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SURFACE WATER SUPPLY OF SOUTHEASTERN ALASKA 1909–1930

BY
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Prepared in cooperation with the
FEDERAL POWER COMMISSION and FOREST SERVICE

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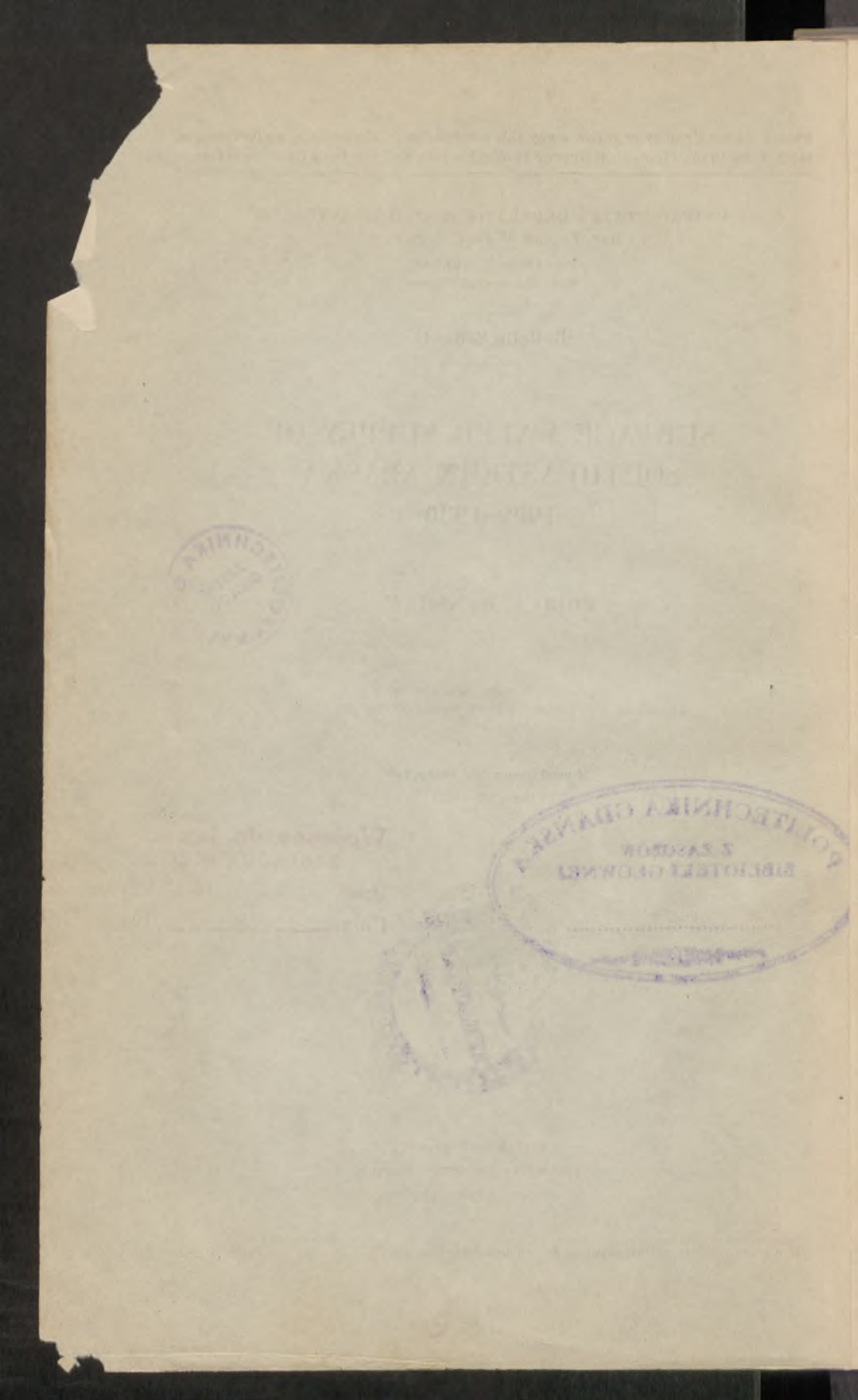

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SURFACE WATER SUPPLY OF SOUTHEASTERN ALASKA, 1909–1930 [1]

By FRED F. HENSHAW [2]

INTRODUCTION

Systematic investigation of the water resources of Alaska was begun by the United States Geological Survey in 1906 and has been carried on successively in Seward Peninsula, the Yukon-Tanana region, south-central Alaska, and southeastern Alaska. This investigation was undertaken in response to the need for definite information in regard to water available for many uses, among which the most essential are hydraulicking, dredging, and supplying power for mines, canneries, sawmills, pulp and paper mills, and public utilities.

The investigation of the water resources of southeastern Alaska was begun by George H. Canfield, of the Geological Survey, in cooperation with the Forest Service, in 1915 and was continued by him until April 30, 1921, when Geological Survey participation was discontinued for lack of funds. A considerable number of the gaging stations were maintained by the Forest Service until about 1927. The stream-flow records for the years 1915–1920 have already been published in complete form, including station descriptions, lists of measurements, and tables of daily and monthly discharge,[3] and the records for 1921 and 1922, as compiled by the Forest Service, have been published in the form of tables of monthly discharge by the Federal Power Commission.[4]

In June, 1927, the Federal Power Commission issued a preliminary permit (project 758) to I. & J. D. Zellerbach, of San Francisco, which gave them priority for the purpose of making surveys and investigations of power sites on eight streams on Revillagigedo Island—Beaver Falls, Mahoney, Fish, Ella, Manzanita, Grace, Swan, and Orchard Creeks—and on Punchbowl Lake outlet on the adjoining mainland. At the same time the commission also issued a preliminary permit to George T. Cameron, of San Francisco, for a proposed power

[1] Prepared in cooperation with the Federal Power Commission and Forest Service.

[2] Senior engineer, Federal Power Commission; formerly district engineer, United States Geological Survey.

[3] U. S. Geol. Survey Bull. 662, pp. 100–154, 1916; Bull. 692, pp. 43–83, 1917; Bull. 712, pp. 53–90, 1918; Bull. 714, pp. 143–187, 1919; Bull. 722, pp. 75–113, 1920.

[4] Dort, J. C., Water powers of southeastern Alaska, 1924.

development (project 755) on Long and Crater Creeks, tributaries to Port Snettisham, in the vicinity of Juneau. In compliance with the terms of the preliminary permit, gaging stations have been maintained by the permittees on all these streams except Orchard Creek since about October 1, 1927. In June, 1930, a preliminary permit was issued to Mr. Cameron for a proposed development (project 1038) on Dorothy Lake, the existence of which had been reported in connection with an aerial survey of parts of southeastern Alaska by the Navy Department in 1929. A gaging station had already been established on Dorothy Creek in September, 1929.

Stream gaging for both permittees has been carried on under the general direction of Robert A. Kinzie, consulting engineer, by Wendell Dawson, formerly of the Geological Survey, who had also worked up the records in this territory subsequent to 1922 for the Forest Service. Special acknowledgment is due to Mr. Dawson and his employers for the extent and excellence of the records which they have obtained.

Acknowledgment is also due to members of the Forest Service, who have conducted and supervised its participation in the work while Mr. Canfield was in Alaska and after he left, particularly to Messrs. Charles H. Flory, regional forester; B. F. Heintzleman, assistant regional forester; W. G. Weigle and R. A. Zeller, forest supervisors; Leonard Lundgren, former district engineer, and Philip H. Dater, the late regional engineer at Portland, Oreg.; and J. C. Dort, regional engineer at Washington, D. C. The manuscript of the report has been reviewed and many helpful suggestions made by Messrs. Canfield, Heintzleman, Dawson, and Dort.

Tables of precipitation have been checked by Mr. Ralph C. Mize, meteorologist of the Weather Bureau, at Juneau.

GENERAL FEATURES OF SOUTHEASTERN ALASKA

LOCATION AND EXTENT

Southeastern Alaska is usually considered as extending from Portland Canal on the southeast to Mount St. Elias on the northwest, separating northern British Columbia from the Pacific Ocean. The area covered by this report is the portion lying south and east of Mount Fairweather and is about 380 by 120 miles in extent. Most of its lies in the Tongass National Forest. It comprises a narrow mainland strip on the seaward side of the Coast Range and an adjacent group of numerous large and small islands sometimes called the Alexander Archipelago.

The mainland and islands are indented and separated by an intricate system of deep waterways and fiords, some of which extend far back into the mountains. Because of the rough topography, there is no extensive system of highways, and only short roads in and adjacent to the towns and settlements have been constructed. The waterways,

however, furnish not only effective routes of communication but deep and protected harbors, where large vessels can land their cargoes at wharves near the shore. Regular lines of steamers operate between Seattle and Vancouver and Alaskan ports. Motor-driven launches are used to reach outlying places not visited by steamers. The charts of the United States Coast and Geodetic Survey show the outlines of the islands and waterways, the soundings below mean low water, and the rocks and shoals that are a menace to navigation. The United States Lighthouse Service maintains lighthouses, beacons, and buoys, marking the navigable channels and principal dangerous obstructions. The average tidal range is about 12 feet, but at certain times of the year the extreme is about 24 feet. At any time the range at the head of the inlets may be considerably greater than that along the main channels.

The largest islands in southeastern Alaska and their approximate areas in square miles are Prince of Wales, 2,800; Chichagof, 2,140; Baranof, 1,610; Admiralty, 1,500; and Revillagigedo, 1,120. Brooks[5] has described some of the geographic features of southeastern Alaska in the following words:

> The southern coast of Alaska has the shape of a broad crescent which opens out to the Pacific Ocean. The southeastern horn of this crescent includes the Alexander Archipelago and its scores of islands, great and small, penetrated and separated by an intricate system of tidal waterways, some of which extend far inland and give the coast the fiord character which has made its scenery famous the world over. These channels fall into two general systems, of which one trends approximately north and south and the other about N. 70° W., though there are many variations from these courses. The largest of the fiords which penetrate the mainland are Glacier Bay and Lynn and Portland Canals.
>
> Glacier Bay stretches about 60 miles northward from Icy Strait. Its shores are broken by numerous embayments, fed by tidewater glaciers. The bay splits the southern end of the St. Elias Range into two parts, the southernmost of which is known as the Fairweather Mountains. Forty miles east of Glacier Bay the mainland and the archipelago are cleft by a remarkably straight waterway known as Chatham Strait and Lynn Canal. This fiord extends nearly 175 miles from the open ocean, forking at its upper end into two branches, the western called Chilkoot and the eastern Taiya Inlet. For many miles the shores of Lynn Canal are bounded by steep rock walls, which often rise sheer from the water, and at its head the peaks of the Coast Range reach a height of 8,000 and 9,000 feet above the sea.
>
> Portland Canal, which marks the southeastern boundary of Alaska, is a narrow waterway extending about 100 miles inland from Dixon Entrance. Unlike most of the other fiords, it is characterized by a number of large bends, but its general direction is northerly. Along its course, which lies chiefly through the Coast Range, the relief is between 5,000 and 6,000 feet.
>
> In these fiords the sea bottom usually falls off abruptly close to land, often reaching a depth of 60 or 70 fathoms within a few yards. The deepest soundings thus far made in these inland waterways register 300 to 400 fathoms, and depths of 100 to 200 fathoms are not uncommon. It is further evident that the contour of the ocean floor is often of a basinlike character.

[5] Brooks, A. H., Geography and geology of Alaska: U. S. Geol. Survey Prof. Paper 45, pp. 18–20, 1906.

The fiords which penetrate the mainland receive numerous glaciers from the large névé fields of the Coast and St. Elias Ranges. Those of Glacier Bay are best known because they are each year visited by many tourists. Besides the tidewater glaciers, there are many others discharging into the tributaries of the channels.

The largest islands of the Alexander Archipelago, beginning at the north, are Chichagof, Baranof, Admiralty, Kupreanof, Kuiu, Prince of Wales, Etolin, and Revillagigedo. The longer axis of nearly all these has a northwest-southeast direction, and they all possess strong relief, bold coast, and irregular shore lines. Chichagof and Baranof, in the northern end of the archipelago, are cut off from the mainland by Cross Sound and Icy Strait, and from the islands on the east by Chatham Strait. Together they form a wedge-shaped land mass which is split into two islands by Peril Strait, a winding waterway whose hidden rocks and strong tidal currents give it its well-merited name. The islands are mountainous, with a relief of 3,000 to 5,000 feet, and their axis is in line with the axis of the St. Elias Range to the northwest. Kruzof, a small island adjacent to Baranof on the west, is of interest because it contains Mount Edgecumbe, the only volcano of southeastern Alaska.

Admiralty Island, east of the two above described, is long and narrow, with rugged highlands, which may also be considered a southern extension of the St. Elias Range. On the east Stephens Passage separates it from the mainland, and on the south Frederick Sound divides it from a group of islands, the largest of which are Kupreanof and Kuiu. These two have less relief and are especially characterized by great irregularity of shore line. In fact, the many channels and embayments which cut into Kuiu Island give it the form of a dendritic land mass. Mitkof Island lies southeast of Kupreanof, from which it is separated by Wrangell Narrows, next to Peril Strait the most dangerous of the passages used by vessels.

South of Sumner Strait the Alexander Archipelago is divided by Clarence Strait into the Prince of Wales group on the west and the Revillagigedo group on the east. Prince of Wales Island, the largest of the archipelago, is about 140 miles long and 40 miles wide. Its coast line is broken by many deep embayments, and where these lie opposite each other the width of the island is reduced to but a few miles. These opposing fiords are, in some instances, connected by broad depressions, with low divides. The relief of the island varies from 1,500 to 3,600 feet. The mountains, the highest of which reach an altitude of 3,600 feet, form no well-defined ranges but have a general northwest-southeast linear arrangement.

In topographic relief and geographic position the Revillagigedo group of islands properly forms a part of that irregular mountain mass known as the Coast Range; their highlands have the same general trend and reach an altitude of 3,300 feet.

TOPOGRAPHY AND DRAINAGE

The dominant feature of southeastern Alaska is its mountainous character. On the mainland the mountains almost everywhere rise from the water's edge to heights of 2,000 to 4,000 feet within 2 to 4 miles, and peaks farther inland reach altitudes of 5,000 to 10,000 feet. Though profoundly dissected by precipitous valleys, the mountains show a notable tendency to uniformity of altitude in the crest line of their summits. The land forms indicate an intensely glaciated region that has been but slightly modified by erosion since the glacial period. The special features of glacial sculpture are U-shaped valleys, fiords, cirques, and hanging valleys.

The islands, viewed from the waterways, present a mountainous mass of irregular sky line. Baranof is the most rugged, but the relief of the islands is less than that of the mainland strip. In the Ketchikan and Wrangell regions the summits are generally 2,000 to 3,000 feet above sea level, but a few reach about 4,000 feet. On Admiralty and Baranof Islands a few peaks ascend to nearly 5,000 feet.

There is little level land. The lower sections of the few large rivers have fairly extensive valley floors, and small flats occur at the mouths of some of the smaller streams.

Southeastern Alaska, being cut up into a narrow sinuous mainland strip and innumerable islands, presents a distinctive and somewhat anomalous drainage system. The tidal waterways or fiords, variously designated channels, canals, straits, or sounds, are analogous to main river systems. They have been eroded by glacial action and submerged by diastrophism until the beds of many of them lie hundreds of feet below sea level.

The drainage from the islands and from the west side of the Coast Range finds outlet from numerous relatively small streams into the bays and channels along the coast. The largest known stream on the islands flows from Hasselborg Lake into Mitchell Bay, on Admiralty Island, and drains about 90 square miles. The area shown on the topographic map of the Juneau gold belt [6] embraces more than 150 streams 2 miles or more in length emptying directly into tidewater; of these, fully 80 per cent are less than 10 miles long, and only 13 measure 18 miles or more.

The Taku and Stikine are the only large rivers that rise on the inland plateau in British Columbia and traverse the Coast Range. Other large rivers on the mainland belt whose extreme headwaters reach into Canada are the Unuk, Whiting, and Salmon. The lower valleys of these streams are wide and flat and offer no opportunity for water-power development.

The lower drainage basins of many of the streams on both the mainland and the islands have lakes or flat, wide valleys 100 to 2,000 feet above sea level and from a fraction of a mile to a few miles back from tidewater. These streams, on which water can be stored, are the only ones in southeastern Alaska that have economically important power possibilities. The usual scheme of development is to provide storage at a lake either by raising its surface by a dam, or by tapping it by tunnel below its natural outlet, or both. The fall from lake to sea level is then utilized by a combination of tunnel and pipe conduit.

CLIMATE

Although southeastern Alaska lies between 55° and 60° north latitude, its climatic conditions are not severe, as the warm ocean

[6] Spencer, A. C., U. S. Geol. Survey Bull. 287, pl. 36, 1906.

currents of the northern Pacific serve to moderate the temperatures. The climate of the region has been fully described by Summers,[7] and only supplemental data will be presented here.

The mean temperature at and near sea level ranges from practically 44° at Ketchikan and Sitka, which are well exposed to the sea, down to about 40° at Stewart, B. C., and Skagway, both inland, near the Canadian border. This region is characterized by mild winters, cool summers, and heavy precipitation. The period of heaviest precipitation is from September 15 to December 15, and that of least from April to July; the total number of rainy days in a year is about 200. The prevailing winds come from the south and southwest and bear humid air from the sea, which condenses about the mountains in the form of mist, rain, and snow. Northerly winds almost invariably bring fair weather. In the winter these north winds, blowing off the glaciers down the channels on the mainland, are frequently very strong. The most violent of these winds come down Taku Inlet, Lynn Canal, and the Stikine River.

PRECIPITATION RECORDS

All records of monthly precipitation collected in southeastern Alaska up to the end of 1922 have been published.[8] Subsequent records of more than 12 months' duration are presented below. They are arranged by climatic years ending September 30, in order to conform to the stream-flow data.

The location and other essential data for Weather Bureau stations maintained subsequent to 1922 are presented in the following table. The letters refer to Plate 1.

Precipitation stations in and near southeastern Alaska

Station	Index letter	Latitude	Longitude	Altitude above sea level	Length of record	Mean annual precipitation
		° ′	° ′	*Feet*	*Years*	*Inches*
Annex Creek	A	58 19	134 07	45	14	105
Calder	B	56 10	133 27	20	20	111
Fortman Hatchery	C	55 36	131 25	132	23	148
Haines	D	59 13	135 34	----------	6	54
Hydaburg	E	55 12	132 49	25	7	110
Jualin	F	58 51	135 00	165	2	81
Juneau	G	58 18	134 24	203–189	36	81
Kake	H	56 59	133 57	8	6	48
Ketchikan	K	55 20	131 37	75	19	156
Killisnoo	L	57 27	134 32	25	29	52
Petersburg	M	56 50	132 57	100	3	92
Porcupine Creek	N	59 22	136 16	1,600	3	43
Prince Rupert, B. C.	O	54 18	130 18	170	22	98
Shaw Island	P	58 12	136 15	8	2	112
Shelter Island	Q	58 23	134 52	----------	5	56
Sitka	R	57 03	135 19	65	61	84
Skagway	S	59 27	135 19	30	23	26
Speel River	T	58 08	133 44	15	13	140
Stewart, B. C.	U	55 56	129 59	215	20	62
Strawberry Point	V	58 14	135 38	----------	3	54
Wrangell	W	56 28	132 23	35–50	17	81

[7] Summers, M. B. (meteorologist, U. S. Weather Bureau), in Dort, J. C., Water power of southeastern Alaska, pp. 145–172, Federal Power Commission, 1924.

[8] Summers, M. B., op. cit., pp. 155–167.

Precipitation, in inches, at stations in and near southeastern Alaska

Annex Creek

Year ending Sept. 30	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1923	10.97	17.21	3.55	6.23	15.22	7 36	6.07	3.91	1.86	3.10	9.39	18.12	102.99
1924	15.45	16.72	13.12	9.01	7.43	8.04	8.48	7.25	1.84	12.75	14.48	28.46	143.03
1925	16.25	11.85	4.14	2.72	5.97	9.34	8.65	3.77	6.04	8.22	9.93	9.68	96.56
1926	9.76	12.30	14.20	16.28	8.20	8.88	9.99	3.86	2.44	3.51	4.31	4.14	102.87
1927	19.85	5.61	16.04	5.19	5.22	6.09	4.48	3.91	1.59	.88	6.53	15.61	91.00
1928	16.28	5.69	9.80	11.93	6.97	10.02	5.87	9.55	.70	7.98	8.69	13.80	107.28
1929	13.26	10.21	9.79	8.30	7.08	6.69	4.13	4.80	5.46	6.78	6.10	8.31	90.91
1930	23.72	20.94	5.43	1.67	14.49	12.00	3.03	3.50	4.35	6.68	11.82	15.66	123.29
Mean[a]	16.86	12.33	9.59	8.41	7.94	7.08	5.77	4.77	3.10	5.95	10.32	13.32	105.44

[a] For entire period of records.

Calder

1923	14.44	23.43	4.18	6.18	12.75	9.17	9.40	6.78	2.14	1.48	6.77	21.85	118.57
1924	13.63	23.69	------	------	------	------	------	------	------	------	------	------	------
1926	------	------	------	------	------	------	------	------	------	------	3.49	3.59	------
1927	18.55	7.35	19.37	4.35	7.53	14.18	6.65	4.50	1.79	2.02	4.86	11.60	102.75
1928	20.51	12.29	11.80	17.07	611	11.50	62.5	9.11	1.23	4.98	5.43	10.36	116.64
1929	14.14	13.77	14.41	8.70	5.13	9.07	2.51	3.59	5.96	7.58	12.17	1.52	98.55
1930	23.09	19.14	9.63	2.26	17.96	6.61	6.31	4.53	7.51	4.37	3.56	8.74	113.71
Mean	16.54	15.40	13.01	9.51	8.27	8.40	8.25	5.35	3.82	4.35	6.76	11.31	110.97

Fortmann Hatchery (Loring post office)

1923	17.09	25.36	8.43	11.31	17.53	14.09	12.97	8.50	2.23	2.05	9.61	16.55	145.92
1924	10.77	26.63	25.53	19.22	19.37	7.62	11.41	8.92	.92	5.61	5.33	15.10	156.43
1925	23.36	20.60	8.83	11.26	7.35	14.98	10.17	6.56	5.16	9.85	5.38	4.02	127.52
1926	9.31	24.41	21.51	22.18	18.66	12.30	11.72	13.19	12.36	11.23	3.75	3.35	163.97
1927	22.37	7.30	19.48	10.70	12.37	18.98	10.27	6.32	------	------	------	------	------
Mean	19.91	20.64	16.22	12.25	11.82	11.70	11.93	8.34	5.75	7.05	8.44	13.69	147.74

Haines

1911	------	------	------	------	------	------	------	------	------	------	0.80	0.99	------
1912	10.63	5.36	4.44	2.10	------	------	------	------	------	------	------	------	------
1914	------	------	------	------	------	------	------	------	------	3.58	3.87	5.80	------
1915	8.15	4.67	1.67	------	------	------	------	------	------	------	------	------	------
1925	------	------	------	------	------	------	------	------	3.91	1.73	2.45	3.17	------
1926	5.72	12.20	12.38	12.18	6.93	6.58	4.86	2.38	1.70	1.86	.74	1.02	68.55
1927	11.08	3.46	11.59	3.22	3.15	4.91	2.29	1.60	.18	1.06	1.44	9.36	53.34
1928	8.64	1.78	7.08	8.40	3.49	5.92	2.56	3.29	.91	.98	2.33	4.97	50.35
1929	5.83	10.32	8.19	4.36	1.48	3.94	1.18	1.62	.79	.92	1.67	2.97	43.27
1930	17.70	9.37	5.49	1.64	9.14	6.33	1.96	1.23	1.89	3.68	3.53	6.80	68.76
Mean	9.68	6.74	7.26	5.32	4.84	5.54	2.57	2.02	1.56	1.97	2.10	4.38	53.98

Hydaburg

1923	------	------	------	------	------	------	------	------	------	1.76	4.51	7.82	------
1924	7.69	9.31	5.80	------	------	------	------	------	------	------	------	------	------
1926	------	------	------	------	------	------	------	------	6.53	11.00	2.62	------	------
1927	------	3.73	5.10	1.25	6.67	8.68	5.75	5.14	1.95	.40	3.65	7.77	------
1928	13.20	4.72	4.07	12.22	4.03	4.68	4.41	6.10	------	------	------	------	------
1930	------	------	------	------	7.90	4.40	7.02	9.34	8.01	------	------	------	------
Mean	15.72	15.79	11.31	11.19	7.98	9.11	6.93	7.48	4.75	4.05	7.29	8.50	110.10

Jualin

1928	------	------	------	10.31	4.81	8.77	3.52	7.82	0.70	4.29	7.25	10.39	------
1929	6.38	11.97	10.03	6.14	3.97	5.35	2.88	2.82	3.33	7.29	5.09	------	------

Precipitation, in inches, at stations in and near southeastern Alaska—Continued

Juneau

Year ending Sept. 30	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1923	6.49	11.43	2.16	5.16	13.39	7.95	5.44	3.24	1.43	4.10	6.86	16.46	84.11
1924	8.66	11.71	13.13	6.85	7.20	7.46	8.87	7.44	.98	8.23	7.99	18.85	107.37
1925	12.74	9.53	4.31	5.82	3.69	6.52	6.25	4.26	4.93	7.61	7.72	8.66	82.04
1926	8.92	11.74	10.14	11.62	5.85	8.71	7.62	3.72	2.59	4.00	2.90	3.28	81.09
1927	13.46	3.21	14.43	3.76	4.34	8.65	4.01	3.89	1.86	1.40	5.46	10.39	74.86
1928	13.64	3.57	7.48	13.46	5.32	6.74	4.66	8.25	.93	4.61	6.10	8.44	83.20
1929	11.43	9.02	10.41	9.09	7.24	6.15	3.34	4.74	4.15	4.81	5.08	5.52	80.98
1930	17.31	17.56	4.58	.91	8.59	10.12	4.05	3.87	3.78	6.29	9.46	9.75	96.27
Mean	10.78	8.43	7.56	6.99	5.42	5.66	5.32	5.16	3.57	4.87	7.20	10.42	81.38

Kake

1923	3.61	3.62	1.47	2.84	4.98	2.88	2.54	1.78	0.18	0.62	6.42	6.59	37.53
1924	3.28	4.91	7.67	4.40	4.73	2.39	3.29	2.33	.07	-------	-------	-------	-------
1930	-------	11.26	4.39	2.10	9.18	2.67	3.07	1.34	3.42	2.57	3.40	6.66	-------
Mean	5.48	5.69	5.49	3.98	5.01	2.58	3.43	2.64	1.78	2.38	4.46	5.70	48.32

Ketchikan

1923	20.77	29.86	9.39	10.76	18.53	17.32	13.23	11.37	3.32	2.34	15.07	11.88	163.84
1924	14.85	31.23	22.80	19.14	15.72	6.46	12.92	15.26	1.20	9.28	8.84	24.04	181.74
1925	21.41	23.93	9.59	11.42	7.78	14.18	11.98	6.70	9.17	12.81	7.15	3.06	139.18
1926	14.24	21.70	34.13	27.57	19.34	13.08	17.33	12.36	10.42	9.32	6.09	3.39	189.29
1927	22.89	8.16	21.76	14.05	14.38	17.82	10.23	5.91	3.34	4.29	9.85	16.36	149.04
1928	18.05	7.20	10.81	18.33	13.88	23.87	7.54	12.28	2.34	9.14	7.08	10.90	141.42
1929	16.10	13.79	17.08	13.24	6.96	16.34	4.90	3.82	8.62	10.90	21.07	1.68	134.49
1930	28.16	21.95	10.00	1.82	14.96	9.49	9.00	6.02	10.72	6.55	1.63	13.37	133.67
Mean	21.19	20.78	16.14	13.71	12.10	13.09	11.97	8.22	6.03	8.45	12.45	12.22	156.35

Killisnoo

1923	-------	-------	1.17	2.27	5.34	2.21	2.93	1.19	0.22	1.31	2.65	2.76	-------
1924	5.22	8.31	7.20	5.20	5.19	2.48	4.78	2.36	-------	-------	-------	-------	-------
1927	-------	-------	-------	-------	1.60	3.02	1.41	1.55	-------	-------	-------	-------	-------
Mean	7.50	5.70	5.12	4.98	4.11	3.02	3.01	2.59	2.02	3.32	4.17	6.63	52.17

Petersburg

1924	9.85	-------	-------	-------	-------	-------	-------	3.47	0.78	4.21	10.98	10.27	-------
1925	14.50	14.16	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
1926	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	2.90	4.35	-------
1927	17.64	6.55	13.67	3.33	6.43	11.10	5.11	5.65	2.49	2.94	6.58	11.96	93.45
1928	14.93	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
1930	-------	20.53	8.11	1.51	11.91	7.25	5.85	3.84	5.07	4.53	5.55	10.28	-------
Mean	14.23	13.75	10.89	2.42	9.17	9.18	5.48	4.32	2.78	3.89	6.50	9.22	91.83

Porcupine Creek

1927	-------	-------	-------	-------	-------	-------	-------	-------	2.60	2.90	6.30	22.77	-------
1928	9.07	-------	3.84	3.35	3.37	4.42	1.75	3.68	.88	1.22	1.40	3.75	-------
1929	3.18	9.93	3.98	1.51	.78	.85	.62	.64	.84	.26	1.34	1.45	25.38
1930	13.63	1.98	2.42	1.52	5.51	3.13	.78	.53	1.59	1.68	2.18	7.08	42.03
Mean	8.63	5.96	3.41	2.19	3.22	2.80	1.05	1.62	1.48	1.52	2.80	8.76	43.44

Precipitation, in inches, at stations in and near southeastern Alaska—Continued

Prince Rupert, B. C.

Year ending Sept. 30	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1923	15.01	23.32	10.18	7.86	18.75	16.78	7.98	4.80	1.13	1.49	7.31	8.78	123.59
1924	7.22	28.08	21.89	18.82	14.48	5.50	10.27	7.60	1.10	6.38	5.98	9.66	136.98
1925	10.78	9.87	4.64	9.28	5.51	11.19	5.83	3.86	4.20	5.96	8.54	4.84	84.50
1926	8.06	10.54	13.40	10.81	9.97	7.44	8.48	6.74	6.95	4.89	5.93	1.09	94.30
1927	12.86	6.46	12.67	7.54	6.51	10.54	9.35	3.58	2.91	1.93	4.09	9.62	88.06
1928	14.53	7.12	9.25	7.61	8.40	8.94	5.21	8.62	1.71	4.62	3.37	7.91	87.29
1929	9.63	9.84	4.98	5.80	4.97	12.21	2.24	3.76	2.37	6.19	7.00	1.04	70.03
1930	12.24	15.73	8.62	2.39	9.30	7.89	5.56	4.00	6.02	5.46	.82	9.53	87.56
Mean	12.85	12.68	11.20	9.12	8.10	9.38	6.94	5.27	3.97	4.81	5.30	8.42	98.04

Shaw Island

1926	.....	12.06	10.91	15.97	7.11	13.18	6.19	4.75	2.60	4.17	3.43	28.47	.....
1927	18.34	4.13	28.43	12.85	15.67	5.04	4.38	2.10	1.64	1.15	5.33	12.88	111.94
1928	12.52	5.35	11.55	18.24	9.13	5.73	.....	.....	.....	.....	.....	.....	.....
Mean	15.43	7.18	16.96	15.69	10.64	7.98	5.28	3.42	2.12	2.66	4.38	20.68	112.42

Shelter Island

1926	.....	.....	6.49	6.30	3.50	5.06	6.20	2.60	2.48	3.32	2.78	2.68	.....
1927	12.49	2.92	10.08	.....	.....	3.03	2.04	2.26	1.25	1.21	3.45	10.67	.....
1928	5.99	3.33	6.04	9.93	3.61	3.58	3.14	4.91	.96	4.01	3.91	6.73	56.14
1929	6.44	5.70	4.96	6.93	4.51	3.61	2.72	2.03	2.32	4.76	4.10	3.68	51.76
1930	7.99	9.46	2.59	1.28	7.63	4.93	1.22	1.22	2.07	4.58	7.62	7.15	57.76
Mean	8.23	5.35	6.03	6.11	4.82	4.04	3.06	2.60	1.82	3.58	4.37	6.18	56.19

Sitka

1923	6.61	11.33	4.15	6.40	13.31	11.17	4.71	3.05	1.19	2.28	5.28	15.17	84.65
1924	9.19	13.99	16.10	9.27	7.92	6.24	12.12	3.66	.82	5.97	5.84	20.84	111.96
1925	11.07	8.33	3.21	10.36	4.27	10.07	6.74	3.38	3.78	6.07	6.42	8.55	82.25
1926	10.06	12.87	12.34	15.20	9.89	9.25	5.98	3.83	3.18	2.24	3.67	3.53	92.04
1927	15.63	4.84	17.12	3.88	5.32	12.80	4.16	2.03	1.90	.72	3.14	13.46	85.00
1928	14.47	7.12	10.12	17.73	7.79	6.70	4.98	6.89	1.20	4.54	7.34	9.13	98.01
1929	13.00	10.39	11.09	9.65	9.86	10.10	2.53	4.79	1.59	6.83	4.25	4.53	88.61
1930	17.71	20.76	5.85	1.36	12.72	10.55	4.53	4.38	3.02	2.75	6.20	11.73	101.56
Mean	12.05	9.34	9.01	7.66	6.33	5.72	5.47	3.96	3.15	4.00	6.92	10.03	83.64

Skagway

1923	3.17	4.81	0.31	0.46	2.89	2.73	2.16	1.08	1.13	2.51	1.38	8.21	30.84
1924	5.00	8.16	4.02	1.55	2.11	1.93	3.67	1.43	.37	1.16	2.74	4.77	36.91
1925	5.45	4.72	1.60	1.39	.63	1.22	1.98	1.42	1.18	2.67	1.72	2.17	26.15
1926	2.19	5.06	5.63	4.20	1.91	3.16	2.33	1.26	1.74	1.55	.56	.66	30.25
1927	5.42	1.28	4.76	.67	1.02	2.36	.96	1.19	.08	.46	1.67	6.97	26.84
1928	5.23	.40	2.52	3.75	2.20	3.39	1.14	1.40	.94	1.23	1.88	2.41	26.49
1929	3.31	7.26	7.30	2.12	.83	1.04	.16	.76	.55	1.15	.96	2.02	27.46
1930	9.88	5.03	2.04	.21	2.21	.43	.16	.33	1.01	3.35	2.80	2.70	30.15
Mean	4.62	4.12	2.80	1.66	1.41	1.35	1.41	.80	.88	1.38	1.83	3.47	25.73

Speel River

1923	12.89	18.18	5.63	10.17	16.35	15.09	8.03	4.92	1.67	3.71	9.73	28.13	134.50
1924	14.87	22.59	18.10	11.70	11.70	9.40	12.79	8.41	2.49	13.51	19.09	26.67	171.32
1925	16.40	14.43	5.72	11.50	6.85	10.19	9.26	6.80	4.57	11.13	10.10	10.35	117.30
1926	15.78	16.98	17.52	20.54	12.96	12.94	11.33	4.85	5.22	4.39	5.27	6.24	134.02
1927	20.34	5.30	21.81	4.04	5.58	13.89	5.95	5.40	2.16	2.07	8.34	19.26	114.14
1928	21.49	9.96	10.89	18.96	9.12	10.84	6.78	12.32	1.01	10.00	11.51	20.09	142.97
1929	15.40	15.19	14.35	13.16	11.75	10.77	4.12	6.84	5.05	8.54	6.25	9.53	120.95
1930	28.58	26.98	9.11	2.75	14.63	14.28	5.41	3.13	4.45	7.59	11.91	16.53	145.25
Mean	20.26	17.40	12.44	11.32	11.40	11.16	8.14	6.33	4.13	6.80	12.33	18.02	139.73

Precipitation, in inches, at stations in and near southeastern Alaska—Continued

Stewart, B. C.

Year ending Sept. 30	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1911	11.16	3.37	11.90	8.64	3.99	8.71	5.61	2.21	2.21	3.01	3.67	3.24	67.72
1912	6.23	8.70	11.71	2.81	3.60	1.78	2.82	2.64	1.50	1.53	------	6.85	------
1913	8.78	7.66	14.44	6.00	3.56	6.31	------	2.58	1.78	5.43	6.69	10.87	------
1914	10.68	8.82	11.62	3.73	6.25	4.82	3.80	1.62	.52	9.06	2.61	9.07	72.60
1915	7.37	8.26	2.98	6.00	3.38	2.87	5.02	1.71	2.21	1.96	------	------	------
1916	------	5.82	9.06	1.40	9.00	5.94	4.71	.78	3.34	4.99	3.29	7.16	------
1917	12.46	9.17	12.52	13.95	6.31	2.88	2.00	1.22	3.06	3.50	11.36	15.29	93.72
1918	18.70	19.66	3.68	8.21	8.53	3.08	2.45	1.90	2.42	2.22	10.20	2.86	83.91
1919	17.76	9.83	11.93	13.91	1.40	3.01	2.01	3.09	1.89	1.81	6.40	9.49	82.53
1920	4.99	11.07	7.70	9.45	5.49	3.21	7.18	4.26	2.03	.91	20.86	5.92	83.07
1921	10.48	5.70	6.78	5.42	12.99	1.92	1.32	.77	.94	2.46	5.14	6.05	59.97
1922	16.19	3.00	11.86	6.61	1.50	2.46	1.36	1.78	.27	.29	2.13	3.75	51.20
1923	3.77	4.94	3.10	3.27	2.68	3.67	2.02	1.19	.74	1.86	3.20	3.55	33.99
1924	3.38	6.72	6.55	12.20	3.75	------	------	------	------	------	------	------	------
1925	------	------	------	------	------	------	------	------	------	------	------	------	------
1926	------	------	------	------	8.18	5.08	5.84	1.74	4.23	4.21	1.87	1.96	------
1927	11.73	4.68	17.93	3.98	------	1.24	4.55	2.00	------	------	------	5.43	------
1928	------	9.32	6.45	11.86	7.36	2.15	.48	1.55	.00	.51	.84	2.22	------
1929	1.93	2.03	2.70	2.59	.26	2.75	.83	.27	.51	1.98	2.50	.06	18.41
1930	6.46	4.02	1.09	------	7.63	2.82	3.53	1.01	2.95	1.43	.59	4.43	------
Mean	9.50	6.82	8.56	7.06	5.33	3.59	3.26	1.80	1.80	2.77	5.42	3.77	61.68

Strawberry Point

1923	------	------	------	------	------	------	1.89	2.19	1.14	1.61	3.28	9.35	------
1924	4.17	8.89	6.92	7.40	4.68	1.98	6.51	4.04	.67	4.55	3.72	4.35	57.88
1925	8.21	6.45	3.62	4.72	2.79	3.33	2.83	------	2.27	5.16	2.72	2.84	------
1926	8.00	------	------	9.33	------	------	------	------	------	------	------	------	------
Mean	6.79	7.67	5.27	7.15	3.74	2.66	3.74	3.12	1.36	3.77	3.24	5.51	54.02

Wrangell

1923	------	12.37	4.09	4.28	12.88	10.66	7.31	3.04	------	------	------	------	------
1925	12.48	9.43	3.56	6.49	3.30	7.44	4.80	4.89	3.26	9.85	4.46	3.83	73.79
1926	7.36	11.65	12.15	14.26	9.46	7.97	7.89	6.86	5.24	4.26	2.23	------	------
1927	------	------	------	------	5.94	9.47	4.76	4.13	2.24	2.84	4.22	9.93	------
1928	15.00	6.85	6.62	11.88	5.74	6.20	4.30	8.51	1.47	5.18	3.30	8.24	83.29
1929	13.10	10.06	10.15	8.65	5.59	7.28	2.73	3.08	3.16	5.91	8.50	2.06	86.27
1930	16.25	29.71	7.64	.84	10.61	6.89	5.42	3.72	4.60	6.45	------	------	------
Mean	10.64	11.28	7.83	7.69	7.54	5.19	4.70	4.33	3.06	4.21	5.32	8.94	80.78

TEMPERATURE RECORDS

Monthly and yearly mean temperatures, based on records up to December 31, 1928, are presented below for all stations for which the Weather Bureau has computed "normals." As a rule the mean temperature at any particular station varies less from year to year than the precipitation; hence the records for individual months and years are hardly necessary for a general understanding of hydrologic conditions.

Monthly and annual mean temperatures, in degrees Fahrenheit, at stations in and near southeastern Alaska

Station	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
Annex Creek	41.7	32.6	25.1	23.7	27.0	30.9	40.1	46.8	56.2	55.5	53.9	49.2	40.3
Calder	42.7	35.8	31.6	28.4	31.8	34.5	39.0	45.1	50.2	53.1	53.7	49.7	41.3
Fortmann Hatchery	44.9	37.4	31.6	25.9	30.3	34.8	40.5	47.7	54.4	58.2	58.2	52.4	43.0
Haines	42.7	32.6	26.4	24.8	28.0	32.7	37.8	48.4	55.2	58.1	56.0	49.8	41.0
Hydaburg	46.5	45.7	34.5	33.3	35.6	38.4	43.6	48.9	55.5	58.2	59.6	54.3	46.2
Juneau	43.2	35.3	31.0	27.4	30.2	33.7	40.5	47.8	54.4	57.2	55.2	50.1	42.2
Ketchikan	45.6	38.8	35.8	31.4	34.3	36.9	41.2	50.8	54.3	57.7	57.9	52.8	44.8
Killisnoo	41.7	34.0	31.3	27.8	28.3	32.9	38.5	47.7	51.5	55.2	54.4	48.0	40.6
Prince Rupert, B. C.	47.1	40.5	36.3	33.7	36.5	38.9	42.8	48.3	52.9	56.1	56.5	53.3	45.3
Sitka	46.0	38.6	35.4	32.2	34.3	36.7	42.6	46.8	51.7	55.0	55.8	51.9	43.9
Skagway	41.5	32.0	25.7	20.7	25.4	30.5	39.7	49.1	55.7	58.4	56.0	49.7	40.4
Stewart, B. C.	41.9	31.7	26.0	19.3	25.9	30.5	39.2	48.2	54.4	47.4	55.8	50.0	40.0
Wrangell	44.6	37.5	30.8	28.6	32.0	34.2	42.1	48.3	55.6	58.6	57.4	51.7	43.6

POPULATION

The following table shows the increase in population of the recording districts and of the principal towns of the first judicial division, which embraces the southeastern part or so-called panhandle of Alaska:

Population in the first judicial division, Alaska

	1910	1920	1930		1910	1920	1930
Ketchikan district	3,520	5,670	6,468	Ketchikan	1,613	2,458	3,796
Hyder district			313	Metlakatla	602	574	466
Wrangell district	1,652	804	1,002	Wrangell	743	821	948
Petersburg district		1,406	2,004	Petersburg	583	879	1,252
Sitka district	2,210	2,350	2,092	Sitka	1,039	1,175	1,056
Juneau district	5,854	5,893	6,174	Juneau	1,644	3,058	4,043
Skagway district	1,980	1,219	1,251	Douglas	1,722	919	593
				Haines	455	314	344
	15,216	17,402	19,304	Skagway	872	494	492

NOTE.—Hyder district organized from part of Ketchikan district and part of Sitka district annexed to Juneau district since 1920. Petersburg district organized from part of Wrangell district between 1910 and 1920.

FACTORS AFFECTING RUN-OFF

The discharge of streams depends primarily on precipitation, for the water that supports them comes from rain or snow. The amount and distribution of the run-off corresponding to the precipitation, and the rate of change in stream flow during and after rainfall, depend on temperature, topography, soil, and vegetation.

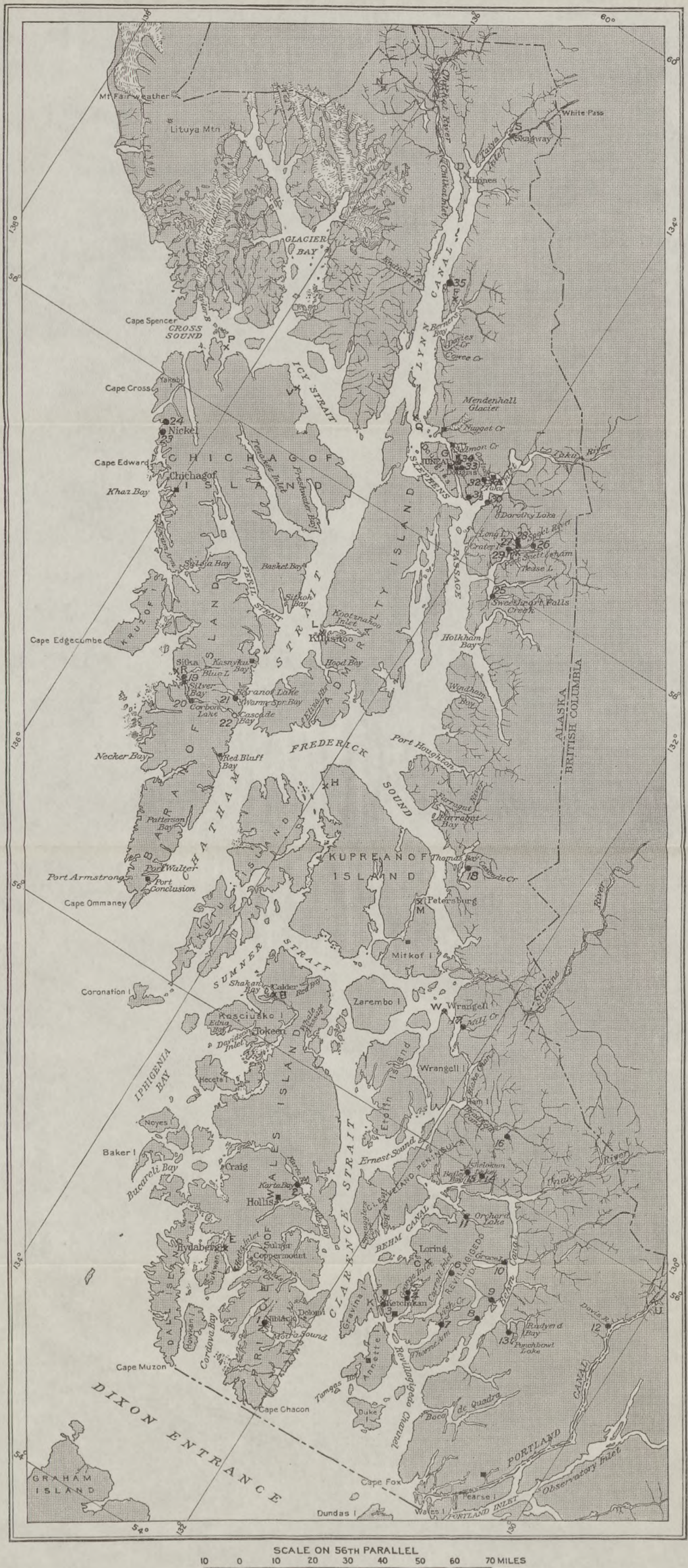
The heavy rainfall of southeastern Alaska serves to place it among the very wettest portions of the Western Hemisphere. There is relatively little dissipation of water by percolation, transpiration, and evaporation, and the yield of the streams per square mile of drainage area is correspondingly high. The table on page 142 shows that the precipitation is heaviest on the islands in the southern part of this region and diminishes northward. It is also much less near the inland extremities of long arms of the sea, as at Stewart and Skagway, which are at the heads of Portland Canal and Lynn Canal, respectively.

From short records of precipitation obtained at the Jumbo mine, near Sulzer, on Prince of Wales Island, and at some of the mining camps near Juneau it appears that the precipitation is much greater on the mountain slopes than at sea level. However, there is no evidence that this relation of increasing precipitation with increasing altitude continues to the crests of the mountains. The maximum precipitation resulting from the effect of the cooler temperature at higher altitudes on the warm moisture-laden air from the sea may occur at some point below the summit.

Records of precipitation in southeastern Alaska can be used only to a limited degree in estimating the run-off of streams on which no stream-flow data have been obtained. The observed precipitation at sea level at the nearest Weather Bureau station can not be assumed to represent the mean precipitation over a certain drainage basin, because of variations due to differences in exposure to the moisture-laden winds and the large differences in altitude. However, where the run-off for a few years has been determined, the precipitation records are of value in estimating the probable run-off for other years.

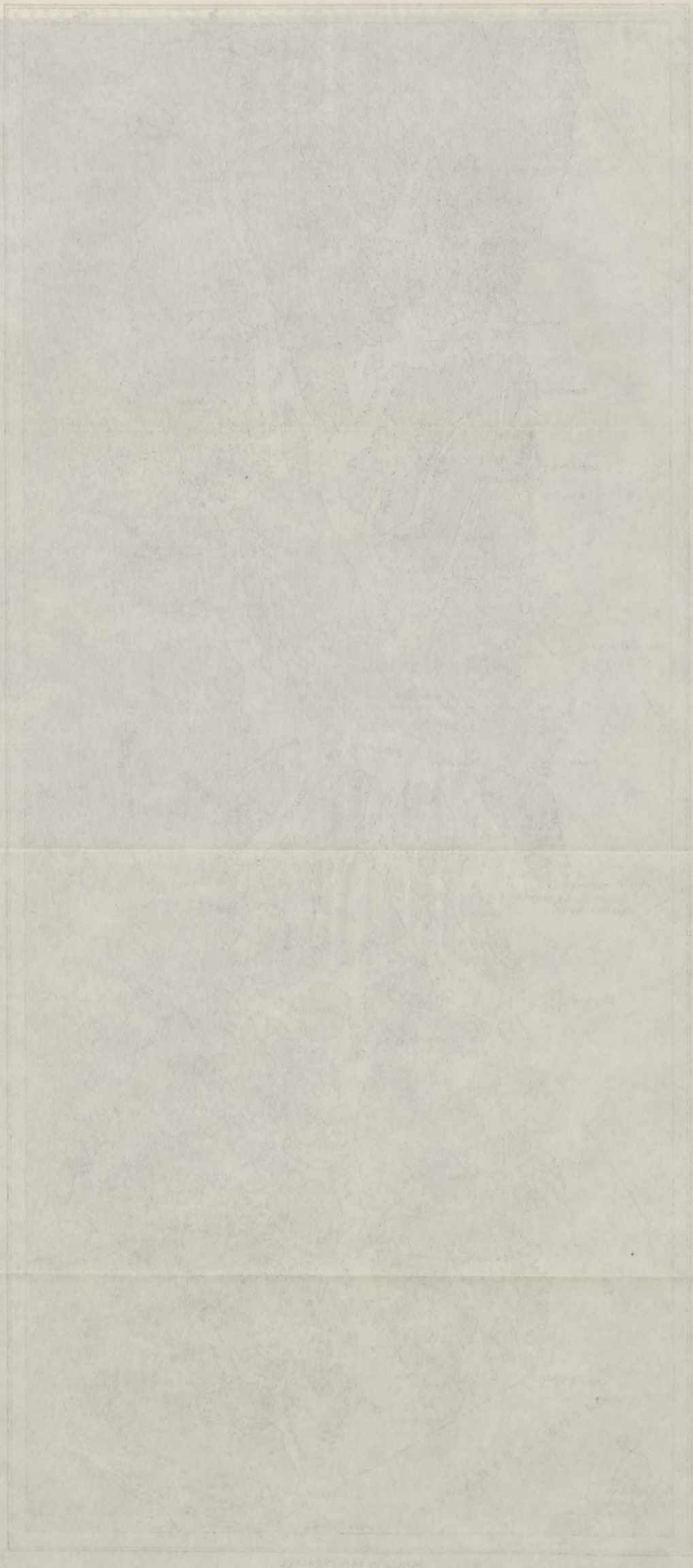
During the winter, much of the precipitation at sea level is in the form of rain. This is particularly true on the islands in the south half of this region and along the west shore line of all those adjacent to the open ocean. In the mountains a large percentage of the yearly precipitation falls as snow, and most of the higher mountain areas are covered with fields of perpetual snow. This is especially true along the mainland and on the northern islands, where snow falls earlier in the season, is less affected by the winter thaws, and melts later in the spring than in localities more exposed to the influence of the ocean. The streams of the mainland and the northern islands have a low winter run-off but a high summer run-off, and more storage is required to equalize the yearly run-off for water-power development than in the more southerly islands.

Many of the streams on the mainland and a few on Baranof Island head in glaciers, ice-capped mountains, or fields of perpetual snow. For these streams the character and distribution of run-off may be influenced fully as much by temperature as by rainfall. During a hot dry period the run-off may be greater than during a cooler period of moderate rainfall. Streams in the drainage basins that have no glaciers or permanent snow fields, however, will experience a decreasing run-off during a warm dry period in July and August. Winter thaws and rainfall have a quick effect on the run-off of these streams, which sometimes rise from a minimum to a maximum in a few days. On streams that derive most of their flow from glaciers and high fields of perpetual snow a large percentage of the run-off occurs from May to October. For instance, during July, 1915, a hot and dry month, the mean flow of the Long River, on the mainland, in the



MAP OF SOUTHEASTERN ALASKA SHOWING LOCATION OF GAGING STATIONS, PRECIPITATION STATIONS, AND WATER-POWER DEVELOPMENTS

Letters indicate precipitation stations (see table on p. 142); numbers indicate gaging stations (see table on p. 158).



A. SWAN LAKE AND OUTLET, REVILLAGIGEDO ISLAND

B. SALMON CREEK RESERVOIR, NEAR JUNEAU

A. DOROTHY LAKE

B. DOROTHY CREEK, LIEUY AND BART LAKES

upper basin of which are several small ice and snow fields, had a mean discharge of 1,100 second-feet from 31.9 square miles, while the Karta River, on Prince of Wales Island, had a mean flow of only 80 second-feet from 49.5 square miles, although the yearly mean flow of the Karta River is about 10 per cent greater than that of Long River. On glacial streams the winter flow is smaller and remains low for a longer period than on nonglacial streams, and consequently a greater amount of storage is required to equalize the flow.

Only the higher peaks are entirely bare of soil and devoid of vegetation. The lower slopes are timbered to altitudes of 2,000 to 3,000 feet. Grass, brush, and moss cover the upper slopes to an altitude of about 4,000 feet, except the steepest cliffs. The lower slopes have soil ranging in depth from a few inches to several feet, depending on altitude and angle of slope, but at many places in the foothills and along the shore bedrock is exposed on cliffs, bluffs, and slides. The soil contains a large amount of decayed vegetable matter, is thickly interwoven with roots, and is generally covered with moss. Many peat bogs, called muskegs, cover small open areas, usually on the flats or benches, but there are some on steep slopes. The soil of the muskeg areas has an acid reaction, which practically limits the vegetation covering them to moss, short grass, and scrubby lodgepole pine.

Because of the mild temperature, the long days in summer, and the heavy rainfall the vegetation is very luxuriant. Dense forests of hemlock (74 per cent), spruce (20 per cent), cedar, jack pine, etc. (6 per cent), cover practically the whole area to an altitude of 2,000 feet. A growth of scrubby trees and brush extends in places 1,000 feet higher. Below an altitude of 1,500 feet there is a thick undergrowth of ferns, devilsclub, alders, willows, and berry bushes.

In view of the excellent forest cover, it might appear that floods would be moderate and the stream flow well sustained. This is true to some extent on the islands in the southern part of the area, but the beneficial influence of the forest is in general offset by the steep slopes and shallow soil and is largely ineffective when the soil and litter are thoroughly saturated. The streams respond very quickly to rainfall, but the flow decreases almost as rapidly as soon as the rain ceases. The dense foliage of the trees and the heavy undergrowth shield the ground from the sun's rays on the comparatively few clear days, so that the loss by evaporation from the moss-covered, spongelike soil is small.

The dominant influence that affects water utilization is the intense glaciation to which the whole region was subjected in Pleistocene time.

Buddington [9] has described this event and its consequences rather fully, and the following quotations are of special significance in the study of the water resources of the region:

> The evidences of the great ice flood of Pleistocene time are found in the fiorded coast line, in the modified shape of most of the preexisting river valleys, in the presence of hanging valleys, in polished, grooved, and striated surfaces, and in roches moutonnées. The results of extensive alpine glaciation are seen in the many cirques, tarns, or mountain lakes in rock-rimmed basins, knife-edged or comb ridges between cirques, and Matterhornlike peaks, on both the mainland and the larger islands of the archipelago.
>
> During the Pleistocene epoch all the valleys and most of the mountains of both the mainland and the islands were buried under an ice sheet that extended across the whole region to the Pacific Ocean. During the period of maximum flooding ice to the depth of a mile or so must have flowed out through these parts of the mainland valleys that now constitute fiords. * * *
>
> Most of the large valleys on the mainland are broad, flat-floored, and U-shaped as the result of the glaciation, which widened, deepened, and straightened the preexisting river valleys. On the islands there are many "through valleys," with broad, flat floors sloping very gradually up to a divide that is low, broad, and rounded. Such valleys were formed by the passage of ice that flowed up one valley, across the divide, and down another valley, or by valley glaciers that flowed in opposite directions from the same head, planing down the intervening divide. * * *
>
> Lakes and broad sphagnum bogs are characteristic features of the glaciated valleys. Many of the lakes occupy deep troughlike basins gouged out of the rock by the ice. The lake in the valley of Cascade Creek, which enters Thomas Bay, and the lake in the valley north of Tracy Arm, which is tributary to Port Snettisham, are apparently of this type. Such lakes have great potential value as storage reservoirs in connection with water-power development. Submergence of valleys containing such lakes beneath sea level would produce typical fiords.

Glaciation has resulted in the steplike profiles of most of the smaller streams, the lakes or wide gravel flats being separated by stretches of stream having a very rapid fall. Such a topography is of course very favorable to power development, in the course of which the lake or flat becomes a reservoir while the concentrated fall below it is utilized by a diversion conduit for the creation of head.

There is no evidence that geologic conditions as distinct from physiographic conditions have any appreciable tendency to modify run-off. Recent lavas having a notable capability of retaining water, such as those in which rise many of the large springs of the western part of the United States, are uncommon in this region.

Most of the streams on which records have been obtained rise in or flow through lakes of considerable size, which tend to smooth out the floods and in some measure to reinforce the low run-off. For instance, Manzanita Creek has a relatively well sustained low-water flow, the average yearly minimum being 28 per cent of the mean. Ella and Grace Creeks, however, the basins of which adjoin that of Manzanita

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[9] Buddington, A. F., and Chapin, Theodore, Geology and mineral deposits of southeastern Alaska: U. S. Geol. Survey Bull. 800, pp. 23–29, 1929.

Creek and contain approximately equal lake areas, have average minima 6 and 8 per cent, respectively, of the mean. The relative uniformity of flow of Manzanita Creek apparently results from the greater regulating effect of Manzanita Lake due to the existence of log jams at its outlet, behind which the flood waters tend to accumulate and through which they are slowly drawn down, thus accentuating the effect of lake regulation.

DRAINAGE AREAS AND MAPS

The areas topographically tributary to the gaging stations have been measured so far as cartographic data are available, and the figures are presented in the station descriptions with brief notes as to the maps used.

The mainland of southeastern Alaska and parts of the adjacent islands are shown on a map in 13 sheets entitled "International boundary between the United States and Canada, from Cape Muzon to Mount St. Elias," issued by the International Boundary Commission, United States and Canada, Washington, D. C. This map is on a scale of 1:250,000, or about 4 miles to the inch. Topography with a 250-foot contour interval is shown for most of the mainland and for portions of some of the islands. These maps are based to a considerable extent on the earlier maps of the Alaska Boundary Tribunal, which were issued about 1895. From the maps of the Alaska Boundary Tribunal were also compiled the maps of the Juneau gold belt in United States Geological Survey Bulletin 287 and of the Wrangell mining district in Bulletin 347. Several gaging stations lie within the chief mining districts, which have been mapped on a larger scale.

Canfield measured the drainage areas for all the stations that he established on the mainland about 1916, using the best maps available.

Dorothy Lake (pl. 3, *A*) is not shown on the boundary maps, and its existence was not reported until 1929. The maps show, instead of the lake draining directly westward into Taku Inlet, a valley draining eastward and northward into Turner Lake. A map prepared for George T. Cameron and submitted to the Federal Power Commission as a part of his application for license for the Dorothy Lake project adequately depicts the outlines of the Dorothy Lake Basin.

Drainage areas for Beaver Falls and Mahoney Creek are based on water-power surveys by the Forest Service and are given in Dort's report; those for other stations on Revillagigedo Island were measured on a preliminary topographic map of that island, published by the Geological Survey in 1928, by R. H. Sargent, who prepared the map. The Karta River Basin is shown on a reconnaissance map of Prince of Wales Island, prepared by the Forest Service in 1914.

A map of the central portion of Baranof Island, embracing four drainage areas in about the latitude of Sitka, has been compiled from aerial photographs taken in 1929 by the Alaskan Aerial Survey Expe-

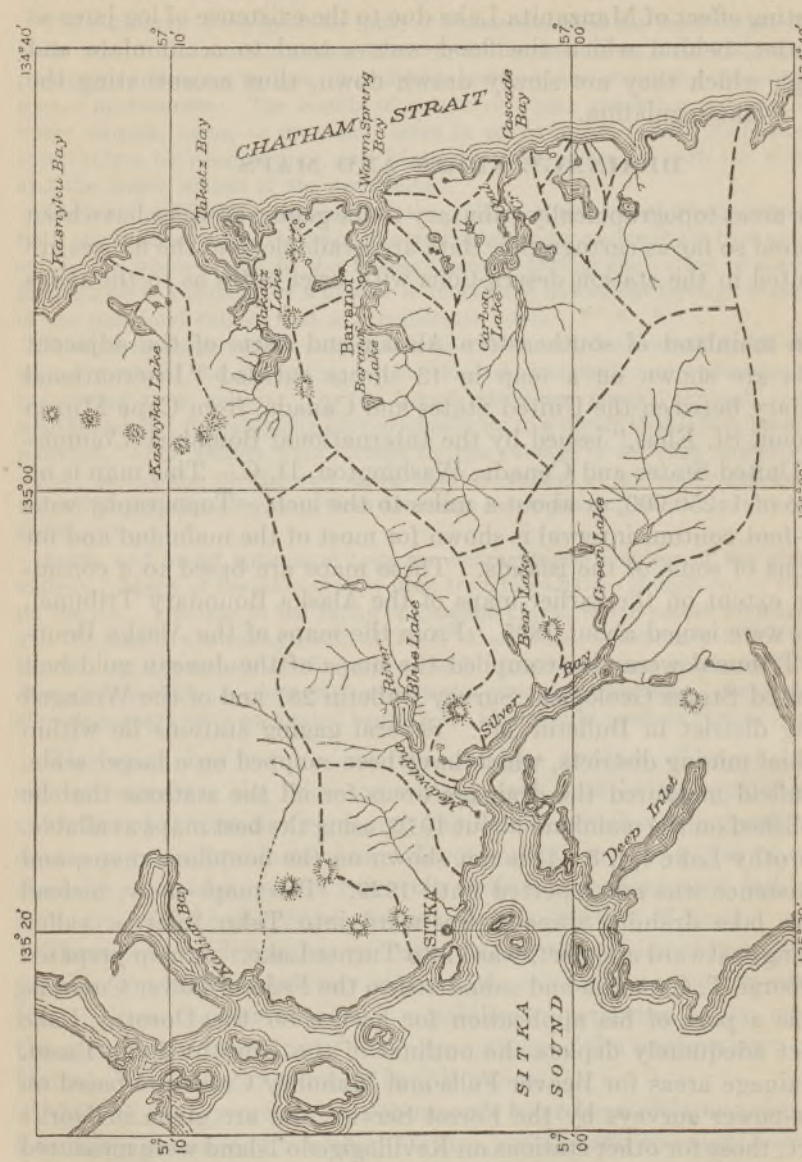

FIGURE 5.—Map of central portion of Baranof Island

dition of the Navy Department and is shown in Figure 5. The drainage divide lines extend across extensive snow fields similar to those shown near the summit of the Coast Range on the international boundary maps. The divides themselves are not distinctly discernible even with the stereoscope, and considerable judgment must be

exercised in outlining them. As adopted, the maps give an area for Coal Creek that seems disproportionately small and one for Green Lake that seems disproportionately large, compared to the observed run-off on these streams, on the Medvetcha River, and on the Baranof Lake outlet. The divide between the headwaters of Coal Creek and of Green Lake as originally compiled from 3-lens pictures taken on east-west flights was checked by pictures taken with a 4-lens camera on a flight southwestward from Warm Spring Bay and found essentially correct, the 4-lens pictures showing the divide somewhat more distinctly.

WATER POWER

In 1921 the Geological Survey, in cooperation with the General Land Office and the Federal Power Commission, made a water-power survey of Fish Creek at Thorne Arm, Revillagigedo Island. Later in that year the Federal Power Commission and the Forest Service entered into a cooperative arrangement for a special water-power reconnaissance of southeastern Alaska. This work was assigned to J. C. Dort, hydroelectric engineer, of the Forest Service, who spent the field seasons of 1921 and 1922 in Alaska. The results of this investigation are embodied in Dort's comprehensive report entitled "Water Powers of Southeastern Alaska," published by the Federal Power Commission in 1924. Detailed surveys were made of many of the better-known water-power sites, with a view to determining their capacities and the methods and costs of development; other sites were covered by reconnaissance surveys. The results of all surveys made prior to this general investigation by either governmental or private agencies, were also incorporated in the report.

The report shows in considerable detail for each power site the location and general description of the project, including proposed storage reservoirs, conduits, and other principal features, and estimates of power discharge, power capacity, and cost of development. It also presents a list of undeveloped water-power sites in southeastern Alaska, showing a total, at 80 per cent efficiency and 100 per cent utilization, of approximately 336,000 primary and 465,000 average horsepower. These figures are now subject to extensive revision on the basis of further information, particularly that obtained by the aerial surveys made by the Navy Department in 1926 and 1929, in cooperation with the Geological Survey and Forest Service. For instance, the power possibilities in connection with Ella, Manzanita, and Grace Lakes, discovered in 1926, aggregate over 25,000 continuous horsepower, while the Dorothy Lake site, which had not been reported prior to 1929, appears to be capable of producing more than 20,000 continuous horsepower.

The greater portion of the developed water power in southeastern Alaska is utilized for mining, a considerable part for public-utility service in the larger towns, and smaller amounts for fish packing and for sawmills. The largest concentration of developed water power is at and near Juneau, where plants with a total capacity of 24,600 horsepower have been installed. For about half the developed projects storage capacity has been provided in natural lakes. The Alaska Gastineau Mining Co. constructed in 1914, as a part of its Salmon Creek No. 2 plant, a constant-angle concrete-arch dam 165 feet in height, with a crest length of 648 feet, which provides a storage capacity of 18,980 acre-feet. The dam and reservoir, formed of what was formerly an elevated basin, without a natural lake, are shown in Plate 2, *B*.

Hoyt [10] has presented a table of developed water power in Alaska, 1908, showing a total of 15,319 horsepower. Canfield [11] gives the developed water power in southeastern Alaska on January 1, 1917, as 37,350 horsepower, on the basis of unpublished information furnished by Leonard Ludgren, district engineer of the Forest Service. If all plants with an installed capacity of less than 100 horsepower are eliminated, these totals, comparable with the total of 32,965 horsepower in 1930, would be about 15,000 and 36,300 horsepower, respectively. Dort [12] described the larger power plants constructed prior to 1923, but gave no complete table of developments.

Plant 1 of the Alaska Gastineau Gold Mining Co., on Salmon Creek near Juneau, was destroyed by fire in 1922, and since that time a large part of the machinery of the plant of the Alaska Juneau Gold Mining Co. on Douglas Island has been retired from service. The plant of the Speel River project, on Tease Lake, has not been in operation for several years and will require extensive repairs before it can again be placed in service. Meanwhile, only small additional capacity has been provided, mostly for use by public utilities and canneries. Hence there has been a considerable net reduction in developed water-power capacity during the 13 years since 1917, although the number of plants in operation has increased.

The essential data regarding the water-power developments with an installed capacity of more than 100 horsepower December 31, 1930, compiled with the assistance of the Forest Service and believed to be complete, are given in the following table:

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[10] Hoyt, J. C., A water-power reconnaissance in southeastern Alaska: U. S. Geol. Survey Water-Supply Paper 372, p. 167, 1915.

[11] Canfield, G. H., Water-power investigations in southeastern Alaska: U. S. Geol. Survey Bull. 692, pp. 43-44, 1919.

[12] Dort, J. C., Water powers of southeastern Alaska, pp. 133-143, Federal Power Commission, 1924.

Developed water power in southeastern Alaska, December 31, 1930

Federal Power Commission project No.	Locality or island	Stream	Latitude and longitude of plant	Rated capacity		Head (feet)	Owner or operator
				Water wheels (horse power)	Generators (kilovolt-amperes)		
812	Prince of Wales Island	Harris Creek	55° 28′ N., 132° 43′ W	200	15	20	Kassan Gold Co.
	Annette Island	Waterfall Creek	55° 07′ N., 131° 33′ W	230	187	737	Council of Annette Island reserve.
420	Revillagigedo Island	Ketchikan Creek	Ketchikan	4,000	2,700	250	Citizens Light, Power & Water Co.
(a)	do	Lake Whitman	55° 20′ N., 131° 32′ W	2,000	1,200	330	New England Fish Co.
509	Pearse Canal	Waterfall Creek	54° 47′ N., 130° 21′ W	100	75	92	Nakat Packing Corporation.
201	Mitkof Island	Crystal Lake	56° 36′ N., 132° 52′ W	1,250	1,000	1,050	Town of Petersburg.
576	Baranof Island	Unnamed creek	Port Armstrong	150	10	260	Buchan & Heinen Packing Co.
793	do	Red Bluff Creek	56° 51′ N., 134° 43′ W	185	20	200	Wakefield Fisheries (Inc.).
408	do	Medvetcha River	57° 3′ N., 135° 14′ W	270	200	48	Sitka Wharf & Power Co.
833	do	Hidden Falls Creek	57° 14′ N., 134° 54′ W	400	30	170	John R. Maurstad.
951	Chichagof Island	Rust Creek	Near Chichagof	1,180	728	320	Chichagof Power Co.
(a)	Taku Inlet	Annex Creek	58° 19′ N., 134° 07′ W	5,000	3,500	775	Alaska Gastineau Mining Co.
	Gastineau Channel	Sheep Creek	Near Thane	4,400	2,225	600	Alaska Juneau Gold Mining Co.
	do	Gold Creek	Near Juneau	1,000	1,000	207	Alaska Electric Light & Power Co.
	Douglas Island	Treadwell Ditch	Near Douglas	1,500	1,000	570	Alaska Juneau Gold Mining Co.
(b)	Gastineau Channel	Salmon Creek No. 2	Near Juneau	5,000	3,500	623	Alaska Gastineau Mining Co.
(b)	Mainland	Nugget Creek	58° 24′ N., 134° 32′ W	5,700	3,200	490	Alaska Juneau Gold Mining Co.
1051	do	Dewey Creek	Skagway	400	375	450	Home Power Co.
				32,965	20,965		

[a] Under Department of Agriculture permit.

[b] Under Department of Interior permit.

DISCHARGE RECORDS

DEFINITION OF TERMS

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those that represent a rate of flow, as second-feet, gallons per minute, miner's inches, and discharge in second-feet per square mile; and (2) those that represent the actual quantity of water, as run-off in inches, acre-feet, and millions of cubic feet and second-feet per square mile. They may be defined as follows:

"Second-feet" is an abbreviation for "cubic feet per second." A second-foot is the rate of discharge of water flowing in a channel of rectangular cross section 1 foot wide and 1 foot deep at an average velocity of 1 foot per second. It is generally used as a fundamental unit from which others are computed.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly as regards both time and area.

"Run-off in inches" is the depth to which an area would be covered if all the water flowing from it in a given period were uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in inches.

An "acre-foot," equivalent to 43,560 cubic feet, is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

The following terms not in common use are here defined:

"Stage-discharge relation" is an abbreviation for the term "relation of gage height to discharge."

"Control" is a term used to designate the natural section or stretch of the channel or artificial structure below the gage which determines the stage-discharge relation at the gage.

EXPLANATION OF DATA

The data presented in this report are arranged by years ending September 30, as is customary for the rest of the United States. In Alaska, as in the northern portion of the United States, much of the precipitation of the last three months of the calendar year is at the beginning of January stored in the form of snow or ice, in lakes or swamps, or as underground water, and this stored water passes off in the streams during the following spring and summer.

August and September are in Alaska usually months of heavy precipitation, practically all of which runs off during those months. Relatively little snow falls, even at high altitudes, until the later part

of October, and practically all the old snow is gone by September 30 of the next year. There is no positive evidence of any material hold-over of snow in the glaciers, most of which are receding very slowly.

The basic data collected at gaging stations consist of records of stage, discharge measurements, and information as to ice or other obstructions affecting the stage-discharge relation. The records of stage are obtained either from direct reading on a staff gage or from an automatic water-stage recorder that gives a continuous record of the fluctuations of a stream. Measurements of discharge are made with a current meter by the general methods outlined in standard textbooks. From the discharge measurements rating tables are prepared that give the discharge for any stage. The application of the daily gage heights to these rating tables gives the daily discharge, from which the monthly and yearly mean discharge is computed. The records have generally been made complete by estimating the discharges for periods during which the recorders were not operating or when the gage-height record, if obtained, can not be used directly in obtaining the discharge. In footnotes to the tables the mean discharge for any month has generally been designated as "estimated" if actual records are available for less than 6 days, and "partly estimated" if available for 6 to 25 days. No footnote is appended if less than 6 days of records are missing or if the estimated discharges constitute less than about 20 per cent of the monthly total.

The data presented for each gaging station in this report comprise a description of the station and a table of monthly and yearly discharge and run-off. The description of the station gives information as to the location and type of gage, diversions or artificial regulation that affect the flow at the gage, maximum and minimum recorded discharges, accuracy of the records, and, where appropriate, a brief statement as to the power and storage possibilities of the stream and as to their development or disposition.

The accuracy of stream-flow data depends primarily on the permanence of the stage-discharge relation and on the accuracy of observation of stage, measurements of flow, and interpretation of records. The station description gives a statement in regard to the general accuracy of the records. "Excellent" indicates that the records are probably accurate within 5 per cent; "good," within 10 per cent; "fair," within 15 per cent, and "poor," within 20 per cent or more.

"Second-feet per square mile" and "run-off in inches" have not generally been computed or published for the Alaska records. During the earlier years of these investigations drainage areas were available only for a few of the streams on the mainland, which had been mapped by the International Boundary Survey, and even these were subject to considerable uncertainty. With the practical completion of the work of covering southeastern Alaska by aerial photography, it has

been possible to measure most of the drainage areas with a fair degree of accuracy. It has not been practicable to compute monthly run-off per square mile, but a table of yearly run-off is given on page 218.

GAGING STATIONS MAINTAINED

The following list comprises the gaging stations that have been maintained in southeastern Alaska. The list has been arranged in general from south to north. A dash after the last date in a line indicates that the station was being maintained December 31, 1930. The numbers refer to Plate 1.

Prince of Wales Island:

1. Myrtle Creek at Niblack, 1917–1921.
2. Karta River at Karta Bay, 1915–1922.

Revillagigedo Island:

3. Ketchikan Creek at Ketchikan, 1909–1912, 1915–1919.
4. Beaver Falls Creek at George Inlet, 1917, 1920–1925, 1927–
5. Mahoney Creek at George Inlet, 1920–1925, 1927–
6. Swan Lake outlet at Carroll Inlet, 1916–1926, 1927–
7. Fish Creek at Thorne Arm, 1915–
8. Ella Creek at Behm Canal, 1927–
9. Manzanita Creek at Manzanita Bay, 1927–
10. Grace Creek at Behm Canal, 1927–
11. Orchard Creek at Shrimp Bay, 1915–1921, 1922–1925.

Mainland South of Frederick Sound:

12. Davis River at Portland Canal, 1927–1928, 1930.
13. Punchbowl Lake outlet at Rudyerd Bay, 1923–1930.
14. Short Creek at Short Bay, 1922–1925.
15. Shelockum Lake outlet at Bailey Bay, 1915–1921, 1922–1924.
16. Tyee Creek at Bradfield Canal, near Wrangell, 1921, 1922, 1924–1925.
17. Mill Creek near Wrangell, 1915–1917.
18. Cascade Creek at Thomas Bay near Petersburg, 1917–1928.

Baranof Island:

19. Medvetcha River near Sitka, 1920–1922, 1928–
20. Green Lake outlet at Silver Bay, near Sitka, 1915–1924.
21. Baranof Lake outlet at Baranof, 1915–1927.
22. Coal Creek at Cascade Bay, 1922–1924, 1925–1926.

Chichagof Island:

23. Falls Creek at Nickel, 1918–1920.
24. Porcupine Creek near Nickel, 1918–1920.

Mainland north of Frederick Sound:

25. Sweetheart Falls Creek at Port Snettisham, 1915–1927.
26. Speel River at Port Snettisham, 1916–1918.
27. Long Lake outlet at Port Snettisham, 1913–1915.
28. Long River below Second Lake, at Port Snettisham, 1915–1924, 1927–
29. Crater Creek at Port Snettisham, 1913–1920, 1923, 1927–
30. Dorothy Creek at Taku Inlet, 1929–
31. Grindstone Creek at Taku Inlet, 1916–1920.
32. Carlson Creek at Sunny Cove, Taku Inlet, 1916–1920.
33. Sheep Creek near Thane, 1916–1920.
34. Gold Creek at Juneau, 1916–1920.
35. Sherman Creek at Kensington Mine, 1914–1916.

STATION RECORDS

PRINCE OF WALES ISLAND

MYRTLE CREEK AT NIBLACK

LOCATION.—Water-stage recorder halfway between beach and Myrtle Lake outlet, 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.

EXTREMES, 1917–1921.—Maximum discharge, from extension of rating curve, 387 second-feet Nov. 18, 1917 (gage height, 4.4 feet); minimum discharge, 24 second-feet July 29, 1920 (gage height, 0.95 foot).

REMARKS.—Stage-discharge relation permanent, unaffected by ice. Records good except those for periods of break in record, which are fair. Myrtle Lake, the outlet of which is 800 feet from Niblack Anchorage, is 95 feet above higher high water 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, unsurveyed, is about 600 feet above sea level and is a mile long and a quarter to half a mile wide.

Monthly discharge of Myrtle Creek at Niblack

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1917				
August	140	38	68.6	4,220
September	120	43	69.5	4,140
1917–18				
October	200	76	116	7,130
November	340	140	249	14,800
December			[a] 82	5,040
January			[a] 140	8,610
February			[a] 77	4,280
March			[a] 48	2,950
April			[a] 70	4,170
May			[a] 104	6,400
June			[a] 83	4,940
July			[a] 48	2,950
August			[a] 50	3,070
September			[a] 43	2,560
The year			924	66,900
1918–19				
October	163		[a] 105	6,460
November			[b] 130	7,740
December	233		[b] 104	6,400
January	220		[b] 124	7,620
February	100	47	69.4	3,850
March	61	34	[b] 48.1	2,960
April			[a] 100	5,950
May			[a] 110	6,760
June		50	[a] 85.0	5,060
July	85	41	55.8	3,430
August	64	32	38.6	2,370
September	77	28	40.8	2,430
The year	233	28	84.3	61,000
1919–20				
October	56	33	40.3	2,480
November	118		[b] 59.4	3,530
December	175	36	78.9	4,850
January	233		[b] 100	6,150
February			[b] 63.6	3,660
March		31	[b] 36.8	2,260
April	60	30	41.6	2,480
May	61	40	48.4	2,980
June	48	40	43.7	2,600
July	43	24	28.8	1,770
August	157	31	67.6	4,160
September	106	46	67.5	4,020
The year	233	24	56.4	40,900

[a] Computed from occasional readings and indicated maximum and minimum.
[b] Partly estimated.

Monthly discharge of Myrtle Creek at Niblack—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1920–21				
October	114	67	88.4	5,430
November	175	60	92.1	5,480
December	140	56	90.2	5,550
January	123	48	73.2	4,500
February	180	50	91.7	5,090
March	144	----------	[b] 59.8	3,680
April	79	41	53.7	3,200
The period	----------	----------	----------	32,900

[b] Partly estimated.

KARTA RIVER AT KARTA BAY

LOCATION.—Water-stage recorder half a mile from tidewater, at head of Karta Bay, 1¼ miles below outlet of Little Salmon Lake, on east coast of Prince of Wales Island, and 42 miles by water across Clarence Strait from Ketchikan.

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

EXTREMES, 1915–1922.—Maximum discharge, 5,070 second-feet Nov. 1, 1917 (gage height, 5.5 feet); minimum, 21 second-feet Feb. 11, 1916.

ACCURACY.—Stage-discharge relation permanent, practically unaffected by ice. Records excellent except those for periods of breaks in record and for discharge above 1,500 second-feet, which are fair. The area of Little Salmon Lake at an altitude of 104 feet is 282 acres; that of Salmon Lake at an altitude of 108 feet is 1,384 acres. The drainage area below an altitude of 2,000 feet is heavily covered with timber and dense undergrowth of ferns, brush, and alders. The snow usually melts by the end of June, and the run-off becomes very low during a dry, hot summer.

Monthly discharge of Karta River at Karta Bay

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1915				
July	----------	52	[a] 82.5	5,070
August	1,200	44	382	23,500
September	830	71	[a] 227	13,500
1915–16				
October	3,000	258	[a] 1,020	62,700
November	1,920	278	822	48,900
December	1,980	206	732	45,000
January	206	30	[a] 91.5	5,630
February	679	21	[a] 245	14,100
March	338	118	203	12,500
April	1,510	382	628	37,400
May	673	326	494	30,400
June	689	350	480	28,600
July	376	172	276	17,000
August	338	83	166	10,200
September	730	76	281	16,700
The year	3,000	21	453	329,000
1916–17				
October	1,680	94	484	29,800
November	1,480	248	697	41,500
December	1,010	135	385	23,700
January	824	118	348	21,400
February	1,170	103	358	19,900
March	----------	83	[a] 112	6,890
April	665	----------	[a] 225	15,200
May	1,030	467	634	39,000
June	722	308	517	30,800
July	773	192	343	21,100
August	1,420	112	457	28,100
September	2,120	83	644	38,300
The year	2,120	83	436	316,000

[a] Partly estimated.

Monthly discharge of Karta River at Karta Bay—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1917–18				
October	2,960	408	977	60,100
November	4,440	625	2,020	120,000
December	2,430	97	393	24,200
January	2,620	314	839	51,600
February	1,330	106	349	19,400
March	240	66	[a] 121	7,440
April	1,580	184	224	13,300
May	1,380	441	808	49,700
June	952	338	583	34,700
July	332	109	193	11,900
August	722	94	306	18,800
September	1,270	78	236	14,000
The year	4,440	66	586	425,000
1918–19				
October	1,820	224	866	53,200
November	1,940	206	843	50,200
December	2,560	160	617	38,000
January	----------	176	[a] 695	42,700
February	522	121	243	13,500
March	1,230	54	172	10,600
April	1,700	344	691	41,100
May	1,330	356	690	42,400
June	448	254	360	21,400
July	350	121	248	15,200
August	415	76	140	8,610
September	1,420	56	312	18,600
The year	2,560	54	491	356,000
1919–20				
October	572	142	335	20,600
November	----------	125	[a] 553	32,900
December	----------	----------	[a] 719	44,200
January	2,430	----------	[a] 603	37,100
February	----------	----------	[a] 366	21,100
March	206	78	118	7,260
April 1–16	254	103	163	5,170
The period	----------	----------	----------	168,000
1920–21				
October	880	300	[a] 537	33,000
November	1,940	118	530	31,500
December	1,420	172	461	28,300
January	747	----------	[a] 290	17,800
February	----------	----------	[b] 663	36,800
March	1,000	64	234	14,400
April	1,000	201	408	24,300
May	925	269	494	30,400
June	799	376	561	33,400
July	388	121	215	13,200
August	197	81	145	8,920
September	1,700	160	570	33,900
The year	----------	64	423	306,000
1921–22				
October	3,240	308	1,120	68,900
November	----------	----------	[a] 594	35,300
December	----------	----------	[b] 680	41,800
January	----------	----------	[b] 216	13,300
February	----------	----------	[b] 80	4,440
March	----------	----------	[b] 124	7,620
April	----------	----------	[a] 274	16,300
May	1,230	454	661	40,600
June	1,010	175	424	25,200
July	----------	71	[a] 143	8,790
August	135	42	70.7	4,350
September	2,820	172	579	34,500
The year	3,240	42	416	301,000
1922				
October	1,590	135	730	44,900

[a] Partly estimated. [b] Estimated.

REVILLAGIGEDO ISLAND

KETCHIKAN CREEK AT KETCHIKAN

LOCATION.—Staff gage one-fourth mile below power house of Citizens Light, Power & Water Co. 200 feet below mouth of Schoenbar Creek, 1½ miles below outlet of Ketchikan Lake, and one-third mile northeast of Ketchikan post office.

DRAINAGE AREA.—15 square miles (preliminary topographic map of Revillagigedo Island).

EXTREMES, 1909–1912, 1915–1919.—Maximum discharge, estimated from extension of rating curve, 4,400 second-feet Nov. 18, 1917 (gage height, 8.3 feet); minimum, 34 second-feet Sept. 24, 1915.

REMARKS.—Stage-discharge relation changed in flood of November, 1917; practically unaffected by ice. A small quantity of water diverted above station for domestic and industrial use. Some diurnal fluctuation caused by operation of power plant; low-water flow increased to some extent by release of storage from Ketchikan Lake. Records fair. Ketchikan Lakes, area 580 acres, lie at an altitude of 340 feet about 1½ miles from Tongass Narrows. The ordinary drawdown of the lakes is somewhat less than 10 feet. The plant of the Citizens Light, Power & Water Co. of 4,000 horsepower (project 420 of the Federal Power Commission) takes water from Ketchikan Creek at the outlet of Ketchikan Lake, and from Granite Basin Creek and other small tributaries; the power is used for public utilities in Ketchikan and vicinity.

Monthly discharge of Ketchikan Creek at Ketchikan

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1909–10				
November	685	44	130	7,740
December	296	40	76.5	4,700
January	252	36	76.3	4,690
February	332	36	82.0	4,550
March	560	40	237	14,600
April	285	44	135	8,030
May	523	160	291	17,900
June	584	200	330	19,600
July	2,040	190	374	23,000
August	1,540	93	256	15,700
September	685	66	183	10,900
The period				131,000
1910–11				
October	2,220	151	550	33,800
November	493	54	211	12,600
December	1,440	54	339	20,800
January	493		[a] 125	7,690
February			[b] 70	3,890
March			[a] 100	6,150
April	880	49	162	9,640
May	464	125	249	15,300
June	1,190	200	334	19,900
July	1,290	160	297	18,300
August	180	86	128	7,870
September	523	93	189	11,200
The year	2,220		231	167,000
1911–12				
October	409	93	173	10,600
November	464	54	169	10,100
December	3,400	93	411	25,300
January	436	66	151	9,280
February	616	66	214	12,300
March	200	40	62.1	3,820
April	180	66	95.2	5,660
May	332	86	187	11,500
June	200	79	112	6,660
The period				95,200

[a] Partly estimated. [b] Estimated.

Monthly discharge of Ketchikan Creek at Ketchikan—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1915				
July	200	59	86.6	5,320
August	2,640	41	303	18,600
September	584	34	106	6,310
1915–16				
October	1,540	54	371	22,800
November	553	79	238	14,200
December	553	54	190	11,700
January	80	40	[a] 47.8	2,940
February	616	40	[a] 109	6,270
March	409	61	110	6,760
April	436	82	155	9,220
May	523	85	199	12,200
June	332	142	241	14,300
July	1,060	125	281	17,300
August	523	79	165	10,100
September	523	74	228	13,600
The year	1,540	40	195	141,000
1916–17				
October	840	66	233	14,300
November	650	71	201	12,000
December	241	64	110	6,760
January	267	61	106	6,520
February	740	54	179	9,940
March	71	42	54.8	3,370
April	245	42	114	6,780
May	523	74	192	11,800
June	553	160	249	14,800
July	720	125	240	14,800
August	3,160	108	455	28,000
September	378	80	146	8,690
The year	3,160	42	190	138,000
1917–18				
October	2,490	125	402	24,700
November	4,400	116	1,170	69,600
December	570	43	99	6,090
January	630	45	167	10,300
February	450	43	90.1	5,000
March	89	43	54.3	3,340
April	402	53	152	9,040
May	410	110	227	14,000
June	205	60	144	8,570
July	530	72	140	8,610
August	675	62	234	14,400
September	260	45	81.0	4,820
The year	4,400	43	247	178,000
1918–19				
October	1,770	67	480	29,500
November	1,950	65	357	21,200
December	1,000	53	231	14,200
January	1,000	62	247	15,200
February	230	55	92.1	5,120
March	650	51	98.9	6,080
April	950	89	294	17,500
May	725	80	238	14,600
June	570	125	195	11,600
July	390	95	137	8,420
August	725	67	135	8,300
September	1,650	60	266	15,800
The year	1,770	51	231	168,000
1919–20				
October	410	62	107	6,580
November	1,590	62	406	24,200
December 1–17	700	55	143	4,820

[a] Partly estimated.

BEAVER FALLS CREEK AT GEORGE INLET

LOCATION.—Water-stage recorder a quarter of a mile from tidewater on west shore of George Inlet and 10 miles by water from Ketchikan.

DRAINAGE AREA.—5.9 square miles (Forest Service map, based on survey in 1917).

EXTREMES, 1920–1925, 1927–1930.—Maximum discharge recorded, 2,180 second-feet Nov. 7, 1929 (gage height, 7.37 feet); minimum, about 5 second-feet Sept. 6–12, 1930, and during ice periods, not accurately recorded.

REMARKS.—Stage-discharge relation permanent, unaffected by ice. A small quantity of water is diverted about 200 yards below station into a flume for a shingle mill and a cannery. Records good except those for August to October, 1917, for 1923, and for estimated periods, which are fair. Lower Silvis Lake is 790 feet above high tide and 1½ miles from the beach, and its area is 62 acres. 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. Beaver Falls Creek power site is one of a group for which a preliminary permit was issued by the Federal Power Commission in 1927 to I. & J. D. Zellerbach, but this site was not included in their application for license filed in 1930.

Monthly discharge of Beaver Falls Creek at George Inlet

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1917				
August	525	38	162	9,960
September	323	11	109	6,490
October 1–10	352	52	163	3,230
1920				
September 6–30	330	30	119	5,900
1920–21				
October	444		[a] 146	8,980
November			[b] 76.6	4,560
December	261	9	49.0	3,010
January	154	9	31.7	1,950
February			[b] 133	7,390
March		11	[a] 41.1	2,530
April	136	17	46.3	2,760
May	317	47	127	7,810
June	479	118	212	12,600
July	393	49	118	7,260
August	444	24	98.1	6,030
September		17	[a] 152	9,040
The year		9	102	73,900
1921–22				
October	815	78	248	15,200
November	600	19	127	7,560
December	815	24	[a] 195	12,000
January			[b] 25.0	1,540
February			[b] 13.5	750
March			[b] 11.2	689
April	252	24	[a] 71.3	4,240
May	394	53	155	9,530
June	405	102	196	11,700
July	133		[a] 91.3	5,610
August	319	31	[a] 64.4	3,960
September	726	32	174	10,400
The year	815		115	83,200
1922–23				
October	780	27	186	11,400
November	720	[b] 55	[a] 219	13,000
December			[b] 57.0	3,500
January			[b] 16.4	1,010
February			[b] 73.0	4,050
March	249		[a] 77.6	4,770
April	720	55	142	8,450
May	615	70	181	11,100
June	258	77	141	8,390
July	96	38	59.6	3,660
August		25	[a] 73.3	4,510
September	445		[a] 122	7,260
The year	780		112	81,100

[a] Partly estimated.
[b] Estimated by comparison with records on Mahoney Creek and Swan Lake outlet.

Monthly discharge of Beaver Falls Creek at George Inlet—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1923–24				
October	395	30	103	6,330
November			[b] 247	14,700
December			[a] 121	7,440
January			[b] 73.0	4,490
February			[b] 119	6,840
March		24	[a] 54.4	3,340
April	153	31	64.4	3,830
May	850	78	219	13,500
June	249	80	130	7,740
July	512	39	125	7,690
August	198	18	57.1	3,510
September	1,160	28	203	12,100
The year		18	126	91,500
1924–25				
October	512	56	185	11,400
November	630	19	173	10,300
December	213	36	71.3	4,380
January	46	[b] 20	29.2	1,800
February			[b] 15.0	833
March			[b] 45.0	2,770
April	222	20	70.5	4,200
May	308	65	163	10,000
June		86	144	8,570
July	585	46	143	8,790
August	284	22	74.0	4,550
September			[a] 30.6	1,820
The year	630		95.9	69,400
1925				
October	570		[a] 91.9	5,650
November	472	39	186	11,100
December			[a] 248	15,200
1927				
September 24–30	625	16	310	4,300
1927–28				
October	565	37	168	10,300
November	107	5	32.7	1,950
December	352		51.1	3,140
January	522	15	168	10,300
February	448	12	63.6	3,660
March	685	12	130	7,990
April	315	16	67.7	4,030
May	422	57	166	10,200
June	194	51	113	6,720
July	315	16	91.3	5,610
August	498		[a] 64.2	3,950
September	268		[a] 58.3	3,470
The year	685		98.3	71,300
1928–29				
October	360	24	[a] 153	9,410
November	385	21	118	7,020
December	448	23	110	6,760
January	990		120	7,380
February	55	[b] 6	[b] 13.4	744
March	201	14	[a] 55.4	3,410
April	335	10	46.5	2,770
May	238	50	97.7	6,010
June	360	58	125	7,440
July	275	28	109	6,700
August	790	16	165	10,100
September	34	8	15.8	940
The year	990	[b] 6	94.8	68,700

[a] Partly estimated.
[b] Estimated by comparison with records on Mahoney Creek and Swan Lake outlet.

Monthly discharge of Beaver Falls Creek at George Inlet—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1929-30				
October	[b] 690	8	[a] 179	11,000
November	745	28	212	12,600
December	325	[b] 6	[a] 53.3	3,280
January	39	----------	[b] 11.8	726
February	448	----------	[a] 74.1	4,120
March	315	10	48.7	2,990
April	260	15	81.1	4,830
May	410	51	118	7,260
June	625	73	184	10,900
July	325	28	76.8	4,720
August	60	7	24.7	1,520
September	660	[b] 5	[a] 105	6,250
The year	745	[b] 5	97.1	[c] 70,200

[a] Partly estimated.
[b] Estimated by comparison with records on Mahoney Creek and Swan Lake outlet.

MAHONEY CREEK AT GEORGE INLET

LOCATION.—Water-stage recorder one-fourth mile below outlet of Mahoney Lake, one-fourth mile above tidewater on west shore of George Inlet, 3 miles north of Beaver Falls Creek, and 13 miles by water from Ketchikan.

DRAINAGE AREA.—5.9 square miles (Forest Service power map).

EXTREMES, 1920–1925, 1927–1930.—Maximum discharge recorded, 2,180 second-feet Aug. 31, 1923 (gage height, 4.15 feet); minimum, 3.0 second-feet Dec. 17, 1922.

REMARKS.—Stage-discharge relation permanent, unaffected by ice. Records good except those for period of break in record and discharge above 150 second-feet, which are poor. Mahoney Lake, the outlet of which is half a mile from the beach, lies 75 feet above high tide. Upper Mahoney Lake, the outlet of which is three-fourths mile above head of Lower Mahoney Lake, lies about 1,900 feet above high tide and has an area of 77 acres. The drainage area at the outlet of Upper Mahoney Lake is 2.1 square miles. The Mahoney Creek power site was one of a group for which a preliminary permit was issued by the Federal Power Commission in 1927 to I. & J. D. Zellerbach, but this site was not included in their application for license.

Monthly discharge of Mahoney Creek at George Inlet

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1920				
September 10-30	212	33	102	4,250
1920-21				
October	----------	26	[a] 114	7,010
November	400	12	[a] 72	4,280
December	202	14	46.3	2,850
January	120	8	34	2,090
February	----------	----------	[a] 61	3,390
March	----------	4	[a] 24	1,480
April	105	15	36	2,140
May	210	22	89	5,470
June	569	110	183	11,300
July	235	65	113	6,950
August	450	32	106	6,520
September	330	16	[a] 142	8,450
The year	569	4	85.6	61,900

[a] Partly estimated.

Monthly discharge of Mahoney Creek at George Inlet—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1921–22				
October	462	62	188	11,600
November	381	7	[a] 82.4	4,900
December	840	7	172	10,600
January	----------	----------	[b] 25.0	1,540
February	----------	----------	[b] 13.5	750
March	----------	----------	[b] 11.2	689
April	----------	----------	[b] 60.0	3,570
May	----------	----------	[a] 121	7,440
June	273	93	151	8,980
July	152	71	106	6,520
August	162	37	72.1	4,430
September	978	25	162	9,640
The year	978	7	97.7	70,700
1922–23				
October	704	11	158	9,720
November	605	----------	[a] 210	12,500
December	290	3	54.9	3,380
January	43	7	19.0	1,170
February	584	11	77.1	4,280
March	160	12	62.5	3,840
April	546	24	116	6,900
May	450	68	[a] 143	8,790
June	210	71	134	7,970
July	137	56	92.1	5,660
August	1,520	26	129	7,930
September	558	16	165	9,820
The year	1,520	3	113	82,000
1923–24				
October	----------	----------	[a] 103	6,330
November	[b] 1,400	43	[a] 270	16,100
December	599	22	140	8,610
January	298	16	82.2	5,050
February	405	30	131	7,540
March	144	[b] 15	[a] 54.0	3,320
April	118	18	50.7	3,020
May	978	67	197	12,100
June	21[illegible]	110	146	8,690
July	552	79	170	10,500
August	252	42	84.2	5,180
September	864	48	175	10,400
The year	[b] 1,400	[b] 15	133	96,800
1924–25				
October	572	75	200	12,300
November	725	16	203	12,100
December	274	15	76.8	4,720
January	35	22	28.4	1,750
February	34	----------	[a] 15.0	830
March	152	21	47.8	2,940
April	185	20	68.0	4,050
May	263	56	153	9,410
June	552	110	193	11,500
July	725	68	185	11,400
August	198	32	82.3	5,060
September	74	8	29.5	1,760
The year	725	----------	107	77,800
1927				
January	----------	9	[a] 56.3	3,460
February	----------	----------	[a] 29.7	1,650
March	----------	19	[a] 55.1	3,390
April	156	18	54.4	3,240
May	----------	44	[a] 106	6,520
June	174	125	154	9,160
July	214	108	144	8,850
August	748	43	[a] 116	7,130
September	634	19	136	8,090
The period	----------	----------	----------	51,600

[a] Partly estimated. [b] Estimated.

Monthly discharge of Mahoney Creek at George Inlet—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1927–28				
October	508	36	178	10,900
November	70	5	[a] 35.8	2,130
December	263	15	42.2	2,590
January	704	20	177	10,900
February	405	15	66.3	3,810
March	697	12	134	8,240
April	375	18	68.2	4,060
May	302	46	149	9,160
June	190	88	133	7,910
July	355	36	124	7,620
August	490	16	79.4	4,880
September	242	6	64.1	3,810
The year	704	5	105	76,000
1928–29				
October	454	42	161	9,900
November			[a] 138	8,210
December	472	31	[a] 105	6,460
January			[a] 108	6,640
February	35	[b] 7	[a] 14.9	828
March	134	22	58.8	3,620
April			[b] 31.1	1,850
May	249		94.3	5,800
June			[a] 147	8,750
July			[a] 144	8,850
August	1,100	38	226	13,900
September	46	9	18.9	1,120
The year	1,100	[b] 7	105	75,900
1929–30				
October	781	7	204	12,500
November	727	[b] 60	185	11,000
December	155	4	36.6	2,250
January			[b] 10.0	615
February	444		79.8	4,430
March	206	7	40.9	2,520
April	192	15	62.3	3,710
May	350	21	85.7	5,270
June	844	70	179	10,700
July	237	34	76.6	4,710
August	98	8	32.0	1,970
September	468	7	81.2	4,830
The year	844	4	89.1	64,500

[a] Partly estimated. [b] Estimated.

SWAN LAKE OUTLET AT CARROLL INLET

LOCATION.—Water-stage recorder half a mile from tidewater just below proposed dam site about 1 mile below Swan Lake, on east shore of Carroll Inlet 1 mile from its head and 30 miles by water from Ketchikan.

DRAINAGE AREA.—37.7 square miles (preliminary topographic map of Revillagigedo Island).

EXTREMES, 1916–1926, 1927–1930.—Maximum discharge recorded, 3,700 second-feet Dec. 18, 1919 (gage height, 6.55 feet); maximum discharge probably occurred Nov. 1, 1917, estimated by comparison with Fish Creek, 5,500 second-feet; minimum, 19 second-feet Feb. 21–25, 1925.

REMARKS.—Stage-discharge relation permanent, unaffected by ice. Records good except those for periods of break in record, which are fair. Swan Lake, which has an area of 1,050 acres according to surveys made in 1930, lies at an altitude of 220 feet about 1½ miles from Carroll Inlet. (See pl. 2, *A*.) The Swan Lake outlet power site is one of a group of five for which a license was authorized by the Federal Power Commission in 1930 to I. & J. D. Zellerbach.

Monthly discharge of Swan Lake outlet at Carroll Inlet, Revillagigedo Island

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1916				
August 24–31	766	238	419	6,650
September	918	154	437	26,000
1916–17				
October	1,090	131	496	30,500
November	617	98	353	21,000
December	394	77	[a] 172	10,600
January	404	74	[a] 168	10,300
February	901	76	319	17,700
March	82	48	59	3,600
April	485	40	211	15,600
May	969	398	609	37,400
June	969	502	682	40,600
July	1,060	337	558	34,300
August	1,700	254	618	38,000
September		115	[a] 681	40,600
The year	1,700	40	415	300,000
1918				
May	1,350	332	678	41,700
June	1,320	460	716	42,600
July	644	255	432	26,600
August	1,410	185	531	32,600
September	711	101	201	12,000
The period				156,000
1918–19				
October	2,140	160	946	58,200
November	2,060	153	610	36,300
December	1,860	135	[a] 392	24,100
January	1,610		[a] 437	26,900
February			[b] 120	6,660
March	1,890	43	166	10,200
April	2,240	193	571	34,000
May	1,320	306	629	38,700
June	848	321	546	32,500
July	730	303	424	26,100
August	1,110	174	366	22,500
September	1,750		[a] 400	23,800
The year	2,240	43	470	340,000
1919–20				
October			[b] 340	20,900
November	2,640	94	[a] 534	31,800
December	3,470	59	638	39,200
January		72	[a] 287	17,600
February	644	66	223	12,800
March	158	72	99.5	6,120
April	790	63	211	12,600
May	765	291	404	24,800
June	902	422	[a] 590	35,100
July	701	111	323	19,900
August	2,600	139	640	39,400
September	585	186	362	21,500
The year	3,470	63	388	282,000
1920–21				
October			[a] 597	36,700
November			[a] 426	25,300
December	621	96	227	14,000
January	361	103	185	11,400
February	2,170	118	506	28,200
March	902	47	172	10,600
April	297	85	177	10,500
May	795	145	436	26,800
June			[a] 695	41,400
July			[a] 391	24,000
August	1,020	85	231	14,200
September	1,890	158	748	44,500
The year	2,170	47	397	288,000

[a] Partly estimated.
[b] Estimated by comparison with records on adjacent streams.

Monthly discharge of Swan Lake outlet at Carroll Inlet, Revillagigedo Island—Con.

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1921–22				
October	----------	----------	1,370	84,400
November	----------	----------	827	49,200
December	----------	----------	[a] 455	28,000
January	265	64	119	7,320
February	78	44	54	3,000
March	172	46	[a] 97	5,960
April	634	92	229	13,600
May	1,320	321	659	40,500
June	1,260	328	646	38,400
July	445	196	312	19,200
August	291	107	164	10,100
September	----------	----------	[b] 800	47,600
The year	----------	44	480	347,000
1922–23				
October	2,170	124	[a] 700	43,000
November	2,480	318	1,100	65,400
December	950	67	264	16,200
January	216	59	116	7,130
February	1,750	60	311	17,300
March	950	95	287	17,600
April	2,560	234	655	39,000
May	2,100	339	718	44,100
June	845	321	527	31,500
July	336	----------	[a] 240	15,000
August	----------	----------	[b] 313	19,200
September	----------	146	[a] 765	45,500
The year	----------	59	499	361,000
1923–24				
October	950	180	494	30,400
November	2,640	185	1,010	60,100
December	2,030	165	[a] 663	40,800
January	1,010	144	370	22,800
February	1,010	140	475	27,300
March	460	96	252	15,500
April	514	132	251	14,900
May	----------	----------	[b] 950	58,400
June	----------	----------	[b] 540	32,100
July	1,220	----------	[a] 466	28,700
August	748	138	289	17,800
September	1,960	225	739	44,000
The year	2,640	96	541	393,000
1924–25				
October	----------	270	[a] 773	47,500
November	[b] 2,400	----------	[b] 820	48,800
December	1,400	----------	[b] 391	24,000
January	----------	60	[a] 81.7	5,020
February	120	19	[a] 40.8	2,270
March	397	82	201	12,400
April	484	112	292	17,400
May	1,250	366	790	48,600
June	1,250	408	599	35,600
July	1,610	202	564	34,700
August	432	91	[a] 227	14,000
September	428	56	192	11,400
The year	[b] 2,400	19	417	302,000
1925–26				
October	1,070	48	256	15,700
November	1,820	234	814	48,400
December	2,720	291	994	61,100
January	2,100	294	979	60,200
The period	----------	----------	----------	185,000
1927				
September	1,470	88	479	28,500

[a] Partly estimated.
[b] Estimated by comparison with records on adjacent streams.

Monthly discharge of Swan Lake outlet at Carroll Inlet, Revillagigedo Island—Con.

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1927–28				
October	2,100	248	951	58,500
November	450	61	182	10,800
December	595	65	163	10,000
January	1,820	60	588	36,200
February	1,080	81	[a] 260	15,000
March	2,240	75	491	30,200
April	870	120	[a] 321	19,100
May	1,340	338	687	42,200
June	748	272	498	29,600
July	1,070	140	411	25,300
August	1,190	72	290	17,800
September	1,270	56	[a] 464	27,600
The year	2,240	56	444	322,000
1928–29				
October	----------	218	[a] 627	38,600
November	1,010	175	460	27,400
December	1,580	151	478	29,400
January	1,250	78	354	31,800
February	245	56	101	5,610
March	658	119	304	18,700
April	658	62	185	11,200
May	845	278	450	27,700
June	920	320	532	31,700
July	702	200	426	26,200
August	2,240	130	717	44,100
September	272	68	121	7,200
The year	2,240	56	399	290,000
1929–30				
October	2,400	62	971	59,700
November	2,400	303	949	56,500
December	748	48	250	15,400
January	289	33	79.7	4,900
February	1,610	105	338	18,800
March	----------	79	[a] 255	15,700
April	795	102	341	20,300
May	820	221	456	28,000
June	2,800	370	810	48,200
July	820	188	371	22,800
August	190	68	123	7,560
September	1,100	57	317	18,900
The year	2,800	33	438	317,000

[a] Partly estimated.

FISH CREEK AT THORNE ARM

LOCATION.—Water-stage recorder on right shore of Lower Lake, 200 feet above outlet, 600 feet from tidewater at head of Thorne Arm, 2 miles northwest of abandoned mine at former Sea Level post office, and 25 miles by water from Ketchikan.

DRAINAGE AREA.—32.1 square miles (preliminary topographic map of Revillagigedo Island).

EXTREMES, 1915–1930.—Maximum discharge recorded, 4,600 second-feet Nov. 1, 1917 (gage height, 5.33 feet); minimum, 20 second-feet Sept. 9, 10, 1928.

REMARKS.—Stage-discharge relation permanent; control unaffected by ice. Records good for 1915 to 1924; fair for 1925 to 1927; excellent for 1928 to 1930, except those for periods of break in record, which 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 15 feet above high tide and has an area of 55 acres; Big Lake is at an altitude of 277 feet and has an area (including lagoon at approximately the same altitude) of 358 acres; Third Lake is at an altitude of 324 feet and has an area of 180 acres; Mirror Lake is at an altitude of 377 feet and has an area of about 1,350 acres; Basin Lake (draining into Big Lake from the east) is at an altitude of 456 feet and has an area of 240 acres. The license authorized by the Federal Power Commission in 1930 to I. & J. D. Zellerbach provides for the diversion of the waters of Mirror Lake, drainage area 22.8 square miles, into Ella Lake and thence into Manzanita Lake, from which it will be used through two power plants to be constructed on Manzanita Creek.

Monthly discharge of Fish Creek at Thorne Arm

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1915				
May 19–31	362	275	328	8,460
June	716	158	352	20,900
July	204	76	122	7,500
August	1,720	67	437	26,600
September	945	91	[a] 274	16,300
The period				79,800
1915–16				
October	3,160	329	988	60,800
November	1,070	178	[a] 455	27,100
December	804	154	393	24,200
January	158	35	[a] 73.5	4,520
February	1,170	22	[a] 295	17,000
March	428	106	190	11,700
April	983	206	412	24,500
May	718	264	456	28,000
June	983	408	584	34,800
July	1,300	290	466	28,700
August	857	159	338	20,700
September	929	107	372	22,200
The year	3,160	22	419	304,000
1916–17				
October	1,550	114	[a] 504	31,000
November	766	117	374	22,200
December	447	80	196	11,900
January	499	107	[a] 212	13,000
February	874	83	[b] 266	14,800
March	107	57	80.2	4,930
April	388	69	[a] 196	11,700
May	897	337	520	32,200
June	1,150	337	619	36,800
July	978	220	418	25,700
August	2,380	148	601	37,000
September	1,730	73	524	31,300
The year	2,380	57	376	273,000
1917–18				
October	2,690	368	[a] 727	44,700
November	4,240	414	1,830	109,000
December	1,730	61	220	13,500
January	2,020	116	479	29,500
February	512	58	182	10,100
March	188	50	105	6,460
April	648	111	264	15,700
May	1,250	302	562	34,600
June	938	368	529	31,500
July	670	161	324	19,900
August	1,310	153	498	30,600
September	473	80	181	10,800
The year	4,240	50	492	356,000
1918–19				
October	1,680	136	721	44,300
November	1,730	157	530	31,500
December	1,960	136	414	25,500
January	1,960		[a] 473	29,100
February			[b] 155	8,610
March	1,620	40	157	9,650
April	1,960		[a] 558	33,200
May	920	254	504	31,000
June	610	330	428	25,500
July	466	188	296	18,200
August	866	116	260	16,000
September	938	69	271	16,100
The year	1,960	40	399	289,000

[a] Partly estimated. [b] Estimated by comparison with records on adjacent streams.

Monthly discharge of Fish Creek at Thorne Arm—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1919–20				
October	546	116	294	18,100
November	1,960		489	29,100
December	3,110		573	35,200
January	750	65	333	20,500
February	756	60	[a] 228	13,100
March	165	57	102	6,270
April	725	74	220	13,100
May	937		[a] 421	25,900
June			[a] 490	29,200
July	605	102	284	17,500
August			[a] 581	35,700
September			[b] 289	17,200
The year	3,110	57	359	261,000
1920–21				
October			[b] 460	28,300
November			[b] 400	23,800
December	665	87	233	14,300
January	590	76	210	12,900
February			[a] 513	28,500
March	1,280	52	[a] 194	11,900
April	352	120	224	13,300
May	657	197	370	22,800
June	1,060	319	573	34,100
July	695	161	343	21,100
August	1,340	67	249	15,300
September	1,340	114	547	32,500
The year		52	358	259,000
1921–22				
October	2,730	397	996	61,200
November			[a] 666	39,600
December			[b] 360	22,100
January			[a] 151	9,280
February			[a] 75	4,170
March	514	64	227	14,000
April	740	124	291	17,300
May	928	280	569	35,000
June	910	280	510	30,300
July	313	130	229	14,100
August	313	67	127	7,810
September	2,910	146	638	38,000
The year	2,910	64	405	293,000
1922–23				
October	2,250	126	[a] 664	40,800
November	3,170	270	1,060	63,100
December	1,050		[a] 283	17,400
January	256	70	136	8,360
February	1,610	44	[a] 287	15,900
March	874	84	273	16,800
April	2,430	209	608	36,200
May	1,610	310	559	34,400
June	541	185	340	20,200
July	193	58	120	7,380
August	2,850	32	224	13,800
September	2,010	138	586	34,900
The year	3,170	32	427	309,000
1923–24				
October	684	150	[a] 410	25,200
November	2,430	150	[a] 912	54,300
December	1,660	185	625	38,400
January	1,030	150	[a] 347	21,300
February	1,080	141	500	28,800
March	562	96	252	15,500
April	464	114	246	14,600
May	2,370	326	726	44,600
June	1,360	280	496	29,500
July	1,070	160	406	25,000
August	724	96	244	15,000
September	2,850	305	[a] 804	47,800
The year	2,850	96	496	360,000

[a] Partly estimated. [b] Estimated by comparison with records on adjacent streams.

Monthly discharge of Fish Creek at Thorne Arm—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1924–25				
October	1,660	362	828	50,900
November		111	[a] 871	51,800
December	1,150	51	331	20,400
January	160	88	124	7,620
February	205	[b] 32	[a] 64.9	3,600
March	597	80	233	14,300
April	492	112	290	17,300
May	892	338	605	37,200
June	1,100	326	454	27,000
July	1,200	136	470	28,900
August	436	103	245	15,100
September	443	57	237	14,100
The year		[b] 32	398	288,000
1925–26				
October	1,100	34	237	14,600
November			[b] 745	44,300
December	2,910	290	912	56,100
January	2,490	248	976	60,000
February			[b] 580	32,200
March			[b] 500	30,700
April			[b] 470	28,000
May			[b] 420	25,800
June			[b] 230	13,700
July	732		[a] 241	14,800
August	982	74	248	15,200
September	464	30	138	8,210
The year		30	475	344,000
1926–27				
October	2,070	44	775	47,700
November	1,450	60	361	21,500
December	1,400	75	503	30,900
January	1,500	51	314	19,300
February	520	115	206	11,400
March	499	132	287	17,600
April	590	115	262	15,600
May	748	213	448	27,500
June	692	362	486	28,900
July	883		[a] 363	22,300
August	1,120	46	[a] 209	12,900
September	1,400	80	416	24,800
The year	2,070	44	387	280,000
1927–28				
October	2,250	238	876	53,900
November	464	36	173	10,300
December	901	65	202	12,400
January	1,890	54	667	41,000
February	1,200	68	305	17,500
March	2,250	56	504	31,000
April	668	97	255	15,200
May	1,080	290	582	35,800
June	660		[a] 366	21,800
July	919		[a] 306	18,800
August	990	42	[a] 246	15,100
September	1,000	20	[a] 359	21,400
The year	2,250	20	405	294,000

[a] Partly estimated. [b] Estimated by comparison with records on adjacent streams.

Monthly discharge of Fish Creek at Thorne Arm—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1928-29				
October	1,110	178	547	33,600
November	1,080	164	440	26,200
December	1,720	178	[a] 496	30,500
January			[a] 358	22,000
February	230	30	75.1	4,170
March	788	154	330	20,300
April	646	63	181	10,800
May	541	238	327	20,100
June	684	230	368	21,900
July	611	143	340	20,900
August	2,310	112	607	37,300
September	243	53	104	6,190
The year	2,310	30	351	254,000
1929-30				
October	2,010	51	842	51,800
November	2,250	285	868	51,600
December	883	45	286	17,600
January	374	25	84.3	5,180
February	2,070	122	486	27,000
March	901	83	270	16,600
April		109	[a] 310	18,400
May	700	217	387	23,800
June	2,250	248	632	37,600
July	684	157	308	18,900
August	164	53	100	6,150
September	901	30	260	15,500
The year	2,250	25	401	290,000

[a] Partly estimated.

ELLA CREEK AT BEHM CANAL

LOCATION.—Water-stage recorder 1½ miles above mouth of creek at Ella Bay, a small arm of Behm Canal on east shore of Revillagigedo Island, in about latitude 55° 29′ N., longitude 130° 59′ W., and 40 miles by water from Ketchikan.

DRAINAGE AREA.—20.4 square miles (preliminary topographic map of Revillagigedo Island).

EXTREMES, 1927–1930.—Maximum discharge recorded, 1,720 second-feet Dec. 6, 1930 (gage height 5.60 feet); minimum, 10 second-feet Sept. 8–12, 1930.

REMARKS.—Stage-discharge relation practically permanent, unaffected by ice. Records excellent except those for estimated periods, which are good. Ella Lake, area 1,930 acres, lies at an altitude of 247 feet, about 2½ miles from tidewater. Its outlet is constricted and filled with large logs. The license authorized by the Federal Power Commission in 1930 to I. & J. D. Zellerbach provides for a storage dam at the lake outlet designed to raise the water surface to 293 feet and diversion of the waters of the stream through a tunnel to Manzanita Lake.

Monthly discharge of Ella Creek at Behm Canal

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1927-28				
October	1,000	240	553	34,000
November	336	39	146	8,690
December	360	60	[a] 149	9,160
January	1,240	43	464	28,500
February	624	58	223	12,800
March	1,100	45	303	18,600
April	304	109	182	10,800
May	488	240	335	20,600
June	278	37	146	8,690
July	285	27	116	7,130
August	258	32	110	6,760
September	451	14	177	10,500
The year	1,240	14	243	176,000

[a] Partly estimated.

Monthly discharge of Ella Creek at Behm Canal—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1928–29				
October	596	198	336	20,700
November	516	175	305	18,100
December	732	141	315	19,400
January	714	49	258	15,900
February	190	23	58.4	3,240
March	443	133	245	15,100
April	325	51	131	7,800
May	235	129	187	11,500
June	225	84	138	8,210
July	252	86	160	9,840
August	935	78	315	19,400
September	230	18	69.1	4,110
The year	935	18	211	153,000
1929–30				
October	817	29	463	28,500
November	985	262	479	28,500
December	484	50	223	13,700
January	290	20	77.5	4,770
February	822	67	308	17,100
March	381	93	176	10,800
April	319	117	209	12,400
May	288	190	235	14,400
June	1,020	109	333	19,800
July	200	76	127	7,810
August	94	19	41.8	2,570
September	498	12	128	7,620
The year	1,020	12	232	168,000

MANZANITA CREEK NEAR MANZANITA BAY

LOCATION.—Water-stage recorder one-fourth mile above extreme high tide, 1½ miles from mouth of creek at Manzanita Bay, an arm of Behm Canal on west shore of Revillagigedo Island, 7 miles north of Ella Bay, and 52 miles by water from Ketchikan.

DRAINAGE AREA.—32.7 square miles (preliminary topographic map of Revillagigedo Island).

EXTREMES, 1927–1930.—Maximum discharge recorded, 3,470 second-feet Oct. 12 or 13, 1927 (gage height, 7.74 feet); minimum, 112 second-feet Sept. 12, 1930.

REMARKS.—Stage-discharge relation practically permanent and unaffected by ice. Records excellent except those for short periods of estimated discharge, which are good. Outflow of Manzanita Lake is rendered relatively uniform by a log jam at its outlet, through which the water flows. The lake has an area of 1,610 acres and lies at an altitude of 232 feet about 2½ miles from tidewater. The license authorized by the Federal Power Commission in 1930 to I. & J. D. Zellerbach provides for a storage and diversion dam at the lake outlet designed to raise the water surface to 293 feet, thus providing a capacity of practically 200,000 acre-feet in Ella and Manzanita Lakes combined, and the use of their waters together with that diverted from Mirror Lake, through two power houses on Manzanita Creek, to supply power for pulp and paper manufacture.

Monthly discharge of Manzanita Creek near Manzanita Bay

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1927–28				
October	2,560	465	[a] 1,070	65,800
November	590	180	298	17,700
December	650	135	247	15,200
January	1,330	130	637	39,200
February	820	200	348	20,000
March	1,480	170	481	29,600
April	590	260	354	21,100
May	988	455	680	41,800
June	702	274	453	27,000
July	545	240	317	19,500
August	650	178	298	18,300
September	780	134	362	21,500
The year	2,560	130	464	337,000
1928–29				
October	965	378	559	34,400
November	820	340	508	30,200
December	1,390	[a] 315	545	33,500
January	1,270	200	462	28,400
February	230	124	158	8,780
March	470	222	307	18,900
April	515	168	241	14,300
May	515	328	388	23,900
June	590	315	394	23,400
July	590	270	382	23,500
August	1,660	230	583	35,800
September	440	139	233	13,900
The year	1,660	124	399	289,000
1929–30				
October	1,480	142	832	51,200
November	1,900	530	932	55,500
December	740	190	383	23,600
January	360	125	192	11,800
February	1,080	186	391	21,700
March	560	194	292	18,000
April	575	240	365	21,700
May	650	360	475	29,200
June	1,700	572	686	40,800
July	515	240	344	21,200
August	250	129	173	10,600
September	820	112	241	14,300
The year	1,900	112	441	320,000

[a] Partly estimated.

GRACE CREEK AT BEHM CANAL

LOCATION.—Water-stage recorder just above high tide, three-fourths mile above mouth of creek, which is 7 miles north of Manzanita Bay, on west shore of Revillagigedo Island, and 60 miles by water from Ketchikan.

DRAINAGE AREA.—33.6 square miles (preliminary topographic map of Revillagigedo Island).

EXTREMES, 1927–1930.—Maximum discharge recorded, 3,470 second-feet Aug. 21, 1929 (gage height, 5.20 feet); minimum, 28 second-feet Sept. 10–12, 1930; minimum of Jan. 30, 1930, estimated as 25 second-feet.

REMARKS.—Stage-discharge relation practically permanent; affected by ice for short periods. Records considered excellent. Grace Lake, area 1,670 acres, lies at an altitude of 422 feet about 3 miles from tidewater. The license authorized by the Federal Power Commission in 1930 to I. & J. D. Zellerbach provides for a storage and diversion dam about half a mile below the lake outlet designed to raise the water surface to 480 feet, and a conduit, mostly in tunnel, to a power house on the creek at a point where it has an altitude of 25 feet.

Monthly discharge of Grace Creek near Behm Canal

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1927				
September 12-30	1,600	76	437	16,500
1927-28				
October	2,400	250	879	54,000
November	408	43	[a] 150	8,920
December	483	51	[a] 156	9,590
January	1,550	47	582	35,800
February	1,050	70	250	14,400
March	2,120	66	465	28,600
April	748	115	310	18,400
May	1,210	392	711	43,700
June	767	196	441	26,200
July	605	105	[a] 282	17,300
August	949	44	232	14,300
September	865	30	328	19,500
The year	2,400	30	401	291,000
1928-29				
October	1,130	172	510	31,400
November	1,130	162	444	26,400
December	1,640	148	460	28,300
January	1,500	68	323	19,900
February	195	38	[a] 72.1	4,000
March	535	101	227	14,000
April	688	56	194	11,500
May	646	285	392	24,100
June	760	244	404	24,000
July	624	145	325	20,000
August	2,870	101	612	37,600
September	235	50	95.7	5,690
The year	2,870	38	341	247,000
1929-30				
October	2,430	44	929	57,100
November	2,980	278	903	53,700
December	607	44	227	14,000
January	274	25	[a] 74.5	4,580
February	1,640	100	384	21,300
March	712	79	218	13,400
April	688	109	322	19,200
May	802	257	483	29,700
June	2,480	306	738	43,900
July	682	150	284	17,500
August	175	43	95.6	5,880
September	1,130	28	259	15,400
The year	2,980	25	408	296,000

[a] Partly estimated.

ORCHARD CREEK AT SHRIMP BAY

LOCATION.—Water-stage recorder on right bank 300 feet below Orchard Lake, in latitude 55° 50′ N., longitude 131° 27′ W., one-third mile from tidewater at head of Shrimp Bay, an arm of Behm Canal, and 46 miles by water from Ketchikan.

DRAINAGE AREA.—59 square miles (preliminary topographic map of Revillagigedo Island).

EXTREMES, 1915–1921, 1922–1925.—Maximum discharge recorded, 6,660 second-feet Dec. 19, 1919 (gage height, 9.6 feet); minimum (estimated), 20 second-feet Feb. 11, 1916; maximum discharge probably occurred Nov. 1, 1917, 7,100 second-feet, 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.

REMARKS.—Stage-discharge relation practically permanent since 1918; not affected by ice. Records good except those for period of break in record and for 1915, 1916, and 1925, which are fair. From Orchard Lake, at 128 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. From a survey made by the Forest Service in 1917 and 1919, the area of Orchard Lake was determined as 965 acres and the altitude 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. The Orchard Creek power site is one of a group for which a license was authorized by the Federal Power Commission in 1930 to I. & J. D. Zellerbach.

Monthly discharge of Orchard Creek at Shrimp Bay

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1915				
June	800	271	482	28,700
July	385	176	239	14,700
August	4,700	126	699	43,000
September	1,720	138	[a] 392	23,300
The period				110,000
1915–16				
October	4,990	299	1,270	78,100
November	1,260	204	[a] 495	29,500
December	1,130	124	392	24,100
January	122	30	[b] 64.2	3,950
February	1,150	20	[a] 319	18,300
March	322	110	167	10,300
April	1,380	340	568	33,800
May	1,350	434	795	48,900
June	1,560	753	1,050	62,500
July	2,100	530	891	54,800
August	1,490	221	490	30,100
September	1,200	150	553	32,900
The year	4,990	20	588	427,000
1916–17				
October	1,600	146	627	38,600
November	748	179	393	23,400
December	488	73	181	11,100
January	440	76	[a] 157	9,650
February	1,400	65	339	18,800
March	79	51	65.6	4,030
April	770	49	309	18,400
May	1,640	542	928	57,100
June	1,400	595	929	55,300
July	1,430	318	623	38,300
August	2,880	215	791	48,600
September	2,370	102	729	43,400
The year	2,880	49	506	367,000
1917–18				
October			[a] 990	60,900
November			[b] 2,200	131,000
December			[b] 233	14,300
January			[b] 525	32,300
February			[b] 200	11,100
March			[b] 90	5,530
April			[b] 433	25,800
May	1,900	533	949	58,400
June	1,460	655	956	56,900
July	882	324	577	35,500
August	2,100	218	757	46,500
September	675	110	236	14,000
The year			680	492,000

[a] Partly estimated.
[b] Estimated by comparison with records on adjacent streams.

Monthly discharge of Orchard Creek at Shrimp Bay—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1918–19				
October	3,370	176	1,180	72,600
November	2,490	176	720	42,800
December	1,860	125	439	27,000
January	2,090	105	532	32,700
February	244	75	139	7,720
March	2,410	35	206	12,700
April	2,530	235	696	41,400
May	1,890	407	869	53,400
June	1,060	620	[a] 788	46,900
July	980	384	571	35,100
August	1,250	194	411	25,300
September	1,860	122	[a] 447	26,600
The year	3,370	35	586	424,000
1919–20				
October			[b] 500	30,700
November			[b] 590	35,100
December	5,790		[a] 791	48,600
January			[a] 299	18,400
February		87	[a] 257	14,800
March			[a] 92.8	5,710
April	1,280		[a] 315	18,700
May	1,060	467	656	40,300
June	1,460	596	908	54,000
July	1,030	184	520	32,000
August	4,560	176	904	55,600
September	762	170	386	23,000
The year	5,790		519	377,000
1920–21				
October			[b] 630	38,700
November			[b] 520	30,900
December	1,000	92	[a] 261	16,000
January	512	94	[a] 185	11,400
February			[b] 582	32,300
March		69	[a] 223	13,700
April	830	151	369	22,000
May	1,460	336	778	47,800
June	1,680	548	[a] 944	56,200
July			492	30,300
August	1,460	130	363	22,300
September	2,620	125	871	51,800
The year	2,620		516	373,000
1921				
October	3,520	512	1,460	89,800
November	3,960	68	636	37,800
December	3,290		[a] 752	46,200
1922–23				
October			[b] 840	51,600
November	4,160	247	[a] 1,320	78,600
December	1,100	78	260	16,000
January			[a] 92.4	5,680
February			[b] 311	17,300
March	1,060	99	333	20,500
April	3,760	311	938	55,800
May	2,580	450	954	58,700
June	1,280	400	782	46,500
July	433	134	272	16,700
August	4,060	76	318	19,600
September	2,840	143	843	50,200
The year	4,160		603	437,000
1923–24				
October	876		[a] 450	27,700
November	3,760		[a] 1,170	69,600
December	2,170	145	755	46,400
January	1,340	143	436	26,800
February	1,280	130	585	33,600
March	620	109	326	20,000
April	930	109	338	20,100
May	3,960	600	1,180	72,600
June	1,680	503	872	51,900
July	1,030	230	508	31,200
August	1,000		[a] 360	22,100
September	[b] 4,000	270	947	56,400
The year	[b] 4,000	109	659	478,000

[a] Partly estimated. [b] Estimated by comparison with records on adjacent streams.

Monthly discharge of Orchard Creek at Shrimp Bay—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1924–25				
October	2,460	371	1,110	68,200
November	2,890	61	850	50,600
December	1,550	43	[a] 415	25,500
January	90	[b] 50	75.1	4,620
February	[b] 100	[b] 25	[b] 37.9	2,100
March	700	87	237	14,600
April	830	115	421	25,100
May	1,820	560	1,140	70,100
June	1,030	503	726	43,200
July	[b] 1,760	207	[a] 646	39,700
August	540	101	284	17,500
September	930	48	276	16,400
The year	2,980	[b] 25	522	378,000
1925				
October	1,550	39	328	20,200
November	2,100	180	884	52,600
December	4,060	259	1,100	67,600

[a] Partly estimated. [b] Estimated by comparison with records on adjacent streams.

MAINLAND SOUTH OF FREDERICK SOUND

DAVIS RIVER AT PORTLAND CANAL

LOCATION.—Water-stage recorder installed Dec. 15, 1930, a mile above mouth of creek and half a mile above proposed dam site, on west shore of Portland Canal about 12 miles by water from Hyder. Staff gage about 175 feet downstream was read six times a month until Aug. 1, 1930; daily thereafter.

DRAINAGE AREA.—Not covered by adequate maps; estimated at 100 to 160 square miles.

EXTREMES, 1928, 1930.—Maximum recorded discharge, 10,800 second-feet Nov. 22, 1930 (gage height, 9.1 feet); minimum, 27 second-feet Feb. 26, Mar. 1, 6, 1928.

REMARKS.—Stage-discharge relation fairly permanent; unaffected by ice. Records good beginning August, 1930; earlier records poor on account of infrequent gage readings and lack of measurements at extreme low stages. A license was issued by the Federal Power Commission to the Commonwealth Mining & Exploring Co. for the Davis River power site in 1930 and transferred to the Portland Canal Power Co. Records furnished by the licensee through Willis T. Batcheller, consulting engineer.

Monthly discharge of Davis River at Portland Canal

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1927–28				
December	83	83	83.0	5,100
January	505	83	244	15,000
February	115	27	79.5	4,570
March	182	27	103	6,330
April	110	49	74.2	4,420
May	781	182	520	32,000
June	1,730	1,020	1,460	86,900
July	1,920	1,130	1,640	101,000
August	1,920	884	1,460	89,800
September	1,570	307	1,040	61,900
The period				407,000

Monthly discharge of Davis River at Portland Canal—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1928				
October	686	402	539	33,100
November	402	58	221	13,200
December	33	33	33.0	2,030
1930				
June	2,180	1,620	1,910	114,000
July	1,940	1,620	1,740	107,000
August	2,050	940	1,490	91,600
September	4,190	290	1,350	80,300
October	9,140	182	1,180	72,600
November	7,000	225	1,150	68,400
December	1,750	201	450	27,700
The period				562,000

PUNCHBOWL LAKE OUTLET AT RUDYERD BAY

LOCATION.—Water-stage recorder near mouth of outlet, approximately in latitude 55° 31′ N., longitude 130° 45′ W., at head of south arm of Rudyerd Bay, about 45 miles by water from Ketchikan.

DRAINAGE AREA.—No maps available.

EXTREMES, 1923–1930.—Maximum discharge recorded, 710 second-feet Dec. 7, 1926 (gage height, 5.90 feet); minimum, 2 second-feet Oct. 18, 1925 (gage height, 0.05 foot). This minimum is very uncertain; there is no conclusive evidence that the flow has ever been appreciably less than 9.6 second-feet obtained as the result of a discharge measurement Feb. 23, 1925.

REMARKS.—Stage-discharge relation somewhat unstable; control is a log jam below gage, overlying boulders, through which the water runs. Records fair for the year, poor for discharges of less than 50 second-feet. Punchbowl Lake, area 1,400 acres, lies at an altitude of 586 feet about half a mile inland from Rudyerd Bay. The low-water flow is relatively large, owing to the large lake area and its constricted outlet.

Monthly discharge of outlet of Punchbowl Lake at Rudyerd Bay

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1923–24				
October	226	133	177	10,900
November	640	133	[a] 314	18,700
December	454	174	281	17,300
January	238	104	163	10,000
February	238	100	174	10,000
March	157	64	112	6,890
April	126	61	100	5,950
May	420	126	206	12,700
June	406	----------	[a] 215	12,800
July	----------	----------	[a] 111	6,820
August	----------	16	54.5	3,350
September	285	135	214	12,700
The year	640	16	176	128,000
1924–25				
October	341	157	256	15,700
November	502	78	251	14,900
December	470	50	201	12,400
January	50	32	42.9	2,640
February	44	13	[a] 28.8	1,600
March	148	14	61.0	3,750
April	137	89	121	7,200
May	306	142	237	14,600
June	220	152	178	10,600
July	278	88	179	11,000
August	109	41	[a] 77.4	4,760
September	86	19	60.3	3,590
The year	502	13	142	103,000

[a] Partly estimated.

Monthly discharge of outlet of Punchbowl Lake at Rudyerd Bay—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1925–26				
October	124	2	37.7	2,320
November	348	139	229	13,600
December	710	184	343	21,100
January	----------	----------	[a] 351	21,600
February	----------	----------	[b] 200	11,100
March	----------	----------	[a] 196	12,100
April	244	62	158	9,400
May	196	95	132	8,120
June	250	36	118	7,030
July	115	33	[a] 64.5	3,970
August	134	39	68.3	4,200
September	82	3	37.9	2,260
The year	710	2	161	117,000
1926–27				
October	362	4	207	12,700
November	327	99	184	10,900
December	320	81	[a] 209	12,900
January	----------	72	[a] 147	9,040
February	94	62	76.1	4,230
March	113	68	90.8	5,580
April	179	76	116	6,900
May	250	136	203	12,500
June	226	174	198	11,800
July	214	73	158	9,720
August	----------	7	[a] 39.2	2,410
September	----------	58	[a] 116	6,900
The year	362	4	146	106,000
1927–28				
October	454	196	297	18,300
November	226	50	113	6,720
December	179	42	97.0	5,960
January	369	34	204	12,500
February	214	72	134	7,710
March	420	50	169	10,400
April	196	99	134	7,970
May	292	168	226	13,900
June	226	88	163	9,700
July	190	69	107	6,580
August	214	46	112	6,890
September	264	13	115	6,840
The year	454	13	156	113,000
1928–29				
October	362	162	234	14,400
November	257	137	186	11,100
December	264	133	174	10,700
January	244	72	155	9,530
February	68	26	40.4	2,240
March	174	68	131	8,060
April	115	62	[a] 78.4	4,670
May	168	110	136	8,360
June	157	126	138	8,210
July	148	94	118	7,260
August	327	84	171	10,500
September	179	38	83.1	4,940
The year	362	26	138	100,000
1929–30				
October	518	35	272	16,700
November	568	271	383	22,800
December	454	92	185	11,400
January	----------	----------	[b] 35	2,150
February	250	----------	125	6,940
March 1–9	130	92	104	1,860
The period	----------	----------	----------	61,800

[a] Partly estimated. [b] Estimated.

SHORT CREEK AT SHORT BAY

LOCATION.—Water-stage recorder one-eighth mile above mouth of East Fork, half a mile by trail from head of Short Bay, and 45 miles by water from Ketchikan.

DRAINAGE AREA.—20 square miles (International Boundary Commission map).

EXTREMES, 1922–1924.—Maximum discharge recorded, 1,220 second-feet Sept. 5, 1924 (gage height, 3.10 feet); no adequate record of minimum discharge.

REMARKS.—Control of large boulders; stage-discharge relation may shift in floods; occasionally affected by ice. Measuring section poor; records fair. Lake Reflection, area 1,090 acres, lies at an altitude of 271 feet, 1½ miles from head of Short Bay. The drainage area at the outlet is 19 square miles. Run-off is restricted by a log jam, with which the outlet of the lake is filled.

Monthly discharge of Short Creek at Short Bay

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1922				
June 25–30	358	258	294	3,500
July		101	[a] 227	14,000
August	285	56	99.3	6,110
September	688	107	310	18,400
The period				42,000
1922–23				
October	590	75	285	17,500
November	665	157	357	21,200
December	361		[a] 129	7,930
January			[a] 37.8	2,320
February			[b] 93	5,160
March			[a] 105	6,460
April	545	133	260	15,500
May	640	222	365	22,400
June	505	215	330	19,600
July	230	69	141	8,670
August			[a] 200	12,300
September		108	[a] 408	24,300
The year			226	163,000
1923–24				
October			[b] 215	13,200
November		152	[a] 378	22,500
December	[b] 420	133	245	15,100
January	[b] 400	81	161	9,900
February	452	108	208	12,000
March	210	53	139	8,550
April	338	75	164	9,760
May	989	275	454	27,900
June	650	260	368	21,900
July	361	144	241	14,800
August	413	89	189	11,600
September	954	187	378	22,500
The year	989	53	261	190,000
1924–25				
October	428	230	340	20,900
November			[a] 237	14,000
December	432	34	154	9,470
January 1–16	111	77	84.9	2,690
April 6–30	240	93	179	8,880
May	706	212	441	27,100
June	396	260	322	19,200
July	595	106	276	17,000
August	292	59	156	9,590
September	318	32	155	9,220
1925				
October	500	53	169	10,400
November 1–6	460	222	34.0	4,050

[a] Partly estimated. [b] Estimated.

SHELOCKUM LAKE OUTLET AT BAILEY BAY

LOCATION.—Water-stage recorder 250 feet above outlet of lake, which lies in latitude 56° N., longitude 131° 36′ W., 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 (Alaska Boundary Tribunal map).

EXTREMES, 1915–1921; 1922–1924.—Maximum discharge, 2,780 second-feet Nov. 1, 1917 (gage height, 6.84 feet); minimum recorded, 16 second-feet Mar. 15, 1919 (gage height, 1.11 feet); discharge probably fell to less than this at times.

REMARKS.—Stage-discharge relation practically permanent; not affected by ice. Records good except those for periods of break in record, which are fair. An outline survey of Shelockum Lake made in 1914 by the United States Forest Service shows the lake to be 344 feet above high tide and to cover 350 acres. 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 sources of the tributary streams.

Monthly discharge of Shelockum Lake outlet at Bailey Bay

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1915				
June	448	94	233	13,900
July	109	31	61.2	3,760
August			[a] 129	7,930
September			[a] 101	6,010
The period			130	31,600
1915–16				
October	2,220		[a] 401	24,700
November	480	57	146	8,690
December	280	41	106	6,520
January	39		[a] 20.8	1,280
February	450		[a] 112	6,440
March	142	43	55.6	3,420
April	333	81	160	9,520
May	536	131	279	17,200
June	718	242	424	25,200
July	769	178	324	19,900
August	478	58	194	11,900
September	600	37	232	13,800
The year	2,220		205	149,000
1916–17				
October	602	44	255	15,700
November	234	51	122	7,260
December	134	28	56.9	3,500
January			[b] 16.0	984
February			[b] 40.0	2,220
March			[b] 16.0	984
April			[b] 80.0	4,760
May			[b] 275	16,900
June			[b] 345	20,500
July	788	136	310	19,100
August	1,010	88	342	21,000
September	720	25	259	15,400
The year			177	128,000
1917–18				
October	1,190	179	[a] 384	23,600
November	2,400	134	780	46,400
December	740	25	[a] 84.9	5,220
January	980	52	186	11,400
February			[b] 67.0	3,720
March			[b] 42.0	2,580
April			[b] 132	7,860
May			[b] 310	19,100
June			[a] 405	24,100
July	324	132	[a] 210	12,900
August	1,010	84	[a] 309	19,000
September	660	38	122	7,260
The year	2,400		253	183,000

[a] Partly estimated. [b] Estimated.

Monthly discharge of Shelockum Lake outlet at Bailey Bay—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1918-19				
October	1,040	84	425	26,100
November			[a] 231	13,700
December		41	[a] 125	7,690
January	730	41	[a] 145	8,920
February			[b] 45.0	2,500
March		16	[a] 47.8	2,940
April			[a] 258	15,400
May	490	150	288	17,700
June	508	220	319	19,000
July	490	180	274	16,800
August	660	69	193	11,900
September	1,180	39	[a] 211	12,600
The year	1,180	16	214	155,000
1919-20				
October			[b] 200	12,300
November			[b] 360	21,400
December	2,470	28	264	16,200
January	316	28	125	7,690
February			[b] 65.0	3,740
March			[b] 30.0	1,840
April	422		[a] 94.8	5,640
May	455	147	245	15,100
June	600	287	416	24,800
July	422	92	251	15,400
August	2,300	60	411	25,300
September	525	72	187	11,100
The year	2,470	28	221	161,000
1920-21				
October	525	72	234	14,400
November	1,320	29	182	10,800
December	392	31	85.7	5,270
January	166	25	60.5	3,720
February		31	[a] 200	11,100
March		25	[a] 72.3	4,450
April	250	53	130	7,740
May	620	123	338	20,800
June	755		[a] 374	22,300
July	508	110	233	14,300
August	920	45	181	11,100
September	705	47	319	19,000
The year	1,320	25	200	145,000
1921				
October	2,000	178	497	30,600
November		[b] 40	[a] 225	13,400
1922-23				
October	900	35	264	16,200
November	1,340	84	375	22,300
December			[b] 116	7,130
January			[b] 34.0	2,090
February			[b] 93.0	5,160
March			[b] 94.0	5,780
April			[a] 294	17,500
May	1,080	261	466	28,700
June	570	194	334	19,900
July	245	61	130	7,990
August	1,780	26	207	12,700
September			[b] 367	21,800
The year			231	167,000
1923-24				
October			[b] 195	12,000
November		70	[a] 326	19,400
December	530	46	190	11,700
January	[b] 470	33	[a] 116	7,130
February			[b] 187	10,800
March		36	[a] 125	7,690
April	[b] 360	41	[a] 129	7,680
May	1,550	229	470	28,900
June			[b] 331	19,700
July			[b] 217	13,300
August			[b] 170	10,500
September			[b] 340	20,200
The year	1,550	33	233	169,000

[a] Partly estimated. [b] Estimated by comparison with records on adjacent streams.

TYEE CREEK AT BRADFIELD CANAL, NEAR WRANGELL

LOCATION.—Water-stage recorder 1 mile from tidewater on south side of Bradfield Canal, in latitude 56° 13′ N., longitude 131° 31′ W., 45 miles by water from Wrangell.

DRAINAGE AREA.—14 square miles (Alaska Boundary Tribunal map).

REMARKS.—Stage-discharge relation fairly permanent. Records good but fragmentary; no record of extremes of discharge. Tyee Lake, with an area of 445 acres, lies 1,366 feet above higher high water, 1½ miles from the shore of Bradfield Canal. The mountains surrounding the lake are barren, and the run-off is extremely rapid.

Monthly discharge of Tyee Creek at Bradfield Canal, near Wrangell

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1921				
November 10–30	294	45	114	4,970
December 1–23	426	44	200	9,120
1922				
May 25–31	455	155	262	3,640
June	535	269	371	22,100
July	----------	201	[a] 268	16,400
August	240	150	185	11,400
September	672	145	278	16,500
October	457	88	258	14,600
November 1–23	568	90	195	8,900
The period	----------	----------	----------	93,500
1924				
May 20–31	980	322	469	11,200
June	612	331	410	24,400
July	494	259	337	20,700
August	370	188	245	15,100
September 1–12	800	210	387	9,200
The period	----------	----------	----------	80,600
1925–26				
May	----------	----------	[a] 288	17,700
June	----------	----------	[b] 340	20,200
July	----------	----------	[a] 343	21,100
August	301	----------	[a] 205	12,600
September	----------	64	[a] 134	7,970
October	----------	53	[a] 128	7,870
November	----------	82	179	10,700
December	808	72	280	17,200
January 1–16	584	215	314	9,960

[a] Partly estimated. [b] Estimated.

MILL CREEK NEAR WRANGELL

LOCATION.—Water-stage recorder one-fourth mile below Lake Virginia, in latitude 56° 28′ N., longitude 132° 12′ W., on east shore of Eastern Passage, a narrow channel between Wrangell Island and mainland, 10 miles by water from Wrangell.

DRAINAGE AREA.—52 square miles as measured on U. S. Coast and Geodetic Survey chart 8200; 36 square miles as measured on maps of Alaska Boundary Tribunal and International Boundary Commission; the former is considered more reliable.

EXTREMES, 1915–1927.—Maximum discharge, 3,310 second-feet Oct. 16, 1915, estimated from extension of rating curve (gage height, 8.0 feet); minimum, 15 second-feet Feb. 11, 1916 (gage height 0.02 foot).

REMARKS.—Stage-discharge relation permanent; not affected by ice. Results good except those for estimated periods, which are fair. Lake Virginia, area 670 acres, lies at an altitude of 94 feet and 1 mile from tidewater.

Monthly discharge of Mill Creek near Wrangell

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1915				
June 17–30	662	346	478	13,300
July	610	291	442	27,200
August	1,910	278	645	39,700
September	1,780	236	639	38,000
The period				118,000
1915–16				
October	[a] 2,620	286	[b] 672	41,300
November	430	102	207	12,300
December	525	74	175	10,800
January	69	22	[b] 39.0	2,400
February	715	14	[b] 131	7,540
March	98	51	63.5	3,900
April	525	122	245	14,600
May	830	170	402	24,700
June	1,460	409	806	48,000
July	1,660	442	808	49,700
August	1,990	302	728	44,800
September	1,370	263	649	38,600
The year	2,620	14	410	299,000
1916–17				
October	1,510	168	[b] 674	41,400
November		[a] 89	[b] 248	14,800
December		[a] 52	[b] 98.9	6,080
January	[a] 180	[a] 51	[b] 89.7	5,520
February	[a] 1,230	[a] 48	[b] 231	12,800
March	[a] 70	[a] 40	[b] 51.2	3,150
April	[a] 400	[a] 34	[b] 137	8,150
May	965	[a] 280	[b] 524	32,200
June	1,340	439	667	39,700
July	1,660		[b] 723	44,500
August			[b] 788	48,500
September			[b] 725	43,100
The year		[b] 34	413	300,000

[a] From maximum or minimum stage indicated by recorder while clock was stopped.
[b] Partly estimated.

CASCADE CREEK AT THOMAS BAY, NEAR PETERSBURG

LOCATION.—Water-stage recorder on left bank one-fourth mile above tidewater on east shore of south arm of Thomas Bay and 22 miles by water from Petersburg.

DRAINAGE AREA.—21.4 square miles (Geological Survey map of Wrangell mining district, 1907).

EXTREMES, 1917–1928.—Maximum discharge recorded, 2,680 second-feet Sept. 4, 1924 (gage height, 8.7 feet); minimum, 17 second-feet about Apr. 6, 1918.

REMARKS.—Stage-discharge relation permanent, a natural rock weir forming a well-defined and permanent control; not affected by ice. Records good except those for periods when recorder did not operate satisfactorily, which are fair. Surveys made by the Forest Service show that Swan Lake, area 614 acres, lies 1,487 feet above higher high water and about 3 miles from Thomas Bay. The drainage area at the outlet of the lake is 17 square miles. A license for the development of the Cascade Creek power site was issued by the Federal Power Commission in 1923 to Hutton, McNear & Dougherty but was canceled in 1926.

Monthly discharge of Cascade Creek at Thomas Bay, near Petersburg

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1917–18				
October			[a] 589	36,200
November	1,720	144	657	39,100
December	128		[b] 73.8	4,540
January		38	[b] 65.9	4,050
February	54		[b] 27.3	1,520
March	24	19	20.3	1,250
April		18	[a] 50.5	3,000
May			[a] 195	12,000
June	675	220	482	28,700
July	770	280	532	32,700
August	1,470	292	656	40,300
September	1,300	175	400	23,800
The year	1,720	18	314	227,000
1918–19				
October	1,000	148	376	23,100
November	383	65	185	11,000
December	270		[b] 90.8	5,580
January			[a] 161	9,900
February		22	[b] 27.0	1,500
March	82		[b] 27.4	1,680
April		38	[b] 74.6	4,440
May			[a] 155	9,530
June	605	145	322	19,200
July	640	355	476	29,300
August	1,320	330	571	35,100
September	1,140	150	487	29,000
The year	1,320	22	248	179,000
1919–20				
October	1,110	92	334	20,500
November	342	42	102	6,070
December			[b] 72.5	4,460
January	192		[b] 77.9	4,790
February			[a] 60	3,450
March		25	[b] 32.7	2,010
April	86	23	34.1	2,030
May	305	48	99.4	6,110
June	710	250	[b] 441	26,200
July	675	355	549	33,800
August	2,460	220	676	41,600
September	588	109	332	19,800
The year	2,460	23	235	171,000
1920–21				
October	368	70	158	9,720
November	622	42	128	7,620
December	114	24	34.8	2,140
January	53		[a] 33.1	2,040
February		23	[a] 41.2	2,290
March		23	[b] 40.3	2,480
April	51	25	34.5	2,050
May	485	37	200	12,300
June	640	395	510	30,300
July	623	330	432	26,600
August			[b] 370	22,700
September	750	153	403	24,000
The year		23	199	144,000
1921–22				
October	2,010	112	566	34,800
November	485	39	124	7,380
December	455	37	147	9,040
January			[a] 50	3,070
February			[a] 25	1,390
March			[a] 20	1,230
April			[a] 65	3,870
May		42	[b] 181	11,100
June			[b] 310	18,400
July	605	330	[b] 473	29,100
August	1,220	318	502	30,900
September	692	183	395	23,500
The year	2,010		240	174,000

[a] Estimated.

[b] Partly estimated.

Monthly discharge of Cascade Creek at Thomas Bay, near Petersburg—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1922–23				
October	560	118	252	15,500
November	815	96	253	15,100
December	174	35	64.3	3,950
January	39	24	27.7	1,700
February	179	24	[b] 41.1	2,280
March	100	34	58.8	3,370
April	211	42	90.1	5,360
May	455	88	248	15,200
June	835	339	511	30,400
July	735	291	450	27,700
August	1,680	276	507	31,200
September			[a] 555	33,000
The year		24	255	185,000
1923–24				
October		80	385	23,700
November	545	72	238	14,200
December	174		[b] 78.0	4,800
January			[b] 36.5	2,240
February			[a] 25.0	1,440
March			[b] 44.7	2,750
April			[a] 65.0	3,870
May	1,060		[a] 292	18,000
June	[a] 920	[a] 350	[a] 594	35,300
July	[a] 915	[a] 410	[b] 529	32,500
August	1,160	276	517	31,800
September			[a] 684	40,700
The year			291	211,000
1924–25				
October	715	130	[b] 357	22,000
November	530	41	204	12,100
December	276	26	85.3	5,240
January			[b] 18.6	1,140
February			[a] 20.0	1,110
March	36		[b] 24.9	1,530
April	53	21	33.3	1,980
May	895	34	334	20,500
June	695	280	488	29,000
July	1,480	302	623	38,300
August	995	[a] 185	[b] 451	27,700
September	[a] 900	102	[b] 315	18,700
The year	1,480		248	179,000
1925–26				
October	595	76	210	12,900
November		75	[b] 184	10,900
December	935		[b] 346	21,300
January			[a] 405	24,900
February			[b] 74.1	4,120
March	265	84	139	8,550
April	935	84	272	16,200
May	655	162	288	17,700
June	715	184	410	24,400
July	675	302	412	25,300
August	735	222	326	20,000
September	935	59	231	13,700
The year	935		276	200,000
1926–27				
October	815	96	389	23,900
November	410		162	9,640
December			[a] 135	8,300
January			[a] 54	3,320
February			[a] 20	1,110
March			[b] 31.2	1,920
April	58	27	32.5	1,930
May	395	36	165	10,100
June	775	326	551	32,800
July	855	291	481	29,600
August	775	291	420	25,800
September	1,840	161	530	31,500
The year	1,840		249	180,000

[a] Estimated. [b] Partly estimated.

Monthly discharge of Cascade Creek at Thomas Bay, near Petersburg—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1927–28				
October	835	93	299	18,400
November	----------	32	[b] 84.5	5,030
December	----------	----------	[b] 32.4	1,990
January	----------	55	[b] 141	8,670
February	77	29	48.7	2,800
March	187	----------	[b] 66.0	4,060
April	179	41	71.7	4,270
May	1,180	102	365	22,400
June	875	352	571	34,000
July	1,780	302	588	36,200
August	1,280	209	442	27,200
September	915	132	424	25,200
The year	1,780	----------	262	190,000

[b] Partly estimated.

BARANOF ISLAND

MEDVETCHA RIVER [13] NEAR SITKA

LOCATION.—Water-stage recorder just above intake to pipe line that extends to power house of Sitka Wharf & Power Co. Staff gage used from 1920 to 1923 was just below power house. Gage-height record obtained by company.

DRAINAGE AREA.—39 square miles. (See fig. 5.)

EXTREMES, 1920–1922, 1928–1930.—Maximum discharge recorded, 1,510 second-feet Oct. 13, 1928 (gage height, 6.8 feet); minimum, 11 second-feet Mar. 30–31, 1922 (very uncertain).

REMARKS.—Stage-discharge relation practically permanent at each station, unaffected by ice; crest of a small diversion dam forms control at present gage. Records for 1920–1922 fair; for later years good. Blue Lake, with an area of about 500 acres, lies at an altitude of 250 feet, 1½ miles from Salmon Cove, Silver Bay.

Monthly discharge of Medvetcha River near Sitka

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1920				
September	1,120	71	370	22,000
1920–21				
October	1,320	100	374	23,000
November	1,320	46	306	18,200
December	303	34	90.3	5,550
January	195	24	84.9	5,220
February	325	24	113	6,280
March	186	16	64.5	3,970
April	293	40	127	7,560
May	1,040	76	416	25,600
June	1,360	694	894	53,200
July	982	589	725	44,600
August	1,120	440	665	40,900
September	1,850	395	728	43,300
The year	1,850	16	383	277,000
1921–22				
October	1,900	352	837	51,500
November	784	66	256	15,200
December	1,200	57	405	24,900
January	555	48	136	8,360
February	112	16	50.1	2,780
March	48	11	24.8	1,520
April	325	14	115	6,840
May	1,200	195	488	30,000
June	1,120	470	705	42,000
July	784	455	640	39,400
August	1,400	440	693	41,400
September	1,850	177	715	42,500
The year	1,900	11	425	308,000

[13] Also called Sawmill Creek.

Monthly discharge of Medvetcha River near Sitka—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1922 23				
October	1,160	149	354	21,800
November	1,320	164	483	28,700
December	380	47	137	8,420
January 1–18	67	28	42.4	1,510
1928				
January 23–31	201	137	163	2,910
February	708	92	248	14,300
March	420	73	180	11,100
April	776	123	231	13,700
May	946	267	615	37,800
June	1,060	708	825	49,100
July	1,200	536	763	46,900
August	1,200	335	669	41,100
September	1,030	278	717	42,700
The period				260,000
1928–29				
October	1,390	240	684	42,100
November	1,050	183	444	26,400
December	766	165	419	25,800
January	875	119	358	22,000
February	465	54	144	8,000
March	776	110	257	15,800
April	586	73	192	11,400
May	918	210	600	36,900
June	960	500	794	47,200
July	946	572	753	46,300
August	1,060	310	705	43,300
September	1,060	230	539	32,100
The year	1,390	54	493	357,000
1929–30				
October	1,150	224	832	51,200
November	1,150	240	747	44,400
December	804	82	249	15,300
January			[a] 307	18,900
February			[a] 200	11,100
March	633	37	139	8,550
April	1,020	101	293	17,400
May	860	230	565	34,700
June	946	658	772	45,900
July	890	593	719	44,200
August	1,160	393	656	40,300
September	1,270	294	704	41,900
The year	1,270	37	517	374,000

[a] Estimated.

GREEN LAKE OUTLET AT SILVER BAY, NEAR SITKA

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

DRAINAGE AREA.—40 square miles. (See fig. 5.)

EXTREMES, 1915–1924.—Maximum discharge recorded, 3,300 second-feet Sept. 26, 1918, computed from extension of rating curve (gage height, 13.0 feet); minimum, 10 second-feet Mar. 27–29, 1919.

REMARKS.—Stage-discharge relation permanent; unaffected by ice. Records good except those for periods when gage was not operating satisfactorily, which are fair. A survey made by the Forest Service in 1921 determined the altitude of Green Lake as 227 feet above high tide and its area as 157 acres. From the lake, which lies about 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.

Monthly discharge of Green Lake outlet at Silver Bay, near Sitka

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1915				
August 22–31	470	262	350	6,940
September	1,400	169	573	34,100
1915–16				
October	1,180		[a] 487	29,900
November		78	[a] 188	11,200
December	281	57	117	7,190
January			[b] 23.0	1,410
February	306		[a] 73.0	4,200
March			[b] 40.5	2,490
April	224	55	116	6,900
May	744	98	283	17,400
June	1,020	254	568	33,800
July	608	304	445	27,400
August	1,310	258	499	30,700
September	1,880	233	564	33,600
The year	1,880		284	206,000
1916–17				
October	1,120	166	471	29,000
November	695	95	210	12,500
December	330	30	96.6	5,940
January			[a] 76.1	4,680
February	470		[a] 120	6,660
March			[b] 50.0	3,070
April	278	15	74.3	4,420
May	751	152	310	19,100
June	662	286	475	28,300
July			[a] 491	30,200
August			[b] 526	32,300
September			[b] 620	36,900
The year			294	213,000
1917–18				
October		200	652	40,100
November	1,800	145	636	37,800
December	177	44	78.1	4,800
January	428	46	127	7,810
February	65	26	[a] 40.0	2,220
March	34	11	18.0	1,110
April	346	13	75.2	4,470
May		87	[a] 296	18,200
June	889		[a] 582	34,600
July	843		[a] 600	36,900
August		354	[a] 489	30,100
September			[b] 492	29,300
The year		11	342	247,000
1918–19				
October			[b] 420	25,800
November			[a] 378	22,500
December		64	[a] 190	11,700
January	1,580	51	231	14,200
February	59	18	37.9	2,100
March	30	10	[a] 14.8	910
April	294	66	126	7,500
May	528	97	255	15,700
June	652	172	358	21,300
July	706	303	488	30,000
August			[a] 452	27,800
September			[b] 500	29,800
The year		10	289	209,000
1919–20				
October			[a] 392	24,100
November			[b] 181	10,800
December		37	[a] 128	7,870
January	1,590		[a] 217	13,300
February			[a] 82.9	4,770
March	42	16	27.0	1,660
April			[a] 40.9	2,430
May	380		[a] 172	10,600
June	889	294	479	28,500
July	588	270	445	27,400
August	1,640		[a] 437	26,900
September			[b] 330	19,600
The year		16	245	178,000

[a] Partly estimated. [b] Estimated.

Monthly discharge of Green Lake outlet at Silver Bay, near Sitka—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1920–21				
October	885	188	[a] 282	17,300
November	1,480	65	[a] 254	15,100
December	275	25	[b] 73.6	4,530
January	270	----------	[a] 64.0	3,930
February	415	----------	[a] 112	6,220
March	125	----------	[a] 58	3,570
April	----------	----------	[b] 69	4,110
May	----------	----------	[b] 285	17,500
June	----------	----------	[a] 542	32,300
July	----------	----------	[a] 387	23,800
August	----------	----------	[b] 309	19,000
September	1,450	129	416	24,700
The year	----------	----------	239	172,000
1921–22				
October	1,510	226	[a] 571	35,100
November	547	47	160	9,520
December	1,280	48	293	18,000
January	508	32	91	5,600
February	116	34	44	2,440
March	80	12	27	1,660
April	----------	----------	[b] 83	5,100
May	----------	----------	[b] 352	21,600
June	774	286	466	27,700
July	----------	----------	[b] 462	28,400
August	----------	----------	[b] 500	30,700
September	2,300	133	551	33,900
The year	2,300	12	304	220,000
1922–23				
October	----------	----------	[a] 246	15,100
November	----------	----------	[b] 400	23,800
December	----------	32	[a] 82.3	5,060
January	----------	23	[a] 30.7	1,890
February	1,210	----------	[a] 110	6,110
March	499	37	117	7,190
April	684	110	219	13,000
May	662	110	341	21,000
June	----------	----------	[a] 510	30,300
July	----------	----------	[b] 390	24,000
August	----------	----------	[b] 250	15,400
September	1,540	----------	[a] 648	38,600
The year	1,540	23	278	201,000
1923–24				
October	----------	49	[a] 292	18,000
November	----------	----------	[a] 484	28,800
December	----------	62	[a] 182	11,200
January	346	49	97.5	6,000
February	182	76	[a] 119	6,840
March	206	----------	[a] 90.2	5,550
April	706	52	159	9,460
May	1,310	219	479	29,500
June	1,160	433	688	40,900
July	1,420	433	674	41,400
August	1,060	262	539	33,100
September	1,660	182	698	41,500
The year	1,660	49	375	272,000

[a] Partly estimated. [b] Estimated.

BARANOF LAKE OUTLET AT BARANOF

LOCATION.—Water-stage recorder 700 feet below Baranof Lake and 800 feet above tidewater at head of Warm Spring Bay, in latitude 57° 5′ N., longitude 134° 54′ W., at town site of Baranof, on east coast of Baranof Island, 18 miles east of Sitka across the island but 96 miles from Sitka by water through Peril Strait.

DRAINAGE AREA.—31 square miles. (See fig. 5.)

EXTREMES, 1915–1927.—Maximum discharge recorded, 4,170 second-feet Sept. 24, 1922 (gage height, 5.8 feet); minimum, 27 second-feet Jan. 31, 1923.

REMARKS.—Stage-discharge relation permanent; slightly affected by ice at times. Records good except those for periods when recorder did not operate satisfactorily and for periods when water was frozen in well, which are fair. From Baranof Lake, area 698 acres, which lies 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 feet concentrated fall. The drainage area is rough and precipitous and contains several small glaciers and ice-capped mountains.

Monthly discharge of Baranof Lake outlet at Baranof, Baranof Island

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1915				
July	1,480	568	759	46,700
August	3,000	----------	[a] 910	56,000
September	1,480	305	652	38,800
1915–16				
October	1,050	255	572	35,200
November	497	119	245	14,600
December	525	80	199	12,200
January	70	28	40.2	2,470
February	145	27	55.3	3,180
March	52	35	42.3	2,600
April	321	50	[a] 161	9,580
May	970	177	[a] 450	27,700
June	1,480	420	804	47,800
July	930	476	673	41,400
August	1,010	352	605	37,200
September	1,850	359	678	40,300
The year	1,850	27	378	274,000
1916–17				
October	930	248	524	32,200
November	737	139	300	17,900
December	157	58	99.4	6,110
January	----------	----------	[b] 78.2	4,810
February	----------	----------	[a] 90.4	5,020
March	62	34	47.4	2,910
April	352	31	99.7	5,930
May	1,050	279	504	31,000
June	930	480	719	42,800
July	1,280	444	724	44,500
August	1,540	460	745	45,800
September	2,000	261	745	44,300
The year	2,000	31	391	283,000
1917–18				
October	1,380	306	683	42,000
November	2,000	245	664	39,500
December	208	50	[a] 90.1	5,540
January	----------	----------	[a] 129	7,930
February	----------	----------	[b] 66	3,670
March	----------	30	[a] 38.4	2,360
April	155	30	99.8	5,940
May	930	147	436	26,800
June	1,230	545	879	52,300
July	1,380	725	980	60,300
August	1,540	568	773	47,500
September	2,510	312	722	43,000
The year	2,510	30	466	337,000
1918–19				
October	1,880	245	675	41,500
November	2,250	118	550	32,700
December	930	----------	[a] 210	12,900
January	----------	----------	[b] 280	17,200
February	----------	----------	[b] 60	3,300
March	----------	----------	[b] 30	1,840
April	----------	----------	[a] 210	12,500
May	970	187	490	30,100
June	930	396	649	38,600
July	----------	----------	[a] 827	50,800
August	----------	----------	[b] 750	46,100
September	1,940	252	756	45,000
The year	1,940	----------	459	333,000

[a] Partly estimated. [b] Estimated.

Monthly discharge of Baranof Lake outlet at Baranof, Baranof Island—Con.

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1919–20				
October	2,320	183	575	35,400
November			[a] 184	10,900
December			[b] 138	8,480
January			[a] 226	13,900
February	165	53	[a] 98.7	5,680
March	57	34	45.7	2,810
April	208	32	75.9	4,520
May	695	181	317	19,500
June	1,010	522	719	42,800
July	1,050	460	[a] 760	46,700
August	1,380	291	581	35,700
September	1,100	137	407	24,200
The year	2,320	32	345	251,000
1920–21				
October	930	141	346	21,300
November	1,940		[b] 380	22,600
December			[b] 55	3,380
January			[b] 80	4,920
February			[b] 120	6,660
March		30	[a] 63.6	3,910
April	243	63	[a] 143	8,510
May	803	165	433	26,600
June	1,620	720	[a] 983	58,500
July			[a] 729	44,800
August	883	399	574	35,300
September	2,250	312	726	43,200
The year	2,250		389	282,000
1921–22				
October		350	[a] 1,260	77,500
November			[a] 189	11,200
December			[a] 428	26,300
January	218	65	105	6,460
1922–23				
October	1,330	194	413	25,400
November	1,480	217	546	32,500
December	358	60	113	6,950
January	99	27	63.8	3,920
February	362	28	77.2	4,290
March		68	[a] 138	8,480
April	891	147	293	17,400
May	891	222	526	32,300
June	1,230	484	714	42,500
July	1,010	495	686	42,200
August	1,590	379	591	36,300
September	[b] 3,050	[b] 250	[a] 983	58,500
The year	[b] 3,050	27	429	311,000
1923–24				
October			[b] 890	54,700
November			[b] 530	31,500
December		95	[a] 200	12,300
January	110	61	828	5,090
February			[b] 750	4,310
March			[b] 100	6,150
April	492	77	133	7,910
May	1,540	344	649	39,900
June	1,430	651	990	58,900
July	1,710	701	1,030	63,300
August	1,280	404	695	42,700
September	1,830	261	849	50,500
The year			520	377,000
1924–25				
October	1,540	229	607	37,300
November	1,010	64	300	17,900
December	1,230	52	273	16,800
January			[b] 45.0	2,770
February			[b] 35.0	1,940
March	122		[a] 74.1	4,560
April	224	50	101	6,010
May	1,330	229	601	37,000
June	1,480	542	832	49,500
July	1,650	515	862	53,000
August	891	255	560	34,400
September	1,010	167	441	26,200
The year	1,650		397	287,000

[a] Partly estimated. [b] Estimated.

Monthly discharge of Baranof Lake outlet at Baranof, Baranof Island—Con.

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1925–26				
October	1,590	141	421	25,900
November	1,710	----------	[a] 695	41,400
December	1,650	153	504	31,000
January	2,070	255	743	45,700
February	891	105	245	13,600
March	576	222	313	19,200
April	791	130	432	25,700
May	1,330	344	652	40,100
June	1,480	429	709	42,200
July	1,330	470	683	42,000
August	----------	----------	[a] 487	29,900
September	----------	----------	[b] 357	21,200
The year	2,070	105	497	378,000
1926–27				
October	1,650	----------	[a] 692	42,500
November	971	56	370	22,000
December	1,140	53	371	22,800
January	821	64	185	11,400
February	----------	----------	[a] 69.0	3,830
March	181	67	[a] 110	6,760
April	177	64	122	7,260
May	891	127	457	28,100
June	1,380	606	937	55,800
July	971	510	717	44,100
August	731	362	474	29,100
September	2,310	297	687	40,900
The year	2,310	----------	435	315,000

[a] Partly estimated. [b] Estimated.

COAL CREEK AT CASCADE BAY

LOCATION.—Water-stage recorder just above sheer fall of 87 feet at mouth of creek at Cascade Bay, in latitude 57° 2′ N., longitude 134° 46′ W., 6 miles south of town of Baranof, on east side of Baranof Island.

DRAINAGE AREA.—27 square miles. (See fig. 5.)

EXTREMES, 1922–1926.—Maximum discharge recorded, 4,800 second-feet Sept. 30, 1923 (gage height, 7.60 feet); no record of minimum.

REMARKS.—Stage-discharge relation permanent, practically unaffected by ice. Rating curve defined only between about 300 and 1,000 second-feet. Records fair. Carbon Lake, area 400 acres, lies at an altitude of about 200 feet and about half a mile from tidewater.

Monthly discharge of Coal Creek at Cascade Bay

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1922–23				
October	1,490	271	521	32,000
November	1,740	274	576	34,300
December	----------	----------	[a] 113	6,950
January	----------	----------	[a] 64	3,940
February	----------	----------	[a] 77	4,280
March	----------	108	[b] 164	10,100
April	1,120	175	[b] 337	20,100
May	910	245	519	31,900
June	1,120	470	676	40,200
July	----------	580	[b] 815	50,100
August	----------	590	938	57,700
September	4,530	580	1,750	104,000
The year	4,530	----------	546	396,000

[a] Estimated. [b] Partly estimated.

Monthly discharge of Coal Creek at Cascade Bay—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1923–24				
October	3,140	201	[b]1,110	68,200
November	1,700	192	664	39,500
December			[b]245	15,100
January			[a]82.8	5,090
February			[a]75.0	4,310
March			[a]100	6,150
April	386	112	168	10,000
May	1,560	302	564	34,700
June	1,320	630	923	54,900
July	1,910	685	1,070	65,800
August			[a]799	49,100
September			[b]926	55,100
The year	3,140		561	408,000
1925				
May	1,030	252	518	31,900
June	1,520	490	739	44,000
July	1,770	540	910	56,000
August	1,150	311	726	44,600
The period				176,000
1925–26				
October	1,910	190	553	34,000
November	1,770	192	673	40,000
December	1,600	175	507	31,200
January	1,840	274	787	48,400
February	1,000	146	267	14,800
March	535	218	310	19,100
April	740	154	420	25,000
May	1,280	308	624	38,400
June	1,740	400	756	45,000
July	1,660	600	914	56,200
August	1,000	558	757	46,500
September	1,210	178	496	29,500
The year	1,910	146	591	428,000

[a] Estimated. [b] Partly estimated.

CHICHAGOF ISLAND

FALLS CREEK AT NICKEL

LOCATION.—Water-stage recorder 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.

EXTREMES, 1918–1920.—Maximum discharge recorded, 665 second-feet Sept. 26, 1918 (gage height, 3.45 feet); minimum, 3.2 second-feet Mar. 12, 1919.

REMARKS.—Gage is 20 feet upstream from rectangular weir, the crest of which is 40 feet long. Stage-discharge relation changed Feb. 17, 1920; the average altitude of crest of weir was disturbed by ice forming on crest of weir for short periods during extremely cold weather. Records fair. Station maintained in cooperation with Alaska Nickel Mines Co.

Monthly discharge of Falls Creek at Nickel

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1918				
May 6–31	258	62	101	5,210
June	162	50	80.1	4,770
July	106	23	44.9	2,760
August	408	35	104	6,400
September	414	28	104	6,190
The period				25,300

Monthly discharge of Falls Creek at Nickel—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1918–19				
October	156	39	78.8	4,850
November	465	31	a103	6,130
December	235	30	81.1	4,990
January	229	----------	a66.3	4,080
February	----------	10	a24.2	1,340
March	----------	6	a17.5	1,080
April	211	24	67.0	3,990
May	127	----------	a60.7	3,730
June	49	25	37.5	2,230
July	72	15	37.3	2,290
August	120	14	47.8	2,940
September	458	15	111	6,600
The year	465	6	61.1	44,200
1919–20				
October	465	28	115	7,070
November	183	11	46.5	2,770
December	----------	14	a54.7	3,360
January	570	----------	a96.3	5,920
February	----------	28	a95.2	5,480
March	42	18	24.5	1,510
April	107	----------	a38.1	2,270
May	225	35	70.6	4,340
June 1–13	101	44	76.8	1,980
The period	----------	----------	----------	34,700

a Partly estimated.

PORCUPINE CREEK NEAR NICKEL

LOCATION.—Water-stage recorder half a mile from 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.

EXTREMES, 1918–1920.—Maximum discharge recorded, 1,180 second-feet Jan. 7, 1930 (gage height, 4.25 feet); minimum, 24 second-feet Mar. 19, 28, 1919.

REMARKS.—Gage is at edge of deep pool formed by contraction of channel where stream passes over exposed bedrock and descends in a series of small falls. Head of falls forms a well-defined and permanent control. Stage-discharge relation practically permanent; not seriously affected by ice. Records fair.

Monthly discharge of Porcupine Creek near Nickel

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1918				
May 21–31	224	88	126	2,750
June	191	98	128	7,620
July	139	58	a87.9	5,400
August	545	60	140	8,610
September	505	82	170	10,100
The period	----------	----------	----------	34,500
1918–19				
October	175	96	124	7,620
November	658	88	179	10,700
December	----------	----------	a130	7,990
January	206	54	104	6,400
February	52	33	41.2	2,290
March	39	25	28.9	1,780
April	133	43	66.3	3,950
May	126	89	102	6,270
June	94	77	82.0	4,880
July	112	66	86.5	5,320
August	133	52	86.3	5,310
September	537	76	218	13,000
The year	658	25	104	75,500

a Partly estimated.

Monthly discharge of Porcupine Creek near Nickel—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1919–20				
October	650	93	228	14,000
November	----------	----------	[a] 91.8	5,460
December	----------	----------	[a] 99.5	6,120
January	930	----------	[a] 213	13,100
February	185	----------	[a] 102	5,870
March	70	36	51.5	3,170
April	56	35	44.2	2,630
May	81	53	66.8	4,110
June	100	74	87.8	5,220
July	93	47	67.8	4,170
August 1–21	162	58	121	5,040
The period	----------	----------	----------	68,800

[a] Partly estimated.

MAINLAND NORTH OF FREDERICK SOUND

SWEETHEART FALLS CREEK AT PORT SNETTISHAM

LOCATION.—Water-stage recorder 300 feet from tidewater and 2 miles below outlet of Sweetheart Lake, on east shore 1 mile from head of south arm of Port Snettisham, 3 miles south of mouth of Whiting River, and 42 miles by water from Juneau.

DRAINAGE AREA.—27 square miles (map of Juneau gold belt, 1905).

EXTREMES, 1915–1927.—Maximum discharge recorded, 2,880 second-feet Sept. 26, 1918 (gage height, 7.15 feet); minimum (estimated by current-meter measurement and climatic data), 15 second-feet Feb. 11, 1916.

REMARKS.—Stage-discharge relation permanent; occasionally affected by ice. Records excellent except those for periods of break in record and for discharge above 1,300 second-feet, which are fair. Sweetheart Lake, area 1,257 acres, lies 531 feet above higher high water and about 2 miles from mouth of creek, according to survey by Forest Service in 1921.

Monthly discharge of Sweetheart Falls Creek near Snettisham

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1915				
August	1,330	284	501	30,800
September	1,090	194	524	31,200
1915–16				
October	1,070	147	412	25,300
November	280	87	[a] 168	10,000
December	161	65	101	6,210
January	55	23	[a] 38.3	2,360
February	----------	18	[a] 38.1	2,190
March	----------	----------	[a] 43.0	2,640
April	----------	----------	[a] 156	9,280
May	788	189	368	22,600
June	1,120	424	787	46,800
July	----------	----------	[a] 501	30,800
August	----------	----------	[a] 582	35,800
September	1,090	283	636	37,800
The year	1,120	18	319	232,000
1916–17				
October	1,220	233	621	38,200
November	369	100	194	11,500
December	139	27	87.7	5,390
January	84	18	[a] 56.5	3,480
February	242	48	127	7,010
March	80	30	[a] 49.5	3,010

[a] Partly estimated.

Monthly discharge of Sweetheart Falls Creek near Snettisham—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1918				
May 21–31	1,120	246	510	11,100
June	990	456	753	44,800
July	805	442	623	38,300
August	1,440	300	666	41,000
September	2,470	199	619	36,800
The period				172,000
1918–19				
October	780	176	376	23,100
November	1,220	104	393	23,400
December	625	88	193	11,900
January	945	74	256	15,700
February	82	43	53.9	2,990
March	60	29	42.2	2,590
April	400	82	[a] 147	8,750
May	645	159	342	21,000
June	785	324	535	31,800
July	865	488	613	37,700
August	968	324	577	35,500
September	1,170	196	604	35,900
The year	1,220	29	346	250,000
1919–20				
October	2,010	125	489	30,100
November	488	60	154	9,160
December	435	39	136	8,360
January	1,040	----------	[a] 227	14,000
February	178	50	93.4	5,370
March	53	----------	[a] 39.3	2,420
April	135	28	50.9	3,030
May	505	113	237	14,600
June	865	424	622	37,000
July	865	348	568	34,900
August	1,530	255	640	39,400
September	1,190	90	418	24,900
The year	2,010	28	308	223,000
1920–21				
October	777	117	349	21,500
November	1,150	64	275	16,400
December	127	29	53.0	3,260
January	93	39	[a] 63.0	3,870
February	166	42	[a] 95.0	5,280
March	160	35	[a] 64.0	3,940
April	141	70	115	6,840
May	733	144	395	24,300
June	854	489	630	37,500
July	693	370	[a] 479	29,500
August	895	245	428	26,300
September	733	183	425	25,300
The year	1,150	29	282	204,000
1921–22				
October	1,360	193	598	36,800
November	380	[b] 70	[a] 163	9,700
December	753	58	292	18,000
January	100	76	91	5,600
February	----------	----------	[b] 30.0	1,670
March	----------	----------	[b] 25.0	1,540
April	----------	----------	[b] 115	6,840
May	956	186	419	25,800
June	1,060	426	677	40,300
July	956	384	574	35,300
August	1,060	345	551	33,900
September	----------	----------	[b] 525	31,200
The year	----------	----------	341	247,000

[a] Partly estimated.

[b] Estimated.

Monthly discharge of Sweetheart Falls Creek near Snettisham—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1922–23				
October	----------	240	[a] 346	21,300
November	1,130	170	403	24,000
December	324	60	116	7,130
January	90	46	57.9	3,560
February	473	59	[a] 93.6	5,200
March	363	61	133	8,180
April	557	104	230	13,700
May	874	195	475	29,200
June	999	437	626	37,200
July	754	315	483	29,700
August	978	255	362	22,300
September	1,410	288	710	42,200
The year	1,410	46	336	244,000
1923–24				
October	----------	----------	[b] 495	30,400
November	----------	140	[a] 488	29,000
December	380	95	203	12,500
January	----------	----------	[a] 67.3	4,140
February	----------	----------	[b] 40.0	2,300
March	----------	----------	[a] 74.4	4,570
April	----------	----------	[a] 115	6,840
May	1,280	----------	586	36,000
June	1,240	538	829	49,300
July	1,240	538	774	47,600
August	1,100	334	585	36,000
September	1,410	226	821	48,900
The year	1,410	----------	424	308,000
1924–25				
October	814	212	458	28,200
November	854	64	287	17,100
December	500	----------	[a] 163	10,000
January	----------	----------	[b] 38.5	2,370
February	----------	----------	[b] 30.0	1,670
March	90	----------	44.8	2,750
April	120	----------	84.1	5,000
May	[b] 1,400	114	[a] 477	29,300
June	936	465	692	41,200
July	1,280	370	637	39,200
August	734	157	372	22,900
September	1,130	145	423	25,200
The year	[b] 1,400	----------	311	225,000
1925–26				
October	694	[b] 110	304	18,700
November	538	198	353	21,000
December	1,320	133	491	30,200
January	----------	----------	[a] 574	35,300
February	303	90	144	8,000
March	430	138	263	16,200
April	1,280	118	422	25,100
May	714	252	363	22,300
June	774	306	451	26,800
July	451	270	344	21,200
August	366	240	301	18,500
September	774	80	238	14,200
The year	----------	80	356	258,000
1926–27				
October	1,320	108	489	30,100
November	[b] 720	[b] 35	[b] 313	18,600
December	[b] 850	[b] 35	[a] 223	13,700
January	334	[b] 50	[a] 108	6,640
February	----------	----------	[b] 37.3	2,070
March	157	56	77.3	4,750
April	175	57	97.3	5,790
May	854	104	396	24,300
June	1,020	[b] 540	767	45,600
July	694	318	[a] 481	29,600
August	557	252	342	21,000
September	2,070	200	592	35,200
The year	2,070	----------	328	237,000

[a] Partly estimated. [b] Estimated.

SPEEL RIVER AT PORT SNETTISHAM

LOCATION.—Water-stage recorder 150 feet to left of constriction of river at entrance of canyon one-fourth mile downstream from mouth of Long River and 8 miles upstream from tide flats and cabins of Speel River Project (Inc.), which are at head of north arm of Port Snettisham, 42 miles by water from Juneau.

DRAINAGE AREA.—200 square miles (International Boundary Commission map).

EXTREMES, 1916–1918.—Maximum discharge (estimated by multiplying maximum discharge at Long River Sept. 27, 1928, by 6.8, the ratio between the maximum discharges at Speel and Long Rivers Aug. 30, 1918), 35,600 second-feet Sept. 27, 1918; minimum, 127 second-feet Mar. 28–31, 1918.

REMARKS.—Stage-discharge relation permanent except for stages below about 1,000 second-feet, when frequent measurements are necessary to estimate the flow; ice does not form at control. The river is restricted from a width of 500 feet to 75 feet at entrance of canyon. This constriction of channel and rock outcrop at entrance of canyon form a very sensitive and permanent control. The extreme range in stage is 28 feet. Results fair for periods when gage was operating satisfactorily; poor for periods when clock was not running. The upper valleys of the two main tributaries, North and East Forks, are filled with glaciers, which flow from large ice fields along the international boundary. The lower valley above the canyon, half a mile below the mouth of Long River, is broad and flat, and the bed of the valley is loose sand. Bed of river in main channel at entrance of canyon is 143 feet above tidewater.

Monthly discharge of Speel River at Port Snettisham

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1916				
July	9,200	4,130	[a] 5,420	333,000
August	11,700	4,010	7,050	433,000
September	12,600		[a] 6,220	370,000
The period				1,140,000
1916–17				
October	7,530		[a] 2,890	178,000
November			[a] 760	45,200
December			[b] 420	25,800
January			[a] 356	21,900
February			[b] 500	27,800
March			[a] 170	10,500
April			[a] 329	19,600
May	3,530	920	1,700	105,000
June			[a] 3,570	212,000
July			[a] 5,670	349,000
August			[b] 8,500	523,000
September	16,000		[a] 5,120	305,000
The year	16,000		2,500	1,820,000
1917–18				
October			[a] 4,230	260,000
November	12,100		[a] 3,550	211,000
December			[b] 500	30,700
January			[a] 378	23,200
February	206	166	181	10,100
March	173	127	141	8,670
April	1,000	600	[a] 357	21,200
May	4,130	690	1,570	96,500
June			[b] 3,960	236,000
July			[a] 6,300	387,000
August		3,890	[a] 7,400	455,000
September			[b] 7,150	425,000
The year			2,980	2,160,000

[a] Partly estimated. [b] Estimated.

LONG LAKE OUTLET AT PORT SNETTISHAM

LOCATION.—Water-stage recorder 30 feet upstream from crest of falls at outlet of Long Lake, 5 miles upstream from mouth of Long River, and 2 miles by trail and water from head of north arm of Port Snettisham, which is 42 miles by water from Juneau.

DRAINAGE AREA.—31.9 square miles (Alaska Boundary Tribunal map).

EXTREMES, 1913–1915.—Maximum discharge recorded, 4,250 second-feet Oct. 20, 1913; minimum, 32 second-feet several days in January and February, 1914.

REMARKS.—Stage-discharge relation permanent; unaffected by ice. Records for 1914 and 1915 fair, for 1913 poor. The outlet from the lake consists of two narrow channels separated by a small island. The stream bed consists of rock and large boulders and breaks off abruptly into high falls. Long Lake, with an area of 1,345 acres, lies 815 feet above mean sea level and 2 miles by conduit line from tidewater at the head of the north arm of Port Snettisham. The Long Lake power site is one of a group for which a license was authorized by the Federal Power Commission in 1930 to George T. Cameron.

Monthly discharge of Long Lake outlet at Port Snettisham

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1913				
February	----------	70	120	6,660
March	297	75	143	8,790
April	185	85	131	7,800
May	1,000	108	449	27,600
June	1,770	579	1,120	66,600
July	2,740	----------	1,900	117,000
August	3,170	1,000	1,760	108,000
September	2,410	600	1,270	75,600
The period	----------	----------	----------	418,000
1913–14				
October	4,250	210	1,150	70,700
November	919	134	375	22,300
December	352	62	163	10,000
January	65	32	50.0	3,070
February	240	32	57.8	3,770
March	124	37	83.3	5,120
April	171	46	111	6,600
May	413	240	338	20,800
June	1,040	315	724	43,100
July	1,950	630	1,210	74,400
August	2,220	670	1,060	65,200
September	1,190	276	629	37,400
The period	4,250	32	501	362,000
1914–15				
October	1,290	264	554	34,100
November	630	132	273	16,200
December	257	56	121	7,440
January	----------	----------	[a]96	5,900
February	----------	----------	[a]46	2,650
March	----------	----------	[a]125	7,690
April	428	----------	202	12,000
May	754	132	529	32,500
June	1,190	556	841	50,000
July	1,650	712	1,100	67,600
August	3,210	712	1,260	77,500
September	1,950	490	1,000	59,500
The year	3,210	----------	515	373,000
1915				
October	1,350	132	507	31,200
November 1–10	264	96	183	3,630

[a] Estimated by comparison with records on Crater Creek.

LONG RIVER BELOW SECOND LAKE, AT PORT SNETTISHAM

LOCATON.—Water-stage recorder on right bank half a mile below outlet of Second Lake, 1 mile downstream from outlet of Long Lake, half a mile upstream from head of Indian Lake, and 45 miles by water from Juneau.

DRAINAGE AREA.—33.2 square miles (Alaska Boundary Tribunal map).

EXTREMES, 1916–1924, 1927–1930.—Maximum discharge (estimated from extension of rating curve), 6,000 second-feet Sept. 10, 1927 (gage height, 10.2 feet); minimum discharge recorded, 24 second-feet at time of meter measurement Feb. 4, 1916; discharge probably fell to less than 20 second-feet during a part of January, 1930.

REMARKS.—Stage-discharge relation permanent; generally affected by ice during January, February, March, April, and December of each year. Records for 1916 to 1922 and 1928 to 1930 good, except those for periods of break in record, which are fair; records for 1923 to 1927 fair. The area draining into 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.

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

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1915–16				
October	1,400	137	527	32,400
November	274	82	136	8,090
December	134	----------	[a] 98.2	6,040
January	----------	----------	[a] 49.9	3,070
February	----------	----------	[b] 49.4	2,840
March	----------	----------	[b] 50	3,070
April	172	87	129	7,680
May	612	138	253	15,600
June	1,460	387	864	51,400
July	1,660	580	855	52,600
August	1,690	660	1,070	65,800
September	2,110	520	1,040	61,900
The year	2,110	----------	428	310,000
1916–17				
October	1,520	194	605	37,200
November	284	86	145	8,630
December	121	63	[a] 86.4	5,310
January	183	53	[a] 87.6	5,390
February	263	60	[a] 130	7,220
March	85	37	51.9	3,190
April	----------	----------	[a] 66.5	3,960
May	680	----------	[a] 335	20,600
June	885	467	695	41,400
July	1,410	660	995	61,200
August	2,580	740	1,290	79,300
September	2,370	478	923	54,900
The year	2,580	37	454	328,000
1917–18				
October	1,720	182	652	40,100
November	1,960	192	660	39,300
December	154	76	[a] 94.6	5,820
January	225	59	[a] 97.5	6,000
February	----------	----------	[b] 41	2,280
March	----------	24	[b] 26	1,600
April	----------	----------	[a] 71.1	4,230
May	930	175	[a] 300	18,400
June	998	405	744	44,300
July	1,380	600	1,070	65,800
August	2,480	660	1,220	75,000
September	4,130	509	1,060	63,100
The year	4,130	24	505	366,000

[a] Partly estimated.
[b] Estimated from records on Crater Creek and Sweetheart Falls Creek.

Monthly discharge of Long River below Second Lake, at Port Snettisham—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1918–19				
October	1,260	134	504	31,000
November	1,440	103	342	20,400
December	474	108	181	11,100
January	720		[a] 209	12,900
February			[b] 55	3,050
March			[b] 50	3,070
April			[b] 125	7,440
May			[a] 309	19,000
June	820	317	[a] 545	32,400
July			[b] 864	53,100
August			[b] 1,050	64,600
September			[b] 1,000	59,500
The year			437	318,000
1919–20				
October		141	[a] 526	32,300
November	565	62	[a] 192	11,400
December		63	[a] 128	7,870
January			[b] 180	11,100
February	204	50	94.7	5,450
March			[a] 45.6	2,800
April		38	[b] 52	3,090
May	420		[a] 235	14,400
June	800	426	580	34,500
July	1,110	700	918	56,400
August	3,760	530	1,200	73,800
September	1,690	152	641	38,100
The year	3,760	38	401	291,000
1920–21				
October	1,040	117	381	23,400
November	1,190	86	262	15,600
December			[b] 60	3,690
January			[b] 68	4,180
February			[b] 95	5,280
March			[b] 69	4,240
April			[a] 282	16,800
May	558	282	388	23,900
June	984	489	715	42,500
July	1,350	562	851	52,300
August	1,930	597	857	52,700
September	1,300	314	709	42,100
The year	1,930		396	287,000
1921–22				
October	1,970	269	688	42,300
November	513		[a] 208	12,400
December	700	112	278	17,100
January			[b] 91	5,600
February			[b] 30	1,670
March			[b] 25	1,540
April			[a] 116	6,900
May	780		[a] 405	24,900
June	930	530	705	42,000
July	1,360	700	912	56,100
August	1,930	700	1,050	64,600
September	1,750	280	829	49,300
The year	1,970		448	324,000
1922–23				
October	1,020	285	476	29,300
November		264	[a] 523	31,100
December			[b] 104	6,400
January			[b] 62	3,810
February	480		[b] 85	4,720
March			[b] 117	7,190
April			[a] 179	11,000
May	640	331	436	26,800
June	1,180	495	724	43,100
July	1,630	680	930	57,200
August		680	[a] 973	59,800
September			[b] 1,140	67,800
The year			480	348,000

[a] Partly estimated. [b] Estimated from records on Crater Creek and Sweetheart Falls Creek.

Monthly discharge of Long River below Second Lake, at Port Snettisham—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1923–24				
October			[a] 563	34,600
November	1,240	244	521	31,000
December			[b] 221	13,600
January			[b] 78.0	4,800
February			[b] 50.0	2,880
March			[b] 90.0	5,530
April			[b] 135	8,030
May	1,750	405	575	35,400
June	1,410	495	910	54,100
July	2,110	780	1,170	71,900
August	1,930	604	[a] 1,050	64,600
September			[b] 1,080	64,300
The year			538	391,000
1927				
June	1,210	510	893	53,100
July	1,260	740	960	59,000
August	1,410	720	966	59,400
September	4,330	220	960	57,100
The period				229,000
1927–28				
October	970	127	347	21,300
November	346		[a] 126	7,500
December			[c] 50	3,070
January	578	[b] 40	[a] 186	11,400
February	455	[b] 40	[a] 137	7,880
March	455	35	[a] 121	7,440
April	413	129	219	13,000
May	1,760	276	554	34,100
June	1,240	530	815	48,500
July	3,820	700	1,080	66,400
August	2,110	500	[a] 887	54,500
September		470	[a] 831	49,400
The year	3,820	35	447	324,000
1928–29				
October	980	230	525	32,300
November	518	217	364	21,700
December	440	200	315	19,400
January	445	38	[a] 197	12,100
February	124	27	[a] 42.8	2,380
March	163	65	105	6,460
April	168		83.1	4,940
May	588	157	348	21,400
June	1,310	374	826	49,200
July	1,800	640	885	54,400
August			[c] 836	51,400
September	1,940	285	[a] 754	44,900
The year	1,940	27	443	321,000
1929–30				
October	2,170	430	1,080	66,400
November	1,360	192	486	28,900
December	580		[a] 144	8,860
January			[c] 20	1,230
February			[c] 45	2,500
March			[c] 60	3,690
April	288	63	[a] 136	8,090
May	600	170	317	19,500
June	1,340	520	712	42,400
July	1,610	640	900	55,300
August	2,640	600	1,080	66,400
September	1,560	320	820	48,800
The year	2,640		486	352,000

[a] Partly estimated.
[b] Estimated from records on Crater Creek and Sweetheart Falls Creek.
[c] Estimated from records on Crater Creek and climatic data.

CRATER CREEK AT PORT SNETTISHAM

LOCATION.—Water-stage recorder on left shore of lake 100 feet upstream from outlet of Crater Lake, 1 mile upstream from edge of tide flats at head of north arm of Port Snettisham, and 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; 13 square miles above staff stage at beach (Alaska Boundary Tribunal map).

EXTREMES, 1913–1920, 1923, 1927–1930.—Maximum discharge (estimated from extension of rating curve), 3,100 second-feet Sept. 9, 1927 (gage height, 8.25 feet); minimum discharge recorded, 5.0 second-feet Feb. 4, 1916, and Feb. 13, 1919; minimum discharge Jan. 26–31, 1930, estimated as 3 second-feet.

REMARKS.—Stage-discharge relation practically permanent; gage is 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. Because of inaccessible location and deep snow, the gage at the lake could not be operated during the winter. A staff gage at beach was read at times (see footnote to discharge table); this was replaced in March, 1929, by a water-stage recorder. Crater Lake, with an area of 500 acres, is 1,021 feet above sea level. The sides of the mountains surrounding the lake are steep and barren, and the tops are covered by glaciers. The Crater Creek power site is one of a group of three for which a license was authorized by the Federal Power Commission in 1930 to George T. Cameron, of San Francisco.

Monthly discharge of Crater Creek at Port Snettisham

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1913				
February	85	23	47	2,610
March	94	24	48.3	2,970
April	81	36	57.3	3,410
May	400	51	203	12,500
June	794	377	531	31,600
July	1,100	----------	[a] 830	51,000
August	1,390	528	858	52,800
September	741	196	491	29,200
The period	----------	----------	----------	186,000
1913–14				
October	1,400	35	260	16,000
November	200	36	108	6,430
December	76	16	38.2	2,350
January	42	6	[b] 20.9	1,290
February	333	12	[b] 45	2,500
March	62	22	[b] 36.7	2,260
April	113	17	[b] 52.8	3,140
May	280	94	144	8,850
June	429	94	272	16,200
July	815	350	517	31,800
August	815	221	409	25,100
September	692	94	266	15,800
The year	1,400	6	182	132,000
1914–15				
October	692	94	313	19,200
November	253	48	104	6,190
December	70	10	[b] 23.9	1,470
January	55	16	[b] 36.1	2,220
February	42	10	[b] 17.2	955
March	62	32	[b] 44.6	2,740
April	120	47	[b] 74	4,400
May	327	49	235	14,400
June	710	203	414	24,600
July	762	282	497	30,600
August	1,680	272	469	28,800
September	762	159	389	23,100
The year	1,680	10	219	159,000

[a] Partly estimated.
[b] Record obtained at beach, drainage area 13 square miles.

Monthly discharge of Crater Creek at Port Snettisham—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1915–16				
October	832	37	185	11,400
November	161		[a] 44.9	2,670
December			[c] 33	2,030
January			[c] 18	1,110
February			[c] 18	1,040
March			[c] 19	1,170
April			[c] 44	2,620
May			[c] 90	5,530
June			[c] 370	22,000
July	850	231	370	22,800
August	885	221	464	28,500
September			[c] 470	28,000
The year			170	124,000
1916–17				
October	990	108	270	16,600
November	101		[a] 51.2	3,050
December	46		[a] 32.7	2,010
January	69	21	[b] 34.9	2,150
February	82	18	[b] 44.5	2,470
March	45	12	[b] 22.5	1,380
April	70	12	[b] 23.8	1,420
May	280	60	[b] 142	8,730
June	443	183	305	18,100
July	723	229	441	27,100
August	1,070	265	539	33,100
September		183	[a] 361	21,500
The year	1,070	12	214	138,000
1917–18				
October	710	70	251	15,400
November			[c] 250	14,900
December			[c] 35	2,150
January		15	[b] 33.2	2,040
February	26	10	[b] 16.8	933
March	15	10	[b] 12.7	781
April	80	10	[b] 20.7	1,230
May	900	34	[b] 129	7,930
June	554	129	347	20,600
July	642	251	482	29,600
August	1,450	282	591	36,300
September		186	411	24,500
The year	1,450	10	219	156,000
1918–19				
October	562	58	202	12,400
November	662	35	133	7,910
December	206	29	[b] 65.4	4,020
January	200	26	[b] 68.4	4,210
February	35	5	[a] 14.6	811
March			[c] 12	738
April			[c] 47	2,800
May			[a] 118	7,260
June	350	105	217	12,900
July	728	261	417	25,600
August			[a] 511	31,400
September			[c] 420	25,000
The year		5	187	135,000
1919–20				
October		52	[a] 209	12,900
November	251		[a] 67	3,990
December			[c] 45	2,770
January			[c] 100	6,150
February			[c] 35	2,010
March			[c] 16	984
April			[c] 20	1,190
May			[a] 53.4	3,280
June	594	95	177	10,500
July	532	293	406	25,000
August	1,720	178	532	32,700
September	798	54	262	15,600
The year	1,720		161	117,000

[a] Partly estimated.
[b] Record obtained at beach, drainage area 13 square miles.
[c] Estimated by comparison with records on Long River and Sweetheart Falls Creek.

Monthly discharge of Crater Creek at Port Snettisham—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1920				
October	350	40	140	8,610
November	402	25	91.8	5,460
December	33	----------	[a] 24.7	1,520
1923				
June	550	141	297	17,700
July	834	329	452	27,800
August	995	341	483	29,700
September	1,720	----------	[a] 502	29,900
The period	----------	----------	----------	105,000
1927				
June 18–30	564	290	416	10,700
July	516	248	377	23,200
August	660	222	357	22,000
September	2,280	----------	[a] 352	20,900
The period	----------	----------	----------	76,800
1927–28				
October	----------	----------	[c] 135	8,300
November	----------	----------	[c] 48	2,860
December	----------	----------	[c] 25	1,540
January	470	12	[b] 88.7	5,450
February	140	12	[b] 30.7	1,770
March	160	8	[b] 40.3	2,460
April	130	10	[b] 42.3	2,520
May	600	60	[a] 193	11,900
June	595	260	381	22,700
July	2,340	213	528	32,500
August	1,260	160	[a] 377	23,200
September	612	160	[a] 343	20,400
The year	2,340	8	187	136,000
1928–29				
October	438	44	194	11,900
November	250	39	113	6,720
December	187	49	81.9	5,040
January	220	14	[a] 76.0	4,670
February	59	12	[b] 19.1	1,060
March	70	24	[b] 49.4	3,030
April	57	19	[b] 29.3	1,740
May	162	47	91.9	5,650
June	620	164	382	22,700
July	1,120	290	419	25,800
August	668	230	404	24,800
September	1,040	118	347	20,600
The year	1,120	12	185	134,000
1929–30				
October	1,040	166	463	28,500
November	920	73	222	13,200
December	250	----------	[a] 60.2	3,700
January	----------	[c] 3	[b] 4.9	301
February	----------	----------	[b] 9.0	500
March	----------	----------	[b] 14.7	904
April	78	18	[a] 34.4	2,050
May	216	47	104	6,400
June	495	228	308	18,300
July	885	254	420	25,800
August	1,600	250	484	29,800
September	762	125	359	21,400
The year	1,600	[c] 3	208	151,000

[a] Partly estimated.
[b] Record obtained at beach, drainage area 13 square miles.
[c] Estimated by comparison with records on Long River and Sweetheart Falls Creek.

DOROTHY CREEK AT TAKU INLET

LOCATION.—Water-stage recorder 100 feet upstream from extreme high tide of Taku Inlet and 18 miles by water from Juneau.

DRAINAGE AREA.—16 square miles (map based on plane-table surveys by Wendell Dawson for George T. Cameron, in connection with application to Federal Power Commission for license).

EXTREMES, 1929–30.—Maximum discharge recorded, 847 second-feet Aug. 14, 1930 (gage height, 5.72 feet); minimum not definitely recorded.

REMARKS.—Stage-discharge relation practically permanent; somewhat affected by ice during extremely cold weather. Records excellent except those for estimated periods, which are fair. Dorothy Lake, area 960 acres, lies at an altitude of 2,415 feet less than 3 miles from shore; Lieuy Lake, 80 acres, at 1,710 feet; and Bart Lake, 250 acres, at 890 feet. (See pl. 3.) The drainage area is 10.7 square miles at the outlet of Dorothy Lake and 14.6 square miles at the outlet of Bart Lake. The Dorothy Lake power site was included along with the Long and Crater Lake sites in the license authorized by the Federal Power Commission to George Cameron in 1930.

Monthly discharge of Dorothy Creek at Taku Inlet

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1929–30				
October	748	150	342	21,000
November	233	106	152	9,040
December	128	18	64.4	3,960
January	18	----	[a] 10.6	652
February	----	----	[a] 13.2	733
March	65	----	[a] 20.8	1,280
April	72	29	48.1	2,860
May	112	51	75.2	4,620
June	298	118	197	11,700
July	507	232	330	20,300
August	815	245	373	22,900
September	482	204	283	16,800
The year	815	----	160	116,000

[a] Estimated.

GRINDSTONE CREEK AT TAKU INLET

LOCATION.—Water-stage recorder on left bank 200 feet from tidewater, 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 (Alaska Gastineau Mining Co.'s map of vicinity of Juneau).

EXTREMES, 1916–1920.—Maximum discharge (estimated from extension of rating curve), 700 second-feet Sept. 26, 1918 (gage height, 6.0 feet); minimum, 2.6 second-feet Apr. 5–7, 1918.

REMARKS.—Gage is at upper end of a turbulent pool between two falls, the lower of which forms a well-defined control. Stage-discharge relation permanent; sometimes affected by ice. Records fair except those for periods of break in record and discharge above 150 second-feet, which are poor. For a distance of one-fourth mile from tidewater the stream descends in a series of rapids and falls through a narrow rocky channel.

Monthly discharge of Grindstone Creek at Taku Inlet

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1916				
May 6–31	74	21	38.9	2,010
June 1–16	112	60	84.6	2,680
September 6–30	206	25	72.3	3,590
1916–17				
October	251	37	79.5	4,890
November	49	19	29.3	1,740
December	----	----	[a] 15.5	953
January	18	6.6	9.50	584
February	83	6.4	14.7	816
March	8.2	5.7	7.03	432
April	46	5.0	15.2	904
May	142	24	49.0	3,010
June	131	56	81.9	4,870
July	205	50	86.9	5,340
August	358	30	[a] 90.7	5,580
September	118	22	[a] 43.0	2,560
The year	358	5.0	43.8	31,700

[a] Partly estimated.

Monthly discharge of Grindstone Creek at Taku Inlet—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1917-18				
October	168	40	64.7	3,980
November	214	21	[a] 82.3	4,900
December	28	10	[a] 16.0	984
January	20	7.7	[a] 12.2	750
February	8.4	4.4	6.24	347
March	4.3	2.7	3.05	188
April	21	2.6	7.19	428
May	95	12	38.5	2,370
June	90	47	64.9	3,860
July	51	27	36.6	2,250
August	314	34	68.8	4,230
September	365	23	68.1	4,050
The year	365	2.7	39.1	28,300
1918-19				
October	----------	----------	[b] 55.0	3,380
November	----------	19	[a] 39.0	2,320
December	68	----------	[a] 24.8	1,530
January	56	10	19.3	1,190
February	10	3.5	7.00	389
March	----------	3.0	[a] 3.82	235
April	52	----------	[a] 19.3	1,150
May	48	17	31.8	1,960
June	71	29	54.6	3,250
July	130	45	69.9	4,300
August	85	28	48.8	3,000
September	----------	21	[a] 68.0	4,050
The year	----------	3.0	36.9	26,800
1919-20				
October	260	21	61.9	3,810
November	----------	14	[a] 22.3	1,330
December	34	8.0	14.7	904
January	83	----------	[a] 16.6	1,020
February	32	5.0	12.1	696
March	8.0	4.5	6.12	376
April	62	3.5	11.5	684
May	72	16	34.8	2,140
June	186	55	81.7	4,860
July	120	24	51.4	3,160
August	174	24	53.0	3,260
September	81	16	31.4	1,870
The year	260	3.5	33.2	24,100
1920				
October	61	17	26.7	1,640
November	66	13	26.1	1,550
December	13	----------	[a] 7.74	476

[a] Partly estimated. [b] Estimated.

CARLSON CREEK AT SUNNY COVE, TAKU INLET

LOCATION.—Water-stage recorder on left bank 2 miles from tidewater, at Sunny Cove, on west shore of Taku Inlet, 20 miles by water from Juneau.

DRAINAGE AREA.—22.3 square miles (surveys by Alaska Gastineau Mining Co.).

EXTREMES, 1916–1920.—Maximum discharge (computed from extension of rating curve), 6,200 second-feet Sept. 26, 1918 (gage height, 8.1 feet); minimum (estimated from climatic data and hydrographs for streams in near-by drainage basins), 10 second-feet Apr. 1–7, 1918.

REMARKS.—Stage-discharge relation permanent; generally affected by ice from January to May. Records good except those for stages below 70 second-feet and above 2,000 second-feet and for periods of break in record, which are fair. A possible site for a dam exists just below the junction of two forks about 2 miles from tidewater at the rocky outlet of a flat gravel basin. The stream bed at this point is 310 feet above high tide. A dam 100 feet high would form a reservoir having a storage capacity of 15,000 acre-feet.

Monthly discharge of Carlson Creek at Sunny Cove

Month	Discharge in second-feet			Run-off in acre-feet, total
	Maximum	Minimum	Mean	
1916				
July 18–31	1,670	347	604	16,800
August	970	286	533	32,800
September	1,540	234	640	38,100
1916–17				
October	1,430	138	455	28,000
November	404	58	122	7,260
December	104	43	[a] 58.2	3,600
January			[b] 50	3,070
February			[b] 80	4,440
March			[b] 40	2,460
April			[b] 60	3,570
May	930	125	374	23,000
June	1,020	465	704	41,900
July	1,830	389	848	52,100
August	2,510	338	838	51,500
September	2,520	183	601	35,800
The year	2,520		355	257,000
1917–18				
October	1,530	138	487	29,900
November	2,440	128	486	28,900
December			[b] 64	3,940
January	175	27	66.6	4,100
February			[b] 18	1,000
March			[b] 11	676
April			[b] 45.2	2,690
May	1,250	86	282	17,300
June	1,340	405	779	46,400
July	1,000	485	[a] 762	46,900
August	1,670	345	739	45,400
September	4,110	185	[a] 634	37,700
The year	4,110		366	265,000
1918–19				
October			[a] 360	22,100
November			[b] 270	16,100
December			[b] 125	7,690
January			[b] 137	8,420
February			[b] 28	1,560
March			[b] 20	1,230
April			[b] 96.5	5,740
May			[a] 327	20,100
June	780	367	581	34,600
July	1,020		[a] 688	42,300
August	1,510	250	620	38,100
September	3,150	102	617	36,700
The year	3,150		324	235,000
1919–20				
October	3,160		[a] 412	25,300
November			[b] 130	7,740
December			[b] 106	6,520
January			[b] 110	6,760
February			[b] 42	2,420
March			[b] 18	1,110
April			[b] 25	1,490
May			[b] 240	14,800
June	1,080		[a] 724	43,100
July	928	455	687	42,200
August	3,950	210	733	45,100
September	1,690	117	414	24,600
The year	3,950		305	221,000
1920				
October	812	98	265	16,300
November	1,000		[a] 161	9,580
December			[b] 33	2,030

[a] Partly estimated.
[b] Estimated from climate records and comparisons with other stations.

SHEEP CREEK NEAR THANE

LOCATION.—Water-stage recorder on right bank at pool formed by artificial control at lower end of a flat basin, 0.3 mile above diversion dam for flume leading to power plant belonging to Alaskan Juneau Gold Mining Co., and 1 mile by tramway and ore railway from Thane.

DRAINAGE AREA.—4.57 square miles (topographic map of Juneau and vicinity).

EXTREMES, 1916–1920.—Maximum discharge (estimated from extension of rating curve), 820 second-feet Sept. 26, 1918 (gage height, 3.5 feet); minimum, 1.0 second-foot Apr. 6–8, 1917.

REMARKS.—Stage-discharge relation somewhat changeable because of shifting of gravel bed above artificial control. Control covered with ice and snow for short period. Records fair.

Monthly discharge of Sheep Creek near Thane

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1916				
August	126	51	77.5	4,770
September	227	43	94.5	5,620
1916–17				
October	246	38	83.9	5,160
November	55	22	32.3	1,920
December	21	11	14.8	910
January	10.8	1.6	5.68	349
February	74	2.6	19.6	1,090
March	17	2.6	9.21	566
April	43	1.0	9.18	546
May	141	36	60.0	3,690
June	139	68	90.3	5,370
July	176	64	99.4	6,110
August	219	55	96.5	5,930
September	270	39	84.3	5,020
The year	270	1.0	50.6	36,700
1917–18				
October	236	41	89.7	5,520
November	387	31	107	6,370
December	41	9	[a] 18.3	1,130
January	14	8.7	10.3	633
February	9.5	5.2	6.92	384
March	5.1	3.5	[a] 4.26	262
April	9.2	----------	[a] 5.91	352
May	272	9.5	63.6	3,910
June	192	64	103	6,130
July	----------	48	[a] 69.3	4,260
August	304	41	86.4	5,310
September	440	27	76.4	4,550
The year	440	----------	53.6	38,800
1918–19				
October	116	31	65.2	4,010
November	220	----------	[a] 62.9	3,740
December	----------	----------	[a] 37.7	2,320
January	75	15	29.6	1,820
February	13	6.6	7.87	437
March	----------	4.0	[a] 4.92	303
April	86	4.0	25.3	1,510
May	96	30	61.4	3,780
June	----------	----------	[a] 86.8	5,160
July	134	72	96.3	5,920
August	141	52	76.3	4,690
September	252	32	91.8	5,460
The year	252	4.0	54.0	39,100

[a] Partly estimated.

Monthly discharge of Sheep Creek near Thane—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1919–20				
October	379	23	ª 86.8	5,340
November	----------	13	ª 28.2	1,680
December	35	----------	17.5	1,080
January	175	13	ª 33.5	2,060
February	19	13	ª 15.5	892
March	----------	6.9	9.81	603
April	22	5.6	7.70	458
May	101	20	47.6	2,930
June	192	77	116	6,900
July	151	53	85.5	5,260
August	238	43	84.0	5,160
September	151	23	ª 55.6	3,310
The year	379	5.6	49.2	35,700
1920				
October	121	26	52.2	3,210
November	134	16	44.7	2,660
December	16	8	ª 11.4	701

ª Partly estimated.

GOLD CREEK AT JUNEAU

LOCATION.—Water-stage recorder on left bank at upstream side of 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 (surveys by Alaska Gastineau Mining Co.).

EXTREMES, 1916–1920.—Maximum discharge (estimated from extension of rating curve), 2,600 second-feet Sept. 26, 1918 (gage height, 6.8 feet); minimum, 0.9 second-foot Mar. 26, 1918.

REMARKS.—Stage-discharge relation somewhat unstable; affected by ice at times. Records fair. Water diverted at several points upstream for 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 Alaska-Juneau Gold Mining Co. A dam 20 feet downstream diverts water into the flume of the Alaska Electric Light & Power Co. No storage or diversions above station regulate the flow more than a few hours in low water.

Monthly discharge of Gold Creek at Juneau

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1916				
July 20–31	472	120	203	4,830
August	323	127	209	12,900
September	494	108	226	13,400
1916–17				
October	545	67	177	10,900
November	140	21	45.8	2,730
December	22	8	13.2	812
January	13	5.2	ª 7.85	483
February	206	4	ª 27	1,500
March	13	5.8	8.42	518
April	68	4	17.3	1,030
May	295	43	118	7,260
June	308	139	216	12,900
July	444	116	251	15,400
August	600	107	220	13,500
September	560	50	157	9,340
The year	600	4	105	76,400

ª Partly estimated.

Monthly discharge of Gold Creek at Juneau—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1917–18				
October	470	41	139	8,550
November	587	42	158	9,400
December	58	6	[a] 18.7	1,150
January	30	6	11.1	682
February			[b] 4	222
March			[b] 1	61
April	39		[a] 7.8	464
May	432	16	105	6,460
June	555	59	212	12,600
July	307	128	209	12,900
August	615	91	260	16,000
September	1,520	48	195	11,600
The year	1,520		111	80,100
1918–19				
October	300	30	113	6,950
November	700	35	[a] 118	7,020
December	143	16	[a] 34.3	2,110
January	86	12	26.6	1,640
February			[a] 9.54	530
March			[b] 5	307
April			[b] 35	2,080
May	152	22	79.8	4,910
June	240	88	159	9,460
July	340	153	237	14,600
August	365	115	176	10,800
September	490	60	192	11,400
The year	700		99.1	71,800
1919–20				
October	725	20	115	7,070
November	230	12	39	2,320
December	93	12	27	1,660
January	434		[a] 47.6	2,930
February	32	8.6	[a] 14.4	828
March	7	1.9	3.91	240
April	33	1.5	[a] 10.4	619
May	149	25	64.5	3,970
June	480	164	248	14,800
July	350	169	256	15,700
August	1,000	72	[a] 252	15,500
September	552	30	161	9,580
The year	1,000	1.5	104	75,200
1920				
October	262	29	89.7	5,520
November	480	23	106	6,310
December	19	5.6	11	676

[a] Partly estimated.
[b] Estimated from climatic records and comparisons with other stations.

SHERMAN CREEK AT KENSINGTON MINE

LOCATION.—Vertical staff gage fastened in center of flume at Kensington mine, on east shore of Lynn Canal one-fourth mile downstream from mouth of Ophir Creek, 1 mile above mouth of creek, and 12 miles north of Berners Bay. The creek at this point flows through a flume 10 feet wide and 20 feet long, constructed for the purpose of affording a better section for making discharge measurements.

DRAINAGE AREA.—3.65 square miles (Berners Bay special topographic map).

EXTREMES, 1914–1916.—Maximum discharge, 208 second-feet Oct. 15, 1915 (gage height, 2.0 feet); minimum, 2.8 second-feet Jan. 25 to Feb. 10, 1916.

REMARKS.—Stage-discharge relation permanent; not affected by ice. The entire flow at all stages passes through the flume. A free fall at lower end of flume forms a permanent control for gage. Records fair.

Monthly discharge of Sherman Creek at Kensington mine

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1914				
August 17–31	70	21	37.5	1,120
September	75	14	30.1	1,790
1914–15				
October	128	14	32.8	2,020
November	----------	----------	[a] 18.3	1,090
December	12	4.2	6.05	372
January	26	4.7	9.81	603
February	5.0	3.3	3.95	219
March	104	3.5	28.7	1,760
April	90	12	39.3	2,340
May	63	11	42.4	2,610
June	63	20	38.1	2,270
July	31	18	24.6	1,510
August	180	17	44.9	2,760
September	133	14	45.6	2,710
The year	180	3.3	28.0	20,300
1915–16				
October	208	13	48.5	2,980
November	31	7.0	15.3	910
December	11	5.0	7.21	443
January	5.3	2.8	3.85	237
February	63	2.8	11.3	650
March	5.3	3.1	3.57	220
April	67	5.3	17.5	1,040
May	97	15	51.8	3,190
June	163	54	83.6	4,970
July	----------	----------	[b] 50.0	3,070
August	101	28	55.4	3,410
September	133	----------	62.7	3,730
The year	----------	2.8	34.2	24,800
1916				
October	148	----------	[a] 49.7	3,060
November	186	5.3	26.7	1,590
December	16	----------	5.89	362

[a] Partly estimated.

[b] Estimated.

The following table presents a summary of yearly discharge at most of the stations for which records are given above:

Yearly discharge, in second-feet per square mile, of streams in southeastern Alaska for the years ending Sept. 30, 1914 to 1930

No. on map	Station	Drainage area (square miles)	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	Average
2	Karta River at Karta Bay	49.5	------	------	9.2	8.8	11.8	9.9	8.3	8.5	------	------	------	------	------	------	------	------	------	9.42
3	Ketchikan Creek at Ketchikan	15	------	------	13.0	12.7	16.5	15.4	------	------	------	------	------	------	------	------	------	------	------	14.4
4	Beaver Falls Creek at George Inlet	5.9	------	------	------	------	------	------	------	17.3	19.5	19.0	21.4	16.3	------	------	16.7	16.1	16.5	17.8
5	Mahoney Creek at George Inlet	5.9	------	------	------	------	------	------	------	14.5	16.6	19.2	22.5	18.1	------	16.9	17.8	17.8	15.1	17.6
6	Swan Lake outlet at Carroll Inlet	38.7	------	------	------	10.7	[a]13.9	12.1	10.0	10.3	12.4	12.9	14.0	10.8	------	------	11.5	10.3	11.3	11.7
7	Fish Creek at Thorne Arm	32.1	------	------	13.1	11.7	15.3	12.4	11.2	11.2	12.6	13.3	15.4	12.4	14.8	12.1	12.6	10.9	12.5	12.8
8	Ella Creek at Behm Canal	20.4	------	------	------	------	------	------	------	------	------	------	------	------	------	------	11.9	10.3	11.4	11.2
9	Manzanita Creek at Manzanita Bay	32.7	------	------	------	------	------	------	------	------	------	------	------	------	------	------	14.2	12.2	13.5	13.3
10	Grace Creek at Behm Canal	33.6	------	------	------	------	------	------	------	------	------	------	------	------	------	------	11.9	10.1	12.1	11.4
11	Orchard Creek at Shrimp Bay	59	------	------	10.0	8.6	11.5	9.9	9.0	8.9	------	10.2	11.2	8.8	------	------	------	------	------	9.79
14	Short Creek at Short Bay	20	------	------	------	------	------	------	------	------	------	11.3	13.0	------	------	------	------	------	------	12.2
15	Shelockum Lake outlet at Bailey Bay	18	------	------	11.4	9.8	14.1	11.9	12.3	11.1	------	12.8	12.9	------	------	------	------	------	------	12.0
18	Cascade Creek at Thomas Bay	21.4	------	------	------	------	14.7	11.6	11.0	9.3	11.2	11.9	13.6	11.6	12.9	11.6	12.2	------	------	12.0
19	Medvetcha River near Sitka	39	------	------	------	------	------	------	------	9.8	10.9	------	------	------	------	------	------	9.8	13.9	11.1
20	Green Lake outlet at Silver Bay	40	------	------	7.1	7.4	8.6	7.2	6.1	6.0	7.6	7.0	9.4	------	------	------	------	------	------	7.38
21	Baranof Lake outlet at Baranof	31	------	------	12.2	12.6	15.0	14.8	11.1	12.5	------	13.8	16.8	12.8	16.0	14.0	------	------	------	13.8
22	Coal Creek at Cascade Bay	27	------	------	------	------	------	------	------	------	------	20.2	20.8	------	21.9	------	------	------	------	21.0
25	Sweetheart Falls Creek at Port Snettisham	27	------	------	11.8	[a]15.2	[a]14.2	12.8	11.4	10.4	12.6	12.4	15.7	11.5	13.2	12.2	------	------	------	12.8
26	Speel River at Port Snettisham	200	------	------	------	12.5	14.9	------	------	------	------	------	------	------	------	------	------	------	------	13.7
27-28	Long River at Port Snettisham	31.9–33.2	15.7	16.1	12.9	13.7	15.2	13.2	12.1	11.9	13.5	14.5	16.2	[b]12.4	[b]14.6	[a]13.5	13.5	13.3	14.6	13.9
29	Crater Creek at Port Snettisham	11.9	15.3	18.4	14.3	18.0	18.4	15.7	13.5	------	------	------	------	------	------	------	15.7	15.6	17.5	16.2
30	Dorothy Creek at Taku Inlet	16.0	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	10.2	10.2
31	Grindstone Creek at Taku Inlet	3.6	------	------	------	12.2	10.9	10.2	9.2	------	------	------	------	------	------	------	------	------	------	10.6
32	Carlson Creek at Sunny Cove, Taku Inlet	22.3	------	------	------	15.9	16.4	14.5	13.7	------	------	------	------	------	------	------	------	------	------	15.1
33	Sheep Creek near Thane	4.57	------	------	------	11.1	11.7	11.8	10.8	------	------	------	------	------	------	------	------	------	------	11.4
35	Sherman Creek at Kensington mine	3.65	------	7.7	9.4	------	------	------	------	------	------	------	------	------	------	------	------	------	------	8.55

[a] Partly estimated.

[b] Estimated from records on Sweetheart Falls Creek.