, and the ground storage is small. During a hot, dry period, however, the flow is greatly augmented by melting ice from several small glaciers and ice-capped mountains.

The drainage basin of this stream has not been surveyed, but Baranof Lake and the region between lake and tidewater at head of Warm Spring Bay was surveyed and map drawn in 1914 by the United States Forest Service. Blue-print copies can be obtained from the district office of the Forest Service at Juneau, Alaska. The elevation of Baranof Lake above high tide as determined by the survey was 134 feet and the area of the lake 700 acres.

It would be necessary to raise the elevation of the lake 100 feet in order to create a reservoir having a capacity of 90,000 acre-feet, the storage required to equalize the flow.

No discharge measurements were made at this station during the year.

Daily discharge, in second-feet, Baranof Lake outlet at Baranof, for 1920.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	.....	52	33	205	695	788	680	590	668	1,330
2	.....	.....	51	33	189	755	695	660	522	545	1,940
3	.....	.....	48	33	210	855	615	590	615	436	.....
4	.....	.....	47	32	235	1,010	640	668	640	362	.....
5	.....	.....	43	34	220	1,010	725	1,330	500	303	.....
6	.....	.....	45	35	203	890	788	1,380	432	255	.....
7	.....	165	45	37	195	788	970	890	890	208	.....
8	.....	149	47	39	185	820	1,010	695	930	189	.....
9	.....	129	49	40	181	820	970	545	640	348	.....
10	.....	118	49	43	183	725	930	480	500	400	.....
11	309	145	49	43	203	695	930	668	500	324	.....
12	255	137	51	43	220	668	1,050	725	420	273	.....
13	218	118	56	43	238	615	1,010	640	460	267	.....
14	195	106	57	42	248	640	930	590	336	250	.....
15	169	95	54	42	291	725	855	492	270	225	.....
16	145	102	53	42	327	695	820	420	225	195	.....
17	125	125	52	47	339	668	755	370	191	171	.....
18	110	129	52	84	336	668	695	352	185	155	.....
19	95	118	51	90	309	615	668	408	230	141	.....
20	.....	102	49	84	285	545	668	460	205	199	.....
21	.....	89	46	82	261	522	640	452	177	264	.....
22	.....	80	44	80	242	640	568	420	173	300	.....
23	.....	70	40	83	242	615	500	362	169	366	.....
24	.....	64	39	100	250	545	460	321	167	359	.....
25	.....	61	39	114	315	545	500	291	155	270	.....
26	.....	59	36	141	568	615	600	362	147	345	.....
27	.....	55	36	167	568	695	650	678	137	488	.....
28	.....	53	36	187	568	820	725	615	324	400	.....
29	.....	53	34	195	615	820	850	444	1,100	330	.....
30	.....	.....	34	208	695	855	800	392	392	772	.....
31	.....	.....	34	.....	695	.....	750	640	.....	930	.....

NOTE.—Discharge for following periods estimated, because of ice effect or unsatisfactory operation of water-stage recorder, by comparison with hydrographs for streams in near-by drainage basins and climatic data for Juneau: Jan. 1–10, 455 second-feet; Jan. 20–31, 70 second-feet; Feb. 1–6, 90 second-feet; and Mar. 29 to Apr. 9, daily discharge. Daily discharge, July 25 to Aug. 2, estimated by comparison with record of flow for outlet of Green Lake; discharge for following periods estimated from records for Sweetheart Falls Creek: Sept. 12–20, daily discharge; Nov. 3–30, 290 second-feet; Dec. 1–31, 55 second-feet.

Monthly discharge of Baranof Lake outlet at Baranof for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	.....	.....	226	13,900	August	1,380	291	581	35,700
February	165	53	98.7	5,680	September	1,100	137	407	24,200
March	57	34	45.7	2,810	October	930	141	346	21,300
April	208	32	75.9	4,520	November	1,940	.....	380	22,600
May	695	181	317	19,500	December	.....	.....	55	3,380
June	1,010	522	719	42,800					
July	1,050	460	760	46,700	The year	1,940	32	335	243,000

FALLS CREEK AT NICKEL, NEAR CHICHAGOF.

LOCATION.—One-eighth mile above beach, on stream that enters tidewater half a mile northeast of camp of Alaska Nickel Mines Co., 20 miles by water northwest of Chichagof, on west coast of Chichagof Island.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 6, 1918, to June 13, 1920.

GAGE.—Stevens water-stage recorder on left bank one-eighth mile above beach.

DISCHARGE MEASUREMENTS.—At medium and high stages, made from cable across stream 500 feet above gage; at low stages, made by wading in channel exposed at beach at low tide.

CHANNEL AND CONTROL.—The gage is 20 feet upstream from rectangular weir, the crest of which is 2 feet above bed of stream, 2 inches wide, and 40 feet long. At the cable section the bed is smooth, the water is deep, and the current is regular and sluggish.

EXTREMES OF DISCHARGE.—1918–1920: Maximum stage recorded during period, 3.45 feet at 3 p. m. September 26, 1918 (discharge, 665 second-feet); minimum stage recorded, 0.18 foot March 12, 1919 (discharge, 3.2 second-feet).

ICE.—Stage-discharge relation affected by ice forming on crest of weir for short periods during extremely cold weather.

ACCURACY.—Stage-discharge relation changed February 17, 1920, when the river was disturbed by ice, the average elevation of crest of weir being raised about 0.11 foot. Rating curves used before and after the change fairly well defined between 30 and 100 second-feet; extended beyond those limits by use of formula the coefficient for which was based on results of current-meter measurements. Operation of water-stage recorder satisfactory except for periods shown in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspection of gage-height graph or for days of considerable variation in stage by averaging discharge for intervals of the day. Records fair.

COOPERATION.—Station maintained in cooperation with the Alaska Nickel Mines Co.

The following discharge measurement was made by G. H. Canfield:
June 14, 1920: Gage-height, 0.66 foot; discharge, 45 second-feet.

Daily discharge, in second-feet, of Falls Creek at Nickel for the period May 6, 1918, to June 13, 1920.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1918.												
1	.....	.....	.....	.....	.....	115	106	49	215	52	128	235
2	.....	.....	.....	.....	.....	95	83	44	120	50	88	179
3	.....	.....	.....	.....	.....	83	71	40	62	70	66	115
4	.....	.....	.....	.....	.....	76	63	37	44	72	85	85
5	.....	.....	.....	.....	.....	76	56	35	39	61	465	74
6	.....	.....	.....	.....	120	81	49	42	34	52	358	101
7	.....	.....	.....	.....	92	90	46	58	31	58	191	62
8	.....	.....	.....	.....	85	102	43	50	28	50	115	51
9	.....	.....	.....	.....	84	104	41	54	79	56	81	47
10	.....	.....	.....	.....	85	94	38	42	60	41	62	41
11	.....	.....	.....	.....	95	96	57	39	50	39	66	37
12	.....	.....	.....	.....	101	94	60	37	44	96	86	34
13	.....	.....	.....	.....	101	85	50	52	41	85	68	30
14	.....	.....	.....	.....	100	79	44	100	37	120	62	31
15	.....	.....	.....	.....	92	76	40	68	50	86	50	29
16	.....	.....	.....	.....	86	68	37	68	62	68	49	58
17	.....	.....	.....	.....	78	62	35	92	174	86	43	68
18	.....	.....	.....	.....	79	58	32	72	235	101	35	60
19	.....	.....	.....	.....	71	54	30	68	156	75	31	52
20	.....	.....	.....	.....	62	58	30	72	100	72	47	43
21	.....	.....	.....	.....	68	56	28	109	72	65	68	143
22	.....	.....	.....	.....	62	51	26	137	56	52	79	137
23	.....	.....	.....	.....	62	50	25	162	94	49	82	156
24	.....	.....	.....	.....	62	57	25	217	68	56	.....	117
25	.....	.....	.....	.....	66	63	24	181	166	52	.....	130
26	.....	.....	.....	.....	70	66	23	128	414	115	.....	115
27	.....	.....	.....	.....	71	68	35	104	271	86	.....	82
28	.....	.....	.....	.....	203	68	54	150	150	156	.....	62
29	.....	.....	.....	.....	258	115	39	156	96	134	.....	54
30	.....	.....	.....	.....	197	162	44	360	66	152	.....	46
31	.....	.....	.....	.....	164	.....	57	408	.....	137	.....	41

Daily discharge, in second-feet, of Falls Creek at Nickel for the period May 6, 1918, to June 13, 1920—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1919.												
1	47	.....	9	.....	.....	40	23	15	60	37	42	17
2	115	.....	9	.....	.....	46	22	14	41	241	29	15
3	89	.....	9	.....	.....	49	26	14	32	420	24	15
4	78	.....	8	51	31	47	30	14	26	345	21	16
5	92	.....	8	56	.....	46	30	20	20	345	17	23
6	229	.....	11	56	.....	44	42	16	17	465	14	44
7	209	.....	12	48	.....	41	39	14	17	278	13	27
8	185	.....	13	44	.....	37	36	34	15	141	18	25
9	128	25	23	43	.....	37	39	56	96	82	13	50
10	98	25	16	36	.....	36	57	44	96	81	11	52
11	83	25	13	34	.....	36	60	.....	62	58	11	39
12	63	22	6	30	.....	36	57	.....	197	48	13	28
13	56	23	.....	30	.....	39	72	.....	458	43	43	22
14	50	27	.....	30	.....	41	72	.....	267	35	30	14
15	41	26	.....	27	.....	41	57	.....	128	28	47	34
16	37	24	.....	24	.....	37	46	60	89	34	51	122
17	36	25	.....	38	.....	35	41	50	134	31	89	.....
18	.....	41	.....	47	63	34	42	62	156	52	183	.....
19	.....	46	.....	56	83	35	38	120	96	50	145	.....
20	.....	30	.....	56	127	39	40	112	82	135	175	.....
21	.....	24	.....	52	95	39	42	68	206	114	102	.....
22	.....	23	.....	46	74	39	.....	50	118	72	71	.....
23	.....	17	.....	55	60	39	.....	39	101	52	50	.....
24	.....	14	.....	51	62	37	.....	34	278	43	38	.....
25	.....	14	.....	158	72	35	.....	24	195	36	30	.....
26	.....	10	.....	211	62	31	.....	20	109	38	26	.....
27	.....	10	.....	205	55	29	.....	37	68	41	24	.....
28	.....	10	.....	.....	55	29	18	56	68	35	23	.....
29	.....	.....	.....	.....	49	27	16	92	56	36	24	46
30	.....	.....	.....	.....	43	25	15	101	46	104	19	39
31	.....	.....	.....	.....	40	.....	15	86	.....	50	.....	145

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1920.							1920.						
1	227	.....	25	21	58	75	16	35	205	38	.....	225	.....
2	221	.....	24	21	57	78	17	35	211	30	.....	166	.....
3	143	.....	19	20	57	89	18	34	150	28	.....	146	.....
4	89	.....	20	20	66	101	19	.....	92	28	.....	101	.....
5	117	.....	20	23	60	96	20	.....	65	25	.....	75	.....
6	258	.....	20	23	46	90	21	.....	58	23	.....	65	.....
7	570	0	20	22	44	81	22	.....	54	20	.....	60	.....
8	342	146	20	21	41	75	23	.....	51	19	.....	56	.....
9	175	112	19	21	37	79	24	.....	44	18	.....	55	.....
10	120	146	22	23	35	75	25	.....	43	18	.....	55	.....
11	78	175	38	42	39	60	26	.....	38	18	89	56	.....
12	56	137	42	28	48	55	27	.....	34	20	107	65	.....
13	56	128	32	.....	50	44	28	.....	30	25	83	68	.....
14	50	109	32	.....	51	.....	29	.....	28	25	72	72	.....
15	40	109	27	.....	89	.....	30	.....	.....	23	65	72	.....
							31	.....	.....	22	.....	75	.....

NOTE.—Discharge for following periods when gage did not operate satisfactorily estimated by comparison with records of Porcupine Creek near Nickel: Nov. 24–30, 1918, 87 second-feet; Jan. 18–31, 1919, 30 second-feet; Feb. 1–8, 27 second-feet; Mar. 13–19, 10 second-feet; Mar. 20–31, 28 second-feet; Apr. 1–3, 50 second-feet; Apr. 28–30, 125 second-feet, May 1–3, 65 second-feet; May 5–17, 55 second-feet; July 22–27, 30 second-feet; Aug. 11–15, 46 second-feet; Dec. 17–28, 77 second-feet; Apr. 13–25, 1920, 34 second-feet. Discharge for following periods estimated because stage-discharge relation was affected by ice: Feb. 10 and Feb. 27 to Mar. 4, 1919, Jan. 14, 15; Mar. 5–8, and Mar. 27 to Apr. 8, 1920, as shown in table; Jan. 19–31, 1920, 26 second-feet and Feb. 1–7, 85 second-feet.

Monthly discharge of Falls Creek at Nickel for the period May 6, 1918, to June 13, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
1918.					1919.				
May 6-31	258	62	101	5,210	July	72	15	37.3	2,290
June	162	50	80.1	4,770	August	120	14	47.8	2,940
July	106	23	44.9	2,760	September	458	15	111	6,600
August	408	35	104	6,400	October	465	28	115	7,070
September	414	28	104	6,190	November	183	11	46.5	2,770
October	156	39	78.8	4,850	December	.....	14	54.7	3,360
November	465	31	103	6,130	The year	465	6	57.3	41,500
December	235	30	81.1	4,990	1920.				
The period	.....	.....	.....	41,300	January	570	.....	96.3	5,920
1919.					February	.....	28	95.2	5,480
January	229	.....	66.3	4,080	March	42	18	24.5	1,510
February	.....	10	24.2	1,340	April	107	.....	38.1	2,270
March	.....	6	17.5	1,080	May	225	35	70.6	4,340
April	211	24	67.0	3,990	June 1-13	101	44	76.8	1,980
May	127	.....	60.7	3,730	The period	.....	.....	.....	21,500
June	49	25	37.5	2,230					

PORCUPINE CREEK NEAR NICKEL.

LOCATION.—Half a mile above beach, on stream that enters tidewater at head of Porcupine Harbor, 4 miles northwest of camp of Alaska Nickel Mines Co., which is 20 miles by water northwest of Chichagof, on west coast of Chichagof Island.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 20, 1918, to August 22, 1920.

GAGE.—Stevens water-stage recorder on left bank of stream half a mile above beach.

DISCHARGE MEASUREMENTS.—At medium and high stages, made from cable across stream 150 feet above gage; at low stages, made by wading near control.

CHANNEL AND CONTROL.—The gage is located at edge of deep pool formed by contraction of channel where stream passes over exposed bedrock and descends in a series of small falls. The head of these falls forms a well-defined and permanent control. At the cable section the bed is rough, the water is deep, and the current is sluggish and irregular, because 15 feet above cable the stream widens into a small lake.

EXTREMES OF DISCHARGE.—1918-1290: Maximum stage during period from water-stage recorder, 4.25 feet at 11 p. m. January 7, 1920 (discharge, from extension of rating curve, 1,180 second-feet); minimum stage, 0.37 foot March 19 and 28, 1919 (discharge, 24 second-feet).

ICE.—Stage-discharge relation not seriously affected by ice.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve fairly well defined between 30 and 200 second-feet; extended beyond these limits. Operation of water-stage recorder satisfactory except for periods indicated in footnote to daily discharge table. Daily discharge ascertained by applying to rating table mean daily gage heights obtained by inspection of gage-height graph, or, for days of considerable fluctuation, by averaging discharge for intervals of the day. Records fair.

The following discharge measurement was made by G. H. Canfield:

June 13, 1920: Gage height, 1.24 feet; discharge, 84 second-feet.

Daily discharge, in second-feet, of Porcupine Creek near Nickel for the period May 21, 1918, to Aug. 21, 1920.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1918.												
1	.....	.....	.....	.....	.....	191	139	75	305	157	181	.....
2	.....	.....	.....	.....	.....	171	132	65	228	140	162	.....
3	.....	.....	.....	.....	.....	157	126	60	183	143	140	.....
4	.....	.....	.....	.....	.....	147	120	60	155	143	130	.....
5	.....	.....	.....	.....	.....	139	113	65	136	133	365	.....
6	.....	.....	.....	.....	.....	139	106	67	122	123	658	.....
7	.....	.....	.....	.....	.....	139	104	75	109	118	465	.....
8	.....	.....	.....	.....	.....	145	100	78	99	117	320	.....
9	.....	.....	.....	.....	.....	147	96	76	93	110	240	.....
10	.....	.....	.....	.....	.....	143	94	74	106	103	185	.....
11	.....	.....	.....	.....	.....	143	98	71	101	98	161	.....
12	.....	.....	.....	.....	.....	140	100	76	100	114	152	.....
13	.....	.....	.....	.....	.....	133	95	94	94	122	137	.....
14	.....	.....	.....	.....	.....	131	90	90	88	130	129	.....
15	.....	.....	.....	.....	.....	129	88	90	82	127	120	.....
16	.....	.....	.....	.....	.....	123	86	103	92	120	113	.....
17	.....	.....	.....	.....	.....	118	83	103	126	120	104	.....
18	.....	.....	.....	.....	.....	114	81	99	175	133	94	.....
19	.....	.....	.....	.....	.....	109	78	103	175	129	88	.....
20	.....	.....	.....	.....	.....	108	76	113	154	123	90	.....
21	.....	.....	.....	.....	93	105	73	133	136	117	96	.....
22	.....	.....	.....	.....	92	100	65	148	123	106	110	.....
23	.....	.....	.....	.....	90	98	60	187	129	100	110	.....
24	.....	.....	.....	.....	88	98	60	197	120	100	116	121
25	.....	.....	.....	.....	88	100	60	185	157	96	117	125
26	.....	.....	.....	.....	88	100	58	166	420	109	136	136
27	.....	.....	.....	.....	89	100	65	177	505	112	145	125
28	.....	.....	.....	.....	126	103	75	195	338	129	143	116
29	.....	.....	.....	.....	197	120	60	311	252	140	179	105
30	.....	.....	.....	.....	224	147	65	545	195	161	185	99
31	.....	.....	.....	.....	208	.....	80	445	.....	175	.....	90
1919.												
1	88	52	32	43	112	92	75	65	126	145	104	.....
2	108	50	31	45	104	92	73	64	120	228	103	.....
3	109	48	31	47	98	94	73	62	109	499	104	.....
4	104	46	29	46	92	90	75	61	100	626	98	.....
5	110	44	28	50	89	88	75	62	93	635	98	.....
6	152	43	29	53	89	86	77	62	84	650	92	.....
7	195	42	29	53	90	84	81	52	80	500	86	.....
8	206	41	30	53	92	82	81	56	76	400	74	.....
9	197	41	33	53	95	80	82	67	94	355	81	.....
10	175	42	31	52	94	80	85	69	113	285	79	.....
11	159	41	30	52	92	79	96	69	103	222	73	.....
12	140	40	30	53	90	79	98	67	120	181	70	.....
13	126	39	29	53	89	78	105	76	445	155	77	.....
14	120	39	28	53	92	78	112	86	537	142	74	.....
15	109	39	26	52	99	79	110	84	362	132	79	.....
16	99	38	26	51	104	78	108	95	272	121	79	.....
17	92	36	26	53	101	78	104	92	252	113	93	.....
18	84	44	26	54	100	78	101	90	305	110	122	118
19	78	48	25	58	106	78	98	117	252	109	140	112
20	74	43	27	60	126	79	95	126	206	136	161	108
21	74	42	32	62	126	81	95	121	305	159	157	108
22	72	40	30	62	123	81	94	113	252	162	148	114
23	67	40	29	64	118	83	89	104	240	137	191	117
24	64	38	28	64	114	83	87	96	368	121	.....	137
25	64	36	27	87	118	83	82	88	425	117	.....	150
26	58	35	26	109	116	81	79	84	305	103	.....	177
27	60	34	26	133	110	80	76	86	235	99	.....	171
28	58	33	25	132	105	79	73	94	208	96	.....	155
29	58	.....	27	125	103	79	70	108	191	93	.....	142
30	56	.....	30	118	95	77	68	126	157	118	.....	127
31	54	.....	39	.....	90	.....	66	133	.....	106	.....	142

Daily discharge, in second-feet, of Porcupine Creek near Nickel for the period May 21, 1918, to Aug. 21, 1920—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1920.								
1	217	.....	70	35	57	81	92	59
2	245	.....	68	35	55	86	90	58
3	265	.....	66	36	53	93	93	62
4	222	.....	64	38	53	94	92	68
5	210	.....	62	42	56	93	88	120
6	366	80	62	41	59	90	87	126
7	912	74	58	40	58	94	83	123
8	930	85	60	40	58	98	81	129
9	590	81	58	39	60	100	81	129
10	408	112	52	38	64	96	78	121
11	296	125	55	37	67	93	74	157
12	235	122	54	39	64	89	70	162
13	206	123	50	42	64	92	73	161
14	175	123	50	44	66	94	69	154
15	157	129	52	43	64	88	67	143
16	.....	147	52	45	61	92	63	137
17	.....	175	49	43	63	90	64	125
18	.....	185	52	43	64	87	61	113
19	.....	157	50	47	68	88	58	127
20	.....	140	48	48	71	86	56	133
21	.....	122	48	49	72	87	55	143
22	.....	113	48	49	71	83	54	.....
23	.....	104	43	51	72	86	54	.....
24	.....	98	44	52	73	83	54	.....
25	.....	89	44	50	80	79	54	.....
26	.....	85	41	49	80	74	51	.....
27	.....	79	42	50	79	77	47	.....
28	.....	75	41	51	81	77	54	.....
29	.....	71	39	55	79	80	55	.....
30	.....	.....	38	56	80	83	50	.....
31	.....	.....	36	.....	80	.....	53	.....

NOTE.—Discharge for following periods estimated because of unsatisfactory operation of water-stage recorder, by comparison with records of flow for near-by streams: July 22 to Aug. 4, 1918, as shown in table; Dec. 1–23, 135 second-feet; May 10–12, July 26–30, and Oct. 6–8, 1919, as shown in table; Nov. 24–30, 53 second-feet; Dec. 1–17, 71 second-feet; Jan. 16–31, 1920, 80 second-feet; discharge for following periods estimated because stage-discharge relation was affected by ice: Feb. 25 and Mar. 12, 1919, Mar. 1–6, and Mar. 28 to Apr. 4, 1920, as shown in table; Feb. 1–5, 1920, 50 second-feet.

Monthly discharge of Porcupine Creek near Nickel for the period May 21, 1918, to Aug. 21, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
1918.					1919.				
May 21–31	224	88	126	2,750	August	133	52	86.3	5,310
June	191	98	128	7,620	September	537	76	218	13,000
July	139	58	87.9	5,400	October	650	93	228	14,000
August	545	60	140	8,610	November	.....	.....	91.8	5,460
September	505	82	170	10,100	December	.....	.....	99.5	6,120
October	175	96	124	7,620					
November	658	88	179	10,700	The year	650	25	103	74,800
December	.....	.....	130	7,990					
The period	.....	.....	.....	60,800	1920.				
					January	930	.....	213	13,100
					February	185	.....	102	5,870
1919.					March	70	36	51.5	3,170
January	206	54	104	6,400	April	56	35	44.2	2,630
February	52	33	41.2	2,290	May	81	53	66.8	4,110
March	39	25	28.9	1,780	June	100	74	87.8	5,220
April	133	43	66.3	3,950	July	93	47	67.8	4,170
May	126	89	102	6,270	August 1–21	162	58	121	5,040
June	94	77	82.0	4,880					
July	112	66	86.5	5,320	The period	.....	.....	.....	43,300

SWEETHEART FALLS CREEK NEAR SNETTISHAM.

LOCATION.—In latitude 57° 56½′ N., longitude 133° 41′ W., on east shore 1 mile from head of south arm of Port Snettisham, 3 miles south of mouth of Whiting River, 7 miles by water from Snettisham, and 42 miles by water from Juneau. No large tributaries enter river between gaging station and outlet of large lake, 2½ miles upstream.

DRAINAGE AREA.—27 square miles (measured on United States Geological Survey topographic map of the Juneau gold belt, edition of 1905).

RECORDS AVAILABLE.—July 31, 1915, to March 31, 1917; May 21, 1918, to December 31, 1920.

GAGE.—Stevens water-stage recorder on right bank, 300 feet upstream from tidewater on east shore of Port Snettisham.

DISCHARGE MEASUREMENTS.—At medium and high stages, made from cable across river one-fourth mile upstream from gage; at low stages, made by wading in channel at mouth of creek exposed at low tide.

CHANNEL AND CONTROL.—From the outlet of the lake at an elevation of 520 feet above sea level and 2½ miles from tidewater the water descends in a series of rapids and falls through a narrow, deep canyon. Gage is in a pool at foot of two falls, each 25 feet high, which are known as Sweetheart Falls; outlet of pool is a natural rock weir, which forms a well-defined and permanent control for gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.7 feet, at 10 a. m. August 6 (discharge computed from an extension of rating curve, 1,620 second-feet); minimum stage, 0.15 foot, April 10 (discharge, 28 second-feet).

1915–1920: Maximum stage recorded, 7.15 feet at midnight, September 26, 1918 (discharge computed from an extension of the rating curve, 2,880 second-feet); minimum discharge, estimated by current-meter measurement and climatic data, 15 second-feet, February 11, 1916.

ICE.—Stage-discharge affected by ice, April 5–7 and December 14–19.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 40 and 1,300 second-feet; extended beyond these limits by estimation. Operation of water-stage recorder satisfactory except for periods indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage heights determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging results obtained by applying to rating table gage heights for regular intervals of day. Records excellent, except for period of break in record and for discharge above 1,300 second-feet, for which they are fair.

The only maps available, showing the lake and the drainage basin of this stream, are sheets 11 and 12 (scale 1:160,000) of the Alaska Boundary Tribunal, edition of 1895; topographic map of the Juneau gold belt (scale 1:250,000), United States Geological Survey, edition of 1905 (topography compiled from sheets of the Alaska Boundary Tribunal). From these maps, the following determinations have been made: Area of drainage basin above gaging station, 27 square miles, and above outlet of lake, 26 square miles; area of lake, 1,500 acres; distance from lake outlet to tidewater, 1¾ miles. The elevation of lake above high tide, measured by aneroid barometer, is 520 feet. An unpublished map of part of Port Snettisham (scale 1:31,680), made in 1920 by the United States Geological Survey in cooperation with the United States Forest Service, shows the topography, by a 100-foot contour interval, from the shore to a point about half a mile from outlet of lake.

The following discharge measurement was made by G. H. Canfield:

October 7, 1920: Gage height, 101 feet; discharge, 178 second-feet.

Daily discharge, in second-feet, of Sweetheart Falls Creek near Snettisham for 1920.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	159	58	47	.....	133	565	865	470	805	765	785	79
2	249	58	44	.....	137	645	805	442	685	505	1,150	72
3	428	58	43	.....	144	705	685	432	645	418	1,040	67
4	351	74	41	.....	146	785	605	470	765	321	705	67
5	264	113	40	37	144	845	625	846	665	255	505	64
6	240	121	47	35	135	845	645	1,530	505	205	685	58
7	628	119	53	34	131	765	665	1,350	765	166	545	57
8	1,040	102	44	32	121	725	705	1,240	1,190	183	407	53
9	725	96	39	29	115	685	745	845	945	505	312	49
10	470	92	40	28	113	665	765	565	645	470	243	46
11	348	125	42	37	125	605	725	922	435	365	196	42
12	258	108	53	52	183	565	705	1,330	330	300	155	40
13	202	90	52	50	199	545	665	1,330	261	276	129	39
14	183	78	48	44	191	545	625	1,080	210	249	113	38
15	152	79	44	41	210	585	625	745	183	219	106	38
16	131	88	40	39	318	605	625	505	164	183	95	38
17	.....	146	41	38	318	565	585	400	148	155	85	38
18	.....	109	38	38	340	565	545	330	137	131	80	38
19	.....	178	36	38	309	505	525	324	152	117	74	38
20	.....	150	33	37	273	452	505	340	150	148	79	37
21	.....	123	32	37	249	424	470	418	137	228	80	36
22	.....	98	.....	37	249	585	452	435	129	231	78	33
23	.....	85	.....	36	261	605	418	365	123	382	76	30
24	.....	73	.....	37	279	505	372	306	111	414	74	29
25	.....	67	.....	47	282	460	348	255	113	321	72	29
26	.....	60	.....	85	282	505	358	300	98	288	72	30
27	.....	57	.....	119	297	565	386	585	90	625	64	82
28	.....	54	.....	131	334	625	386	505	159	625	73	127
29	.....	50	.....	135	386	745	382	393	682	452	88	90
30	.....	.....	.....	133	452	865	382	315	1,120	545	88	70
31	.....	.....	.....	.....	505	.....	418	452	.....	777	.....	90

NOTE.—Discharge for following periods estimated, because of ice or unsatisfactory operation of water-stage recorder, by comparison with climatic data for Juneau and hydrographs for streams in near-by drainage basins: Jan. 17–31, 80 second-feet; Mar. 22–31, 32 second-feet; Apr. 1–4, 30 second-feet; Feb. 1, 2, Apr. 5–7, Dec. 14–19, and Dec. 29–31, daily discharge.

Monthly discharge of Sweetheart Falls Creek near Snettisham, for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	1,040	.....	227	14,000	August	1,530	255	640	39,400
February	178	50	93.4	5,370	September	1,190	90	418	24,900
March	53	.....	39.3	2,420	October	777	117	349	21,500
April	135	28	50.9	3,030	November	1,150	64	275	16,400
May	505	113	237	14,600	December	127	29	53.0	3,260
June	865	424	622	37,000					
July	865	348	568	34,900	The year	1,530	28	298	217,000

CRATER LAKE OUTLET AT SPEEL RIVER, PORT SNETTISHAM.

LOCATION.—At outlet of Crater Lake, 1 mile upstream from edge of tide flats at head of north arm of Port Snettisham, 2 miles by trail from cabins of Speel River project, which are 42 miles by water from Juneau.

DRAINAGE AREA.—11.9 square miles above water-stage recorder at lake outlet, and 13 square miles above staff gage at beach (measured on topographic maps of the Alaska Boundary Tribunal, edition of 1895).

RECORDS AVAILABLE.—January 23, 1913, to December 31, 1920.

GAGE.—Stevens water-stage recorder on left shore of lake 100 feet upstream from outlet. A locally made water-stage recorder having a natural vertical scale and a time scale of 7 inches to 24 hours was used until replaced by Stevens gage June 29, 1916. The gage datum remained the same during the period. During the winter, because of inaccessible location and deep snow, the operation of the gage at the lake was discontinued, and the stage read at staff gage in channel exposed at low tide at beach. The first gage at beach was set at an unknown datum and washed out in winter of 1915–16. Another staff gage was set at about the same location November 24, 1916. Other staff gages were set at about the same location January 11 and November 13, 1918.

DISCHARGE MEASUREMENTS.—Made from cable across outlet of lake, 100 feet downstream from gage and 10 feet upstream from crest of first falls. The rope sling from which discharge measurements were first made was replaced in fall of 1915 by a standard United States Geological Survey gaging car, making more reliable measurements possible.

CHANNEL AND CONTROL.—The gage is on left shore of lake, 100 feet upstream from outlet, where the stream becomes constricted into a narrow channel, the bed of which is composed of large boulders and rock outcrops that form a well-defined and permanent control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year, 6.75 feet at 2 a. m. August 6 (discharge computed from an extension of rating curve, 2,100 second-feet); minimum discharge, estimated, 10 second-feet about March 31.

1913–1920: Maximum stage occurred probably on September 26, 1918 (discharge estimated at 2,300 second-feet by multiplying maximum discharge at Long River on September 27, 1918, by 0.44, which is the ratio between the maximum discharges of Crater Lake outlet and Long River on August 19 and 20, 1917); minimum discharge, 5.0 second-feet, February 4, 1916, and February 13, 1919.

ACCURACY.—Stage-discharge relation permanent. Rating curve well-defined below and extended above 1,000 second-feet. Operation of water-stage recorder satisfactory except for periods indicated by breaks in record as shown in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table daily gage height determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging results obtained by applying to rating table mean gage heights for regular intervals of the day.

Crater Lake is 1,010 feet above sea level and covers 1.1 square miles. The sides of the mountains surrounding the lake are steep and barren, and the tops are covered by glaciers.

Discharge measurements of Crater Lake outlet at Port Snettisham during 1920.

[Made by G. H. Canfield.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Feb. 4	.....	[a] 12	May 14	0.26	[b] 52
Apr. 6	.....	[b] 11.5	Nov. 11	.48	[b] 52

[a] Estimated discharge at beach.
[b] Estimated inflow between the outlet of Crater Lake and the beach subtracted from the discharge measured at the beach.

Daily discharge, in second-feet, of Crater Lake outlet at Speel River, Port Snettisham, for the period Oct. 1919, to Nov. 11, 1920.

Day.	Oct.	Nov.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	50	.....	95	532	517	251	350	251
2	.....	43	.....	103	416	416	327	212	402
3	.....	33	.....	108	327	362	532	171	350
4	.....	34	.....	114	304	443	594	125	221
5	.....	.....	.....	118	338	1,440	375	93	153
6	.....	.....	.....	121	388	1,720	350	74	241
7	.....	.....	.....	122	429	1,230	675	62	186
8	.....	.....	.....	125	472	610	798	151	126
9	282	.....	.....	126	502	402	798	304	98
10	194	.....	.....	127	502	304	280	217	78
11	139	.....	.....	130	502	1,080	186	150	62
12	116	.....	.....	131	472	1,090	138	120	.....
13	98	.....	.....	132	443	762	115	108	.....
14	82	.....	.....	134	443	502	101	94	.....
15	70	.....	.....	135	443	338	95	78	.....
16	63	.....	.....	136	472	259	98	64	.....
17	62	56	.....	138	443	221	90	52	.....
18	67	194	.....	140	402	219	98	43	.....
19	100	241	.....	142	402	302	142	40	.....
20	246	221	.....	143	388	375	122	55	.....
21	338	251	.....	146	388	532	100	78	.....
22	203	161	.....	146	375	429	89	79	.....
23	132	108	64	161	327	304	81	122	.....
24	98	78	66	180	293	221	74	126	.....
25	78	60	68	198	293	178	67	98	.....
26	66	49	68	241	327	287	61	108	.....
27	63	.....	70	304	362	762	54	327	.....
28	62	.....	75	362	362	472	79	251	.....
29	55	.....	78	472	375	282	472	158	.....
30	55	.....	84	594	388	208	626	203	.....
31	52	.....	90	.....	472	223	.....	231	.....

NOTE.—Discharge for following periods estimated, because of ice or unsatisfactory operation of water-stage recorder, by comparison with hydrograph and record of flow for Sweetheart Falls Creek: Oct. 1–8, 1919, 470 second-feet; Nov. 5–16, 22 second-feet; Nov. 27–30, 40 second-feet; Dec. 1–31, 45 second-feet; Jan. 1–31, 1920, 100 second-feet; Feb. 1–29, 35 second-feet; Mar. 1–31, 16 second-feet; Apr. 30, 20 second-feet; and May 1–22, 45 second-feet; June 24 and Aug. 6–10, daily discharge. Figures for October, November, and December, 1919, supersede those published in previous report.

Monthly discharge of Crater Lake outlet at Speel River, Port Snettisham, for the period Oct. 1, 1919, to Nov. 11, 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
1919.									
October	.....	52	209	12,900	April	.....	.....	20	1,190
November	251	.....	67	3,990	May	.....	.....	53.4	3,280
December	.....	.....	45	2,770	June	594	95	177	10,500
					July	532	293	406	25,000
The period	.....	.....	107	19,700	August	1,720	178	532	32,700
					September	798	54	262	15,600
1920.					October	350	40	140	8,610
January	.....	.....	100	6,150	November 1–11	402	62	197	4,300
February	.....	.....	35	2,010					
March	.....	.....	16	984	The period	.....	.....	.....	110,000

NOTE.—Figures for October, November, and December, 1919, supersede those published in previous report.

LONG RIVER BELOW SECOND LAKE, AT PORT SNETTISHAM.

LOCATION.—Half a mile downstream from outlet of Second Lake, 1 mile downstream from outlet of Long Lake, half a mile upstream from head of Indian Lake; 2½ miles by trail and boat across Second Lake from cabins of the Speel River project at head of the North Arm of Port Snettisham, 45 miles by water from Juneau.

DRAINAGE AREA.—33.2 square miles (measured on sheet No. 12 of the Alaska Boundary Tribunal maps, edition of 1895).

RECORDS AVAILABLE.—November 11, 1915, to December 31, 1920.

GAGE.—Stevens continuous water-stage recorder on right bank half a mile below outlet of Second Lake.

DISCHARGE MEASUREMENTS.—At medium and high stages made from cable across river at gage; at low stages made by wading one-fourth mile downstream.

CHANNEL AND CONTROL.—At the gage the channel is deep and the current sluggish; banks are low and are overflowed at extremely high stages; bed smooth except for one large boulder. A rapid, 500 feet downstream, forms a well-defined and permanent control.

EXTREMES OF DISCHARGE.—Maximum stage during year, 9.2 feet at about 5 a. m. August 6 (discharge, estimated from extension of rating curve, 4,300 second-feet); minimum discharge, estimated, 30 second-feet, April 9–10. 1916–1920: Maximum stage, 10.2 feet September 27, 1918 (discharge, estimated from extension of rating curve, 5,300 second-feet); minimum discharge, 23 second-feet, February 13, 1916.

ICE.—Stage-discharge relation affected by ice during January, February, March, April, and December.

ACCURACY.—Stage-discharge relation permanent; affected by ice or poor connection between well and river January 1 to February 8, March 23 to May 15, and November 29 to December 31. Rating curve fairly well defined between 50 and 400 second-feet and well defined between 400 and 2,000 second-feet. Operation of water-stage recorder satisfactory except for periods indicated in footnote to daily discharge table. Daily discharge ascertained by applying to the rating table daily gage heights determined by inspecting the gage-height graph. Records good, except for stages below 400 second-feet and for periods of break in record, for which they are fair.

Long Lake is at an elevation of 803 feet above sea level, is 2,000 acres in area, and is about 2 miles, by line of possible water conduit, from tidewater at cabins of the Speel River project.

The area of the drainage basin above the outlet of Long Lake is 31.9 square miles. The area draining to Long River between the outlet of Long Lake and this station comprises only 1.3 square miles, including First Lake and Second Lake. Because this area is at a low altitude and has no glaciers the run-off per square mile from it is greater early in the spring but much less in summer than that from the area above Long Lake, which is partly covered by glaciers.

Discharge measurements of Long River below Second Lake, at Port Snettisham, during 1920.

[Made by G. H. Canfield.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-feet.*		*Feet.*	*Sec.-feet.*
Apr. 6	[a] 0.84	38	Nov. 11	1.71	181
May 13		140			

[a] River partly frozen over at control.

Daily discharge, in second-feet, of Long River below Second Lake, at Port Snettisham, for 1920.

Day.	Feb.	Mar.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	50	51	.....	465	900	998	740	1,040	620
2	50	50	.....	512	800	930	840	740	1,190
3	55	49	.....	582	750	840	1,160	582	952
4	60	48	.....	620	700	908	1,310	426	600
5	100	48	.....	680	760	2,360	998	330	468
6	160	48	.....	680	820	3,760	885	239	582
7	130	46	.....	640	908	2,340	1,490	194	487
8	110	45	.....	600	1,020	1,510	1,690	337	357
9	93	44	.....	600	1,060	1,090	1,240	565	264
10	108	42	.....	600	1,110	885	840	468	202
11	180	45	.....	582	1,110	1,900	600	375	173
12	120	50	.....	565	1,110	2,480	468	339	157
13	89	54	.....	530	1,060	1,780	387	341	138
14	81	50	.....	530	1,060	1,310	339	293	123
15	82	50	.....	548	1,060	975	301	239	113
16	95	48	390	565	1,090	780	331	181	105
17	204	47	325	548	1,040	660	295	149	101
18	204	46	354	600	998	620	351	130	98
19	134	49	312	565	975	740	402	117	86
20	98	45	295	523	952	840	314	220	94
21	77	45	298	471	930	1,130	262	357	95
22	68	45	339	600	908	1,020	234	312	94
23	63	.....	341	548	820	800	211	435	92
24	62	.....	325	465	740	640	190	282	91
25	58	.....	301	426	700	530	177	220	89
26	56	.....	298	465	760	756	166	259	88
27	54	.....	325	530	820	1,380	152	620	87
28	53	.....	334	800	820	1,110	306	548	89
29	52	.....	354	750	862	800	1,090	414	110
30	.....	.....	390	800	885	620	1,460	540	110
31	.....	.....	420	.....	930	660	.....	523	.....

NOTE.—Discharge estimated for following periods, because stage-discharge relation was affected by ice or obstructed connection between well and river, or because of unsatisfactory operation of water-stage recorder, by comparison with climatic data at Juneau and by hydrographs and records of flow for streams in near-by drainage basins: Jan. 1–31, 180 second-feet; Feb. 1–8, daily discharge; Mar. 23–31, 41 second-feet; Apr. 1–30, 52 second-feet; May 1–15, 125 second-feet; June 28 to July 3, Oct. 5, Nov. 29 and 30, daily discharge; Dec. 1–31, 60 second-feet.

Monthly discharge of Long River below Second Lake, at Port Snettisham, for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	.....	.....	180	11,100	August	3,760	530	1,200	73,800
February	204	50	94.7	5,450	September	1,690	152	641	38,100
March	51	.....	45.6	2,800	October	1,040	117	381	23,400
April	.....	.....	52	3,090	November	1,190	86	262	15,600
May	420	.....	235	14,400	December	.....	.....	60	3,690
June	800	426	580	34,500					
July	1,110	700	918	56,400	The year	3,760	.....	389	282,000

GRINDSTONE CREEK AT TAKU INLET.

LOCATION.—On north shore of Taku Inlet, between Point Bishop and Point Salisbury, one-fourth mile west of mouth of Rhine Creek and 11 miles by water from Juneau.

DRAINAGE AREA.—3.6 square miles (measured on general map of vicinity of Juneau prepared by Alaska Gastineau Mining Co., edition of 1916).

RECORDS AVAILABLE.—May 6, 1916, to December 31, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank, 200 feet from tidewater, installed September 16, 1916. A Lietz seven-day graph water-stage recorder was used May 6 to June 17, 1916.

DISCHARGE MEASUREMENTS.—At all stages made by wading either in the channel on the beach, which is exposed at low tide, or 100 feet below gage at high tide.

CHANNEL AND CONTROL.—For a distance of one-fourth mile from tidewater the stream descends in a series of rapids and falls through a narrow, rocky channel. The gage is at upper end of a turbulent pool between two falls, the lower of which forms a well-defined control. When gage was installed, logs were jammed in channel near upper end of pool.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 3.4 feet at 4 a. m., August 6 (discharge, from extension of rating curve, 317 second-feet); minimum discharge estimated by comparison with hydrographs for streams in near-by drainage basins, 3.5 second-feet, April 6, December 24 and 25.

1916–1920: Maximum stage, 6 feet at 7 p. m. September 26, 1918 (discharge, estimated from an extension of the rating curve, 700 second-feet); minimum stage, −0.24 foot April 5–7, 1918 (discharge, 2.6 second-feet).

ICE.—Stage-discharge relation sometimes affected by ice.

ACCURACY.—Stage-discharge relation permanent. Rating curve fairly well defined below 150 second-feet; extended above 150 second-feet by estimation. Operation of water-stage recorder satisfactory except for periods shown in the footnote to daily-discharge table. Discharge ascertained by applying to rating table mean daily gage heights determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging results obtained by applying to rating table mean gage heights for regular intervals of day. Records fair, except those for periods of break in record and discharge above 150 second-feet, which are poor.

Discharge measurements of Grindstone Creek at Taku Inlet during 1920.

[Made by G. H. Canfield.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 5	−0.04	3.9	Oct. 4	0.74	28
July 10	1.17	55	Nov. 10	.81	30
Aug. 24	1.23	64			

Daily discharge, in second-feet, of Grindstone Creek at Taku Inlet for 1920.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	17	6	7.5	4.4	21	67	120	48	24	35	63	13
2	24	5	7.0	4.2	24	84	92	34	24	30	66	12
3	22	5	6.3	4.1	24	97	77	38	32	25	57	12
4	17	8	7.8	4.0	20	91	72	43	24	22	47	12
5	16	12	7.9	3.9	19	102	72	174	24	21	42	12
6	21	15	8.0	3.5	18	92	72	168	40	19	48	11
7	83	14	8.0	3.6	18	80	72	80	73	18	40	11
8	49	11	8.0	3.7	16	77	72	55	81	21	33	10
9	26	11	6.9	3.7	16	77	70	45	52	29	31	8.4
10	21	12	6.8	3.7	17	75	67	41	43	26	27	.....
11	18	15	7.2	7.5	21	72	60	102	36	24	24	.....
12	.....	11	7.2	12	25	72	59	65	31	22	22	.....
13	.....	10	6.4	8.1	35	68	50	55	26	24	20	.....
14	.....	12	6.3	6.2	35	70	49	46	24	29	19	.....
15	.....	13	5.9	5.8	45	77	48	41	22	24	19	.....
16	.....	20	5.9	5.7	60	77	45	37	24	22	17	.....
17	.....	32	5.8	5.4	50	74	45	32	21	19	17	.....
18	.....	24	5.8	6.0	40	77	42	39	24	18	16	.....
19	.....	16	5.6	7.2	32	66	38	60	24	17	16	.....
20	.....	14	5.4	7.5	26	57	34	48	21	21	16	.....
21	.....	12	5.4	7.8	26	55	32	67	20	21	16	.....
22	.....	11	5.1	7.8	34	74	30	44	19	23	15	.....
23	.....	10	5.1	8.4	36	72	26	38	19	24	14	.....
24	.....	9.0	4.8	9.2	36	61	24	32	19	22	14	.....
25	.....	9.0	4.8	16	37	55	26	29	18	20	14	.....
26	.....	8.7	5.2	45	41	82	26	38	17	28	14	.....
27	.....	8.4	5.0	62	49	92	30	39	16	49	13	.....
28	.....	8.2	5.0	34	55	88	30	31	40	35	15	.....
29	.....	8.2	4.6	25	62	133	28	26	60	30	15	.....
30	.....	.....	4.5	20	68	186	26	24	45	61	13	.....
31	.....	.....	4.5	.....	72	.....	60	25	.....	49	.....	.....

NOTE.—Discharge estimated for following periods, because stage-discharge relation was affected by ice or water-stage recorder was not operating: Jan. 12–31 (10 second-feet), Feb. 1–5, Mar. 4–8, and Mar. 30 to Apr. 10, by comparison with hydrographs of streams in near-by drainage basins and climatic data for Juneau; May 12–18, from maximum and minimum stages indicated by recorder and comparison with record of flow for Sheep Creek; Aug. 16–20, from gage-height graph drawn by comparison with that for Sheep Creek; Sept. 27 to Oct. 3 (daily discharge) and Dec. 10–31 (6.3 second-feet), from maximum and minimum stages indicated by recorder and comparison with records of flow for Sheep Creek and Sweetheart Falls.

Monthly discharge of Grindstone Creek at Taku Inlet for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	83	.....	16.6	1,020	August	174	24	53.0	3,260
February	32	5.0	12.1	696	September	81	16	31.4	1,870
March	8.0	4.5	6.12	376	October	61	17	26.7	1,640
April	62	3.5	11.5	684	November	66	13	26.1	1,550
May	72	16	34.8	2,140	December	13	.....	7.74	476
June	186	55	81.7	4,860					
July	120	24	51.4	3,160	The year	186	3.5	29.9	21,700

CARLSON CREEK AT SUNNY COVE, TAKU INLET.

LOCATION.—At Sunny Cove, on west shore of Taku Inlet, 20 miles by water from Juneau.

DRAINAGE AREA.—22.26 square miles (determined by engineering department of Alaska Gastineau Mining Co. from surveys made by that company).

RECORDS AVAILABLE.—July 18, 1916, to December 31, 1920.

GAGE.—Stevens water-stage recorder on left bank, 2 miles from tidewater.

DISCHARGE MEASUREMENTS.—At high stages, made from cable across river half a mile downstream from gage; at medium and low stages, made by wading 500 feet upstream from gage.

CHANNEL AND CONTROL.—Above the gage the stream meanders in one main channel and several small channels through a flat, sandy basin about a mile long; just below the gage the channel contracts and the stream passes over rocky falls that form a well-defined and permanent control. The point of zero flow is at gage height −1.5 feet.

EXTREMES OF DISCHARGE.—Maximum stage during year, 7.15 feet at 8 p. m. August 5 (discharge computed from extension of rating curve, 4,950 second-feet); minimum flow, estimated, 12 second-feet, April 3.

1916–1920: Maximum stage, 8.1 feet at 2 p. m. September 26, 1918 (discharge, computed from extension of rating curve, 6,200 second-feet); minimum flow, estimated from climatic data and hydrographs for streams in near-by drainage basins, 10 second-feet, April 1–7, 1918.

ICE.—Stage-discharge relation affected by ice January 1 to about May 1.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 70 and 2,000 second-feet, extended below 70 second-feet to point of zero flow and above 2,000 second-feet by estimation. Operation of water-stage recorder satisfactory except for periods of break in record as indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage heights determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging results obtained by applying to rating table mean gage heights for regular intervals of the day. Records good, except for stages below 70 second-feet and above 2,000 second-feet, and for periods of break in record, for which they are fair.

A possible site for a dam is about 2 miles from tidewater at the outlet of a flat gravel basin. The elevation of the stream bed at this point is 350 feet above high tide. A dam 120 feet high would form a reservoir having a storage capacity of 30,000 acre-feet, which is less than half the capacity required to equalize the annual run-off.

Discharge measurements of Carlson Creek at Sunny Cove during 1920.

[Made by G. H. Canfield.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Feb. 6	.....	[a] 49	May 29	1.46	[a] 425
Apr. 7	.....	[a] 15	Nov. 10	.08	130

[a] Creek frozen over. Measurement made 2 miles below gage, and measured discharge reduced 5 per cent in order to give flow at gage.

Daily discharge, in second-feet, of Carlson Creek at Sunny Cove for 1920.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	882	640	318	308	390	16	.....	780	320	164	117	.....
2	.....	675	470	500	250	1,000	17	.....	675	328	124	98	.....
3	.....	590	455	975	258	545	18	820	658	367	164	122	.....
4	.....	658	561	658	172	265	19	658	640	590	234	108	.....
5	.....	762	3,950	425	124	196	20	560	605	515	164	176	.....
6	.....	800	2,090	545	108	396	21	485	605	742	144	214	.....
7	.....	882	745	1,690	102	300	22	692	575	390	124	212	.....
8	.....	928	545	1,180	337	230	23	545	485	285	117	396	.....
9	.....	928	396	485	812	175	24	461	455	234	117	265	.....
10	.....	905	354	302	308	124	25	515	470	210	118	172	.....
11	.....	860	2,440	243	227	108	26	762	545	586	118	410	.....
12	.....	800	905	196	227	102	27	820	560	1,360	119	710	.....
13	.....	762	710	167	247	.....	28	840	545	560	714	396	.....
14	.....	762	545	172	191	.....	29	1,080	545	338	1,440	223	.....
15	.....	745	396	188	144	.....	30	1,080	530	270	515	455	.....
							31	.....	675	421	.....	340	.....

NOTE.—Discharge estimated for following periods from current-meter measurements and by comparison with records of flow for Sweetheart Falls Creek, because stage-discharge relation was affected by ice or water-stage recorder was not operating: Jan. 1-31, 110 second-feet; Feb. 1-28, 42 second-feet; Mar. 1-31, 18 second-feet; Apr. 1-30, 25 second-feet; May 1-31, 240 second-feet; June 1-17, 730 second-feet; Nov. 6-9, as shown in table; Nov. 13-30, 55 second-feet; and Dec. 1-31, 33 second-feet.

Monthly discharge of Carlson Creek at Sunny Cove for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	.....	.....	110	6,760	August	3,950	210	733	45,100
February	.....	.....	42	2,420	September	1,690	117	414	24,600
March	.....	.....	18	1,110	October	812	98	265	16,300
April	.....	.....	25	1,490	November	1,000	.....	161	9,580
May	.....	.....	240	14,800	December	.....	.....	33	2,030
June	1,080	.....	724	43,100					
July	928	455	687	42,200	The year	3,950	.....	289	209,000

SHEEP CREEK NEAR THANE.

LOCATION.—At lower end of flat basin, above diversion dam for flume leading to Treadwell power house at beach and 1 mile by tramway and ore railway from Thane.

DRAINAGE AREA.—4.57 square miles above gaging bridge (measured on United States Geological Survey map of Juneau and vicinity, edition of 1917).

RECORDS AVAILABLE.—July 26, 1916, to December 31, 1920.

GAGE.—Stevens water-stage recorder on right bank, at pool formed by an artificial control just below small island three-tenths mile upstream from diversion dam. Recorder inspected by an employee of the Alaska Gastineau Mining Co.

DISCHARGE MEASUREMENTS.—At extremely high stages, made from gaging bridge two-tenths mile downstream from gage; at low stages, made by wading near bridge section. No streams enter between gage and measuring section, but seepage inflow ranges from a small amount to 10 per cent of total flow, the percentage of inflow usually being large after periods of heavy precipitation.

CHANNEL AND CONTROL.—The station is near the lower end of a flat basin through which the stream meanders in a channel having low banks and a bed of sand and gravel. An artificial control was built 2 feet below the intake for the gage well, to confine the flow in one channel during high water and to insure a permanent stage-discharge relation. The spillway of the control at low stages consists of a timber, 16 feet long, set in the bed of the stream. During medium and high stages another timber, 8 feet long, bolted at the top near the right end, forms part of the control. A 3-foot cut-off wall is driven at the upstream face of the spillway. There are wing walls at each end, and an 8-foot apron extends downstream from the control.

ICE.—Control covered with ice and snow for short period. Flow passes through gravel bed under and around weir and enters creek again above gaging section one-fourth mile downstream.

EXTREMES OF DISCHARGE.—Maximum stage during year, 2.41 feet at 12.30 a. m. August 6 (discharge, 458 second-feet); minimum stage, −0.35 foot, on April 13 and 14 (discharge, 5.6 second-feet).

1916–1920: Maximum stage during period, 3.5 feet, at 2 p. m. September 26, 1918 (discharge, estimated from extension of rating curve, 820 second-feet); minimum flow, 1.0 second-foot, April 6–8, 1917.

ACCURACY.—Stage-discharge relation below 1.2 feet changed January 6 because of shifting of gravel bed above the artificial control. Rating curves used January 1–6 and January 7 to December 31 fairly well defined below 700 second-feet.

Operation of water-stage recorder satisfactory except for periods indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage heights determined by inspecting gage-height graph, or, for days of considerable fluctuation, by averaging discharges obtained by applying to rating table mean gage heights for regular intervals of the day. Records fair.

Discharge measurements of Sheep Creek near Thane during 1920.

[Made by G. H. Canfield.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Jan. 31	0.44	13	Aug. 9	0.96	66
Mar. 27	.07	7.6	Sept. 27	.64	23
Apr. 15	−.32	[a] 5.7	Oct. 25	.80	39
June 10	1.15	103	Nov. 23	.55	18

[a] Discharge at gaging section at bridge, two-tenths mile downstream from weir; no flow at weir section.

Daily discharge, in second-feet, of Sheep Creek near Thane for 1920.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	30	13	.....	6.8	22	108	151	84	47	50	113	16
2	50	13	.....	6.7	25	121	121	61	53	45	134	16
3	40	13	.....	6.6	25	144	108	58	77	45	101	15
4	30	13	.....	6.5	25	146	108	72	61	35	82	14
5	22	13	.....	6.4	24	151	108	238	53	32	74	14
6	30	13	.....	6.2	22	138	108	226	77	28	121	13
7	175	14	.....	6.1	22	126	108	115	151	26	82	13
8	108	15	.....	6.0	20	121	113	86	136	53	68	13
9	72	15	.....	5.9	22	113	108	68	96	96	60	12
10	53	15	.....	5.8	25	108	100	70	77	56	50	12
11	44	16	.....	5.8	35	108	96	216	63	51	41	12
12	34	15	11	5.7	39	108	92	115	54	50	36	12
13	29	15	10	5.7	41	103	88	91	47	50	30	12
14	25	15	9.8	5.6	39	105	84	77	43	48	28	12
15	25	14	9.6	5.7	53	115	88	61	43	41	28	11
16	23	15	9.3	5.8	74	113	82	53	39	39	25	11
17	22	16	9.1	5.9	63	108	79	48	39	33	24	10
18	20	19	9.1	6.1	68	126	77	53	45	30	22	10
19	19	19	8.9	6.2	56	101	70	82	45	29	22	11
20	18	19	8.8	6.2	47	88	70	72	39	41	22	11
21	18	19	8.7	6.4	45	84	70	101	34	39	21	10
22	17	18	8.5	6.6	48	98	61	60	30	43	19	10
23	17	18	8.4	6.8	48	86	58	50	28	53	18	10
24	16	17	8.2	7.2	54	77	53	44	26	43	18	9
25	16	17	8.0	7.7	56	79	53	43	24	39	17	9
26	15	16	8.0	8.6	56	115	56	72	24	84	17	8
27	15	16	7.7	11	63	118	61	74	23	101	17	9
28	14	15	7.5	14	77	126	61	63	56	72	17	9
29	14	14	7.3	19	86	166	61	53	77	60	17	9
30	14	.....	7.2	22	96	192	58	48	60	121	16	10
31	13	.....	6.9	.....	101	.....	98	51	.....	84	.....	10

NOTE.—Water-stage recorder not operating for following periods; discharge estimated by comparison with hydrographs and records of flow for streams in near-by drainage basins: Jan. 1-7, Jan. 18-30, and Feb. 22-29, as shown in table; Mar. 1-11, 112 second-feet; May 8-11, July 9-13, Sept. 18-26, and Dec. 17-31, as shown in table.

Monthly discharge of Sheep Creek near Thane for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	175	13	33.5	2,060	August	238	43	84.0	5,160
February	19	13	15.5	892	September	151	23	55.6	3,310
March	.....	6.9	9.81	603	October	121	26	52.2	3,210
April	22	5.6	7.70	458	November	134	16	44.7	2,660
May	101	20	47.6	2,930	December	16	8	11.4	701
June	192	77	116	6,900					
July	151	53	85.5	5,260	The year	238	5.6	47.1	34,100

GOLD CREEK AT JUNEAU.

LOCATION.—At highway bridge at lower end of Last Chance basin, 200 feet upstream from diversion dam of Alaska Electric Light & Power Co. and one-fourth mile from Juneau.

DRAINAGE AREA.—9.47 square miles (determined by engineering department of Alaska Gastineau Mining Co. from surveys made by that company.

RECORDS AVAILABLE.—July 20, 1916, to December 31, 1920.

GAGE.—Stevens continuous water-stage recorder on left bank at upstream side of highway bridge.

DISCHARGE MEASUREMENTS.—At medium and high stages made from gaging bridge suspended, at right angles to current, from floor of highway bridge; at low stages made by wading near gage.

CHANNEL AND CONTROL.—Station is at lower end of a flat gravel basin three-fourths mile long. For 20 feet upstream from gage the stream is confined between the abutments of an old bridge and for 15 feet downstream it is confined between the abutments of present bridge. For a distance of 130 feet farther downstream the stream is confined in a narrow channel which is not subject to overflow. Because of the steep gradient of channel opposite and for 150 feet below gage, a short stretch of the channel immediately below the gage acts as the control. The operation of the headgates of flume at diversion dam, 200 feet downstream, does not affect the stage-discharge relation at gage, but the swift current during high stages shifts the gravel in bed of stream, thereby causing changes in the stage-discharge relation.

EXTREMES OF DISCHARGE.—Maximum stage during year, 5.0 feet August 5 (discharge estimated from extension of rating curve, 1,600 second-feet); minimum discharge, 1.5 second-feet April 10.

1916–1920: Maximum stage, 6.8 feet September 26, 1918 (discharge estimated from extension of rating curve, 2,600 second-feet); minimum discharge, 0.9 second-foot March 26, 1918.

ICE.—Stage-discharge relation affected by ice January 13 and March 30.

DIVERSION.—Water diverted at several points upstream for the development of power is returned to creek above gage, except about 20 second-feet for seven months (when there is a surplus over amount used by Alaska Electric Light & Power Co., which has prior right) and 1 second-foot the remainder of year, used by the Alaska-Juneau Gold Mining Co. A dam 200 feet downstream diverts water into the flume of the Alaska Electric Light & Power Co.

REGULATION.—No storage or diversions above station regulate the flow more than a few hours in low water.

ACCURACY.—Stage-discharge relation changed during periods of high water; 11 discharge measurements made during year, by use of which rating curves have been constructed applicable as follows: January 1–7, poorly defined; January 8 to Aug. 5, August 6 to September 27, September 28 to November 1, and November 2 to December 31, fairly well defined below and poorly defined above 200 second-feet. Operation of water-stage recorder satisfactory except for periods indicated in footnote to daily discharge table. Daily discharge ascertained by applying to rating table mean daily gage heights determined by inspecting gage-height graph, or, for days of considerable fluctuations, by averaging discharges obtained by applying to rating table mean gage heights for equal intervals of the day. Records fair.

Discharge measurements of Gold Creek at Juneau during 1920.

[Made by G. H. Canfield.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Jan. 19	0.79	19.	June 25	1.77	166
30 [a]	.68	9.8	Aug. 16	1.95	101
Mar. 26	.47	2.3	Sept. 27	1.44	28
Apr. 10	.40	1.5	Oct. 29	1.96	77
30	.91	30	Dec. 20	.96	7.8
May 27	1.33	83			

[a] Control and measuring section frozen over.

Daily discharge, in second-feet, of Gold Creek at Juneau for 1920.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	45	9	7.0	1.8	36	171	343	301	143	92	205	19
2	74	9	6.1	1.7	37	198	270	173	220	78	480	17
3	69	9	5.8	1.7	35	245	234	162	362	83	305	19
4	41	9	5.6	1.7	33	263	254	225	295	53	196	19
5	33	10	5.4	1.6	29	279	285	1,000	178	46	190	17
6	43	14	5.2	1.6	28	263	307	620	220	39	381	17
7	434	21	5.0	1.6	26	220	334	280	552	36	222	16
8	162	17	4.8	1.5	25	217	350	206	510	83	160	15
9	82	15	4.8	1.5	26	220	334	220	265	262	126	14
10	62	17	4.8	1.5	33	225	317	168	168	114	102	12
11	48	19	5.2	5.0	52	212	291	880	137	83	79	11
12	38	18	5.7	20	55	212	276	432	116	75	65	10
13	.....	12	4.8	15	50	198	263	180	105	75	58	10
14	.....	11	4.8	10	61	219	254	127	94	67	58	8.5
15	.....	11	3.0	8.0	90	248	270	108	91	56	56	7.0
16	.....	19	3.4	7.0	75	270	260	108	96	44	46	7.5
17	.....	30	3.9	6.0	91	245	240	96	75	36	44	8.0
18	.....	32	3.0	5.7	69	317	237	131	75	30	43	10
19	19	19	3.0	5.7	58	248	225	274	98	29	42	10
20	.....	19	3.0	6.2	56	203	219	192	75	42	39	10
21	.....	15	2.7	6.2	62	180	225	295	68	63	37	9.5
22	.....	14	2.7	5.7	65	225	212	143	61	48	33	8.0
23	.....	12	2.7	6.2	72	196	183	98	44	88	30	6.0
24	.....	11	2.4	8.6	76	164	169	78	41	78	29	5.6
25	.....	10	2.4	19	76	178	178	72	38	61	28	6.0
26	.....	9.2	2.5	31	80	301	206	192	35	198	25	6.0
27	.....	8.6	2.5	33	91	317	214	378	30	262	23	7.5
28	.....	8.6	2.5	33	105	327	219	214	185	122	33	8.5
29	.....	8.6	2.5	30	121	413	219	147	325	83	29	8.5
30	9.8	.....	2.1	33	136	480	206	127	137	219	25	8.5
31	9.0	.....	1.9	.....	149	.....	334	173	.....	137	.....	8.5

NOTE.—Discharge estimated from discharge measurements, climatic data at Juneau, and by comparison with hydrographs for streams in near-by drainage basins for following periods, because of unsatisfactory operation of water-stage recorder: Jan. 13–18, 28 second-feet; Jan. 20–29, 14 second-feet; Jan. 30, Feb. 1–6, Mar. 3–7, Mar. 30–31, Apr. 1–9, and Apr. 11–17, as shown in table. Discharge, May 26, interpolated: Aug. 1–12 and Oct. 23–25, determined from gage-height graph drawn by comparison with that for Carlson Creek.

Monthly discharge of Gold Creek at Juneau for 1920.

Month.	Discharge in second-feet.			Run-off in acre-feet.	Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
January	434	.....	47.6	2,930	August	1,000	72	252	15,500
February	32	8.6	14.4	828	September	552	30	161	9,580
March	7	1.9	3.91	240	October	262	29	89.7	5,520
April	33	1.5	10.4	619	November	480	23	106	6,310
May	149	25	64.5	3,970	December	19	5.6	11.0	676
June	480	164	248.	14,800					
July	350	169	256.	15,700	The year	1,000	1.5	106	76,700